Coaxial Cable

Specifications

	Type SC	Type SS	Type SR
Dimensions			
Center conductor—AWG (diameter)	32 (0.2032 mm [0.008 in])	32 (0.2032 mm [0.008 in])	37 (0.1143 mm [0.004 in])
Dielectric/insulating material (diameter)	0.406 mm (0.016 in)	0.406 mm (0.016 in)	0.38 mm (0.015 in)
Shield (diameter)	0.711 mm (0.028 in)	0.711 mm (0.028 in)	0.51 mm (0.02 in)
Drain wire (parallel to conductor)	NA	NA	NA
Jacket outer dimension	1.0 mm (0.04 in)	1.0 mm (0.04 in)	0.51 mm (0.02 in)
Material			
Center conductor	Stranded copper[1]	304 stainless steel[2]	Carbon steel[3]
Dielectric/insulating material	Teflon® FEP	Teflon® FEP	Teflon® PTFE
Shield	Braided gold-plated copper[4]	304 braided stainless[5]	304 stainless steel[6]
Drain wire	NA	NA	NA
Jacket material	Teflon® FEP	Teflon® FEP	NA
Jacket color	Gold	Gray	NA
Electrical properties			
Resistance Ω/m (Ω/ft)			
Center conductor at 293 K (20 °C)	0.282 (0.086)	23.62 (7.2)	4.30 (1.31)
Shield at 296 K (23 °C)	0.085 (0.026)	3.61 (1.1)	8.63 (2.63)
Drain wire at 296 K (23 °C)	NA	NA	NA
Center conductor maximum DC voltage	600 V	600 V	700 V
Center conductor maximum DC current	200 mA	200 mA	200 mA
Temperature range	<1 K to 400 K	10 mK to 473 K	10 mK to 400 K
Characteristic impedance	35 Ω at 10 MHz	40 Ω at 10 MHz	50 Ω (±2 Ω)
Nominal capacitance at 5 kHz	154.2 pF/m (47 pF/ft)	173.9 pF/m (53 pF/ft)	95.14 pF/m (29 pF/ft)

[1] 65 strands of 50 AWG
[2] 64 strands of 50 AWG 304 SS wire
[3] Silver-plated copper-clad carbon steel (0.103 mm outer diameter carbon steel covered by 0.0057 mm thick copper cladding covered by 0.001 mm thick silver plating
[4] 12 × 3 matrix of 42 AWG wire
[5] 12 × 4 matrix of 44 AWG wire
[6] A seamless tubular metal jacket serves as the outer conductor/shield

Ultra miniature coaxial cable – Type SC and SS

- Very flexible
- Long flex life
- Available in two configurations:

  SC – stranded copper conductors

  SS – stranded 304 stainless steel conductors

Ultra miniature coaxial cable is for use when a strong and flexible cable is needed. Type SC is recommended when low conductor resistance is a prime consideration. Type SC and type SS are mechanically the most flexible, due to their braided construction. Type SS is recommended for use when both shielding and low thermal losses are important.

For technical specifications on types SS, C, SC and SR, see page 139.

Thermal conductivity of copper—units are W/(m·K)

	4 K	20 K	30 K	77 K	300 K
RRR[8] = 20	122	719	870	502	397
RRR = 100	460	2460	2070	533	407

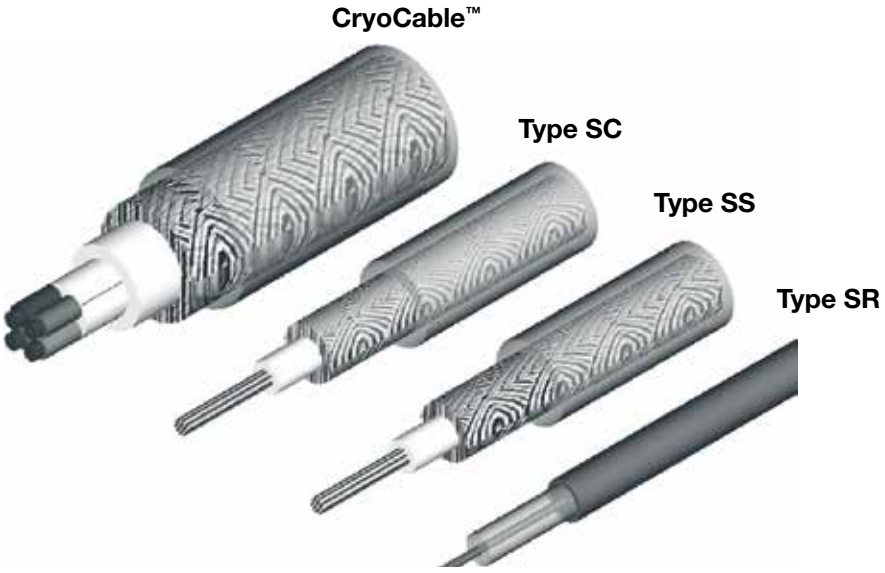
[8] *RRR = residual resistance ratio*

$$\frac{R_{273\,K}}{R_{4.2\,K}} = RRR$$

	Nominal attenuation (dB/m)	
	SC	SS
1 MHz	0.108	0.569
5 MHz	0.240	1.272
10 MHz	0.344	1.799
15 MHz	0.421	2.850
20 MHz	0.486	2.545
50 MHz	0.769	4.031
100 MHz	1.090	5.694
500 MHz	2.453	12.749
1 GHz	3.488	18.048
2 GHz	—	—
5 GHz	7.968	40.526

Ordering information

Part number	Description
CC-SC-25	Stranded copper, 7.6 m (25 ft)
CC-SC-50	Stranded copper, 15 m (50 ft)
CC-SC-100	Stranded copper, 30 m (100 ft)
CC-SC-500	Stranded copper, 152 m (500 ft)
CC-SS-25	Stranded stainless, 7.6 m (25 ft)
CC-SS-50	Stranded stainless, 15 m (50 ft)
CC-SS-100	Stranded stainless, 30 m (100 ft)
CC-SS-500	Stranded stainless, 152 m (500 ft)



Semi-rigid coaxial cable—type SR

- Easily bent, coiled, stripped, machined, soldered, or connected without impairing performance
- Solid center conductor provides the optimum geometrical surface for transmission
- Low standing wave ratio (SWR) with a dielectric controlled to exacting tolerances
- Low thermal conductivity (≈0.4 W/(m·K) at 4.2 K)[9]
- Matching minimizes reflective power loss
- Provides shielding isolation for virtually no extraneous signal pickup
- Tubular outer conductor offers minimum size and maximum conductor integrity; stainless steel jacket can be soldered directly to circuit boards
- 37 AWG, silver-plated copper-weld steel center conductor

[9] *Thermal conductivity at low temperatures is dominated by the copper cladding around the center conductor*

This cable transmits and receives high-speed, high-frequency microwave signals. Typically used for transmission lines in cryogenic-vacuum test systems.

To remove the outer conductor:

1. Score jacket
2. Bend at score until shield kinks, fatigues, and breaks
3. Slide off outer conductor

Extreme caution must be used in this process to avoid damage to the cable

SR coaxial cable frequency response specifications		
	Insertion loss dB/m (dB/ft)	Power CW (20 °C, sea level, W)
0.5 GHz	4.43 (1.35)	7.6
1.0 GHz	6.27 (1.91)	5.3
5.0 GHz	14.09 (4.30)	2.4
10.0 GHz	20.01 (6.10)	1.7
20.0 GHz	28.45 (8.67)	1.2

Ordering information

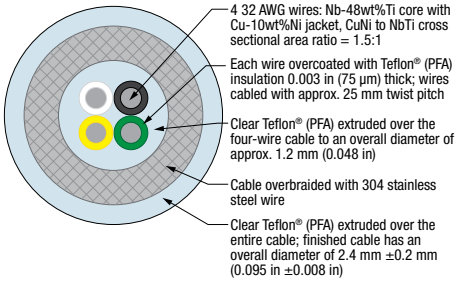
Part number	Description
CC-SR-10	Semi-rigid, 3 m (10 ft)

CryoCable™—type CYRC

- **Robust:** the NbTi wire cores are strong and fatigue resistant, and the cable overbraid of 304 stainless steel adds significant strength and crush resistance
- **Low heat leak** due to all metal alloy and Teflon® construction
- **Solderable:** the CuNi wire surface is easy to solder with conventional rosin fluxes
- **Cryo-compatible:** all Teflon® (PFA) insulation is heat strippable for ease of preparation

A robust, 4-wire cable for use in cryogenic environments to room temperature is now available. The cable is designed around 32 AWG (203 µm) diameter superconductive wires consisting of a NbTi core (128 µm diameter) and a Cu-10% Ni jacket.

Minimum bend radius: 15 mm (0.6 in)
Critical temperature: 9.8 K
Critical field: 10 T



	Temperature (K)		
	295	77	4.2
Wire resistance — per wire (Ω/m)	9.2	8.4	0[10]
Overbraid resistance (Ω/m)	0.90	0.64	0.62
Thermal conductivity — entire cable assembly (Ω/(m·K))	7.6	2.8	0.17

[10] *Superconducting*

Field	Critical current (per wire)
3 T	35 A
5 T	25 A
7 T	15 A
9 T	6 A

Ordering information

Part number	Description
CRYC-32-25	CryoCable™, 7.6 m (25 ft)
CRYC-32-50	CryoCable™, 15 m (50 ft)
CRYC-32-100	CryoCable™, 30 m (100 ft)