

MACXLine® Rigid Line with Bellows

More than double the life of standard rigid lines.

During broadcasting, RF heating of the inner and outer connectors causes differential expansion between them. With original design rigid transmission line, this expansion is compensated for with sliding metal bullets. Eventually this produces wear, hot spots—and burnout. Experienced broadcast consultants recommend replacing these bullets every seven years to avoid sudden failure.

The solution to eliminating sliding-contact wear is to eliminate the sliding. All expansion of the ERI, patented, MACXLine® inner connector is taken up with a flexible, built-in bellows; once put into service. Burnout and bullet replacement are eliminated. This advantage comes with no VSWR penalty or significant cost premium.

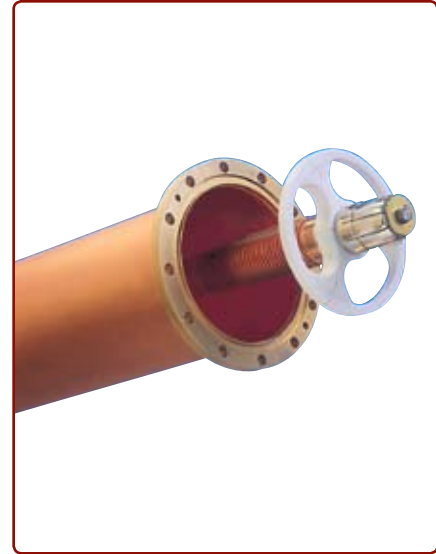
MACXLine® is manufactured by ERI from high conductivity copper tubing, outer conductors. Extra strength, custom PTFE dielectric disk insulators maintain precise mechanical alignment. Each section comes complete with a bullet/bellows assembly, stainless steel flange hardware and pressure sealing gasket.

A full range of sizes is offered:

- 3-1/8" 50-ohm, MACX350A
- 4-1/16" 50-ohm, MACX450
- 6-1/8" 50-ohm, MACX650
- 6-1/8" 75-ohm, MACX675B
- 7-3/16" 75-ohm, MACX775
- 8-3/16" 75-ohm, MACX875B

All are available in standard channel lengths and field cut kits— and for 6-1/8" and larger sizes, broadband OPTILine™ versions for multi-channel DTV/analog broadcast applications. With OPTILine™, excellent VSWR performance over multiple channels can be achieved, depending on channels. WIDELine™ offers full UHF bandwidth of the selection line, without prohibited channels, plus VHF capability for individual channels. Contact ERI with details of your application for an estimate.

ERI also supplies economical Inners Only™ replacement sections, allowing you to retrofit your old rigid line system (in most cases) with long-life MACXLine® inner conductors, at not much more than half the cost of a new system. MACXLine® inners install quickly since they are similar to pre-existing inners, this allows retrofitting to be done in stages during night-time off-air intervals. All Inners Only™ replacement sections include captivated inner connectors/ bellows assembly, flange hardware kits, and installation instructions.



Coaxial Line

Recommended MACXLine® Section Lengths

Line Type	Section Length, ft (m)		TV Channels	FM Radio Frequencies
MACX (Line) - 1	20.00	(6.0960)	2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 15, 18, 19, 22, 23, 27, 31, 32, 35, 36, 39, 40, 43, 44, 47, 48, 51, 52, 55, 56, 60, 64, 68	88.1-95.9 100.3-107.9
MACX (Line) - 2	19.75	(6.0198)	16, 20, 24, 28, 33, 37, 41, 45, 49, 53, 57, 61, 62, 65, 66, 69	96.1-98.3
MACX (Line) - 3	19.50	(5.9436)	4, 10, 13, 17, 21, 25, 26, 29, 30, 34, 38, 42, 46, 50, 54, 58, 59, 63, 67	98.5-100.1
MACX (Line) - 11	17.50	(5.3340)	—	88.1-107.9

Television channels listed are preferred; others may also be acceptable. Contact ERI for more information. Specifications subject to change without notice.

NOTE:

Standard conditions for rating HELIAX semiflex cables are as follows. Attenuation: VSWR 1:1.0, ambient temperature 20°C (68°F), atmospheric pressure, dry air.1 Average Power: VSWR 1:1.0, ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading, and inner conductor temperature 100°C (212°F) [HJ4-50, HJ4.5-50, HJ5-50, HJ7-50A, HJ12-50, and HJ9-50], 121°C (250°F) [HJ8-50B and HJ11-50], or 150°C (302°F) [HJ9HP-50]. The safety factor on peak power ratings is 200% (safety factor of 1.4 on voltage), unchanged. The average power ratings do not have a safety factor, but are based on a design life of approximately 20 years, at rated inner conductor temperature.

Standard conditions for rating rigid lines are as follows. Attenuation: VSWR 1:1.0, ambient temperature 20°C (68°F), atmospheric pressure, dry air.1 Average Power: VSWR 1:1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), atmospheric pressure, dry air, and no solar loading. The safety factor on peak power

ratings is 400% (safety factor of 2.0 on voltage) to allow for the possible effects of fine matchers, tuning slugs, etc. Also, the theoretical peak breakdown voltage is derated by 35% for production testing purposes, as done across the broadcast industry. Due to the difficulty of measuring the attenuation of large diameter rigid lines precisely, attenuation, (and consequently average power), ratings are calculated based on line geometry, copper losses, and dielectric losses.

ERI rigid coaxial transmission lines are EIA compliant. To ensure high conductivity, they are made from ASTM B188 Alloy 102, Alloy 103 and Alloy 110 seamless copper tubes, which have an I.A.C.S rated conductivity at or above 99%. Temper is Hard Drawn, H80, for line sizes ≤ 3-1/8 inch and is rated Hard, H75, for sizes > 3-1/8 inch. The coefficient of thermal expansion is 9.4 x 10⁻⁶ in/(in/°F) over 68°F – 212°F. Copper tube straightness is maintained at ≤ 1/2 inch per 20 foot length. This choice of copper material has been optimized in balancing the effects of both temperature and alloying elements on conductivity, as well as the need for strength, corrosion resistance and formability.

While typical RF broadcast transmission line systems are pressurized to 2-5 psig, ERI components are designed to handle 20 psig minimum. In RF applications, attenuation is affected by the nature of the signal to concentrate on the surface of the conductor due to skin effect, by some surface oxidation which is always present, and also by small additional losses occurring at the flange interface. In order to insure that attenuation ratings are conservative and agree closely with field-measured data, they include a derating factor on conductivity of 4 percentage points.

1 One atmosphere absolute dry air pressure at sea level is 0 psig (gauge reading) or 14.7 psia (absolute); where the gauge pressure = absolute pressure – 14.7).

2 Conductivity of copper is expressed as a percentage of I.A.C.S (International Annealed Copper Standard) which is based upon annealed copper wire having a density of 8.89 g/cm³, 1 meter long, weighing 1 gram, with a resistance of 0.15328 ohms, such that the percentage was assigned as 100 times the ratio of volume resistivity at 68°F (20°C).