

ULTRA-SAFE™ Explosion-proof Duct Heaters

Standard Construction

Heat Exchanger has copper tubes with integral aluminum fins. Each unit undergoes hydrostatic testing at 350 psig, five times the pressure relief valve setting of 70 psig.

Heat Transfer Fluid is propylene glycol, a non-toxic, rust-inhibiting fluid that provides freeze protection to -49°F (-45°C). Its high heat transfer rate at 70 psig makes the heat exchanger suitable for gases that ignite at temperatures as low as 320°F (160°C). Thus every ULTRA-SAFE™ heater is rated for Temperature Code T3C.

Industrial Grade Heating Elements, built by INDEECO, are .475" (1.21 cm) diameter to provide extra insulation between the coil and sheath for high voltage protection.

Frame is heavy gauge galvanized steel, fitted with lifting lugs to facilitate installation.

Four Levels of Safety are provided on every heater: automatic and manual reset thermal cutouts, airflow interlock and pressure relief valve.

Two thermal cutouts limit the heat transfer fluid temperature, assuring thermal safety. The automatic reset operates a "primary" magnetic contactor. The manual reset operates a separate backup magnetic contactor. If either cutout opens, the entire heater is de-energized.

A fan relay, acting as an airflow interlock, prevents the heater from being energized unless the fan starter is on.

The pressure relief valve on the heat exchanger opens only if the thermal cutout system fails to prevent excessive temperatures.

Standard Built-in Control Package includes the following components mounted in a cast aluminum explosion-proof enclosure:

- De-energizing control and back-up magnetic contactors.
- 24V control circuit transformer.
- Fan relay, supplied with 24V or 120V holding coil to match the fan starter coil voltage.
- Terminal blocks for field power and control wiring.
- Grounding terminal.
- Supplemental fusing for heaters drawing more than 48 amps.

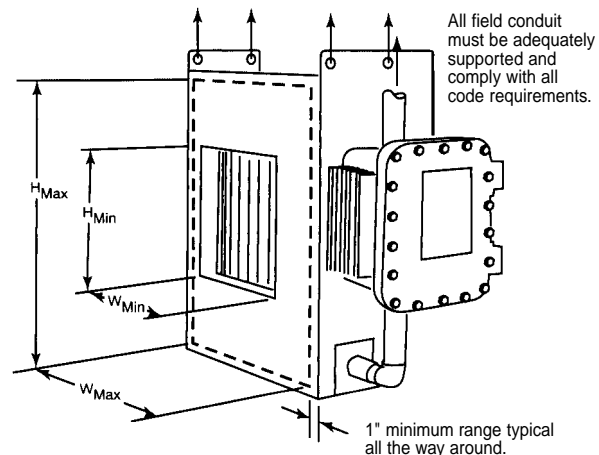
Installation

Complete installation instructions are furnished with each heater. Following are some guidelines:

- The heater must be securely attached to external duct flanges.
- The heater must be adequately supported. If the duct flanges will not afford enough support, overhead hangers attached to the lifting lugs may be used for additional support.
- Each heater is suitable for a variety of duct sizes. See **Table XIX** on page 51 for maximum and minimum dimensions. Note that duct height and width can vary independently.
- Airflow must be horizontal. See page 47 for airflow requirements.

Attach hanger rods to structure capable of supporting the weight of the heater.

Ensure attachment allows for height adjustment so that heater is level along both axis.



Maximum duct dimensions (W_{Max} & H_{Max}) should allow for 1" minimum flange all around.

Minimum duct dimensions (W_{Min} & H_{Min}) are same as heat exchanger dimensions.

Figure 76. ULTRA-SAFE™ Mounting Configuration



Classes I and II, Division 1 and 2
Groups B, C, D, F and G
Temperature Code
T3C, 320°F (160°C)



Ratings Available
• Up to 240 KW
• Up to 600V



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Temperature Control

Single Stage Control – For many applications, single stage on/off control is adequate. For higher KW ratings using two heat exchanger modules (unit size codes D, E, and F in **Table XIX** on page 51), each module may constitute a heating circuit. Non-catalog multi-unit designs with up to four ULTRA-SAFE™ duct heater units in series are also available.

Solid-State SCR Control – When temperature must be controlled precisely, built-in SCR's manufactured by INDEECO are recommended. They are furnished with field-selected inputs of 2200 or 135 ohms, 0-10 VDC, or 4-20 mA. SCR's have zero-cross firing to eliminate radio frequency interference.

To meet FM and CSA requirements, non-catalog multi-unit designs (up to four heating units in series) also have controls set at 80°F (27°C) to limit the inlet air temperature to all but the inlet unit. These limit controls prevent excessive temperatures at the heater outlet as the inlet air temperature rises.

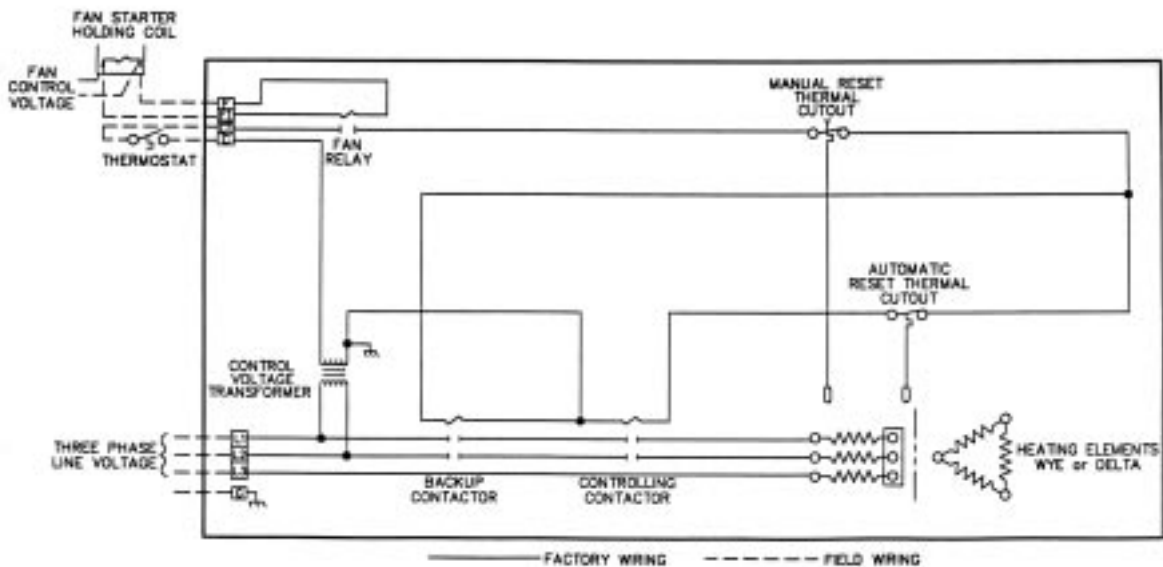


Figure 77. Heater with Single Stage Control

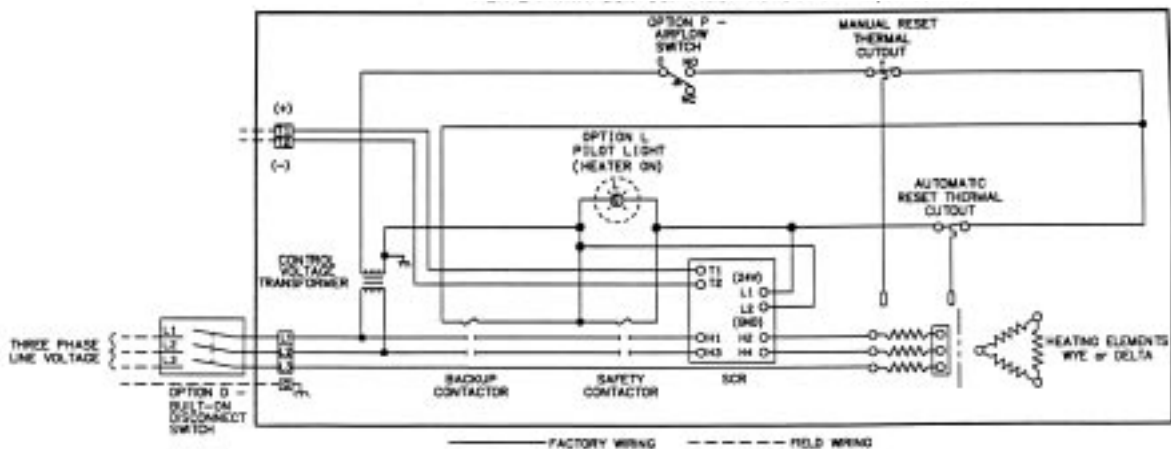


Figure 78. Heater with SCR Control and Options D, L and P

ULTRA-SAFE™

Explosion-proof Duct Heaters

Table XIX
Standard Heater Listing

Catalog Number	KW	Inside Duct Dimensions - in (cm)		Depth(2) in (cm)	Weight(2) lb (kg)	Unit Size Code	Max. KW Available(2)
		Minimum(1) W x H	Maximum W x H				
227F30A003 227F30A005 227F30A008 227F30A010	3 5 7.5 10	12 x 12 (30.5 x 30.5)	18 x 24 (45.7 x 61)	8 (20.3)	130 (59)	A	40
227F30B003 227F30B005 227F30B010 227F30B015 227F30B020	3 5 10 15 20	16.5 x 16 (41.9 x 40.6)	22.5 x 28 (57.2 x 71.1)	12 (30.5)	150 (68)	B	80
227F30C010 227F30C015 227F30C020 227F30C025 227F30C030	10 15 20 25 30	21 x 21 (53.3 x 53.3)	27 x 35 (68.9 x 88.9)	12 (30.5)	200 (91)	C	120
227F30D006 227F30D010 227F30D015 227F30D020	6 10 15 20	24 x 12 (61 x 30.5)	36 x 24 (91.4 x 61)	8 (20.3)	260 (118)	D	80
227F30E006 227F30E010 227F30E020 227F30E030 227F30E040	6 10 20 30 40	33 x 16 (83.8 x 40.6)	45 x 28 (114.3 x 71.1)	12 (30.5)	300 (136)	E	160
227F30F020 227F30F030 227F30F040 227F30F050 227F30F060	20 30 40 50 60	42 x 21 (106.7 x 53.3)	54 x 35 (137.2 x 88.9)	12 (30.5)	390 (177)	F	240

(1) Use only Minimum W x H dimensions for minimum air velocity calculations (see page 47).
 (2) Depth and weights shown for catalog listed KW ratings. They will be greater for larger KW, non-catalog designs. Max KW based on non-catalog designs with 4 units in series.

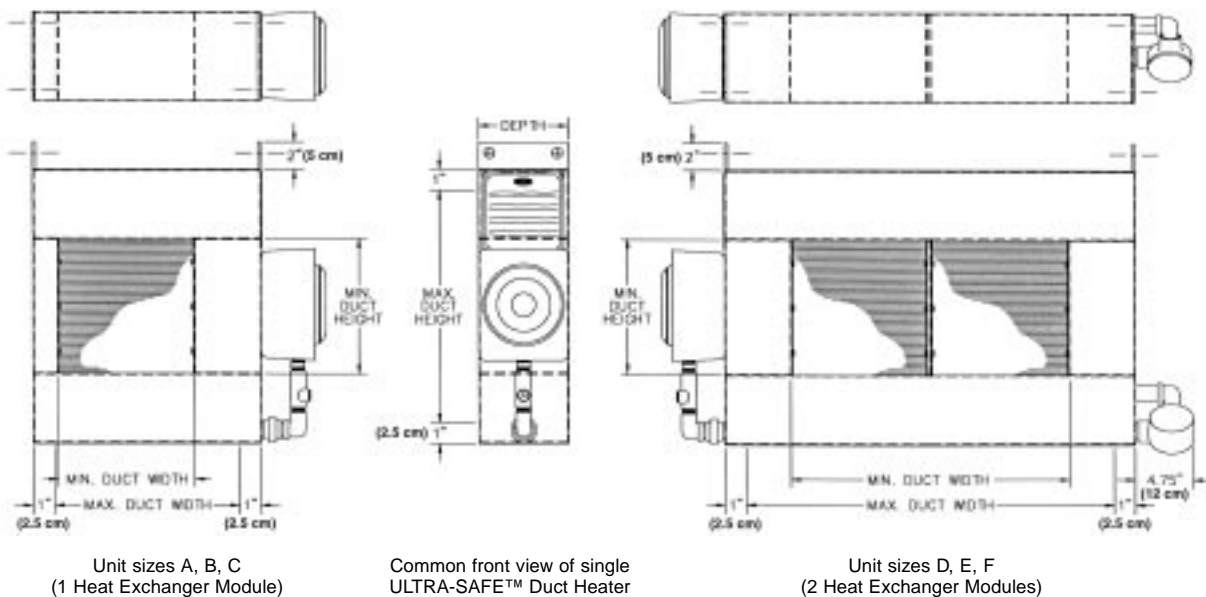


Figure 79. Dimensions

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Explosion-proof Duct Heaters

Table XX
Custom Options

Option	Description	Code
Corrosion Resistant Construction	Stainless frame, coated heat exchanger, epoxy-coated NEMA 4X, 7, 9 terminal box, conduit and fittings.	C
Built-on Disconnect Switch	To meet NEC requirement for a disconnect at or within sight of the heater. (Not available for outdoor or washdown use)	D
Built-on Airflow Switch	An explosion-proof differential pressure switch replaces the fan relay. Use only for positive pressure inside the duct. (Not available for outdoor or washdown use)	P
Supplementary Fusing	For heaters drawing 48 amps or less. Fusing is standard above 48 amps.	F
“Warning” Pilot Light	Red light to indicate when a thermal cutout or airflow interlock has tripped.	K
“Heater On” Pilot Light	Green light indicates when there is power to the heater.	L
Disconnecting Magnetic Contactors	Contactors that break all ungrounded lines replace standard de-energizing contactors.	M
120 Volt Control Circuit	A 120V control transformer with one leg fused replaces the standard 24V transformer.	V
NEMA 4 Construction	Explosion-proof box is gasketed for outdoor or wet locations.	G
Group B Construction	For Class I, Group B areas. Heater will be rated for Classes I and II; Divisions 1 and 2; Groups B, C, D, E, F and G.	Z

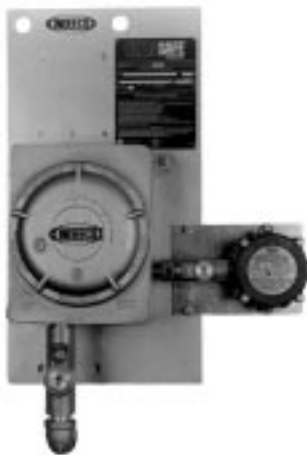


Figure 80. Built-on Airflow Switch



Figure 81. Built-on Disconnect Switch

Explosion-proof Duct Heaters

How to Order

1. **Catalog No. or Size** – For Standard Selections, specify Catalog Number from **Table XIX** on page 51. For special KW ratings, specify Size Code and KW Ratings.
2. **KW Rating** – Up to the maximum shown in **Table XIX**.
3. **Heater Voltage and Phase**
4. **Temperature Control** – Single Stage or SCR Control. If SCR Control, specify input signal.
5. **Fan Relay Voltage** – Specify 24 or 120 volt to match fan starter holding coil voltage.
6. **Airflow Direction** – Horizontal Right-Hand or Left-Hand airflow, as defined on page 47.
7. **Options** – Select from ULTRA-SAFE™ Custom Option codes in **Table XX**.

Sample Specification

A sample specification can be prepared by using the following information. A circle has been supplied so that you may darken those sections which you require. Material which is part of the standard ULTRA-SAFE™ Explosion-proof Duct Heater specification has already been darkened.

- 1. Electric explosion-proof duct heaters shall be INDEECO ULTRA-SAFE™ Series, of the KW rating, voltage, phase, duct size and airflow direction specified in the schedule. They shall be Factory Mutual and CSA Approved for:
 - Class I, Divisions 1 and 2, Groups C and D; Class II, Divisions 1 and 2, Groups E, F, and G Ignition Temperature Code No. T3C, 320°F (160°C).
 - Class I, Divisions 1 and 2, Groups B, C, and D; Class II, Divisions 1 and 2, Groups E, F, and G Ignition Temperature Code No. T3C, 320°F (160°C).
- 2. Duct heaters shall have automatic and manual reset thermal cutouts for redundant overtemperature protection, fan relay for airflow interlock, de-energizing controlling and backup magnetic contactors, 24 volt

control circuit transformer, terminal blocks for field wiring and supplementary fusing for heaters over 48 amps. Controls shall be housed in a NEMA 7, 9 cast aluminum enclosure.

- 3. The heat exchanger shall be liquid-to-air design, utilizing a copper tube core with integral aluminum fins. Nontoxic, inhibited, propylene glycol heat transfer fluid shall be used that provides freeze protection down to -49°F (-45°C). Pressure relief valve setting to be 70 psig. The heat exchanger shall include industrial grade INDEECO electric heating elements.
- 4. Duct heaters shall be furnished with the control option indicated below (select one):
 - Single stage on/off control with field installed thermostat.
 - Solid-state control with built-in zero-cross switching SCR and field installed thermostat.
- 5. The following options are to be included:
 - Corrosion resistant stainless steel construction with iridite coated heat exchanger, epoxy coated NEMA 4X, 7, 9 terminal box, conduit and fittings.
 - Built-on disconnect switch (not available with Group B construction).
 - Supplementary fusing for heaters drawing less than 48 amps.
 - Warning pilot light to indicate overtemperature or no airflow.
 - “Heater On” pilot light to indicate power to the heater.
 - Disconnecting magnetic contactors.
 - Built-on airflow switch in place of the fan relay (not available with Group B construction).
 - 120 volt transformer in place of 24 volt transformer.
 - NEMA 4, 7, 9 gasketed control box for wet locations.

Typical ULTRA-SAFE™ Duct Heater Schedule

Tag No.	KW	Supply Line		Stages	Duct Dimensions (Inches)		Special Features
		Volts	Phase		W (Width)	H (Height)	
DH1	10	480	3	1	18	12	Built-on disconnect switch
DH2	15	480	3	1	36	18	Corrosion resistant construction
DH3	75	480	3	1	48	24	