CuTS® CATALOG

2022 Edition

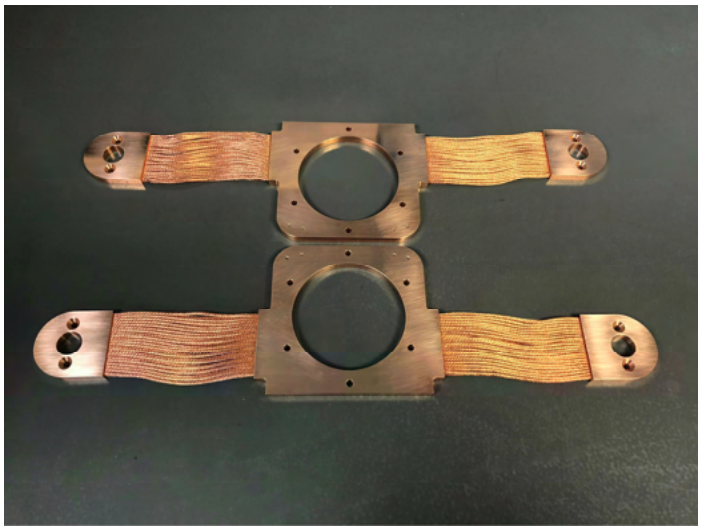
TAI

TAI'S COPPER CABLE THERMAL STRAPS (CuTS®)

TAI developed and refined our swaged CuTS® products over 20 years to provide flexible heat transfer for a wide range of cryogenics, aerospace, semiconductor, photonics, and light source applications.

Each of our CuTS® products is manufactured using only OFHC copper cables/ropes and end fittings made from either OFHC copper or Aluminum 6061 (for mass reduction).

Thermal straps are a passive heat transfer tool which provide vibration isolation, and in most cases, a wide range of motion on all axes (setting them apart from other products such as heat pipes and metallic foil thermal straps).



SPACE FLIGHT HERITAGE & PRODUCTION PROGRAM HISTORY

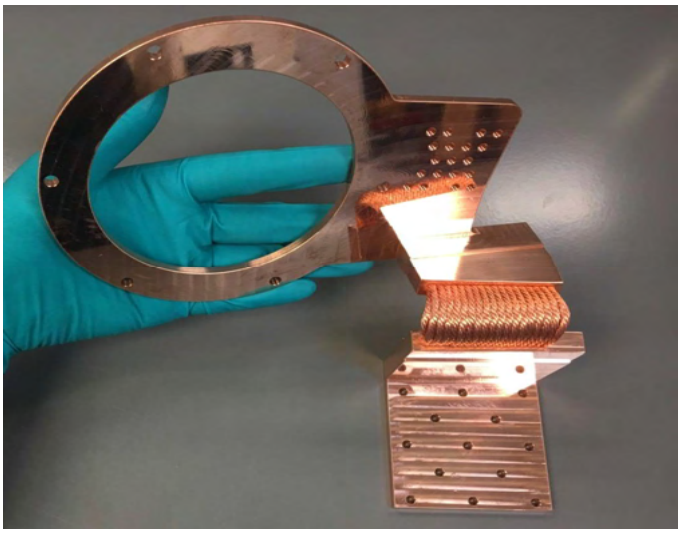
While CuTS® are often used in space and found on nearly all commercial crew and cargo vehicles, the ISS, and numerous satellites, they are most commonly used in terrestrial applications at engineering companies, universities, national laboratories, and particle accelerator/light source facilities.

Though many programs may require only a single strap, TAI routinely fills production orders, and tens of thousands of CuTS® are used across the United States in notable programs including: SLAC's LCLS II, LCLS-II-HE, Fermi's PIP-II, and Argonne's Advanced Photon Source Upgrade (APSU), as well as autonomous vehicle fleets in Europe and Asia, and optical systems used by the US Military, or in the international avionics and photonics industries.

PROVEN EXPERTISE & QUALITY

CuTS® have been extensively qualified by NASA, ESA, and universities and national laboratories across North America, Asia, and Europe. They have been featured in scholarly articles, and tested for use at temperatures ranging from 150mK to over 900K.

This rich history and decades of data & experience has afforded TAI the ability to make highly accurate thermal conductance Predictions at nearly any temperature. It has also allowed us to make the most unique and challenging thermal straps in the industry.



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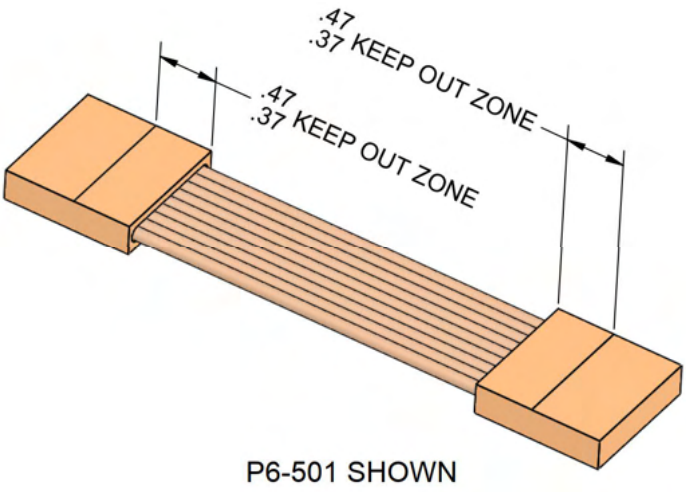
IMPORTANT CuTS® DESIGN & INQUIRY NOTES:



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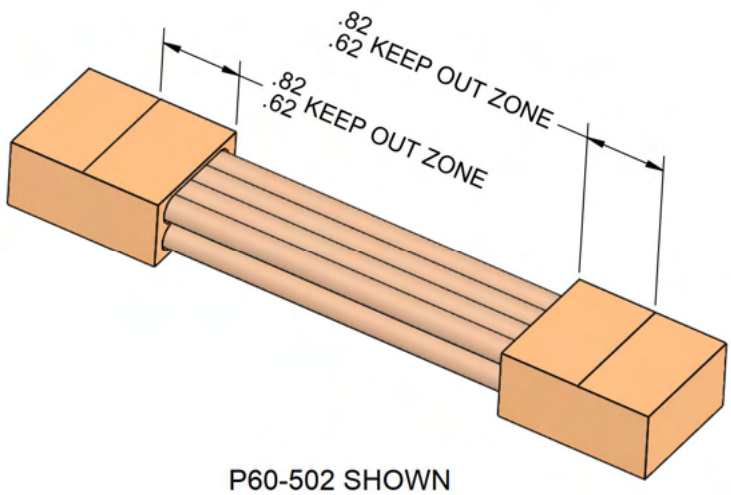

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BOLT HOLE KEEP-OUT ZONES

TAI swages our CuTS® to preserve the flexibility of the cabling. As a result of this cold press process, bolt holes are not drilled through the swage zone. Standard and custom models using our 0.10 inch diameter OFHC UltraFlex I cabling typically require a rope insertion depth ranging from 0.35-0.45 inches. Standard and customs models using our 0.20 inch diameter OFHC UltraFlex II cabling typically require an insertion depth of 0.60 - 0.80 inches depending on rope length and model. Note that these are general rules of thumb, and some custom designs may require different keep-out zones. When designing your thermal straps, please be sure to keep bolt patterns behind the lines in the images above.

NUMBER OF ROWS

TAI only swages straps with 1 or 2 rows of cables, as adding a third or fourth row of cables significantly increases the stiffness. However, OFHC UltraFlex II cabling allows us to offer the equivalent of a 4-row strap (using UFI), without this stiffness penalty. If your application requires more performance, we can stack straps, use a custom design, or reduce the rope length to increase the thermal performance.

BEND RADIUS

When planning your design, assume a 0.50 inch (12.5mm) minimum bend radius for all straps.

INSTALLATION CONFIGURATION AND DOUBLE ROW DESIGNS

If your application requires a double row standard or custom design, and the strap is to be installed in a curve configuration (L, C, U-shape), the outer row of cables will need to be made longer than the inner, to optimize flexibility and avoid potential damage to the strap. In these cases, TAI will need an STP file detailing your interfaces and envelope to properly model the appropriate rope lengths.

CONDUCTANCE PREDICTIONS & THERMAL INTERFACE MATERIALS

All Predictions assume the use of a TIM like eGRAF HT1205 or Indium foil, and account for interface resistance losses. Conductance can vary based on number and size of bolt holes, rope insertion depth, and number of L-fittings. Please contact TAI for more accurate Predictions for any strap. To learn more about our conductance test procedures, request a copy of our Thermal Conductance Test Work Instruction.

If you are ready to submit an inquiry, please complete our Questionnaire and send stp files detailing the interfaces and envelope(s). While you are free to design a strap yourself, note that all design work performed by TAI is provided free of charge so you know exactly what you are buying BEFORE a quote is made or an order is placed.

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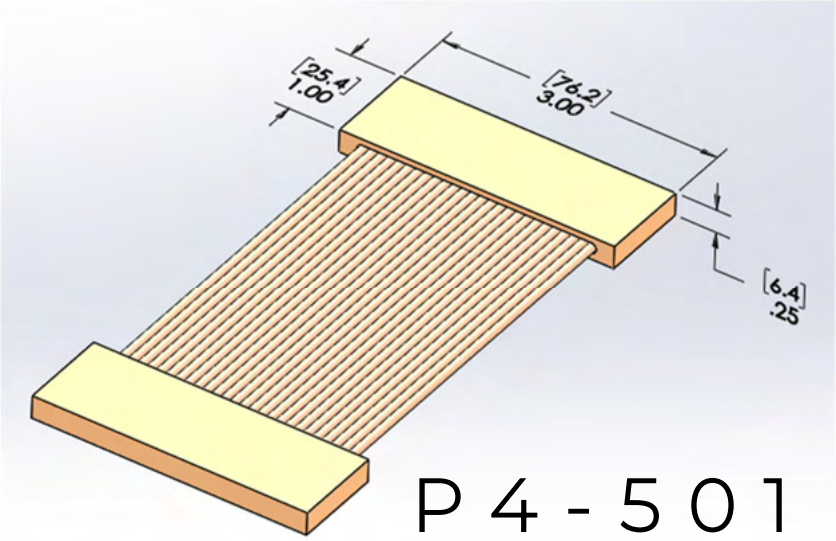
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.59	0.31	0.16
77K	0.75	0.41	0.21
40K	1.63	0.98	0.55
10K	1.32	0.76	0.42
4K	0.56	0.30	0.15

Approximate Mass (100mm RL): 318g
Rope Type: UltraFlex™ I Cabling (26x1), 0.10"Ø
Minimum RL: 12.7mm
Click Here to use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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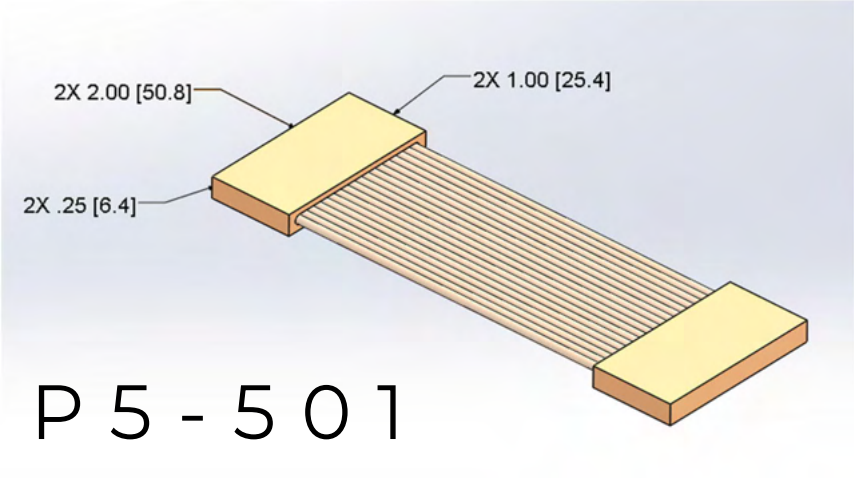

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Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

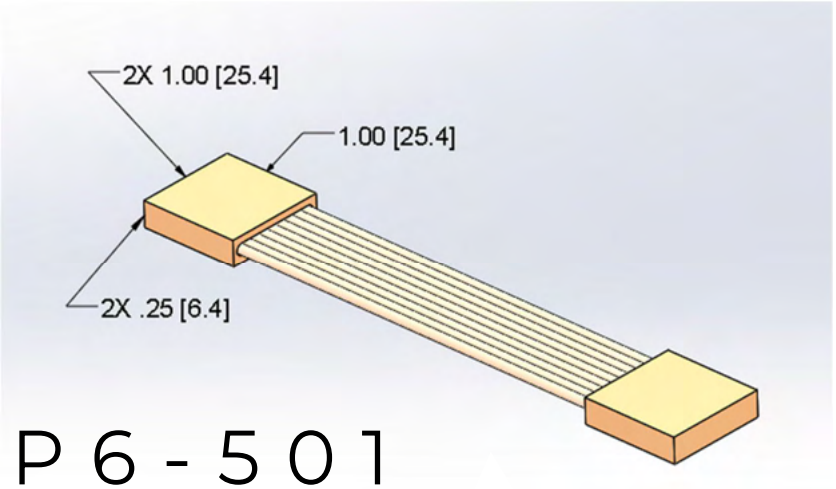
	50mm	100mm	200mm
300K	0.40	0.21	0.11
77K	0.52	0.28	0.15
40K	1.12	0.68	0.38
10K	0.91	0.53	0.29
4K	0.38	0.20	0.10

Approximate Mass (100mm RL): 163g
Rope Type: UltraFlex™ I Cabling (18x1), 0.10"Ø
Minimum RL: 12.75mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.20	0.11	0.05
77K	0.26	0.14	0.07
40K	0.57	0.34	0.19
10K	0.46	0.26	0.15
4K	0.18	0.10	0.05

Approximate Mass (100mm RL): 82g
Rope Type: UltraFlex™ I Cabling (9x1), 0.10"Ø
Minimum RL: 12.75mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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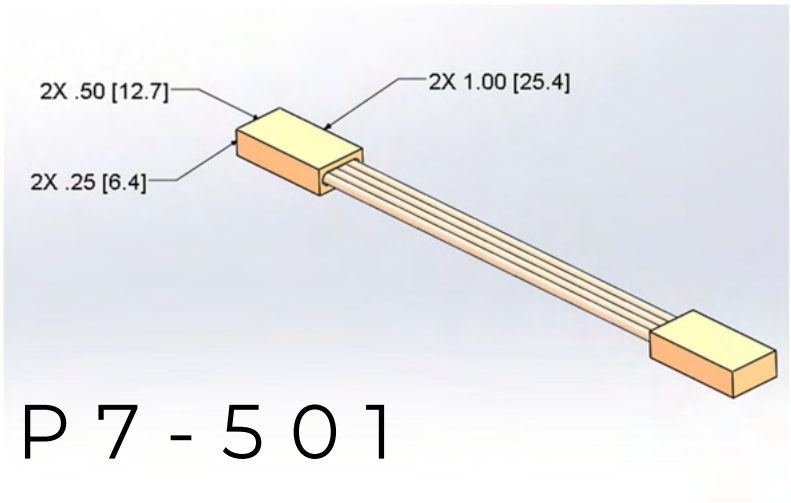
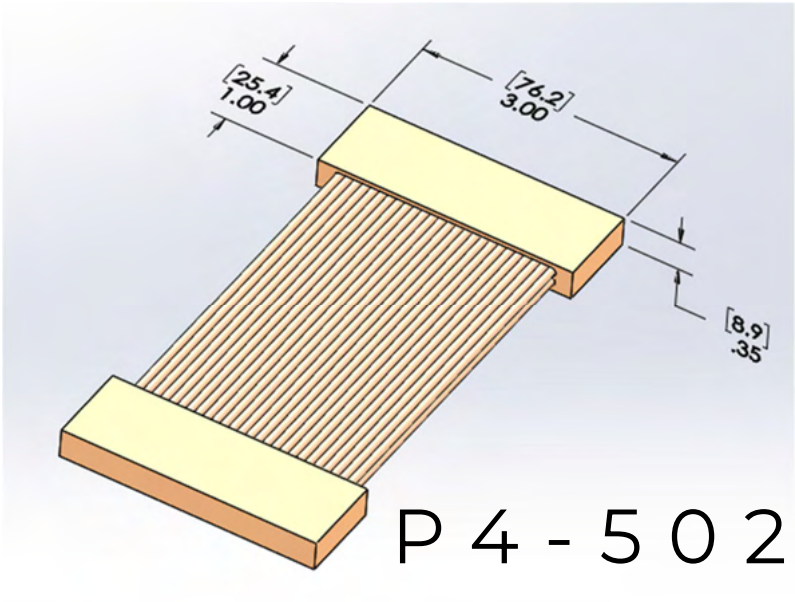
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.09	0.05	0.03
77K	0.11	0.06	0.03
40K	0.26	0.16	0.09
10K	0.21	0.12	0.06
4K	0.09	0.05	0.03

Approximate Mass (100mm RL): 40g
Rope Type: UltraFlex™ I Cabling (4x1), 0.10"Ø
Minimum RL: 12.75mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**





Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

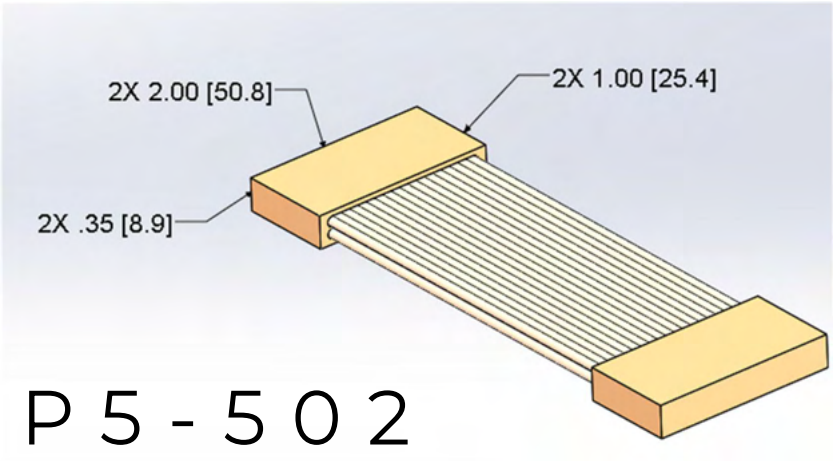
	50mm	100mm	200mm
300K	1.06	0.59	0.31
77K	1.32	0.76	0.43
40K	2.51	1.67	1.01
10K	2.12	1.34	0.78
4K	1.01	0.56	0.28

Approximate Mass (100mm RL): 486g
Rope Type: UltraFlex™ I Cabling (26x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.73	0.41	0.22
77K	0.91	0.53	0.28
40K	1.75	1.15	0.70
10K	1.47	0.93	0.54
4K	0.69	0.39	0.21

Approximate Mass (100mm RL): 259g
Rope Type: UltraFlex™ I Cabling (18x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator



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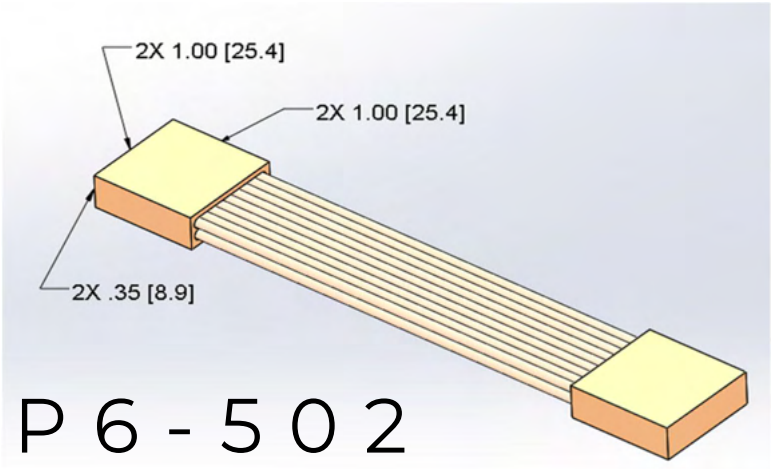
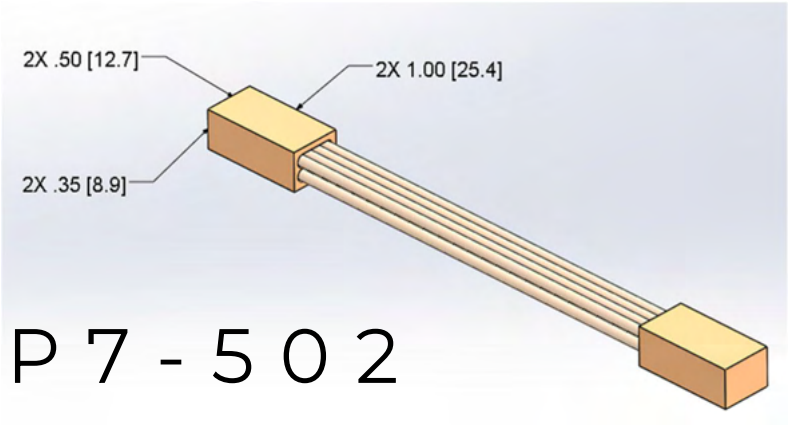
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.37	0.20	0.11
77K	0.46	0.26	0.14
40K	0.90	0.59	0.35
10K	0.75	0.47	0.27
4K	0.35	0.18	0.10

Approximate Mass (100mm RL): 129g
Rope Type: UltraFlex™ I Cabling (9x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator





Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

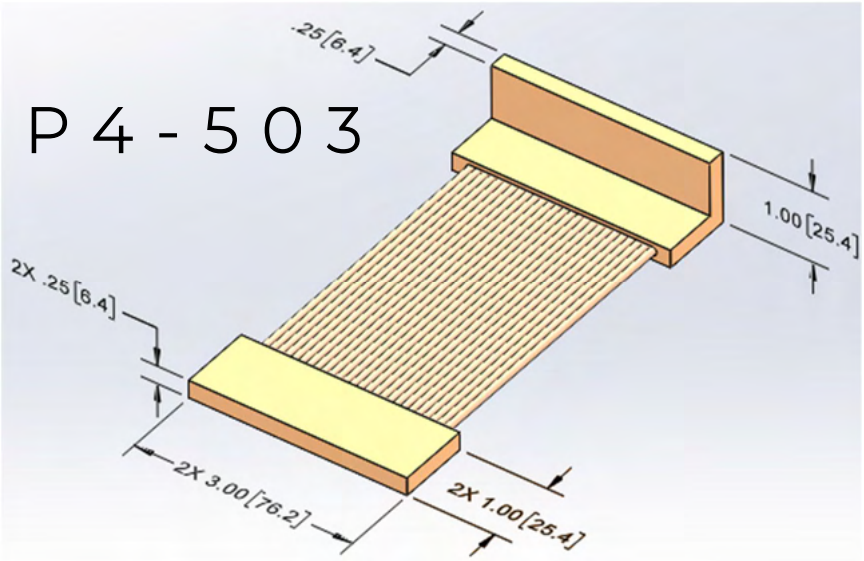
	50mm	100mm	200mm
300K	0.17	0.09	0.05
77K	0.21	0.12	0.06
40K	0.43	0.27	0.16
10K	0.36	0.22	0.12
4K	0.16	0.09	0.05

Approximate Mass (100mm RL): 62g
Rope Type: UltraFlex™ I Cabling (4x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.59	0.31	0.16
77K	0.75	0.41	0.21
40K	1.63	0.98	0.55
10K	1.32	0.76	0.42
4K	0.56	0.30	0.15

Approximate Mass (100mm RL): 389g
Rope Type: UltraFlex™ I Cabling (26x1), 0.10"Ø
Minimum RL: 12.7mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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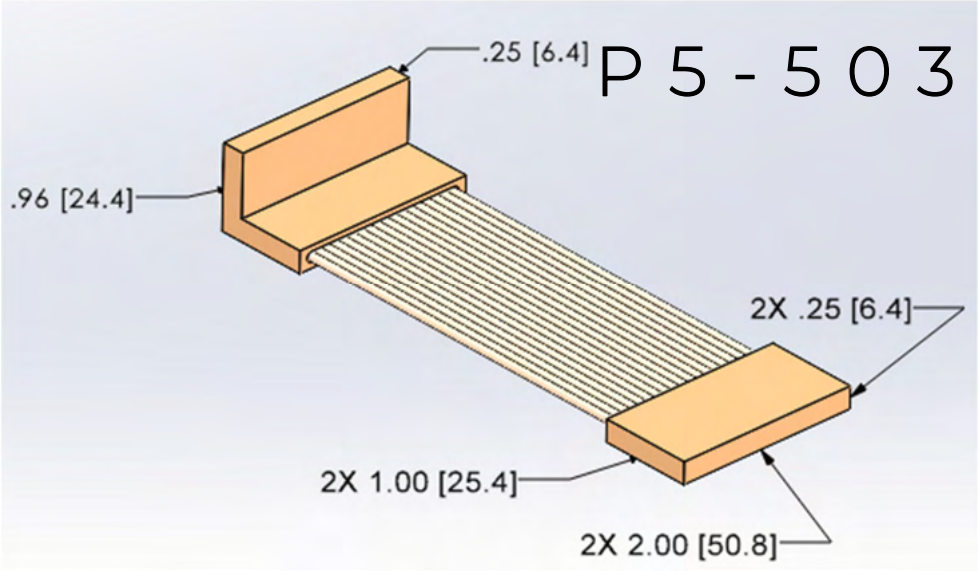
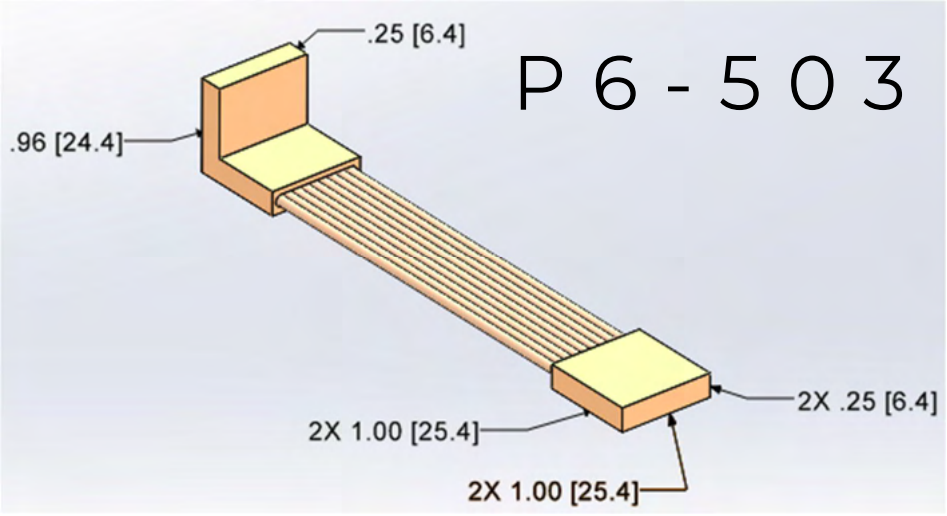
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.40	0.21	0.11
77K	0.52	0.28	0.15
40K	1.12	0.68	0.38
10K	0.91	0.53	0.29
4K	0.38	0.20	0.10

Approximate Mass (100mm RL): 240g
Rope Type: UltraFlex™ I Cabling (18x1)
Minimum RL: 12.75mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**





Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

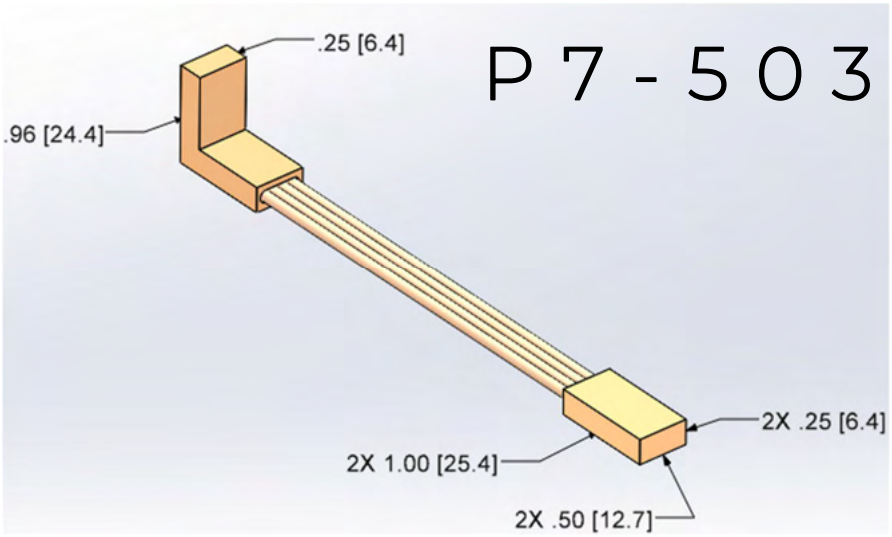
	50mm	100mm	200mm
300K	0.20	0.11	0.05
77K	0.26	0.14	0.07
40K	0.57	0.34	0.19
10K	0.46	0.26	0.15
4K	0.18	0.10	0.05

Approximate Mass (100mm RL): 120g
Rope Type: UltraFlex™ I Cabling (9x1)
Minimum RL: 12.75mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.09	0.05	0.03
77K	0.11	0.06	0.03
40K	0.26	0.16	0.09
10K	0.21	0.12	0.06
4K	0.09	0.05	0.03

Approximate Mass (100mm RL): 61g
Rope Type: UltraFlex™ I Cabling (4x1)
Minimum RL: 12.75mm
Use TAI's Conductance Calculator



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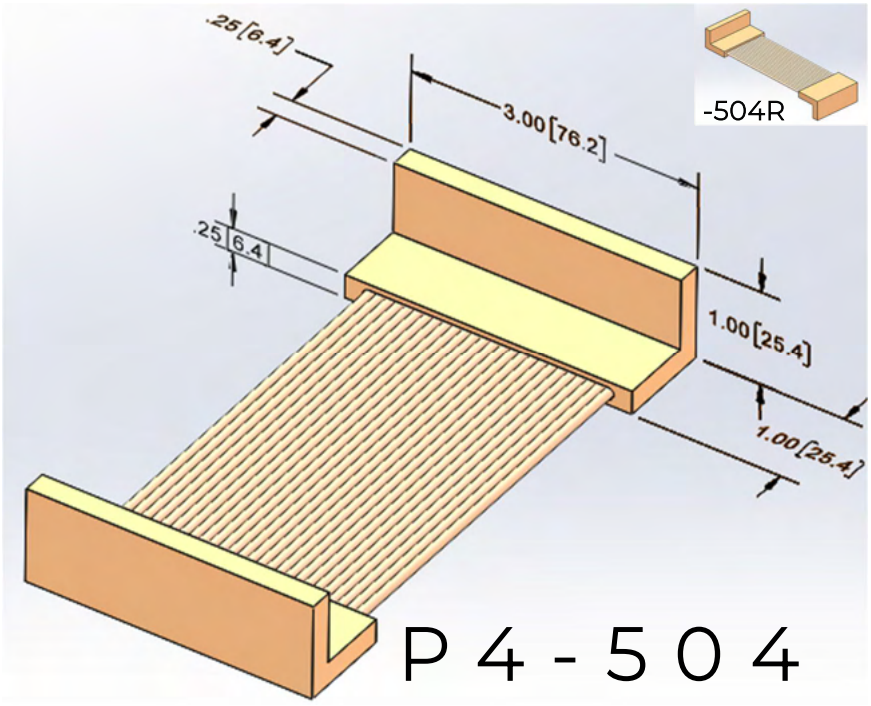
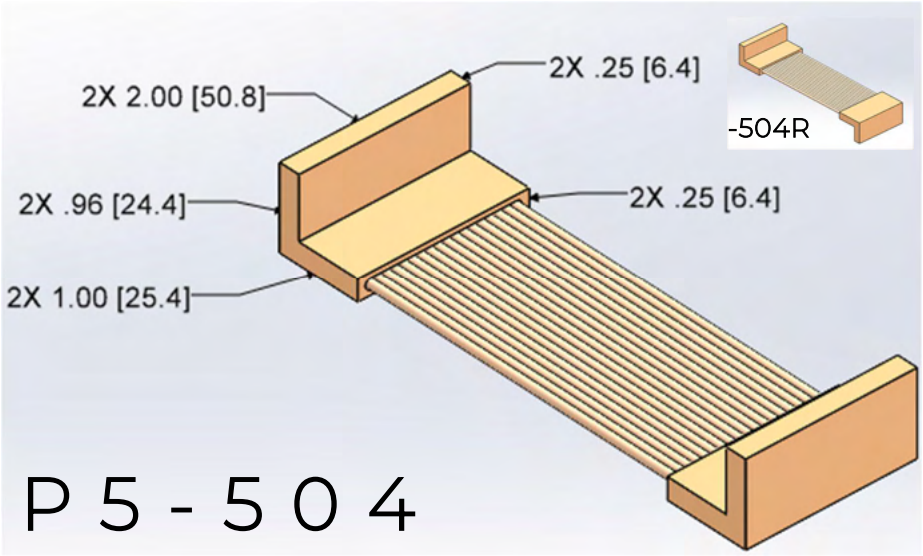
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.54	0.28	0.14
77K	0.75	0.41	0.21
40K	1.55	0.90	0.50
10K	1.25	0.67	0.38
4K	0.51	0.27	0.13

Approximate Mass (100mm RL): 461g
Rope Type: UltraFlex™ I Cabling (26x1), 0.10"Ø
Minimum RL: 12.7mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**





Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

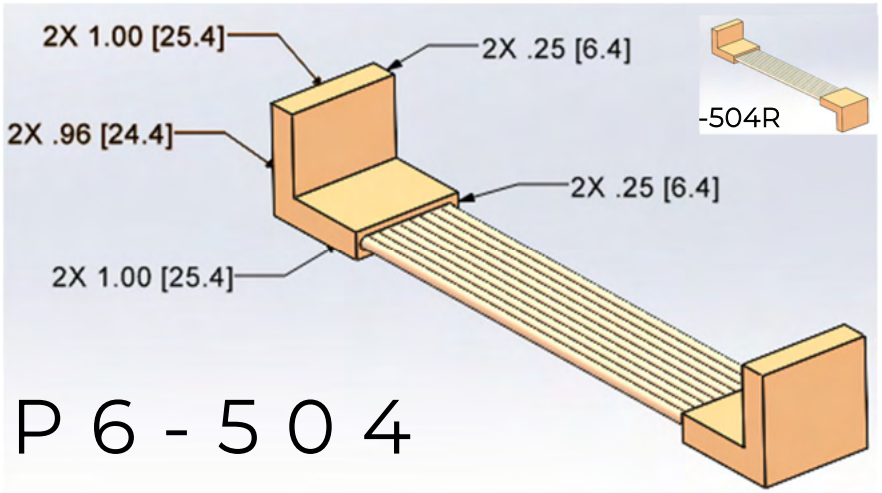
	50mm	100mm	200mm
300K	0.36	0.19	0.10
77K	0.52	0.28	0.15
40K	1.01	0.61	0.34
10K	0.82	0.48	0.26
4K	0.34	0.18	0.09

Approximate Mass (100mm RL): 280g
Rope Type: UltraFlex™ I Cabling (18x1)
Minimum RL: 12.75mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.18	0.10	0.05
77K	0.26	0.14	0.07
40K	0.52	0.31	0.17
10K	0.42	0.24	0.14
4K	0.16	0.09	0.04

Approximate Mass (100mm RL): 140g
Rope Type: UltraFlex™ I Cabling (9x1), 0.10"Ø
Minimum RL: 12.75mm
Use TAI's Conductance Calculator



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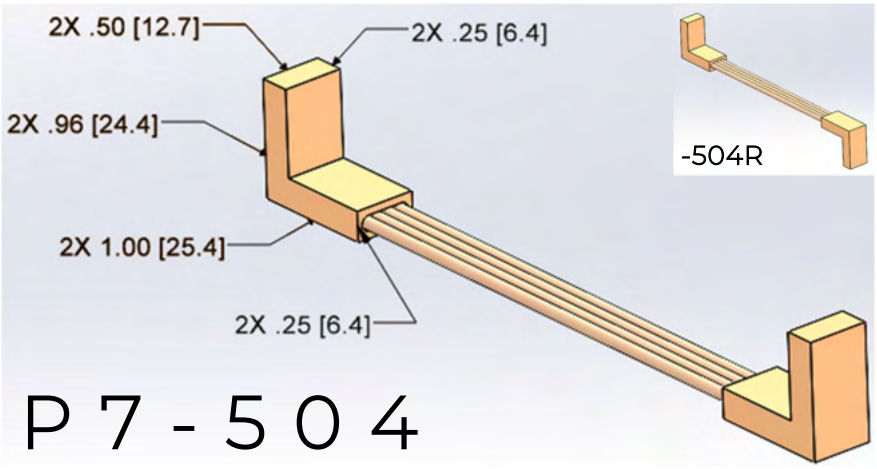
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.08	0.05	0.03
77K	0.11	0.06	0.03
40K	0.24	0.14	0.08
10K	0.19	0.11	0.06
4K	0.07	0.05	0.03

Approximate Mass (100mm RL): 73g
Rope Type: UltraFlex™ I Cabling (4x1), 0.10"Ø
Minimum RL: 12.75mm
Use TAI's Conductance Calculator



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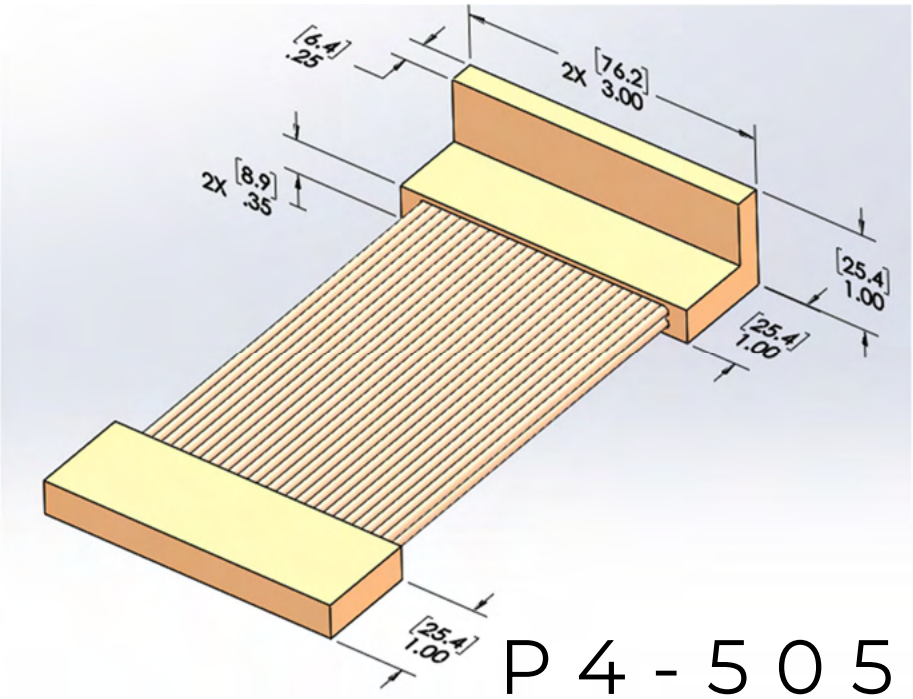

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Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

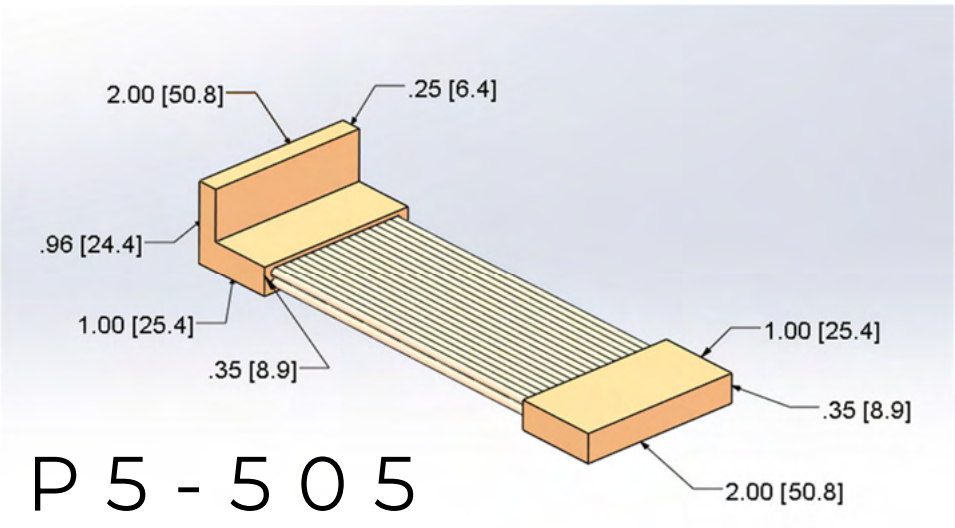
	50mm	100mm	200mm
300K	1.06	0.59	0.31
77K	1.32	0.76	0.43
40K	2.51	1.67	1.01
10K	2.12	1.34	0.78
4K	1.01	0.56	0.28

Approximate Mass (100mm RL): 558g
Rope Type: UltraFlex™ I Cabling (26x2)
Minimum RL: 23mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.73	0.41	0.22
77K	0.91	0.53	0.28
40K	1.75	1.15	0.70
10K	1.47	0.93	0.54
4K	0.69	0.39	0.21

Approximate Mass (100mm RL): 304g
Rope Type: UltraFlex™ I Cabling (18x2)
Minimum RL: 23mm
Use TAI's Conductance Calculator



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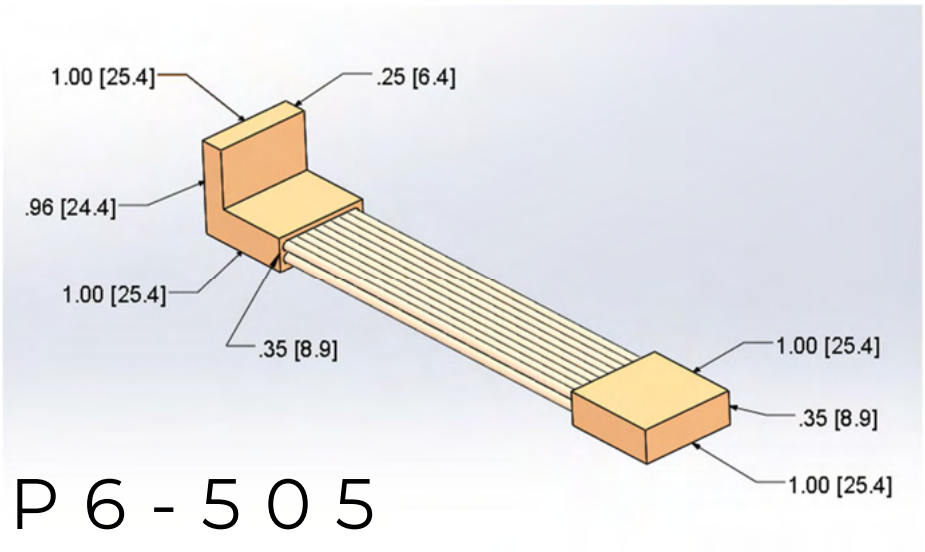
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.37	0.20	0.11
77K	0.46	0.26	0.14
40K	0.90	0.59	0.35
10K	0.75	0.47	0.27
4K	0.35	0.18	0.10

Approximate Mass (100mm RL): 152g
Rope Type: UltraFlex™ I Cabling (9x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator



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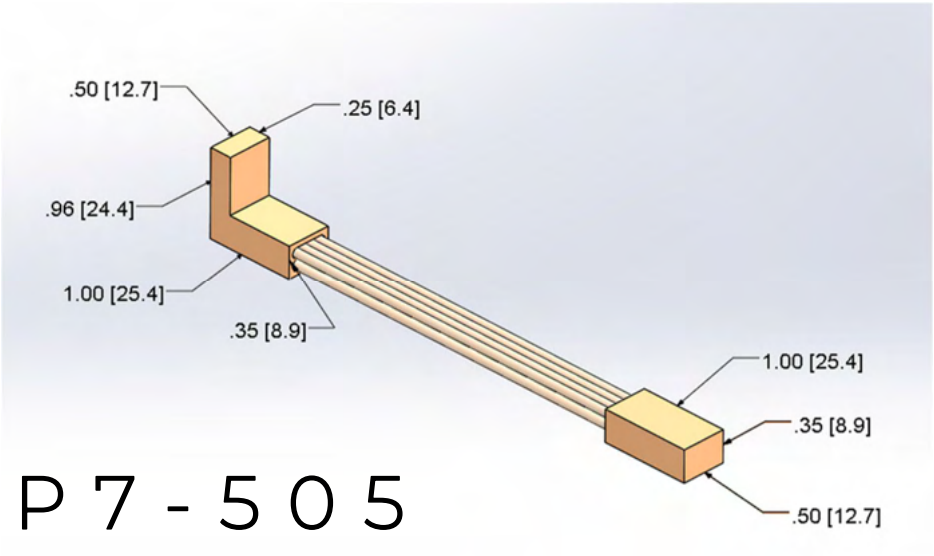

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Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

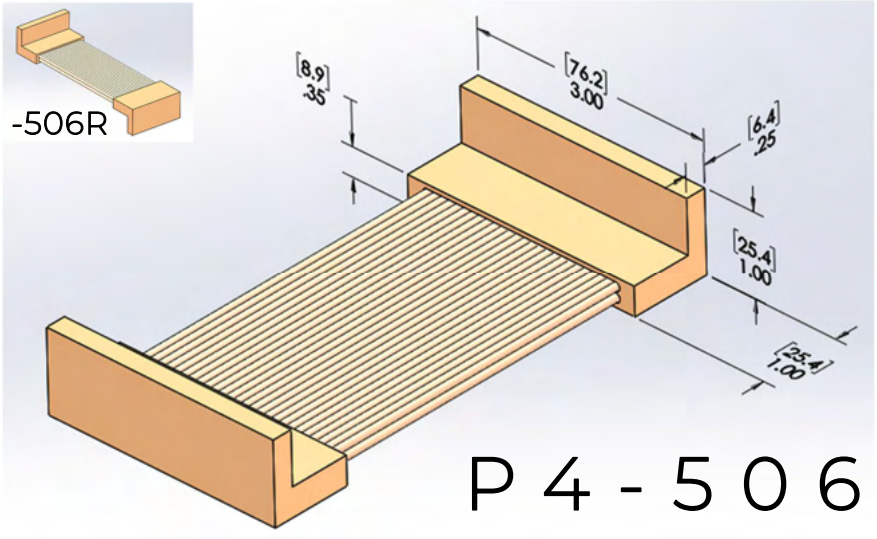
	50mm	100mm	200mm
300K	0.17	0.09	0.05
77K	0.21	0.12	0.06
40K	0.43	0.27	0.16
10K	0.36	0.22	0.12
4K	0.16	0.09	0.05

Approximate Mass (100mm RL): 73g
Rope Type: UltraFlex™ I Cabling (4x2)
Minimum RL: 23mm
Use TAI's Conductance Calculator

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.95	0.53	0.28
77K	1.32	0.76	0.43
40K	2.25	1.50	0.91
10K	1.90	1.20	0.71
4K	0.90	0.51	0.25

Approximate Mass (100mm RL): 628g
Rope Type: UltraFlex™ I Cabling (26x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator



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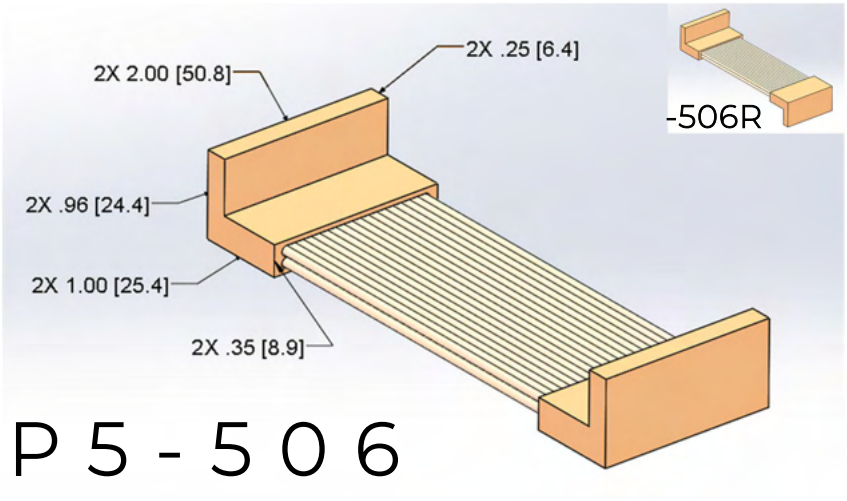
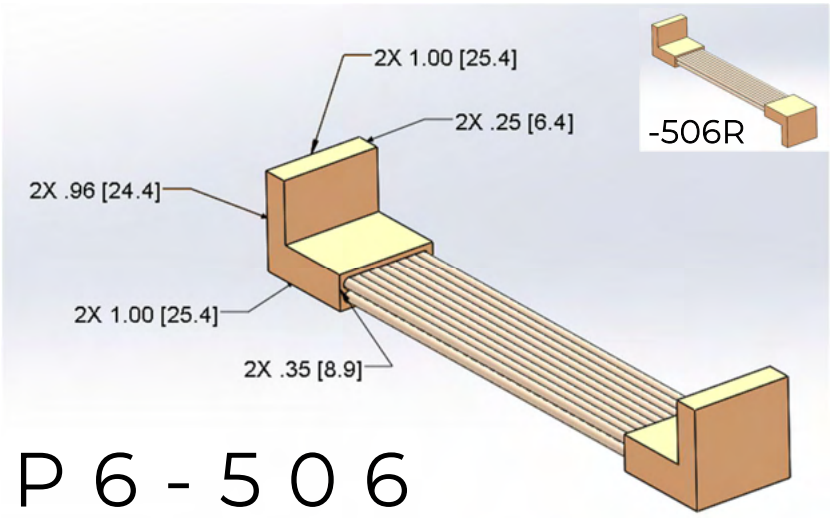
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.66	0.37	0.20
77K	0.91	0.53	0.28
40K	1.57	1.03	0.63
10K	1.32	0.84	0.49
4K	0.62	0.35	0.19

Approximate Mass (100mm RL): 348g
Rope Type: UltraFlex™ I Cabling (18x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator





Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

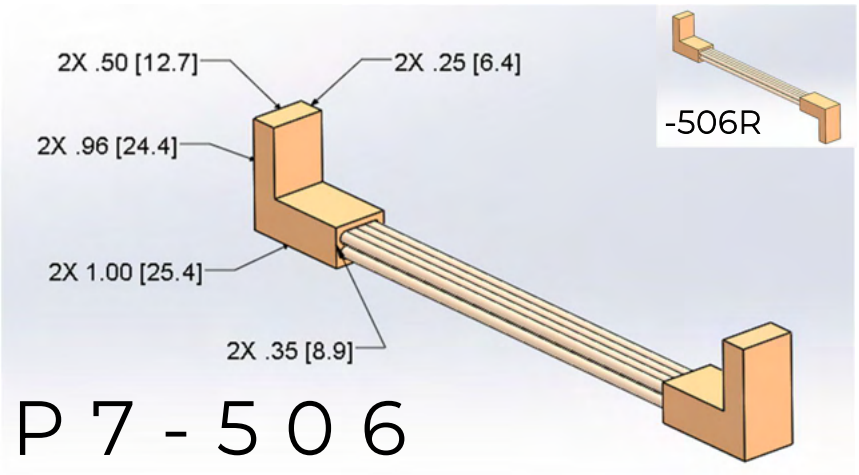
	50mm	100mm	200mm
300K	0.33	0.18	0.09
77K	0.46	0.26	0.14
40K	0.81	0.53	0.31
10K	0.67	0.42	0.24
4K	0.32	0.16	0.09

Approximate Mass (100mm RL): 174g
Rope Type: UltraFlex™ I Cabling (9x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	50mm	100mm	200mm
300K	0.15	0.08	0.04
77K	0.21	0.12	0.06
40K	0.39	0.24	0.14
10K	0.32	0.20	0.11
4K	0.14	0.08	0.04

Approximate Mass (100mm RL): 84g
Rope Type: UltraFlex™ I Cabling (4x2), 0.10"Ø
Minimum RL: 23mm
Use TAI's Conductance Calculator



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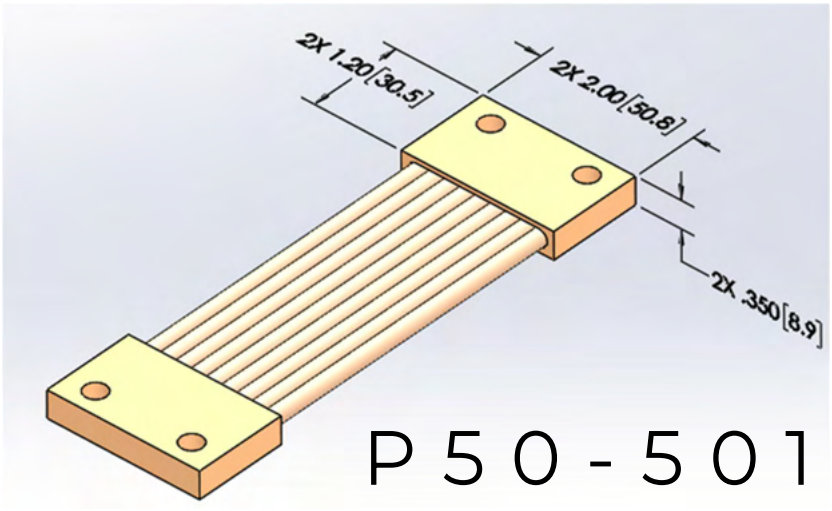
ULTRAFLEX™ II (UFII) MODELS

TAI's OFHC UltraFlex II (UFII) cabling is our standard 0.20" (5mm) diameter copper rope. It is only offered by TAI, and has been extensively qualified by our engineers and customers.

Beyond it's larger diameter (which allows us to make the equivalent of a 4 -row UFI strap), what makes UFII unique is its weave type/ manufacturing method. A strap using a single row of UFII cables offers superior flexibility and lower stiffness than a double row strap using UFI (though there are some trade-offs to consider given the number of ropes, allowable fitting dimensions, and a minor performance penalty due to the cross section of the cabling itself).

Due to the size of the cabling, our swage manufacturing method, and the assembly process, fittings must be longer and bolt holes do need to be pushed further back (than UFI straps) to allow for a durable bond and predictable thermal performance. For allowable bolt patterns and keep-out zones, contact TAI.

TAI will be releasing more UFII models in the 2023 catalog. However, we have discontinued our P70 series in 2022. We will be adding projection calculators to our website for these larger models in 2022 and beyond. But, for Predictions of any custom or standard UFII strap, contact our Director of Business Development, and provide geometry and operating temperature details.



Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

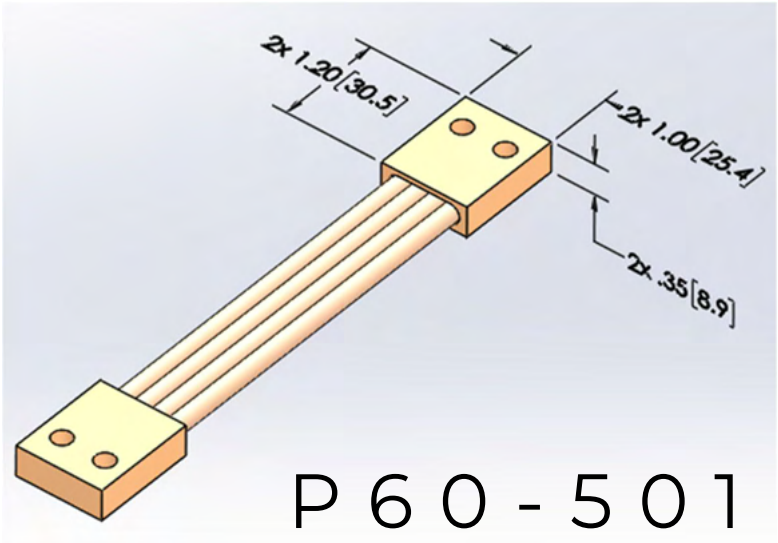
	57mm	100mm	200mm
300K	0.69	0.40	0.22
77K	0.87	0.54	0.29
40K	1.83	1.15	0.71
10K	1.50	0.94	0.54
4K	0.66	0.38	0.21

Approximate Mass (100mm RL): 352g
Rope Type: UltraFlex™ II Cabling (9x1), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	57mm	100mm	200mm
300K	0.31	0.18	0.09
77K	0.39	0.24	0.12
40K	0.84	0.54	0.32
10K	0.69	0.43	0.25
4K	0.29	0.17	0.09

Approximate Mass (100mm RL): 172g
Rope Type: UltraFlex™ II Cabling (4x1), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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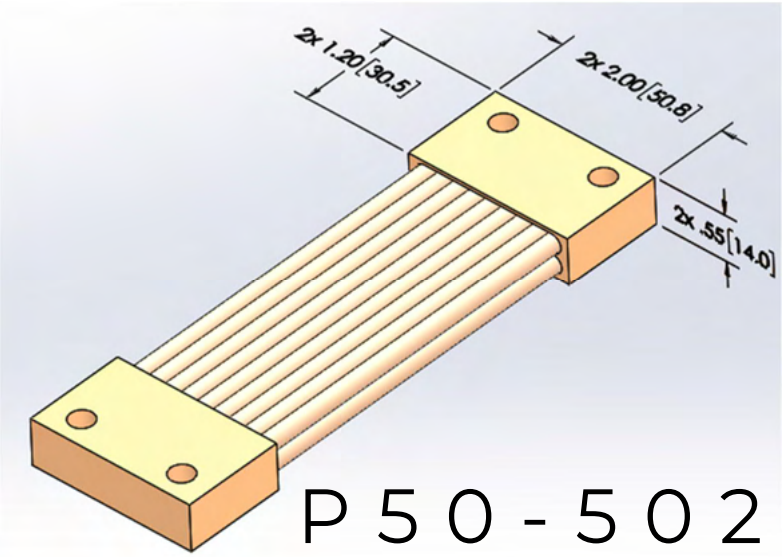


Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

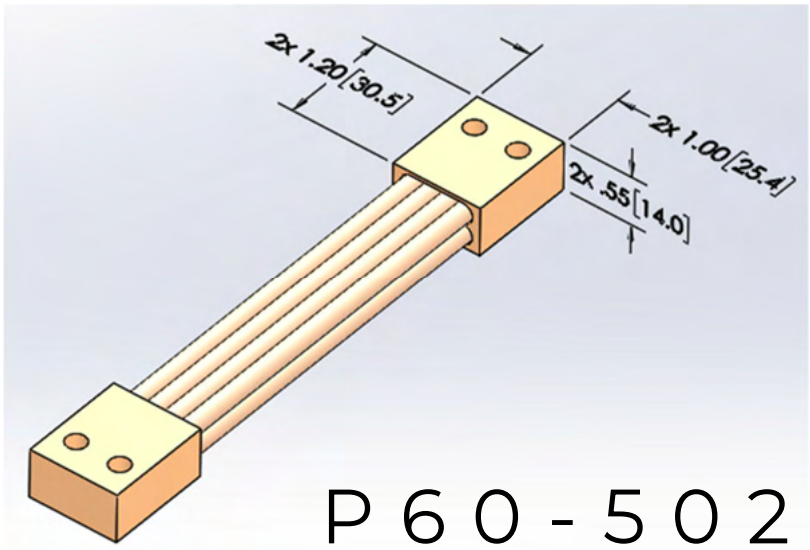
	57mm	100mm	200mm
300K	1.24	0.75	0.42
77K	1.54	1.00	0.55
40K	2.86	1.86	1.25
10K	2.44	1.61	0.99
4K	1.19	0.71	0.40

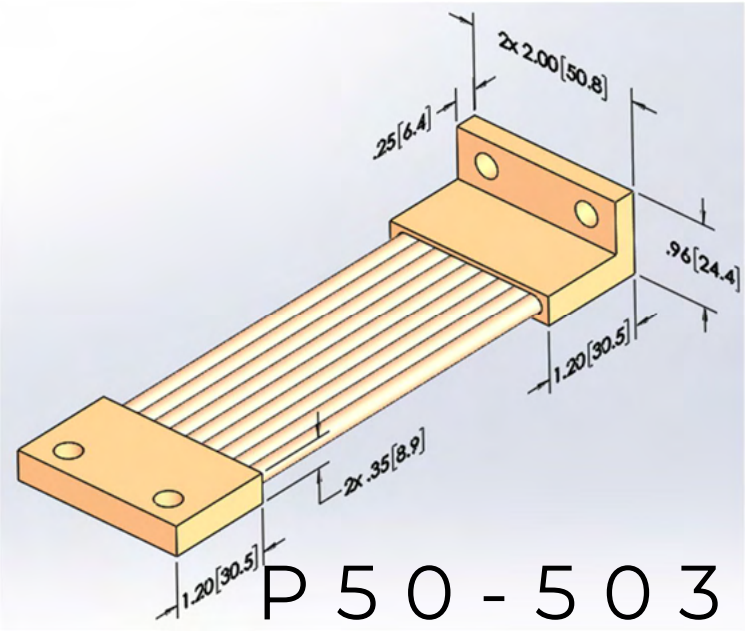
Approximate Mass (100mm RL): 586g
Rope Type: UltraFlex™ II Cabling (9x2), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	57mm	100mm	200mm
300K	0.56	0.34	0.19
77K	0.70	0.45	0.25
40K	1.34	0.92	0.58
10K	1.14	0.75	0.45
4K	0.46	0.32	0.18

Approximate Mass (100mm RL): 285g
Rope Type: UltraFlex™ II Cabling (4x2), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**





Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	57mm	100mm	200mm
300K	0.69	0.40	0.22
77K	0.87	0.54	0.29
40K	1.83	1.15	0.71
10K	1.50	0.94	0.54
4K	0.66	0.38	0.21

Approximate Mass (100mm RL): 397g
Rope Type: UltraFlex™ II Cabling (9x1), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

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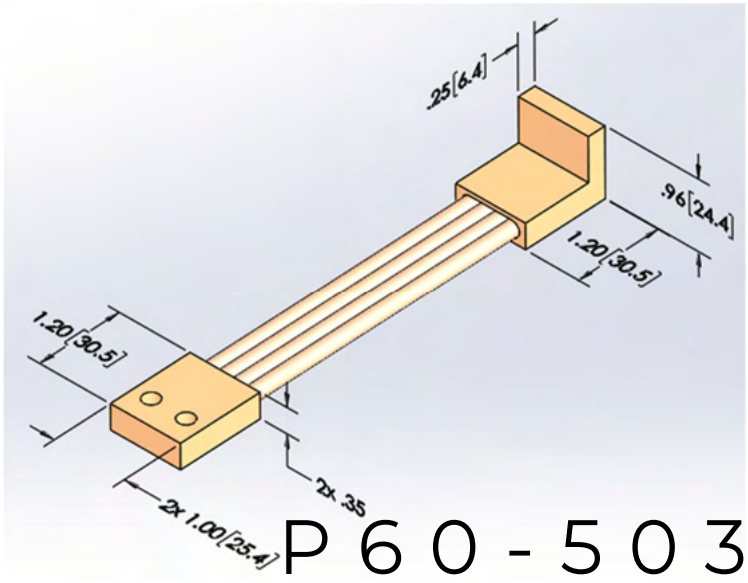
Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	57mm	100mm	200mm
300K	0.31	0.18	0.09
77K	0.39	0.24	0.12
40K	0.84	0.54	0.32
10K	0.69	0.43	0.25
4K	0.29	0.17	0.09

Approximate Mass (100mm RL): 194g
Rope Type: UltraFlex™ II Cabling (4x1), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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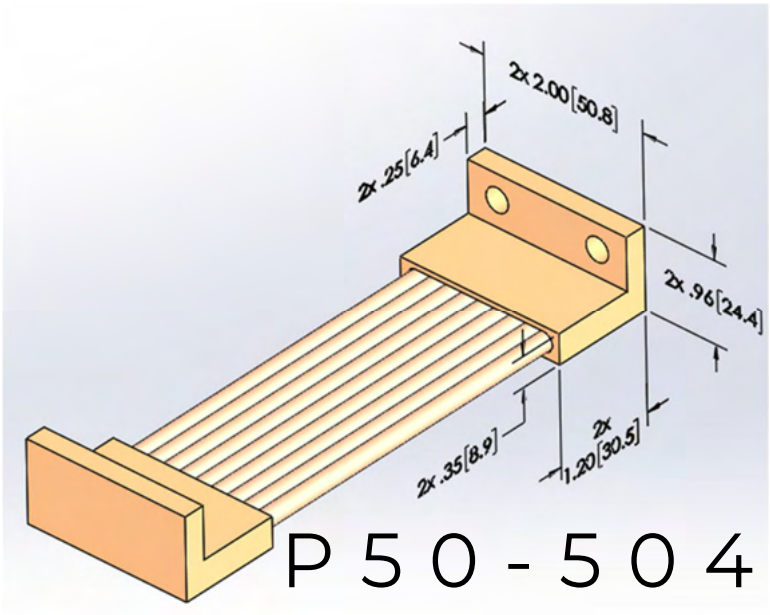


P50-504

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

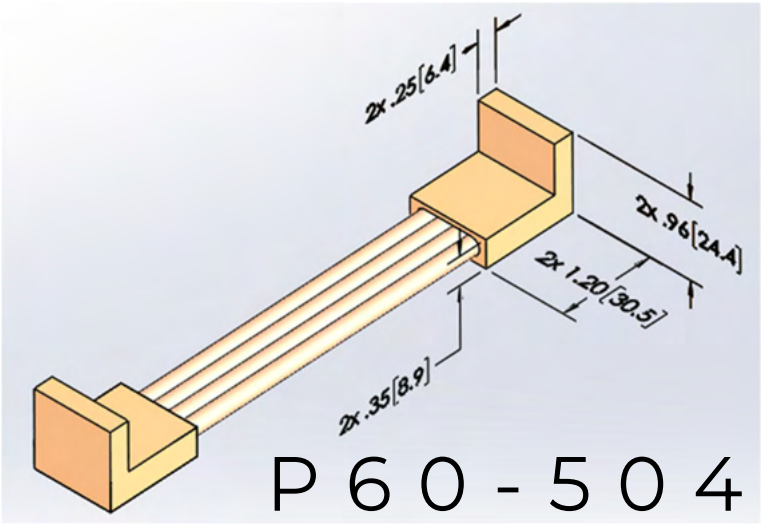
	57mm	100mm	200mm
300K	0.69	0.36	0.20
77K	0.87	0.54	0.29
40K	1.83	1.02	0.64
10K	1.50	0.85	0.49
4K	0.66	0.34	0.19

Approximate Mass (100mm RL): 442g
Rope Type: UltraFlex™ II Cabling (9x1), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) and Temp (K)

	57mm	100mm	200mm
300K	0.31	0.16	0.08
77K	0.39	0.24	0.12
40K	0.84	0.49	0.29
10K	0.69	0.39	0.23
4K	0.29	0.15	0.08

Approximate Mass (100mm RL): 216g
Rope Type: UltraFlex™ II Cabling (4x1), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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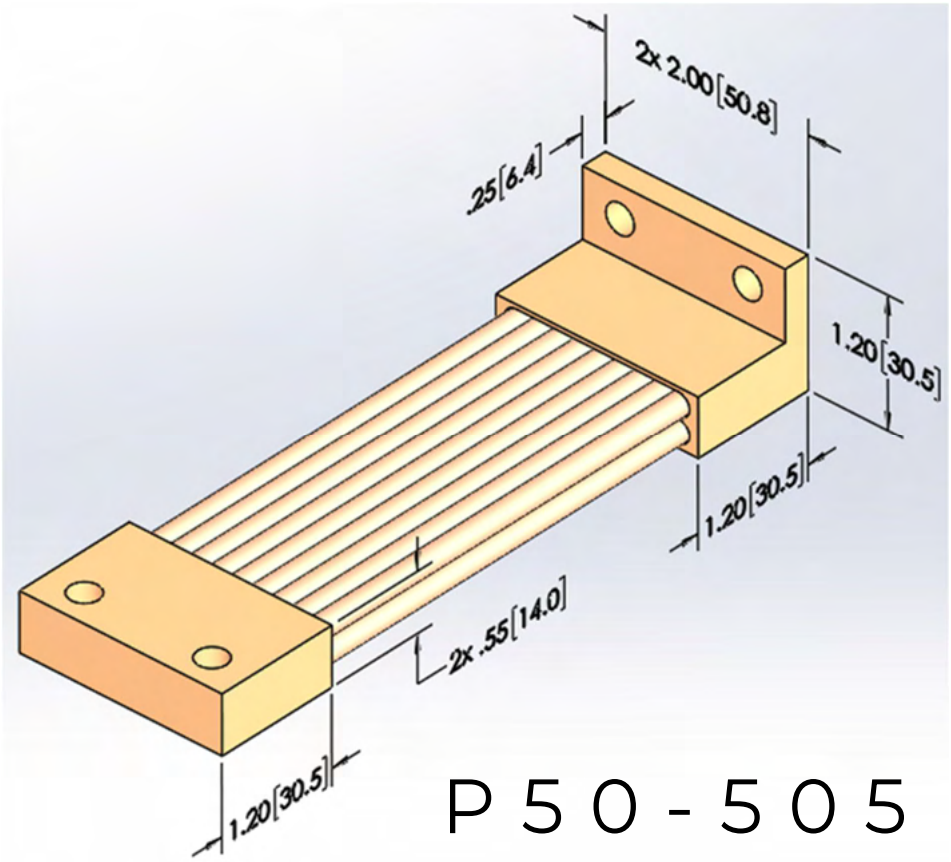

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Conductance Predictions (W/K)
by Rope Length (RL) & Temperature

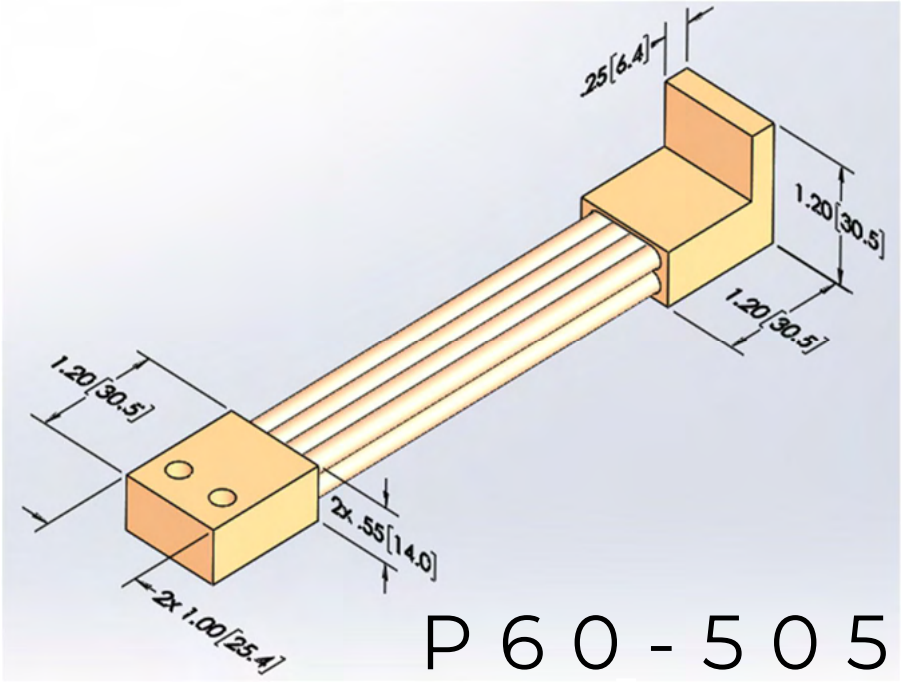
	57mm	100mm	200mm
300K	1.24	0.75	0.42
77K	1.54	1.00	0.55
40K	2.86	1.86	1.25
10K	2.44	1.61	0.99
4K	1.19	0.71	0.40

Approximate Mass (100mm RL): 634g
Rope Type: UltraFlex™ II Cabling (9x2)
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

Conductance Predictions (W/K)
by Rope Length (RL) & Temperature

	57mm	100mm	200mm
300K	0.56	0.34	0.19
77K	0.70	0.45	0.25
40K	1.34	0.92	0.58
10K	1.14	0.75	0.45
4K	0.46	0.32	0.18

Approximate Mass (100mm RL): 309g
Rope Type: UltraFlex™ II Cabling (4x2), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**



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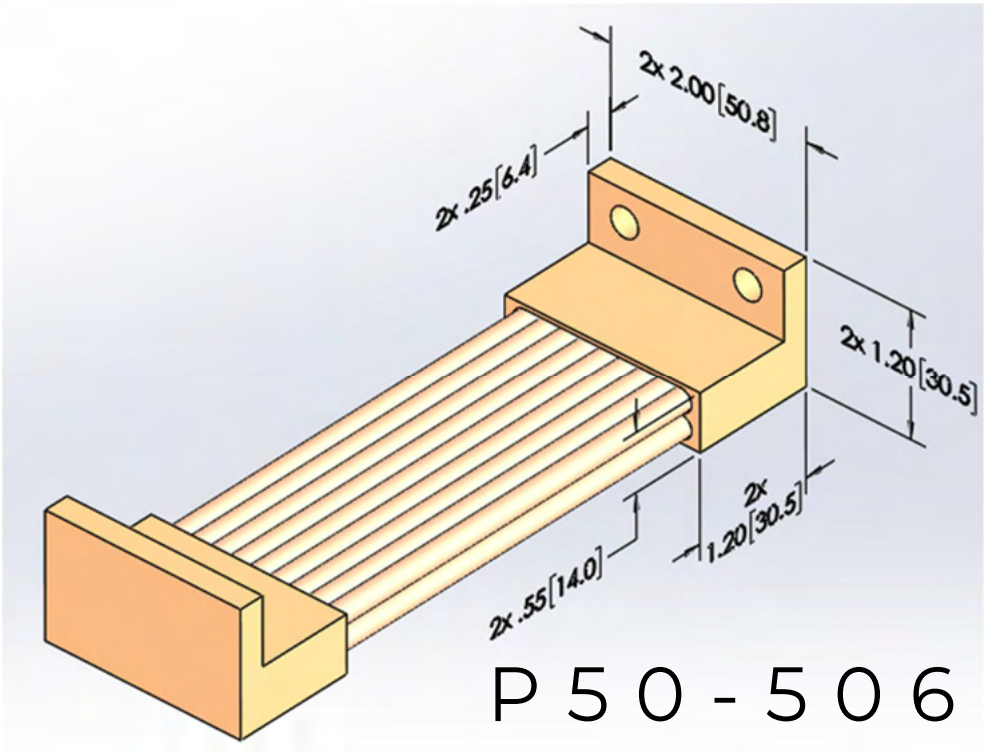
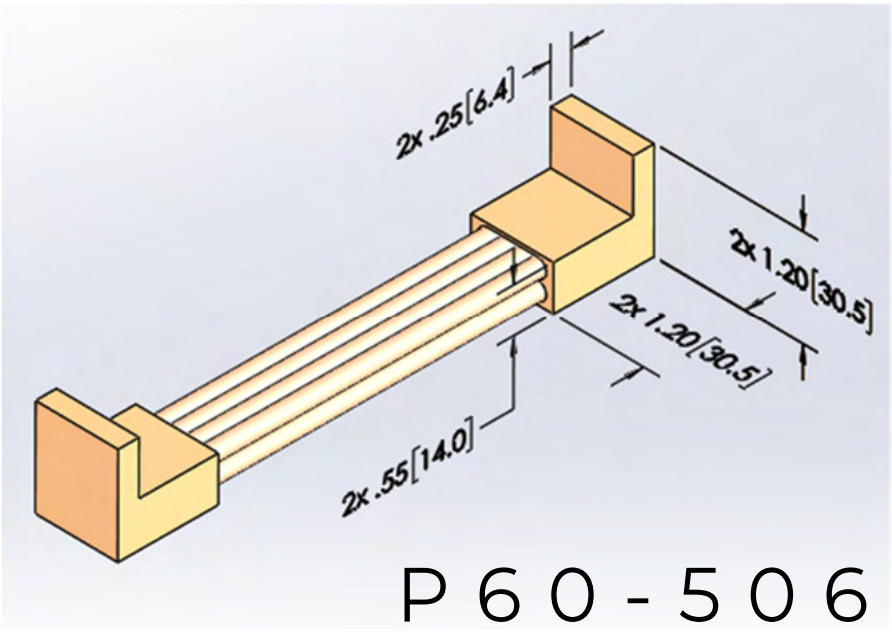
Conductance Predictions (W/K)
by Rope Length (RL)

	57mm	100mm	200mm
300K	1.24	0.67	0.38
77K	1.54	1.00	0.55
40K	2.86	1.67	1.12
10K	2.44	1.45	0.90
4K	1.19	0.64	0.36

Approximate Mass (100mm RL): 682g
Rope Type: UltraFlex™ II Cabling (9x2)
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**





Conductance Predictions (W/K)
by Rope Length (RL)

	57mm	100mm	200mm
300K	0.56	0.31	0.17
77K	0.70	0.45	0.25
40K	1.34	0.83	0.53
10K	1.14	0.67	0.40
4K	0.46	0.29	0.16

Approximate Mass (100mm RL): 333g
Rope Type: UltraFlex™ II Cabling (4x2), 0.20"Ø
Minimum RL: 57mm
Use TAI's Conductance Calculator
***RL & Bolt Pattern Customizable at No Charge**

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CRYOCOOLER SERIES

The Cryocooler Series is designed specifically around the cold head / 2nd stage interface of popular cryocoolers from Sumitomo Heavy Industries (SHI) and Cryomech.

All CS™ straps are made with double rows of our OFHC UltraFlex™ cabling for maximized thermal performance and flexibility, and are available in submodels with multiple arms for increased performance.

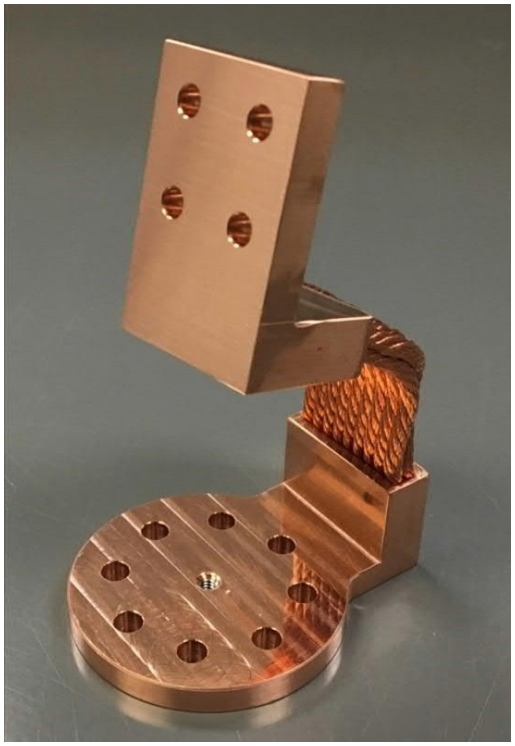
All Cryocooler Series Straps also come with optional "L" fittings with the same standard width. As always, bolt pattern and rope/cabling length customization are free of charge, as are our front-end design and consultation services.

Please note that due to the additional machining and complex fixturing for these straps, all CS™ models typically cost $200—$600 more per unit than other standard CuTS® models (in small quantities), and orders typically ship in 7 weeks instead of 5-6. For pricing, please contact our Director of Business Development.

If your diameter is not listed here, please feel free to contact us. TAI is always releasing new standard models with each revision of our CuTS® Catalog, and we are happy to hear from our customers (we are even willing to heavily discount the NRE associated with any new CS models not currently offered in our catalog).

CS™ Series

- No NRE or Design Fees
- Typical 6-7 week lead times
- Made entirely of 99.99 - 99.998% Pure OFHC cu (CU-101)
- Solder-Free, never brazed/welded
- Made with TAI's exclusive OFHC UltraFlex® I cabling
- Designed and fabricated for maximum flexibility
- Available in double row straps
- AVAILABLE IN 9 POPULAR COLD HEAD DIAMETERS
- 72 SUBMODELS TO CHOOSE FROM
- NICKEL AND GOLD PLATING AVAILABLE
- Mylar® sleeves available for a small additional fee
- Material Certs and CoC's - FREE
- Bolt pattern customization - FREE
- Cable length customization - FREE
- Front-end Design & Projection Services - FREE
- Large Discounts for All New Customers, University, NASA, and National Laboratory Customers



Pictured (Top): Custom CS CuTS® (45mm Cold Head)
(Bottom): CS-47B and CS-64BL CuTS® with Mylar®

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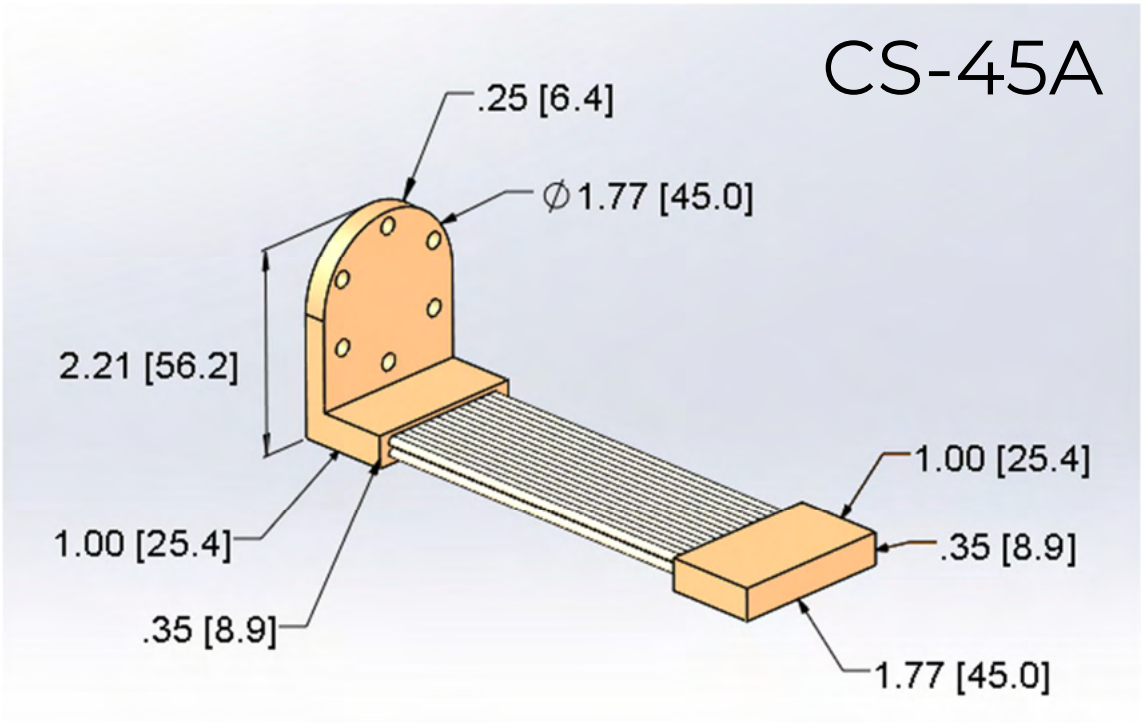
CS™ - 45 (Ø45MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (15x2), 0.10"Ø :

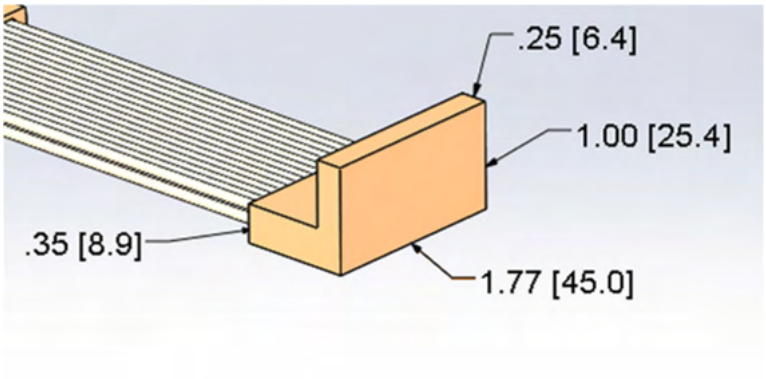
100mm RL Conductance Predictions (will vary with model):
@300K: 0.340 W/K
@40K: 0.936 W/K
@10K: 0.851 W/K
@4K: 0.323 W/K
Approximate Mass: Varies

Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E models) offer roughly double the performance. **Contact TAI for Predictions.



L-Fittings

All models are available with optional L fitting, and denoted by adding an L to the part number ("CS-45AL").



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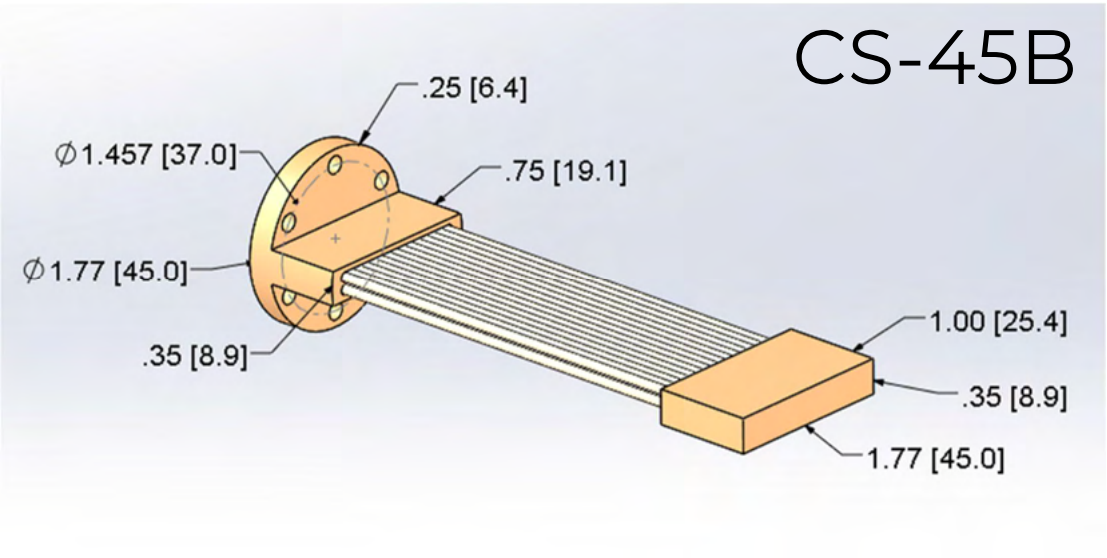
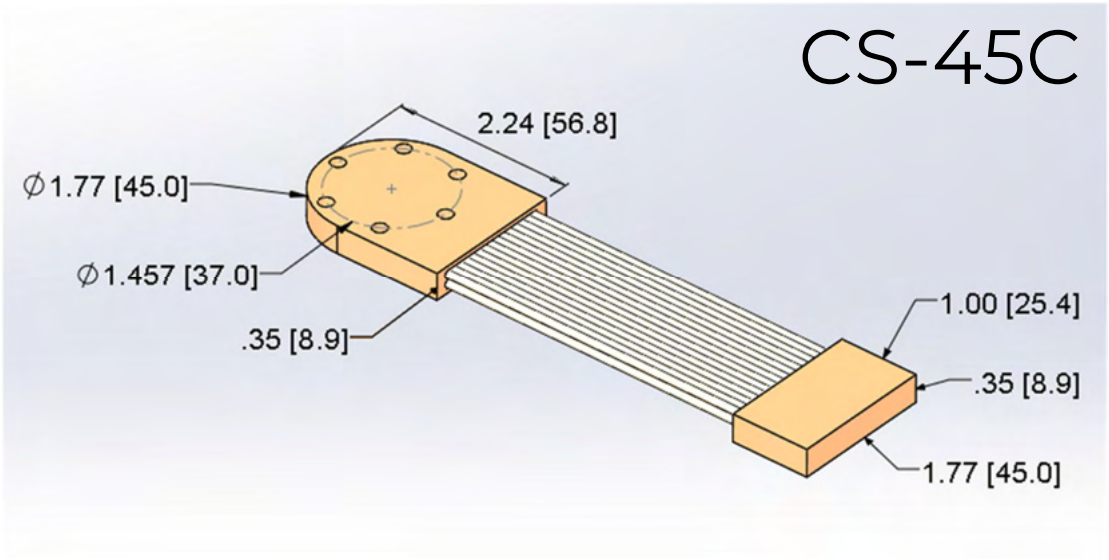
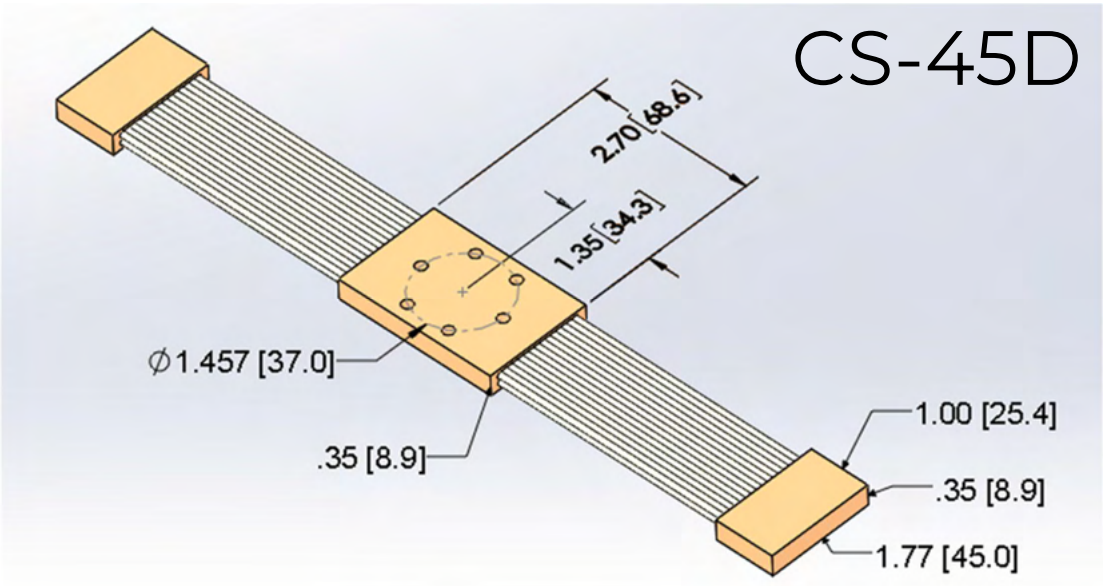
CS-45B



CS-45C



CS-45D



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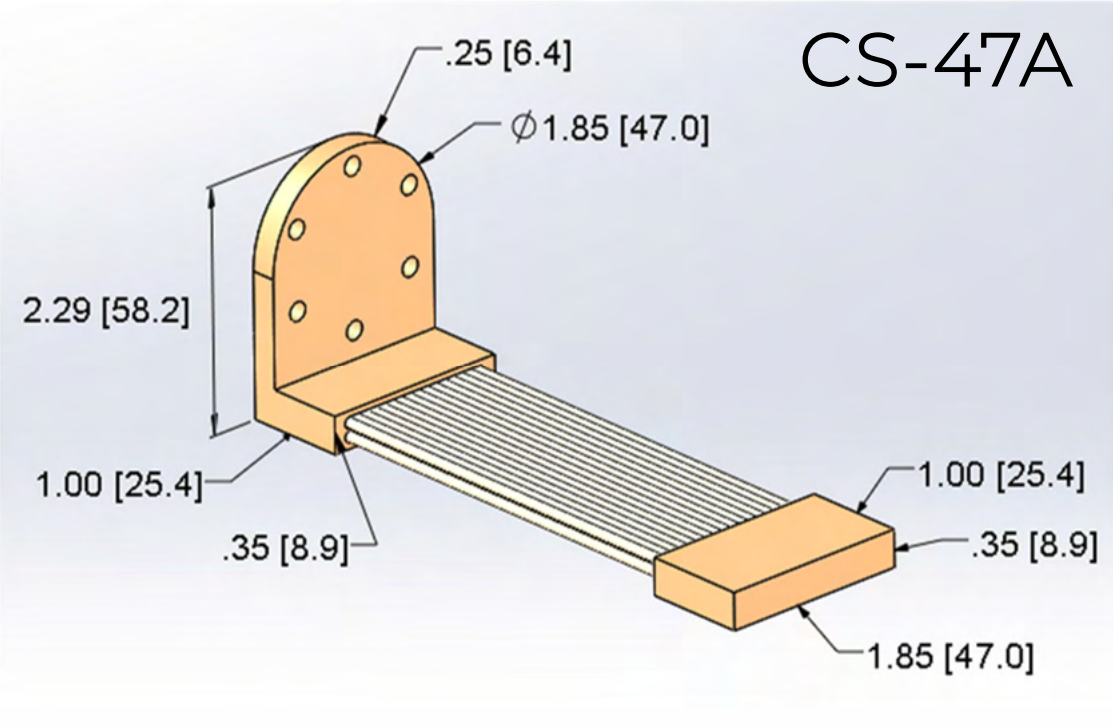
CS™ - 47 (Ø47MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (16x2), 0.10"Ø :

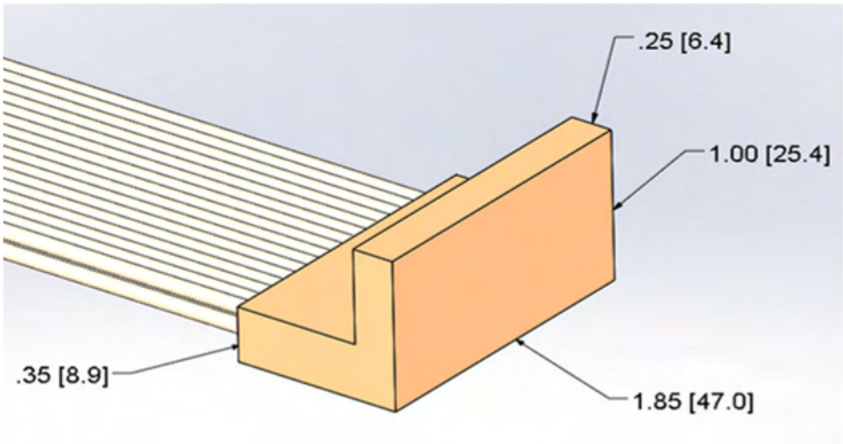
100mm RL Conductance Predictions (will vary with model and RL):
@300K: 0.363 W/K
@40K: 0.997 W/K
@10K: 0.907 W/K
@4K: 0.345 W/K
Approximate Mass: Varies

Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E **models) offer roughly double the performance. Contact TAI for Predictions.



L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-47AL").



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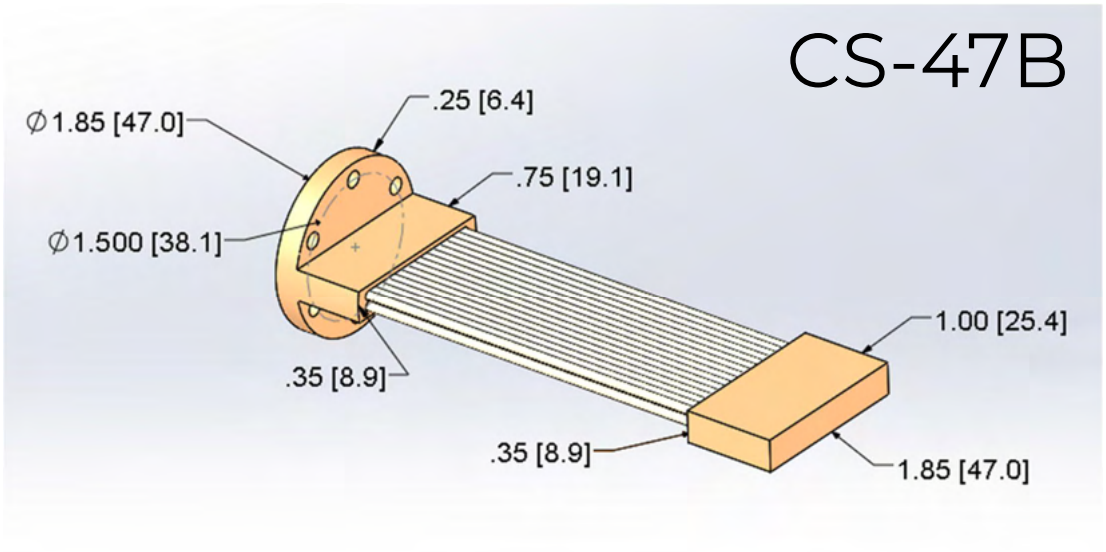
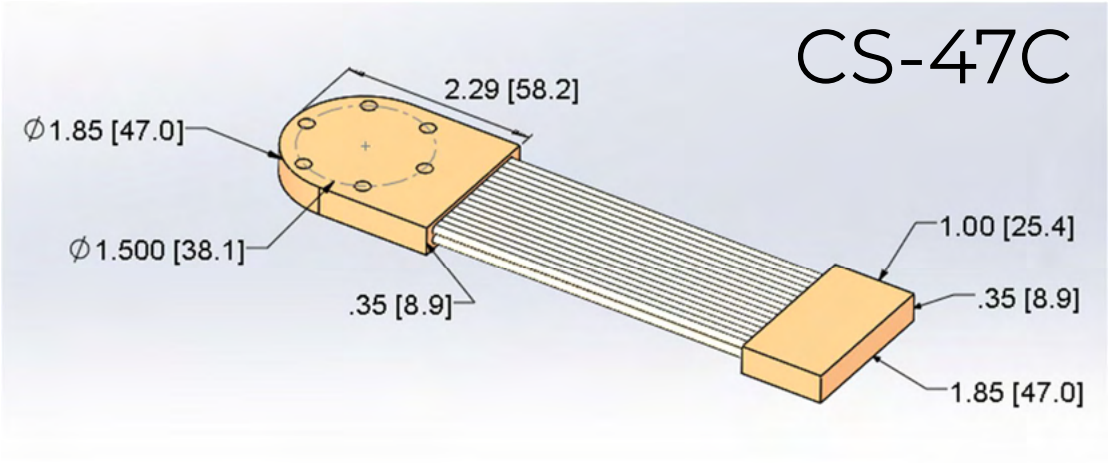
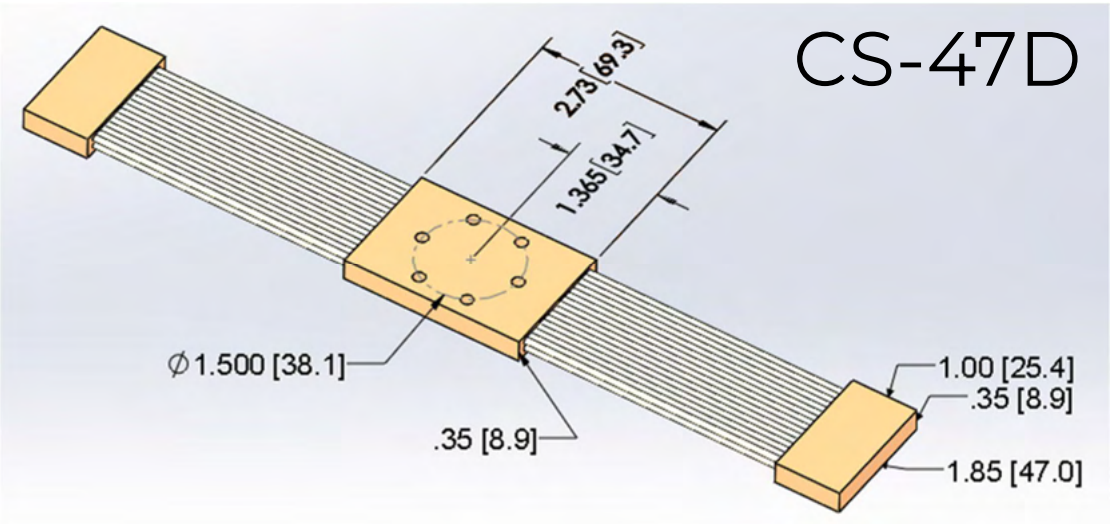
CS-47B



CS-47C



CS-47D



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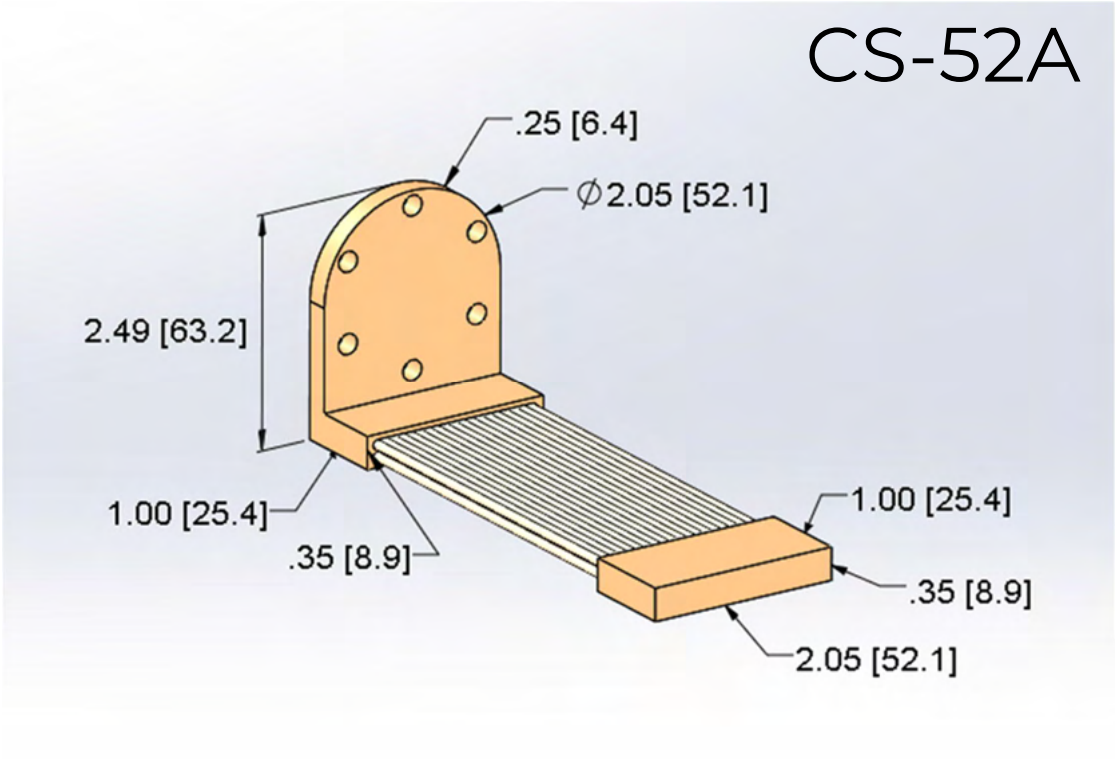
CS™ - 52 (Ø52.1MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (19x2), 0.10"Ø :

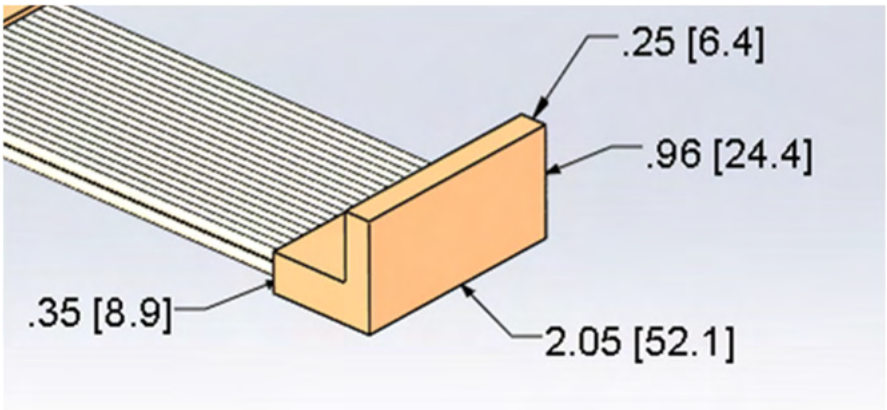
100mm RL Conductance Predictions (will vary with model and RL):
@300K: 0.440 W/K
@40K: 1.171 W/K
@10K: 1.100 W/K
@4K: 0.418 W/K
Approximate Mass: Varies

Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E models) offer **roughly double the performance. Contact TAI for Predictions.



L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-52AL").



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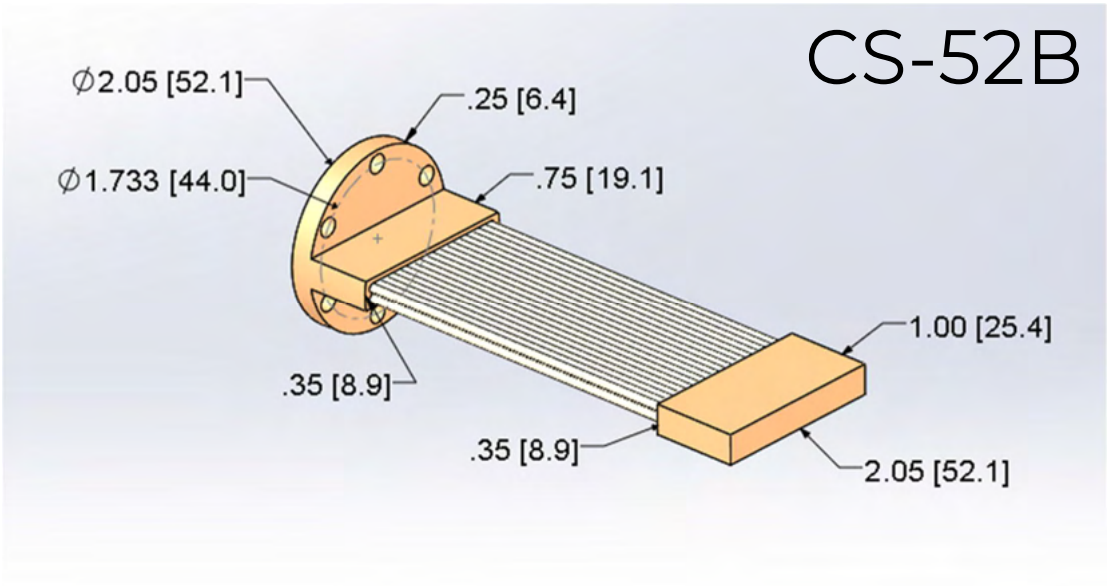
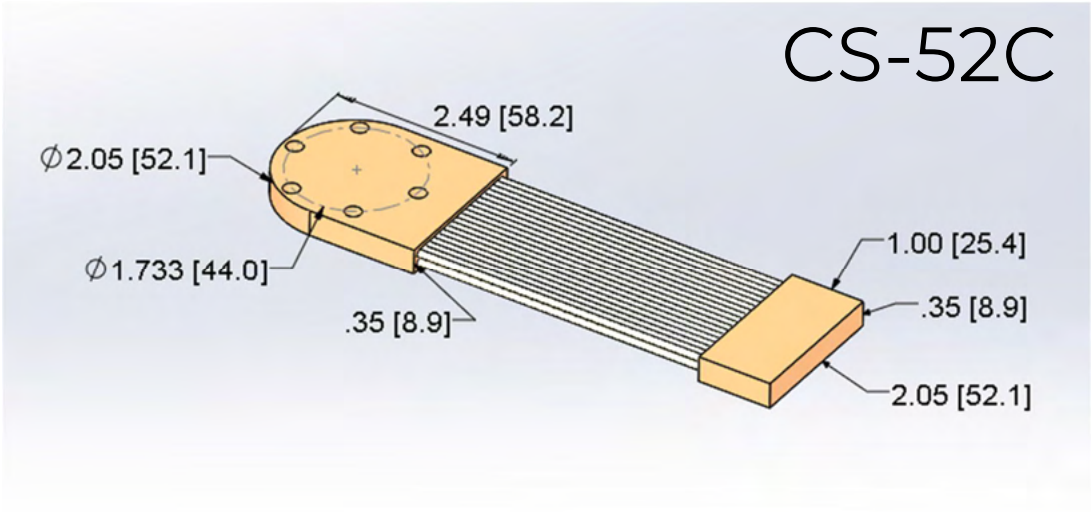
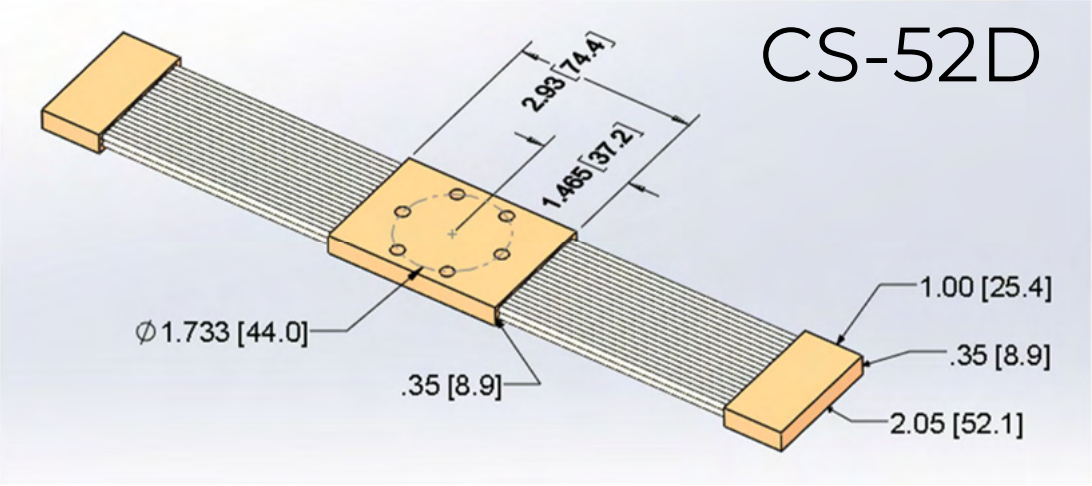
CS-52B



CS-52C



CS-52D



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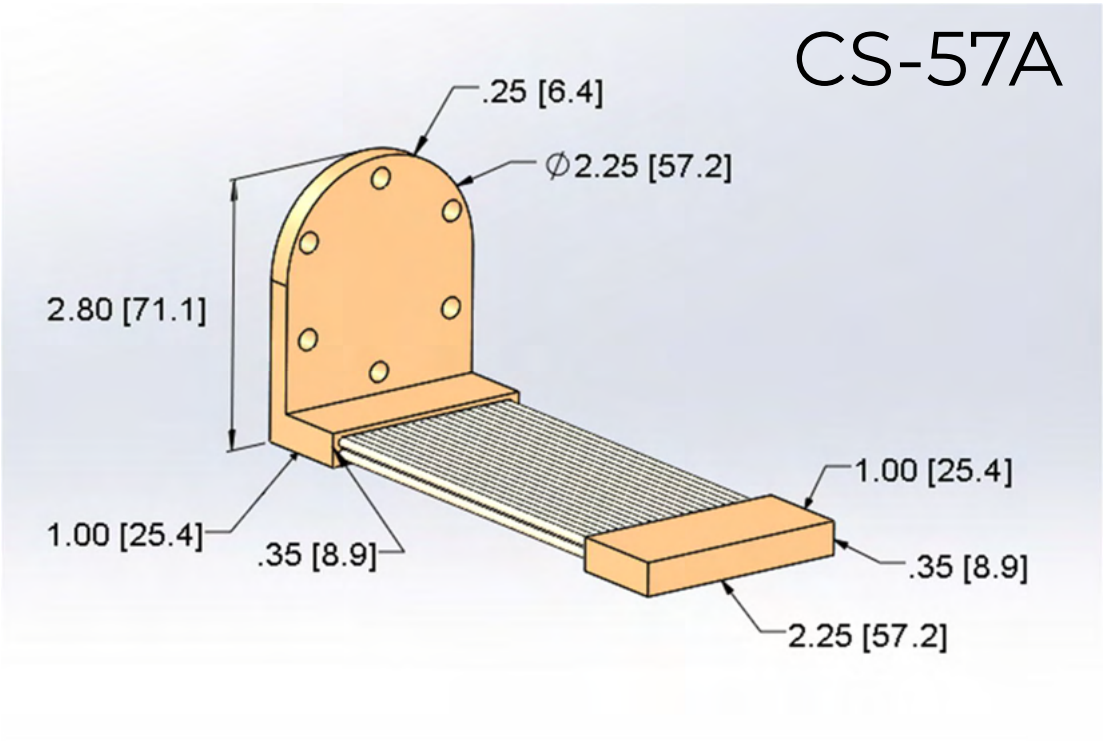
CS™ - 57 (Ø57.2MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (21x2), 0.10"Ø :

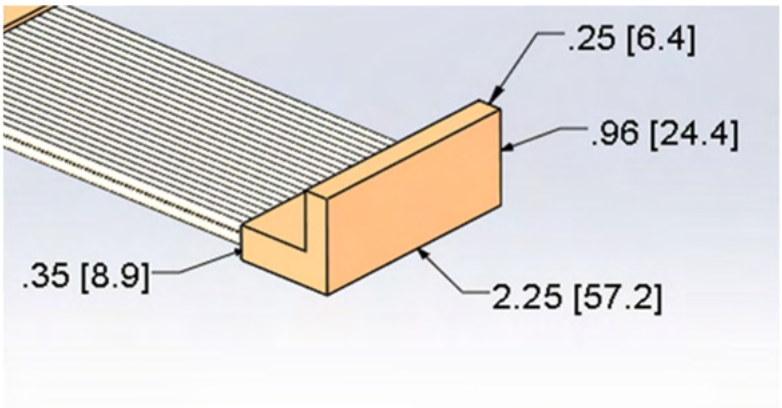
100mm RL Conductance Predictions (will vary with model and RL):
@300K: 0.486 W/K
@40K: 1.291 W/K
@10K: 1.215 W/K
@4K: 0.462 W/K
Approximate Mass: Varies

Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E models) offer **roughly double the performance. Contact TAI for Predictions.



L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-57AL").



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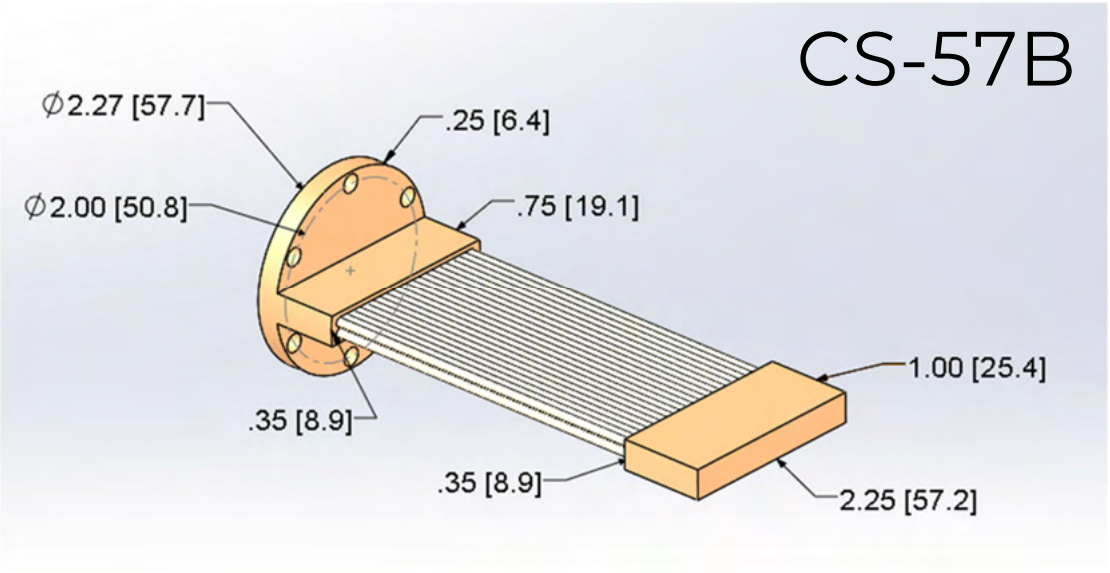
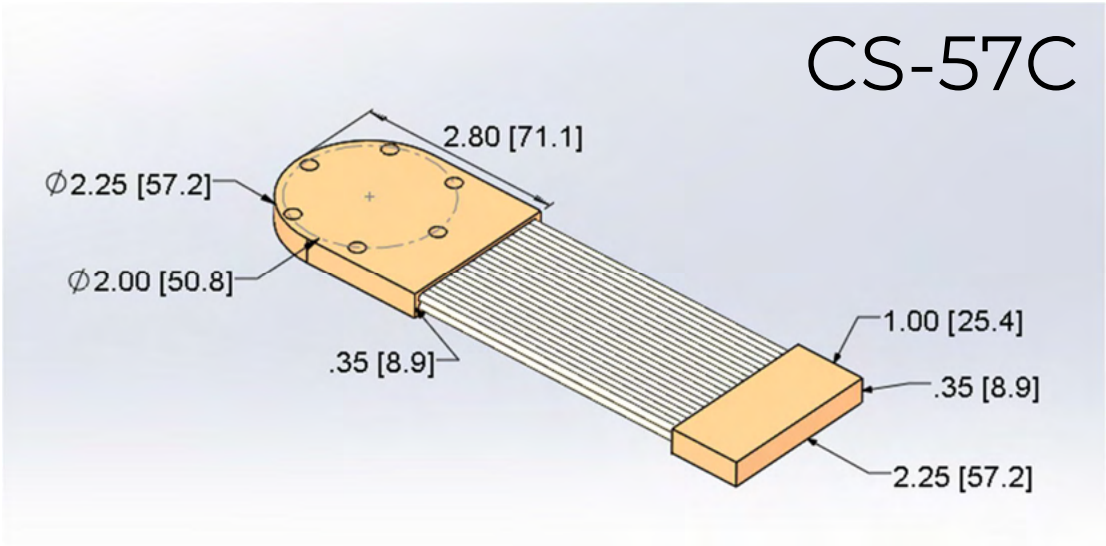
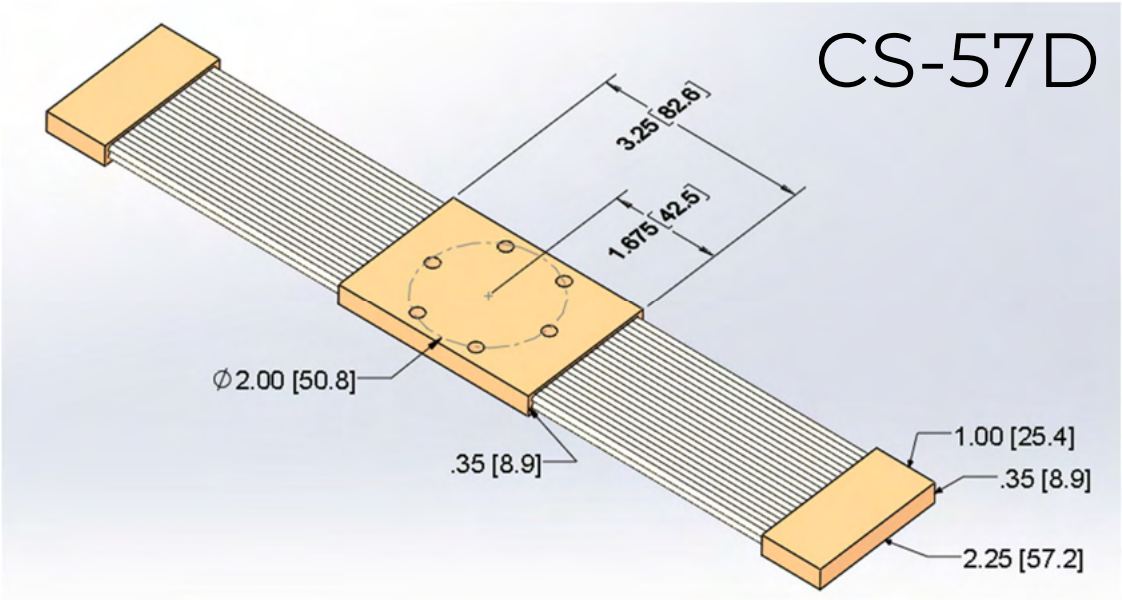
CS-57B



CS-57C



CS-57D



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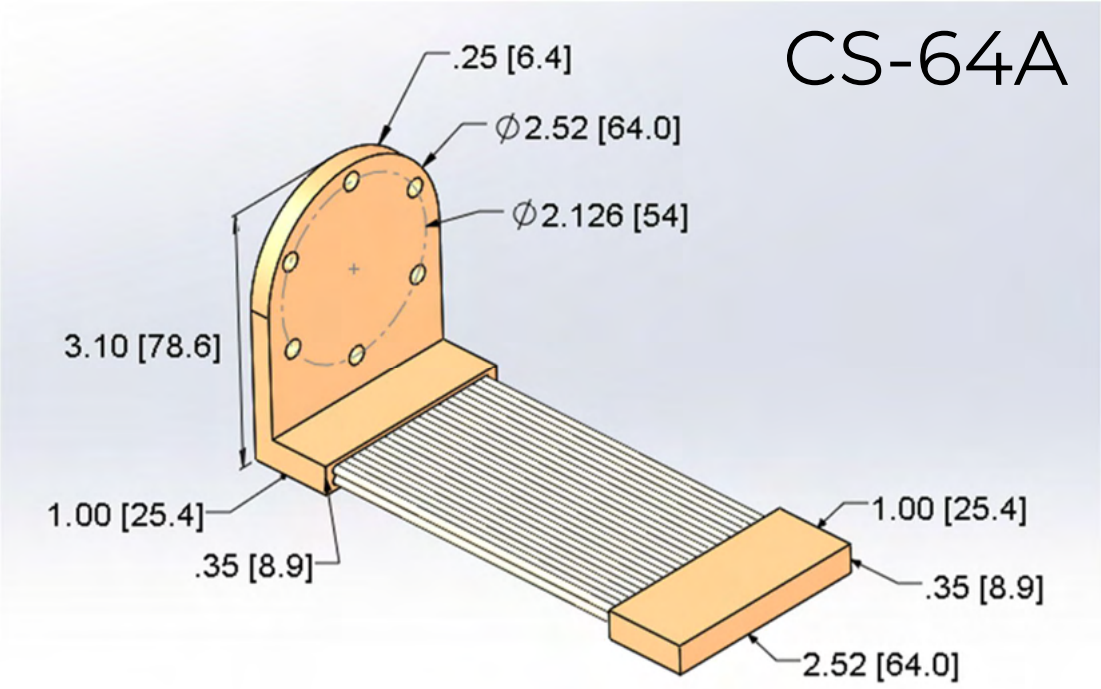
CS™-64 (Ø64MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (23x2), 0.10"Ø :

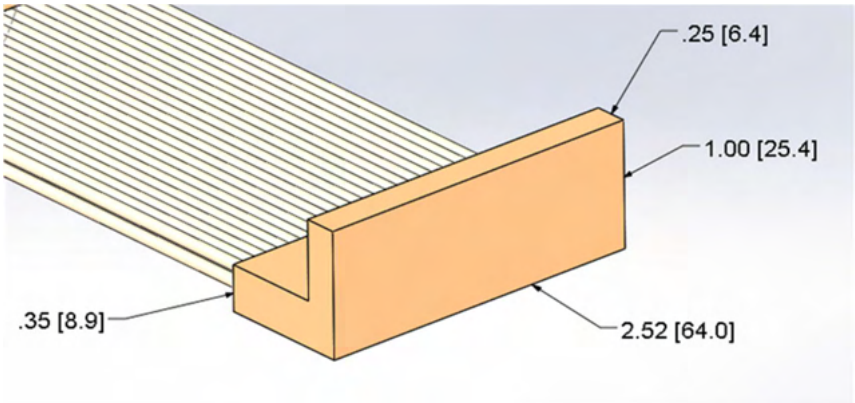
100mm RL Conductance Predictions (will vary with model and RL):
@300K: 0.521 W/K
@40K: 1.432 W/K
@10K: 1.302 W/K
@4K: 0.495 W/K
Approximate Mass: Varies

*Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E models) offer **roughly double the performance. Contact TAI for Predictions.**



L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-64AL").



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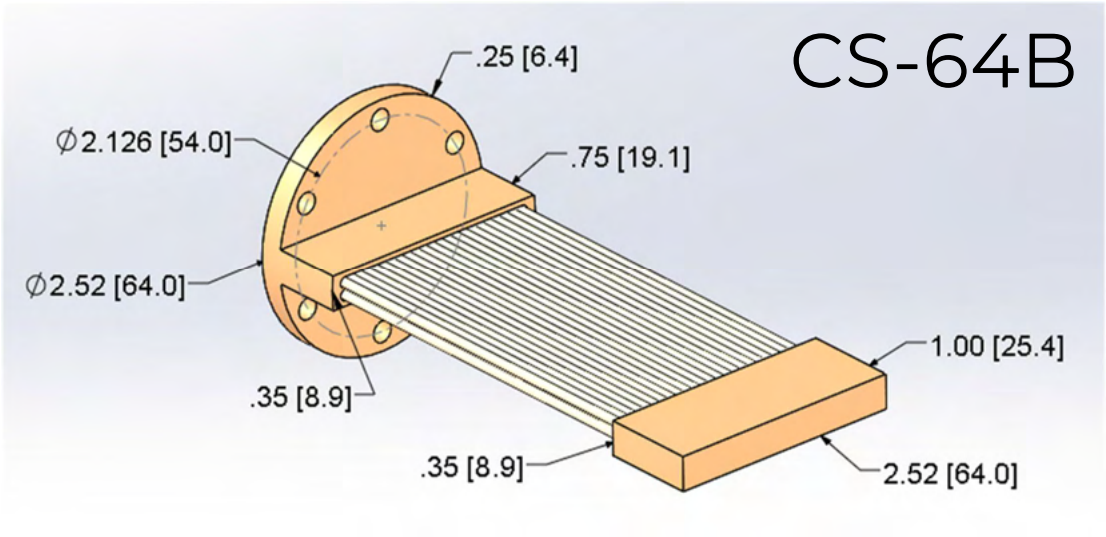
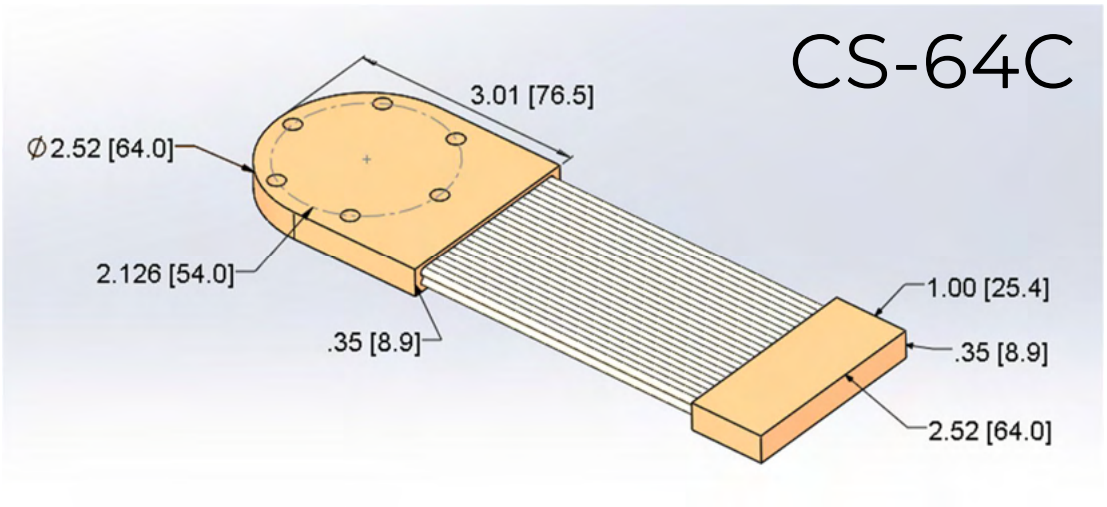
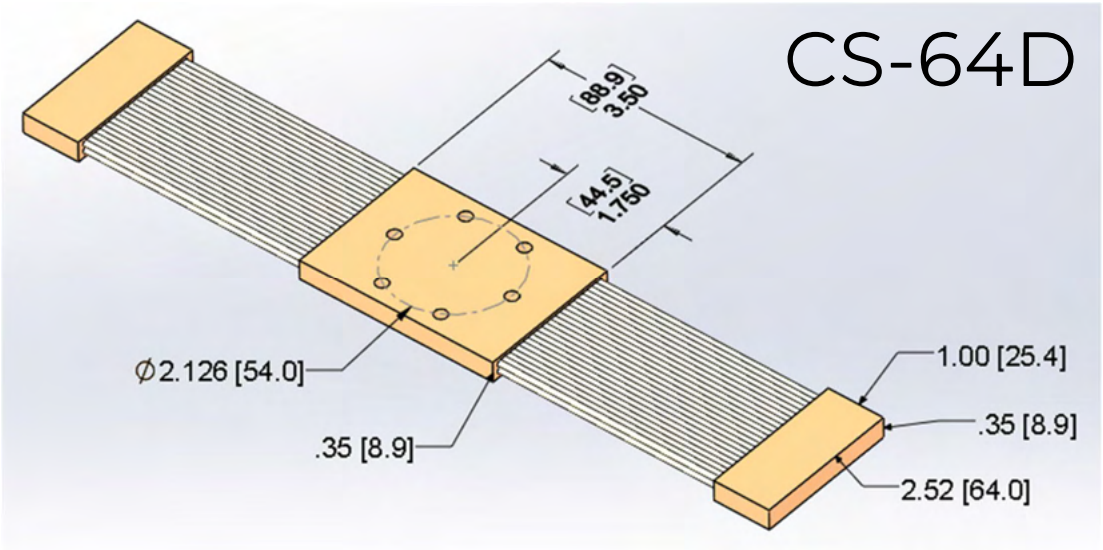
CS-64B



CS-64C



CS-64D



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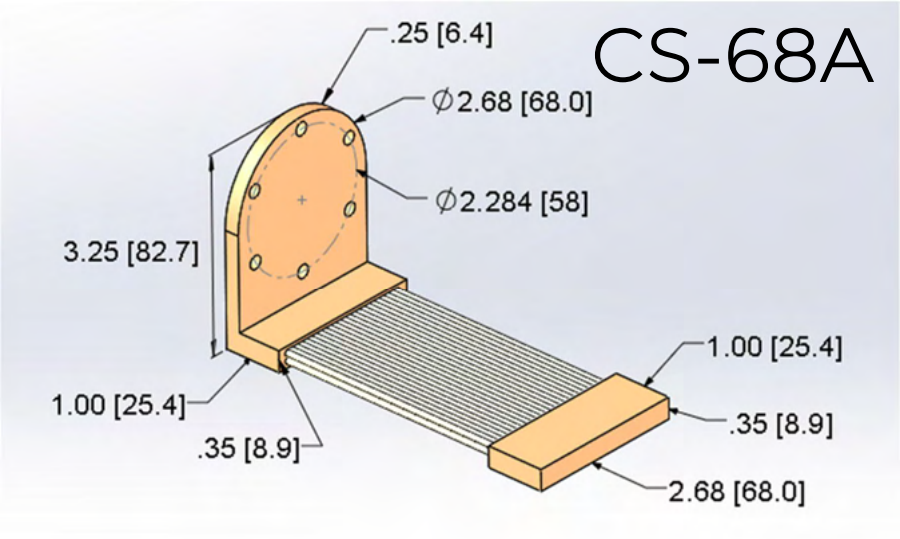
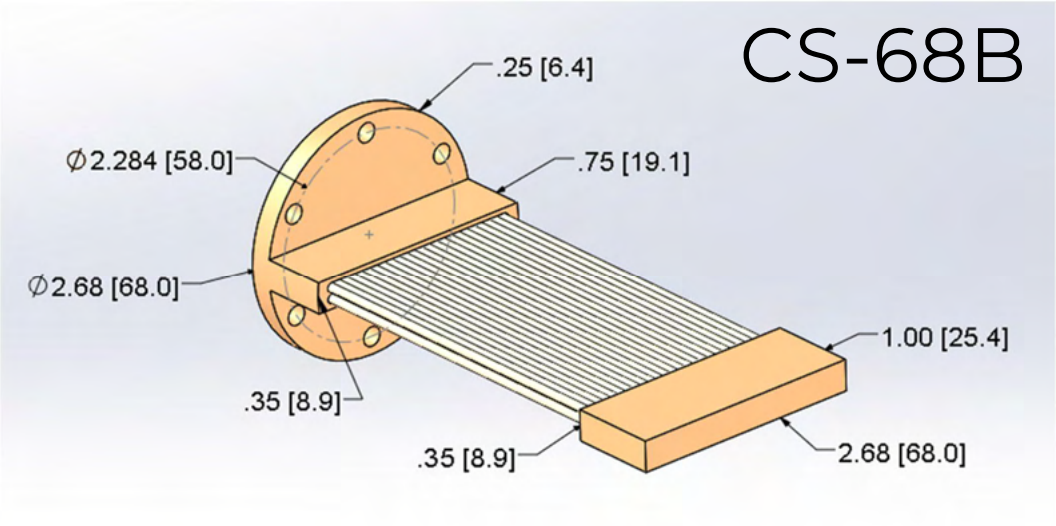
CS™ - 68 (Ø68MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (24x2):

@300K: 0.544 W/K
@40K: 1.496 W/K
@10K: 1.360 W/K
@4K: 0.517 W/K
Approximate Mass: Varies

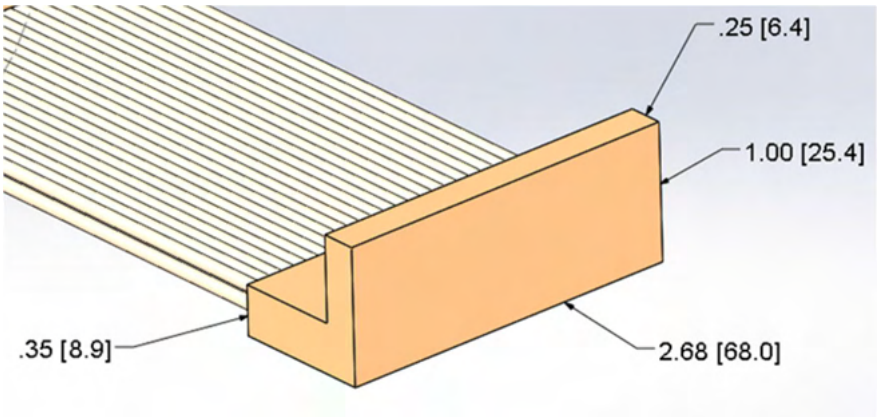
*Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E models) offer roughly double the performance. Contact TAI for Predictions.





L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number (“CS-68AL”).



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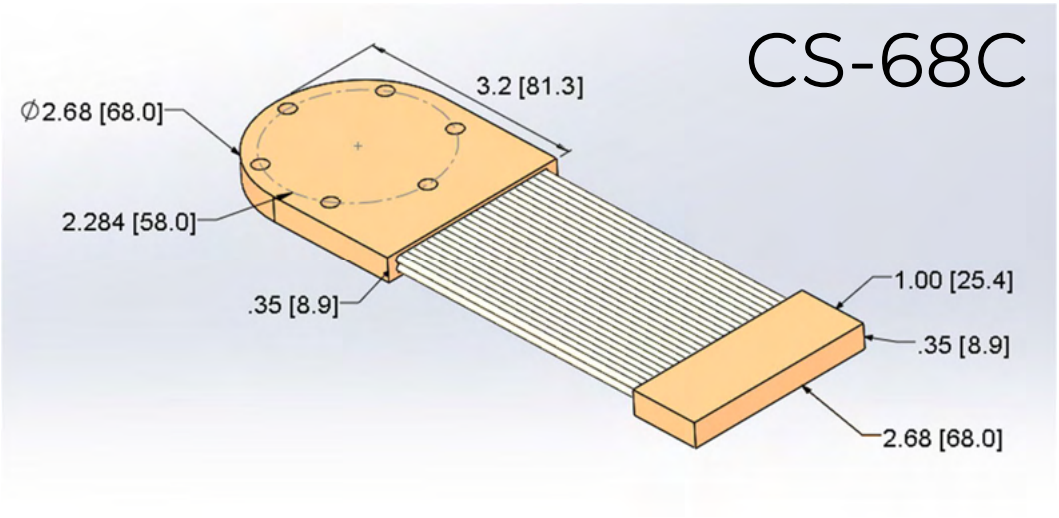
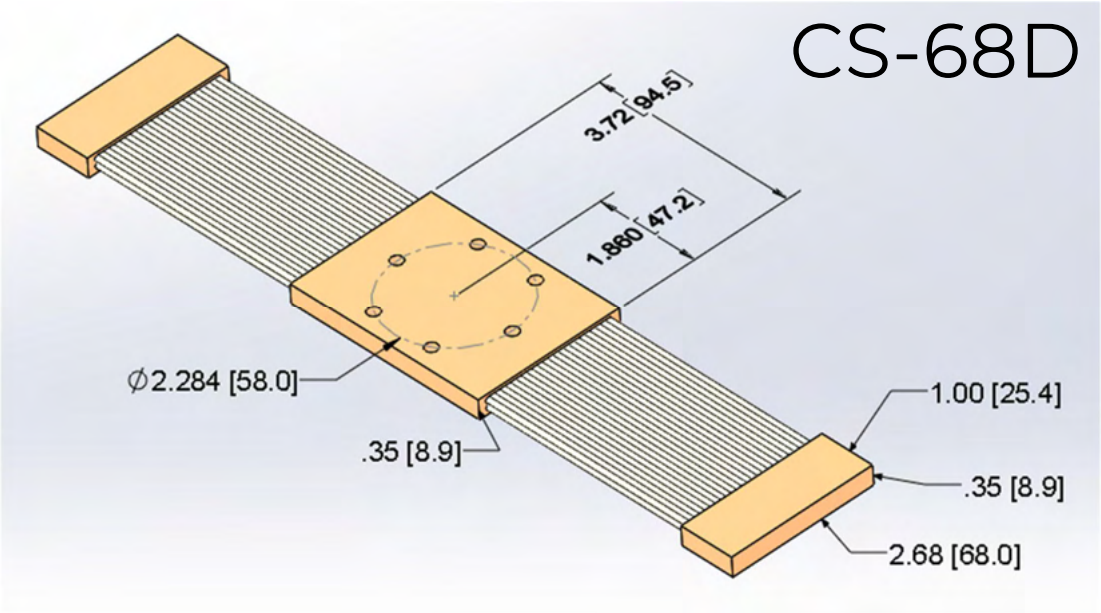
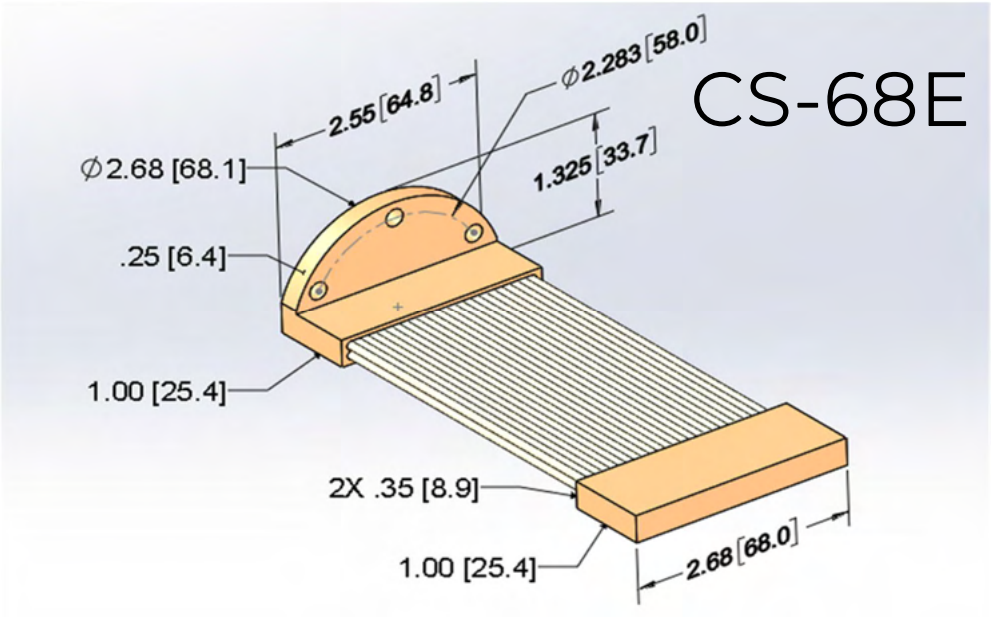
CS-68C

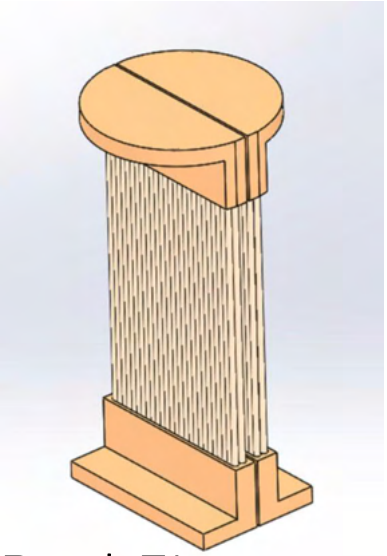


CS-68D



CS-68E





Dual-EL

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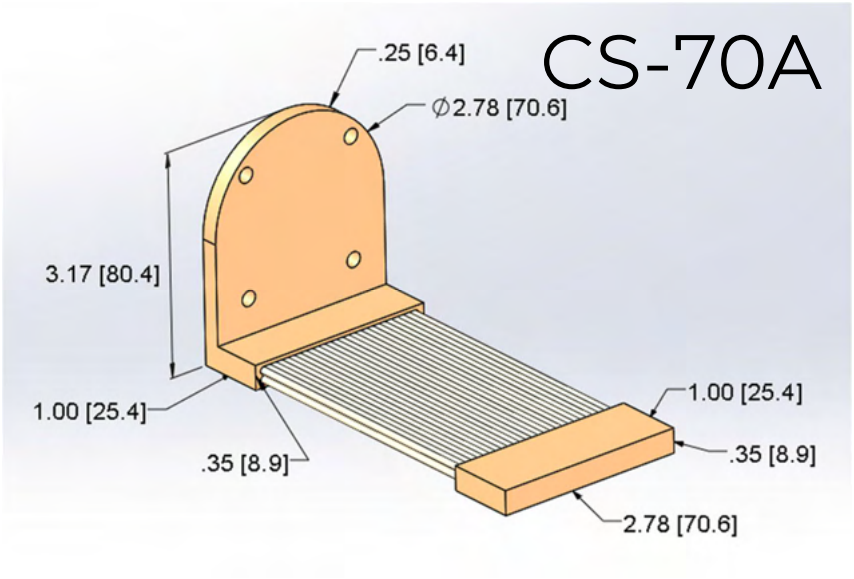
CS™ - 70 (Ø70.6MM)

*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (25x2), 0.10"Ø :

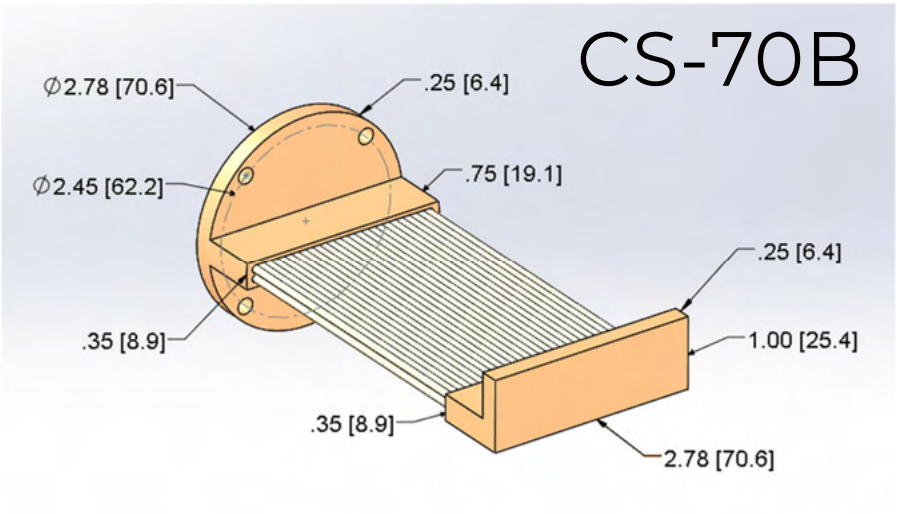
@300K: 0.577 W/K
@40K: 1.535 W/K
@10K: 1.446 W/K
@4K: 0.549 W/K
Approximate Mass: Varies

*Conductance varies slightly by sub-model, and dual strap assemblies (-D and –E models) offer roughly double the performance. Contact TAI for Predictions.

CS-70A

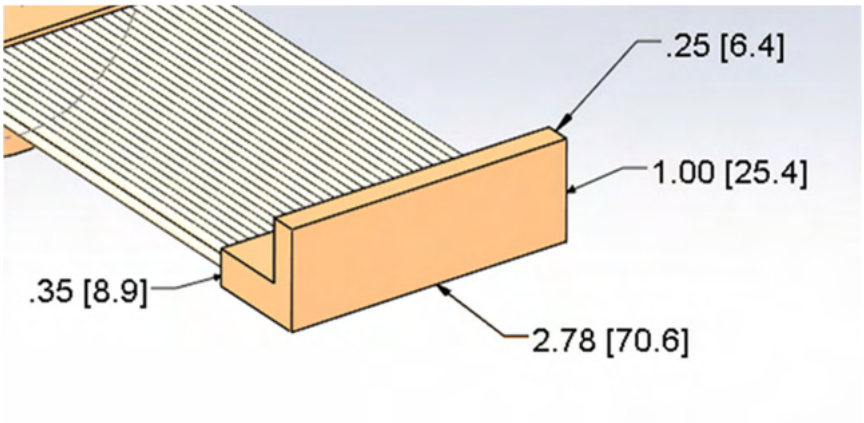


CS-70B



L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-70AL").



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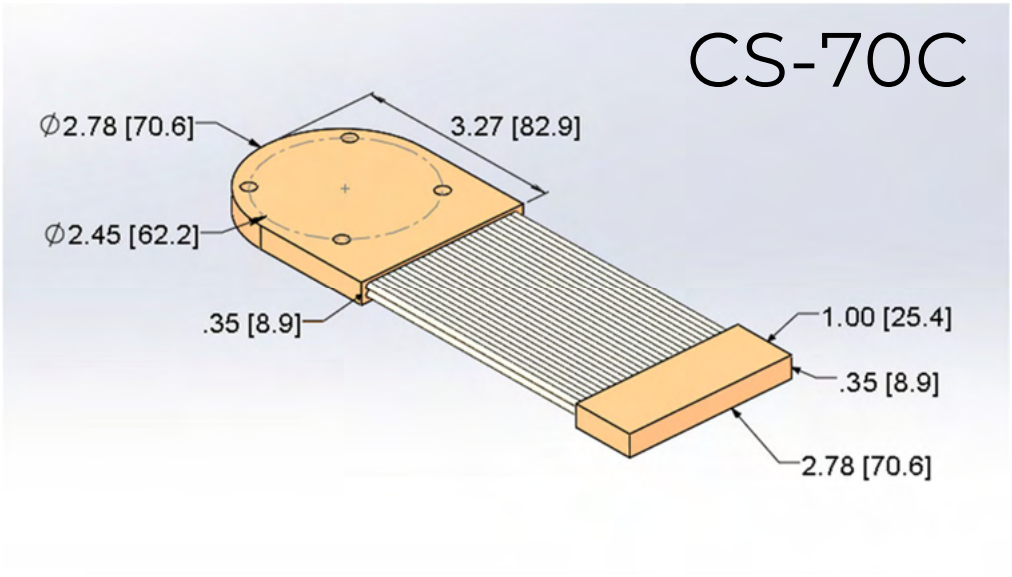
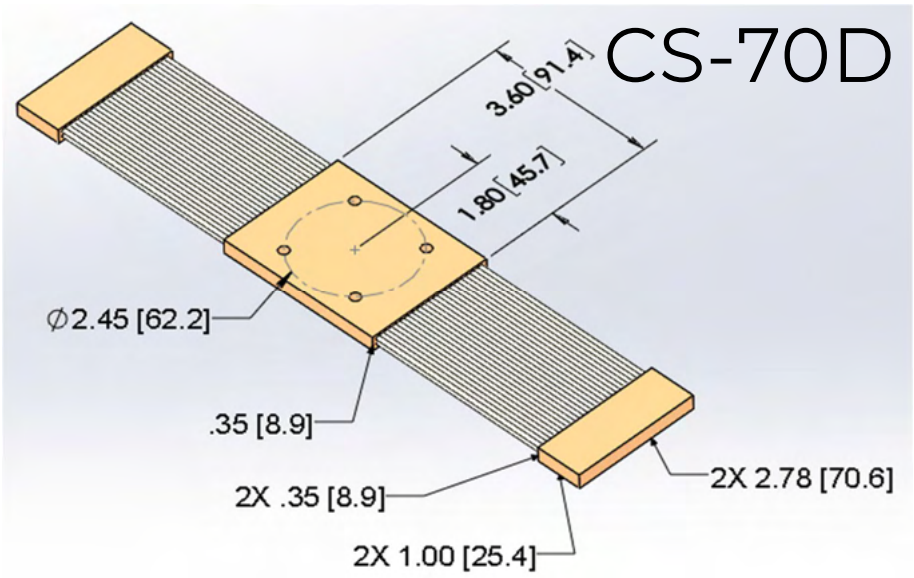
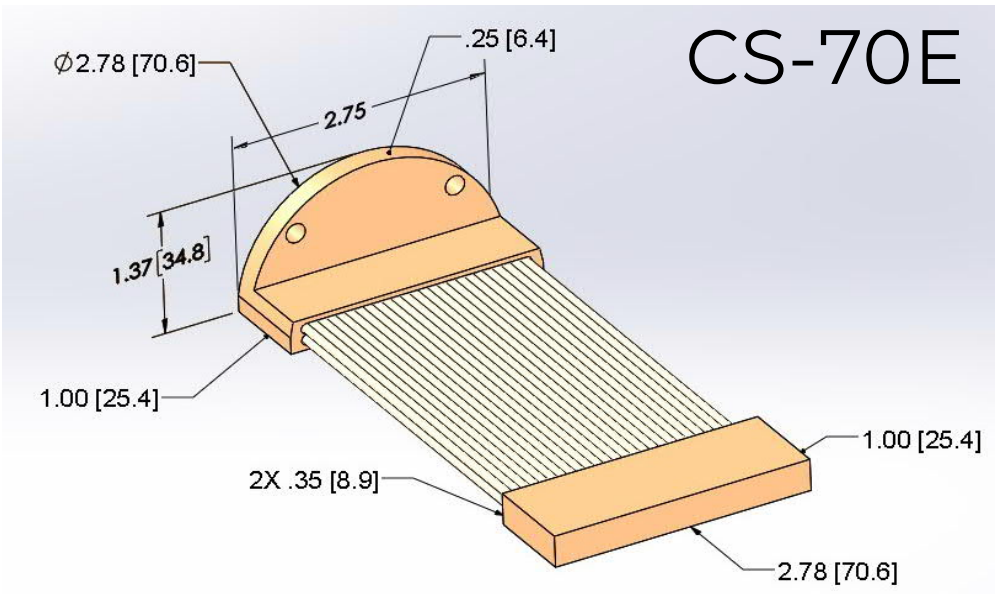
CS-70C

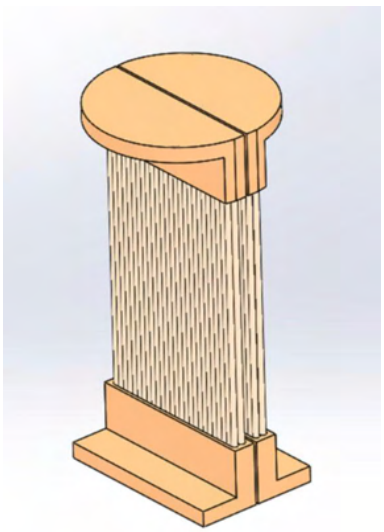


CS-70D



CS-70E





Dual-EL

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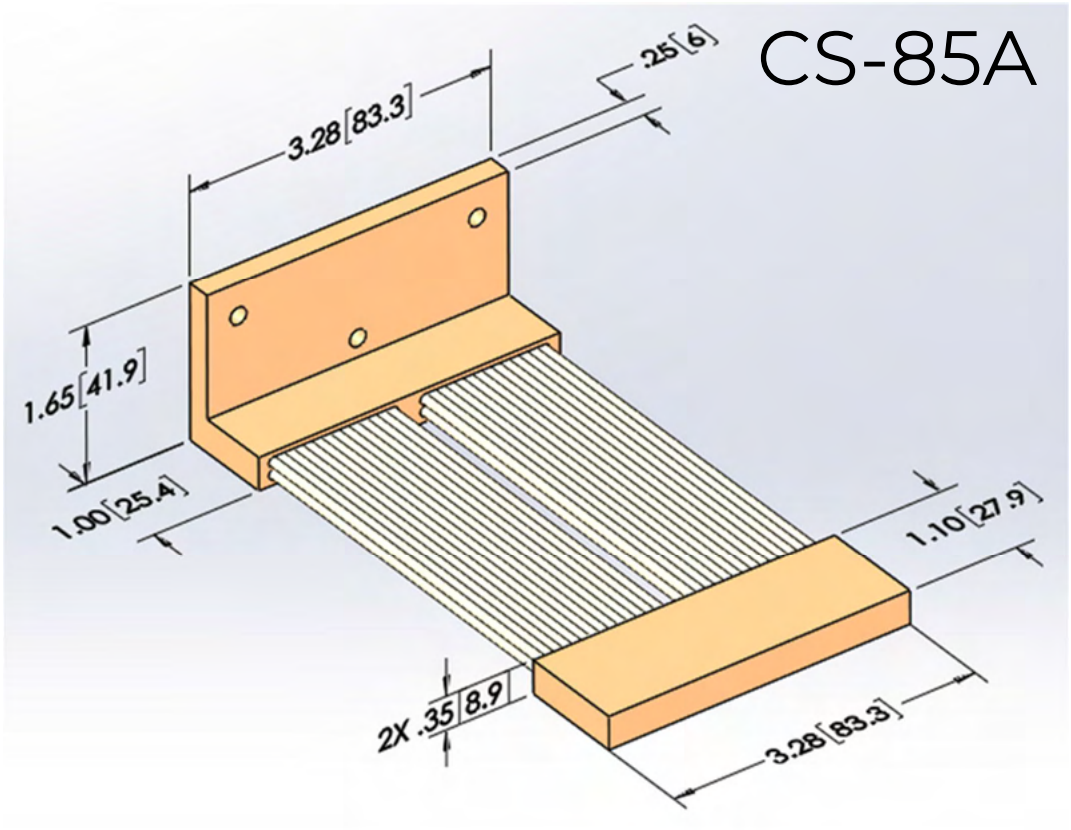
CS™-85 (Ø85.7MM)

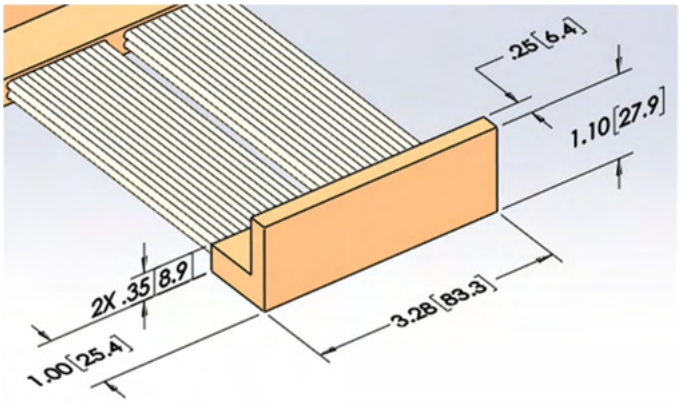
*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (28x2), 0.10"Ø, 2 units per cooler:

@300K: 0.63 W/K (per strap)
@40K: 1.75 W/K (per strap)
@10K: 1.59 W/K (per strap)
@4K: 0.60 W/K (per strap)
Approximate Mass: Varies

*Conductance varies slightly by sub-model. Contact TAI for **Predictions.**

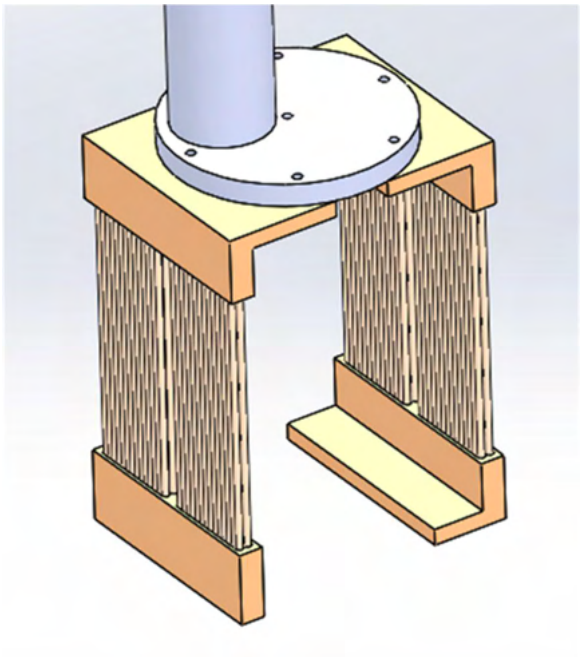
If you require higher thermal performance (but cannot reduce RL), TAI can design larger **adapter brackets to attach** more straps, or stack/"nest" straps, for a small NRE fee, **and the cost of any additional** straps required.





L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-85AL").



CS-85A and CS-85AL Installed on PT405 Cryocooler

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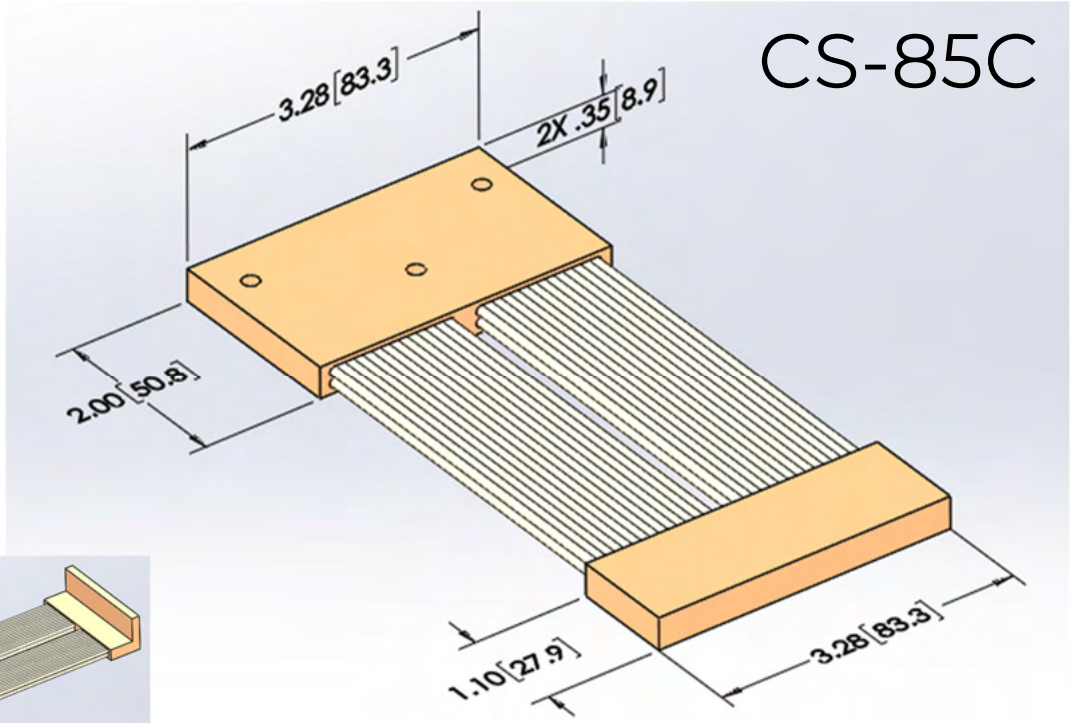
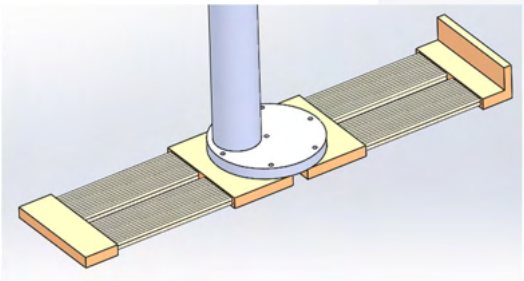
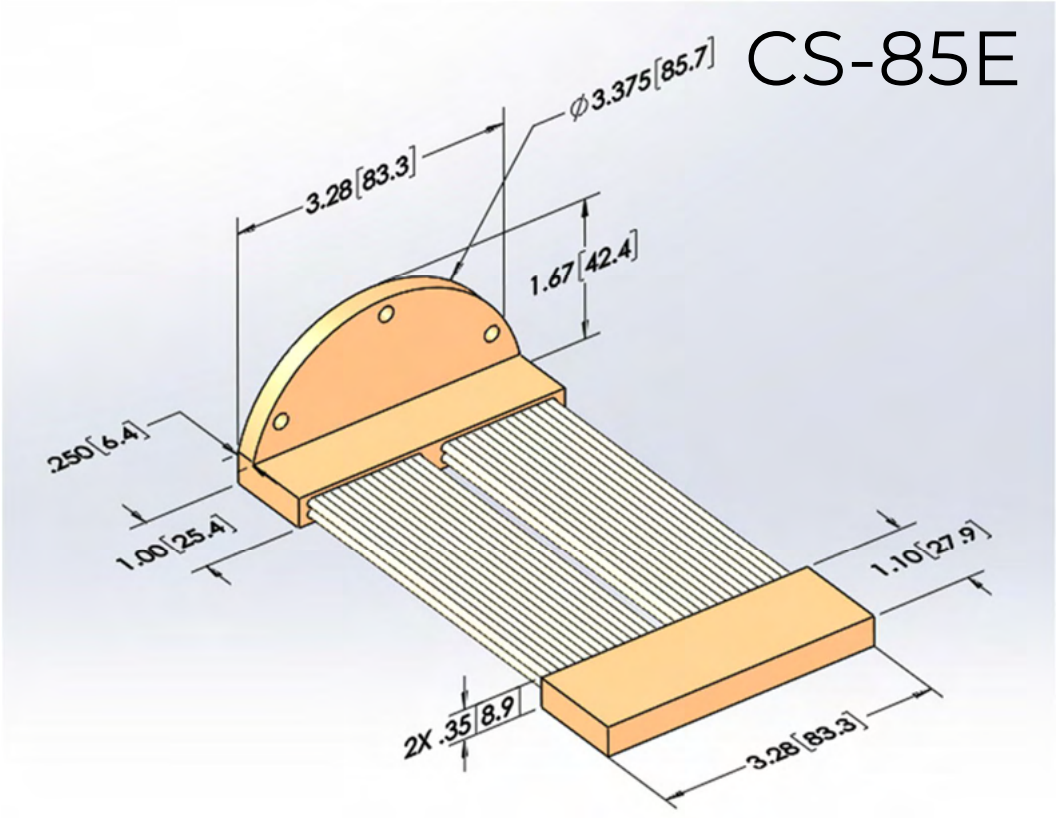
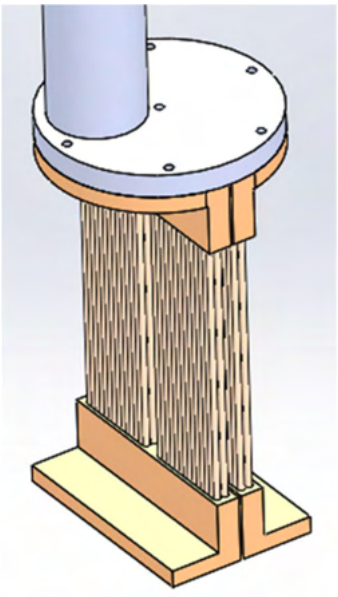
CS-85C





CS-85E





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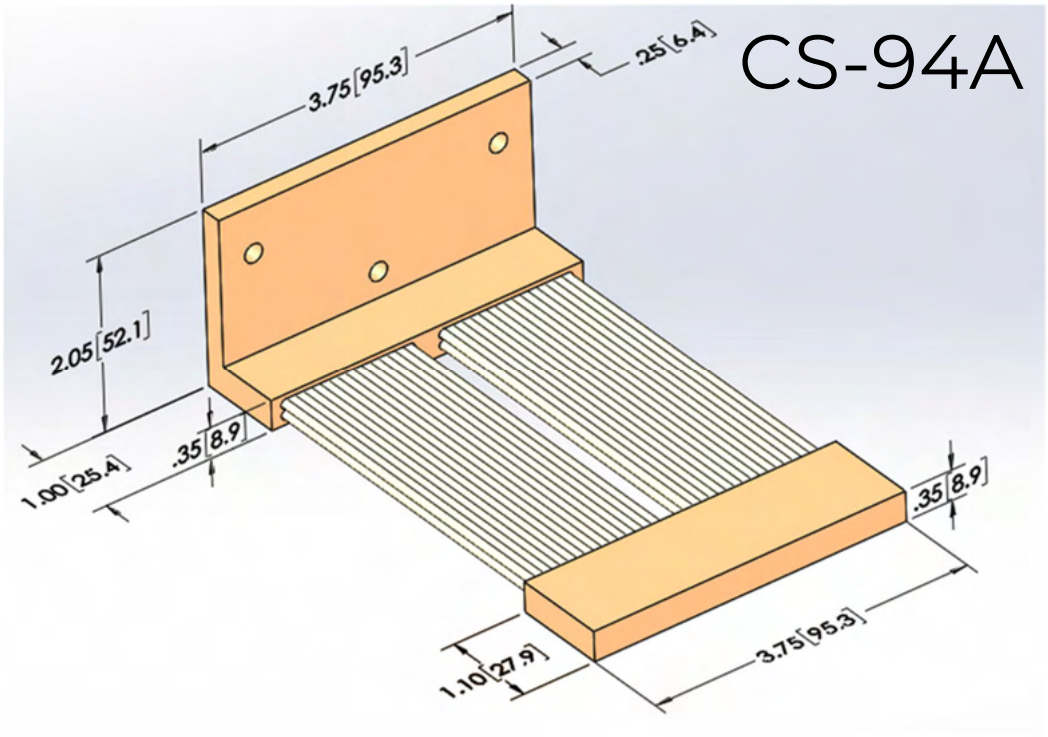
CS™-94 (Ø94MM)

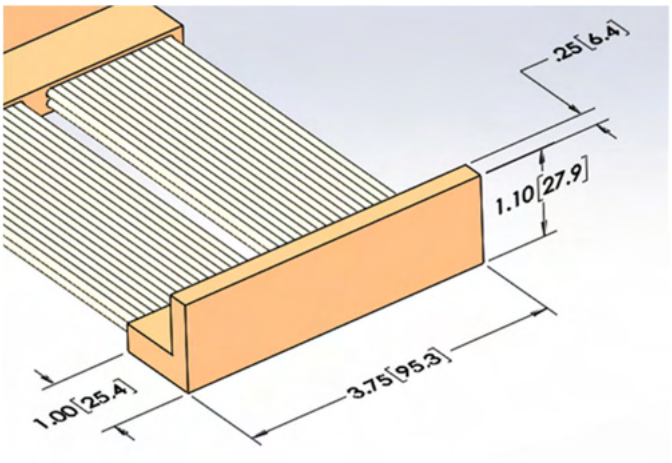
*Performance Data & Mass
RL = 100mm, OFHC UltraFlex™ I Cabling (32x2), 2 units per cooler:

@300K: 0.73 W/K (per strap)
@40K: 2.00 W/K (per strap)
@10K: 1.82 W/K (per strap)
@4K: 0.69 W/K (per strap)
Approximate Mass: Varies

*Conductance varies slightly by sub-model. Contact TAI for Predictions.

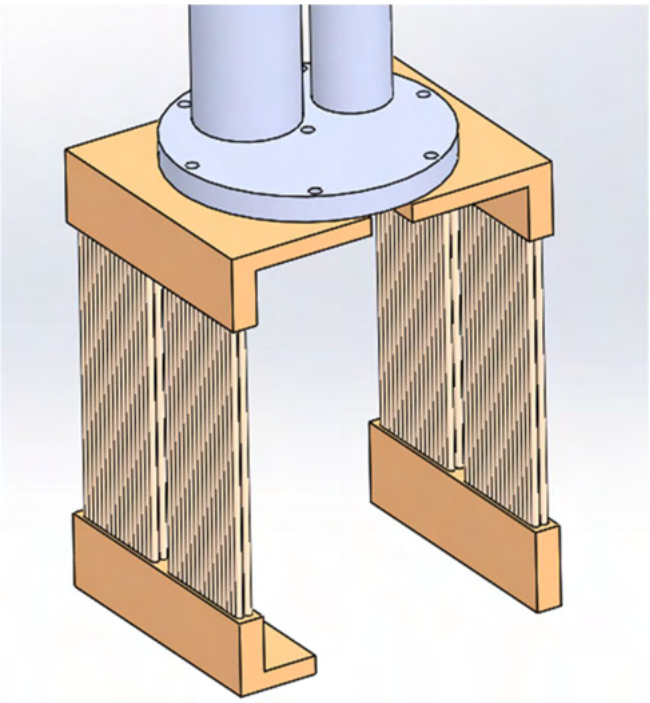
If you require higher thermal performance (but cannot reduce RL), TAI can design larger **adapter brackets to attach** more straps, or stack/"nest" straps, for a small NRE fee, and **the cost of any additional** straps required.





L-Fittings

All models are available with optional L fittings, and denoted by adding an L to the part number ("CS-94AL").



CS-94A and CS-94AL Installed on PT420 Cryocooler

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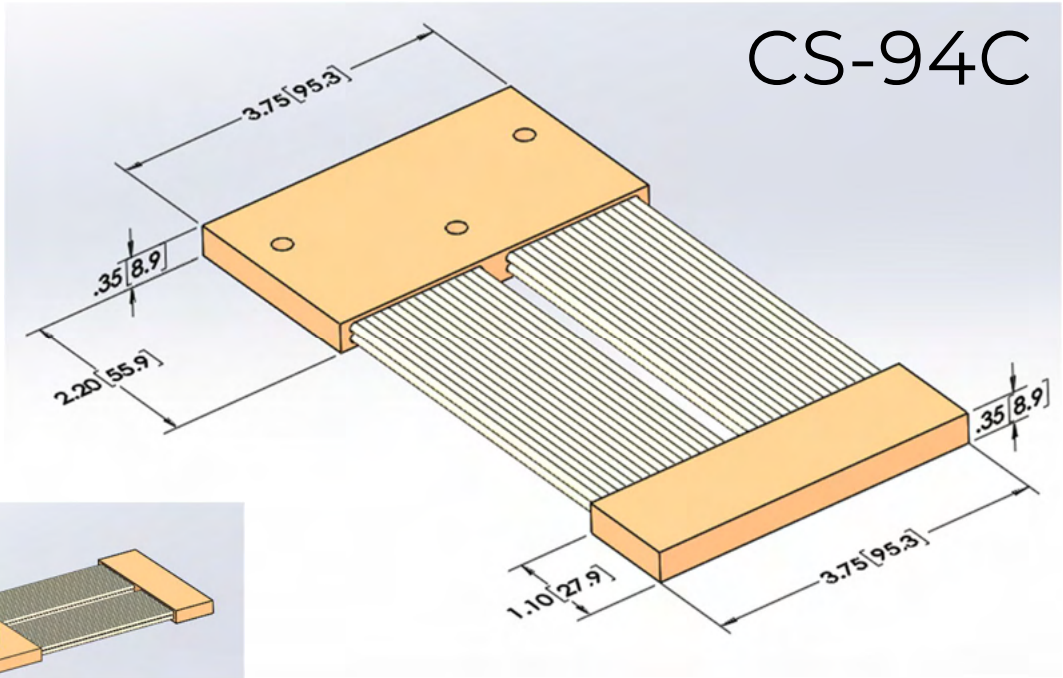
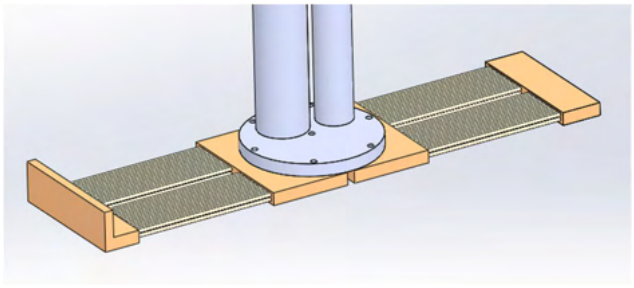
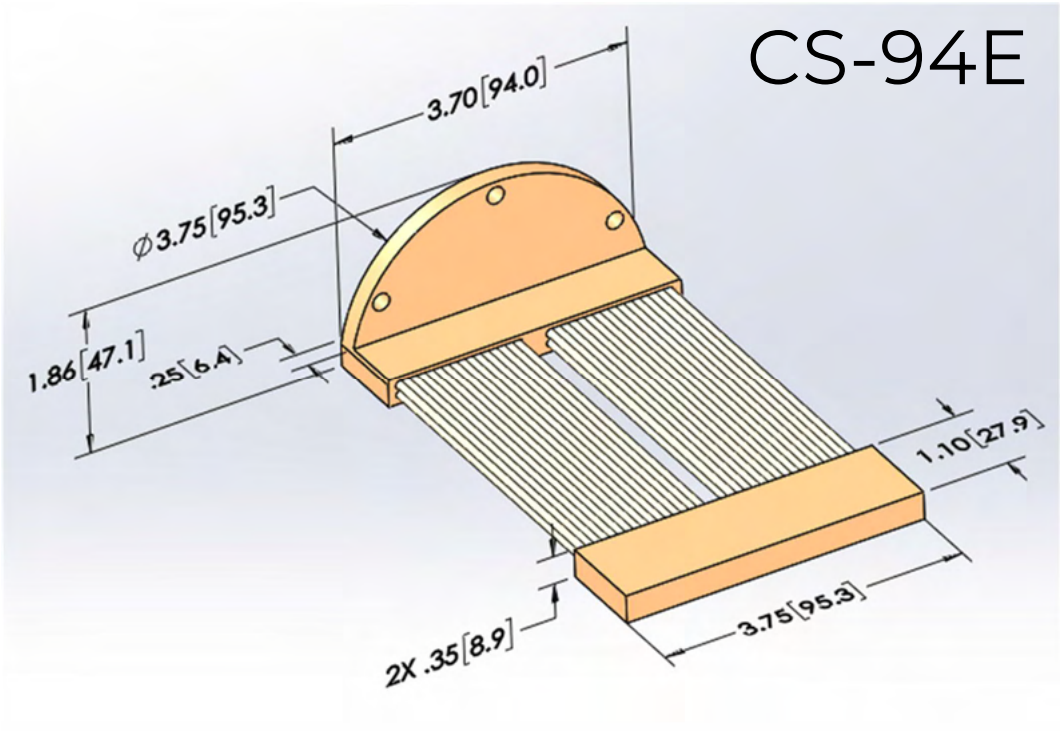
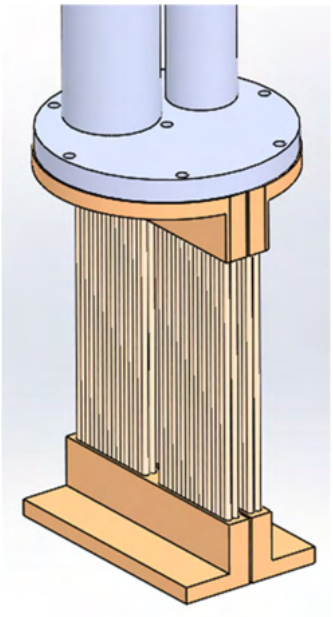
CS-94C





CS-94E





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GOLD & NICKEL PLATED CuTS®

TAI offers the industry's only gold and nickel-plated thermal strap products. For customers requiring gold plating, we offer multiple diffusion barrier options (both magnetic and non-magnetic), and straps can be plated to certain ASTM standards (B-488 Type I & III, Code C & D, for example). However, our two most popular gold plating options are TAI's "Lab Grade" (99.7% pure au, non-magnetic diffusion barrier), and our "NASA Grade" (99.99% pure, "hard gold" plating, with a Knoop Hardness of 180, and electroless ni diffusion barrier). Plating does increase unit cost and lead time by 1 - 2 weeks (depending on type).

Plated straps are designed, assembled, plated, and cleaned, using proprietary methods (developed by our experts), to ensure all straps are as clean as possible. While our customers consider them UHV-compatible/ready, we always recommend a vacuum bake out prior to installation in sensitive UHV and optical applications (as we cannot guarantee cleanliness to a specific spec). RGA Spectra analysis demonstrated that TAI's plated straps are as clean as non-plated CuTS® that were ultrasonically cleaned and subjected to a standard vacuum bake out (24 hours at 150C).

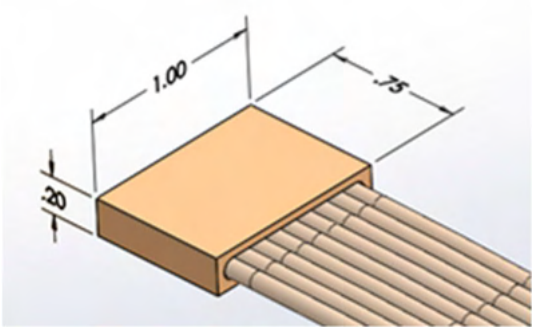
Plating has a negligible impact on stiffness and thermal performance (at room temperature). However, gold-plating greatly reduces resistance losses at cryogenic temperatures).

COMPACT CuTS®—LOW PROFILE END

All Standard OFHC UltraFlex I CuTS® models (P4—P7 series), are available in an optional "Compact CuTS®" version (for P4 models, contact TAI; the available bolt pattern is limited).

All compact model end fittings are reduced in length from 1.0" to just 0.75", and end fitting thicknesses are reduced from 0.25" down to 0.20" (for single row straps), and from 0.35" to 0.30" (for double row units).

End fittings of compact straps are 30-40% lighter than their standard model counterparts, and though the overall "footprint" is smaller, the average conductance/performance loss between compact and standard models is less than 2%.



P6-501—Compact CuTS® Model

ALUMINIZED MYLAR® SLEEVES

TAI can modify any of our custom and standard model copper strap products to incorporate an aluminized mylar sleeve for a small additional fee.

Mylar® is secured using kapton tape, and frequently used by laboratory customers for radiation heat transfer control and other reasons.

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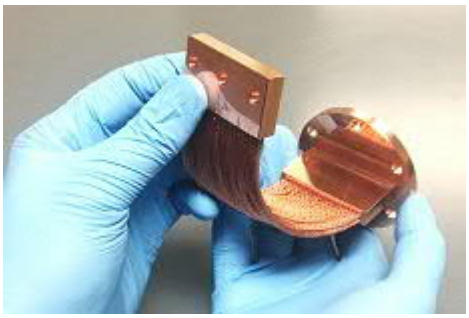
CuTS® DESIGN GALLERY

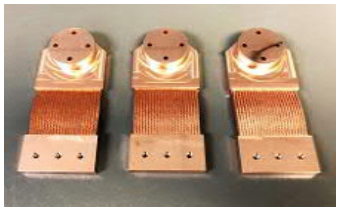
TAI has designed, fabricated and tested tens of thousands of copper thermal straps for space, airborne, and terrestrial applications. While many of our straps are used in space & satellite applications by NASA, and aerospace organizations across the globe, they are more commonly used in laboratory and commercial electronics applications.

These straps are not only a testament to our expertise, but our ability to accommodate a comprehensive array of customer demands. The following are just a few examples of the thousands of straps we have manufactured. To visit more design galleries, use links below:

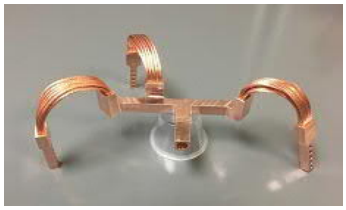
CuTS Design Gallery 1
CuTS Design Gallery 2
CuTS Design Gallery 3



CS-68B Cryocooler Series CuTS®

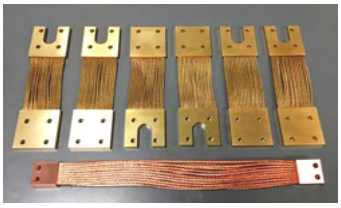


Cryocooler Post-Type Fittings



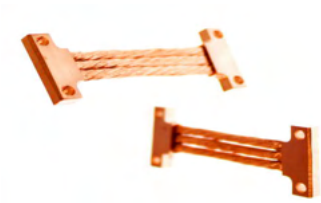
Dual and Tri-Armed Custom CuTS®

Pulse Tube Cold Head Adapter Fittings

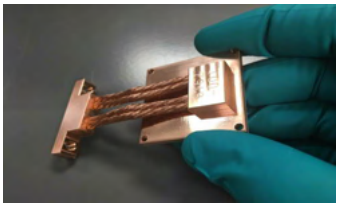


Lab Grade Gold Plated CuTS®

Aluminum 6061 End Fittings

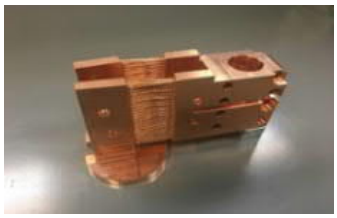


T-Shaped, Low Profile Fittings

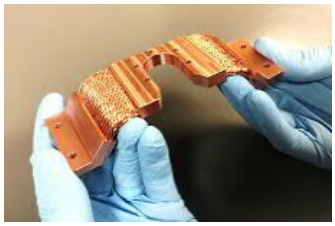


FPGA/Electronics Box Interface

1st Stage Cryocooler CuTS®

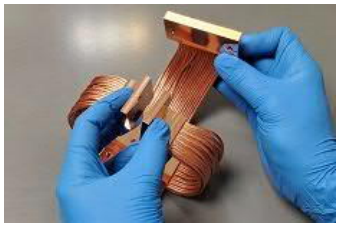


Custom Cryocooler CuTS®



Dual-Armed Cryocooler CuTS®

Heat Pipe Interface & Clamp Plate



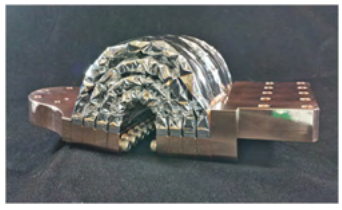
3-Armed SHI RDK 415D CuTS®

Telescope Custom CuTS®:

Optional 0.2” Diameter Cu Cabling for increased performance, with Counter-bored Bolt Holes and Pins

Nested Cryocooler Custom CuTS®:

Optional Aluminized Mylar Overwrap. Assembly contains 4 nested, double row thermal straps



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