ELECTRIC AIR DUCT HEATER INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS

ELTRON
Chromalox®

1. INSTALLATION INSTRUCTIONS

1.1 Attention is drawn to the Health and Safety at Work Act 1974, the Factories Act 1961, the Regulations made under these Acts and also any other appropriate statutory requirements or bylaws. These place responsibility for complying with specific safety requirements on the manufacturer and the user.

1.2 Heaters are manufactured with great care from the highest quality materials and thoroughly inspected before leaving our works. They must be handled with care and stored in dry conditions as befits any electrical apparatus and not exposed to wet or damp atmospheres. Before installation and commissioning it is advisable that the elements be checked to ensure that the insulation readings are above 2 meg ohms per element at 500 Volts DC. If there is an unacceptable low insulation reading on any of the elements, it will be necessary to dry them out. For procedures, see: Maintenance, Paragraph 3.3.

1.3 Flanged/Full Case type heaters are bolted to the duct by means of an externally flanged frame which matches turned out duct mounting flanges as illustrated in Figure 1.

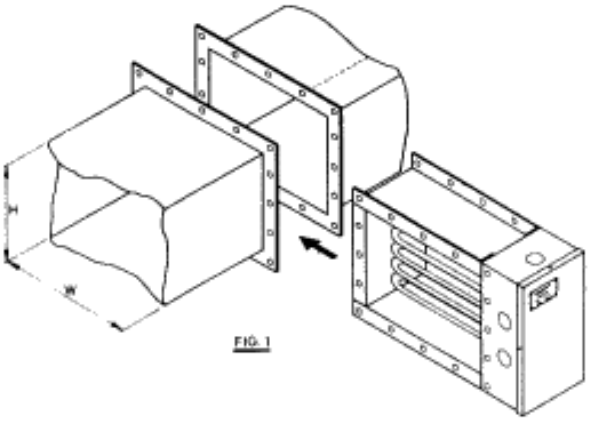

FIG. 1

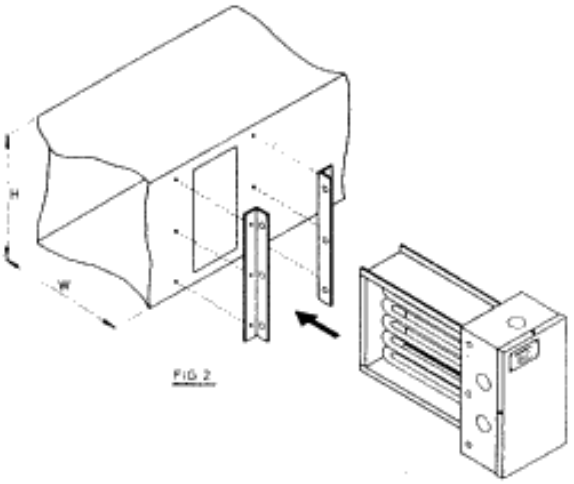

FIG. 2

1.4 Stab-in type heaters are fitted through an opening in the side of the duct as illustrated in Figure 2. The units are mounted to the duct with angle section (supplied by others). Where duct widths (W) exceed 600mm, additional support brackets or rails within the duct are recommended. Ensure that fixings through into the terminal enclosure do not protrude into the enclosure more than 15mm.

1.5 ...e heater unit should NOT be mounted outdoors where exposed to the weather, or where it is likely to suffer severe shock/vibration or explosive/hazardous atmospheres or corrosive/dust laden environments, unless it has been specifically designed for the application.

1.6 Heaters are designed for installation in either horizontal or vertical ducts but when mounting the units into the duct work the terminal enclosure should be at the side of the ducting and in such a manner that the thermal cutout capillary is at the highest position possible protecting the area above the heater bank. Position of the thermal cutout capillary can be altered by repositioning securing clips, if fitted.

1.7 Ensure that the ducting is strong enough to support the additional weight of the heater. On externally insulated ducts, a section of the insulation must be removed or adequate reinforcement added to the outer cleading. If insulation is removed, the terminal enclosure sides and top must not be insulated.

1.8 When installing heaters, sufficient clearance must be allowed for access to the terminal enclosure and to enable the heater bundle to be withdrawn from the duct.

1.9 Ensure that the mains supply available corresponds with the supply voltage on the heater nameplate and ensure that the size of the supply cables, fuses and contactors are adequate for the electrical load they carry.

1.10 Incoming cables must be connected to the terminations by means of cable lugs to ensure that they are secured from loosening or twisting, so that the contact pressure is permanently maintained.

...s not recommended that general purpose PVC cables be run into the terminal enclosure, but cables should be Butyl, EP or Silicone ...ber or, preferably, mineral insulated cables.

1.11 Where the heater is divided into several control stages, the overheat cutout must be wired into the first heater stage, i.e. the stage which is continuously switched on whilst the heater is energised. It must be so wired into the control system in series with the coil of the main contactor, such that complete shutdown of the heater is ensured in the event of overheating and the supply cannot be re-energised until the system is re-set. If more than one cutout is fitted, these should be wired in series.

1.12 Check that a sufficiently good earth connection is made to the heater by means of the earth facility provided in the terminal enclosure. Earthing is to comply with latest IEE Regulations.

1.13 When the controls for the heaters are being installed, it should be arranged so that they are interlocked with the fan controls so that the heater cannot be switched on if the fan is stationary. It is recommended that if the heater is in a confined space, or if the ambient temperature is high, a time delay relay should be fitted into the fan control allowing the fan to continue running for a period after the heater has been switched off so that residual heat remaining in the elements is dispersed and the thermal cutout is not activated.

1.14 **Airflow Requirements**

A minimum air velocity is required at all points across the duct heater face. This is essential for trouble-free operation. Inadequate air distribution across the face of the duct heater in operation will cause nuisance tripping of the thermal cutout/s and possible element burnout.

1.15 **Hints on Obtaining Uniform Airflow**

Duct heaters should be installed at least 1200mm downstream from heat pump, central air conditioner, air handler discharge and branch take-off ducts.

They should also be installed at least 1200m downstream and 600mm upstream from duct turns, transition sections, dampers, filters, baffle plates, fan outlets and flexible duct connectors.

When heaters are installed within these specified limits directional vanes are recommended which will reduce pressure losses and ensure that the air velocity is uniformly distributed over the cross section of the duct.

1.16 **Multiple Heaters in Ducts.**

Flanged/Full case type heaters may be combined in multiples of two to four when larger horizontal or vertical ducts are used, as illustrated in Fig.3. Joining plates can be fabricated to join the units together as shown in Fig. 4.

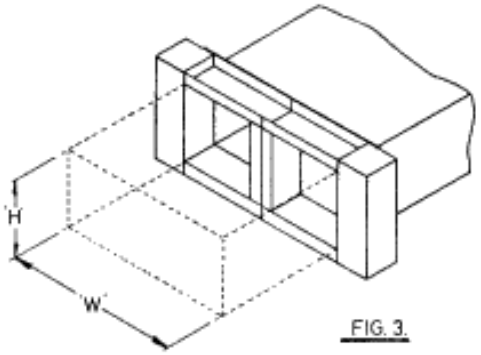

FIG. 3.

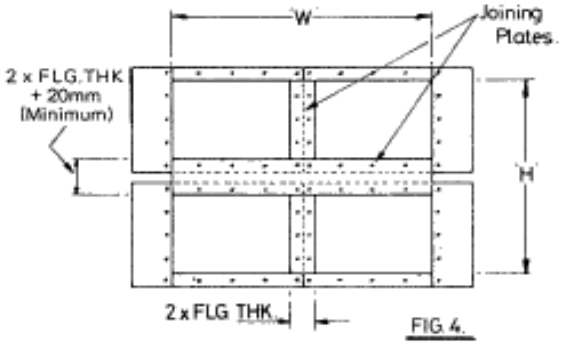

FIG. 4.

1.17 **Installation with Duct Transitions**

When the heater unit is larger than the ductwork, the duct area must be increased by sheet metal transition sections. The incline of these transformation sections, on upstream and downstream, should not be more than 30°. The result of larger inclines can be a nuisance tripping of thermal cutouts with possible element burnout.

1.18 **Installation In Ducts Larger Than Heater**

When the duct dimensions exceed the stab-in type heater, the area beyond the heater dimensions can be filled with wire mesh, expanded or perforated sheet metal of 70-80% free area. This will maintain a uniform resistance across the duct face area and ensures adequate and uniform airflow across the heater.

The filler material must not exceed 20% of the total duct free area.

1.19 When installing heaters having terminal enclosures which are stood off from the framework, the stand off area between the terminal enclosure and framework must not be enclosed or insulated.

2. OPERATING INSTRUCTIONS

2.1 Generally the elements in the heater units are wired in stages such that varying numbers can be switched on or off as the heat requirement varies. These stages can be controlled, either manually or automatically and the installer and operator should be familiar with the type of control fitted.

2.2 All foreign matter must be removed from the duct before initial use of the duct heater system. Failure to remove such matter may cause a potential hazard and result in heater failure if carried through the duct to the heater.

2.3 **Electrical Checks Prior to Start-up.**

2.3.1 **Insulation Resistance (Megger)**

The megger should be applied between phase and earth, with any control supplies disconnected from the power supply, the insulation resistance shall be measured with a voltage of not less than 500v d.c. and should be above 2 meg ohms divided by the number of heating elements. Should the insulation resistance be below this value, then the elements should be individually checked for insulation resistance to identify those that will need drying out. For procedure see: Maintenance, Paragraph 3.3.

2.3.2 **Continuity**

Check that the ohms per phase on each stage are approximately equal and correct.

2.4 **.ult Finding**

If the control system cycles or trips during initial start-up there is insufficient airflow or incorrect distribution across the entire face of the heater. In the event of a shutdown caused by over-heating the MAIN ISOLATOR MUST BE SWITCHED OFF BEFORE checking the fan. The duct work should be checked for obstructions of the airflow, air filters checked for blockage and the control system inspected to determine the cause of overheating BEFORE the unit is put back into operation. Do not forget to manually reset the thermal cutout within the terminal enclosure.

2.5 Always switch "OFF" the main isolator before removing the heater unit terminal enclosure lid.

3. MAINTENANCE INSTRUCTIONS

3.1 *"THE HEATER MUST BE SWITCHED OFF AT THE MAINS ISOLATOR BEFORE ANY MAINTENANCE IS CARRIED OUT."*

3.2 It is essential to periodically check all the electrical connections in the terminal enclosures for tightness and to ensure that there are no signs of overheating etc.

3.3 Heating elements should periodically be examined to ensure insulation and continuity readings are satisfactory if the heater has been shut down for any length of time.

If there is an unacceptably low insulation reading on any of the elements, it will be necessary to dry them out using the following procedure.

1. Remove the ceramic sealing bead from each end of the element.
2. Completely scrape out the silicone sealing compound down to the white powdered magnesium oxide.
3. Ensure that all loose debris is removed from the element ends.
4. Connect the elements to a low voltage (say 50 volts) supply in order to heat the element to between 100 and 200° and drive out the moisture. This operation should be continued for approximately 12 hours or until the resistance to earth is greater than 2 meg ohms.
5. Important Note: Priming of element ends should be carried out as soon as possible after drying out to avoid ingress of moisture.
6. Eltron Primer (Part No. 112470) is to be applied to the element ends, i.e. to the internal face of the sheath, the surface of the dead within the sheath and the surface of the insulant (magnesium oxide).
7. A thin film of the primer will give the best seal. Film thickness can be estimated by the colour; the thicker the film the darker the tint. The correct thickness should give only a pale tinge to the surface.
8. Allow the primer to cure at normal temperature and humidity conditions for 1 ½ hours before sealing the elements.
9. Fill the end cavity of the element with Eltron Silastic sealing compound (Part No. 113800) to ensure complete potting.
10. Fit sealing bead by pushing down and rotating (to ensure complete wiping of bead) until it is seated in the top of the element sheath.
11. Fit clamping nut above sealing bead (half nut).
12. Wipe excess sealant from around joint of bead.
13. Allow sealant to cure for a minimum period of 24 hours before subjecting to any inspection/running procedures.

3.4 Check all incoming cables for damage and replace where necessary.

3.5 **Removal of Element Bundle from Ducting**

If it is required to remove the heater element bundle from the ductwork for inspection or repair then the element mounting plate must be withdrawn as a unit, complete with the elements. To accomplish this, proceed as follows:

1. Isolate heater from supply.
2. Remove the terminal enclosure lid.
3. Disconnect the supply cables and remove them from the glands
4. Flanged type heater, remove the hexagon-headed bolts holding the terminal enclosure to the heater framework and remove duct fixing bolts from terminal enclosure.
   Stab-in type heater, remove duct fixing bolts from terminal enclosure and, where fitted, remove duct fixing from within enclosure.
5. If the heater is fitted with a stand-off terminal enclosure it may be necessary to remove the terminal enclosure before the heater bundle can be removed. (See 3.6.6).
6. Carefully withdraw the element assembly from the duct.

3.6 Removal of One or More Elements from the Bundle.

If it is necessary to remove an element, proceed as follows:

1. Firstly check that the element to be removed has no thermal cutout probe attached. If attached, this will have to be released before proceeding.
2. Disconnect the busbars and remove them, having first noted their exact positioning, relative to the element terminals.
3. By unscrewing the gland backnut from the gland, which secures the element, the element can be removed downwards from the mounting plate or enclosure. (See Note: 3.6.5).
4. NOTE: On the larger heater units, the elements are supported in the duct by a spacer assembly. This will remain with the elements when the bundle is removed from the ductwork and it will be necessary to remove the appropriate fitments before the element can be withdrawn.
5. On certain heater units the crimp type gland securing the element is replaced by either "non-bite" or "bite" type glands. The "non-bite" type are a two-piece fitting, whilst the "bite" type have an additional olive.
   a) If the "bite" type are used, the gland backnuts are to be removed from above the mounting plate and the element removed complete with mounting glands. Take an exact measurement from the end of the gland nearest the end of the element, to the end of the element sheath and note it.
   Holding the hexagon of the gland body in a vice, or with a spanner, undo the glands leaving the top nuts and olives on the ends of the element.
   b) If the "non-bite" type are used the gland top nuts are to be removed from above the mounting plate and the element removed downwards leaving the gland body affixed to the mounting plate.
6. Where the heater is fitted with a stand-off terminal enclosure weatherproof glands may have been used. In order to remove either the terminal box or individual elements, undo the gland top nuts and take out the rubber sealing washers (these cannot be re-used and should be replaced with new items upon re-assembly). If the terminal box is to be removed, the nuts securing the enclosure to the support studs will have to be released.

3.7 Replacement of New Element

1. Replacement spare elements will be povided with two crimp glands complete with backnuts and fibre washers or two "non-bite" top nuts or two olives and fibre washers, where appropriate. Rubber sealing washers will also be supplied where appropriate.
2. Elements fitted with "crimp" glands can be fitted in the reverse order to the dismantling procedure (3.6.3).
3. Elements fitted with "non-bite" glands can be fitted in the reverse order to the dismantling procedure (3.6.5b).
4. Elements fitted with "bite" glands can be fitted as follows:
   a) Cut off the used olive from the old element and recover the top nut.
   b) Mark each end of the new element and recover the top nut.
   c) Put one top nut followed by an olive and then the gland body on each end of the element.
   d) Assemble the gland components on the element and do up finger tight.
   e) Carefully position the gland body to the mark obtained in 3.6.5a and holding the gland body in a vice, the top nut should be tightened down finger tight, plus one and a quarter turns, which is equivalent to a torque of 35 pounds force feet (47.5 Nm). This will cause the olive to bite into the element sheath. Take care that the gland does not move on the element whilst tightening the nut.
   f) Repeat the operation on the other end of the element.
   g) Insert the new element from below onto the mounting plate and replace the fibre washers and backnuts.
5. Replace terminal enclosure, if removed.
6. Replace weatherproof gland top nuts and new rubber seals, where appropriate.
7. Refit the busbar assembly.
8. Refit thermal cutout probe and spacer assembly, where fitted.
9. Refitting the element bundle into the duct casing is the reversal of the dismantling procedure.
10. Re-connect supply cables, ensuring that all connections are made properly.
11. Recheck electrically and visually.
12. Ensure that all gland plates (where fitted) and covers are secured before the supply is switched on.

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