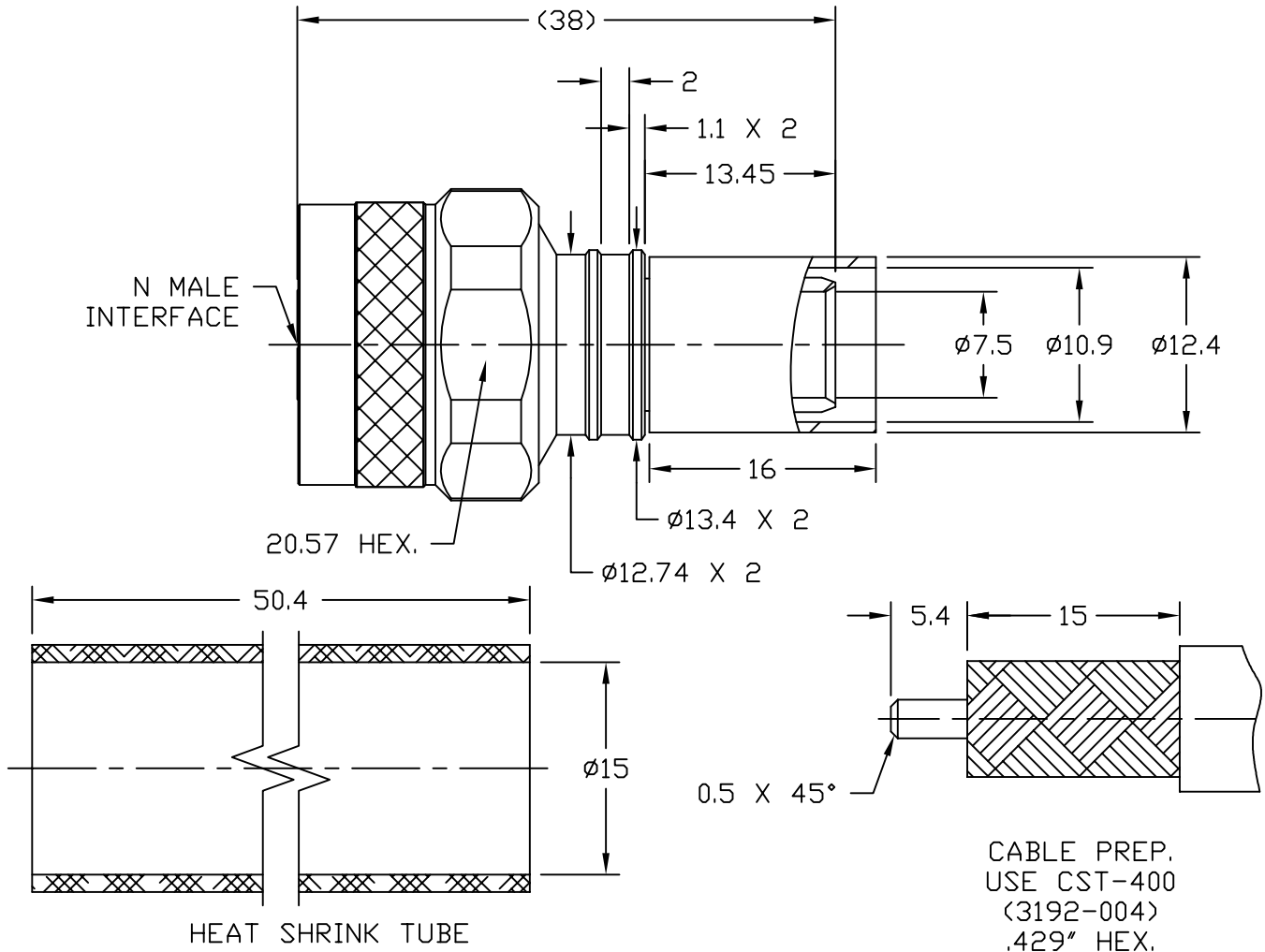


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| SYM | REVISION DESCRIPTION    | DFTM     | DATE    | APPD     | DATE    |
|-----|-------------------------|----------|---------|----------|---------|
| A   | RELEASED FOR PRODUCTION | D. J. H. | 6/13/11 | J. D. B. | 6/27/11 |
| B   | CHANGED PER CDC #33920  | D. J. H. | 8/12/11 | J. D. B. | 8/15/11 |



|                              |  |                             |                                |
|------------------------------|--|-----------------------------|--------------------------------|
| Reference standard           | IEC60169-16                                  | III. Material and plating:  |                                |
| I. Electric Performance      |  | <b>Component</b>            | <b>Material</b>                |
| Impedance(Ω):                | 50   | inner conductor             | Brass                          |
| Frequency Range:             | DC-6GHz                                      | outer conductor             | Brass                          |
| VSWR:                        | ≤1.25  | tube                        | Copper                         |
| Insert Loss: (dB)            | ≤ 0.05                                       | nut                         | Brass                          |
| Insulation resistance (MΩ)   | >5000  | gasket                      | Silicone rubber                |
| Work voltage (V)             | 1500   | insulator                   | PTFE                           |
| Conductor resistance (mΩ)    | outer conductor <0.2<br>inner conductor <0.8 | IV. Environment             |                                |
| II. Mechanical Performance   |  | Temp.range                  | -55°C~+155°C                   |
| Nut torque                   | 25N.m  | Weather standard            | IEC 60068 55 / 155/ 56         |
| (Nut) Whorl pull             | 1000N  | Thermal shock               | US MIL-STD 202,Meth.107,Cond.B |
| Tensile force(cable-connect) | 400N   | Vibration                   | US MIL-STD 202,Meth.204,Cond.B |
| Torsion(cable-connect)       | 2N.m   | Shock                       | US MIL-STD 202,Meth.213,Cond.I |
|                              |  | Waterproofing standard IP67 |                                |

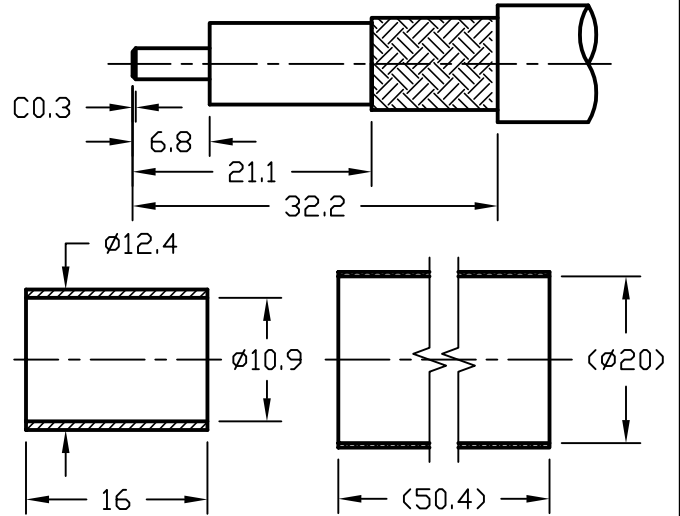
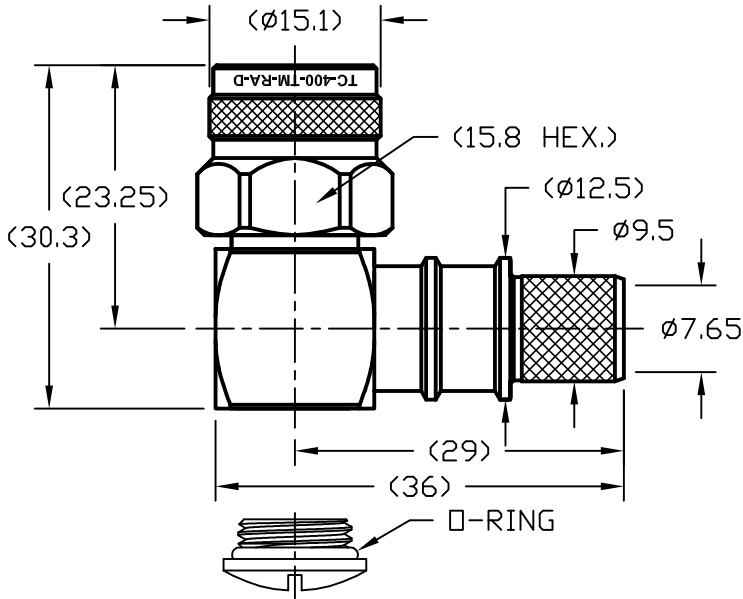
V. Assembly: inner conductor installed and outer conductor crimped

|                      |   |                |   |
|----------------------|---|----------------|---|
| MATERIAL:            | UNLESS OTHERWISE SPECIFIED  | DFTM. D. J. H. | TIMES MICROWAVE SYSTEMS   |
|                      | ALL DIMENSIONS ARE IN mm<br>MACHINED SURFACES FINISH N/A RMS MAX.<br>REMOVE ALL BURRS N/A MAX. BREAK<br>MACHINE CORNERS N/A MAX. FILLET R.<br>TOLERANCES ON DECIMALS<br>.XX ± N/A .XXX ± N/A<br>ANGLES ± 1° FRACTIONS ± N/A | DATE 6/13/11   |   |
| USED ON: 0           |   | CHKD. J. D. B. | <b>EZ-400-NMH-X</b><br>"N" MALE FOR LMR-400 CABLE<br>EZ/CRIMP/NO BRAID TRIM |
|                      |   | DATE 6/27/11   |   |
| SCALE: N/A           | DWG. SIZE A   | APPD. J. D. B. | 1 of 1   SD3190-2590   B  |
| DO NOT SCALE DRAWING | CODE IDENT 68999  | DATE 6/27/11   |   |

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| SYM | REVISION DESCRIPTION         | DFTM   | DATE    | APPD   | DATE    |
|-----|------------------------------|--------|---------|--------|---------|
| A   | RELEASED FOR PRODUCTION      | K.A.M. | 6/3/11  | J.D.B. | 6/3/11  |
| B   | CHANGED PER CDC #34607/36250 | D.J.H. | 9/24/12 | J.D.B. | 9/25/12 |

RECOMMENDED CABLE STRIPPING DIM'S.



NOTES:

- CONTACT PIN IS SOLDERED.
- FERRULE IS CRIMPED TO .429" HEX.

ALL PARTS SATISFIED ROHS REQUIREMENTS

| MATERIALS AND PLATING |                    | UNIT: MICRO-INCHES        |
|-----------------------|--------------------|---------------------------|
| BODY/SHELL            | BRASS C3604        | ALBALOY 80 MIN/COPPER     |
| CONTACT PIN           | BRASS C3604        | GOLD 50 MIN/NICKEL/COPPER |
| INSULATOR             | TEFLON MIL-P-19468 | N/A                       |
| GASKET                | SILICONE           | RED                       |
| FERRULE               | BRASS              | ALBALOY 80 MIN/COPPER     |
| SHRINK TUBING         | PO                 | BLACK                     |

| ELECTRICAL CHARACTERISTICS      |                                    |
|---------------------------------|------------------------------------|
| Impedance                       | 50 $\Omega$                        |
| Frequency range                 | 0~11GHz                            |
| Voltage rating                  | 500V(rms)                          |
| Dielectric withstanding voltage | 1000V                              |
| Contact resistance              | Center contact $\leq 3$ m $\Omega$ |
|                                 | Outer contact $\leq 2$ m $\Omega$  |
| Insulation resistance           | $\geq 5000$ M $\Omega$             |
| Insertion loss                  | According to the cable             |
| RF-leakage                      | N/A                                |
| VSWR                            | $\leq 1.35$ MAX@0-6GHz             |

| MECHANICAL CHARACTERISTICS     |                   |
|--------------------------------|-------------------|
| Force to engage and disengage  | N/A               |
| Center contact retention force | 6 lbs Min         |
| Coupling torque                | 15 in-lbs Min     |
| Coupling nut retention force   | 60 lbs Min        |
| Durability                     | $\geq 500$ cycles |

| ENVIRONMENTAL CHARACTERISTICS |                                 |
|-------------------------------|---------------------------------|
| Temperature range             | -55°C- +125°C                   |
| Thermal Shock                 | MIL-STD-202, Method 107, Cond B |
| Vibration                     | MIL-STD-202, Method 204, Cond B |
| Shock                         | MIL-STD-202, Method 213, Cond I |
| Climatic Class                | IEC 60068 55/155/56             |

|                      |   |                |   |
|----------------------|---|----------------|---|
| MATERIAL:            | UNLESS OTHERWISE SPECIFIED<br>ALL DIMENSIONS ARE IN mm<br>MACHINED SURFACES FINISH 1.6 RMS MAX.<br>REMOVE ALL BURRS 0.15X45° MAX. BREAK<br>MACHINE CORNERS 0.15X45°D MAX. FILLET R.<br>TOLERANCES ON DECIMALS<br>.X $\pm 0.3$ .XX $\pm 0.2$<br>ANGLES $\pm 1^\circ$ FRACTIONS $\pm$ N/A | DFTM: K. A. M. | TIMES MICROWAVE SYSTEMS                                   |
|                      |   | DATE: 6/3/11   |   |
| USED ON: 0-4         |   | CHKD: J. D. B. | <b>TC-400-TM-RA-D</b><br>90° TNC MALE<br>FOR LMR400 CABLE |
|                      |   | DATE: 6/3/11   |   |
| SCALE: N/A           | DWG. SIZE: A  | APPD: J. D. B. | 1 of 1   SD3190-2671   REV B                              |
| DO NOT SCALE DRAWING | CODE IDENT: 68999   | DATE: 6/3/11   |   |

## LMR-<sup>®</sup>400-UF UltraFlex Communications Coax

### Ideal for...

- Drop-in replacement for RG-8/9913 Air-Dielectric type Cable
- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs
- Any application that requires periodic/repeated flexing



• **LMR<sup>®</sup> - UltraFlex** has a stranded center conductor and rubber outer jacket designed for multiple bending/flexing cycles. It is used for both indoor and outdoor applications.

• **Flexibility** and bendability are hallmarks of the LMR-400-UF cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.

• **Low Loss** is another hallmark feature of LMR-400-UF. Size for size LMR has the lowest loss of any flexible cable and comparable loss to semirigid hard-line cables.

• **RF Shielding** is 50 dB greater than typical single shielded coax (40 dB). The multi-ply bonded foil outer conductor is rated conservatively at > 90 dB (i.e. >180 dB between two adjacent cables).

• **Weatherability:** LMR-400-UF cables are designed for outdoor exposure and have a life expectancy in excess of 10 years.

• **Connectors:** A wide variety of connectors are available for LMR-400-UF cable, including all common interface types, reverse polarity, and solder-on center pins. Most LMR connectors employ crimp outer attachment using standard hex crimp sizes.

• **Cable Assemblies:** All LMR-400-UF cable types are available as pre-terminated cable assemblies. Refer to the section on FlexTech for further details.

| Part Description |                |        |       |            |
|------------------|----------------|--------|-------|------------|
| Part Number      | Application    | Jacket | Color | Stock Code |
| LMR-400-UF       | Indoor/Outdoor | TPE    | Black | 54040      |

| Construction Specifications |                               |       |         |  |
|-----------------------------|-------------------------------|-------|---------|--|
| Description                 | Material                      | In.   | (mm)    |  |
| Inner Conductor             | Stranded BC                   | 0.108 | (2.74)  |  |
| Dielectric                  | Foam Polyethylene             | 0.285 | (7.24)  |  |
| Outer Conductor             | Aluminum Tape                 | 0.291 | (7.39)  |  |
| Overall Braid               | Tinned Copper                 | 0.320 | (8.13)  |  |
| Jacket                      | Black Thermoplastic Elastomer | 0.405 | (10.29) |  |

# LMR®-400-UF UltraFlex Communications Coax



## Connectors

| Interface       | Description   | Part Number     | Stock Code | VSWR**<br>Freq. (GHz) | Coupling<br>Nut | Inner<br>Contact<br>Attach | Outer<br>Contact<br>Attach | Finish*<br>Body<br>/Pin | Length<br>in<br>(mm) | Width<br>in<br>(mm) | Weight<br>lb<br>(g) |
|-----------------|---------------|-----------------|------------|-----------------------|-----------------|----------------------------|----------------------------|-------------------------|----------------------|---------------------|---------------------|
| 7-16 DIN Female | Straight Jack | TC-400-716-FC   | 3190-376   | <1.25:1 (2.5)         | NA              | Solder                     | Clamp                      | S/S                     | 1.6 (41)             | 1.13 (28.7)         | 0.281 (127.5)       |
| 7-16 DIN Male   | Straight Plug | TC-400-716-MC   | 3190-279   | <1.25:1 (2.5)         | Hex             | Solder                     | Clamp                      | S/S                     | 1.4 (36)             | 1.40 (35.6)         | 0.268 (121.6)       |
| BNC Male        | Straight Plug | TC-400-BM       | 3190-318   | <1.25:1 (2.5)         | Knurl           | Solder                     | Crimp                      | N/S                     | 1.7 (43)             | 0.56 (14.2)         | 0.063 (28.6)        |
| Mini-UHF        | Straight Plug | TC-400-MUHF     | 3190-520   | <1.25:1 (2.5)         | Knurl           | Solder                     | Crimp                      | N/G                     | 1.1 (28)             | 0.50 (12.7)         | 0.020 (9.1)         |
| N Female        | Straight Jack | TC-400-NFC      | 3190-299   | <1.25:1 (2.5)         | NA              | Solder                     | Clamp                      | N/S                     | 1.6 (41)             | 0.75 (19.1)         | 0.119 (54.0)        |
| N Male          | Straight Plug | SC-400-NM       | 3190-1454  | <1.25:1 (2.5)         | Knurl           | Solder                     | Crimp                      | N/G                     | 1.5 (38)             | 0.75 (19.1)         | 0.090 (40.8)        |
|                 | Straight Plug | TC-400-NM       | 3190-188   | <1.25:1 (2.5)         | Knurl           | Solder                     | Crimp                      | N/G                     | 1.5 (38)             | 0.75 (19.1)         | 0.090 (40.8)        |
|                 | Straight Plug | TC-400-NMC      | 3190-277   | <1.25:1 (2.5)         | Knurl           | Solder                     | Clamp                      | N/G                     | 1.5 (38)             | 0.75 (19.1)         | 0.121 (54.9)        |
|                 | Straight Plug | TC-400-NMH-D    | 3190-552   | <1.25:1 (10)          | Hex/Knurl       | Solder                     | Crimp                      | A/G                     | 1.5 (38)             | 0.89 (22.6)         | 0.113 (51.3)        |
|                 | Right Angle   | TC-400-NMH-RA   | 3190-422*  | <1.35:1 (6)           | Hex             | Solder                     | Crimp                      | S/G                     | 1.8 (46)             | 1.25 (31.8)         | 0.130 (59.0)        |
|                 | Right Angle   | TC-400-NMH-RA-D | 3190-2293* | <1.35:1 (6)           | Hex/Knurl       | Solder                     | Crimp                      | A/G                     | 1.8 (46)             | 1.25 (31.8)         | 0.130 (59.0)        |
| SMA Male        | Straight Plug | TC-400-SM       | 3190-439   | <1.25:1 (8)           | Hex             | Solder                     | Crimp                      | N/G                     | 1.2 (29)             | 0.50 (12.7)         | 0.032 (14.5)        |
| TNC Male        | Straight Plug | TC-400-TM       | 3190-260   | <1.25:1 (2.5)         | Knurl           | Solder                     | Crimp                      | N/S                     | 1.7 (43)             | 0.59 (15.0)         | 0.074 (33.6)        |
|                 | Right Angle   | TC-400-TM-RA    | 3190-442*  | <1.35:1 (2.5)         | Knurl           | Solder                     | Crimp                      | N/G                     | 1.7 (43)             | 0.59 (15.0)         | 0.085 (38.6)        |

\* Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Alballoy \*\*VSWR spec based on 3 foot cable with a connector pair \*Available in bulk pack

**Mechanical Specifications**

| Performance Property      | Units          | US    | (metric) |
|---------------------------|----------------|-------|----------|
| Bend Radius: installation | in. (mm)       | 1.0   | (25.4)   |
| Bend Radius: repeated     | in. (mm)       | 4.0   | (101.6)  |
| Bending Moment            | ft-lb (N-m)    | 0.375 | (0.51)   |
| Weight                    | lb/ft (kg/m)   | .088  | (0.131)  |
| Tensile Strength          | lb (kg)        | 160   | (72.6)   |
| Flat Plate Crush          | lb/in. (kg/mm) | 20    | (0.36)   |

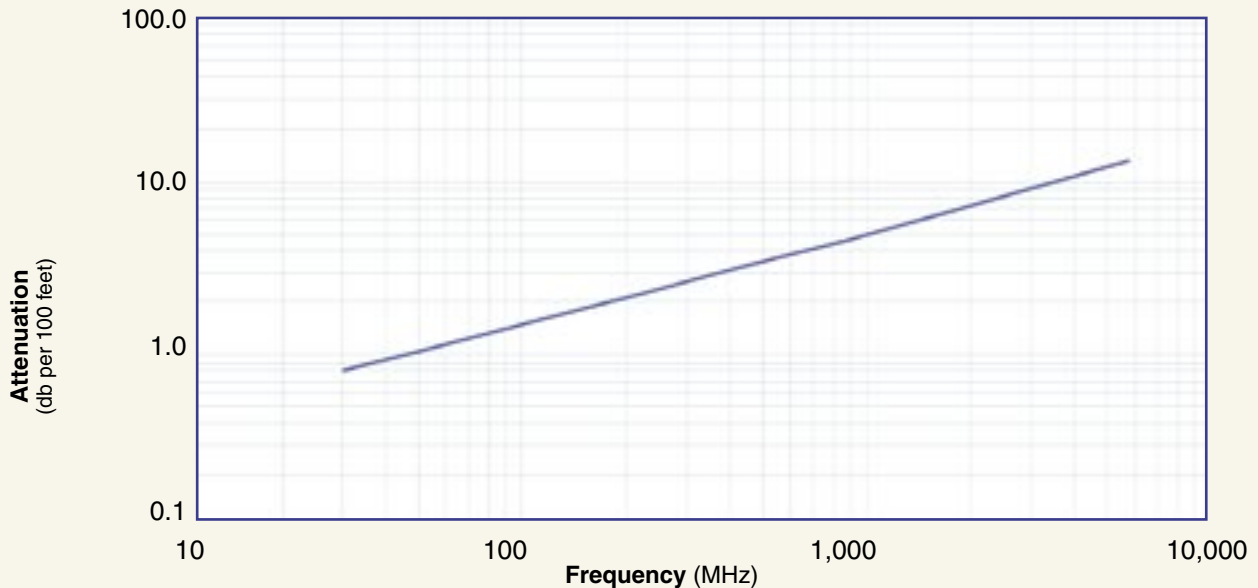
**Environmental Specifications**

| Performance Property           | °F       | °C      |
|--------------------------------|----------|---------|
| Installation Temperature Range | -40/+185 | -40/+85 |
| Storage Temperature Range      | -94/+185 | -70/+85 |
| Operating Temperature Range    | -40/+185 | -40/+85 |

**Electrical Specifications**

| Performance Property    | Units             | US    | (metric) |
|-------------------------|-------------------|-------|----------|
| Cutoff Frequency        | GHz               | 16.2  |          |
| Velocity of Propagation | %                 | 85    |          |
| Dielectric Constant     | NA                | 1.38  |          |
| Time Delay              | nS/ft (nS/m)      | 1.20  | (3.92)   |
| Impedance               | ohms              | 50    |          |
| Capacitance             | pF/ft (pF/m)      | 23.9  | (78.40)  |
| Inductance              | uH/ft (uH/m)      | 0.060 | (0.21)   |
| Shielding Effectiveness | dB                | >90   |          |
| <b>DC Resistance</b>    |                   |       |          |
| Inner Conductor         | ohms/1000ft (/km) | 1.07  | (3.51)   |
| Outer Conductor         | ohms/1000ft (/km) | 1.65  | (5.4)    |
| Voltage Withstand       | Volts DC          | 2500  |          |
| Jacket Spark            | Volts RMS         | 8000  |          |
| Peak Power              | kW                | 16    |          |

**Attenuation vs. Frequency (typical)**



| Frequency (MHz)              | 30   | 50   | 150  | 220  | 450  | 900  | 1500 | 1800 | 2000 | 2500 | 5800 |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Attenuation dB/100 ft</b> | 0.8  | 1.1  | 1.8  | 2.2  | 3.3  | 4.7  | 6.2  | 6.8  | 7.2  | 8.1  | 13.0 |
| <b>Attenuation dB/100 m</b>  | 2.7  | 3.5  | 6.1  | 7.4  | 10.7 | 15.4 | 20.2 | 22.3 | 23.6 | 26.6 | 42.6 |
| <b>Avg. Power kW</b>         | 2.77 | 2.14 | 1.22 | 1.00 | 0.69 | 0.48 | 0.36 | 0.33 | 0.31 | 0.28 | 0.17 |

Calculate Attenuation =  $(0.146748) \cdot \sqrt{\text{FMHz}} + (0.000312) \cdot \text{FMHz}$  (interactive calculator available at [http://www.timesmicrowave.com/cable\\_calculators](http://www.timesmicrowave.com/cable_calculators))  
 Attenuation: VSWR=1.0; Ambient = +25°C (77°F) Power: VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F);  
 Sea Level; dry air; atmospheric pressure; no solar loading



## Hardware Accessories

| Type          | Part Number | Stock Code | Description                   |
|---------------|-------------|------------|-------------------------------|
| Ground Kit    | GK-S400TT   | GK-S400TT  | Standard Grounding Kit (each) |
| Hoisting Grip | HG-400T     | HG-400T    | Laced Type (each)             |



## Install Tools

| Type              | Part Number | Stock Code | Description  |
|-------------------|-------------|------------|--|
| Crimp Tool        | HX-4        | 3190-200   | Crimp Handle   |
| Crimp Dies        | Y1719       | 3190-202   | .429" Hex Dies                                       |
| Crimp Tool        | CT-400/300  | 3190-666   | Crimp tool for LMR 400 connectors                    |
| Crimp Rings       | CR-400      | 3190-830   | Crimp rings for TC/EZ-400 connectors (package of 10) |
| Cutting Tool      | CCT-01      | 3190-1544  | Cable end flush cut tool                             |
| Replacement Blade | RB-01       | 3190-1609  | Replacement blade for cutting tool                   |