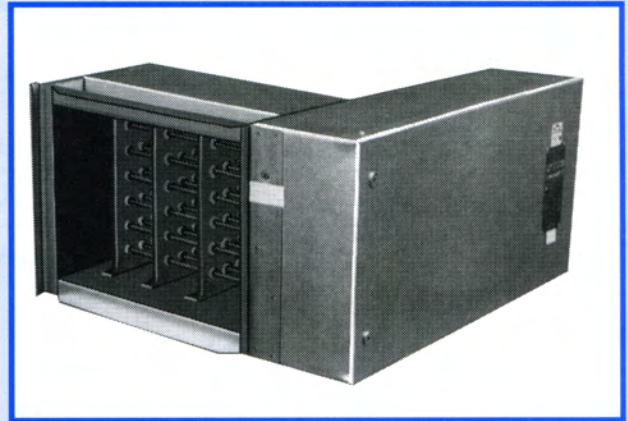


The **Carnes Electric Coil** is available on the fan powered terminal units. Electric coils meet all applicable requirements of the National Electric Code (NEC) and are of **UL** or **ETL** listed construction. Heater frames and boxes are constructed of 20 gauge or heavier galvanized steel. Factory pre-wiring of components eliminates costly field installation. A specific wiring diagram is furnished for every heater regardless of the options.



Standard Features Include

- Automatic Reset Primary Thermal Cutout.
- Replaceable Secondary Thermal Cutout.
- Power Terminal Block.
- Control Terminal Block.
- Fan Interlock Switch (in lieu of an air flow interlock switch).
- 80/20 Ni-CH Wire.
- Slip-and-Drive Construction.
- P/E Switches (Pneumatic Controls Only).
- Transformer for 24 Volt Controls (Electric and Electronic only).

Optional Features

- Single Point Connection (*Heater mounted to unit*).
- Disconnect Switch.
- Fusing.
- Mercury Contactors.

ENGINEERING DATA — Electric Heater

1. Conversion:	1 KW	=	3413 Btu/h
2. Load Requirement:	KW	=	$\frac{\text{Cubic Feet per Min.} \times \text{Temperature Rise}}{3160}$
3. *Temperature Rise:	TR	=	$\frac{\text{KW} \times 3160}{\text{Cubic Feet per Min.}}$
4. Ohm's Law:	Watts	=	$\frac{(\text{Volts})^2}{\text{Resistance}} = \text{Volts} \times \text{Amps}$
5. Line Current, 1 Phase:	Amps	=	$\frac{\text{Watts}}{\text{Volts}}$
6. Line Current, 3 Phase:	Amps	=	$\frac{\text{Watts}}{1.73 \times \text{Volts}}$
7. Pressure Drop:	Inches H ₂ O	=	$\frac{\text{KW/ft}^2}{760} \times \left[\frac{\text{Velocity in FPM}}{500} \right]^2$
8. Maximum Discharge Air Temperature		=	125° F

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

Electric heaters are of the open coil design. Each heater is furnished with two over-temperature safety devices serviceable and replaceable in the enclosure without removing the heater from the duct. The primary safety device is a disc type automatic reset that will de-energize the heater on over-temperature and automatically bring the heat back on when the surrounding temperature has cooled. The second safety device is a heat limiter in the power lines that will open the circuit and disconnect the elements if the primary safety device should fail.

Elements are constructed of 80/20 Ni-CH wire. Elements are suspended by steatite ceramic bushings which are held in place by 20 gauge brackets.

Electric heaters exceeding 48 amperes of the line current must have fusing for over current protection as required by **NEC** and **UL**. A disconnecting means must be provided within sight of the heater and furnished per the electrical specification. It must be designed so that all power and/or control lines to the heater control panel will be disabled when the hinged access panel is opened.

The minimum air flow velocity through the electric heater based on the discharge duct area (ft²) is determined by:

$$V_{fpm} = \frac{KW \times 3160}{Area \times (T_2 - T_1)}$$

- Vfpm** = minimum air velocity
- Area** = Sq. Ft. of duct area
- KW** = Kilowatt of Heater
- T2** = Discharge air (125°F max.)
- T1** = Entering Air Temperature

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 air flow will prevent over-temperature causing nuisance tripping and will maintain element life expectancy. The velocity of air flow in the duct is determined by the formula;

VELOCITY = CFM ÷ DUCT AREA

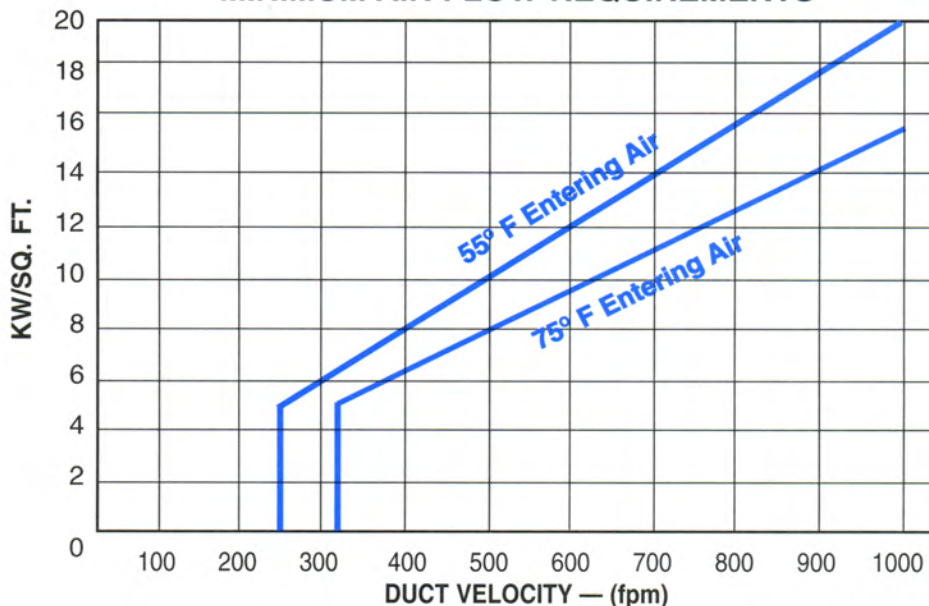
and can be compared to the minimum air flow velocity recommended by the application as indicated on each heater.

The electric heaters are suitable for a zero clearance between the heater and combustible material. Electric heaters are shipped uninsulated with slip and drive connections for easy installation into duct work.

The inlet and outlet air temperature should be selected within the temperature limitations of the heater. The maximum discharge air temperature is 125°F. The electric heater is an open coil design and should be mounted in a horizontal position maintaining proper air flow direction.

Graph 1

**HEATER DESIGN
MINIMUM AIR FLOW REQUIREMENTS**



5 ENGINEERING DATA — Electric Heaters

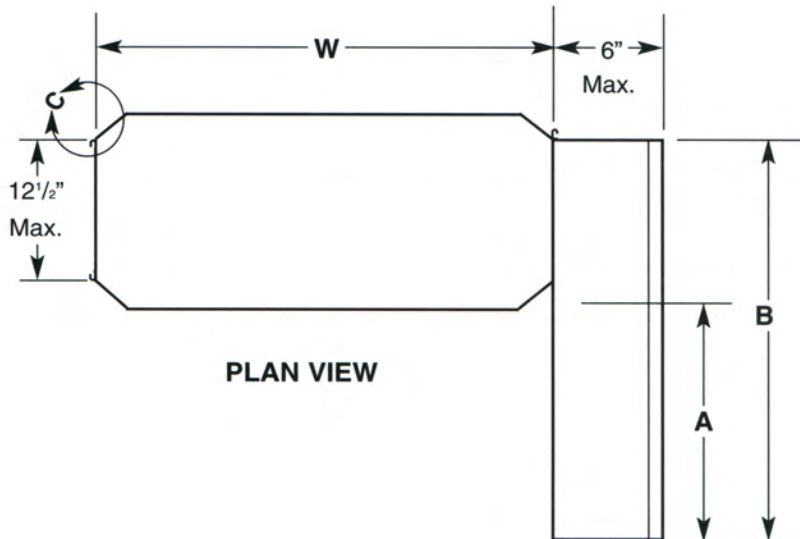
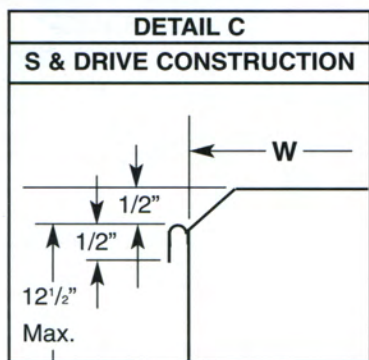
Table A MAXIMUM and MINIMUM ALLOWABLE ELECTRIC HEATER KW FOR MODELS ASE & ACE _ FAN TERMINALS

ASE _ FAN SIZE		A, B, C	D	E, F	—	
ACE _ FAN SIZE		A, B, C	D	E, F	G, H	
H x W (Flow Area)		10 x 14	12-1/2 x 14	15 x 16	17-1/2 x 32	
VOLTAGE/PHASE:		Min. KW PER STEP	MAXIMUM HEATER KW*			
HTR	FAN					
120/1	120/1	.5	5.5	5.1	4.9	4.1
277/1	277/1	.9	9.5	11.9	12.5	11.6
208/3	120/1	1.2	9.5	11.9	14.8	12.2
480/3	277/1	2.6	9.5	11.9	16.3	34.9

*KW requirements above this maximum KW will require fusing. Consult factory for special pricing.

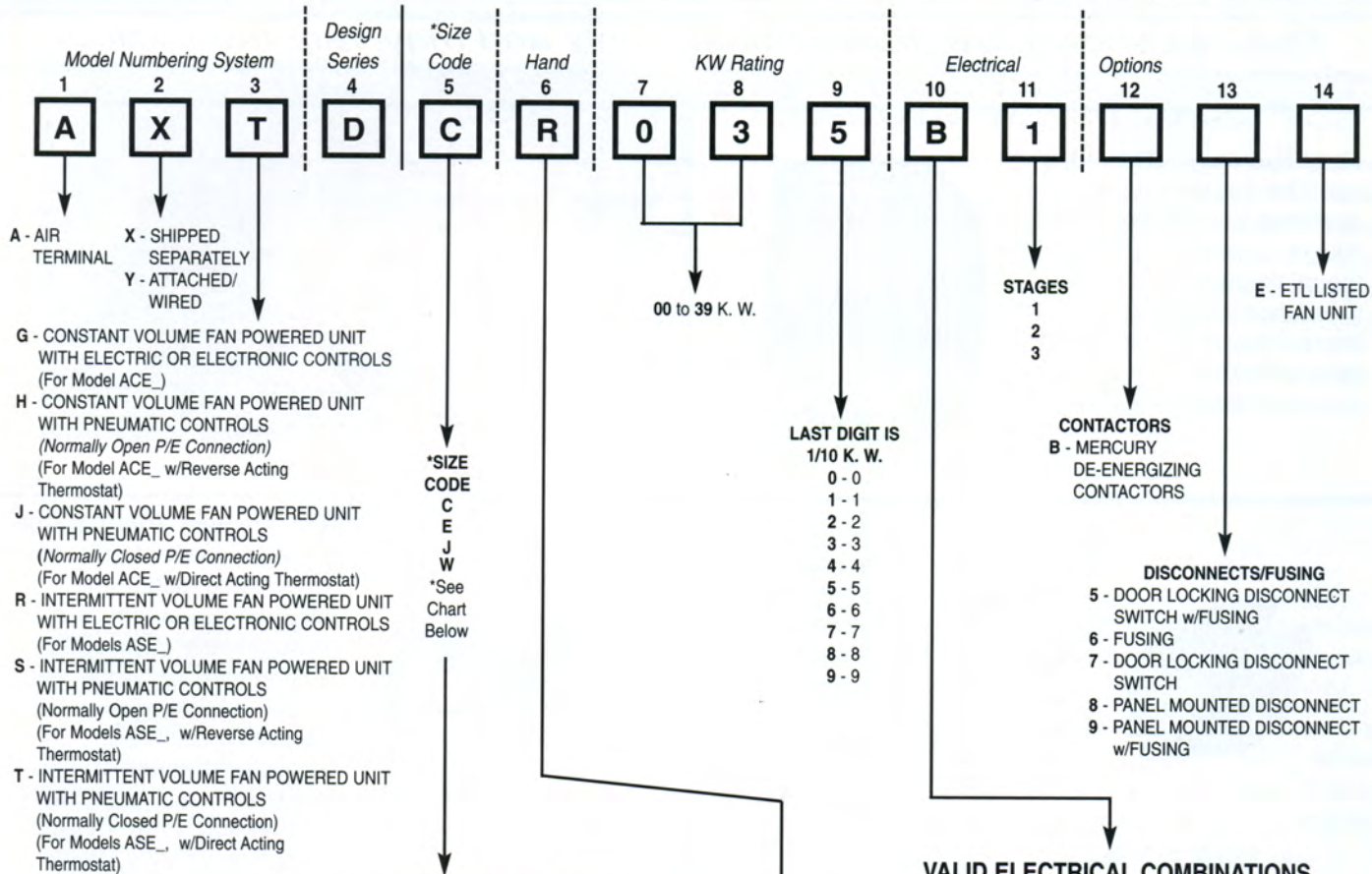
- NOTES: 1. Maximum heater discharge temperature should not exceed 125°F to avoid nuisance tripping.
2. Discharge temperature = $[(KW \times 3160)/CFM] + \text{entering air temperature (EAT)}$.

DIMENSIONAL DATA — Models AX_ and AY_ - Electric Heaters



DIMENSIONS LISTED IN INCHES			
Coil Size Code	Height x Width H x W	Overhang A*	Panel Door B*
C	10 x 14	19-1/2	32
E	12-1/2 x 14	19-1/2	32
J	15 x 16	19-1/2	32
W	17-1/2 x 32	32-1/2	45

NOTE: *All "A" and "B" dimensions are maximum (not to exceed) and may be less than those shown.



*** COIL SIZE CODE SELECTION**

COIL SIZE CODE	TERMINAL UNIT FAN SIZE
C	A, B, C
E	D
J	E, F
W	G, H

VALID ELECTRICAL COMBINATIONS

CODE	SUPPLY/ PHASE/ CONTROL	FAN VOLTAGE	CONTROL TYPES		ACCEPTABLE MODEL TYPES
			PNEU.	ELEC.	
A	120/1/24	120		X	G, R
B	120/1/120	120	X		H, J, S, T
G	277/1/24	277		X	G, R
H	277/1/277	277	X		H, J, S, T
K*	208/3/24	120		X	G, R
L*	208/3/120	120	X		H, J, S, T
R*	480/3/24	277		X	G, R
S*	480/3/277	277	X		H, J, S, T

* Requires 4-wire system.

PRODUCT DESCRIPTION - Standard Features:

For Unit Model ASE, ACE Electric Coils Only

- Automatic Reset Primary Thermal Cutout.
- Replaceable Secondary Thermal Cutout.
- Power Terminal Block.
- Control Terminal Block.
- De-energizing Magnetic Contactors (as required).
- Fan Interlock Switch.
- 80/20 Ni-Ch Wire.
- Slip-and-Drive Construction.
- P/E Switches (Pneumatic Controls Only).
- Transformer for 24 Volt Controls (Electric, Electronic or 480 Volt Pneumatic).

OPTIONAL FEATURES

- Single Point Connection (Heater Mounted to unit).
- Disconnect Switch.
- Fusing.
- Mercury Contactors.

HAND OF CONTROL PANEL L - Left R - Right	
★ FAN UNIT CONTROL & DAMPER ARRANGEMENT	HAND OF CONTROL PANEL
	ACE & ASE
1	R
2	L
3	R
4	L
5	R
6	L
7	R
8	L

★ From position 11 of corresponding fan unit model number.