

# 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
- **NEW!** Times Protect® LP-18-400 protector-series



• **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 is UL/NEC & CSA rated 'CMR' and 'FT4' respectively, meets FAA FAR25 requirements and is MSHA-P for mining applications.

• **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 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 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/Outdoor Riser CMR | FRPE   | Black | 54030 |       |
| LMR-400-FR-PVC   | Indoor/Outdoor Riser CMR | FRPVC  | Black | 54073 |       |
| LMR-400-PVC      | General Purpose          | PVC    | Black | 54218 |       |
| LMR-400-PVC-W    | General Purpose          | 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)   |

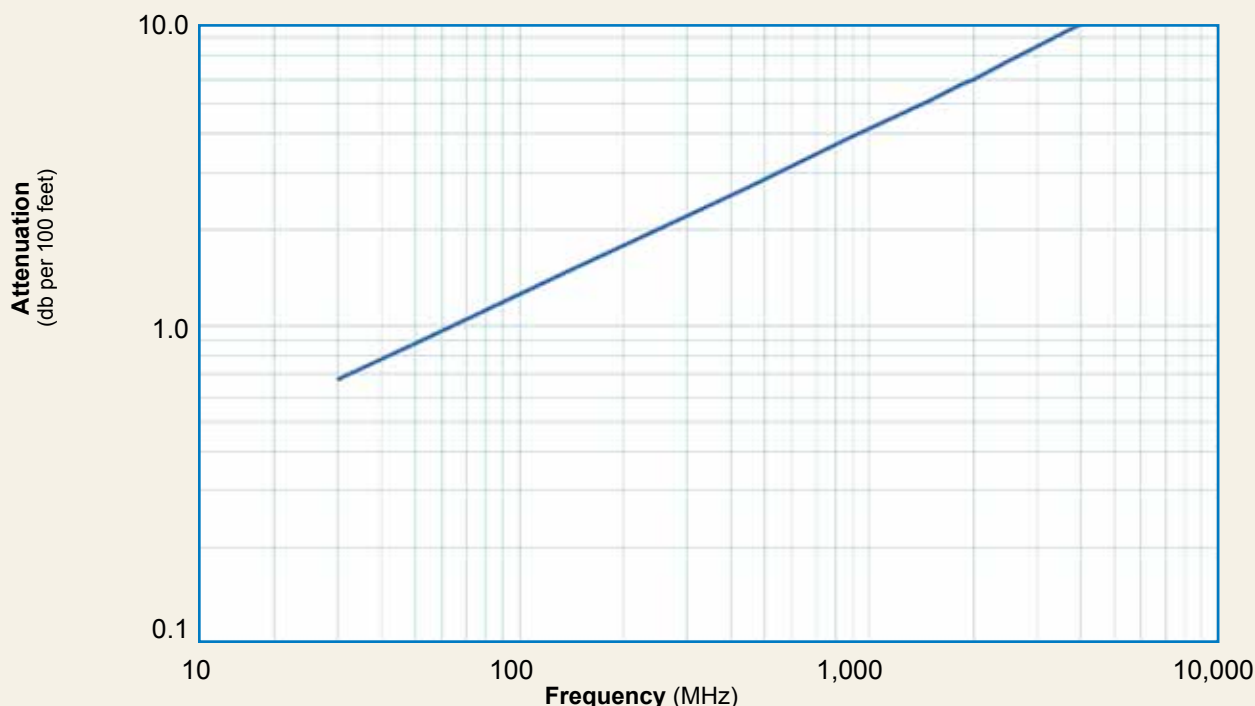
## Environmental Specifications

| 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) |
|-------------------------|-------------------|-------|----------|
| 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    |          |

## 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](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

**Connectors**

| Connectors         |                  |                   |            | VSWR**      | Coupling | Inner          | Outer          | Finish*   |           |      |          |      |           |               |
|--------------------|------------------|-------------------|------------|-------------|----------|----------------|----------------|-----------|-----------|------|----------|------|-----------|---------------|
| Interface          | Description      | Part Number       | Stock Code | Freq. (GHz) | Nut      | Contact Attach | Contact Attach | Body /Pin | Length in | (mm) | Width in | (mm) | Weight lb | (g)           |
| 1. 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) |
| 2. 7-16 DIN        | Right Angle      | TC-400-716M-RA-D  | 3190-2598  | <1.35:1     | (6)      | Hex            | Solder         | Crimp     | A/S       | 1.7  | (43.20)  | 1.98 | (50.3)    | 0.374 (169.5) |
| 3. 7-16 DIN Male   | Straight Plug    | EZ-400-716M-X     | 3190-2524  | <1.25:1     | (6)      | Hex            | Spring Finger  | Crimp     | A/G       | 1.6  | (39.5)   | 1.38 | (35)      | 0.277 (126.0) |
| 4. 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) |
| 5. 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)    |
| 6. 7-16DIN Male    | Right Angle      | EZ-400-716M-RA-X  | 3190-2545  | <1.35:1     | (6)      | Hex            | Spring Finger  | Crimp     | A/G       | 1.6  | (41.7)   | 1.75 | (44.3)    | 0.374 (0.17)  |
| 7. 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)  |
| 8. BNC Male        | Straight Plug    | EZ-400-BM-X       | 3190-2852  | <1.35:1     | (2)      | Knurl          | Spring Finger  | Crimp     | A/G       | 1.7  | (42.7)   | 0.56 | (14.2)    | 0.066 (29.9)  |
| 9. BNC Male        | Right Angle      | EZ-400-BM-RA-X    | 3190-2847  | <1.35:1     | (2)      | Knurl          | Spring Finger  | Crimp     | A/G       | 1.9  | (48.0)   | 1.32 | (33.5)    | 0.097 (44.0)  |
| 10. 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)  |
| 11. HN Male        | Right Angle      | TC-400-HNM-RA     | 3190-2541  | <1.25:1     | (2.5)    | Hex            | Solder         | Crimp     | A/G       | 1.6  | (41.4)   | 1.56 | (39.6)    | 0.198 (90.0)  |
| 12. 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)  |
| 13. UHF Male       | Straight Plug    | EZ-400-UM         | 3190-997   | <1.25:1     | (2.5)    | Knurl          | Spring Finger  | Crimp     | N/G       | 1.8  | (48)     | 0.80 | (20.3)    | 0.076 (34.4)  |
| 14. 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)   |
| 15. 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)  |
| 16. N Femail       | Straight Jack    | EZ-400-NF-X       | 3190-2818  | <1.25:1     | (2.5)    | NA             | Spring Finger  | Crimp     | N/G       | 1.8  | (45)     | 0.66 | (16.8)    | 0.105 (47.6)  |
| 17. N Femail       | Straight Jack    | TC-400-NF-X       | 3190-2815  | <1.25:1     | (2.5)    | NA             | Solder         | Crimp     | N/G       | 1.8  | (45)     | 0.66 | (16.8)    | 0.105 (47.6)  |
| 18. N Femail       | 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)  |
| 19. N Femail       | 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)  |
| 20. 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)  |
| 21. N Male         | 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)  |
| 22. N Male         | Straight Plug    | EZ-400-NMC-2-D    | 3190-2640  | <1.25:1     | (2.5)    | Hex/Knurl      | Spring Finger  | Clamp     | N/G       | 1.5  | (38)     | 0.75 | (19.1)    | 0.121 (54.9)  |
| 23. N Male         | Straight Plug    | EZ-400-NMH-X      | 3190-2590  | <1.25:1     | (10)     | Hex/Knurl      | Spring Finger  | Crimp     | A/G       | 1.5  | (38)     | 0.89 | (22.6)    | 0.103 (46.8)  |
| 24. N Male         | Straight Plug    | TC-400-NMH-X      | 3190-2626  | <1.25:1     | (10)     | Hex/Knurl      | Solder         | Crimp     | A/G       | 1.5  | (38)     | 0.89 | (22.6)    | 0.113 (51.3)  |
| 25. N Male         | Straight Plug    | EZ-400-NMK-D      | 3190-661   | <1.25:1     | (10)     | Knurl          | Spring Finger  | Crimp     | S/G       | 1.5  | (38)     | 0.75 | (22.6)    | 0.113 (51.3)  |
| 26. N Male         | Right Angle      | EZ-400-NMH-RA-X   | 3190-2638  | <1.35:1     | (6)      | Hex/Knurl      | Spring Finger  | Crimp     | A/G       | 1.87 | (47)     | 1.42 | (36.0)    | 0.177 (80.2)  |
| 27. N Male         | Right Angle      | TC-400-NMH-RA-SS  | 3190-1668  | <1.25:1     | (2.5)    | Hex            | Solder         | Crimp     | SS/G      | 1.5  | (38.1)   | 0.89 | (2.6)     | 0.130 (59.0)  |
| 28. N Male         | 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)  |
| 29. N Male         | 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)  |
| 30. N Male         | 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)  |
| 31. SMA Male       | Straight Plug    | TC-400-SM-X       | 3190-3046  | <1.25:1     | (8)      | Hex            | Solder         | Crimp     | N/G       | 1.2  | (29)     | 0.50 | (12.7)    | 0.032 (14.5)  |
| 32. 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)  |
| 33. TNC Female     | 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)  |
| 34. TNC Male       | Straight Plug    | TC-400-TM-X       | 3190-2532  | <1.25:1     | (6)      | Hex/Knurl      | Solder         | Crimp     | A/G       | 1.9  | (48)     | 0.67 | (17.5)    | 0.075 (34.3)  |
| 35. TNC Male       | Straight Plug    | EZ-400-TM-X       | 3190-2533  | <1.25:1     | (6)      | Hex/Knurl      | Spring Finger  | Crimp     | A/G       | 1.9  | (48)     | 0.67 | (17.5)    | 0.075 (34.3)  |
| 36. TNC Male       | 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)  |
| 37. TNC Male       | 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)  |
| 38. TNC Male       | Right Angle      | TC-400-TM-RA-D    | 3190-2671  | <1.35:1     | (6)      | Hex/Knurl      | Solder         | Crimp     | A/G       | 1.4  | (35)     | 1.41 | (35.8)    | 0.130 (59.0)  |
| 39. TNC Male       | Right Angle      | EZ-400-TM-RA-X    | 3190-2800  | <1.24:1     | (6)      | Hex            | Spring Finger  | Crimp     | A/G       | 2.0  | (50.0)   | 0.62 | (15.7)    | 0.130 (59.0)  |

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

**Install Tools and Hardware**





## Install Tools and Hardware

| 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, Tool Pouch) |
| Replacement Blade Kit | RB-CST      | 3192-086   | Replacement blade kit for all CST strip tools                                            |
| Ground Kit            | GK-S400TT   | GK-S400TT  | Standard Grounding Kit (each)                                                            |
| Hoisting Grip         | HG-400T     | HG-400T    | Laced Type (each)                                                                        |