04

ELECTRIC DUCT HEATER

@Performance
QATIF - AUJAM INDUSTRIAL
AREA DHAHRAN - JUBAIL HI WAY
P.O. BOX 10848 - QATIF 31911
القطيف – صناعية الأوجام – طريق الظهران الجبيل السريع – ص.ب ١٠٨٤٨ – القطيف ٣١٩١١

PERFORMANCE
for Metal Production
مصنع واحة الإنجاز للصناعات المعدنية

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company profile 2022

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Electric Duct Heater

STANDARD CONSTRUCTION FEATURE
ELECTRIC HEATER

PRODUCT DESCRIPTION

The Electric Coil is available on single duct terminal units. Electric coils meet all applicable requirements of National Electric Code (NEC)

Heater frames and boxes are constructed of 20 gauges G.I. Steel. Factory pre-wiring of components eliminates costly field installation. A specified wiring diagram is furnished for every heater

Other Features Include :

- Automatic reset primary thermal cutout.
- Replaceable secondary thermal cutout.
- Low-pressure drop/sound levels.
- Power terminal blocks.
- Control line terminal blocks.
- De-energizing magnetic contactors as required.
- Airflow interlock switch.
- Coils are provided with S and Drive connections on the inlet and flange connection on the discharge.
- 80-20 Nickel-Chromium wire.
- Airflow proving switch with total pressure pick up probe.
- Control transformer in heaters for electric or electronic control options.
- Ground connector for earth.
- Disconnect switch/fusing and mercury contractors as required /optional.

Electric Duct Heater

PERFORMANCE SELECTION DATA
ELECTRIC HEATER

KW Required to Match Heat Loss	$(Q)\ KW = \frac{Q\ (Btu/h)}{3413}$
Sensible Heat Load	$Q\ (Btu/h) = 1.08 \times CFM \times Temp.\ Rise$
Load Requirement	$KW = \frac{CFM \times Air\ Temperature\ Rise}{3160}$
Temperature Rise	$T.R. = \frac{Kw \times 3160}{Cubic\ Feet\ Per\ Min.}$
Ohm's Law	$Watts = \frac{(Volts)^2}{Resistance} = Volts \times Amps$
Line Current, 1 Phase	$Amps = \frac{Watts}{Volts}$
Line Current, 3 Phase	$Amps = \frac{Watts}{1.73 \times Volts}$
Pressure Drop	$Inches\ H_2O = \frac{KW/ft.^2}{760} \times \left(\frac{Velocity\ in\ FPM}{500}\right)^2$
Maximum Discharge Air Temperature	125^0
KW Per Square Foot	$(KW/Ft.^2) = KW \div \frac{Duct\ Width\ (in) \times Duct\ Height\ (in)}{144}$

Note : Maximum heater discharge temperature should not exceed 125° F to avoid nuisance tripping.

Electric Duct Heater

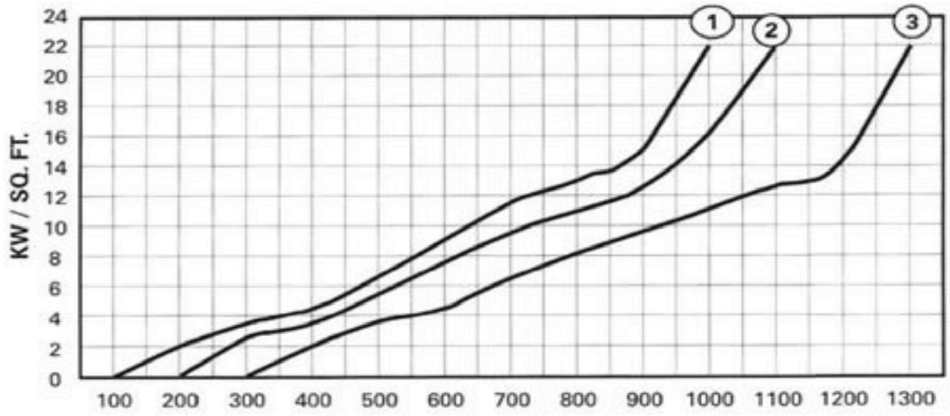
ELECTRIC COIL PERFORMANCE DATA
ELECTRIC HEATER

Since an electric duct heater has a constant BTU output as long as the heater is energized, a minimum air velocity must be maintained through the heater. Proper airflow will prevent over-temperature causing nuisance tripping and will maintain element life expectancy. The velocity of airflow in the duct is determined by the formula:

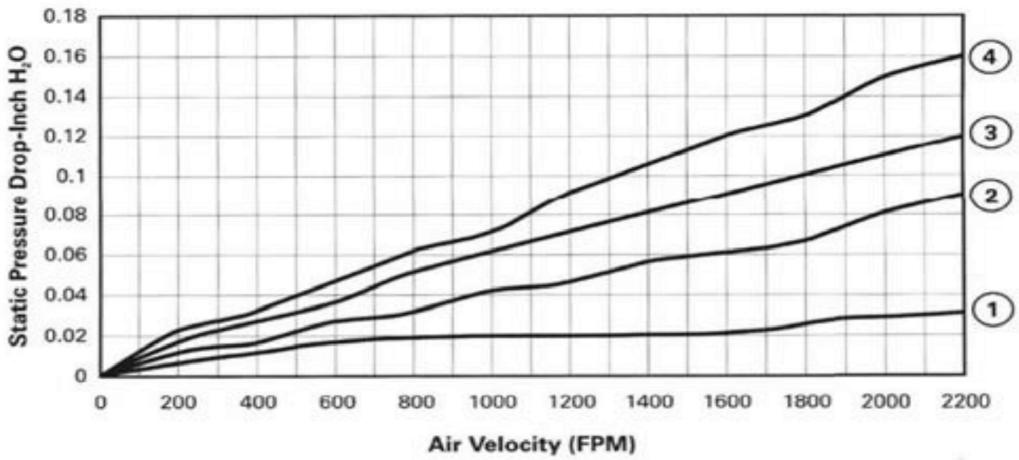
VELOCITY = CFM DUCT AREA (Ft.²)

And has to be compared with the minimum airflow velocity through the electric heater based on discharge duct area (Ft.²). The minimum uniform airflow in a duct heater is directly related to the inlet air temperature and consideration must be given to both the airflow across the heater and the inlet air temperature.

Divide the total watts by square footage of duct area to calculate the watts per sq. foot of that duct area. Use the chart to determine the minimum FPM based on inlet entering air temperature.



1 - Below 70°F inlet air **2** - 70°F to 90°F inlet air **3** - 91°F to 110°F inlet air



1,2,3 and 4 are the number of rows for heater coils

Electric Duct Heater

TECHNICAL DATA

TYPICAL CONTRACTOR POWER CIRCUITRY

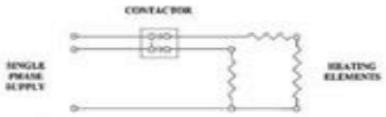
(Only power circuite shown, Safety devices etc., omitted)

DE - ENERGIZING CONTRACTOR TYPE:

SINGLE PHASE

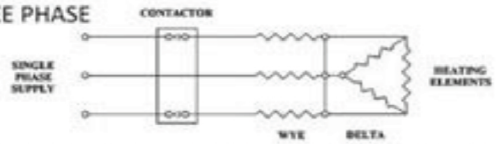
SINGLE LINE BREAK

Heater is de-energized by breaking only one side of the line trough the action of the single contact. This type will be disconnecting for 120V and 277V, provided the contractor opens the under grounded line.



The above illustrates using a two pole contractor to de-energize one side of the line. This type of circuitry doubles the contractor capacity. This type would be disconnecting on 120V and 277V.

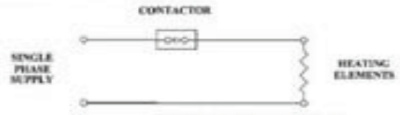
THREE PHASE



Illustrates a two line break which will de-energize the heater. Both WYE and Delta heating elements configuration is shown.

DISCONNECTING TYPE:

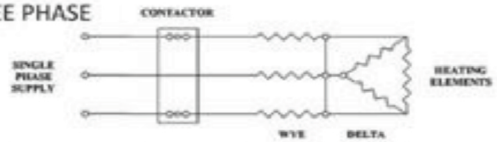
SINGLE PHASE



TWO LINE BREAK

Heating power is completely disconnected by breaking both sides of the power source. All ungrounded power conductors are disconnected.

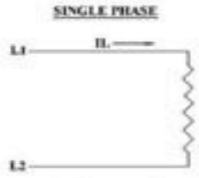
THREE PHASE



All grounded conductors disconnected. Both WYE and Delta Configurations are shown.

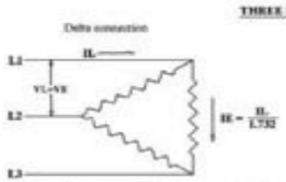
HEATER ELEMENTS WIRING CONFIGURATION AND PROPERTIES

SINGLE PHASE



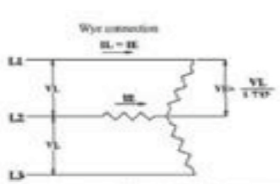
Element Voltage = Line Voltage
P = Power in watts.
IE = Current in Amps.
VE = Element Voltage in Volts.
IL = Line Current in Amps.
VL = Line Voltage in Volts.

THREE PHASE



THREE WIRE "DELTA" CONNECTION

1. Element Voltage = Line Voltage
2. Phase Current In = I_{L1} = I_{L2} = I_{L3}
3. Voltage measured between any two power legs (L1 to L2 etc.) should be equal to the three phase line voltage.



THREE WIRE "WYE" CONNECTION

1. Element voltage = $\frac{\text{line Voltage}}{1.73}$
2. Phase Current In = I_{L1} = I_{L2} = I_{L3}
3. Voltage measured between any two power legs (L1 to L2 etc.) should be equal to the three phase voltage.

Electric Duct Heater

BTU/H-KW-AMPERES CHART

SL. NO.	BTU/HR	KW	AMPHERES				KW	BTU/HR
			220 VOLTS		380 VOLTS			
			1 Ø	3 Ø	1 Ø	3 Ø		
01	3413	1	4.5	2.6	2.6	1.52	1	3413
02	6826	2	9.1	5.3	5.26	3.04	2	6826
03	10239	3	13.6	7.9	7.89	4.56	3	10239
04	13652	4	18.2	10.5	10.52	6.08	4	13652
05	17065	5	22.7	13.1	13.15	7.6	5	17065
06	20478	6	27.3	15.8	15.78	9.13	6	20478
07	23891	7	31.8	18.4	18.42	10.65	7	23891
08	27304	8	36.4	21	21.05	12.17	8	27304
09	30717	9	40.9	23.6	23.68	13.69	9	30717
10	34130	10	45.5	26.3	26.31	15.21	10	34130
11	37543	11	50	28.9	28.94	16.73	11	37543
12	40956	12	54.5	31.5	31.58	18.25	12	40956
13	44369	13	59.1	34.2	34.21	19.77	13	44369
14	47782	14	63.6	36.8	36.84	21.29	14	47782
15	51195	15	68.2	39.4	39.47	22.81	15	51195
16	54608	16	72.7	42.0	42.1	24.33	16	54608
17	58021	17	77.3	44.7	44.73	25.85	17	58021
18	61434	18	81.8	47.3	47.37	27.38	18	61434
19	64847	19	86.4	49.9	50.0	28.9	19	64847
20	68260	20	90.9	52.5	52.63	30.42	20	68260

FORMULA FOR CALCULATING LINE CURRENTS

SINGLE PHASE

$$\text{AMPHERES} = \frac{\text{WATTS}}{\text{LINE VOLTAGE}}$$

THREE PHASE

$$\text{AMPHERES} = \frac{\text{WATTS}}{\text{LINE VOLTAGE X 1.73}}$$

TO CONVERT "KW" TO WATTS
MULTIPLY "KW" BY 1,000

Electric Duct Heater

HEATER ACCESSORIES

AIR FLOW SWITCH

An airflow switch of the pressure type shown right is the best and most positive method of protection against loss of air flow. The switch has a built-in diaphragm that senses the pressure differences from the inside to the outside of the duct. It's adjustable pressure range is from 0.05±0.2 wg" to 13.8"wg.

MAGNETIC CONTACTORS

Magnetic contactors are standard in all heaters. They are used for primary back-up control. Two and three pole contactors are available with coil (control voltage) of 24,120,208,240,277 volts.
Full line break: this refers to a contactor that disconnects all ungrounded conductors when the contactor is open. To assure that all lines break, a three pole contactor is required for three phase and a two pole contactor for single phase

POWER FUSING

UL standards and NEC code required for heaters drawing more than 48 AMPS. Accessory fusing is available on heaters drawing less than 48 AMPS when requested.
UL and NEC require that heaters exceeding a total or 48 AMPS, be subdivided into circuits not exceeding 48 Amps each. Therefore, if the heater exceeds 48 AMPS, circuit fusing is required built in and furnished by the heater manufacturer.

DISCONNECT SWITCH

Available with door interlock disconnecting switch as an option. The picture in the right shows a disconnecting switch. We can furnish either door interlocking or non-door interlocking and fused or non-fused disconnecting switches.
For door interlocking type disconnect switches the handle is mounted on the outside of the hinged panel door and indicates an ON or OFF position.

TERMINAL BLOCK

A device that join wires or cable. Terminal block, typically snap into a metal rail or are screw mounted on the panel of a control enclosure.

Electric Duct Heater

HEATER ACCESSORIES

TRANSFORMERS

Transformers are required when a control voltage source is not available and the line volt diffusers from the control unit. Normally, transformers are furnished together with the other heater accessories as an integral part of the VAV with heater. Primary, or line voltages, of 120,208,240,277 or 480 are available with secondary of 24 V.

AUTOMATIC AND MANUAL RESET THERMAL CUT OFF SWITCH

The primary automatic reset thermal cut off switch disconnect the heater from the main circuit once the temperature limit is reached. The secondary manual thermal cut off switch comes into action if primary cut off switch fails. The cut off switch enhance the safety of the heater in addition to the air flow switch.

RDU 340(Room Temperature Controller)

- Modulating PI control
- Control depending on the room or the return air temperature
- Output for a DC 0...10 V actuator and AC 230 V electric heater(ON-OFF0
- Automatic or manual heating/cooling changeover
- Operating modes; Comfort, Energy saving and Protection
- Two multifunctional inputs for keycard contact, external sensor etc
- Adjustable commissioning and control parameters
- Minimum and maximum set point limitation
- Adjustable minimum and maximum limitation for air flow signal DC 0...10V
- Output signal inversion as an option
- Mounting on recessed rectangular conduit box, 60.3 mm fixing centers
- AC 24 V operating voltage
- Application selectable
- Single-duct system
- Single-duct system with electrical heater
- our productions based on coopration with (K.B.E) factory

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ص.ب ١٠٨٤٨ – القطيف ٣١٩١١ ـ المملكة العربية السعودية