ELECTRIC DUCT HEATERS

General Information

EHO, EHT, EHFT Series

SAFID electric duct heaters series “EHO”, “EHT” and “EHFT” are designed for a trouble free operation at a competive price. We designed these heaters for easy installation into a duct either in slip-in insert type or in flagned type as to meet with the project requirements. Safid can manufature the Duct Heaters with any size, capacity, power supply and optional controls/ accessories as per the project requirement and according to the specifications here under. Most of our products are custom designed, so that you meet these products with your project specifications with a competitve price and trusted years of operation.

Description

Duct heater are primarily use as as source for space heating. Duct heaters are self contained and designed to install in a duct system either in a horizontal or vertical duct. It can be installed as a stand alone or combined with any source of heating and cooling systems. SAFID heaters can be use as for primary heating, secondary heating, auxillary heating reheat and humidity control or multi zone with VAV systems to meet the maximum comfort conditions. SAFID duct heaters are custom engineered and designed with the help of our newly developed Computer Software packages which will specify the element size, sheet metal, support racks with insulator, controls configurations and all optional accessories. The software will alow us to prepare and immediate custom design or qoutation and it will help to any design or modification of controls without any delay.

As standard, SAFID duct heaters are manufactured with the following specifications and components. You can select the optional controls in accordance with the project specifications and requirements. Please contact SAFID for more information you may require.

1. 1mm thick galvanized steel casing with NEMA-1 type control panel.
2. De-energizing type magnetic contractor per each step.
3. Class-II type step down control transformer.
4. Auto reset thermal cut-out. (Disc Type).
5. Manual reset thermal cut-out. (Disc Type).
6. Diffential airflow switch.
7. Terminal blocks for power and ontrols cable terminations.
8. Type- A, 80/20 Nickel.Chromium alloy wire.
9. Stainless steel tube for “EHT” series.
10. Stainless steel tube and fins for “EHFT” series.

In addition to the above standard package, a variety of controls and designs are available for you to choose from. Please refer to the rest of this section for more controls and designs available at SAFID, or contact us for assistance.

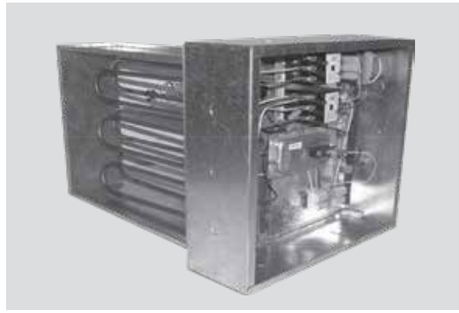
EHO Series: Open Coil Series

Description

SAFID electric duct heaters, EHO series, or open coil duct heaters, are very rugged and efficient duct mounting type air heaters. They are designed to heat large volume of air in ducts based in capacity. These heaters are designed with very low air pressure drops across the heaters. This will allow to select and install smaller and more economical blowers due to duct heaters low pressure drop and it will be more efficient.

The open frame duct heaters have a long history of trouble free operation in field. The inherent efficiency of the “EHO” series design assures that exessive temperatures don’t built up in the heater to shorten its life. Since the heater is so open, it does not obstruct of tax the overall air delivery system. These heaters are essentially very competent, since the circuits are open directly to the airflow. This case the heat transfer from wire to air is direct and immediate. As a result these heaters give their heat readilly to the air and remain cool themselves which offer long life for heater elements. Fast warm up and cool down times are inherent advantage of this construction.

EHT Series: Tubular Coil Series



Description

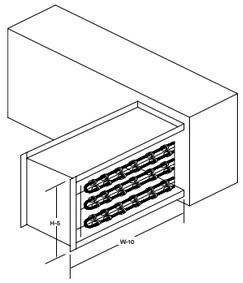
SAFID’s EHT electric dust series are manufactured with tubular heater elements. The heat resistance coils are passing through a magnesium-filled stainless steel tube and coil ends are fitted with high temperature rated ceramics.

EHFT Series: Finned Tubular Coil Series

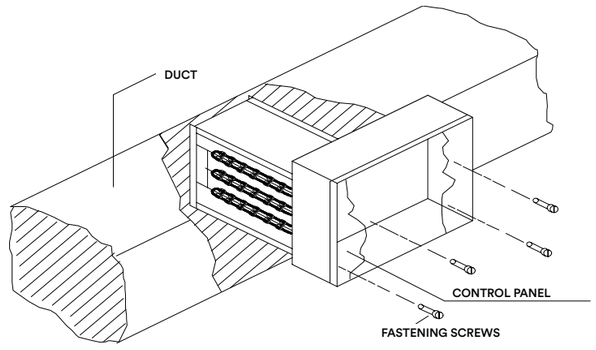
Description

SAFID’s EHFT electric dust series are manufactured with finned tubular heater elements. The heat resistance coils are passing through a magnesium-filled stainless steel tube and coil ends are fitted with high temperature rated ceramics. Tubes are fitted with stainless steel fins.

1. Slip-In Insert Type



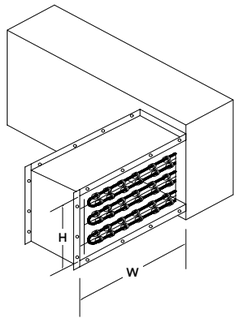
INSERT TYPE



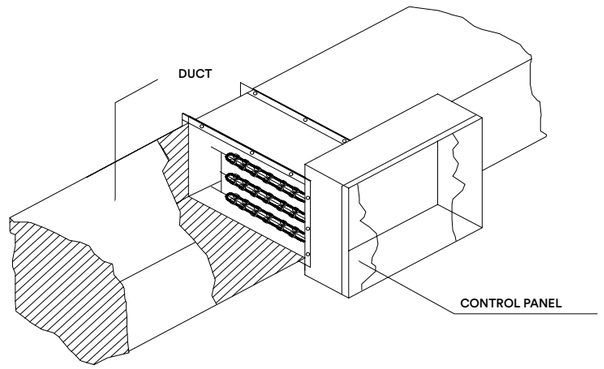
INSERT TYPE INSTALLATION

This is the most commonly used type due to its simple installation. It can be inserted in to a duct from the side by cutting an opeaning to match with the heater size and fastened by metallic screws thru inside the control panel. In this type of installation, the heater height is everlapped by 25mmm that the element enclousure, so the panel will cover all rough opening in duct.

2. Flanged Type



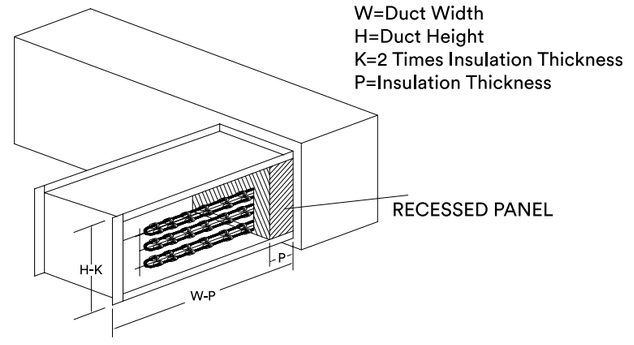
FLANGED TYPE



FLANGED TYPE INSTALLATION

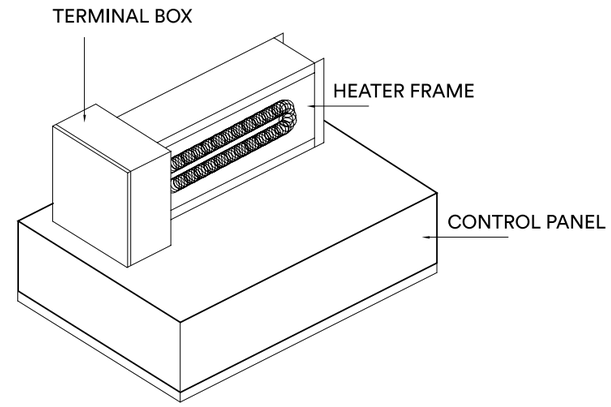
This type of installation provides maximum duct rigidity. Heater has to be installed in between two ducts by means of joining the flanges in ducts and heater. Element enclosures inside dimensions are same as the opening size of ducts. 25mm flanges are provided in heater as standard unless otherwise specified. All flanges are to be joined with proper bolts & nuts to secure the heater in between the duct and fastened by metallic screws through the control panel.

3. Recessed Type



This type of installation is suitable for internally insulated ducts where other obstructions restrict the full duct face area. The recessed panel is designed to project beyond the insulation, so that the element termination and thermal cut-out surfaces are exposed in airflow. The depth of the recessed panel wil be depends the internal insulation thickness.

4. Bottom Terminal Box

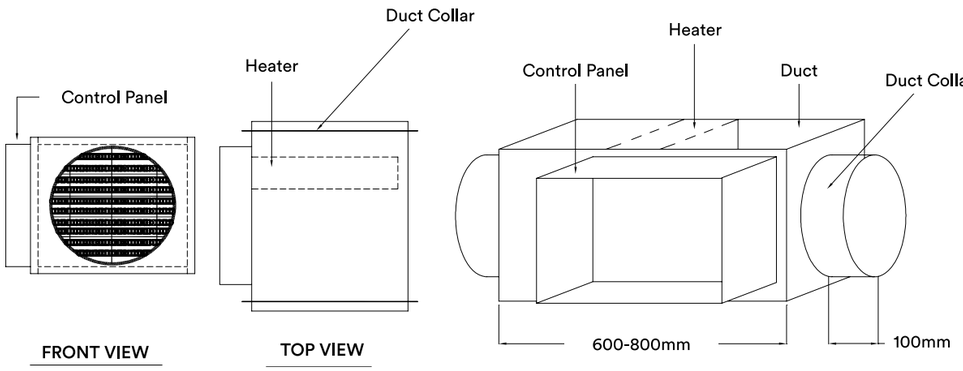


This type of designs are allow the heater installation by bottom where the space retriction is for side mounting. This will provide maximum ease of serviceability in limited space. Element termination and thermal limits cut-outs are installed in side terminal box and remaining controls except Mercury Contactors, SCR Controls and Power Fusing are built-in bottom control panel. SCR Controller, Mercury Controller are Power Fusing are to be installed in separate remote control panel.

5. Remote Control Panel

If there are any space restrictions for service acces, select the heater with remote control panel for easy service and maintenance. The contorl panel can be mounted in a convenient space in near proximity to the duct heater. Connection between the heater terminals and control panels are easy made through the terminals installed in both sections. All components and accessories are factory wired and only the connections made between the heater and panel need to be field connected. All contactors should be disconnecting type as per UL requirements for remote panels.

6. Round Duct Heater



This type allows for an easy method of installing duct heaters in a round duct. The heater section is fitted with factory installed adaptor as sized to round duct connections provided at the inlet and outlet for field connection.

Vapour Barrier

To avoid condensation, heaters can be supplied with factory installed insulation on the back side of the control panel. This will avoid the contact between metal to metal and prevent the possible condensation.

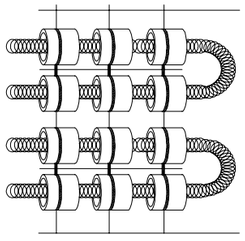
Heater Element Design

As standard all SAFID open coil heaters “EHO” series are built with Type -A, 80% Nickel/20% Chromium high temperature alloy resistance heating elements. These elements are desigend to operated with maximum 55 watts per square inch and below than the maximum allowable operating temperature recommended by the alloy manufacturer. This unique designs eleminates most problems with hot spots and red color caused by poor airlfow pattern. It will also increase the life of heating elements and guaranteed a trouble free operation.

These elements are passing through high quality anti thermal shock, moisture resistant stealite cylindrical bushing ceramics. Ceramics are free floating within wire support and eliminating any binding. Ceramics and heating elements are supported by corrosion resistant heavy guage steel rod contruction and rods are welded or bolted in between and with the control panel. This design allows for free flow of air around the ceramics and reducing the pressure drop through element and supports.

SAFID Tubular Duct Heaters series “EHT” are manufactured with stainless steel tube heater elements. Type -A 80/20 Nichrome wire precisely centered in a Magnesium filled SS316 tube and element is welded to a 10-32 SS pin terminal for field electric termination.

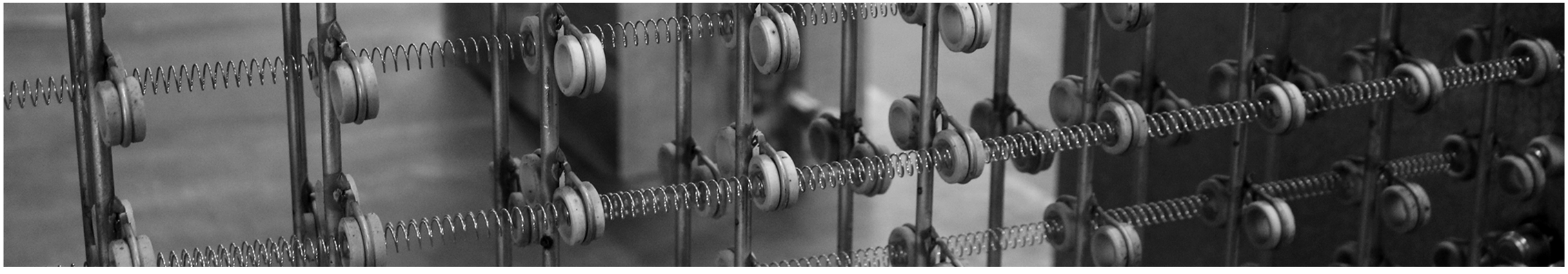
SAFID Finned Tubular Duct Heaters series “EHFT” are manufatured with stainless steel tube & fins heater elements. Type -A 80/20 Nichrome wire precisely centered in a Magnesium filled SS316 tube and element is welded to a 10-32 SS pin terminal for field electric termination. Tubes are wounded with SS304 hellical fins for maximum heat transfer.



Open Coil Heater

Tubular Heater

Finned Tubular Heater



UL & NEC Requirements

The design and installation of electric duct heater must conform all local and national standards and regulations in addition to the below requirements. The below listed information are offered as guideline for electric duct heaters and it is based on UL & NEC space heating standards.

1. Over Temperature Protection: UL & NEC requires the manufacturer to provide two types of over temperature protection. As standard all SAFID duct heaters are supplied with one primary and one secondary thermal cut-outs to comply with this requirement. Disc type Auto reset thermal limit switch de-energize the heater control-circuit in the event of an over temperature occur and work as a primary protection. Disc type Manual reset cut-out will work as secondary protection in case of failure primary limit switch and it is rated for higher temperature then primary cut-out.

2. Over Current Protection: UL & NEC require that a heater in excess of total 48 ampere must be subdivided into number of circuits having less than 48 ampere and protected by built in fuses or circuit breakers and this over current protection must be rated for 125% of the circuit load. SAFID complies this requirements with fuses when and required. Fuses and circuit breakers are optional for all duct heaters (with exception to the above conditions).

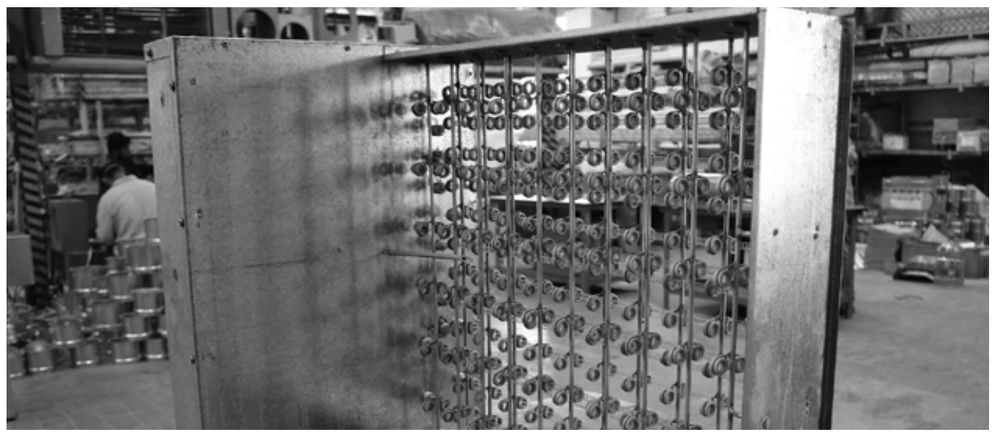
3. Loss of Airflow Protection: UL & NEC require that a method to be provided to prevent the duct heater element from being energized unless the fan circuit is on and airflow is available in duct. To comply with this all SAFID duct heaters are equipped with built in deferential airflows switch as standard. In addition, we can provide optional fan interlock relay or volt-free contacts for fan connection to meet this requirement.

4. Transformer Protection: Control transformers are required for heater operation unless an external control voltage source is available and the heater supply voltage is different from the control voltage. This transformer should be with primary over current protection. Generally Class -II transformers are with built-in over current protection and others have to protect with separate fusing. Secondary protection is available as an option and it is not necessary by UL.

5. Contactors: UL require that built in contactors is required to on-off the circuits in each heater. SAFID provide de-energizing type magnetic contactors as standard for all our duct heaters to comply with this requirements Disconnecting Type and Mercury Contactors are optional.

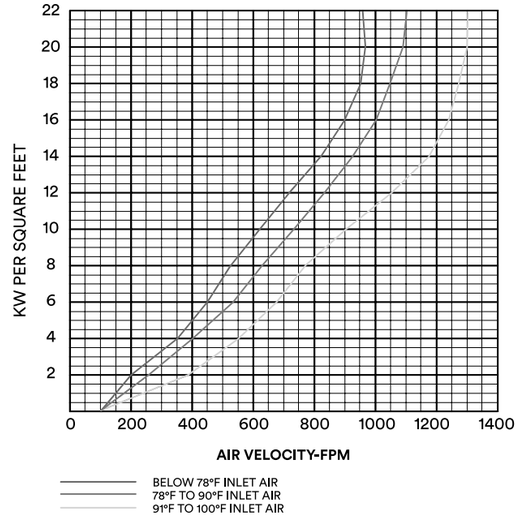
6. Disconnect Means: As per NEC, an equipment disconnect switch to be installed as built in or within the sight of the heater. SAFID offer an optional door interlock or non interlock type of disconnect switch as built in or separate for field installation to meet this.

7. Grounding Lugs: UL requires a built in grounding lug to be installed for field wiring terminations. All SAFID. heaters built in grounding lugs to comply this requirement.



MINIMUM AIR VELOCITY FOR ELECTRIC DUCT HEATER

Minimum Air Velocities for Open Coil Terminal



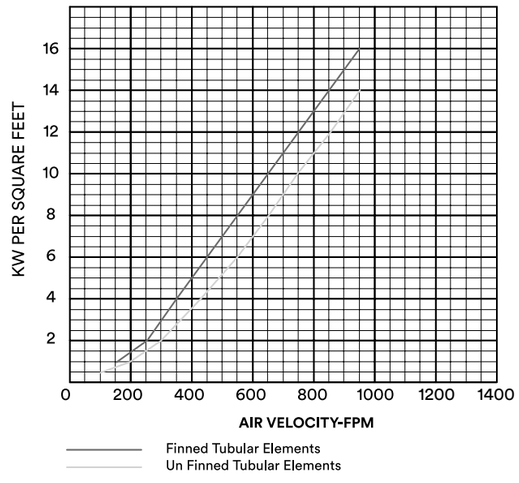
The minimum airlfow across the electric heater is directly related to the inlet air temperature. Consideration must be given to both airflow across the electric heater and the inlet air temperature.

To calculate the watts per square foot (watts/sq.ft) of duct area, divide the total required watts by the duct cross sectional area.

To determine the minimum air velocity across the electric heater. Draw a horizontal line from the required watts/sq.ft up to the designed inlet air temperatre line. From this point of intersection on the inlet temperature line, draw a vertical line to established the air velocity.

The velocity across the electric heater should never be lower than the determined velocity from the chart.

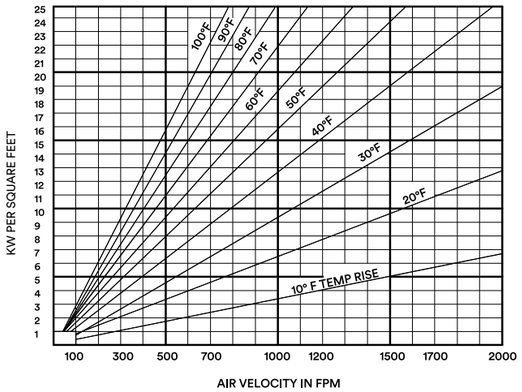
Minimum Air Velocities for Finned & Unfinned Coil Heater



The air velocity across the electric heater must be minimum 1.5 m/s to give a surface temperature of the heating elements of about 300-350 degrees Celsius.

TEMPERATURE RISE CHART AND PRESSURE DROP

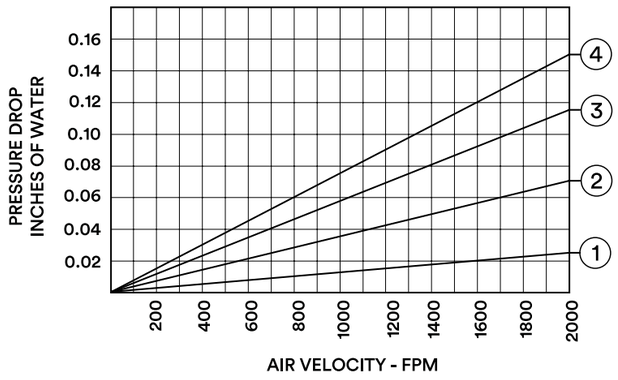
Temperature Rise Chart



Temperature rise of a duct heater is an important factor in the selection of duct heater. By this chart you can calculate the approximate temperature rise if you know the airflow and heater capacity used.

Draw line vertically up from the required air velocity on the bottom scale up to the design temperature rise line. From that point, draw a horizontal line to the left side scale to know the required heater capacity per square feet of duct area to maintain the required temperature rise at design air velocity.

Pressure Drop Across Open Coil Heater



The pressure drop across the electric heater depends on the air velocity and the number of rows of heating coils.

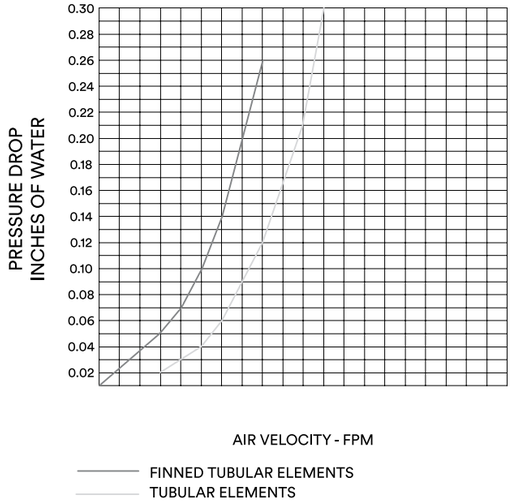
If the number of rows of heating coils is unknown, assume 4 rows for the selection.

NOTE

1. ① ② ③ ④ are the number of rows of heater elements.
2. The pressure drop that can be selected from the above graph is for the electric heater only.

PRESSURE DROP

Pressure Drop For Tubular Coil Heater



The pressure drop across the electric heater depends on the air velocity and the number of installed heating coils of the heater.

The Pressure drop shown is for 2 rows of elements.

Major Advantages and Disadvantages of Coils

Open Coil:

Advantages: Very low pressure drop. Fast heat transferring. More heater capacity per area. Quick response time. Quick manufacturing and fast delivery.

Disadvantages: Not suitable for dusty and high humidity environments due to direct contact with air. Chance to damage the coils during maintanance or service period.

Tubular Coil:

Advantages: Compare to open coil, less sensitive to dust and humidity environments. Elements are enclosed type. Excellent mechanical resistance. Shock proof construction. Can be replace easily. More stronger than open coils.

Disadvantages: Pressure drop is higher than open coil. Slow response. Manufacturing time is more compare to open coil. Less heater capacity per area.

Finned Tubular Coil:

Advantages: Compare to open coil less sensitive to dust and humidity environments. Elements are enclosed type. Excellent mechanical resistance. Shock proof construction. Can be replace easily. More stronger than open coils. Good controllability.

Disadvantages: Pressure drop is higher. Slow response. Manufacturing time is more compare to open coil. Less heater capacity per area.

Contactor Wiring Configurations

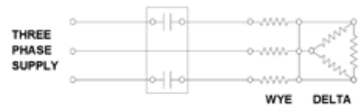
Typical Contactor Power Circuitry

De-energizing Contactor

Single Phase - Single Line Break

Heater is de-energized by breaking only one power line through the action of single contact. By opening the contactor contacts the undergrounded line would be disconnected from single phase power supply.

Three Phase - Two Line Break



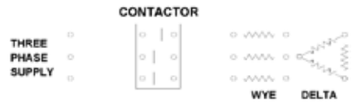
Above shown is for a two line break which will de-energize the heater. Heating elements those used in three phase balanced configurations are factory wired as manufacturers standard in two basic configurations either in Delta or in Wye. General standard is Delta Connection.

Disconnecting Contactor

Single Phase - Two Line Break

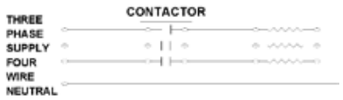
Heater power supply is completely disconnected by opening both side of the contactor contacts. All undergrounded power conductors are disconnected.

Three Phase - Three Line Break



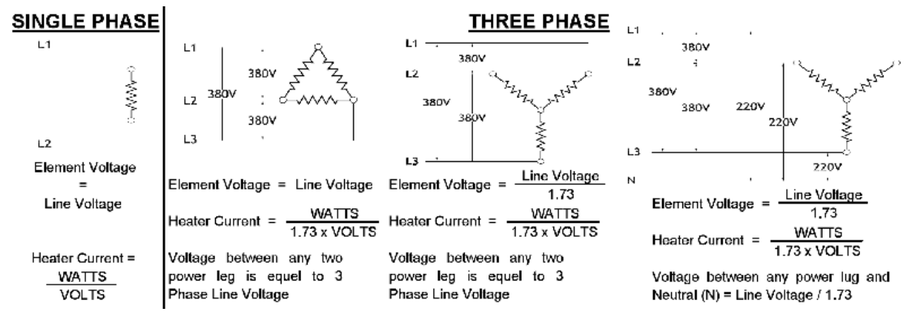
Heater power supply is completely disconnected by opening all sides of the contactor contacts. All undergrounded power conductors are disconnected.

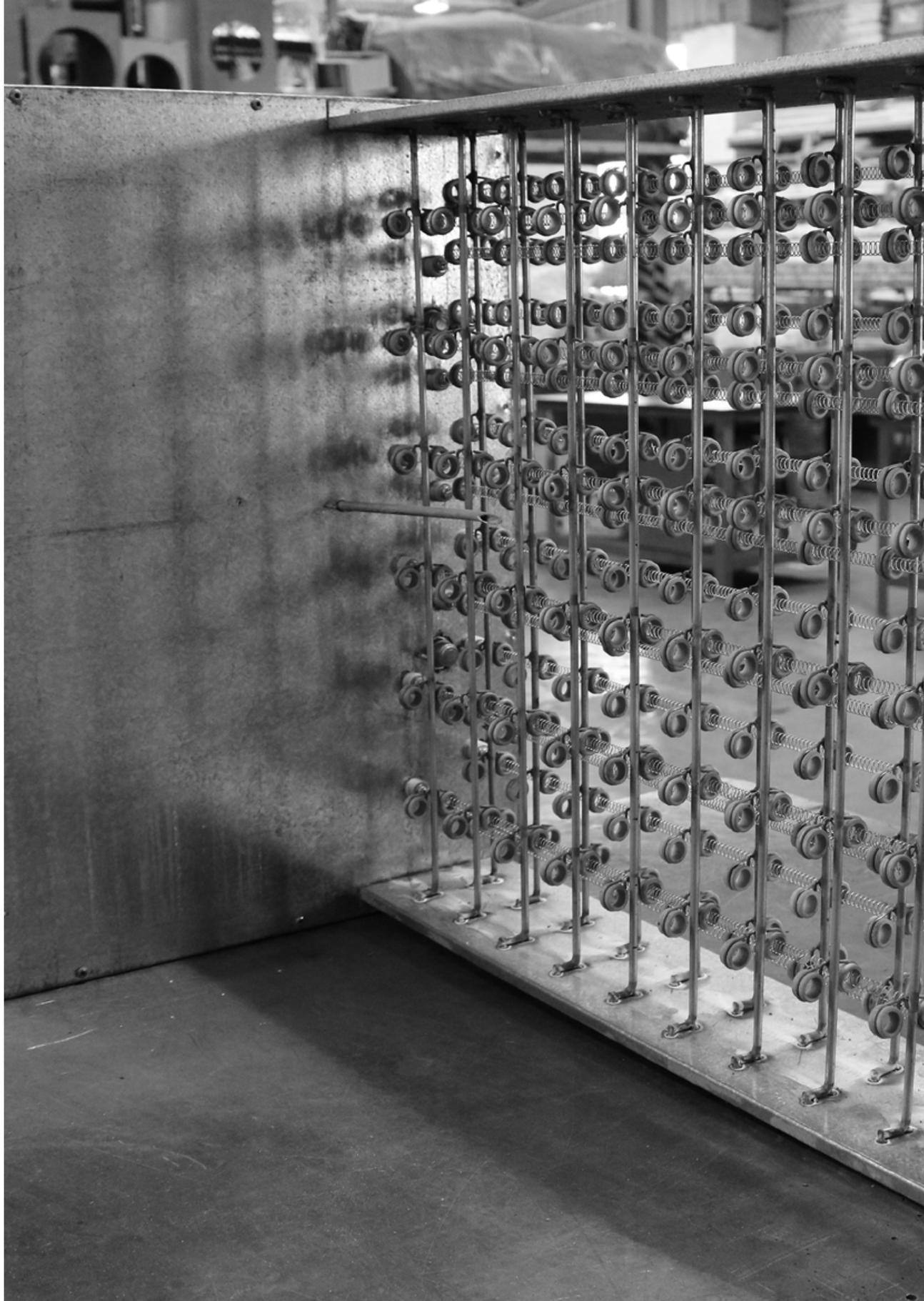
Four Wire “WYE” (Optional)



In this configuration, each element may be operated independently through individual contacts. A three pole Disconnecting contactor must be used to open all elements from power supply.

Heating Element Wiring Configurations and Properties





Magnetic Contactors

De-energizing Magnetic Contactors are built in as standard for all heaters. These contactors are UL approved for 100,000 cycle operation and listed as a defenite purpose. Coil voltage may be 24, 120 or 240. This contactor will open/ close the minimum number of power lines to control the current flow to each stage being controlled. This can be used as a primary or backup controlling contactor. If required with break all power lines, use Disconnecting Type Contactors.

Mercury Contactors

When silent operation or frequent cycling is required use Mercury Contactors instead of Magnetic Type. These are UL approved for 100,000 cycle operation and listed. This will eliminate contact noise and have long life under continuous heavy duty. All Mercury Contactors must be installed in the upright vertical position.

Control Transformer

A step down transformer may be built in to supply the correct control voltage when control voltage is differ from line voltage. Class-II transformers are primary over current protected and do not required additional protection unless specified. Class-I transformers must have primary protection by fusing. Secondary protection is not necessary. It is available as an option when specified.

Airflow Switch

This switch sense the air pressure across the heater face and energize / de-energize the contactors based on airflow. Airflow switch is available for positive or negetive pressure sensing type and switch is set at 0.05”+/- 0.02”. The heater will deactivate when the fan is not on or at less air pressure than the setting.

Power Fusing

Heaters in excess of 48 ampere must be subdivided into branch circuits of 48 ampere or less and protected with fuses of 125% rated load. Fusing is optional for heaters drawing less than 48 amperes.

Thermal Cut-Outs

A disc type automatic reset thermal cut-out de-energize the heater on overheating and energize the heater automatically after the temperature has lowered. The standard cut-out temperature is 140°F.

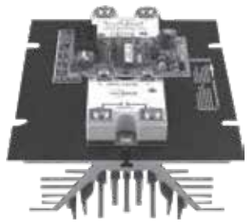
Disc type manual reset cut-out is provided as a secondary limit control in case of failure the auto cut-outs. This device requires a reset button to restore the power after over temperature occur. The standard cut-outs temperature is 185°F.

Both cut-out should be UL listed and suitable for 100,000 cycles of operation. Above cut-outs can be wired in power circuits or control circuit within the rated capacity. Both cut-outs are built or control circuits within the rated capacity. Both cut-outs are built in as standard in all SAFID duct heaters.

Disconnect Switch

Door interlocking type disconnect switch can be provided to prevent the door opening until disconnect the power to heater. The door will remain close until to switch off the disconnect. Fused or non-fused switches can be supplied as an option.

SCR Controls



The SCR controller has been safe and reliable control of electric heaters and suitable for applications where noise is a factor. This provides continuous modulation from zero to maximum heater output in proportion to the room temperature demand. The built in anodized heat sink improves heat dissipation. Availble in different voltage, ampere and with multiple input control signal. The controller can be connected to modulation thermostats or directly to any BMS. The SCR controller also has built-in LED indication for proper operation.

Step Controller

Step controllers are availabe for multiple staged heaters in a predetermined time sequence. This microcomputer based low voltage step controller is suitable for precise control of applications typically found in duct heater. This has a built in intesrtage adjustable time delay and a test button to by-pass the time delay and also accepts modulating signals from thermostats or BMS.

Fan Interlock Relay

This optional relay is used to interlock the fan circuit with heater to prevent the heater from energizing unless the fan is on. External control voltage from fan starter is required to operate this relays. The control voltage must be specified when ordering with this option.

Also volt free contacts can be provided from this relays to interlock with fan control circuits. Then the relay will use heater control voltage as supply.

Pilot Switch

This consist of a toggle switch wired with the heater control circuit and used to on/off each heater stages or the complete heater by manually. This can not be used as a disconnect swicth.

Pilot Lights

To show the heater operation modes, pilot lights can be installed in control panel door or on the side of the control panel. Following indications are available.

1. Heater on/off (entire heater or step by step)
2. Thermal cut-outs open
3. Low airflow
4. Common alarms
5. Power on (control circuit)

Pilot Relay

Pilot Relay can be provided when the load of contatcors coils exceed the rated capacity of thermostat or control transformers.

These relays can also be use to get volt free contact signals from heater to a DDC panels or BMS for remote monitoring.

Terminal Blocks

High voltage terminal blocks are built in as standard for power supply terminations. All terminal blocks are sized to accommodate either copper or aluminun conductors.

Low voltage terminal blocks are provided for ease of field connections.

Circuit Breaker

A circuit breaker can be supplied as optional instead of pwer fusing. This will trip in when an over-current situation occurs. You will have to reset it manually after rectifying the problems that caused it to trip.

Protective Screen

An optional protective screen by wire mesh can be installed on either side of the heater or at the air entering side to protect the elements and or for personnel protection.

Conversion Tables

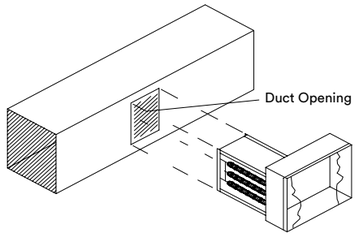
KW	=	$\frac{\text{BTU}}{3413}$
KW	=	$\frac{\text{Airflow (CFM)} \times \text{Temperature rise (°F)}}{3160}$
WATTS	=	$\frac{(\text{Volts})^2}{\text{Resistance}}$
Ampere (1 - Phase)	=	$\frac{\text{Watts}}{\text{Volts}}$
Ampere (3 - Phase)	=	$\frac{\text{Watts}}{\text{Volts (1.732)}}$
KW per square foot	=	$\frac{\text{KW}}{\text{Duct area in square foot}}$
Velocity (fpm)	=	$\frac{\text{Airflow (CFM)}}{\text{Duct area in square foot}}$

BTU/h - KW/Ampere Chart

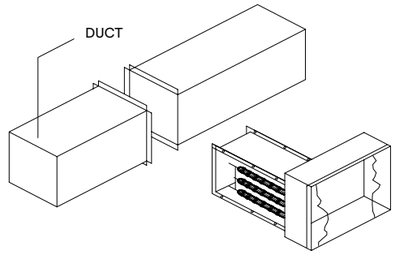
BTU/h	KW	120	208		220		240		277	380	415	440	460	480	KW
		1ø	1ø	3ø	1ø	3ø	1ø	3ø	1ø	3ø	3ø	3ø	3ø	3ø	
3413	1	8.3	4.8	2.8	4.5	2.6	4.2	2.4	3.6	1.5	1.4	1.3	1.3	1.2	1
6826	2	16.7	9.6	5.5	9.1	5.2	8.3	4.8	7.2	3.0	2.8	2.6	2.5	2.4	2
10239	3	25.0	14.4	8.3	13.6	7.9	12.5	7.2	10.8	4.6	4.2	3.9	3.8	3.6	3
13652	4	33.3	19.2	11.1	18.2	10.5	16.6	9.6	14.4	6.1	5.6	5.2	5.0	4.8	4
17065	5	41.7	24.0	13.9	22.7	13.1	20.8	12.0	18.1	7.6	7.0	6.6	6.3	6.0	5
20478	6	50.0	28.9	16.6	27.2	15.7	25.0	14.4	21.7	9.1	8.3	7.9	7.5	7.2	6
23891	7	58.3	33.7	19.4	31.8	18.3	29.1	16.8	25.3	10.6	9.7	9.2	8.8	8.4	7
27304	8	66.6	38.5	22.2	36.3	21.0	33.3	19.2	28.9	12.2	11.1	10.5	10.0	9.6	8
30717	9	75.0	43.3	24.9	40.9	23.6	37.4	21.6	32.5	13.7	12.5	11.8	11.3	10.8	9
34130	10	83.3	48.1	27.7	45.4	26.2	41.6	24.0	36.1	15.2	13.9	13.1	12.5	12.0	10
37543	11	91.6	52.9	30.5	49.9	28.8	45.8	26.4	39.7	16.7	15.3	14.4	13.8	13.2	11
40956	12	100.0	57.7	33.2	54.5	31.4	49.9	28.8	43.3	18.2	16.7	15.7	15.0	14.4	12
44369	13	108.3	62.5	36.0	59.0	34.1	54.1	31.2	46.9	19.8	18.1	17.0	16.3	15.6	13
47782	14	116.6	67.3	38.8	63.6	36.7	58.2	33.6	50.5	21.3	19.5	18.3	17.5	16.8	14
51195	15	125.0	72.1	41.6	68.1	39.3	62.4	36.0	54.2	22.8	20.9	19.7	18.6	18.0	15
54608	16	133.3	76.9	44.3	72.6	41.9	66.6	38.4	57.8	24.3	22.3	21.0	20.0	19.2	16
58021	17	141.6	81.8	47.1	77.2	44.5	70.7	40.8	61.4	25.8	23.7	22.3	21.3	20.4	17
61434	18	150.0	86.5	49.9	81.7	47.2	74.9	43.2	65.0	27.3	25.0	23.6	22.5	21.6	18
64847	19	158.3	91.4	52.6	86.3	49.8	79.0	45.6	68.6	28.8	26.4	24.9	23.8	22.8	19
68260	20	166.6	96.2	55.4	90.8	52.4	83.2	48.0	72.2	30.4	27.8	26.2	25.0	24.0	20
71673	21	174.9	101.0	58.2	95.3	55.0	87.4	50.4	75.8	31.9	29.2	27.5	26.3	25.2	21
75086	22	183.3	105.8	60.9	99.9	57.6	91.5	52.8	79.4	33.4	30.6	28.8	27.5	26.4	22
78499	23	191.6	110.6	63.7	104.4	60.3	95.7	55.2	83.0	34.9	32.0	30.1	28.8	27.6	23
81912	24	200.0	115.4	66.5	109.0	62.9	99.8	57.6	86.6	36.5	33.4	31.4	30.0	28.8	24
85325	25	208.3	120.2	69.3	113.5	65.5	104.0	60.0	90.3	38.0	34.8	32.8	31.3	30.0	25
88738	26	218.6	125.1	72.0	118.0	68.1	108.2	62.4	93.9	39.5	36.2	34.1	32.5	31.2	26
92151	27	225.0	129.9	74.8	122.6	70.7	112.3	64.8	97.5	41.0	37.6	35.4	33.8	32.4	27
95564	28	233.3	134.7	77.6	127.1	73.4	116.5	67.2	101.1	42.5	39.0	36.7	35.0	33.6	28
98977	29	241.6	139.5	80.3	131.7	76.0	120.6	69.6	104.7	44.1	40.3	38.0	36.3	34.8	29
102390	30	250.0	144.3	83.1	136.2	78.6	124.8	72.0	108.3	45.6	41.7	39.3	37.5	36.0	30
105803	31	258.3	149.1	85.9	140.7	81.2	129.0	74.4	111.9	47.1	43.1	40.6	38.8	37.2	31
109216	32	266.6	153.9	88.6	145.3	83.8	133.1	76.8	115.5	48.6	44.5	41.9	40.0	38.4	32
112629	33	275.0	158.7	91.4	149.8	86.5	137.3	79.2	119.1	50.1	45.9	43.2	41.3	39.6	33
116042	34	283.3	163.5	94.2	154.4	89.1	141.4	81.6	122.7	51.7	47.3	44.5	42.5	40.8	34
119455	35	291.7	168.4	97.0	159.0	91.7	145.6	84.0	126.4	53.2	48.7	45.9	43.8	42.0	35
122868	36	300.0	173.2	99.7	163.4	94.3	149.8	86.4	130.0	54.7	50.1	47.2	45.2	43.2	36
126281	37	308.3	178.0	102.5	168.0	96.9	153.9	88.8	133.6	56.2	51.5	48.5	46.3	44.4	37
129694	38	316.7	182.8	105.3	172.5	99.6	158.1	91.2	137.2	57.7	52.9	49.8	47.5	45.6	38
133107	39	325.0	187.6	108.0	177.1	102.2	162.2	93.6	140.8	59.3	54.3	51.1	48.8	46.8	39
136520	40	333.3	192.4	110.8	181.6	104.8	166.4	96.0	144.4	60.8	55.6	52.4	50.0	48.0	40
139993	41	341.7	197.2	113.6	186.1	107.4	170.6	98.4	148.0	62.3	57.0	53.7	51.3	49.0	41
143346	42	350.0	202.0	116.3	190.7	110.0	174.7	100.8	151.6	63.8	58.4	55.0	52.5	50.4	42
146759	43	358.3	206.8	119.1	195.2	112.7	178.9	103.2	155.2	65.3	59.8	56.3	53.8	51.6	43
150172	44	366.7	211.7	121.9	199.8	115.3	183.0	105.6	158.8	66.9	61.2	57.6	55.0	52.8	44
153582	45	375.0	216.5	124.7	204.3	117.9	187.2	108.0	162.5	68.4	62.6	59.0	56.3	54.0	45
156998	46	383.3	221.3	127.4	208.8	120.5	191.4	110.4	166.1	69.9	64.0	60.3	57.5	55.2	46
160411	47	391.7	226.1	130.2	213.4	123.1	195.5	112.8	169.7	71.4	65.4	61.6	58.8	56.4	47
163824	48	400.0	230.9	133.0	217.9	125.8	199.7	115.2	173.3	72.9	66.8	62.9	60.0	57.6	48
167237	49	408.3	235.7	135.7	222.5	128.4	203.8	117.6	176.9	74.4	68.2	64.2	61.3	58.8	49
170650	50	416.6	240.5	138.5	227.0	131.10	208.0	120.0	180.5	76.0	69.6	65.5	62.5	60.0	50

Installation Instructions

1. Before proceeding heater installation, inspect all heater assembly for any damage during transportation or site mishandling. Check physically all ceramic insulators for breakage and check coils that none have been damaged.
2. The duct which the duct heater to be installed should be constructed in accordance with the standards of the National Fire Protection Association (NFPA-90A & 90B) for the installation of Air-Conditioning and Ventilation Systems.
3. Heaters should be installed in the duct with atleast 4 feet downstream from an Air Handler Unit. This will allow any change in direction of airflow to ensure even airflow over the entire heater area.
4. Install heaters with at least 4 feet away from the heat pumps or central air conditioners.
5. All Cooling Coils, Dampers, Air Filters or Humidifiers must be installed at least 4 feet length away from the heater.
6. Provide 4 feet length between heater and any canvas duct connector of transition sections and provide 2 feet length between heater and an elbow or turn.
7. The minimum air velocity is required for the satisfactory operation of heaters. Please refer the attached required minimum velocity chart. Entering air temperature is limited to 100°F.
8. For Insert type installation, cut a hole in the side of the duct, 3mm larger than the element metal enclosure portion. Insert the heater into this opening and attach control panel to the side of the duct by means of sheet metal screws. For bottom mount type heaters follow the same procedure except, making hole in bottom side instead of side. If duct is internally insulated used a recessed type construction to cover the insulation.
9. For Flanged type installation, the flange portion of the heater to be matched with the out turned flanges of the duct. No duct flange in the control panel side as shown below. Join heater and duct flanges by means of metal screws or bolts & nuts. Fasten control panel to duct with steel metal screws.
10. Follow the air flow direction arrow in heater control panel and position the heater to match with duct air flow
11. Heater control panel should not be covered by any insulation.
12. Provide enough space to open the door and ease access for maintenance and service.



INSERT TYPE INSTALLATION



FLANGED TYPE INSTALLATION

1. Follow the schematic wiring diagram pasted inside the heater to make proper power cable and control cable termination. Minimum wire size, fuse sizes are shown in the wiring diagram. All electrical connections, wire sizes and type of conduit sizes are according to National Electric Codes (NEC) and local codes.
2. All incoming power cables must be rated for 125% of the total load that handle and rated for minimum 75°C. If heater is supplied with Fan Interlock Relay, connect the circuit with fan circuit to energize the heater after energize the fan.
3. Provide disconnect switch near heater as per NEC, if not supplied with built in heater.
4. Do not bundle or tie the power cables.
5. Over current protection (power fuse or circuit breaker) must be provided at site if not supplied with heater.
6. Provide enough space for air circulation in heat sink if heater supplied with SCR controls.

OPERATION AND MAINTENANCE

Operation

Check the installation instructions and wiring diagrams to make sure that the heater was wired and installed properly.

1. Before proceeding heater operation, make sure that all electrical terminations are tight as these may have loose during transportation, installation or improper site handling. It is recommended to retighten all connection after complete the installation process.

2. Clean all dirts, dust and moisture from heater. Check for any missing insulation on cables that terminated inside the heater.

3. Check all fuses and circuit breakers are in position and rating are adequate.

4. Check all control circuit wiring and power supply to the controller are match with their requirement.

5. Turn the heater power to on and measure the supply voltage and compare with rated name plate.

6. Power on the control circuit or select the thermostat to heat mode. Check the steps are energizing step by step. with a time delay. Don't allow to energize all steps together of entire heater battery if load is more, Use propoer time delay between stages to energize the heater.

7. Measure heater ampere to record, either total or step by step for multi-step heater. Measure airlfow and inlet and outlet temperature to record.

Maintenance and Service

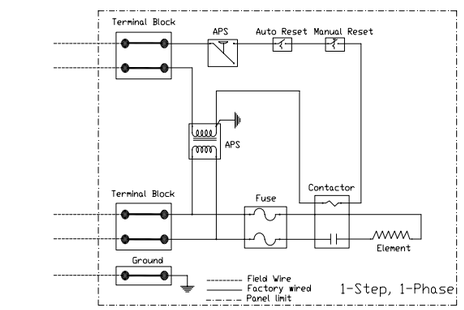
Always shut down the Power supply before doing any work on duct heater.

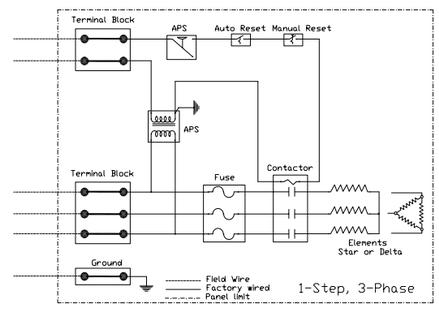
1. All SAFID Duct Heaters are manufactured with little or no maintenance requirements. We propose following a periodic service plan to maintain the long life of heater.
2. Check for any loose contacts, and retighten all screws if necessary.
3. Clean for any dust inside the panel, especially in magnetic contactors.

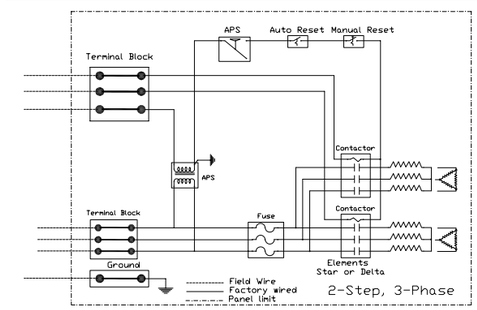
If the heater is not operating, please check the below. These often help solve general problems for duct heaters:

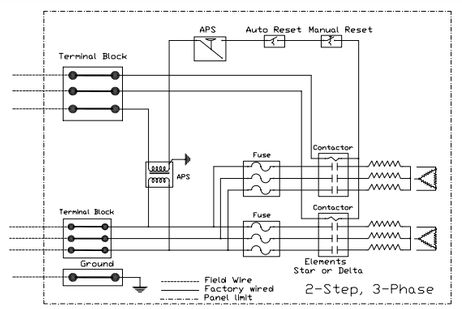
1. Power supply to heater.
2. Check for any loose contacts or connections.
3. Power fuses blow or not.
4. Check for control supply and transformer.
5. Thermostat is working or not.
6. Check fan is operating and maintain the airflow to sense the air pressure for airflow switch.
7. Check high-temperature cut-outs (Automatic/Manual) are close.
8. Check airflow switch is closed.

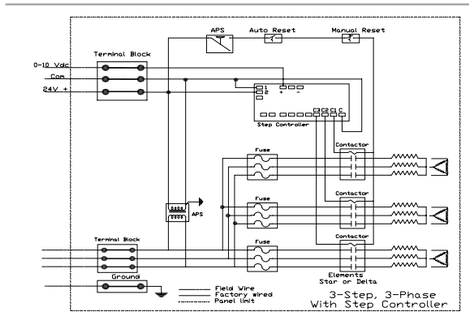
Typical Wiring Diagrams

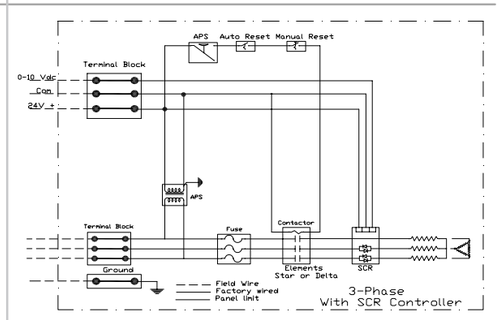


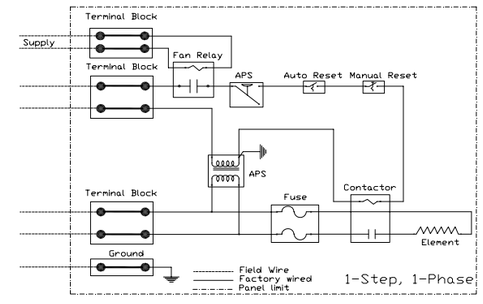


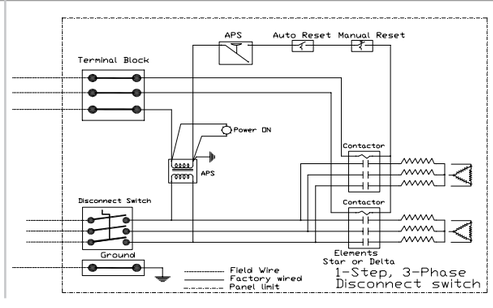




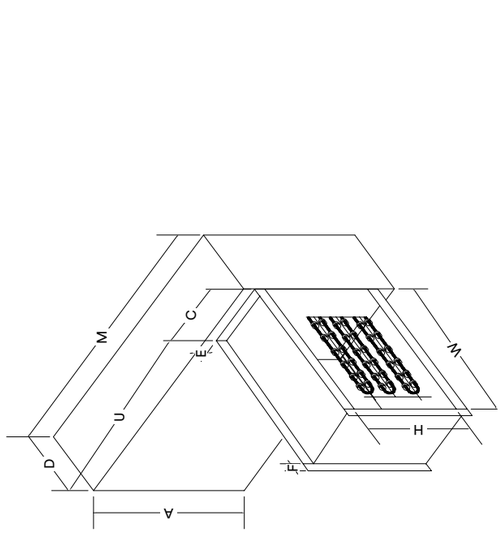








Duct Heater Submittal

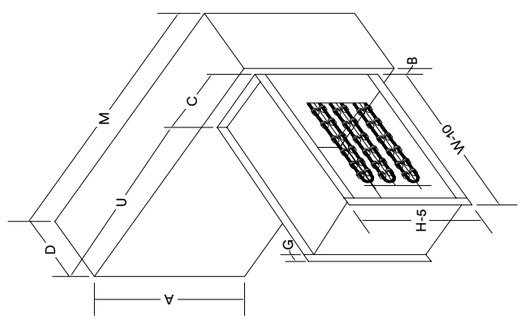


FLANGED TYPE

Duct Heater Submittal

Quatation No.:
Customer:
Project:
Date:
Model:
Location:

No.	Tag	Duct Size	Qty.KW	Step	Volts	Ph	Hz	S/F	Amps	Kw/Step	Ctl	Vlt	W	H	A	B	C	D	E	F	G	M	U



SLIP-IN INSERT TYPE

Standard Built-In Accessories

1. De-Energizing Magnetic Contactor
2. Airlflow Switch
3. Power and Control Terminal Blocks
4. Dics Type Auto and Manual Thermal Cut-Outs
5. NEMA -1 Type Control Panel
6. 1mm Thick Galvanized Steel Construction
7. Grounding Lugs
8. Class-II Control Transformer

Optional Accessories

1. Disconnecting Contactor
2. Mercury Contators
3. Transformer Secondary Fusing
4. Power Fusing
5. Door Interlocking Disconnect Switch (Non-Fused)
6. Door Interlocking Disconnect Switch (Fused)
7. Disconnect Switch
8. Circuit Breaker
9. Modulating SCR (Thyristor) Controller
10. Step Controller
11. Room Thermostat
12. Fan Interlock Relay
13. Pilot Light Indications
14. Volt Free Contacts for Remote Monitoring
15. Remote Control Panel
16. Recessed Control Panel
17. Bottom Mount Control Panel
18. Dust Proof Control Panel
19. Stainless Steel Construction
20. Aluminized Steel Construction
21. Weather Proof Control Panel
22. Derated Element Below 35 Watts per Square Inch
23. Powder/Epoxy Coating
24. SCR with Venier System

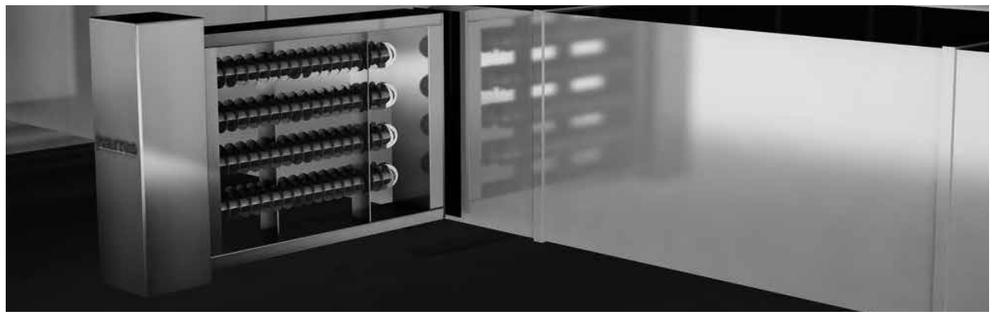
Sample Specifications for Duct Heaters

Sample Specifications for Open Coil

1. Electric duct heaters are referred to as an Open Coil type or series EHO as manufactured by SAFID.
2. Capacity, power supply, voltage, phase, duct size, no. of steps & control to be as per project requirement.
3. All heaters shall meet the requirements of UL and NEC specifications.
4. Heaters shall be either Slip-In Insert type or Flanged type as per project requirement.
5. Heating element shall be Type-A, high grade Nickel (80%) Chromium (20%) alloy resistance.
6. Heater frames and Control Panel shall be constructed of 20 gauge galvanized steel sheet.
7. Heater element insulator mounting shall be suitable for free floating type and allowing expansion of the insulators under high temperature conditions without cracking or breaking.
8. All heaters shall have its load divided into equal step to a maximum of 48A per steps. Fuses and neccassary controls shall be provided in heaters if total current is more than 48A and subdivide all the steps to limit the load within 48A per steps.
9. All heaters shall be with built in primary & secondary over temperature protections, airflow switch and neccesary magnetic contactors per each steps.
10. All safety devices shall be servicable through the control panel without removing the heater from the duct.
11. A wiring diagram showing wire size, fuse size and complete control and power termination shall be placed on each heater's door.

Sample Specifications for Finned or Unfinned Tubular Heater

1. Electric duct heater are referred to as Finned or Unfinned type, series EHFT or EHT as manufactured by SAFID.
2. Capacity, power supply, voltage, phase, duct size, number of steps and control will be customized according project requirement.
3. All heaters shall meet the requirement of UL & NEC specifications.
4. Heaters shall be either Slip-In Insert type of Flanged type as per project requirement
5. Heating element shall be Type- A, high grade Nickel (80%) Chromium (20%) alloy resistance.
6. Heater frames and Control panel shall be constructed of 20 gauge galvanized steel sheet.
7. Heater element shall be covered wih Stainless Steel Tube (for "EHT") & rounded with Stainless Steel Fins (for 'EHFT" series) and annealed after assembly.
8. All heaters shall have their load divided into equal steps to a maximum of 48A per steps Fused and necessary controls shall be provided in heaters if total current is more then 48A and subdivided all the steps to limit the load within 48A per steps.
9. All heaters shall be with built in primary & secondary over temperature protections, airflow switch and necessary magnetic contactors per each steps.
10. All safety devices shall be servicable through the control panel without removing the heater from the duct.
11. A wiring diagram showing wire size, fuse size and complete control and power termination shall be placed on each heater's door.



Order Details

Order Code:

SEH- aaa- bb- cc- dd- ee- ff- gg- hh- ii-

Model:

O = Open Coil Element
T = Tubular Element
FT = Finned Tubular Element

I = Slip-In Insert Type
F = Flanged Type

S = Standard Controls & Construction
O = Optional Controls & Construction

K = Heater Capacity

S = No. of Steps

V = Power Supply

P = No. of Phase

H = Frequency

D = Duct Size (W x H)

Order Example

Requirements:
Open Coil Heater, slip-in type with standard controls and construction, 5 kilowatts, 2 step, 380 volts, 3 phase, 60Hz, suitable for 500mm width x 300mm height duct.

Ordering:
Make : SAFID
Type : SE H - O - I - S -5 - 2 - 380 -3 - 60 - 500 X 300
Qty. : 1pc

NOTE
Please refer to the accessories page for standard/optional controls and constructions.