



Thermal Management Technologies

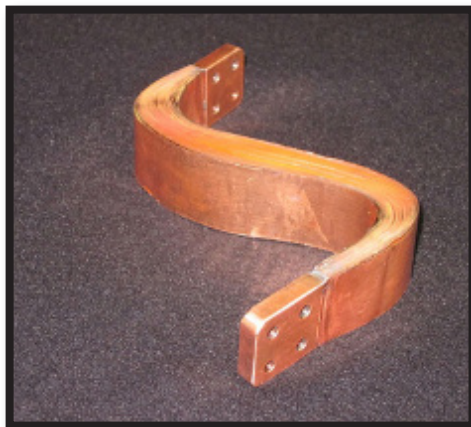
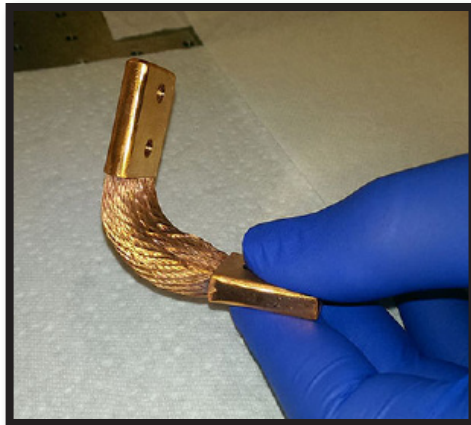
INNOVATIVE PRODUCTS & ENGINEERING



THERMAL STRAP CATALOG

Flexible Thermal Straps

TMT has developed thermal straps - reliable, flexible, metallic thermal straps that facilitate the transfer of heat while retaining elastic connections between thermal components. Thermal straps are constructed of copper (braid or foil) or aluminum (foil only) and can be produced to meet customer requirements (aluminum straps are only available as custom designs). Flexible thermal straps are used in a wide variety of applications to provide a passive means of transporting heat from source to thermal sink.



Applications

There are many different scenarios where you need a flexible solutions for transporting heat from source to thermal sink. Applications for flexible thermal straps include, but are not limited to:

- Cryogenic shrouds
- Infrared instruments
- Electronic cooling
- Thermoelectrics
- Component testing
- Cryocoolers
- Superconductors
- Cross hinge-cooling
- Heat sinks
- Spacecraft

Thermal straps are relatively simple to implement but require careful system considerations. Typical considerations include cost, operating temperature, thermal conductance, mass, stiffness, geometry, and contamination. When mass is a driver, the optimal material choices depend on specific conductivity (k/ρ) and temperature. TMT has a limited number of standard sizes and configurations for faster delivery.

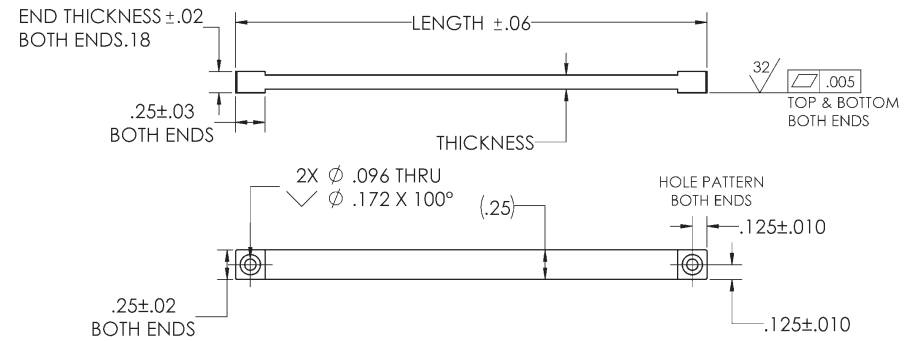
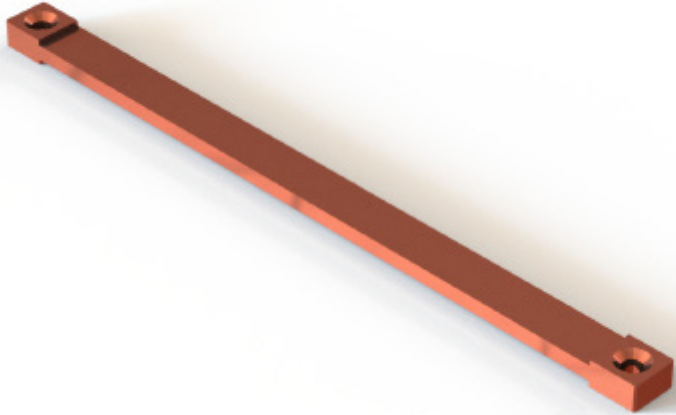
TMT engineers have designed and fabricated a variety of thermal straps from very small instrument thermal straps at 1.6 K/W to large ~50 cm long 90 K chamber heat spreaders at 0.67 K/W. With this in mind, let TMT work with you to make your project successful!

TMT010-200 Series

Copper foil thermal straps

TMT010-202

Copper foil - 0.25 in. wide

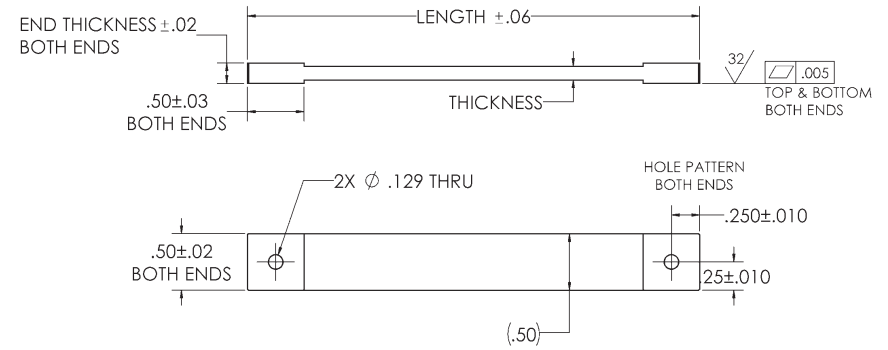
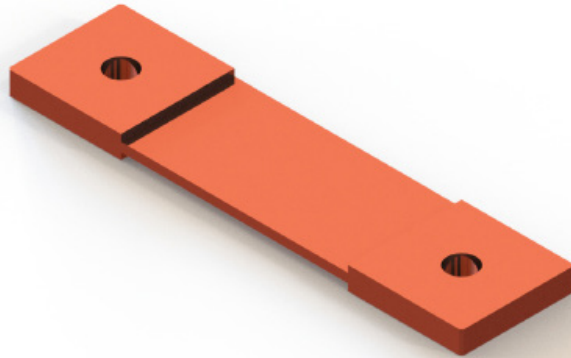


FTS CONFIGURATIONS

P/N		WIDTH		LENGTH		THICKNESS		END THICKNESS		RESISTANCE ($\pm 10\%$, K/W)			MASS ($\pm 10\%$)	
		MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)	295 K	77 K	10 K	KG	(LB)
TMT010-202	-02-04	6.35	(0.25)	50.80	(2.00)	1.02	(0.04)	2.54	(0.10)	15.88	11.71	8.14	0.004	(0.008)
	-02-08					2.03	(0.08)	3.56	(0.14)	8.18	6.03	4.19	0.007	(0.015)
	-02-12					3.05	(0.12)	4.57	(0.18)	5.54	4.08	2.84	0.009	(0.021)
	-04-04			101.60	(4.00)	1.02	(0.04)	2.54	(0.10)	35.56	26.22	18.24	0.007	(0.015)
	-04-08					2.03	(0.08)	3.56	(0.14)	18.02	13.29	9.24	0.012	(0.028)
	-04-12					3.05	(0.12)	4.57	(0.18)	12.10	8.92	6.21	0.018	(0.040)
	-06-04			152.40	(6.00)	1.02	(0.04)	2.54	(0.10)	55.25	40.73	28.33	0.010	(0.021)
	-06-08					2.03	(0.08)	3.56	(0.14)	27.86	20.54	14.29	0.018	(0.040)
	-06-12					3.05	(0.12)	4.57	(0.18)	18.66	13.76	9.57	0.027	(0.060)

TMT010-205

Copper foil - 0.5 in. wide

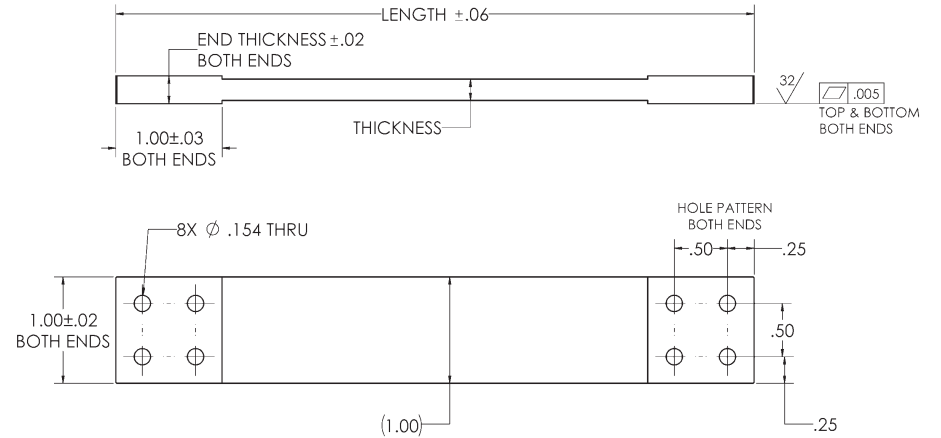
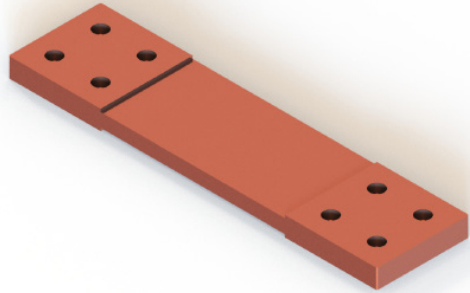


FTS CONFIGURATIONS

P/N		WIDTH		LENGTH		THICKNESS		END THICKNESS		RESISTANCE (±10 %, K/W)			MASS (±10%)	
		MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)	295 K	77 K	10 K	KG	(LB)
TMT010-205	-02-04	12.70	(0.50)	50.80	(2.00)	1.02	(0.04)	2.54	(0.10)	7.94	5.85	4.07	0.008	(0.017)
	-02-08					2.03	(0.08)	3.56	(0.14)	4.09	3.01	2.10	0.014	(0.030)
	-02-12					3.05	(0.12)	4.57	(0.18)	2.77	2.04	1.42	0.019	(0.043)
	-04-04			101.60	(4.00)	1.02	(0.04)	2.54	(0.10)	17.78	13.11	9.12	0.014	(0.030)
	-04-08					2.03	(0.08)	3.56	(0.14)	9.01	6.64	4.62	0.025	(0.056)
	-04-12					3.05	(0.12)	4.57	(0.18)	6.05	4.46	3.10	0.037	(0.081)
	-06-04			152.40	(6.00)	1.02	(0.04)	2.54	(0.10)	27.62	20.37	14.17	0.020	(0.043)
	-06-08					2.03	(0.08)	3.56	(0.14)	13.93	10.27	7.14	0.037	(0.081)
	-06-12					3.05	(0.12)	4.57	(0.18)	9.33	6.88	4.79	0.054	(0.120)

TMT010-210

Copper foil - 1.0 in. wide

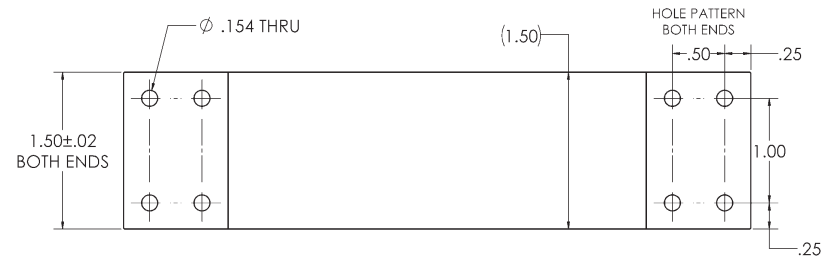
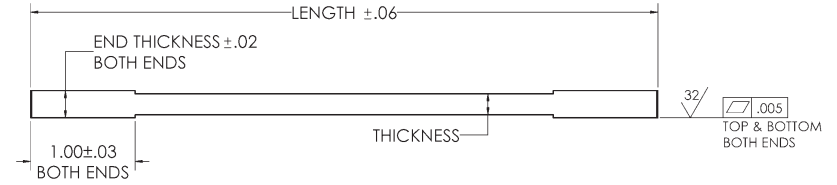
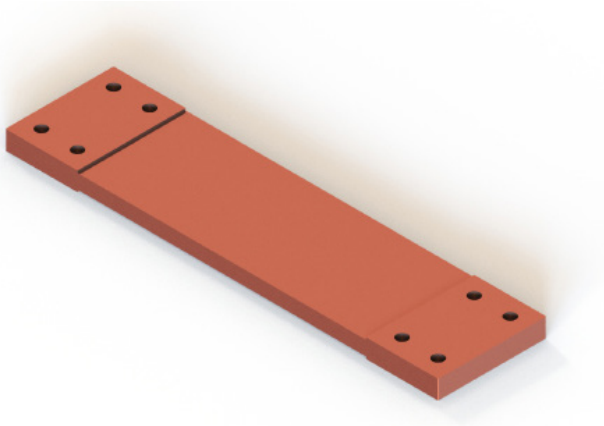


FTS CONFIGURATIONS

P/N		WIDTH		LENGTH		THICKNESS		END THICKNESS		RESISTANCE (±10 %, K/W)			MASS (±10%)	
		MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)	295 K	77 K	10 K	KG	(LB)
TMT010-210	-04-15	25.40	(1.00)	101.60	(4.00)	3.81	(0.15)	5.33	(0.21)	1.82	1.36	0.94	0.101	(0.22)
	-04-20					5.08	(0.20)	6.60	(0.26)	1.39	1.04	0.72	0.129	(0.28)
	-04-25					6.35	(0.25)	7.87	(0.31)	1.13	0.85	0.59	0.157	(0.35)
	-04-30					7.62	(0.30)	9.14	(0.36)	0.95	0.71	0.49	0.185	(0.41)
	-06-15			152.40	(6.00)	3.81	(0.15)	5.33	(0.21)	3.13	2.33	1.62	0.144	(0.32)
	-06-20					5.08	(0.20)	6.60	(0.26)	2.38	1.77	1.23	0.187	(0.41)
	-06-25					6.35	(0.25)	7.87	(0.31)	1.92	1.43	0.99	0.230	(0.51)
	-06-30			7.62	(0.30)	9.14	(0.36)	1.61	1.20	0.83	0.273	(0.60)		
	-09-15			228.60	(9.00)	3.81	(0.15)	5.33	(0.21)	5.10	3.78	2.63	0.210	(0.46)
	-09-20					5.08	(0.20)	6.60	(0.26)	3.85	2.86	1.99	0.275	(0.61)
	-09-25					6.35	(0.25)	7.87	(0.31)	3.10	2.30	1.60	0.339	(0.75)
	-09-30					7.62	(0.30)	9.14	(0.36)	2.59	1.92	1.34	0.404	(0.89)
	-12-15			304.8	(12.00)	3.81	(0.15)	5.33	(0.21)	7.07	5.23	3.64	0.276	(0.61)
	-12-20					5.08	(0.20)	6.60	(0.26)	5.33	3.94	2.74	0.362	(0.80)
	-12-25					6.35	(0.25)	7.87	(0.31)	4.28	3.17	2.20	0.449	(0.99)
	-12-30					7.62	(0.30)	9.14	(0.36)	3.58	2.65	1.84	0.535	(1.18)

TMT010-215

Copper foil - 1.5 in. wide

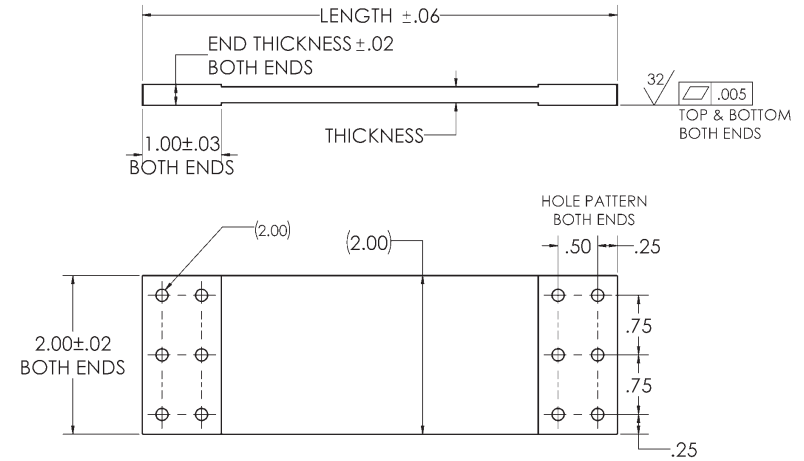
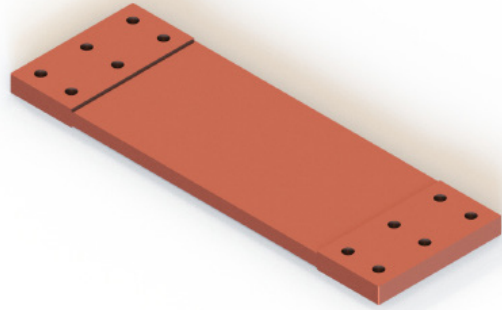


FTS CONFIGURATIONS

P/N		WIDTH		LENGTH		THICKNESS		END THICKNESS		RESISTANCE (±10 %, K/W)			MASS (±10%)	
		MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)	295 K	77 K	10 K	KG	(LB)
TMT010-215	-04-15	38.10	(1.50)	101.60	(4.00)	3.81	(0.15)	5.33	(0.21)	1.21	0.91	0.63	0.153	(0.34)
	-04-20					5.08	(0.20)	6.60	(0.26)	0.93	0.69	0.48	0.196	(0.43)
	-04-25					6.35	(0.25)	7.87	(0.31)	0.75	0.56	0.39	0.239	(0.53)
	-04-30					7.62	(0.30)	9.14	(0.36)	0.63	0.47	0.33	0.281	(0.62)
	-06-15	152.40	(6.00)	3.81	(0.15)	5.33	(0.21)	2.09	1.55	1.08	0.219	(0.48)		
	-06-20			5.08	(0.20)	6.60	(0.26)	1.58	1.18	0.82	0.284	(0.63)		
	-06-25			6.35	(0.25)	7.87	(0.31)	1.28	0.95	0.66	0.348	(0.77)		
	-06-30			7.62	(0.30)	9.14	(0.36)	1.07	0.80	0.55	0.413	(0.91)		
	-09-15	228.60	(9.00)	3.81	(0.15)	5.33	(0.21)	3.40	2.52	1.75	0.317	(0.70)		
	-09-20			5.08	(0.20)	6.60	(0.26)	2.57	1.90	1.32	0.415	(0.91)		
	-09-25			6.35	(0.25)	7.87	(0.31)	2.07	1.53	1.06	0.512	(1.13)		
	-09-30			7.62	(0.30)	9.14	(0.36)	1.73	1.28	0.89	0.610	(1.34)		
	-12-15	304.8	(12.00)	3.81	(0.15)	5.33	(0.21)	4.71	3.49	2.42	0.416	(0.92)		
	-12-20			5.08	(0.20)	6.60	(0.26)	3.55	2.63	1.83	0.546	(1.20)		
	-12-25			6.35	(0.25)	7.87	(0.31)	2.85	2.11	1.47	0.677	(1.49)		
	-12-30			7.62	(0.30)	9.14	(0.36)	2.38	1.76	1.23	0.807	(1.78)		

TMT010-220

Copper foil - 2.0 in. wide



FTS CONFIGURATIONS

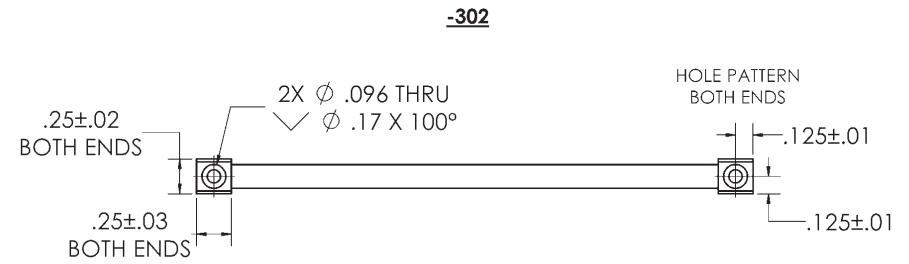
P/N		WIDTH		LENGTH		THICKNESS		END THICKNESS		RESISTANCE (±10 %, K/W)			MASS (±10%)	
		MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)	295 K	77 K	10 K	KG	(LB)
TMT010-220	-04-15	50.80	(2.00)	101.60	(4.00)	3.81	(0.15)	5.33	(0.21)	0.91	0.68	0.47	0.203	(0.45)
	-04-20					5.08	(0.20)	6.60	(0.26)	0.70	0.52	0.36	0.260	(0.57)
	-04-25					6.35	(0.25)	7.87	(0.31)	0.57	0.42	0.29	0.317	(0.70)
	-04-30					7.62	(0.30)	9.14	(0.36)	0.48	0.36	0.25	0.374	(0.82)
	-06-15			152.40	(6.00)	3.81	(0.15)	5.33	(0.21)	1.57	1.16	0.81	0.291	(0.64)
	-06-20					5.08	(0.20)	6.60	(0.26)	1.19	0.88	0.61	0.377	(0.83)
	-06-25					6.35	(0.25)	7.87	(0.31)	0.96	0.71	0.50	0.463	(1.02)
	-06-30					7.62	(0.30)	9.14	(0.36)	0.80	0.60	0.42	0.549	(1.21)
	-09-15			228.60	(9.00)	3.81	(0.15)	5.33	(0.21)	2.55	1.89	1.31	0.423	(0.93)
	-09-20					5.08	(0.20)	6.60	(0.26)	1.93	1.43	0.99	0.552	(1.22)
	-09-25					6.35	(0.25)	7.87	(0.31)	1.55	1.15	0.80	0.682	(1.50)
	-09-30					7.62	(0.30)	9.14	(0.36)	1.30	0.96	0.67	0.812	(1.79)
	-12-15	304.8	(12.00)	3.81	(0.15)	5.33	(0.21)	3.53	2.61	1.82	0.554	(1.22)		
	-12-20			5.08	(0.20)	6.60	(0.26)	2.67	1.97	1.37	0.728	(1.60)		
	-12-25			6.35	(0.25)	7.87	(0.31)	2.14	1.58	1.10	0.901	(1.99)		
	-12-30			7.62	(0.30)	9.14	(0.36)	1.79	1.32	0.92	1.075	(2.37)		

TMT010-300 Series

Copper braid thermal straps

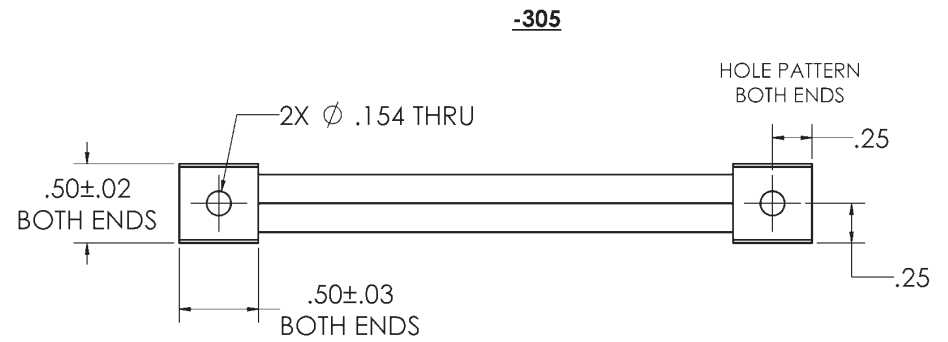
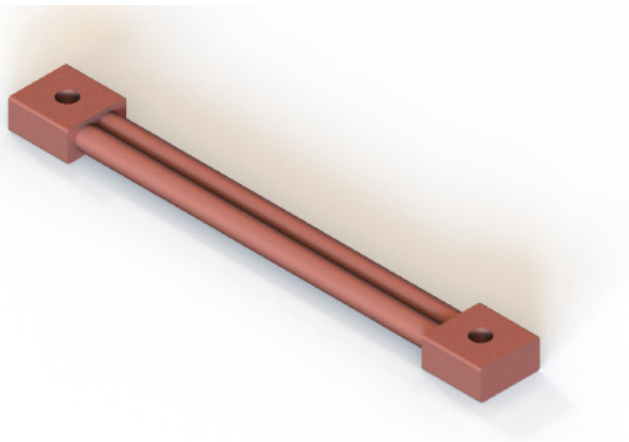
TMT010-302

Small copper braid - 0.25 in. wide



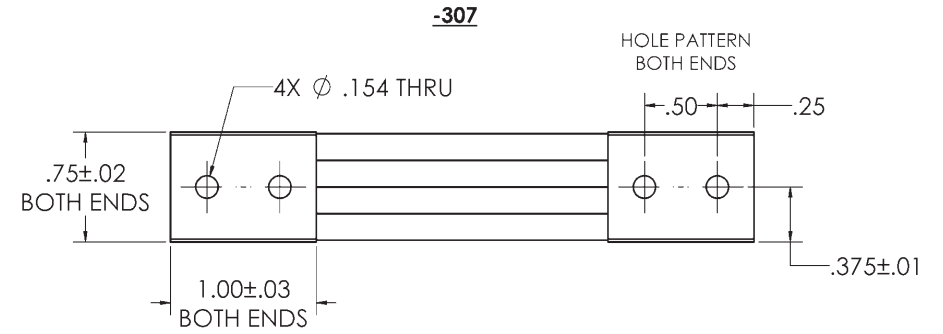
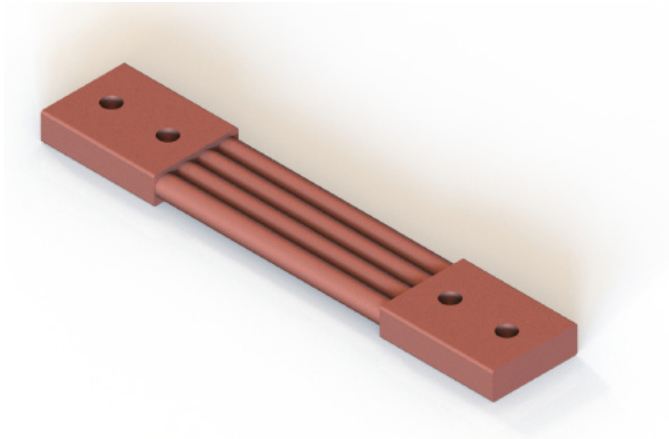
TMT010-305

Small copper braid - 0.5 in. wide



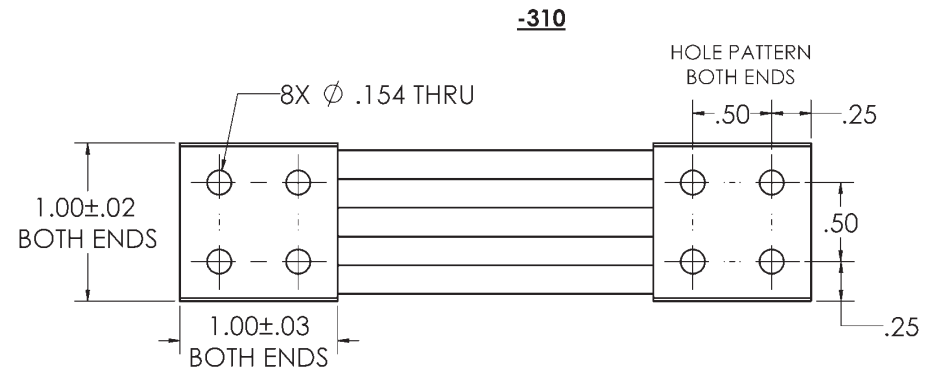
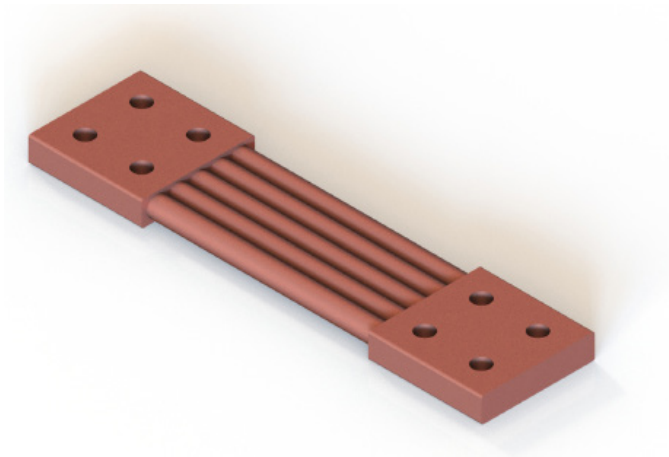
TMT010-307

Small copper braid - 0.75 in. wide



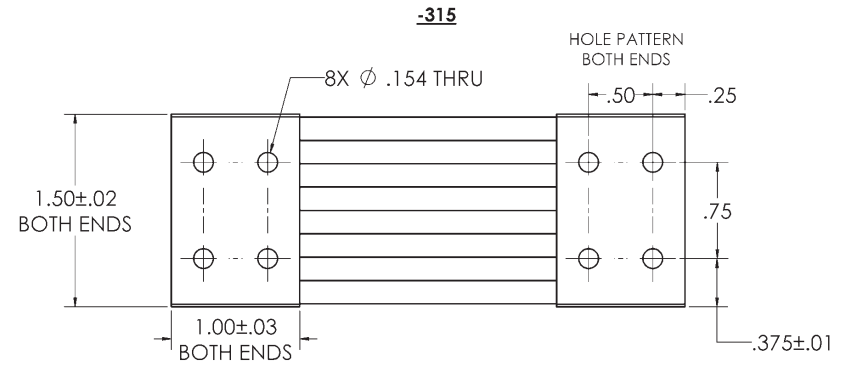
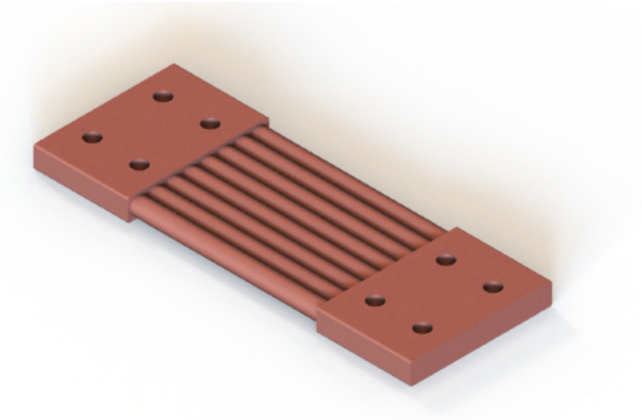
TMT010-310

Small copper braid - 1.0 in. wide



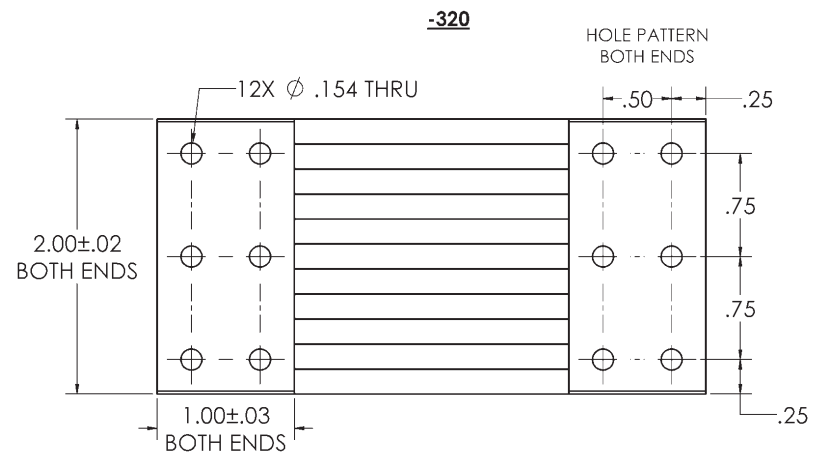
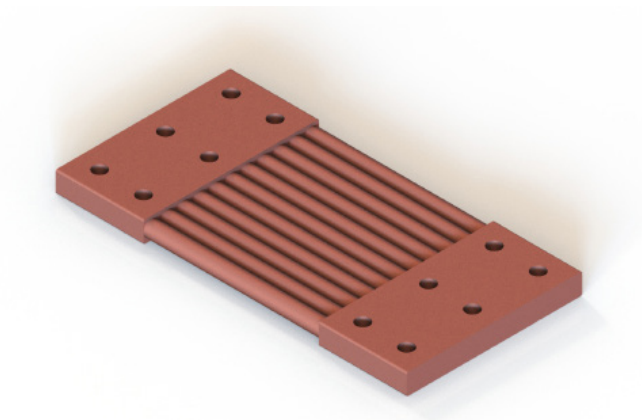
TMT010-315

Small copper braid - 1.5 in. wide

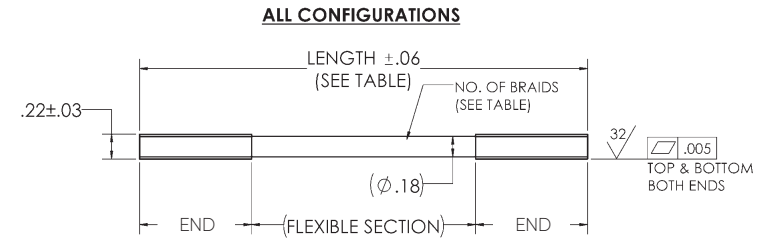


TMT010-320

Small copper braid - 2.0 in. wide



Series 300 Configurations



FTS CONFIGURATIONS

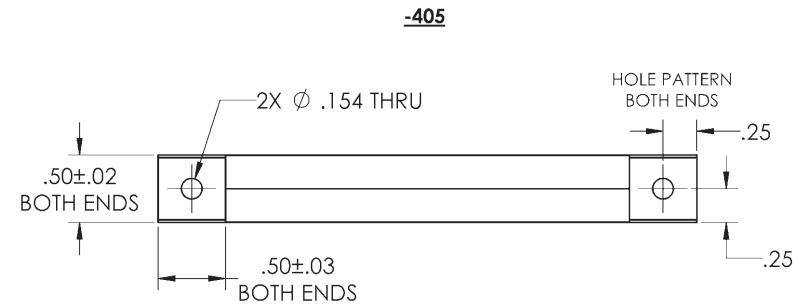
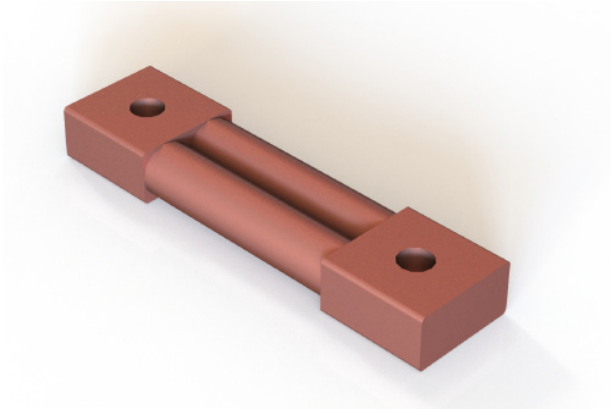
P/N	NO. OF BRAIDS	WIDTH		LENGTH		END LENGTH		END HEIGHT		HOLES	DIA		RESISTANCE (± 10%, K/W)			MASS (± 10%)		
		MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)		MM	(IN)	295 K	77 K	10 K	KG	(LB)	
TMT010-302	-02-18	1	6.35	(0.25)	50.80	(2.00)	6.35	(0.25)	5.08	(0.20)	1	2.413	(0.095)	11.53	8.78	9.68	0.008	(0.018)
	-03-18				76.50	(3.00)								18.87	14.38	15.85	0.010	(0.022)
	-04-18				101.60	(4.00)								26.22	19.98	22.01	0.012	(0.026)
	-05-18				127.00	(5.00)								33.57	25.74	28.18	0.015	(0.033)
TMT010-305	-02-18	2	12.70	(0.50)	50.80	(2.00)	12.70	(0.50)	5.84	(0.23)	1	3.912	(0.154)	4.15	3.17	3.49	0.021	(0.046)
	-03-18				76.50	(3.00)								7.83	5.96	6.57	0.026	(0.057)
	-04-18				101.60	(4.00)								11.50	8.76	9.66	0.030	(0.066)
	-05-18				127.00	(5.00)								15.18	11.56	12.74	0.035	(0.077)
TMT010-307	-04-18	4	19.50	(0.75)	101.60	(4.00)	25.40	(1.00)	5.59	(0.22)	2	3.912	(0.154)	4.30	3.27	3.61	0.067	(0.147)
	-05-18				127.00	(5.00)								6.13	4.67	5.15	0.076	(0.167)
	-06-18				152.40	(6.00)								7.97	6.07	6.69	0.086	(0.189)
	-08-18				203.20	(8.00)								11.64	8.87	9.78	0.105	(0.231)
TMT010-310	-04-18	5	25.40	(1.00)	101.60	(4.00)	25.40	(1.00)	5.59	(0.22)	4	3.912	(0.154)	3.42	2.61	2.87	0.088	(0.194)
	-06-18				152.40	(6.00)								6.36	4.84	5.34	0.111	(0.244)
	-09-18				228.60	(9.00)								10.77	8.20	9.04	0.146	(0.321)
	-12-18				304.80	(12.00)								15.18	11.56	12.74	0.182	(0.400)
TMT010-315	-04-18	8	38.10	(1.50)	101.60	(4.00)	25.40	(1.00)	6.10	(0.24)	4	3.912	(0.154)	2.13	1.64	1.81	0.134	(0.295)
	-06-18				152.40	(6.00)								3.97	3.04	3.35	0.172	(0.378)
	-09-18				228.60	(9.00)								6.73	5.14	5.67	0.228	(0.502)
	-12-18				304.80	(12.00)								9.49	7.24	7.98	0.284	(0.625)
TMT010-320	-04-18	11	50.80	(2.00)	101.60	(4.00)	25.40	(1.00)	6.10	(0.24)	6	3.912	(0.154)	1.56	1.20	1.32	0.180	(0.396)
	-06-18				152.40	(6.00)								2.90	2.22	2.44	0.232	(0.510)
	-09-18				228.60	(9.00)								4.90	3.74	4.12	0.309	(0.680)
	-12-18				304.80	(12.00)								6.91	5.27	5.81	0.387	(0.851)

TMT010-400 Series

Copper braid thermal straps

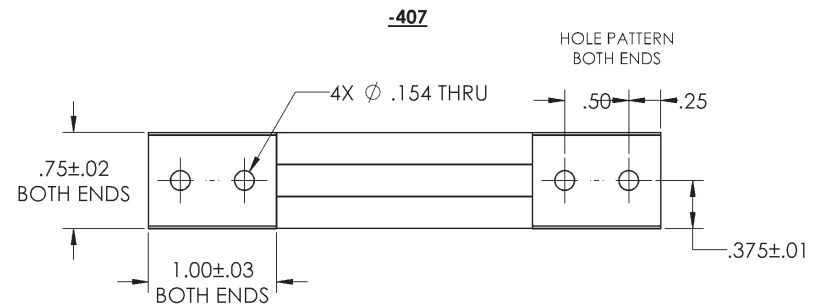
TMT010-405

Large copper braid - 0.5 in. wide



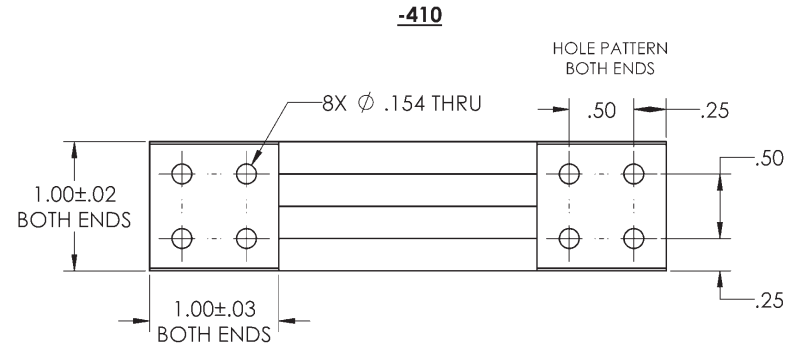
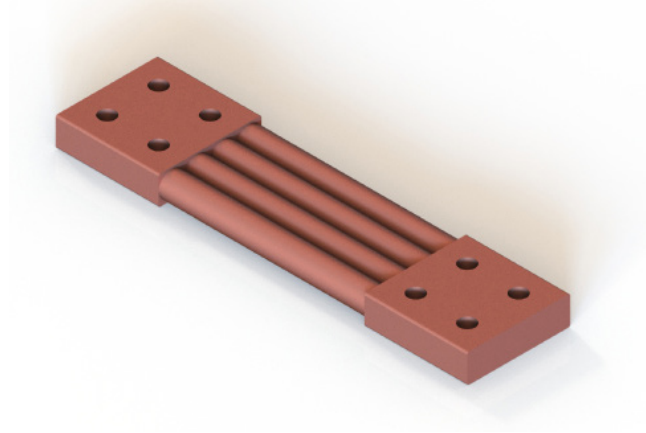
TMT010-407

Large copper braid - 0.75 in. wide



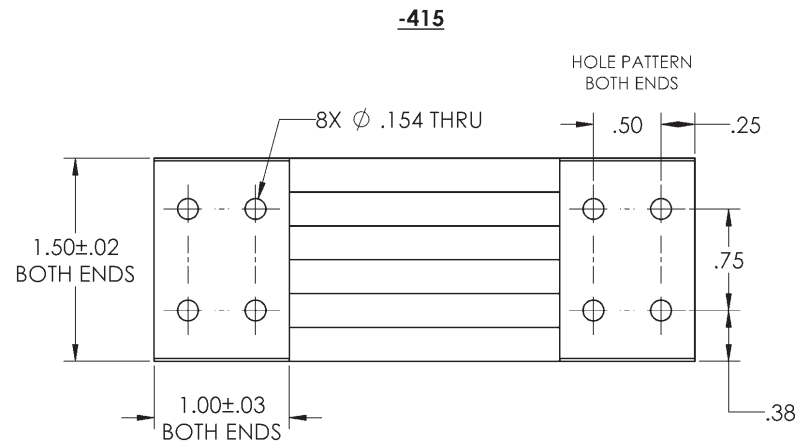
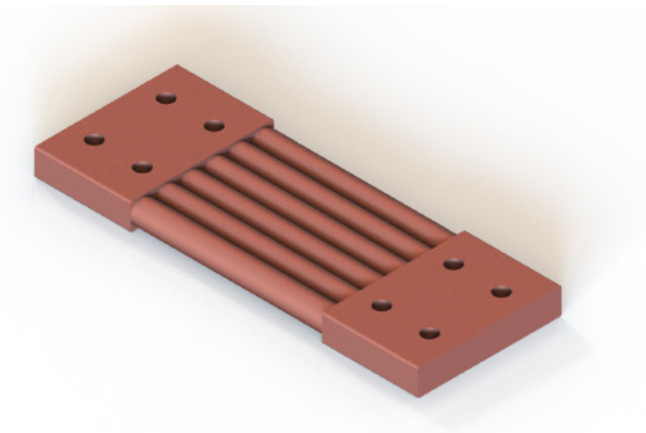
TMT010-410

Large copper braid - 1.0 in. wide



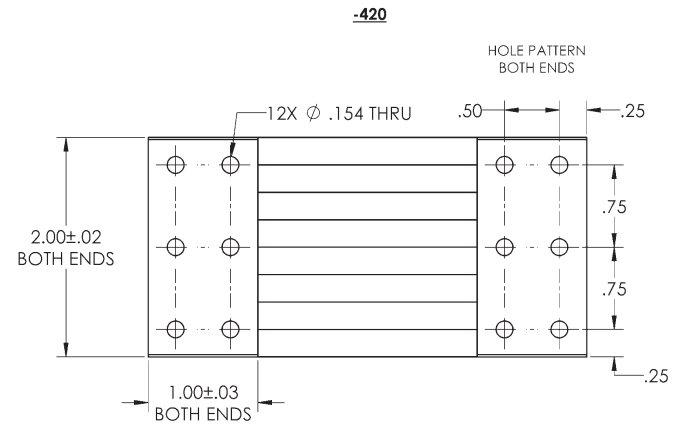
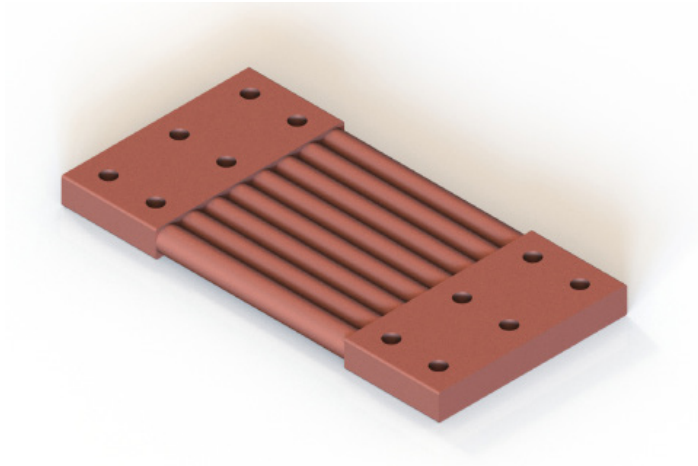
TMT010-415

Large copper braid - 1.5 in. wide



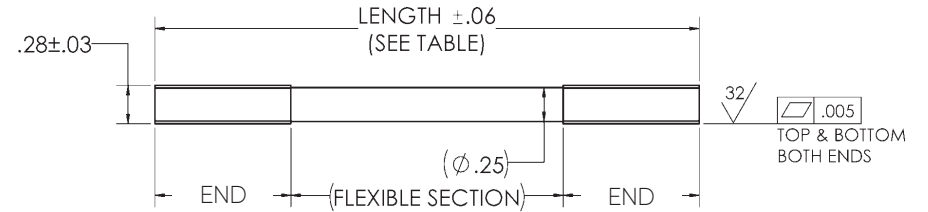
TMT010-420

Large copper braid - 2.0 in. wide



Series 400 Configurations

ALL CONFIGURATIONS

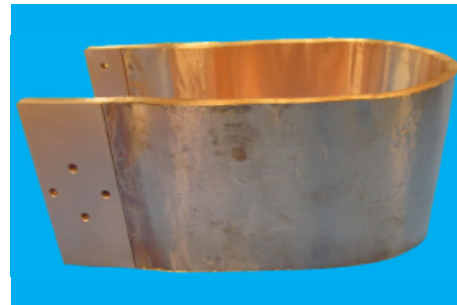
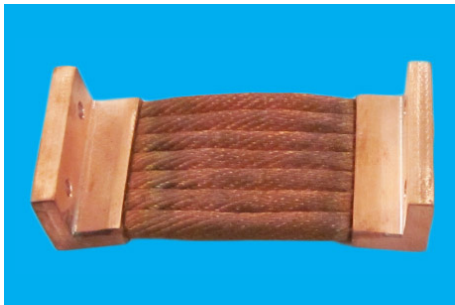
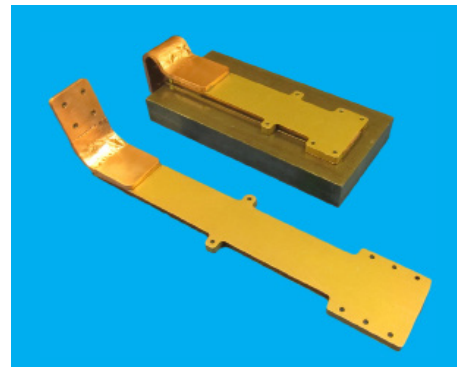


FTS CONFIGURATIONS

P/N		NO. OF BRAIDS	WIDTH		LENGTH		END LENGTH		END HEIGHT		HOLES	DIA		RESISTANCE (± 10%, K/W)			MASS (± 10%)	
			MM	(IN)	MM	(IN)	MM	(IN)	MM	(IN)		MM	(IN)	295 K	77 K	10 K	KG	(LB)
TMT010-405	-02-25	2	12.70	(0.50)	50.80	(2.00)	12.70	(0.50)	6.35	(0.25)	1	3.912	(0.154)	2.07	1.58	1.75	0.031	(0.068)
	-03-25				76.50	(3.00)								3.76	2.87	3.16	0.041	(0.090)
	-04-25				101.60	(4.00)								5.45	4.15	4.58	0.051	(0.112)
	-05-25				127.00	(5.00)								7.15	5.44	6.00	0.061	(0.134)
TMT010-407	-04-25	3	19.50	(0.75)	50.80	(2.00)	25.40	(1.00)	7.11	(0.28)	2	3.912	(0.154)	2.75	2.09	2.31	0.092	(0.202)
	-05-25				101.60	(4.00)								3.87	2.95	3.25	0.107	(0.235)
	-06-25				152.40	(6.00)								5.00	3.81	4.20	0.123	(0.271)
	-08-25				203.20	(8.00)								7.26	5.53	6.09	0.153	(0.337)
TMT010-410	-04-25	4	25.40	(1.00)	101.60	(4.00)	25.40	(1.00)	7.11	(0.28)	4	3.912	(0.154)	2.07	1.58	1.74	0.123	(0.271)
	-06-25				152.40	(6.00)								3.76	2.87	3.16	0.163	(0.359)
	-09-25				228.60	(9.00)								6.30	4.80	5.29	0.225	(0.495)
	-12-25				304.80	(12.00)								8.84	6.73	7.42	0.286	(0.629)
TMT010-415	-04-25	6	38.10	(1.50)	101.60	(4.00)	25.40	(1.00)	7.11	(0.28)	4	3.912	(0.154)	1.37	1.05	1.15	0.184	(0.405)
	-06-25				152.40	(6.00)								2.50	1.91	2.10	0.245	(0.539)
	-09-25				228.60	(9.00)								4.19	3.19	3.52	0.337	(0.741)
	-12-25				304.80	(12.00)								5.86	4.48	4.94	0.429	(0.944)
TMT010-420	-04-25	8	50.80	(2.00)	101.60	(4.00)	25.40	(1.00)	7.11	(0.28)	6	3.912	(0.154)	1.03	0.79	0.87	0.245	(0.539)
	-06-25				152.40	(6.00)								1.88	1.43	1.58	0.327	(0.719)
	-09-25				228.60	(9.00)								3.15	2.40	2.64	0.449	(0.988)
	-12-25				304.80	(12.00)								4.41	3.36	3.71	0.572	(1.258)

Custom Configurations

In addition to standard, flexible thermal straps, TMT also provides custom designs for unique applications. Custom thermal straps can be fabricated using copper braid or foil or using aluminum foil. Multiple shapes and configurations are possible.



For custom thermal strap configurations, fill out the Request for Quote form and send to TMT at information@tmt-ipe.com to discuss options.

Thermal Strap Order Form



CONTACT NAME

COMPANY NAME

PHONE NUMBER

EMAIL ADDRESS

Copper Foil

TMT010-202	TMT010-210	o -04-25	o -06-20
o -02-04	o -04-15	o -04-30	o -06-25
o -02-08	o -04-20	o -06-15	o -06-30
o -02-12	o -04-25	o -06-20	o -09-15
o -04-04	o -04-30	o -06-25	o -09-20
o -04-08	o -06-15	o -06-30	o -09-25
o -04-12	o -06-20	o -09-15	o -09-30
o -06-04	o -06-25	o -09-20	o -12-15
o -06-08	o -06-30	o -09-25	o -12-20
o -06-12	o -09-15	o -09-30	o -12-25
	o -09-20	o -12-15	o -12-30
TMT010-205	o -09-25	o -12-20	
o -02-04	o -09-30	o -12-25	
o -02-08	o -12-15	o -12-30	
o -02-12	o -12-20		
o -04-04	o -12-25	TMT010-220	
o -04-08	o -12-30	o -04-15	
o -04-12		o -04-20	
o -06-04	TMT010-215	o -04-25	
o -06-08	o -04-15	o -04-30	
o -06-12	o -04-20	o -06-15	

Copper Braid

TMT010-302	o -04-18	TMT010-407	o -09-25
o -02-18	o -05-18	o -04-25	o -12-25
o -03-18		o -05-25	
o -04-18	TMT010-315	o -06-25	
o -05-18	o -02-18	o -08-25	
	o -03-18		
TMT010-305	o -04-18	TMT010-410	
o -02-18	o -05-18	o -04-25	
o -03-18		o -05-25	
o -04-18	TMT010-320	o -09-25	
o -05-18	o -02-18	o -12-25	
	o -03-18		
TMT010-307	o -04-18	TMT010-415	
o -04-18	o -05-18	o -04-25	
o -05-18		o -05-25	
o -06-18	TMT010-405	o -09-25	
o -08-18	o -02-25	o -12-25	
	o -03-25		
TMT010-310	o -04-25	TMT010-420	
o -02-18	o -05-25	o -04-25	
o -03-18		o -05-25	

Custom Configurations

For custom thermal strap configurations, fill out the Request for Quote form and send to TMT at information@tmt-ipe.com to discuss options.

To order, email this form to

information@tmt-ipe.com

Questions? Contact TMT or visit tmt-ipe.com/thermal-components for more information.

Custom Thermal Strap Request for Quote



CONTACT NAME _____

COMPANY NAME _____

PHONE NUMBER _____

EMAIL ADDRESS _____

Thermal Resistance _____ K/Watt
or _____

Maximum Heat Load _____ Watt
and _____

Temperature Drop Across Link _____ OC/OF

End Temperatures or Average Operating Temperature _____ OC/OF/K

Link Shape or Configuration (see figure) _____

Length Between Connections L _____
W _____ US or Metric

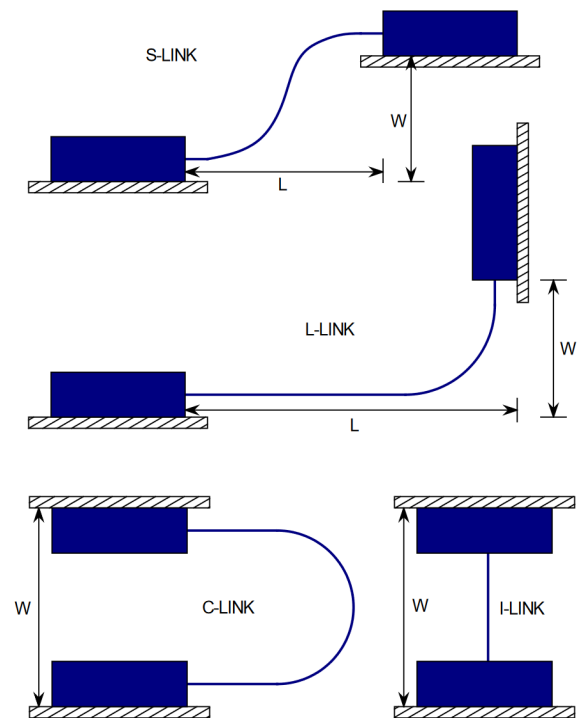
Type of End Connections _____
(threaded holes, through-holes, etc.)

Maximum Mass _____ g/lb

Flexibility Needs _____
(i.e. number of axes)

Quantity _____

Other Notes _____



From this information, we'll put together a design and drawing, which we will send to you along with a quote.