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INSTALLATION, OPERATION
MAINTENANCE and SERVICE
INSTRUCTION MANUAL
OPEN COIL
ELECTRIC DUCT HEATERS
Series F, G, S, T and W *

UL UNDERWRITERS'
LABORATORIES,
INC.®
DUCT HEATER
ISSUE NO. XXX

To establish if this heater is UL listed,
look for this listing mark on the heater.

INSTALLATION

CAUTION: DO NOT REMOVE NAMEPLATE OR APPLY ANY COVERING OVER THE LABELS ON THIS UNIT.

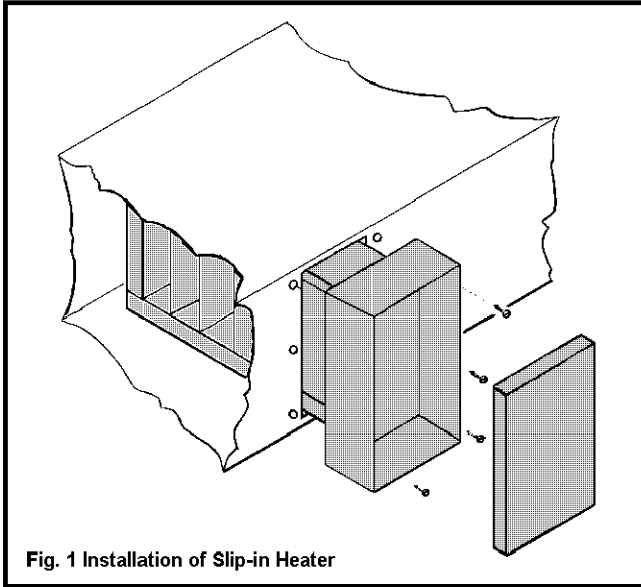


Fig. 1 Installation of Slip-in Heater

MOUNTING:

- Step 1 - Cut a hole in the side of the duct, 1/8" larger than the heater body.
- Step 2 - Insert the heater body into the duct until the terminal box covers the opening.
- Step 3 - Secure the heater in place with sheet metal screws.

Note: For vertical airflow, angle brackets, a maximum of 1" wide, are recommended inside the duct on both sides to support the heater when the duct width exceeds 24 inches.

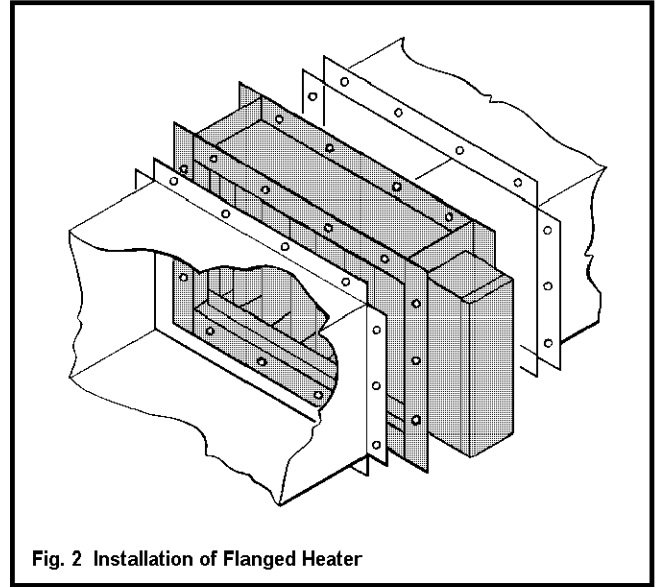


Fig. 2 Installation of Flanged Heater

MOUNTING:

- Step 1 - Provide flanges on both ends of ductwork to be mated to heater flanges.
- Step 2 - Secure heater flanges to duct with sheet metal screws or bolts.

Note: When flanges are properly aligned, the entire coil section should be within the air stream.

These heaters are suitable for either vertical up or horizontal airflow with airflow in either direction. Observe directions on UP label when positioning heater (see Page 2, Item 7). Note: If mercury contactors or SCRs are built into the heater, it will operate only in the position indicated by the CAUTION label.

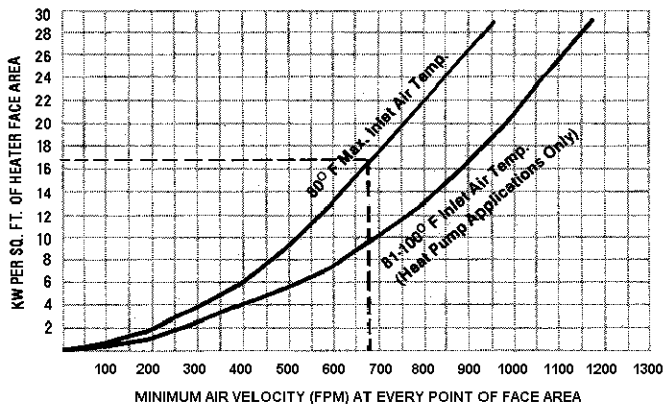
In special cases where the heater terminal box is no longer than the heater frame, refer to separate mounting instructions (Bulletin I-139).

OPERATION

CAUTION – DO NOT OPERATE WITHOUT AIR

For efficient and trouble-free operation it is important that air distribution be uniform over all the heating coils in the entire heated section, particularly in the area where the coils terminate. No electric duct heater should ever be operated with insufficient airflow or overheating and subsequent damage will result. The minimum air velocity required at any point should be determined from the graph below. NOTE: Heating elements may retain a light surface film due to the manufacturing process. A small amount of vapor and/or odor may be detected at the start of operation. This is a normal condition and is completely harmless.

Fig. 3 MINIMUM AIR VELOCITY FOR SLIP-IN AND FLANGED HEATERS



EXAMPLE of how to use the graph in Fig.3 for a 25.0 KW heater rated for 75°F inlet air temperature.

Duct width (W) = 24" (open face width = 24" - 3/4" = 23-1/4")
Duct height (H) = 12" (open face height = 12" - 2-1/2" = 9-1/2")

$$\text{KW per sq. ft. of heater face area} = \frac{25.0}{(9-1/2) \times (23-1/4)} = 16.3 \text{ KW/Sq. Ft.}$$

From graph, minimum velocity is 690 fpm (see dotted lines).

* F - Flanged, G - Flanged (81°F inlet max.)
S - Slip-in, T - Slip-in (81°F inlet max.)
W - Outdoor use

HOW NOT TO INSTALL DUCT HEATERS

Electric duct heaters differ from other types of heating coils (such as steam or hot water coils) in that they produce 100% heat as long as the elements are energized, regardless of air flow. Therefore, problems may arise if portions of the heater are blocked. Listed below are some of the important items to watch when installing any duct heater.

1 DO NOT OPERATE WITHOUT AIR

Heater should be interlocked with fan (using pressure type airflow switch or electrical interlock). Do not energize heaters with remote contactors until thermal cutout has been connected.

2 DO NOT OPERATE HEATER WITH INADEQUATE AIRFLOW

Refer to figure 3, page 1 to obtain minimum velocity needed to keep heating coils from glowing red and to prevent nuisance tripping of thermal cutout.

3 DO NOT OPERATE HEATER WITH UNEVEN AIR DISTRIBUTION

Adequate airflow must be present at all points of the heater face area. Use of turning vanes or baffles may be necessary to obtain even air distribution.

4 AIR MUST BE FILTERED, free of combustible particles and hazardous vapors.

5 LEAVE AT LEAST 48" BETWEEN HEATER AND ANY TURN OR ELBOW

in the ductwork and between heater and heat pumps or air conditioners. If less than 48" between heater and elbow, provide turning vanes and order heater with coils de-rated to 35W/sq. in. Absolute minimum distance is 24"

6 LEAVE AT LEAST 48" BETWEEN HEATER AND DUCT TRANSITION

Transitions can be avoided by specifying a duct heater sized to match the duct size exactly. If a transition cannot be avoided and heater has to be less than 48" from the transition, transition should conform to the maximum angles shown.

7 DO NOT MOUNT HEATER WITH TERMINAL BOX ON THE TOP OR BOTTOM OF HORIZONTAL DUCT

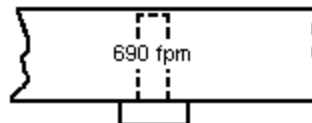
because resistance coils will be unsupported and may sag. For applications where electrical connections must be at bottom, specify UL listed bottom insert (slip-in) or bottom outlet (flanged) heater.

8 DO NOT INSTALL HEATER IN HORIZONTAL DUCT WITH THERMAL CUTOUT AT BOTTOM

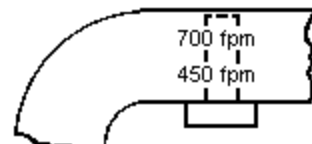
ELECTRODUCT heaters can be mounted in any position in a vertical duct. In a horizontal duct, the thermal cutout must be at the top. Follow THIS SIDE UP instructions on the heater.

NOTE: If mercury contactors or SCRs are built into the heater, install only in the position indicated by the label.

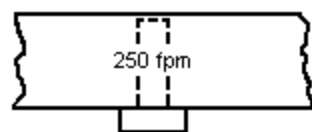
Example: 25 kW Heater, W = 24", H = 12", minimum velocity required is 690 fpm (see Fig. 3, Page 1).



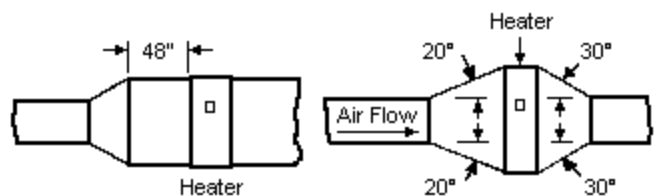
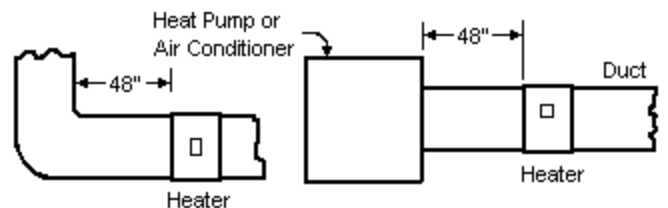
RIGHT
PROPER VELOCITY
AND GOOD AIR
DISTRIBUTION



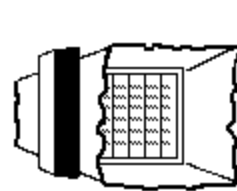
WRONG
AIR FLOW NOT
EVEN - HEATER
TOO CLOSE TO
BEND IN DUCT.



WRONG
VELOCITY
TOO LOW.



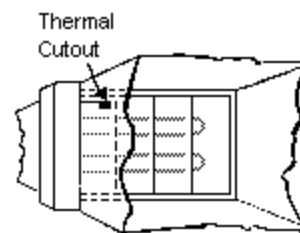
HORIZONTAL DUCT (CROSS SECTION)



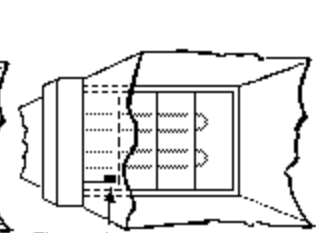
RIGHT



WRONG



RIGHT



Thermal
Cutout

WRONG

- 9 DO NOT INSTALL STANDARD HEATER IN DUCT WITH INTERNAL OBSTRUCTION GREATER THAN 1"** because the obstruction may block airflow near coil terminations, thermal cut-out and heat limiters. Instead, use a special slip-in heater with recessed terminal box and reduced frame size, or flanged heater with face area based on inside duct dimensions and with extra wide flanges.

Note: For heaters used in air conditioning ducts in areas of high relative humidity, specify insulated terminal box to prevent condensation.

- 10 DO NOT INSULATE TERMINAL BOX EXTERIOR**

Terminal box must not be externally insulated or blocked in any way. Use heater with factory installed insulation on duct side of terminal box.

- 11 DO NOT INSTALL STANDARD HEATER** where face area may be blocked by filters, filter supports, insulation, cooling coil headers, blower scrolls or any other kind of obstruction. Use recessed terminal box and order heater with no coils three to four inches from top, bottom or back flange.

Note: Derating coils is no substitute for good air distribution. Heaters should be located as far as possible from obstructions in airstream.

- 12 DO NOT INSTALL HEATER NEAR DUAL OUTLET BLOWER** since there will be little or no airflow across the area between the outlets. Use individual heaters for each blower outlet or move the heater far enough (four feet minimum) from the outlets to assure good air distribution.

- 13 DO NOT INSTALL HEATER LESS THAN FOUR FEET FROM FAN** unless turning vanes, pressure plates or other devices are used on the inlet side of the heater to ensure even air distribution over the entire face area of the heater.

- 14 HEATERS IN SERIES** Two heaters can be installed in series providing:
- the leaving air temperature of the first heater does not exceed 100 degrees F.
 - both heaters have a minimum air velocity according to the graph, Figure 3, page 1, and
 - the downstream heater is a Type F or S and is so located that it is either in a branch duct or, if in the same duct, a minimum of five feet distant from the upstream heater.

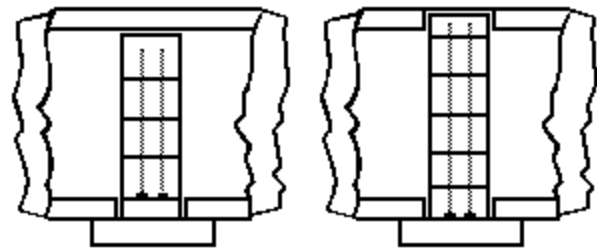
- 15 LONG HEATERS** It is recommended that heaters with W dimensions greater than 72" be ordered with a linear thermal cut-out. The sensing linear cutout element extends the entire length of the heater and turns the heater off when a hot spot develops. When the hot spot has cooled, the heater resumes normal operation.

- 16 DO NOT CONNECT ALUMINUM SUPPLY WIRES** to a standard duct heater. Order special line terminals that are suitable for aluminum conductors and are properly sized for the larger wire gauge they require.

- 17 DO NOT INSTALL STANDARD HEATER OUTDOORS** If heater will be subject to weather, specify raintight construction.

- 18 DO NOT BUNDLE, TIE OR WRAP POWER WIRING** This may cause overheating and eventual breakdown of insulation.

HORIZONTAL DUCT (TOP CUTAWAY VIEW)



RIGHT
Special heater construction avoids problems with internal insulation

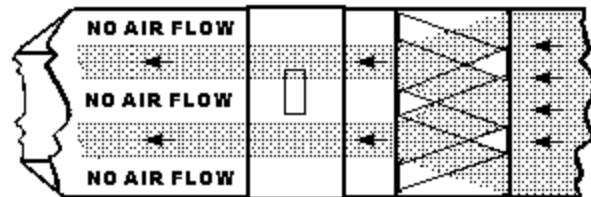
WRONG
Internal insulation blocks portions of the heating coils.

HORIZONTAL DUCT (TOP VIEW)



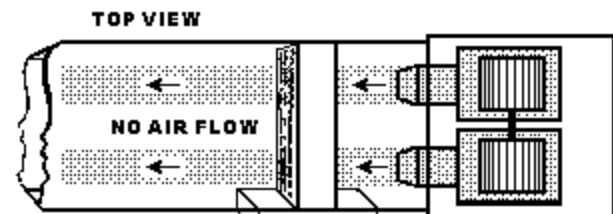
RIGHT

WRONG



WRONG

Filter supports are too close to heater



WRONG

WIRING INSTRUCTIONS

DISCONNECT ALL POWER SOURCES before doing any work on the heater installation. Follow the wiring diagram located on inside of terminal box cover. If there is more than one heating step, wire the unit so the steps are energized in the same sequence as numbered in the heater. If the heater does not have a built-in disconnect switch or main circuit breaker, install a remote disconnect in accordance with National Electrical Code Articles 424-65 and 424-19. The fan must be interlocked with the heater so that the heater is not energized unless the fan is on. UL Listed heaters have a fan interlock either built-in or furnished as part of a separate UL Listed assembly. If remote contactors are employed, they must have adequate ratings and be UL Listed for 100,000 cycles of operation. Do not exceed the control circuit volt-ampere rating shown on the nameplate. These contactors must be supplied by Brasch Manufacturing Company for a UL Listed heater. Use NEC Class 1 wiring for the control circuit as described in Article 725 of the National Electrical Code.

MAINTENANCE

This heater is made with the finest components available and should not normally require any maintenance. Associated equipment, however, may require periodic cleaning, adjustment or calibration. Maintenance of associated equipment should be performed in accordance with manufacturer's specifications.

SERVICE INSTRUCTIONS

DISCONNECT ALL SOURCES OF POWER BEFORE SERVICING EQUIPMENT. All ELECTRODUCT heaters are equipped with double safety protection (automatic reset thermal cutout usually in the control circuit and heat limiters and/or manual reset thermal cutouts in the power lines). Heater may also have optional additional safety devices. Safety devices should not be replaced without first correcting the problem causing them to open the circuit. Additional instruction manuals covering specific components will be supplied with any built-in equipment other than the standard thermal cutouts.

TROUBLESHOOTING	
PROBLEM	POSSIBLE SOLUTION
1. HEATER WILL NOT OPERATE	Review installation instructions and wiring diagrams to be sure equipment has been properly installed. Disconnect or main circuit breaker may be in "OFF" position. If heater has built-in disconnect, door must be closed and switch turned "ON" before heater will operate. If the fan and heater are interlocked with a fan relay, the fan must be on before the heater will operate. If an air flow switch is installed, air pressure in the duct must be sufficient (at least .07" WC) to close the switch before the heater will operate. Automatic (or manual) reset thermal cutout (see Form I-12) may have opened when overheating resulted from insufficient airflow or poor air distribution. Allow heater temperature to return to normal so that automatic thermal cutout may reset or manual reset thermal cutout may be reset. Correct cause of overheating before proceeding. Heat limiter(s) may have opened if local "hot spot" developed or if automatic reset thermal cutout failed to open first when overheating occurred. Correct cause of overheating and replace heat limiter. Check main fuses. If open, correct cause of failure before replacing fuse.
2. HEATER CYCLES (WILL NOT STAY ON)	Check air inlet and discharge openings for obstructions. See that filters are not clogged, fire dampers are open and air system is balanced. Check to see that the heater terminal box is tight against duct and heater safety devices are receiving sufficient airflow. Airflow must be distributed evenly over entire face area. Look at heater coils in operation (through observation port in duct). Any red area is not receiving enough air. (A small amount of redness is permissible inside the coil insulating bushings.) Refer to minimum airflow graph (Figure 3) for airflow requirements and make sure that airflow through every part of the heater is sufficient. Coils must not glow. If airflow switch is used, contactors may "chatter" if airflow is insufficient to keep switch fully on. If duct has internal insulation, the insulation may be blocking the safety devices (see Page 3, item 9).
3. IMPROPER TEMPERATURE REGULATION	Review installation instructions and wiring diagrams to be sure equipment has been properly installed. Make sure associated control equipment, such as thermostats, are in the correct location and that all controls are adjusted to manufacturer's specifications. Check air system balance to see that correct amount of airflow is supplied for proper zone control. Automatic thermal cutout may be opening (cycling) before room thermostat is satisfied (see item 2 above). Insufficient heat may be caused by open thermal cutout or heat limiter(s), incorrect supply voltage or heater being too small (in wattage) for application.

LIMITED WARRANTY

Brasch Manufacturing Company, Inc. guarantees ELECTRODUCT heater resistance coils against defects in material and workmanship for a period of two years from date of shipment. Other components and accessories are guaranteed for a period of one year from date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the guarantee period, Brasch Manufacturing Company, Inc. will repair or replace the heater at its own discretion without charge. Brasch Manufacturing Company shall not be held responsible for any charges in connection with the removal or replacement of allegedly defective equipment, nor for incidental or consequential damage.