C21-2

INDEECO®

# Electric Heaters for Naval and Marine Applications

# Introduction

This catalog represents over 80 years of experience in electric heating. Shortly after our founding in 1929, heaters for Naval and Marine use were added to our product line. With over 400,000 square feet devoted exclusively to designing and manufacturing electric heaters, a separate facility dedicated to electronic controls, a staff of experienced engineers and local sales support, we are able to satisfy any marine application – large or small, custom designed or off-the-shelf.

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# Fluid Heating Equipment

## Circulation Heaters and Controls

With complete in-house facilities to manufacture pressure vessels, immersion heaters, sheet metal enclosures and electronic controls, INDEECO offers a complete line of heater-control packages for water, oil, and other fluids. Typical applications for INDEECO circulation heaters include heating lube, hydraulic, and heavy fuel oils. Circulation heaters are also used to provide supplementary heat for fresh water makers and jacket heaters for radar domes. Our welding shop is ASME qualified to weld per Section IX. INDEECO ASME welding stamps: “U” (Section VIII, Division I). INDEECO circulation heaters and remote control panels with SCR’s have been shock tested per MIL-S-901 and vibration tested per MIL-STD-167-1.

## Immersion Heaters

From small pipe thread heaters for galley use to 480 KW or larger flanged heaters for vapor compression water makers, our immersion heaters can handle virtually any marine job. Special lube oil heaters with hermetic seals and liquid-proof outlet boxes are qualified per MIL-H-24299. Water purification heaters are qualified per MIL-H-22577 and MIL-S-16196D for vapor compression distillers. Hydraulic fluid heaters have been shock tested per MIL-S-901 and vibration tested per MIL-STD-167-1. Pipe thread immersion heaters are listed by UL (Underwriters Laboratories) per Standard 499, File #E23541 and by CSA (Canadian Standard Association) per Standard Class 2871, Report #LR11895-35. Copper, stainless steel, Incoloy, Copper/Nickel and Monel sheathed heaters are available, along with liquid-proof and explosion-proof terminal boxes and hermetic seals.

**Circulation Heater**

**Flanged Immersion Heater**

**Remote Control Panel with SCR’s**

**Flanged Immersion Heater**

# Vent Duct Heaters

## Duct Heaters

As long time leaders in this field, we fabricate all essential components …right through to final assembly and testing. We make our own finned tubular elements, weld and fabricate the sheet metal frames and manufacture electronic controls.

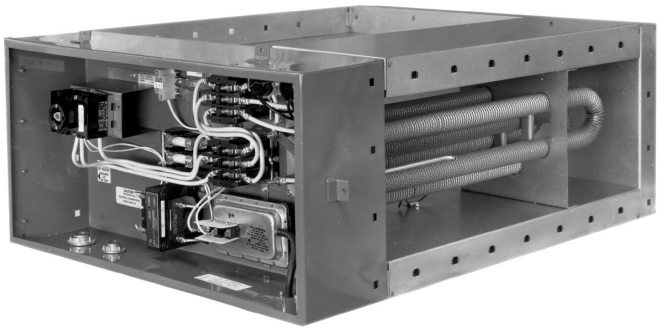
## MIL-SPEC Duct Heaters

Fully qualified per MIL-H-22594A and MIL-PRF-22594B (all sizes), these heaters are made with Monel 400 finned tubular elements with hermetic terminal end seals and stainless steel frames, qualifying them for standard or nonmagnetic installations and making them impervious to salt water corrosion. They have been shock tested per MIL-S-901 and vibration tested per MIL-STD-167-1. Where required, they may be qualified for low magnetic permeability per MIL-I-17214. See heater listing on pages 4-5.

**MIL-SPEC Duct Heater**

## Marine Duct Heaters

Used on commercial and non-combat Naval vessels, these heaters are available with either side or bottom mounted terminal boxes housing control and safety components. They meet U.S. Coast Guard requirements per 46CFR-111.87, are listed by UL per Standard 1996, File #E23192, and are ABS (American Bureau of Shipping) approved. Captive nuts may be furnished in factory-provided mounting holes to simplify installation. Built-in thermal cutouts, magnetic contactors, airflow switch, and control transformer are standard. Our wide range of optional controls includes pilot lights, SCR's, and electronic step controls.



**Marine Duct Heater with Side Mount Terminal Box**

# MIL-SPEC Duct Heaters

| Heater Size & Type | INDEECO No. | Rating | | Inside Frame Dimensions (Inches) | | | Weight (Lbs) | APL No. 0707- |
|---|---|---|---|---|---|---|---|---|
| | | KW | 3 Phase Volts | W | H | C | | |
| 19H | TFZ-19H | 0.5 | 115 | 6 | 3-1/4 | 6 | 12 | 10054 |
| 20M | TFZ-20M | 0.58 | 115 | 6 | 3-1/4 | 6 | 12 | 10173 |
| 20H | TFZ-20H | 1 | 115 | 6 | 3-1/4 | 6 | 12 | 10185 |
| 21L | TFZ-21L | 0.65 | 115 | 6 | 3-1/4 | 6 | 12 | 10055 |
| 21M | TFZ-21M | 1.26 | 115 | 6 | 3-1/4 | 6 | 12 | 10144 |
| 21H | TFZ-21H | 1.9 | 115 | 6 | 3-1/4 | 6 | 12 | 10056 |
| 22L | TFZ-22L | 1 | 115 | 9 | 3-1/4 | 6 | 14 | 10044 |
| 22M | TFZ-22M | 1.93 | 440 | 9 | 3-1/4 | 6 | 14 | 10057 |
| 22H | TFZ-22H | 2.9 | 440 | 9 | 3-1/4 | 6 | 14 | 10169 |
| 23L | TFZ-23L | 1.52 | 440 | 14 | 3-1/4 | 6 | 18 | 10058 |
| 23M | TFZ-23M | 3 | 440 | 14 | 3-1/4 | 6 | 18 | 10059 |
| 23H | TFZ-23H | 4.5 | 440 | 14 | 3-1/4 | 6 | 18 | 10184 |
| 24L | TFZ-24L | 1.9 | 440 | 9 | 6-1/4 | 6 | 15 | 10045 |
| 24M | TFZ-24M | 3.74 | 440 | 9 | 6-1/4 | 6 | 15 | 10060 |
| 24H | TFZ-24H | 5.5 | 440 | 9 | 6-1/4 | 6 | 19 | 10049 |
| 25L | TFZ-25L | 2.9 | 440 | 14 | 6-1/4 | 6 | 19 | 10046 |
| 25M | TFZ-25M | 5.72 | 440 | 14 | 6-1/4 | 6 | 19 | 10061 |
| 25H | TFZ-25H | 8.5 | 440 | 14 | 6-1/4 | 6 | 26 | 10145 |
| 26L | TFZ-26L | 4.59 | 440 | 22 | 6-1/4 | 8 | 28 | 10051 |
| 26M | TFZ-26M | 9.1 | 440 | 22 | 6-1/4 | 8 | 28 | 10062 |
| 26H | TFZ-26H | 13.5 | 440 | 22 | 6-1/4 | 8 | 36 | 10170 |
| 27L | TFZ-27L | 6.76 | 440 | 22 | 9-1/4 | 8 | 30 | 10047 |
| 27M | TFZ-27M | 13.4 | 440 | 22 | 9-1/4 | 8 | 38 | 10063 |
| 27H | TFZ-27H | 20 | 440 | 22 | 9-1/4 | 6 | 38 | 10064 |
| 28L | TFZ-28L | 9.26 | 440 | 30 | 9-1/4 | 8 | 38 | 10050 |
| 28M | TFZ-28M | 18.3 | 440 | 30 | 9-1/4 | 8 | 49 | 10171 |
| 28H | TFZ-28H | 27.3 | 440 | 30 | 9-1/4 | 8 | 40 | 10182 |
| 29L | TFZ-29L | 12.3 | 440 | 30 | 12-1/4 | 8 | 39 | 10043 |
| 29M | TFZ-29M | 24.3 | 440 | 30 | 12-1/4 | 8 | 52 | 10172 |
| 29H | TFZ-29H | 36.2 | 440 | 30 | 12-1/4 | 8 | 63 | 10176 |
| 30L | TFZ-30L | 15.3 | 440 | 30 | 15-1/4 | 8 | 55 | 10065 |
| 30M | TFZ-30M | 30.2 | 440 | 30 | 15-1/4 | 8 | 55 | 10052 |
| 30H | TFZ-30H | 45 | 440 | 30 | 15-1/4 | 8 | 66 | 10066 |

# MIL-SPEC Duct Heaters

| Heater Size & Type | INDEECO No. | Rating | | Inside Frame Dimensions (Inches) | | | Weight (Lbs) | APL No. 0707- |
|---|---|---|---|---|---|---|---|---|
| | | KW | 3 Phase Volts | W | H | C | | |
| 31L | TFZ-31L | 17.2 | 440 | 42 | 12-1/4 | 8 | 53 | 10053 |
| 31M | TFZ-31M | 33.9 | 440 | 42 | 12-1/4 | 8 | 68 | 10146 |
| 31H | TFZ-31H | 50.5 | 440 | 42 | 12-1/4 | 8 | 83 | 10156 |
| 32L | TFZ-32L | 18.2 | 440 | 30 | 18-1/4 | 8 | 59 | 10634 |
| 32M | TFZ-32M | 26 | 440 | 30 | 18-1/4 | 8 | 70 | 10206 |
| 32H | TFZ-32H | 53.8 | 440 | 30 | 18-1/4 | 8 | 79 | 10067 |
| 33L | TFZ-33L | 23.5 | 440 | 42 | 16-3/4 | 8 | 73 | 10068 |
| 33M | TFZ-33M | 46.4 | 440 | 42 | 16-3/4 | 8 | 88 | 10177 |
| 33H | TFZ-33H | 69.2 | 440 | 42 | 16-3/4 | 8 | 104 | 10175 |
| 34L | TFZ-34L | 28.5 | 440 | 56 | 15-1/4 | 8 | 88 | 07A02026 |
| 34M | TFZ-34M | 56.3 | 440 | 56 | 15-1/4 | 8 | 108 | 10174 |
| 34H | TFZ-34H | 84 | 440 | 56 | 15-1/4 | 8 | 129 | 10183 |
| 35L | TFZ-35L | 33.9 | 440 | 42 | 24-1/4 | 8 | 82 | 01090 |
| 35M | TFZ-35M | 67.1 | 440 | 42 | 24-1/4 | 8 | 113 | 10147 |
| 35H | TFZ-35H | 100 | 440 | 42 | 24-1/4 | 8 | 129 | 10635 |
| 36L | TFZ-36L | 39.7 | 440 | 56 | 21-1/4 | 8 | 95 | (1) |
| 36M | TFZ-36M | 78.4 | 440 | 56 | 21-1/4 | 8 | 136 | 10148 |
| 36H | TFZ-36H | 117 | 440 | 56 | 21-1/4 | 8 | 156 | (1) |
| 37L | TFZ-37L | 50.9 | 440 | 42 | 36-1/4 | 8 | 111 | (1) |
| 37M | TFZ-37M | 100.6 | 440 | 42 | 36-1/4 | 8 | 142 | 10149 |
| 37H | TFZ-37H | 150 | 440 | 42 | 36-1/4 | 8 | 188 | 07A090021 |
| 38L | TFZ-38L | 61.9 | 440 | 56 | 33-1/4 | 8 | 129 | (1) |
| 38M | TFZ-38M | 122.4 | 440 | 56 | 33-1/4 | 8 | 170 | 10151 |
| 38H | TFZ-38H | 183 | 440 | 56 | 33-1/4 | 8 | 210 | 07A020024 |

(1) APL Number not yet assigned. Contact INDEECO for National Contract Number.

# Sample Specification

### Marine Duct Heater Sample Specification

A specification to assure that the design and construction meet U.S. Coast Guard requirements can be prepared for electric duct heaters by copying the appropriate numbered sections below. A check box has been supplied so that you may mark those sections which you require. Material which is part of the basic specification has already been checked.

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☑ **1.** Supply electric duct heaters of the finned tubular type. All exposed metal frame and element surfaces and/or electrical enclosures shall be Type 304 stainless steel. Galvanized or aluminized coatings are acceptable only if applied after equipment is fabricated. The heaters shall be:

- ☐ For flange mounting to external duct flanges.
- ☐ For slip-in mounting through side of duct.

☑ **2.** Heaters shall be ABS approved, UL Listed to Standard 1996 and shall be in compliance with CFR Title 46 and all referenced Standards, including NEC, UL and IEEE-45. Heaters shall be manufactured by INDEECO.

☑ **3.** Heaters shall be rated for the KW, voltage, phase and number of heating stages indicated in the schedule. Heaters shall be specifically designed for the airflow direction and terminal box overhang indicated in the schedule.

☐ **4.** Heaters shall be furnished with the Control Option indicated below:

☐ **Basic Option "G"**
To include thermal cutouts, airflow switch, disconnecting magnetic contactors, fuses per NEC, fused and grounded control circuit transformer, and disconnect switch with mechanical door interlock.

☐ **Solid State Proportional Option "K"**
To include thermal cutouts, airflow switch, solid state power controller/step controller, fuses per NEC, disconnect switch with mechanical door interlock and for heaters which exceed 277 volts, a fused and grounded control circuit transformer.

**The following shall be supplied with Option K:**

- ☐ Tamperproof room thermostat (standard).
- ☐ Duct thermostat with remote setpoint adjuster.
- ☐ PE Transducer.

☐ **5.** The following additional special construction features shall be supplied:

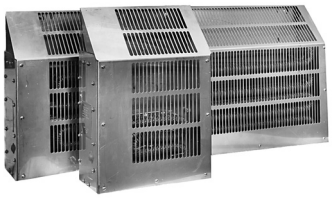
- ☐ Watertight construction.
- ☐ Captive nuts for mounting heaters to duct work. (Flanged heaters only)
- ☐ Insulated terminal box.
- ☐ Bottom terminal box.
- ☐ Zero overhang terminal box. (Heater frame will be extended to match the terminal box width. Flanged heaters only).
- ☐ NEMA 3R construction.

☐ **6.** The heaters shall be supplied with the following control circuit special features:

- ☐ Electronic step controller (Option G) Multistage heaters only.
- ☐ All controls to be mounted in remote panelboard.
- ☐ Pilot lights.
- ☐ Delete transformer and contactors.
- ☐ Fusing for heaters rated under 48 amps.
- ☐ Fan relay in place of airflow switch.
- ☐ Delete transformer.
- ☐ Pilot switch.

# Space Heating Equipment

**TRIAD® Washdown/Corrosion Resistant Unit Heater**



**Navy Sloped Top Convectors**

**Type “T” Convector**

## TRIAD® Washdown/Corrosion Resistant Unit Heaters

This stainless steel construction with non-metallic NEMA 4X enclosure can be hosed down for cleaning in dirty, wet, and corrosive marine applications. TRIAD® unit heaters are UL listed, File #E97759(N), meet U.S. Coast Guard requirements, and are ABS approved. See catalog C23/90 for details.

## MIL-Spec Convectors

Two types are available. The new Navy sloped top design, per NAVSEA document #59512-BS-MMA-010 includes both a built-in manual reset over temperature cutout and a thermostat. The Type T (turrett) construction per MIL-H-22663 has no built-in controls. Heaters are also available with a complete built-in control package to eliminate the need for remote contactors and transformers.

### Navy Sloped Top Convectors

| Reference Size | KW | Volts/ Phase | Dimensions L” x H” x D” | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|---|
| CE 3/4 | .25 | 120/1 | 15 x 21 x 7 | 27 | 252-179649 |
| CE 1-1/2 | .50 | 120/1 | 15 x 21 x 7 | 30 | 252-179650 |
| CE 2-1/2 | .75 | 440/3 | 24 x 21 x 7 | 38 | 252-179651 |
| CE 3-1/2 | 1.00 | 440/3 | 24 x 21 x 7 | 46 | 252-179652 |
| CE 5 | 1.50 | 440/3 | 24 x 21 x 7 | 46 | 252-179653 |
| CE 6 | 2.00 | 440/3 | 36 x 21 x 7 | 64 | 252-179654 |
| CE 8 | 2.50 | 440/3 | 36 x 21 x 7 | 64 | 252-179655 |
| CE 12 | 3.50 | 440/3 | 36 x 21 x 7 | 90 | 252-179656 |
| CE 15 | 4.50 | 440/3 | 48 x 21 x 7 | 120 | 252-179657 |
| CE 20 | 6.00 | 440/3 | 48 x 21 x 7 | 120 | 252-179658 |

### Navy Sloped Top Convectors with Controls

| Reference Size | KW | Volts/ Phase | Dimensions L” x H” x D” | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|---|
| CE 3/4 | .25 | 120/1 | 15 x 21 x 7 | 35 | 252-179659 |
| CE 1-1/2 | .50 | 120/1 | 15 x 21 x 7 | 38 | 252-179660 |
| CE 2-1/2 | .75 | 440/3 | 24 x 21 x 7 | 46 | 252-179661 |
| CE 3-1/2 | 1.00 | 440/3 | 24 x 21 x 7 | 54 | 252-179662 |
| CE 5 | 1.50 | 440/3 | 24 x 21 x 7 | 54 | 252-179663 |
| CE 6 | 2.00 | 440/3 | 36 x 21 x 7 | 72 | 252-179664 |
| CE 8 | 2.50 | 440/3 | 36 x 21 x 7 | 72 | 252-179665 |
| CE 12 | 3.50 | 440/3 | 36 x 21 x 7 | 98 | 252-179666 |
| CE 15 | 4.50 | 440/3 | 48 x 21 x 7 | 114 | 252-179667 |

# Space Heating Equipment

### Type "T" Turret Heaters

| Wattage | Volts/ Phase | Dimensions L" x H" x D" | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|
| 500 | 115/1 | 21.875 x 6.875 x 5.875 | 6 | 252-X21A18948-1 |
| 500 | 440/1 | 21.875 x 6.875 x 5.875 | 6 | 252-X21P18948-2 |
| 500 | 440/1 | 21.875 x 6.875 x 5.875 | 6 | 252-X21P18948-6 |
| 1000 | 115/1 | 21.875 x 6.875 x 5.875 | 8 | 252-X21A18948-3 |
| 1000 | 440/1 | 21.875 x 6.875 x 5.875 | 8 | 252-X21P18948-4 |
| 1000 | 440/1 | 21.875 x 6.875 x 5.875 | 8 | 252-X21P18948-8 |

### Commercial Marine Sloped Top Convectors

INDEECO Commercial Marine Sloped Top Convectors are available with the same electrical ratings and physical dimensions as their Mil-Spec counterparts and may also be provided with built-in controls to allow for a single point electrical connection.

Standard built-in controls include an adjustable thermostat with a range of 40 -100° F, a manual reset thermal cutout, main power terminal blocks and 440/24 control circuit transformer with fusing as required. Transformers are not required for 120 volts units (sizes CE 3/4 and CE 1-1/2) because all devices are load carrying.

The cabinet is manufactured of 316 series stainless steel and features a watertight control enclosure. The heating elements are made of 304 series stainless steel and have either Hermetic or RTV seals to prohibit the entrance of moisture. The use of stainless steel throughout guarantees rugged construction and long life.

### Commercial Marine Sloped Top Convector SST Hermetically Sealed Elements

| Reference Size | KW | Volts/ Phase | Dimensions L" x H" x D" | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|---|
| CE 3/4 | .25 | 120/1 | 15 x 21 x 7 | 27 | 252-179669 |
| CE 1-1/2 | .50 | 120/1 | 15 x 21 x 7 | 30 | 252-179670 |
| CE 2-1/2 | .75 | 440/3 | 24 x 21 x 7 | 38 | 252-179671 |
| CE 3-1/2 | 1.00 | 440/3 | 24 x 21 x 7 | 46 | 252-179672 |
| CE 5 | 1.50 | 440/3 | 24 x 21 x 7 | 46 | 252-179673 |
| CE 6 | 2.00 | 440/3 | 36 x 21 x 7 | 64 | 252-179674 |
| CE 8 | 2.50 | 440/3 | 36 x 21 x 7 | 64 | 252-179675 |
| CE 12 | 3.50 | 440/3 | 36 x 21 x 7 | 90 | 252-179676 |
| CE 15 | 4.50 | 440/3 | 48 x 21 x 7 | 106 | 252-179677 |
| CE 20 | 6.00 | 440/3 | 48 x 21 x 7 | 106 | 252-179678 |

# Component Heating Elements

### Commercial Marine Sloped Top Convector
### SST Hermetically Sealed Elements with Controls

| Reference Size | KW | Volts/ Phase | Dimensions L" x H" x D" | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|---|
| CE 3/4 | .25 | 120/1 | 15 x 21 x 7 | 35 | 252-179679 |
| CE 1-1/2 | .50 | 120/1 | 15 x 21 x 7 | 38 | 252-179680 |
| CE 2-1/2 | .75 | 440/3 | 24 x 21 x 7 | 46 | 252-179681 |
| CE 3-1/2 | 1.00 | 440/3 | 24 x 21 x 7 | 54 | 252-179682 |
| CE 5 | 1.50 | 440/3 | 24 x 21 x 7 | 54 | 252-179683 |
| CE 6 | 2.00 | 440/3 | 36 x 21 x 7 | 72 | 252-179684 |
| CE 8 | 2.50 | 440/3 | 36 x 21 x 7 | 72 | 252-179685 |
| CE 12 | 3.50 | 440/3 | 36 x 21 x 7 | 98 | 252-179686 |
| CE 15 | 4.50 | 440/3 | 48 x 21 x 7 | 114 | 252-179687 |

### Commercial Marine Sloped Top Convector SST RTV Sealed Elements

| Reference Size | KW | Volts/ Phase | Dimensions L" x H" x D" | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|---|
| CE 3/4 | .25 | 120/1 | 15 x 21 x 7 | 27 | 252-179689 |
| CE 1-1/2 | .50 | 120/1 | 15 x 21 x 7 | 30 | 252-179690 |
| CE 2-1/2 | .75 | 440/3 | 24 x 21 x 7 | 38 | 252-179691 |
| CE 3-1/2 | 1.00 | 440/3 | 24 x 21 x 7 | 46 | 252-179692 |
| CE 5 | 1.50 | 440/3 | 24 x 21 x 7 | 46 | 252-179693 |
| CE 6 | 2.00 | 440/3 | 36 x 21 x 7 | 64 | 252-179694 |
| CE 8 | 2.50 | 440/3 | 36 x 21 x 7 | 64 | 252-179695 |
| CE 12 | 3.50 | 440/3 | 36 x 21 x 7 | 90 | 252-179696 |
| CE 15 | 4.50 | 440/3 | 48 x 21 x 7 | 106 | 252-179697 |
| CE 20 | 6.00 | 440/3 | 48 x 21 x 7 | 106 | 252-179698 |

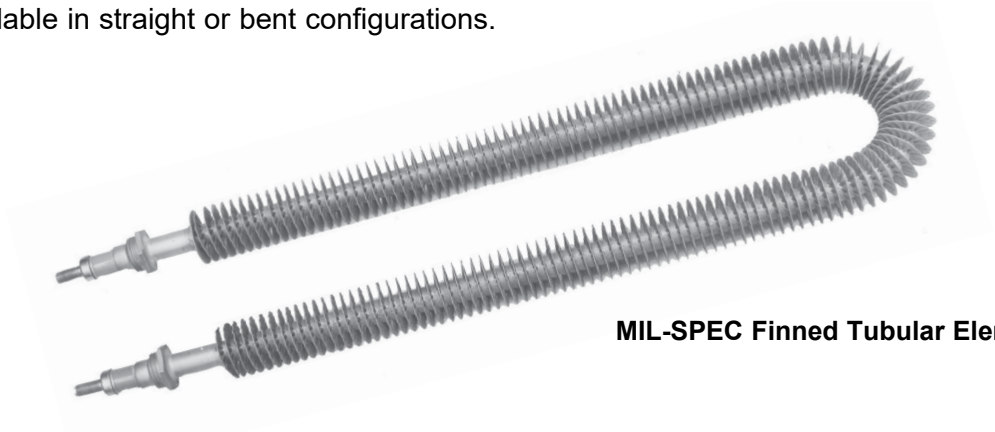
### Commercial Marine Sloped Top Convector with
### SST RTV Hermetically Sealed Elements with Controls

| Reference Size | KW | Volts/ Phase | Dimensions L" x H" x D" | Weight (Lbs) | Catalog Number |
|---|---|---|---|---|---|
| CE 3/4 | .25 | 120/1 | 15 x 21 x 7 | 35 | 252-179699 |
| CE 1-1/2 | .50 | 120/1 | 15 x 21 x 7 | 38 | 252-179700 |
| CE 2-1/2 | .75 | 440/3 | 24 x 21 x 7 | 46 | 252-179701 |
| CE 3-1/2 | 1.00 | 440/3 | 24 x 21 x 7 | 54 | 252-179702 |
| CE 5 | 1.50 | 440/3 | 24 x 21 x 7 | 54 | 252-179703 |
| CE 6 | 2.00 | 440/3 | 36 x 21 x 7 | 72 | 252-179704 |
| CE 8 | 2.50 | 440/3 | 36 x 21 x 7 | 72 | 252-179705 |
| CE 12 | 3.50 | 440/3 | 36 x 21 x 7 | 98 | 252-179706 |
| CE 15 | 4.50 | 440/3 | 48 x 21 x 7 | 114 | 252-179707 |

# Component Heating Elements

## MIL-SPEC Finned Tubular Elements

These hermetically sealed elements have Monel sheath and fins, continuously brazed together, to meet the most rigorous Navy requirements. Qualified to MIL-H-22594A and MIL-PRF-22594B they are available in straight or bent configurations.



**MIL-SPEC Finned Tubular Element**

## Tubular/Finned Tubular Elements

Tubular and finned tubular elements for general use are available to meet your specifications. UL recognized per Standard 1030, File #E78533. Options include many different terminations, insulators, seals, bending configurations and mounting assemblies.

**Two-Pass Finned Tubular Element**

**Custom Formed Tubular Element**


INDEECO

**INDUSTRIAL ENGINEERING & EQUIPMENT CO.**
425 HANLEY INDUSTRIAL COURT
ST. LOUIS, MO 63144
314-644-4300
Fax: 314-644-5332
**www.indeeco.com**