

Selecting the Right Cable for FOUNDATION™ fieldbus Control Networks – What You Need to Know

FOUNDATION™ fieldbus ITC- and PLTC-Listed Cables Explained

FF-844 is the new Fieldbus Foundation cable compliance specification. FF-844 includes the electrical requirements of ISA 50.02 and IEC 61158, but it also contains some additional requirements, which help you know your cable is the right cable for use in FOUNDATION fieldbus control networks.

Cable certified by the Foundation must be UL ITC- and PLTC-listed. What does *that* mean? At a minimum, it means these cables meet important mechanical strength requirements and are UL-listed to comply with the National Electric Code (NEC).

Simply stated, UL ITC is UL Standard 2250 Instrumentation Tray Cable (ITC). UL PLTC is UL 13 Power Limited Tray Cable (PLTC). UL writes cable standards that correspond to NEC articles detailing the use of these cables in specific applications. UL 13 PLTC corresponds to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling and Power-Limited Circuits. UL 2250 ITC corresponds to NEC Article 727 Instrumentation Tray Cable: Type ITC.

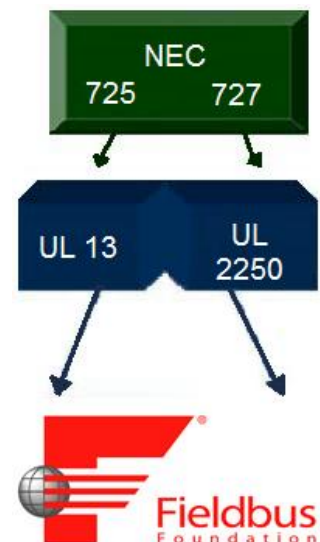
Article 725 has been around for a very long time. It is fairly complex and encompasses many types of circuits and other installations that are not always applicable to bus networks including FOUNDATION fieldbus. Article 727 was written to simplify the guidelines when the instrumentation and control circuits operate at 150 volts or less and 5 amperes or less.

Cable specifications for Articles and both UL 13 and UL 2250 are very similar, though not quite exact. The disparities do not apply to FOUNDATION fieldbus cables; so all cable requirements discussed here apply to both FOUNDATION fieldbus control networks.

A FOUNDATION fieldbus Type A H1 cable by definition is a shielded twisted pair,

- Maximum resistance of 23.5Ω/km @ 20°C (18 AWG minimum)
- Characteristic Impedance of 100Ω +/- 20Ω @ 31.25 kHz
- Signal Attenuation < 3 dB/km @ 39 kHz

Conformance to UL 13 PLTC and UL 2250 ITC adds physical property requirements, flame retardant requirements, and UV stability while also offering some other attributes, which may be necessary for specific applications in specific locations.





Both UL listings require the cable to pass the UL 1685 flame test. This is a vertical tray test. Eight feet of cable is suspended in the center of the chamber. 70,000 BTUs from a 10" (25.4 cm) ribbon burner is applied for 20 minutes. The cable fails if the flame propagates to the top of the cable tray. The CSA FT4 and IEEE 1202 flame tests are similar, though the angle at which the flame is applied differs as does the pass/fail criteria. FT4 measures char lengths with a max of 150 cm (50") IEEE 1202 measures melt/blistering.

The cable jacket must be a gas/vapor-tight continuous sheath and must be sunlight-resistant. The cable is submitted to a 720 hour Xenon arc test and must retain at least 80% of the original tensile and elongation strength. Tensile strength must originally be at least 1500 psi and the original elongation must be at least 100%.

The UL standards require that every reel of cable be subjected to a 1.5 KVAC Dielectric Withstand test to insure the cable has no shorts or insulation breakdown.

Cables must meet the flame test, UV test and T&E tests to be listed and bear ITC and PLTC in the legend on the cable. There are also some optional attributes, which are carefully defined and tested under these standards. These additional merit badges must be earned before they can appear as markings on the cable.

Temperature ratings can be tested, qualified and marked on the cables. FF-844 requires a temperature range of at least -30°C to + 90°C. Cable manufacturers can achieve better performance than this, and ITC and PLTC allow cables to be marked with the temperatures they can sustain. -40°, -50°, and -60°C listings are available assuming the cables meet cold bend test requirements consistently. Higher temperature ratings also exist with tests to support them.

Exposed-Run (formerly known as Open Wiring) listings are one of the options for ITC/PLTC-listed FOUNDATION fieldbus cables. The ER mark on the cable means the cables pass the same crush and impact tests applied to metal clad cables, without the metal (UL1569 Crush and Impact Tests). These cables are strong.

NEC Article 725.154(D) Hazardous (Classified) Locations (2) and Article 727.4(5) allow ER listed cable "to be installed exposed. The cable shall be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles or channels. The cable shall be secured at intervals not exceeding 1.8 m (6 ft)." This provision can result in a great deal of freedom for installers and system designers and can result in significant cost savings over armored cables or cables installed in conduit.

Cables can also be listed for Direct Burial. This additional listing requires a crushing test of the entire cable and also requires the insulated conductors to pass the Long Time Insulation Resistance in Water requirements for Type TW wires in UL 83 and a mechanical water absorption test.

Back to the original question: what does ITC/PLTC listing mean? It means cables built to these requirements are strong and comply with the National Electrical Code even for Class 1 Div 2 areas. They guarantee you're getting the cable you need for safe and secure installations of FOUNDATION fieldbus systems.

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