Experience Our Value-Added Services that are Second to None

Casting Alloys

Casting Alloy	Aluminum	Copper	Silicone	Zinc	Lead	Maximum Iron	Tin	Other
Aluminum 319	85.8 - 91.58%	3.0 - 4.0%	5.50 - 6.50%	≤ 1.0%	—	≤ 1.0%	—	≤1.7%
Aluminum 356	90.1 - 93.3 %	≤0.25%	6.50 - 7.50%	≤0.35%	—	≤0.60%	—	≤1.125%
Bronze	9.0 - 11.0%	≥ 86.0%	—	—	—	0.80 - 1.50%	—	≤1%
Yellow Brass	≤0.55%	58.0 - 64.0%	≤0.05%	32.0 - 40.0%	0.80 - 1.50%	≤0.70%	0.50 - 1.50%	≤1%

Material Properties

Material	Classification	Max. Surface Temperature °F (°C)	Density (lb/in^3)	Coefficient of Linear Thermal Expansion (in/in/°F × 10^{-6})	Specific Heat Capacity (BTU/lb-°F)	Thermal Conductivity (BTU-in/hr-ft^2-°F)	Melting Point (°F)
Aluminum 319	Aluminum 319.0	700 (371)	0.101	12.7 @ 68° – 572°F	0.23	754	960 – 1120
Aluminum 356	Aluminum 356.0	750 (399)	0.0968	12.9 @ 68° – 572°F	0.23	1160	1030 – 1140
Bronze	UNS C95300	1350 (732)	0.272	9 @ 68° – 572°F	0.0896	437	1900 – 1913
Yellow Brass	UNS C85700	1200 (649)	0.304	12.2 @68° – 500°F	0.0899	582	1660 – 1690

Linear Thermal Expansion Formula: $\Delta L = Li \times \alpha \times (T_f - T_i) \times 10^{-6}$

ΔL = Change in Length
Li = Initial Length α = Coefficient of Linear Thermal Expansion
T_f = Final Temperature T_i = Initial Temperature

Minimum Casting Thickness vs. Heating Element and/or Cooling Tube Diameters

Casting Thickness	Maximum Available Element Diameter Heat Only	Maximum Available Cooling Tube Diameter Cool Only	Maximum Element and Cooling Tube Combination Heat and Cool
5/8" (15.9 mm)	.260	1/4	—
3/4" (19.1 mm)	.375	3/8	—
1" (25.4 mm)	.430	1/2	—
1-1/4" (31.8 mm)	.430	1/2	.260 and 3/8
1-3/8" (34.9 mm)	.430	1/2	.315 and 1/2
1-1/2" (38.1 mm)	.430	1/2	.430 and 1/2
1-5/8" (41.3 mm)	.430	1/2	.430 and 1/2
1-3/4" (44.5 mm)	.430	1/2	.430 and 1/2
Finned Casting			
3/4" (19.1 mm)	.375	—	—
7/8" (22.2 mm)	.430	—	—
1" (25.4 mm)	.430	—	—
1-3/4" (44.5 mm)	.430	—	—

Casting Size & Weight Limitations

	Cylindrical	Platen
Minimum Inside Diameter:	1" (25.4 mm)	—
Maximum Inside Diameter:	48" (1219 mm)	—
Minimum Width:	—	1-1/2" (38.1 mm)
Maximum Width:	—	60" (1524 mm)
Minimum Length:	1-3/4" (44.5 mm)	4" (102 mm)
Maximum Length:	40" (1016 mm)	72" (1829 mm)
Finish:	125 RMS Standard or to customer spec.	

Gap (two-piece cylindrical cast-in band heaters)**:** 1/4" (6.4 mm) top and bottom or to customer specification

Maximum Weight: Aluminum— 600 pounds
Bronze & Brass— 300 pounds

NOTES: Cylindrical heaters are made with two half-round heaters. Cast-In thermal components can be made in any practical size, weight and geometric shape.

Heating Element Electrical Specifications

Tubular Heater Diameter	.260"	.315"	.375"	.430"
Maximum Volts	240	277	480	600
Maximum Amps **Per Element**	15	30	40	40

Maximum Watt Density: Aluminum Alloy—35 W/in^2 on the element
Bronze or Brass—45 W/in^2 on the element

Resistance Tolerance: +10%, –5% **Wattage Tolerance:** +5%, –10%

Three Phase available depending on casting size.
Ground Studs can be added to most cast-ins.

Note: Tempco-Pak mineral insulated cable heaters can be used in place of tubular heating elements to fit physical constraints not possible with conventional heating elements. See catalog Section 5 for more details.

Cooling Tube Materials for Castings with Liquid Cooling

Tube Material	Tube OD and Wall Thickness
Stainless Steel (Standard)	1/4" O.D. × .028 wall
Stainless Steel (Standard)	3/8" O.D. × .035 wall
Stainless Steel (Standard)	1/2" O.D. × .049 wall
Stainless Steel (Optional)	5/8" O.D. × .049 wall
Incoloy® 840 (Optional)	1/2" O.D. × .049 wall

Tubing with heavier wall thickness is available upon request.

Options for Cast-In Thermal Components

Casting Surface Treatments

Special surface finishes are required in some applications:

- Electroless Nickel Plating
- Teflon®
- Magnaplate
- Anodizing
- Hard-Coat Anodizing

Lab Services

- Computerized Infrared Heating Profiles
- Life Cycle Testing
- X-Rays to confirm heating element location and casting density
- Heating Ramp Rate Testing

Agency c UL us ***Approvals***

Cast-In Heater Elements are UL recognized under UL File Number E90771.
If you require UL Agency Approval, please specify when ordering.