



Electric Heaters for Naval and Marine Applications



Introduction

This catalog represents over 75 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 240,000 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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Shipbuilding Applications

Shipyards and Shipbuilding Programs Using INDEECO Heaters

Shipyards

Atlantic Marine
Autal USA
BAE Systems, San Diego
Bath Iron Works (General Dynamics)
Bender Shipbuilding
Coastal Dry Dock
Coastal Marine
Continental Maritime
Derecktor
Detyens
Electric Boat (General Dynamics)
Ingalls (Northrup Grumman)
Intermarine
Jacksonville Naval Shipyard
Long Beach Naval Shipyard
Marinette Marine
McDermott
National Shipbuilding Co. (NASSCO)
Newport News Shipyard
Norfolk Naval Shipyard
Norfolk Shipyard
North American Shipbuilding
Northrop Grumman Ship Systems
 Avondale Operation
Northwest Marine
Philadelphia Naval Shipyard
Portsmouth Naval Shipyard
San Diego Naval Station
Tacoma Boat
Tampa Shipyards
Todd Shipyard
Trinity Marine

Programs

Alaska State Ferry
AOE – Fast Combat Support Ship
CG – Guided Missile Cruiser
CVN – Convection Heaters, Various Spaces
DDG – Guided Missile Destroyer
DDX – Navy Destroyer Program
DREDGE (US Army)
FFG – Guided Missile Frigate
Fishing Boats
Icebreaker
LHA6 – Amphibious Assault Ship
LCU – Landing Craft Utility (Army)
LHD – Amphibious Transport Dock
LHD-8 – Amphibious Transport Dock
LPD – Amphibious Assault Ship
LSD – Landing Ship Dock
LST – Landing Ship Tank
LT1 – US Army Towboats
MCM – Mine Counter Measure Ship
MHC – Mine Hunter, Coastal
 Mine Hunter, Sweeper
MSC Ships, Various
Offshore Drilling Platforms
PGF-2 – Guided Missile Frigate
 (Taiwanese Navy)
River Gambling Boats
SA'AR-5 CORVETTES (Israeli Navy)
SSN-21 Seawolf Nuclear Attack Submarine
Submarines (688 and Virginia Class)
TAGS – Surveying Ship
TAO – Fleet Oiler
Tugboats
TWR – Torpedo Weapons Retriever
T-AGOS – Oceanographic Survey Ship
USCG – Deepwater
WHEC-FRAM-USCG Coast Guard Cutter

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: "H" (Section IV) and "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.



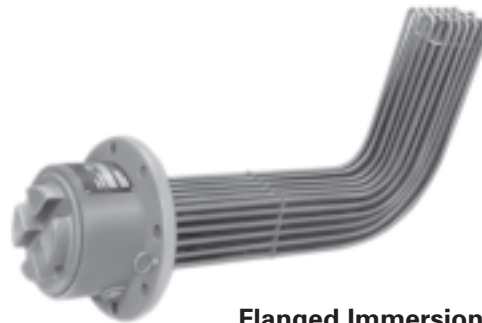
Circulation Heater



Remote Control Panel with SCR's

Immersion Heaters

From small pipe thread heaters for galley use to 480 KW 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/Nickle and Monel sheathed heaters are available, along with liquid-proof and explosion-resistant terminal boxes and hermetic seals.



Flanged Immersion Heater



Flanged Immersion Heater

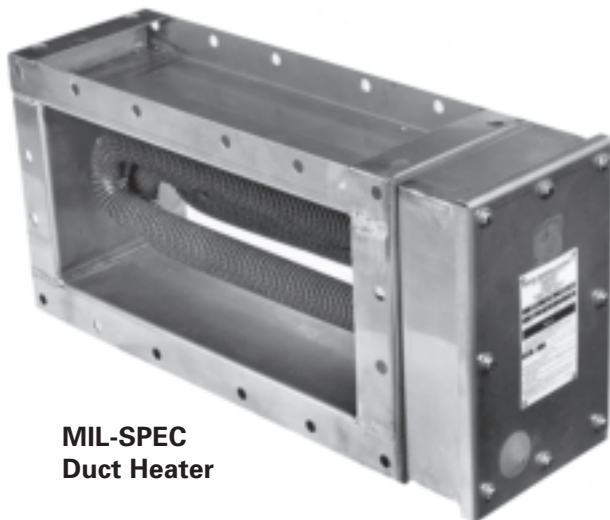
Vent Duct Heaters

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

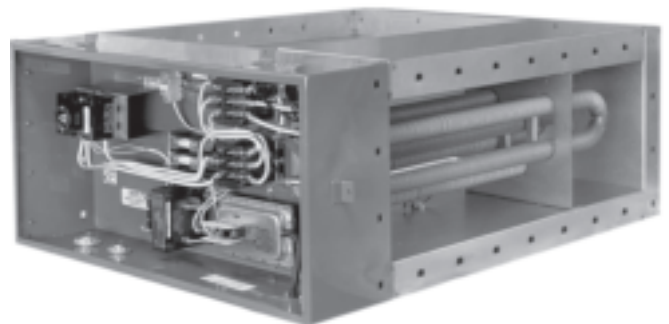
Fully qualified per MIL-H-22594A (all sizes), these heaters are made with Monel 400 finned tubular elements with hermetic terminal end seals and stainless steel frames, qualifying them for standard or nonmagnetic installations and making them impervious to salt water corrosion. They have been shock tested 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.



**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, Certificate #91-JE3195-X. 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	(1)
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	10150
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	(1)

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

Sample Specification

Marine Duct Heater Sample Specification

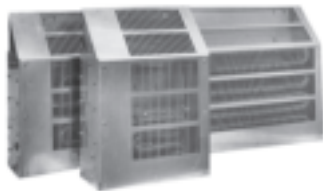
A specification to assure that the design and construction meet U.S. Coast Guard requirements can be prepared for electric duct heaters by copying the appropriate numbered sections below. A check box has been supplied so that you may mark those sections which you require. Material which is part of the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

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:
- | | | |
|---|--|--|
| <input type="checkbox"/> Basic Option "G"
To include thermal cutouts, airflow switch, disconnecting magnetic contactors, fuses per NEC, fused and ungrounded control circuit transformer, and disconnect switch with mechanical door interlock. | <input type="checkbox"/> 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 ungrounded control circuit transformer. | The following shall be supplied with Option K: <ul style="list-style-type: none"><input type="checkbox"/> Tamperproof room thermostat (standard).<input type="checkbox"/> Duct thermostat with remote setpoint adjuster.<input type="checkbox"/> PE Transducer. |
|---|--|--|
5. The following additional special construction features shall be supplied:
- | | | |
|---|--|---|
| <input type="checkbox"/> Watertight construction. | <input type="checkbox"/> Insulated terminal box. | <input type="checkbox"/> Zero overhang terminal box. (Heater frame will be extended to match the terminal box width. Flanged heaters only). |
| <input type="checkbox"/> Captive nuts for mounting heaters to duct work. (Flanged heaters only) | <input type="checkbox"/> Bottom terminal box. | <input type="checkbox"/> NEMA 3R construction. |
6. The heaters shall be supplied with the following control circuit special features:
- | | | |
|---|--|--|
| <input type="checkbox"/> Electronic step controller (Option G) Multistage heaters only. | <input type="checkbox"/> Pilot lights. | <input type="checkbox"/> Fan relay in place of airflow switch. |
| <input type="checkbox"/> All controls to be mounted in remote panelboard. | <input type="checkbox"/> Delete transformer and contactors. | <input type="checkbox"/> Delete transformer. |
| | <input type="checkbox"/> Fusing for heaters rated under 48 amps. | <input type="checkbox"/> Pilot switch. |

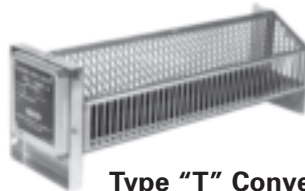
Space Heating Equipment

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, Certificate #91-JE3195-X.



Navy Sloped Top Convectors



Type "T" Convector

TRIAD® Washdown and Corrosion Resistant Unit Heater



MIL-Spec Convectors

Two types are available. The Type T (turrett) construction per MIL-H-22663 has no built-in controls. The new Navy design, per NAVSEA document #59512-BS-MMA-010 includes both a built-in manual reset over temperature cutout and a thermostat which eliminates the need for remote control panels.

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	252-197660
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 come standard 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°F-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 304 series stainless steel and features a watertight control enclosure. The heating elements are also made of 304 series stainless steel and have 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	252-197670
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

**Commercial Marine Sloped Top Convactor
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	252-197680
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 Convactor with SST 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	252-197690
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

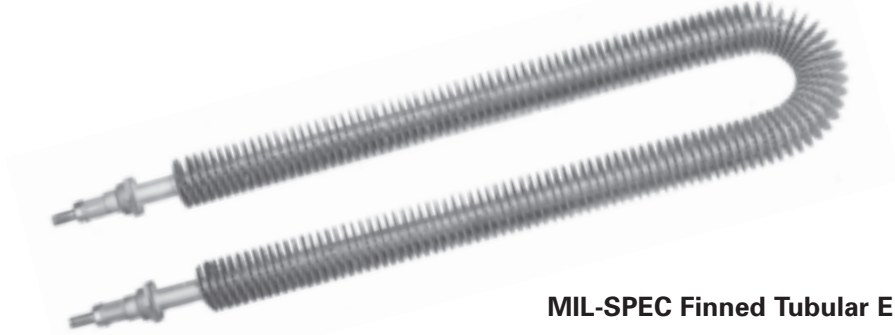
Commercial Marine Sloped Top Convactor with SST Elements with Controls

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	252-197700
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, 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 16 different terminations, insulators, seals, and mounting assemblies.



Two-Pass Finned Tubular Element



Custom Formed Tubular Element



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