

LMR[®]-400 Flexible Low Loss 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 (e.g. WLL, GPS, LMR, WLAN, WISP, WiMax, SCADA, Mobile Antennas) requiring an easily routed, low loss RF cable



• **LMR[®]** standard is a UV Resistant Polyethylene jacketed cable designed for 20-year service outdoor use. The bending and handling characteristics are significantly better than air-dielectric and corrugated hard-line cables.

• **LMR[®]-DB** is identical to standard LMR plus has the advantage of being watertight. The addition of waterproofing compound in and around the foil/braid insures continuous reliable service should the jacket be inadvertently damaged during installation or in the future.

• **LMR[®]-FR** is a non-halogen (non-toxic), low smoke, fire retardant cable designed for in-building runs that can be routed anywhere except air handling plenums. LMR-FR has a UL/NEC & CSA rating of 'CMR' and 'FT4' respectively. In addition, the LMR-FR series is MSHA-P rated for mining operations.

• **LMR[®]-FR-PVC** is a general-purpose indoor cable and has a UL/NEC & CSA rating of 'CMR' and 'FT4' respectively. It is less expensive than LMR-FR, however it emits toxic fumes (HCL) and greater smoke density when burned.

• **LMR[®]-PVC** is designed for low loss general-purpose indoor/outdoor applications and is somewhat more flexible than the standard polyethylene jacketed LMR.

• **LMR[®]-PVC-W** is a white-jacketed version of LMR-PVC for marine and other indoor/outdoor applications where color compatibility is desired.

• **Flexibility** and bendability are hallmarks of the LMR-400 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.

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 cables designed for outdoor exposure incorporate the best materials for UV resistance and have life expectancy in excess of 20 years.

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

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

| Part Description | | | | | Stock |
|------------------|--------------------|--------|-------|-------|-------|
| Part Number | Application | Jacket | Color | Code | |
| LMR-400 | Outdoor | PE | Black | 54001 | |
| LMR-400-DB | Outdoor/Watertight | PE | Black | 54091 | |
| LMR-400-FR | Indoor -Riser CMR | FRPE | Black | 54030 | |
| LMR-400-FR-PVC | Indoor -Riser CMR | FRPVC | Black | 54073 | |
| LMR-400-PVC | Indoor/Outdoor | PVC | Black | 54218 | |
| LMR-400-PVC-W | Indoor/Outdoor | PVC | White | 54204 | |

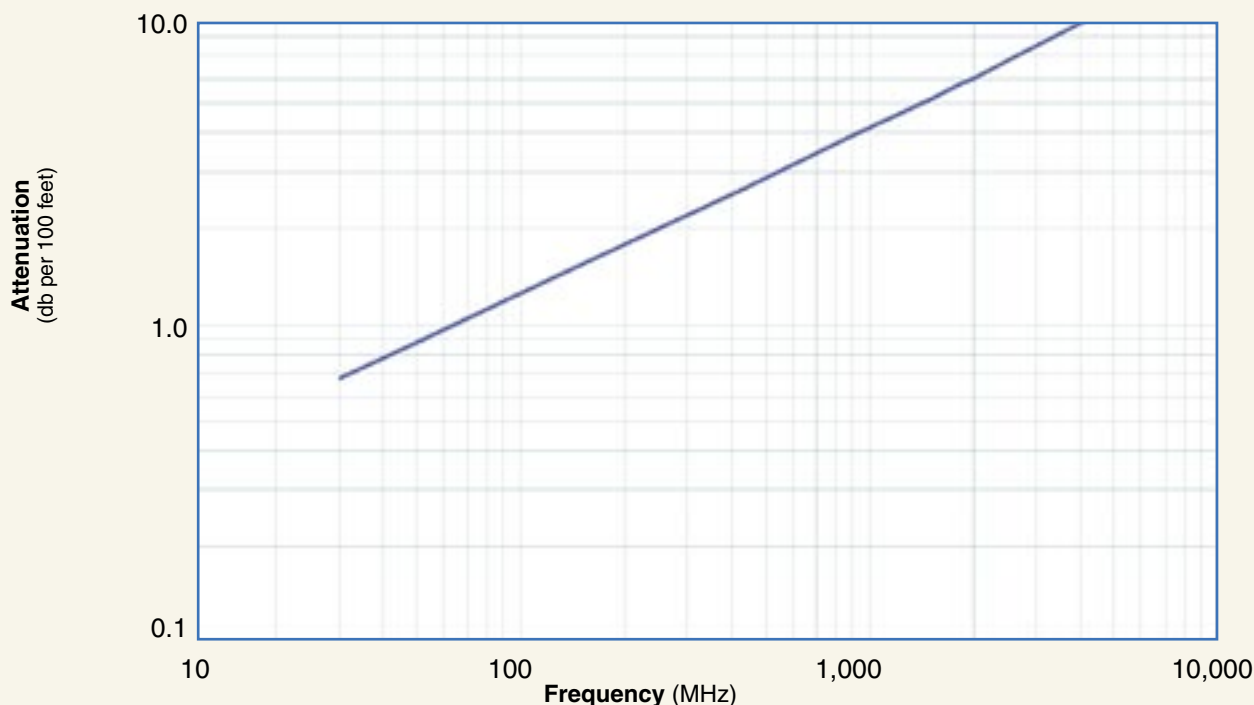
| Construction Specifications | | | |
|-----------------------------|-------------------|-------|---------|
| Description | Material | In. | (mm) |
| Inner Conductor | Solid BCCAI | 0.108 | (2.74) |
| Dielectric | Foam PE | 0.285 | (7.24) |
| Outer Conductor | Aluminum Tape | 0.291 | (7.39) |
| Overall Braid | Tinned Copper | 0.320 | (8.13) |
| Jacket | (see table above) | 0.405 | (10.29) |

| Mechanical Specifications | | | |
|---------------------------|----------------|-------|----------|
| Performance Property | Units | US | (metric) |
| Bend Radius: installation | in. (mm) | 1.00 | (25.4) |
| Bend Radius: repeated | in. (mm) | 4.0 | (101.6) |
| Bending Moment | ft-lb (N-m) | 0.5 | (0.68) |
| Weight | lb/ft (kg/m) | 0.068 | (0.10) |
| Tensile Strength | lb (kg) | 160 | (72.6) |
| Flat Plate Crush | lb/in. (kg/mm) | 40 | (0.71) |

| 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 | (78.4) |
| Inductance | uH/ft (uH/m) | 0.060 | (0.20) |
| Shielding Effectiveness | dB | | >90 |
| DC Resistance | | | |
| Inner Conductor | ohms/1000ft (/km) | 1.39 | (4.6) |
| Outer Conductor | ohms/1000ft (/km) | 1.65 | (5.4) |
| Voltage Withstand | Volts DC | | 2500 |
| Jacket Spark | Volts RMS | | 8000 |
| Peak Power | kW | | 16 |

| 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 |

Attenuation vs. Frequency (typical)



| Frequency (MHz) | 30 | 50 | 150 | 220 | 450 | 900 | 1500 | 1800 | 2000 | 2500 | 5800 |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Attenuation dB/100 ft | 0.7 | 0.9 | 1.5 | 1.9 | 2.7 | 3.9 | 5.1 | 5.7 | 6.0 | 6.8 | 10.8 |
| Attenuation dB/100 m | 2.2 | 2.9 | 5.0 | 6.1 | 8.9 | 12.8 | 16.8 | 18.6 | 19.6 | 22.2 | 35.5 |
| Avg. Power kW | 3.33 | 2.57 | 1.47 | 1.20 | 0.83 | 0.58 | 0.44 | 0.40 | 0.37 | 0.33 | 0.21 |

Calculate Attenuation =
 $(0.122290) \cdot \sqrt{\text{FMHz}} + (0.000260) \cdot \text{FMHz}$ (interactive calculator available at 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

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-Connectors

| Interface | Description | Part Number | Stock Code | VSWR** Freq. (GHz) | Coupling Nut | Inner Contact Attach | Outer Contact Attach | Finish* Body /Pin | Length in (mm) | Width in (mm) | Weight lb (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) |
| 7-16 DIN Male | Right Angle | TC-400-716MC-RA | 3190-1671 | <1.25:1(<3) | Hex | Solder | Clamp | A/S | 2.4 (61.5) | 1.88 (47.8) | 0.35 (159) |
| 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) |
| HN Male | Straight Plug | TC-400-HNM | 3190-923 | <1.25:(<1) | Knurl | Solder | Clamp | S/G | 2.3 (59.2) | 0.88 (22.4) | 0.25 (113.4) |
| QDS Male | Straight Plug | TC-400-QDSM | 3190-620 | <1.25:(<3) | Knurl | Solder | Clamp | A/G | 1.8 (46.6) | 1.00 (25.4) | 0.25 (113.4) |
| 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) |
| | Straight Plug | EZ-400-NFC-2 | 3190-1907 | <1.25:1(2.5) | NA | Spring Finger | Clamp | N/G | 1.5 (38) | 0.89 (22.6) | 0.121 (54.9) |
| | Straight Jack | EZ-400-NF | 3190-956 | <1.25:1(2.5) | NA | Spring Finger | Crimp | N/G | 1.8 (45) | 0.66 (16.8) | 0.105 (47.6) |
| | Bulkhead Jack | EZ-400-NF-BH | 3190-518* | <1.25:1(2.5) | NA | Spring Finger | Crimp | N/G | 1.8 (46) | 0.88 (22.4) | 0.102 (46.3) |
| | Bulkhead Jack | TC-400-NFC-BH (A) | 3190-872 | <1.25:1(2.5) | NA | Solder | Clamp | A/G | 1.8 (46) | 0.88 (22.4) | 0.145 (65.8) |
| 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) | 0.70 (17.8) | 0.121 (54.9) |
| | Straight Plug | EZ-400-NMC-2 | 3190-1906 | <1.25:1(2.5) | Hex/Knurl | Spring Finger | Clamp | N/G | 1.5 (38) | 0.75 (19.1) | 0.121 (54.9) |
| | Straight Plug | EZ-400-NMH-D | 3190-400* | <1.25:1(10) | Hex/Knurl | Spring Finger | Crimp | A/G | 1.5 (38) | 0.89 (22.6) | 0.103 (46.8) |
| | 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) |
| | Straight Plug | EZ-400-NMK | 3190-661 | <1.25:1(10) | Knurl | Spring Finger | Crimp | S/G | 1.5 (38) | 0.75 (22.6) | 0.113 (51.3) |
| | 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) |
| | Right Angle | TC-400-NMC-RA (A) | 3190-870 | <1.35:1(2.5) | Hex | Solder | Clamp | A/G | 1.8 (46) | 1.25 (31.8) | 0.150 (68.0) |
| | Right Angle | EZ-400-NMH-RA | 3190-761 | <1.35:1(2.5) | Hex | Spring Finger | Crimp | S/G | 1.8 (46) | 1.25 (31.8) | 0.130 (59.0) |
| | Reverse Polarity | TC-400-NM-RP | 3190-960 | <1.25:1(2.5) | Knurl | Solder | Crimp | N/G | 1.5 (38) | 0.75 (19.1) | 0.090 (40.8) |
| 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 Female | Reverse Polarity | TC-400-TF-RP | 3190-1063 | <1.25:1(2.5) | NA | Solder | Crimp | N/G | 1.8 (46) | 0.55 (14.0) | 0.074 (33.6) |
| | Reverse Polarity | EZ-400-TF-RP | 3190-795 | <1.25:1(2.5) | -NA | Spring Finger | Crimp | A/G | 1.8 (46) | 0.55 (14.0) | 0.074 (33.6) |
| 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) |
| | Straight Plug | EZ-400-TM | 3190-650 | <1.25:1(2.5) | Knurl | Spring Finger | 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) |
| | Reverse Polarity | TC-400-TM-RP | 3190-1062 | <1.25:1(2.5) | Knurl | Solder | Crimp | N/G | 1.7 (43) | 0.59 (15.0) | 0.074 (33.6) |
| | Reverse Polarity | EZ-400-TM-RP | 3190-794 | <1.25:1(2.5) | Knurl | Spring Finger | Crimp | A/G | 1.7 (43) | 0.59 (15.0) | 0.074 (33.6) |
| UHF Male | Straight Plug | EZ-400-UM | 3190-997 | <1.25:1(2.5) | Knurl | Spring Finger | Crimp | N/G | 1.9 (48) | 0.80 (20.3) | 0.090 (40.8) |

* 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



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) |
| Strip Tool | ST-400C-2 | 3190-1972 | Prep tool for EZ-400-NMC-2 two piece clamp style connector |
| Strip Tool | CST-400 | 3192-004 | Combination prep tool for LMR-400 crimp and clamp style connectors |
| Mid-Span Strip Tool | GST-400 | 3190-2174 | For ground strap attachment |
| Replacement Blades | RB-456 | 3190-421 | Replacement blades for Strip Tool |
| Deburr Tool | DBT-U | 3192-001 | Removes center conductor rough edges |
| Cutting Tool | CCT-01 | 3190-1544 | Cable end flush cut tool |
| Replacement Blade | RB-01 | 3190-1609 | Replacement blade for cutting tool |
| Tool Kit | TK-400EZ | 3190-1601 | Tool kit for LMR-400 Crimp Connectors (includes CCT-01, CST-400, CT-400/300, DBT-U, Tool Pouch) |