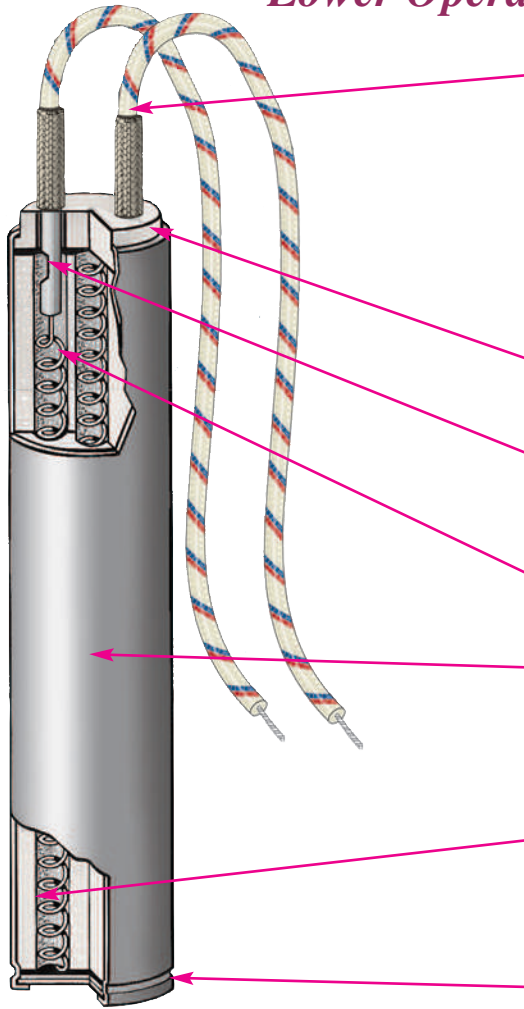


Low-Density CARTRIDGE HEATER FEATURES

*An Economical and Reliable Cartridge Heater,
Used in Applications Requiring
Lower Operating Temperatures and Watt Densities*



A The standard termination for Low-Density Cartridge Heaters is Type F, consisting of 10" (254 mm) internally connected flexible lead wires with high temperature insulation, UL approved for 300 Volt or 600 Volt service and temperature rated to 482°F (250°C).



Note: To meet the requirements of your application we offer over 40 standard termination styles to select from that will solve many of the most common application problems. See pages 2-39 through 2-60.

B Ceramic end cap protects the cartridge internally from outside contamination.

C Resistance wire and lead wires are mechanically spliced with heavy wall nickel connectors for a positive electrical connection.

D Helically wound Nickel-Chrome resistance wire is evenly stretched and strung through ceramic insulators.

E Alloy 304 Stainless Steel is used to provide high temperature strength, good thermal conductivity and resistance to oxidation up to 1200°F (650°C). Alloy 304 is a Nickel-Chromium Stainless Steel. For immersion heating of corrosive solutions consult Tempco.

F Specially selected grain size high purity Magnesium Oxide (MgO) is used to fill all remaining space inside the ceramic insulator, thus increasing thermal conductivity, dielectric strength and heater life.

G Sheath is roll crimped over a 304 Stainless Steel end disc. A mica spacer electrically insulates the heater core from the end disc. This style end seal is not moisture proof.



Low Density Cartridge Heaters are UL recognized and CSA certified in many design variations under UL File Number E65652 and CSA File Number 043099.

If you require UL and/or CSA Agency Approval, please specify when ordering.

Tempco Low-Density Cartridge Heaters are an excellent, cost effective choice without compromising quality for Original Equipment Manufacturers (OEMs) consuming large quantities of cartridge heaters for their equipment.

Typical Applications

- ➔ Heat Sealing Equipment
- ➔ Molds and Dies
- ➔ Glue Guns
- ➔ Laminating Equipment
- ➔ Food Processing
- ➔ Wax Pots
- ➔ Packaging Equipment
- ➔ Refrigeration
- ➔ Heating Liquids
- ➔ Labeling Machines
- ➔ Shoe Machinery
- ➔ Heating Gases



Low-Density Cartridge Heater Specifications

Standard Specifications and Tolerances of Low Density Cartridge Heaters. If tighter tolerances are required consult Tempco.

PERFORMANCE RATINGS

Maximum Temperature: 1200°F (650°C)

Maximum Watt Density: 20-45 W/in² (3.1-7.0 W/cm²) depending on heater size and operating temperature.

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4
Actual Diameter— in.	.185	.247	.372	.496	.621	.745	.870	.995	1.250
Actual Diameter—(mm)	(4.70)	(6.27)	(9.45)	(12.60)	(15.77)	(18.92)	(22.10)	(25.27)	(31.75)
Diameter Tolerance	±.002 (.051 mm)				±.003 (.076 mm)				±.005 (.127 mm)
Length Tolerance	±1/16 (1.59 mm) up to 6" (152.4 mm) long; ±1/8" (3.18 mm) over 6" long								
Camber Tolerance	.010" (.254 mm) per foot of length								

ELECTRICAL SPECIFICATIONS

Nominal Diameter	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4
Maximum Voltage	240	240	240	240	480*	480*	480*	480*	480*
Maximum Amperage	1.5	3.5	6	8	10	15	15	25	30
Maximum Wattage	Consult Tempco								
Wattage Tolerance	Plus 5%, Minus 10%								
Resistance Tolerance	Plus 10%, Minus 5%								

*480V when applicable. Consult Tempco.

Standard (Non-Stock) Low-Density Cartridge Heaters

3/16" Diameter Actual .185" (4.70 mm)

Sheath Length	Watts		Watt Density		Part Number	
	in	mm	W/in ²	W/cm ²	120V	240V
1	25.4	15	34	5.3	LDC00001	—
1½	38.1	20	30	4.7	LDC00002	—
2	50.8	30	31	4.9	LDC00003	—
2½	63.5	40	32	5.0	LDC00004	—
3	76.2	45	29	4.5	LDC00005	—
4	101.6	65	31	4.7	LDC00006	—
5	127.0	80	29	4.6	LDC00007	—
6	152.4	100	30	4.7	LDC00008	—
7	177.8	125	32	5.0	LDC00009	—
8	203.2	150	33	5.2	LDC00010	—
10	254.0	170	30	4.7	LDC00011	—

1/4" Diameter Actual .247" (6.27 mm)

Sheath Length	Watts		Watt Density		Part Number	
	in	mm	W/in ²	W/cm ²	120V	240V
1	25.4	20	34	5.3	LDC00012	—
1½	38.1	20	23	3.5	LDC00014	—
2	50.8	32	27	4.2	LDC00015	—
2	50.8	40	34	5.3	LDC00016	—
2	50.8	50	42	6.6	LDC00017	—
2½	63.5	30	19	3.0	LDC00018	—
3	76.2	32	16	2.5	LDC00019	—
3	76.2	50	25	3.9	LDC00020	—
3½	88.9	80	34	5.3	LDC00021	—
4	101.6	100	36	5.6	LDC00022	LDC00023
5	127.0	125	35	5.5	LDC00024	—
6	152.4	150	35	5.4	LDC00025	LDC00026
7	177.8	100	20	3.0	LDC00027	LDC00028
8	203.2	200	34	5.3	LDC00029	LDC00030
10	254.0	250	34	5.2	LDC00031	LDC00032



Note: Part Numbers above are for Low Density Cartridge Heaters terminated with Type F flexible leads, 10" long. See pages 2-39 through 2-57 for other terminations.

Low-Density Cartridge Heaters are made-to-order only. **Standard lead time is 3 weeks.**

Custom Engineered/Manufactured Low-Density Cartridge Heaters

Refer to ordering information on page 2-38.

Cartridge Heaters



Low-Density

Standard (Non-Stock) Low-Density Cartridge Heaters

3/8" Diameter Actual .372" (9.45 mm)

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
1½	38.1	15	13	2.0	LDC00033	—
1½	38.1	40	34	5.3	LDC00034	—
2	50.8	50	28	4.4	LDC00035	—
2½	63.5	75	32	4.9	LDC00036	—
2½	63.5	100	42	6.6	LDC00037	—
3	76.2	100	34	5.3	LDC00038	—
3½	88.9	120	34	5.3	LDC00039	LDC00040
4	101.6	75	18	2.8	LDC00041	LDC00042
4	101.6	130	32	4.9	LDC00043	LDC00044
4	101.6	150	36	5.6	LDC00045	LDC00046
4	101.6	180	44	6.8	LDC00047	LDC00048
4½	114.3	75	16	2.5	LDC00049	LDC00050
4½	114.3	150	32	4.9	LDC00051	LDC00052
5	127.0	150	28	4.4	LDC00053	LDC00054
5	127.0	200	38	5.8	LDC00055	LDC00056
5½	139.7	200	34	5.3	LDC00057	LDC00058
6	152.4	225	35	5.4	LDC00059	LDC00060
6	152.4	250	39	6.0	LDC00061	LDC00062
7	177.8	200	26	4.0	LDC00063	LDC00064
7	177.8	265	35	5.4	LDC00065	LDC00066
8	203.2	300	34	5.3	LDC00067	LDC00068
9	228.6	350	35	5.4	LDC00069	LDC00070
9½	241.3	300	28	4.4	LDC00071	LDC00072
10	254.0	375	34	5.2	LDC00073	LDC00074
12	304.8	425	31	4.9	LDC00075	LDC00076
12	304.8	450	33	5.1	LDC00077	LDC00078
12	304.8	475	35	5.4	LDC00079	LDC00080
12	304.8	500	37	5.7	LDC00081	LDC00082
14	355.6	500	31	4.9	LDC00083	LDC00084
16	406.4	550	30	4.7	LDC00085	LDC00086
20	508.0	200	9	1.3	LDC00087	LDC00088
20	508.0	650	28	4.4	LDC00089	LDC00090
22	558.8	800	32	4.9	—	LDC00091
24	609.6	750	27	4.2	—	LDC00092

1/2" Diameter Actual .496" (12.60 mm)

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
1½	38.1	60	38	5.9	LDC00093	—
2	50.8	75	32	4.9	LDC00094	—
2½	63.5	40	13	2.0	LDC00095	—
2½	63.5	125	40	6.2	LDC00096	—
3	76.2	150	38	5.9	LDC00097	LDC00098
3½	88.9	150	32	4.9	LDC00099	LDC00100
3¾	98.4	90	17	2.6	LDC00101	LDC00102
4	101.6	180	33	5.1	LDC00103	LDC00104
4½	114.3	200	32	4.9	LDC00105	—
5	127.0	200	28	4.4	LDC00106	LDC00107
5½	139.7	300	38	5.9	LDC00108	LDC00109
6	152.4	150	17	2.7	LDC00110	LDC00111
6	152.4	250	29	4.5	LDC00112	LDC00113
6	152.4	300	35	5.4	LDC00114	LDC00115
6½	165.1	300	32	4.9	LDC00116	LDC00117
7	177.8	275	27	4.2	LDC00118	LDC00119
7	177.8	350	34	5.3	LDC00120	LDC00121
7½	190.5	350	32	4.9	LDC00122	LDC00123
8	203.2	400	34	5.3	LDC00124	LDC00125
8	203.2	425	36	5.6	LDC00126	LDC00127
8½	215.9	400	32	4.9	LDC00128	LDC00129
9	228.6	450	34	5.2	LDC00130	LDC00131
10	254.0	500	34	5.2	LDC00132	LDC00133
10½	266.7	500	32	4.9	LDC00134	LDC00135
11	279.4	550	33	5.2	LDC00136	LDC00137
12	304.8	500	28	4.3	LDC00138	LDC00139
12	304.8	600	33	5.1	LDC00140	LDC00141
14	355.6	600	28	4.4	LDC00142	LDC00143
15	381.0	650	29	4.4	LDC00144	LDC00145
15	381.0	750	33	5.1	LDC00146	LDC00147
16	406.4	500	21	3.2	LDC00148	LDC00149
16	406.4	675	28	4.3	LDC00150	LDC00151
18	457.2	725	26	4.1	LDC00152	LDC00153
18	457.2	800	29	4.5	—	LDC00154
20	508.0	750	24	3.8	LDC00155	LDC00156
21	533.4	750	23	3.6	LDC00157	LDC00158
24	609.6	500	14	2.1	LDC00159	LDC00160
24	609.6	1000	27	4.2	—	LDC00161
25	635.0	1100	29	4.4	—	LDC00162



Note: Part Numbers above are for Low Density Cartridge Heaters terminated with Type F flexible leads, 10" long. See pages 2-39 through 2-57 for other terminations.

Low-Density Cartridge Heaters are made-to-order only. **Standard lead time is 3 weeks.**

Custom Engineered/Manufactured Low-Density Cartridge Heaters

Refer to ordering information on page 2-38.



Standard (Non-Stock) Low-Density Cartridge Heaters

5/8" Diameter Actual .621" (15.77 mm)

3/4" Diameter Actual .745" (18.92 mm)

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
1½	38.1	100	51	7.9	LDC00163	LDC00164
2	50.8	100	34	5.3	LDC00165	LDC00166
2½	63.5	80	20	3.2	LDC00167	LDC00168
2½	63.5	150	38	5.9	LDC00169	LDC00170
3	76.2	175	36	5.5	LDC00171	LDC00172
3½	88.9	190	32	5.0	LDC00173	LDC00174
4	101.6	200	29	4.5	LDC00175	LDC00176
4½	114.3	240	31	4.7	LDC00177	LDC00178
4½	114.3	275	35	5.4	LDC00179	LDC00180
5	127.0	200	23	3.5	LDC00181	LDC00182
5	127.0	250	28	4.4	LDC00183	LDC00184
5	127.0	375	42	6.6	LDC00185	LDC00186
5½	139.7	200	20	3.2	LDC00187	LDC00188
5½	139.7	285	29	4.5	LDC00189	LDC00190
5½	139.7	510	52	8.1	LDC00191	—
5½	149.2	350	33	5.1	LDC00192	LDC00193
6	152.4	200	19	2.9	LDC00194	LDC00195
6	152.4	300	28	4.3	LDC00196	LDC00197
6	152.4	350	32	5.0	LDC00198	LDC00199
6½	165.1	350	30	4.6	LDC00200	LDC00201
7	177.8	375	29	4.6	LDC00202	LDC00203
8	203.2	400	27	4.2	LDC00204	LDC00205
8½	215.9	425	27	4.2	LDC00206	LDC00207
9	228.6	450	27	4.2	LDC00208	LDC00209
9½	241.3	475	27	4.2	LDC00210	LDC00211
10	254.0	500	27	4.2	LDC00212	LDC00213
11	279.4	550	27	4.1	LDC00214	LDC00215
12	304.8	250	11	1.7	LDC00216	LDC00217
12	304.8	500	22	3.4	LDC00218	LDC00219
12	304.8	600	27	4.1	LDC00220	LDC00221
12	304.8	700	31	4.8	LDC00222	LDC00223
12¾	314.3	450	19	3.0	LDC00224	LDC00225
14	355.6	700	26	4.1	LDC00226	LDC00227
15	381.0	750	26	4.1	LDC00228	LDC00229
16	406.4	800	26	4.1	LDC00230	LDC00231
17	431.8	1000	31	4.8	LDC00232	LDC00233
18	457.2	725	21	3.3	LDC00234	LDC00235
18	457.2	800	23	3.6	LDC00236	LDC00237
20	508.0	900	24	3.6	LDC00238	LDC00239
21	533.4	1000	25	3.9	—	LDC00240
22	558.8	2000	47	7.3	—	LDC00241
24	609.6	2000	43	6.7	—	LDC00242
25	635.0	768	16	2.5	LDC00243	—
25	635.0	1100	23	3.5	—	LDC00244
25	635.0	1500	31	4.8	LDC00245	LDC00246
27	685.8	1200	23	3.6	LDC00247	—
28	711.2	2000	37	5.7	—	LDC00248
30	762.0	2000	35	5.4	—	LDC00249
31	787.4	2000	33	5.2	—	LDC00250
34	863.6	2000	30	4.7	—	LDC00251
36	914.4	2000	29	4.4	—	LDC00252
38	965.2	2000	27	4.2	—	LDC00253
38¾	979.5	1200	16	2.5	LDC00254	—

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
3	76.2	225	38	5.9	LDC00255	LDC00256
3½	88.9	225	32	4.9	LDC00257	LDC00258
3½	88.9	250	35	5.5	LDC00259	LDC00260
4	101.6	300	36	5.6	LDC00261	LDC00262
5	127.0	350	33	5.1	LDC00263	LDC00264
6	152.4	170	13	2.0	LDC00265	LDC00266
6	152.4	350	27	4.2	LDC00267	LDC00268
6	152.4	400	31	4.8	LDC00269	LDC00270
7	177.8	350	23	3.5	LDC00271	LDC00272
7	177.8	450	29	4.6	LDC00273	LDC00274
7	177.8	535	35	5.4	LDC00275	LDC00276
8	203.2	350	20	3.1	LDC00277	LDC00278
8	203.2	500	28	4.4	LDC00279	LDC00280
8	203.2	600	34	5.3	LDC00281	LDC00282
8½	215.9	675	36	5.6	LDC00283	LDC00284
9	228.6	350	17	2.7	LDC00285	LDC00286
9	228.6	550	27	4.3	LDC00287	LDC00288
9½	241.3	575	27	4.2	LDC00289	LDC00290
10	254.0	600	27	4.2	LDC00291	LDC00292
10	254.0	800	36	5.5	LDC00293	LDC00294
11	279.4	675	27	4.2	LDC00295	LDC00296
12	304.8	750	28	4.3	LDC00297	LDC00298
12	304.8	1000	37	5.7	LDC00299	LDC00300
13½	342.9	600	20	3.0	LDC00301	LDC00302
14	355.6	1000	31	4.9	LDC00303	LDC00304
16	406.4	950	26	4.0	LDC00305	LDC00306
18	457.2	950	23	3.6	LDC00307	LDC00308
18	457.2	1100	27	4.1	—	LDC00309
20	508.0	1000	22	3.4	LDC00310	LDC00311
21	533.4	1150	24	3.7	LDC00312	LDC00313
30	762.0	1800	26	4.0	—	LDC00314
31	787.4	1800	25	3.9	—	LDC00315



Note: Part Numbers above are for Low Density Cartridge Heaters terminated with Type F flexible leads, 10" long. See pages 2-39 through 2-57 for other terminations.

Low-Density Cartridge Heaters are made-to-order only. **Standard lead time is 3 weeks.**

Custom Engineered/Manufactured Low-Density Cartridge Heaters

Refer to ordering information on page 2-38.

Standard (Non-Stock) Low-Density Cartridge Heaters

7/8" Diameter Actual .870" (22.10 mm)

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
3½	88.9	250	30	4.7	LDC00316	LDC00317
4	101.6	300	31	4.8	LDC00318	LDC00319
5	127.0	400	32	5.0	LDC00320	LDC00321
6	152.4	475	31	4.9	LDC00322	LDC00323
7	177.8	525	29	4.6	LDC00324	LDC00325
8	203.2	550	27	4.1	LDC00326	LDC00327
10	254.0	600	23	3.6	LDC00328	LDC00329
11	279.4	600	21	3.2	LDC00330	LDC00331
11	279.4	700	24	3.8	LDC00332	LDC00333
12	304.8	850	27	4.2	LDC00334	LDC00335
13	330.2	900	26	4.1	LDC00336	LDC00337
15	381.0	950	24	3.7	LDC00338	LDC00339
18	457.2	1000	21	3.2	LDC00340	LDC00341
21½	546.1	1000	17	2.7	—	LDC00342

1" Diameter Actual .995" (25.27 mm)

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
3	76.2	250	32	4.9	LDC00373	LDC00374
4	101.6	300	27	4.2	LDC00375	LDC00376
5	127.0	375	27	4.1	LDC00377	LDC00378
6	152.4	500	29	4.5	LDC00379	LDC00380
8	203.2	600	25	3.9	LDC00381	LDC00382
9	228.6	700	26	4.1	LDC00383	LDC00384
10	254.0	800	27	4.2	LDC00385	LDC00386
10¾	273.1	600	19	2.9	LDC00387	LDC00388
10¾	273.1	850	26	4.1	LDC00389	LDC00390
12	304.8	1000	28	4.3	LDC00391	LDC00392
14	355.6	1100	26	4.0	LDC00393	LDC00394
18	457.2	1250	23	3.5	LDC00395	LDC00396
22¼	565.2	1000	15	2.3	LDC00397	LDC00398
23	584.2	1000	14	2.2	LDC00399	LDC00400
23½	596.9	1500	21	3.2	—	LDC00401
24	609.6	1500	20	3.1	—	LDC00402

1-1/4" Diameter Actual 1.250" (31.75 mm)

Sheath Length		Watts	Watt Density		Part Number	
in	mm		W/in ²	W/cm ²	120V	240V
3¼	82.6	400	37	5.7	LDC00403	LDC00404
5	127.0	450	25	3.9	LDC00405	LDC00406
6	152.4	500	23	3.6	LDC00407	LDC00408
6	152.4	800	37	5.7	LDC00409	LDC00410
7	177.8	550	22	3.3	LDC00411	LDC00412
7	177.8	1000	39	6.1	LDC00413	LDC00414
9	228.6	675	20	3.1	LDC00415	LDC00416
10	254.0	1000	27	4.2	LDC00417	LDC00418
12	304.8	1000	22	3.4	LDC00419	LDC00420
14	355.6	2000	38	5.8	—	LDC00421
15	381.0	1250	22	3.4	—	LDC00422
16½	419.1	1000	16	2.5	LDC00423	LDC00424
22½	571.5	2200	25	3.9	—	LDC00425
24	609.6	2400	26	4.0	—	LDC00426



Note: Part Numbers above are for Low-Density Cartridge Heaters terminated with Type F flexible leads, 10" long.

Low-Density Cartridge Heaters are made-to-order only. Standard lead time is 3 weeks.
See pages 2-39 through 2-57 for other terminations.

Ordering Information

Catalog Heaters

Order by Catalog Part Number from the Standard Sizes and Ratings List on the preceding pages. Note that Part Numbers shown are for heaters with Type F Termination (10" leads).

Available Terminations and Optional Features can be found on pages 2-39 through 2-60.

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Low-Density Cartridge Heater to meet your requirements. **Standard lead time is 3 weeks.**

Please Specify the following:

- Diameter
- Length
- Wattage
- Voltage
- Termination types (see pages 2-39 through 2-51)
- Options/Special Features (see pages 2-52 through 2-60)
- Lead Length
- Cable/Braid length
- Application Type
- Operating Temperature

Tempco Offers Innovative Cartridge Heater Terminations Focused on Providing Maximum Performance Under a Diverse Segment of Demanding Applications

Cartridge Heater Terminations Can be Elusive to Define and Are Often Overlooked

To ensure maximum efficiency and reliable cartridge heater service, evaluate your existing operating conditions and proceed to select the best suited termination(s) for your application.

Failure to evaluate the operating conditions and the environment of a cartridge heater application and/or improper termination selection will compromise the operating reliability and functional life of the cartridge heater, resulting in costly machine downtime and loss of revenue due to lack of productivity.

The synergy between the cartridge heater termination and the application will result in reduced operating cost, increased productivity, optimized performance and improved customer satisfaction.

Take Advantage of Tempco's Innovative Cartridge Heater Terminations.

We offer a selection of over 40 standard terminations specifically designed to address the operating requirements of a multitude of diverse applications requiring protection against the following conditions:

- **Abrasion**
- **Moisture Resistance**
- **Contamination**
- **High Temperatures**
- **Flexing**

In addition, there are many cartridge heater adaptations to facilitate their use:

- **Double-End Powerleads**
- **Locating Ring or Bushings**
- **NPT or Bulkhead Fittings**
- **Built-In Thermocouples & Thermostats**
- **Electrical Boxes**
- **Mounting Flanges**
- **Pull Straps**

Refer to pages 2-39 through 2-60 for complete specifications and details on all available terminations and options.

A Wise Man Once Said . . .

“A Cartridge Heater is Only As Good as the Termination that Powers It.”

Standard Termination — HDC and HDM Hi-Density Cartridge Heaters



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

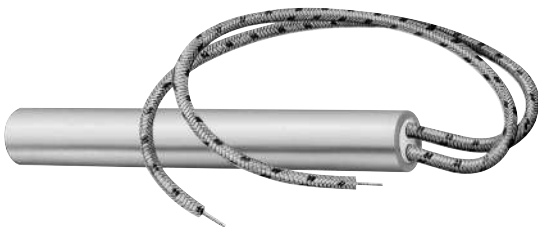
Type N External Pins with Leads

Available on HDC and HDM cartridge heaters

Flexible stranded lead wires have fiberglass insulation and are connected to 1-1/4" (32 mm) long solid conductors. Silicone rubber coated fiberglass sleeving insulates the pin/lead wire connection.

- Nominal 3/8" unheated section at the lead end is required.
- Standard lead wire temperature rating: 482°F (250°C)
- **Standard 10" (254 mm) leads.** Specify longer leads.

Standard Termination — LDC Low-Density Cartridge Heaters



Type F Internally Connected Flexible Leads

Available on HDC, HDM and LDC Cartridge Heaters

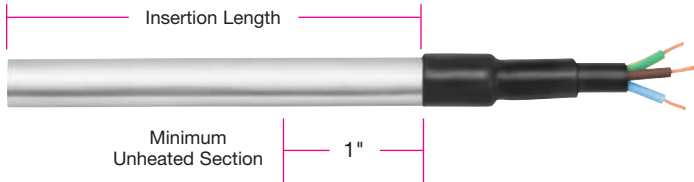
The fiberglass lead wires are internally connected to the terminal pins. This lead termination provides flexibility, permitting the lead wires to be sharply bent as they exit the heater.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard lead wire temperature rating for HDC and HDM cartridge heaters is 842°F (450°C)
- Standard lead wire temperature rating for LDC cartridge heaters is 482°F (250°C)
- **Standard 10" (254 mm) leads.** Specify longer leads. For HDC & HDM heaters, leads longer than 60" require a splice.



Note: The standard termination for Tempco's line of Miniature Hi-Density Cartridge Heaters is Type M3 - Teflon® End Plug Seal. See pages 2-10 and 2-11 for complete Miniature Cartridge heater details.

Cartridge Heater — Moisture Resistant Terminations



Type M1 Polyolefin Liquid Barrier

Available on HDC, HDM, and LDC cartridge heaters

A liquid barrier used for low temperature applications primarily in refrigeration or food service applications. The seal bonds to both the heater and the leads.

- Minimum 1" unheated section at the lead end is required.
- Three conductor SJO type cord.
- Available only in certain diameters. Heaters smaller than 1/2" diameter require an adapter.
- **Standard 10" (254 mm) leads. Specify longer leads.**

Type M2 Potted End Seal

Available on HDC, HDM and LDC cartridge heaters

Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bottom end disc seal is welded in.

M2A Cement potting with silicone varnish. Fiberglass lead wires externally connected.

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

M2B Silicone rubber potting. Silicone rubber lead wires internally connected.

- Silicone rubber potting temperature rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2C High temperature epoxy potting. Teflon® lead wires internally connected.

- High temp. epoxy potting temp. rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2D Low temperature epoxy potting. Teflon® lead wires internally connected.

- Low temp. epoxy potting temp. rating: 266°F (130°C), UL rated to 194°F (90°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2E Cement potting with silicone varnish. Fiberglass lead wires internally connected.

- Cement potting temperature rating: 1000°F (548°C)
- Standard lead wire temperature rating: 482°F (250°C)
- Minimum of 3/8" up to 1" unheated section at the lead end is required.
- **Standard 10" (254 mm) leads. Specify longer leads.**

Type M3 Teflon® End Plug Seal

Available on HDC and HDM cartridge heaters

A moisture resistant Teflon® seal that is swaged in during the manufacturing process with Teflon® insulated lead wire.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Teflon® seal temperature rating: 392°F (200°C)
- Standard lead wire temperature rating: 392°F (200°C)
- **Standard 10" (254 mm) leads. Specify longer leads. Leads longer than 60" require a splice.**

TYPE M2A



TYPE M2B, M2C, M2D and M2E



M2A and M2E are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping



Note: Type M3 is the **Standard Termination** for Tempco's Miniature Hi-Density Cartridge Heaters. See pages 2-10 and 2-11 for complete details.



Cartridge Heater — Moisture Resistant Terminations

Type SA Sealed Corrugated Armor Cable

Available on 1/2" Diameter and Larger HDC, HDM and LDC cartridge heaters

A liquid-proof stainless steel corrugated metal hose is silver brazed to the end of the cartridge heater. The end disc of the heater is also welded or brazed. This termination provides a positive seal against moisture and contamination entering the heater.

- ▶ Minimum 3/8" up to 1" unheated section at the lead end is required.
- ▶ Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- ▶ **Standard 10" (254 mm) cable over 12" (305 mm) leads.**
Specify longer leads or cable.



Cartridge Heater — Flexible Spring Abrasion Resistant Terminations

Type S1 Flexible Spring

Available on HDC, HDM, and LDC cartridge heaters.

The leads are reinforced with a steel spring for applications with extreme flexing. The spring is mechanically fastened or silver brazed.

S1A Mechanically fastened spring.

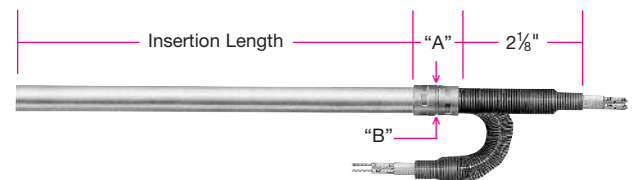
S1B Silver brazed spring.

- ▶ Minimum 3/8" up to 1" unheated section at the lead end is required.
- ▶ Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- ▶ **Standard 10" (254 mm) leads.** Specify longer leads.

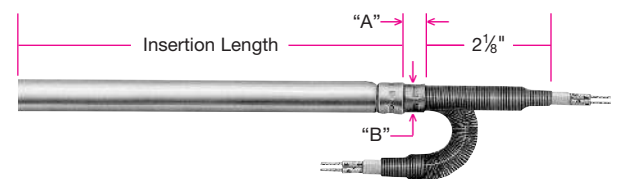
Dimensions for Type S1

	Diameter		Fig.	"A" Dim.		"B" Dim.	
	in	mm		in	mm	in	mm
Hi-Density Cartridge Heaters	1/4	6.35	1	11/16	17.46	5/16	7.94
	5/16	7.94	1	11/16	17.46	7/16	11.11
	3/8	9.53	1	11/16	17.46	7/16	11.11
	1/2	12.70	1	13/16	20.64	9/16	14.29
	5/8	15.88	1	1	25.40	3/4	19.05
	3/4	19.05	1	1-1/4	31.75	7/8	22.23
	1	25.40	2	5/8	15.88	5/8	15.88
Low-Density Cartridge Heaters	3/16	4.76	—	—	—	—	—
	1/4	6.35	1	11/16	17.46	5/16	7.94
	3/8	9.53	1	11/16	17.46	7/16	11.11
	1/2	12.70	1	13/16	20.64	9/16	14.29
	5/8	15.88	2	7/16	11.11	9/16	14.29
	3/4	19.05	2	1/2	12.70	9/16	14.29
	7/8	22.23	2	5/8	15.88	9/16	14.29
	1	25.40	2	5/8	15.88	5/8	15.88
	1-1/4	31.75	2	5/8	15.88	5/8	15.88

TYPE S1 Fig. 1

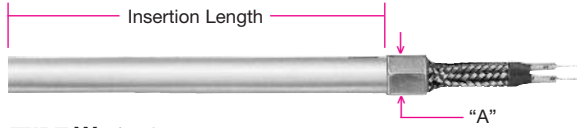


TYPE S1 Fig. 2

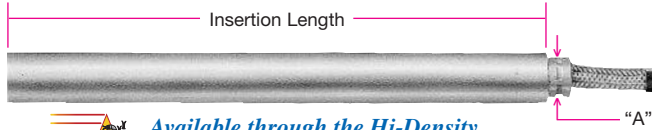


Cartridge Heater — Flexible Braid Abrasion Resistant Terminations

TYPE W Fig. 1



TYPE W Fig. 2



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Diameter		Fig.	"A" Dim./HD		"A" Dim./LD	
in	mm		in	mm	in	mm
3/16	4.76	1	—	—	1/4	6.35
1/4	6.35	1	5/16	7.94	5/16	7.94
5/16	7.94	1	3/8	9.53	—	—
3/8	9.53	2	3/8	9.53	3/8	9.53
1/2	12.70	2	7/16	11.11	7/16	11.11
5/8	15.88	2	9/16	14.29	9/16	14.29

Type W Wire Braided Leads

Available on HDC, HDM, and LDC cartridge heaters

Stainless steel braid over fiberglass leads offers sharp bending not possible with armor cable, as well as abrasion protection.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard 10" (254 mm) braid over 12" (305 mm) leads.**
Specify longer braid/leads.

Diameter		Fig.	"A" Dim./HD		"A" Dim./LD	
in	mm		in	mm	in	mm
3/4	19.05	2	9/16	14.29	9/16	14.29
7/8	22.23	2	—	—	9/16	14.29
1	25.40	2	9/16	14.29	9/16	14.29
1-1/4	31.75	2	—	—	9/16	14.29

Type W2 Embedded Wire Braided Leads

Available on HDC, HDM and LDC cartridge heaters

Stainless Steel braid embedded into seal offers moisture resistance and abrasion protection.

W2A Fiberglass Leads with Cement Potting

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

W2B Teflon® Leads with High Temperature Epoxy

- High temperature epoxy temp. rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

W2C Teflon® Leads with Low Temperature Epoxy

- Low temperature epoxy temp. rating: 266°F (130°C)
UL rated to 194°F (90°C)
- Standard lead wire temperature rating: 392°F (200°C)
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- **Standard 10" (254 mm) braid over 12" (305 mm) leads.**
Specify longer braid/leads.



Type W3 Swaged-In Wire Braided Leads

Available on HDC and HDM cartridge heaters

Stainless steel braid over fiberglass leads offers sharp bending not possible with armor cable, as well as abrasion protection. In addition, Type W3 offers contamination resistance due to the Teflon® seal required for holding the wire braid.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Teflon® Seal temperature rating: 392°F (200°C)
- Standard lead wire temperature rating: 842°F (450°C)
- **Standard 10" (254 mm) braid over 12" (305 mm) leads.**
Specify longer braid/leads.

Cartridge Heater — Armor Cable Abrasion Resistant Terminations

Type CS Straight Armor Cable Directly Attached to Sheath

Available on HDC, HDM, and LDC cartridge heaters

The armor cable is directly attached to the cartridge heater, eliminating the coupling, to maintain an overall diameter equal to or smaller than the cartridge diameter.

CSA Galvanized armor cable – minimum diameter: 5/16"

CSB Stainless steel armor cable – minimum diameter: 5/16"

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Heaters with an OD of 3/4" or larger require reducing diameter washer
- Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard 10" (254 mm) cable over 12" (305 mm) leads.**
Specify longer leads or cable.



Type C1 Straight Armor Cable with Coupling

Available on HDC, HDM, or LDC cartridge heaters

Armor cable provides the maximum in protection for abrasive, jagged environments. The coupling between the cartridge and the armor cable is mechanically fastened or silver brazed.

C1A Galvanized armor cable, mechanically fastened

C1B Stainless steel armor cable, mechanically fastened

- Standard fiberglass lead wire temperature rating
482°F (250°C)

C1C Galvanized armor cable, silver brazed

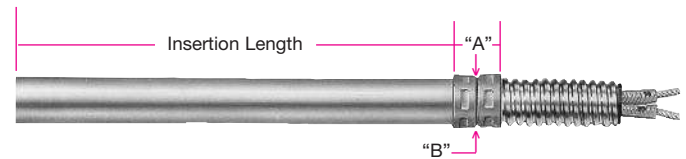
C1D Stainless steel armor cable, silver brazed

- Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)

- Minimum 3/8" up to 1" unheated section at the lead end is required.

- **Standard 10" (254 mm) cable over 12" (305 mm) leads.**
Specify longer leads or cable.

TYPE C1 Fig. 1

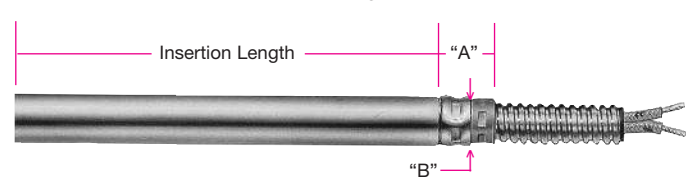


C1A and C1B are available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Dimensions for Type C1

	Diameter		Fig.	"A" Dim.		"B" Dim.		Cable Dia.
	in	mm		in	mm	in	mm	
Hi-Density Cartridge Heaters	1/4	6.35	1	11/16	17.46	5/16	7.94	1/4
	5/16	7.94	1	11/16	17.46	7/16	11.11	1/4
	3/8	9.53	1	11/16	17.46	7/16	11.11	3/8
	1/2	12.70	1	13/16	20.64	9/16	14.29	1/2
	5/8	15.88	1	1	25.40	3/4	19.05	1/2
	3/4	19.05	1	1-1/4	31.75	7/8	22.23	1/2
Low-Density Cartridge Heaters	1	25.40	2	5/8	15.88	5/8	15.88	1/2
	3/16	4.76	—	—	—	—	—	—
	1/4	6.35	1	11/16	17.46	5/16	7.94	1/4
	3/8	9.53	1	11/16	17.46	7/16	11.11	3/8
	1/2	12.70	1	13/16	20.64	9/16	14.29	1/2
	5/8	15.88	2	7/16	11.11	9/16	14.29	1/2
	3/4	19.05	2	1/2	12.70	9/16	14.29	1/2
	7/8	22.23	2	5/8	15.88	9/16	14.29	1/2
1	25.40	2	5/8	15.88	5/8	15.88	1/2	

TYPE C1 Fig. 2



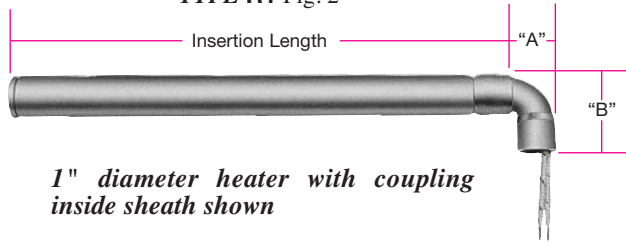
Right-Angle Terminations

Cartridge Heater — Plain Leads Right-Angle Terminations

TYPE R1 Fig. 1



TYPE R1 Fig. 2



Type R1 Right-Angle Leads with Copper Elbow

Available on HDC, HDM, and LDC cartridge heaters

This termination is used when space is limited. The copper elbow is mechanically fastened or silver brazed.

R1A Mechanically fastened

R1B Silver brazed

- ▶ Minimum 3/8" up to 1" unheated section at the lead end is required.
- ▶ Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- ▶ **Standard 10" (254 mm) leads. Specify longer leads.**

Dimensions for Type R1

	Diameter		Fig.	"A" Dim.		"B" Dim.	
	in	mm		in	mm	in	mm
Hi-Density Cartridge Heater	1/4	6.35	1	3/4	19.05	3/4	19.05
	5/16	7.94	1	15/16	23.81	15/16	23.81
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	1	1-1/4	31.75	1-1/4	31.75
	3/4	19.05	1	1-3/4	44.45	1-1/4	31.75
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
Low Density Cartridge Heater	3/16	4.76	—	—	—	—	—
	1/4	6.35	1	3/4	19.05	3/4	19.05
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	2	11/16	17.46	1-1/4	31.75
	3/4	19.05	2	3/4	19.05	1-1/4	31.75
	7/8	22.23	2	3/4	19.05	1-3/8	34.93
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
	1-1/4	31.75	2	1-1/8	28.58	1-3/8	34.93



Note: For Right-Angle Sheath Options, see page 2-53.



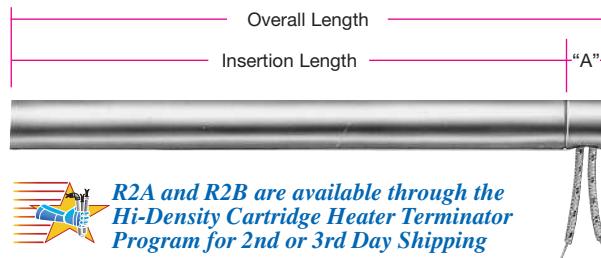
Cartridge Heater — Flexible Spring Abrasion Resistant Right-Angle Terminations

Type R2 Right-Angle Leads

Available on HDC, HDM, and LDC cartridge heaters

This termination is used when space is limited. Not suitable for abrasive environments. Same as C3 and W1 except plain leads. Various lead end finishes are available as listed below:

- R2A** Cement potting, no lead end disc
 - Cement potting temperature rating: 1000°F (538°C)
 - Standard fiberglass lead wire temperature rating: 482°F (250°C)
 - R2B** Cement potting, welded lead end disc
 - Cement potting temperature rating: 1000°F (538°C)
 - Standard fiberglass lead wire temperature rating: 482°F (250°C)
 - R2C** Silicone rubber potting, welded lead end disc
 - Silicone Rubber potting temperature rating: 450°F (232°C)
 - Standard silicone rubber lead wire temperature rating: 392°F (200°C)
 - R2D** High temperature epoxy potting, welded lead end disc
 - High Temperature epoxy potting temperature rating: 450°F (232°C)
 - Standard Teflon® lead wire temperature rating: 392°F (200°C)
 - R2E** Low temperature epoxy potting, welded lead end disc
 - Low Temperature epoxy potting temperature rating: 266°F (130°C)
 - Standard Teflon® lead wire temperature rating: 392°F (200°C)
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- **Standard 10" (254 mm) leads. Specify other lead lengths.**



R2A and R2B are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Dimensions for types R2

Diameter		Availability		"A" Dim.	
in	mm	HD	LD	in	mm
3/16	4.76	No	No	—	—
1/4	6.35	Yes	Yes	5/16	7.94
5/16	7.94	Yes	No	5/16	7.94
3/8	9.53	Yes	Yes	7/16	11.11
1/2	12.70	Yes	Yes	9/16	14.29
5/8	15.88	Yes	Yes	9/16	14.29
3/4	19.05	Yes	Yes	9/16	14.29
7/8	22.23	No	Yes	5/8	15.88
1	25.40	Yes	Yes	5/8	15.88
1-1/4	31.75	No	Yes	5/8	15.88

Type S2 Right-Angle Spring

Available on HDC, HDM, and LDC cartridge heaters

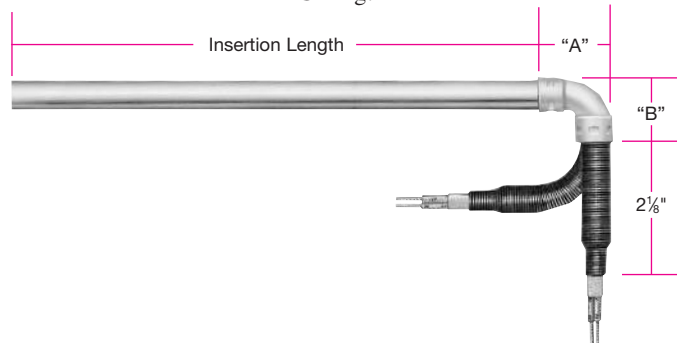
The leads are reinforced with a steel spring for applications with extreme flexing. The spring is mechanically fastened or silver brazed.

- S2A** Mechanically fastened spring
- S2B** Silver brazed spring
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard 10" (254 mm) leads. Specify longer leads.**

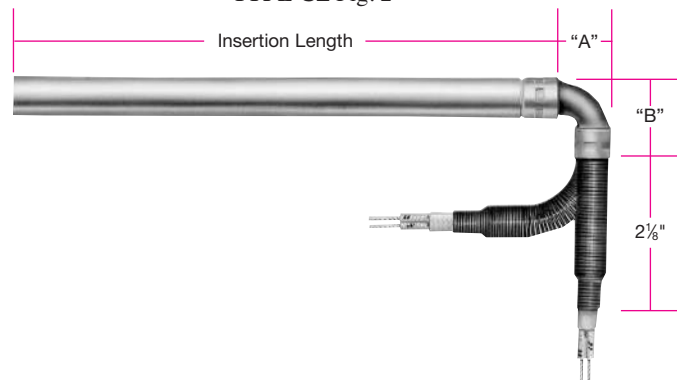
Dimensions for Type S2

	Diameter		Fig.	"A" Dim.		"B" Dim.	
	in	mm		in	mm	in	mm
Hi-Density Cartridge Heaters	1/4	6.35	1	3/4	19.05	3/4	19.05
	5/16	7.94	1	15/16	23.81	15/16	23.81
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	1	1-1/4	31.75	1-1/4	31.75
	3/4	19.05	1	1-3/4	44.45	1-1/4	31.75
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
Low-Density Cartridge Heaters	3/16	4.76	—	—	—	—	—
	1/4	6.35	1	3/4	19.05	3/4	19.05
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	2	11/16	17.46	1-1/4	31.75
	3/4	19.05	2	3/4	19.05	1-1/4	31.75
	7/8	22.23	2	3/4	19.05	1-3/8	34.93
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
	1-1/4	31.75	2	1-1/8	28.58	1-3/8	34.93

TYPE S2 Fig. 1

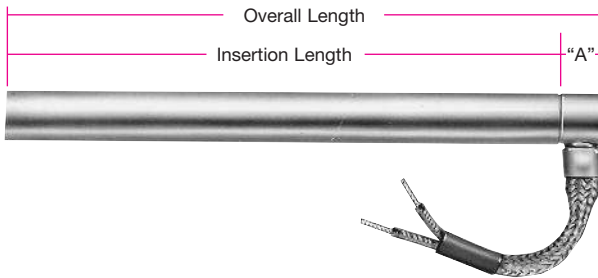


TYPE S2 Fig. 2



Right-Angle Terminations

Cartridge Heater — Flexible Braid Abrasion Resistant Right-Angle Terminations



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Dimensions for Type W1

Diameter		Availability		"A" Dim.	
in	mm	HD	LD	in	mm
3/16	4.76	No	No	—	—
1/4	6.35	Yes	Yes	5/16	7.94
5/16	7.94	Yes	No	5/16	7.94
3/8	9.53	Yes	Yes	7/16	11.11
1/2	12.70	Yes	Yes	9/16	14.29
5/8	15.88	Yes	Yes	9/16	14.29
3/4	19.05	Yes	Yes	9/16	14.29
7/8	22.23	No	Yes	5/8	15.88
1	25.40	Yes	Yes	5/8	15.88
1-1/4	31.75	No	Yes	5/8	15.88

Type W1 Right-Angle Wire Braided Leads

Available on HDC, HDM, and LDC cartridge heaters

Stainless steel braid over fiberglass leads for abrasion protection, mechanically crimped to the cartridge sheath at 90°. Wire braid offers extreme flexibility not possible with armor cable. Various lead end finishes are available as listed below.

W1A Cement potting and silicone varnish, no lead end disc.

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

W1B Welded lead end disc.

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- **Standard** 10" (254 mm) braid over 12" (305 mm) leads. Specify longer braid or leads.



Note: For Right-Angle Sheath Options, see page 2-53.



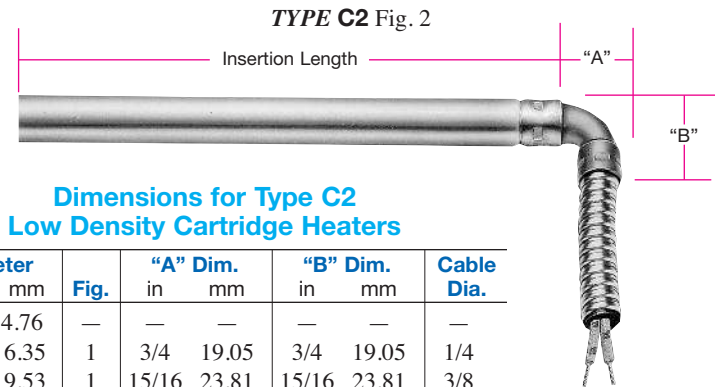
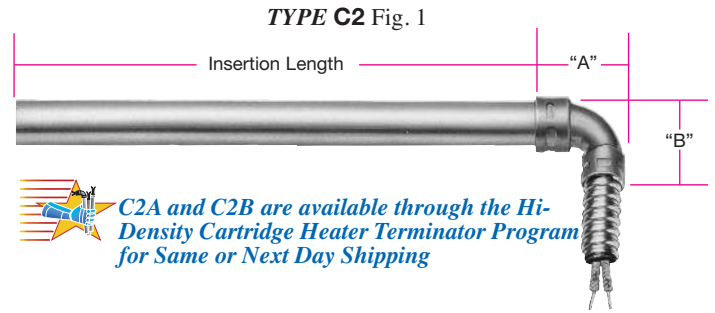
Cartridge Heater — Armor Cable Abrasion Resistant Right-Angle Terminations

Type C2 Right-Angle Armor Cable with Copper Elbow

Available on HDC, HDM, and LDC cartridge heaters

Armor cable provides the maximum in protection for abrasive, jagged environments. The copper elbow between the cartridge and the armor cable is mechanically fastened or silver brazed.

- C2A** Galvanized armor cable, mechanically fastened
 - C2B** Stainless steel armor cable, mechanically fastened
 - C2C** Galvanized armor cable, silver brazed
 - C2D** Stainless steel armor cable, silver brazed
- Minimum 3/8" up to 1" unheated section at the lead end is required.
 - Standard fiberglass lead wire temperature rating
HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
 - **Standard 10" (254 mm) cable over 12" (305 mm) leads.**
Specify longer cable or leads.



Dimensions for Type C2 Hi-Density Cartridge Heaters

Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm	Cable Dia.
1/4 6.35	1	3/4 19.05	3/4 19.05	1/4
5/16 7.94	1	15/16 23.81	15/16 23.81	1/4
3/8 9.53	1	15/16 23.81	15/16 23.81	3/8
1/2 12.70	1	1-1/4 31.75	1-1/4 31.75	1/2
5/8 15.88	1	1-1/4 31.75	1-1/4 31.75	1/2
3/4 19.05	1	1-3/4 44.45	1-1/4 31.75	1/2
1 25.40	2	1-1/8 28.58	1-3/8 34.93	1/2

Dimensions for Type C2 Low Density Cartridge Heaters

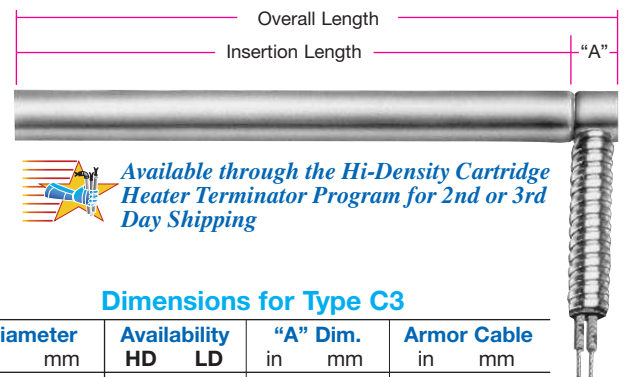
Diameter in mm	Fig.	"A" Dim. in mm	"B" Dim. in mm	Cable Dia.
3/16 4.76	—	—	—	—
1/4 6.35	1	3/4 19.05	3/4 19.05	1/4
3/8 9.53	1	15/16 23.81	15/16 23.81	3/8
1/2 12.70	1	1-1/4 31.75	1-1/4 31.75	1/2
5/8 15.88	2	11/16 17.46	1-1/4 31.75	1/2
3/4 19.05	2	3/4 19.05	1-1/4 31.75	1/2
7/8 22.23	2	3/4 19.05	1-3/8 34.93	1/2
1 25.40	2	1-1/8 28.58	1-3/8 34.93	1/2
1-1/4 31.75	2	1-1/8 28.58	1-3/8 34.93	1/2

Type C3 Right-Angle Armor Cable

Available on HDC, HDM, and LDC cartridge heaters

Use this termination when space is limited and maximum protection is required. The armor cable is tack welded or silver brazed to the cartridge sheath at 90°. The sheath extension is potted with cement. Various lead end finishes are available as listed below.

- C3A** Cement potting and silicone varnish with no lead end disc, galvanized cable
 - C3B** Cement potting and silicone varnish with no lead end disc, stainless steel cable
 - C3C** Welded lead end disc, with galvanized cable
 - C3D** Welded lead end disc, with stainless steel cable
- Minimum 3/8" up to 1" unheated section at the lead end is required.
 - Cement potting temperature rating: 1000°F (538°C)
Standard fiberglass lead wire temperature rating: 482°F (250°C)
 - **Standard 10" (254 mm) armor cable over 12" (305 mm) leads.**
Specify longer cable or leads.



Dimensions for Type C3

Diameter in mm	Availability HD LD	"A" Dim.		Armor Cable	
		in mm	in mm	in mm	in mm
3/16 4.76	No No	—	—	—	—
1/4 6.35	Yes Yes	5/16 7.94	7/16 11.11	1/4 6.35	3/8 9.53
5/16 7.94	Yes No	5/16 7.94	7/16 11.11	1/4 6.35	3/8 9.53
3/8 9.53	Yes Yes	7/16 11.11	11/16 17.46	3/8 9.53	1/2 12.70
1/2 12.70	Yes Yes	9/16 14.29	11/16 17.46	1/2 12.70	1/2 12.70
5/8 15.88	Yes Yes	9/16 14.29	11/16 17.46	1/2 12.70	1/2 12.70
3/4 19.05	Yes Yes	9/16 14.29	11/16 17.46	1/2 12.70	1/2 12.70
7/8 22.23	No Yes	5/8 15.88	11/16 17.46	1/2 12.70	1/2 12.70
1 25.40	Yes Yes	5/8 15.88	11/16 17.46	1/2 12.70	1/2 12.70
1-1/4 31.75	No Yes	5/8 15.88	11/16 17.46	1/2 12.70	1/2 12.70

Cartridge Heater — Screw Terminations



Type T1 Screw Terminals

Available on LDC type cartridge heaters only

For use with leads, crimp terminals, or bus bars. Includes washers and nuts.

- Minimum 1/2" unheated section at the lead end is required.
- Diameters available: 3/4", 7/8", 1", and 1-1/4".
- **Standard:** screw #6-32 × 3/4" long

Diameter	in	3/4	7/8	1	1-1/4
	mm	19.05	22.23	25.40	31.75
"A" Dimension	in	3/8	7/16	1/2	1/2
	mm	9.53	11.11	12.70	12.70



Type T2 Screw Terminals

Available on HDC and HDM type cartridge heaters only

For use with leads, crimp terminals, or bus bars. Includes washers and nuts.

- Minimum 1/2" unheated section at the lead end is required.
- Diameters available: HD — 5/8", 3/4", 1"
HDM — 16 mm and 20 mm
- **Standard:** screw #8-32

Cartridge Heater — High Temperature Termination



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type B Heat Resistant Ceramic Bead Insulation

Available on HDC, HDM, and LDC cartridge heaters.

The ultimate in high temperature lead protection. Allows for the attachment of flexible leads to the heater away from the high heat area. Used when the ambient temperature exceeds 842°F (450°C).

- **Standard** 10" (254 mm) solid nickel pins insulated with ball and socket construction type ceramic beads



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type BL Heat Resistant Ceramic Bead Insulation with Leads

Available on HDC, HDM, and LDC cartridge heaters.

High temperature flexible leads are connected away from the high heat area.

- **Standard** 6" (254 mm) solid nickel pins insulated with ball and socket construction type ceramic beads and 10" (254 mm) fiberglass leads rated at 842°F (450°C). Specify longer leads.

Cartridge Heater — Double End Terminations

Type T4 Double End Terminal Pin

Available on HDC, HDM, and LDC cartridge heaters

For those applications in which wiring from both ends is an advantage. Various seals are available:

- T4A** Cement potting seal with silicone varnish
 - Cement potting temperature rating: 1000°F (538°C)
- T4B** High temp. moisture resistant epoxy seal
 - High temp. epoxy temp. rating: 450°F (232°C)
- T4C** Low temp. moisture resistant epoxy seal
 - Low temp. epoxy temp. rating: 266°F (130°C)
- Minimum 1" unheated section at each end is required.
- **Standard** terminal pin length is 2".



Type F1 Double End Flexible Leads

Available on HDC, HDM, and LDC cartridge heaters

For applications in which it is an advantage to wire from both ends. The leads are internally connected and can be bent sharply as they exit the potted ends. Various seals are available:

- F1A** Fiberglass leads with cement potting seal and silicone varnish
 - Cement potting temperature rating: 1000°F (532°C)
 - Standard lead wire temperature rating: 482°F (250°C)
- F1B** Teflon® leads with high temp. moisture resistant epoxy seal
 - High temp. epoxy temperature rating: 450°F (232°C)
 - Standard lead wire temperature rating: 392°F (200°C)
- F1C** Teflon® leads with low temp. moisture resistant epoxy seal
 - Low temp. epoxy temperature rating: 266°F (130°C)
 - Standard lead wire temperature rating: 392°F (200°C)
- Minimum 1" unheated section at each end is required.
- **Standard** 10" leads. Specify longer leads.
Leads longer than 60" require a splice.



Type T3 Double End Screw Terminals

Available on HDC, HDM, and LDC cartridge heaters from 1/2" to 1-1/4" diameter

A double ended heater with quick change wiring screw terminals. Includes zinc plated washers and nuts.

- Minimum 1/2" unheated section at each end is required.

Standard screw sizes:

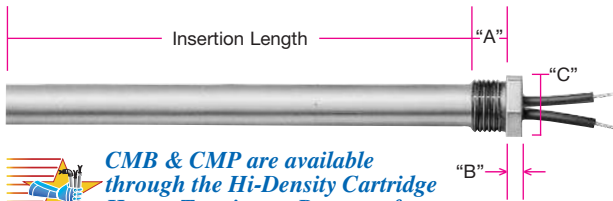
- 1/2" diameter — #8-32 × 3/4" screws
- 5/8" to 1-1/4" diameter — #10-32 × 3/4" screws



Mounting Fitting Termination & Option

Cartridge Heater Termination — Single Ended National Pipe Thread (NPT) Fitting

TYPE CM Fig. 1 – Fitting Flush with Lead End of Sheath



 **CMB & CMP are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping**

NOTE: Stainless steel fittings are available through the Terminator program for heaters 1/2" diameter and larger.



Note: Fitting can be offset from end of sheath. See Figure 2, Single Threaded Mounting Options CMV and CMW below.

Standard NPT Bushing Dimensions
(Fig. 1 & Fig. 2)

Heater Diameter (in)	NPT Size	"A"	"B"	"C"
1/4	1/8-27	3/8	3/16	7/16
3/8	1/4-18	1/2	3/16	9/16
1/2	3/8-18	9/16	1/4	11/16
5/8	1/2-14	5/8	1/4	7/8
3/4	3/4-14	3/4	1/4	1-1/8
7/8	1-11 1/2	3/4	1/4	1-3/8
1	1-11 1/2	3/4	1/4	1-3/8
1-1/4	1 1/4-11 1/2	7/8	5/16	1-3/4

Type CM Single Threaded Fitting Mounting Termination Fitting Flush with Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

A single threaded pipe fitting is attached to the end of a cartridge heater to allow for installation into a threaded hole. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded. Available with the potting seals listed in the table.

Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bushing cavity can be sealed with various materials such as:

CMA/CMN Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

CMB/CMP Hi-temp cement potting with silicone varnish — 1000°F (538°C)
Fiberglass leads internally connected, rated 482°F (250°C).

CMC/CMQ Silicone rubber potting — 450°F (232°C)
Silicone rubber leads internally connected, rated 392°F (200°C).

CMD/CMR High temperature epoxy potting — 450°F (232°C)
Teflon® leads internally connected, rated 392°F (200°C).

➤ A minimum of 1/4" unheated section below the bushing is required.

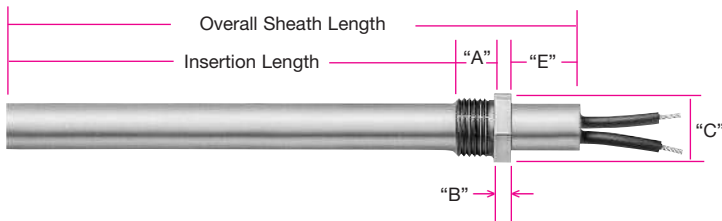
➤ **Standard 10" (254 mm) leads. Specify longer leads.**

Type Codes for Single Threaded Fittings

Potting Seal Type	Fitting Material	
	Brass	Stainless Steel
Low Temp Epoxy	CMA	CMN
Hi-Temp Cement	CMB	CMP
Silicone Rubber	CMC	CMQ
Hi-Temp Epoxy	CMD	CMR

Single Ended National Pipe Thread (NPT) Fitting Option

TYPE CM Fig. 2 – Fitting Offset from Lead End of Sheath



Type CM Single Threaded Fitting Mounting Option Fitting Offset from Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

This mounting option available with many terminations attaches a fitting offset from the lead end of the sheath. This option is useful when the lead wires need to be kept away from the heated area. Brass fittings are silver brazed and stainless steel fittings are offset heli-arc welded.

CMV Brass Fitting

CMW Stainless Steel Fitting

➤ Specify offset dimension "E" when ordering.

➤ A termination must be specified separately.

Hi-Density Cartridge Immersion Heater Specifically Designed for Heating Water & Other Liquids



See Page 2-23.

Cartridge Heater — Double Ended National Pipe Thread (NPT)

Type CN Double Threaded Fitting Mounting Termination Fitting Flush with Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

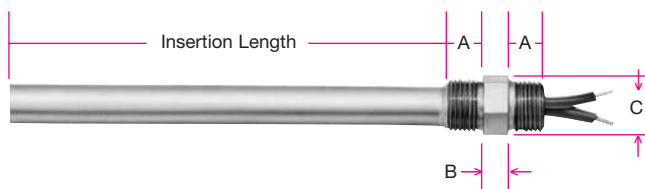
A double threaded pipe fitting is attached to the end of a cartridge heater to allow for installation into a threaded hole. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded.

Standard NPT Bushing Dimensions

Heater Diameter (in)	NPT Size	"A"	"B"	"C"
1/4	1/8-27	3/8	1/4	7/16
3/8	1/4-18	1/2	1/4	9/16
1/2	3/8-18	9/16	1/4	11/16
5/8	1/2-14	5/8	5/16	7/8
3/4	3/4-14	3/4	3/8	1-1/8
7/8	1-11 1/2	3/4	3/8	1-3/8
1	1-11 1/2	3/4	3/8	1-3/8
1-1/4	1 1/4-11 1/2	7/8	1/2	1-3/4

Type Codes for Double Threaded Fittings

Potting Seal Type	Fitting Material	
	Brass	Stainless Steel
Low Temp Epoxy	CNA	CNN
Hi-Temp Cement	CNB	CNP
Silicone Rubber	CNC	CNQ
Hi-Temp Epoxy	CND	CNR



Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bushing cavity can be sealed with various materials such as:

CNA/CNN Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

CNB/CNP Hi-temp cement potting w/ silicone varnish — 1000°F (538°C)
Fiberglass leads internally connected, rated 482°F (250°C).

CNC/CNQ Silicone rubber potting — 450°F (232°C)
Silicone rubber leads internally connected, rated 392°F (200°C).

CND/CNR High temperature epoxy potting — 450°F (232°C)
Teflon® leads internally connected, rated 392°F (200°C).

- A minimum of 1/4" unheated section below the bushing is required.
- Standard 10" (254 mm) leads. Specify longer leads.

Cartridge Heater Immersion Heater Top Hat Screw Plug Termination

Type TH Top Hat Screw Plug

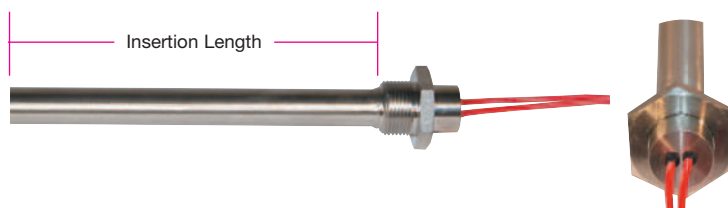
Available on HDC (except 1/8") and HDM cartridge heaters

This heater has a header cap as an integral part of the fitting. Leads exit through small holes which are sealed with epoxy for moisture protection.

Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)

Teflon® leads internally connected, rated 392°F (200°C).

- Standard 10" (254 mm) leads. Specify longer leads.



Cartridge Heater — Bulkhead Fitting Termination

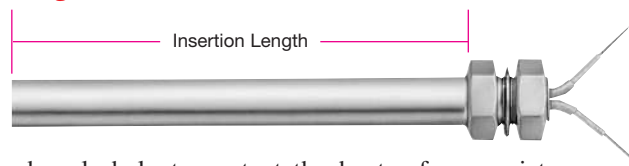
Type BF Bulkhead Fitting

Available on HDC and LDC 1/2" and 5/8" cartridge heaters

A 5/8-18 UNF fitting is attached to the end of the cartridge heater to allow for mounting the heater to the wall of a tank or enclosure. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded. Includes a copper washer and jam nut. The lead wires are internally connected. Available with the potting seals listed in the table.

Type Codes for Bulkhead Fittings

Potting Seal Type	Fitting Material	
	Brass	Stainless Steel
Low Temp Epoxy	BFA	BFJ
Silicone Rubber	BFB	BFK
Hi-Temp Epoxy	BFC	BFL



Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The fitting cavity can be sealed with various materials such as:

BFA/BFJ Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

BFB/BFK Silicone rubber potting — 450°F (232°C)
Silicone rubber leads internally connected, rated 392°F (200°C).

BFC/BFL High temperature epoxy potting — 450°F (232°C)
Teflon® leads internally connected, rated 392°F (200°C).

- A minimum of 1/4" unheated section below the bushing is required.
- Standard 10" (254 mm) leads. Specify longer leads.

Options

Cartridge Heater Mounting Flange Options

Type MFR Mounting Flange — Round

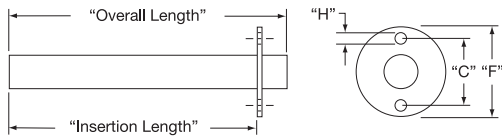
Available on HDC, HDM, and LDC cartridge heaters

Recommended for applications where excessive vibration exists and may cause the heater to back out of its mounting hole. The 16 ga. 304 SS flange is used as a means of securing the cartridge heater in place.

The default position of the flange is flush with the lead end. Specify the position of the flange when ordering.



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping with flush flange only



Standard Round Mounting Flanges

Heater Diameter in (mm)	"F"		"C"		"H"	
	in	mm	in	mm	in	mm
1/4 (6.35), 5/16 (7.94), 3/8 (9.53), 1/2 (12.70), 5/8 (15.88), 3/4 (19.05)	1-1/2	38.10	1-1/8	28.57	.156	3.97
7/8 (22.23), 1 (25.40), 1-1/4 (31.80)	2	50.80	1-5/8	41.28	.203	5.16



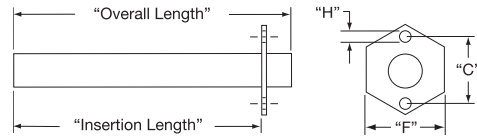
Note: 5/16" dia. cartridge heater can only be HDC; 7/8" and 1-1/4" can only be LDC.

Type MFH Mounting Flange — Hex

Available on HDC, HDM, and LDC cartridge heaters

A hex shape allows the possibility of using a wrench when removal is tight. The 16 ga. 304 SS flange is used as a means of securing the cartridge heater in place.

The default position of the flange is flush with the lead end. Specify the position of the flange when ordering.



Standard Hex Mounting Flanges

Heater Diameter		"F"		"C"		"H"	
in	mm	in	mm	in	mm	in	mm
1/4	6.35	1	25.40	3/4	19.05	.144	3.66
5/16	7.94	1	25.40	3/4	19.05	.144	3.66
3/8	9.53	1	25.40	3/4	19.05	.144	3.66
1/2	12.70	1-3/8	34.93	1-5/32	29.37	.187	4.76
5/8	15.88	1-3/8	34.93	1-5/32	29.37	.187	4.76
3/4	19.05	1-3/8	34.93	1-5/32	29.37	.187	4.76
7/8	22.26	1-7/8	47.63	1-9/16	39.69	.203	5.16
1	25.40	1-7/8	47.63	1-9/16	39.69	.203	5.16
1-1/4	31.80	1-7/8	47.63	1-11/16	42.86	.203	5.16

Custom Mounting Flanges available upon request. Consult Tempco with your requirements.

Cartridge Heater Lead Wire with Strain Relief Options



Type S3 Lead Wire Strain Relief

Available on HDC, HDM, and LDC cartridge heaters

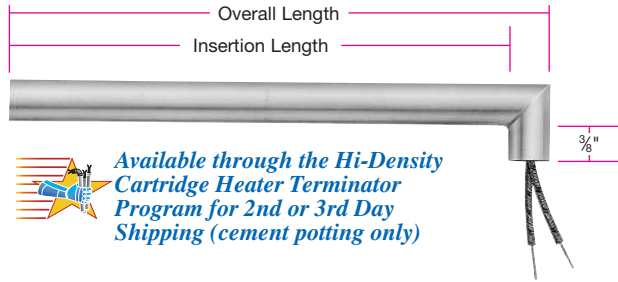
Strain relief clip for leads subject to tension and stress. A "T" type strain relief is silver brazed to the sheath.

Type S4 Right-Angle Lead Wire Strain Relief

Available on HDC, HDM, and LDC cartridge heaters

Strain relief clip for leads subject to tension and stress. A "T" type strain relief is silver brazed to the sheath and bent at a 90° angle.

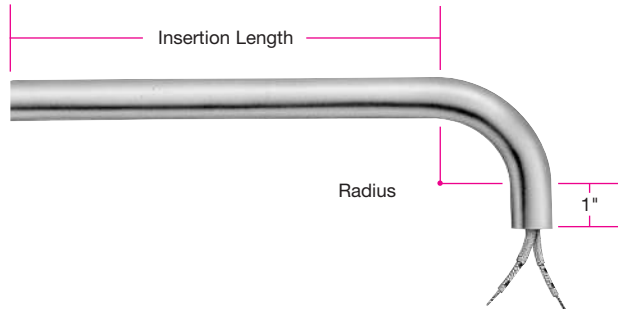
Cartridge Heater Option — Angled Sheath



Type R3 Angled Sheath Extension

Available on HDC, HDM, and LDC cartridge heaters

The sheath extension is silver brazed to the cartridge at a 90° angle. The leads are internally connected. The standard sheath extension is 3/8" long. Specify when ordering if a longer sheath extension is required. If abrasion resistance is required, armor cable or stainless steel wire braid can be attached to the sheath extension. Available with various lead wire types and potted end seals.



Type R4 Bent Cartridge

Available on HDC and HDM cartridge heaters

The heater sheath itself is bent to 90°. The bend is through a required unheated section. The standard sheath extension past the bend is 1". Specify when ordering if a longer sheath is required.

Cartridge Dia.	in	1/4	3/8	1/2	5/8	3/4	1
	mm	6.35	9.53	12.70	15.88	19.05	25.40
Bend Radius	in	1/2	1/2	3/4	1	1-1/4	1-1/2
	mm	12.70	12.70	19.05	25.40	31.75	38.10



Type R5 Square Block with Tube Extension

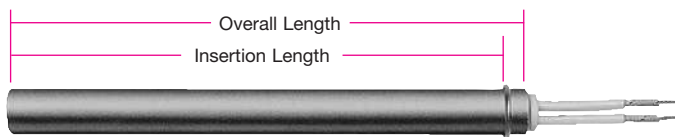
Available on HDC, HDM, and LDC cartridge heaters

The tube extension is silver brazed or tack welded to a square S/S block. The standard tube length is 1", but different lengths can be specified. Available with various lead wire types, abrasion resistant options or potted end seals.

Heater Diameter		"A"		"B"	
in	mm	in	mm	in	mm
1/4	6.35	7/16	11.11	5/16	7.94
3/8	9.53	1/2	12.70	3/8	9.52
1/2	12.70	5/8	15.87	1/2	12.70
5/8	15.88	3/4	19.05	5/8	15.87
3/4	19.05	1	25.40	11/16	17.46

Other Sheath Options

Cartridge Heater Locating Ring



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type LR Locating Ring

Available on HDC, HDM, and LDC cartridge heaters

A locating ring can be attached to the heater to aid in positioning the heater for the application.

The default position of the ring is 1/4" from the lead end. Specify the position of the ring when ordering.

Cartridge Heater Pull Strap



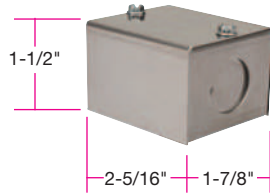
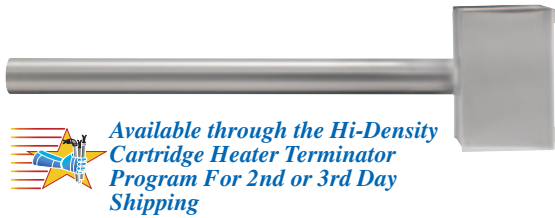
Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type PS Pull Strap

Available on HDC, HDM, and LDC cartridge heaters

A nickel wire rope is silver brazed to the lead end of the cartridge heater sheath to assist in removing the heater.

Cartridge Heater Terminal Box Options

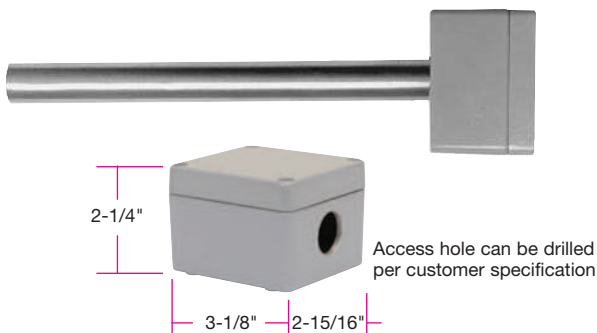


Type E1 General Purpose Terminal Box

Available on HDC, HDM, and LDC cartridge heaters

General purpose Stainless Steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The boxes have a 5/8" conduit knockout and are welded or brazed to the cartridge sheath.

➤ A termination must be specified separately.



Type E2 Moisture Proof Terminal Box

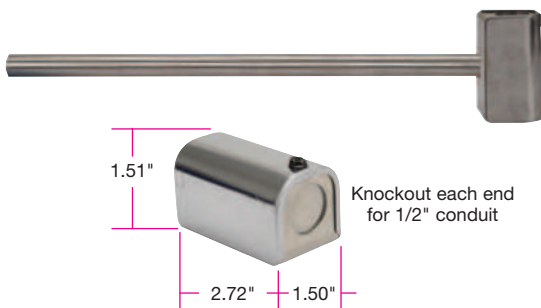
Available on HDC, HDM, and LDC cartridge heaters

NEMA 4 aluminum electrical enclosures provide protection from splashing or hose directed water, external condensation and water seepage. The box is mechanically attached to the cartridge sheath.

➤ A single 5/8" access hole is standard.

➤ A termination must be specified separately.

NOTE: Potted End Seal M2C (high temperature epoxy) or M2D (low temperature epoxy) is recommended.

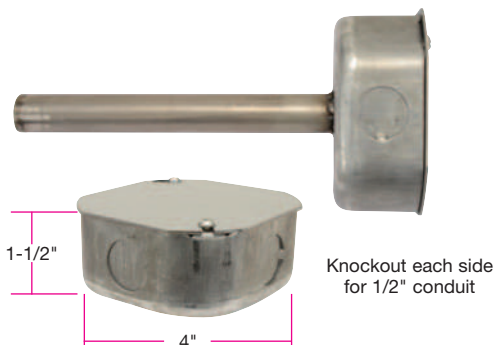


Type E4 General Purpose Terminal Box (mailbox style)

Available on HDC, HDM, and LDC cartridge heaters

General purpose Stainless Steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The box is welded or brazed to the cartridge sheath.

➤ A termination must be specified separately.



Type E5 Octagon Terminal Box

Available on HDC, HDM, and LDC cartridge heaters

General purpose steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The box is welded to the cartridge sheath.

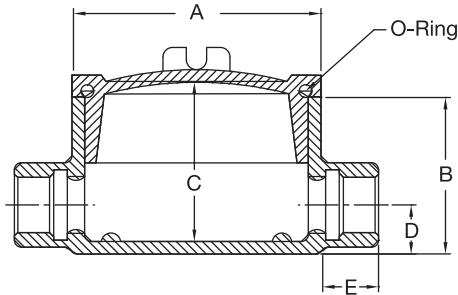
➤ A termination must be specified separately.

Type E3 Explosion Resistant Terminal Box Options

Available on HDC and HDM cartridge heaters 1/2" diameter and larger.

NEMA 4/7 electrical enclosures provide protection from contaminants, moisture, and hazardous conditions. These housings are screwed onto a heater with a single or double ended Brass or Stainless Steel fitting.

- A threaded fitting mounting termination must be specified. See pages 2-50 and 2-51.
- Other terminal box configurations available upon request.

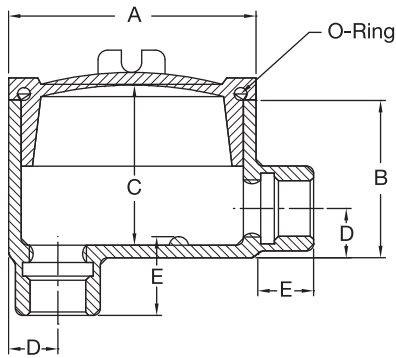


Style **E3C**



Housing E3C Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2	2	3/4	7/8
1	1-11/2	3-1/2	2-5/16	2-3/16	7/8	1

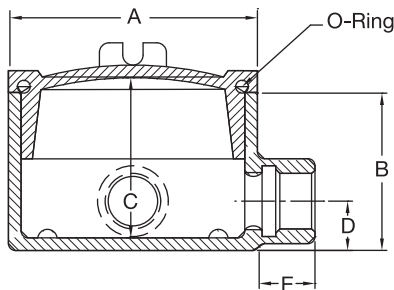


Style **E3D**



Housing E3D Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2-1/2	2-7/16	3/4	7/8
1	1-11/2	3-1/2	2-5/16	2-3/16	7/8	1



Style **E3L**



Housing E3L Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2-1/2	2-7/16	3/4	7/8
1	1-11/2	3-1/2	2-5/16	2-3/16	7/8	1



Explosion resistant terminal housings are intended to provide containment of an explosion in the enclosure only. No portion of the heater assembly outside the enclosure is covered under this NEMA rating. Abnormal use of a heater which results in excessive temperature can create hazardous conditions such as a fire. Never perform any type of service nor remove the housing cover prior to disconnecting all electrical power to the heater.

Cartridge Heaters



Lead Wire Options

Cartridge Heater Options — Lead End Connections

Type RT Ring Terminal

Type ST Spade Terminal

Type QTA 1/4" Female Straight Quick Disconnect

Type QTB 1/4" Female Right-Angle Quick Disconnect

Available on HDC, HDM and LDC cartridge heaters

Various types of crimp terminals can be attached to the heater leads to make wiring into applications quick and easy. Non-insulated and insulated with nylon (221°F/105°C) or PVC (194°F/90°C).



Note: Specify insulation type and ring size (#6, #8, or #10) when ordering. Standard is a non-insulated #10 terminal. Consult Tempco with your requirements.



Type RT



Type ST



Type QTA



Type QTB

Type P Quick Disconnect Plugs

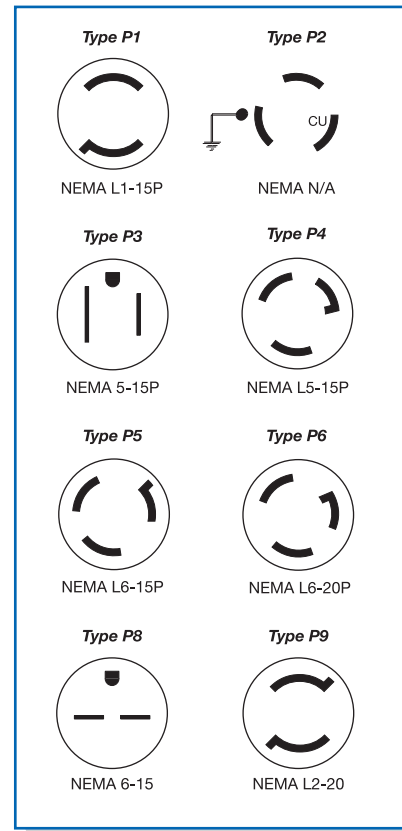
Available on HDC, HDM, and LDC cartridge heaters

Allows for the quick and easy replacement of the heater. The plug can be attached to galvanized armor cable, stainless steel armor cable, or wire braid.

Plug Type

Description

- | | |
|----------|---|
| 1 | 2-pole/2-wire twist locking plug, 15 amp 125 volt
NEMA L1-15P (Part Number EHD-102-102) |
| 2 | 2-pole/3-wire twist locking plug, 15 amp 125 volt or
10 amp 250 volt
NEMA N/A. (Part Number EHD-102-107)
NOTE: This plug is not listed by UL, and is recommended
for replacement use only. |
| 3 | 2-pole/3-wire straight blade plug, 15 amp 125 volt
NEMA 5-15P (Part Number EHD-102-103) |
| 4 | 2-pole/3-wire twist locking plug, 15 amp 125 volt
NEMA L5-15P (Part Number EHD-102-113) |
| 5 | 2-pole/3-wire twist locking plug, 15 amp 250 volt
NEMA L6-15P (Part Number EHD-102-121) |
| 6 | 2-pole/3-wire twist locking plug, 20 amp 250 volt
NEMA L6-20P (Part Number EHD-102-122) |
| 8 | 2-pole/3-wire straight blade plug, 15 amp 250 volt
NEMA 6-15P (Part Number EHD-102-114) |
| 9 | 2-pole/3-wire twist locking plug, 20 amp 250 volt
NEMA L2-20P (Part Number EHD-102-104)
NOTE: For other types of plugs, consult Tempco or
specify the manufacturer's part number when ordering.
See page 15-15 for additional information. |



Caution! Voltage and Amperage ratings of heater and plug must match.



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Cartridge Heater Lead Wire Options

Type MIL High Temperature Lead Wire

Available on HDC, HDM and LDC cartridge heaters

When required, high temperature lead wire can be used on most cartridge heaters. The stranded wire is insulated with mica tapes and then a treated fiberglass overbraid.

- Maximum temperature rating: 450°C (842°F)

Type TL Teflon® Leads

Available on HDC and HDM cartridge heaters

- Maximum temperature rating: 200°C (392°F)

Type HA Heat Shrink Covered Armor Cables

Available on HDC, HDM and LDC cartridge heaters

- Either the galvanized or stainless steel armor cable can be covered with moisture proof heat shrink PVC tubing.

Type HTL Very High Temperature Lead Wire

Available on HDC, HDM and LDC cartridge heaters

When required, high temperature lead wire can be used on most cartridge heaters. The stranded wire is insulated with mica composite and then a treated fiberglass overbraid.

- Available wire gauge sizes: 10-18
- Maximum temperature rating: 550°C (1022°F)

Type SR Silicone Rubber Coated Fiberglass Slewing

Available on HDC, HDM and LDC cartridge heaters

For added protection, strength, and resistance to various chemicals, the lead wires can be covered with silicone rubber slewing.

SRA Silicone rubber coated fiberglass slewing on each lead separately

SRB Silicone rubber coated fiberglass slewing on both leads together

- Specify length when ordering.
- Maximum temperature rating: 200°C (392°F)

Consult Tempco with your requirements.

We welcome your inquiries.

Cartridge Heater Options — Sheath Surface and Sheath Material

Type IS Incoloy® Sheath

Available on HDC and HDM cartridge heaters.

The standard sheath material for all Hi-Density Cartridge Heaters except 1" diameter is 321 stainless steel; standard for 1" diameter is 304 stainless steel. The incoloy sheath option is available on all diameters except 1/8", 5/16", 8 mm and 20 mm.

To assist you in selecting the proper sheath material, corrosion resistant ratings and chemical properties of various heater sheath materials are given in Section 16, Engineering Data, in the back of this catalog.

Type DSM Other Special Sheath Materials

If your application requires a specific alloy sheath material other than described in Type IS above, consult Tempco with your requirements.

Type PAS Passivation

Available on HDC, HDM, and LDC cartridge heaters.

Passivating is a chemical process accomplished by dipping the heater in a solution of nitric acid. The process removes surface contamination, usually iron, so that the optimum corrosion resistance of the stainless steel is maintained.

Type OAL Special Length Tolerance

Available on HDC, HDM, and LDC cartridge heaters.

If a special length tolerance different than the standard length tolerance specified on page 2-4 is required, consult Tempco with your requirements.

Type ELP Electro-Polish

Available on HDC, HDM, and LDC cartridge heaters.

Electro-Polishing is an electro-chemical process that removes surface imperfections and contaminants, enhancing the corrosion resisting ability of the heater sheath.

Type CG Centerless Grinding

Available on HDC and HDM cartridge heaters.

For applications requiring high precision fit and tolerance, the sheath can be centerless ground.

Tolerance: ±0.0005 inches (0.013 mm)

Specify diameter when ordering.

Type SDA End Disc Seals Silver Brazed

Type SDB End Disc Seals Heli-Arc Welded

Available on LDC cartridge heaters.

End discs on HDC and HDM cartridge heaters are heli-arc welded as standard.

The normally mechanically attached end discs on LD cartridge heaters can be silver brazed or heli-arc welded if desired.

Cartridge Heater With Built-In Internal Thermocouples

Built-in Internal Thermocouples are available on all HDC, HDM, and LDC cartridge heater diameters except for 3/16", 5/16" and 8 mm.



Notes: Type TJ4 and TK4 are not available on 1/4" and 6.5 mm diameter cartridges.

Minimum sheath length: 3" for 1/4", 3/8" and 1/2" diameter. 4" for 5/8" and 3/4" diameter.

10" leads are standard for both heater and thermocouple. Leads are internally connected. Specify longer leads.

ANSI Code	Conductor Characteristics		Temperature Range	
	Positive	Negative	°F	°C
J	Iron (Magnetic)	Constantan (Non-Magnetic)	0 to 1400	-17 to 760
K	Chromel (Non-Magnetic)	Alumel (Magnetic)	0 to 2300	-17 to 1260

For other thermocouple types consult Tempco.

Type TJ1 and TK1



Type TJ1 and TK1 Grounded at Disc End

The thermocouple junction is grounded to the sheath at the disc end and packed with MgO. The concave end disc is filled with silver solder and ground flat. When inserted into a flat end blind hole, it will provide fast responsive temperature readings. Widely used in Hot Runner mold probes.

TJ1 Type J thermocouple; **TK1** Type K thermocouple

Type TJ2 and TK2



Type TJ2 and TK2 Ungrounded at Disc End

The thermocouple junction is ungrounded, located at the end of the heater section, 1/8" behind the end disc and packed with MgO. Only provides reference temperature reading of the part being heated – slower response.

TJ2 Type J thermocouple; **TK2** Type K thermocouple

Type TJ3 and TK3



Type TJ3 and TK3 Ungrounded at Center

The thermocouple junction is ungrounded and is located in the center of the length and diameter of the cartridge heater. It provides internal temperature readings of the heater core. Generally used for research applications and is not recommended for controlling process temperatures.

TJ3 Type J thermocouple; **TK3** Type K thermocouple

Type TJ4 and TK4



Type TJ4 and TK4 Grounded at Center

The thermocouple junction is grounded to the sheath in a 1/2" unheated section located in the center of the cartridge length unless otherwise specified. It provides good temperature readings with quick response.

TJ4 Type J thermocouple; **TK4** Type K thermocouple

Type TJ5 and TK5



Type TJ5 and TK5 Grounded at Lead End

The thermocouple junction is grounded to the sheath at the lead end. A minimum of 3/8" of cold section is required. It provides good temperature readings with quick response.

TJ5 Type J thermocouple; **TK5** Type K thermocouple



Note: For a complete selection of standard Hi-Density Pennybottom™ Cartridge Heaters, with built-in Type J thermocouple for Hot Runner plastic molds, see pages 2-24 through 2-26.

Available from stock.

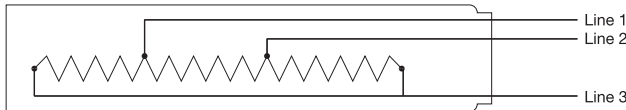
Cartridge Heater Options — Internal Power Variations



Type DW Distributed Wattage

Available on HDC and HDM cartridge heaters

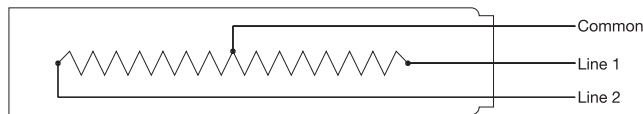
Cartridge heaters can be designed to vary the wattage along the length of the heater. Specify number of zones and the required watts and length per zone starting from the disk end. Leads can be connected externally or internally. Picture shows a heater with Type N externally connected leads. Heaters with other terminations may require a longer cold section at the lead end.



Type 3PH Three Phase

**Available on HDC, HDM, and LDC cartridge heaters
1/2" diameter and larger (See page 2-4)**

In order to minimize the gauge of the wiring on high wattage cartridge heaters, 3-phase elements can be designed.



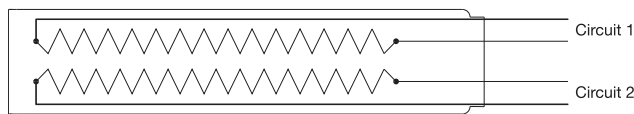
Type DV Dual Voltage

**Available on HDC, HDM, and LDC cartridge heaters
3/8" diameter and larger (See page 2-4)**

3/8" and 1/2" diameter heaters may require a larger diameter transition area at lead end.

Cartridge heaters can be designed using 3-wire series/parallel circuits for dual voltage applications. Whether the heater is run on the high or low voltage, the wattage will be the same.

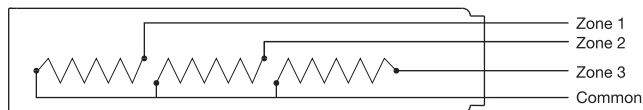
DV1 120/240 volts **DV2** 240/480 volts



Type DWV Dual Circuits

**Available on HDC, HDM, and LDC cartridge heaters
1/2" diameter and larger (See page 2-4)**

Independent resistance elements can be designed in a single cartridge heater for added versatility.

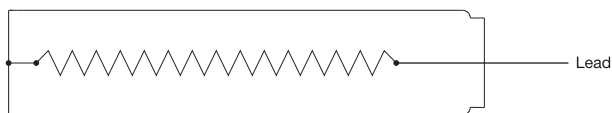


Type MHZ Multiple Heat Zones (3-Zones Maximum)

**Available on HDC and HDM cartridge heaters
3/8" diameter and larger (See page 2-4)**

3/8" and 1/2" diameter heaters may require a larger diameter transition area at lead end.

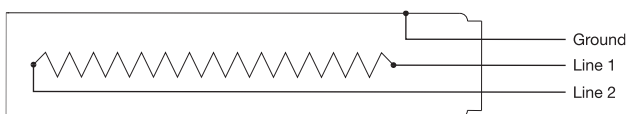
Multiple independently operated sections of the heater with a common wiring connection can be designed for increased flexibility.



Type GJ Grounded Element Winding

Available on HDC, HDM, and LDC cartridge heaters

For DC applications where the electrical circuit is negative grounded, the cartridge heater can be designed with one side of the element winding grounded to the sheath and a single lead wire exiting the cartridge heater.



Type GL Ground Lead/Sheath

Available on HDC, HDM, and LDC cartridge heaters

For those applications requiring a separate ground lead attached to the cartridge heater sheath.

Standard ground lead wire is a 10" long insulated stranded conductor. Optional insulated and color coded leads are available.



Available through the **Hi-Density Cartridge Heater Terminator Program** for 2nd Day Delivery

Cartridge Heater Internal Sensor and Control Options

Type TF Thermal Fuses

Available on HDC, HDM, and LDC cartridge heaters 1/2" diameter and larger

Thermal fuses can be built into cartridge heaters to act as a high limit for the heater in applications where the temperature must be limited to avoid dangerous situations. When the trigger point is reached, the thermal fuse will open, cutting the electrical current to the cartridge heater. Once the thermal fuse opens, it cannot be reset. Many different trigger temperatures are available.

Type TS Thermostat

Available on HDC, HDM, and LDC cartridge heaters 5/8" diameter or larger

Cartridge heaters with built-in thermostats are very efficient and economical for heating and controlling temperatures. Available with NPT or special type mounting fittings, they provide a self-contained heater mainly recommended for immersion applications. They can also be used as over-temperature safety devices. The thermostats are factory preset for the trip temperature; therefore, prototyping and testing is required to determine the exact fixed setpoint. Maximum temperature—302°F (150°C). Maximum Amps—8@120 Volts.

A minimum 2-1/2" cold section is required to house the thermostat. Consult Tempco with your requirements.

Type TM Thermistor

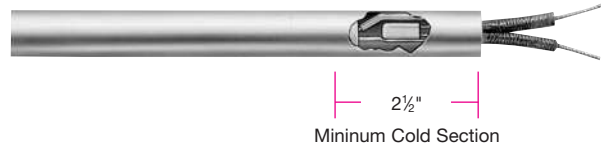
Type RD RTD Temperature Sensors

Available on HDC, HDM, and LDC cartridge heaters

Tempco has the ability to custom design cartridge heaters with built-in temperature sensors such as thermistors and RTDs. For specific applications that have a limited or single set point range, thermistors or RTDs in conjunction with simple electronic controllers can be an economical choice.

NOTE: For thermocouples see page 2-58.

Type TS



Cartridge Heater Option — Inspection Services and Test Reports

Standard Electrical Tests and Optional Test Reports

1. Resistance test — measures ohms at room temperature.
2. IR (insulation resistance) test — measures the insulation resistance to the flow of current. Standard test is done at 500VDC.
3. Hipot (high potential) test — a high voltage is applied between a product's current carrying conductors and its metallic enclosure to verify that the insulation is sufficient to protect the operator from electrical shock.
4. Leakage current test — measures the current that flows from any conductive part to ground.
5. Heaters can be serialized and test reports can be sent with each shipment if required. Contact Tempco with your requirements.

Optional Die Penetrant Test

This non-destructive testing can detect imperfections in weld joints. For critical applications, each individual heater's weld joints by end cap and fittings can be tested. Certified test reports will be sent with each shipment. Consult Tempco for details.

Optional Hydrostatic Pressure Test

Cartridge heaters with attached pipe fittings can be pressure tested to your specifications at Tempco. Our in-house testing capabilities can ensure that your products meet your exact specifications. Contact Tempco with your requirements.

LDA and HAC Forced Air In-Line Process Cartridge Heaters

TEMPCO manufactures a variety of Air Process Cartridge Heaters. They can be standard units or designed to the customer's specifications. The following diameter sizes are available: 3/8", 1/2", 5/8" and 3/4".

These diameters can be adapted with various types of fittings and made into any practical length.

See Section 11, Pages 11-74 through 11-77
for complete details

