



THOR SYSTEMS, INC.

SURGE APPS SA-018: LOW IMPEDANCE, INCREASED PERFORMANCE (Guidelines and application tools to promote improved Power Quality)

3621 Saunders Avenue
Richmond, VA 23227

“Rope-Lay” Wire: Low Impedance, Increased Performance

APPLICATION

Recommended Low Impedance interconnect wiring from a Surge Protective Device (SPD) to its electrical distribution connection points to improve overall surge protection performance.

THOR SYSTEMS uses #6 AWG high strand count “Rope-Lay” wire for *internal* buss connections on all Series TSr Modular products and recommends a maximum of thirty (30) feet (total length for all Phase/Neutral/Ground conductors) of #6 “Rope-Lay” wire with each TSr Surge Protective Device. The TSn Non-modular products are provided with #10 AWG “Rope-Lay” wire pre-terminated in the SPD with leads provided for the contractor to terminate at the point of install.

It is always recommended to install surge protection as close as possible to the equipment being protected. The field connected leads should always be kept as short and straight as possible, as additional lead length adds impedance which reduces surge protection system performance.

Ref. Standards:

UL 1449 4th Ed.
UL 1283 5th Ed.
C62.41.1: 2002 IEEE
C62.41.2: 2002 IEEE
C62.45: 2002 IEEE
C62.62: 2010 IEEE
C62.72: 2007 IEEE
NEMA
NEC 2014
NFPA 70
FIPS 94
MIL-STD 220A

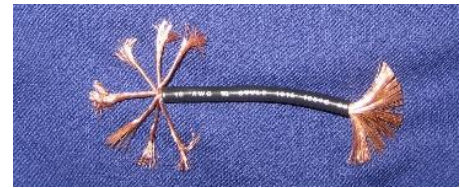
WHY “ROPE-LAY” WIRE

The low impedance “Rope-Lay” wire is constructed using a center stranded core surrounded by six (6) helically wound groups of stranded wire. This “Rope” construction, using twisted groups of high strand count wire, creates an exponential increase in



#6 AWG “Rope-Lay” Wire
259 Strands of #30 AWG (.010" dia.)
(7 twisted groups of 37 strands/group)
VS. #6 AWG THW/THHN (19 Strands)

conductor surface area, thereby reducing the “skin effect” of high frequency surges (typically 40 to 50 kHz). The twisted rope construction also reduces the mutual inductance of the conductor groups, providing improved surge protection performance.



#10 AWG “Rope-Lay” Wire
413 Strands of #36 AWG (.005" dia.)
(7 twisted groups of 59 strands/group)
VS. #10 AWG THW/THHN (19 Strands)

The “Rope-Lay” wire is UL

Listed under the MTW Cable Standard. It can, therefore, be used in any application where MTW Cable is listed as acceptable in the current version of the NEC (ref. Article 310.10). While this “Rope-Lay” wire is commercially available, it is not typically stocked at most electrical distribution warehouses. For this reason, THOR SYSTEMS stocks the “Rope-Lay” wire in its inventory as it is used for all internal wiring as well as supplied for field installations.

#6 Rope-Lay Wire Spec: AWM 105°C I A/B FT-1 600V 6 AWG (259 Strands) E55408 (UL) MTW
#10 Rope-Lay Wire Spec: AWM 105°C I A/B FT-1 600V 10 AWG (413 Strands) E80304 (UL) TEW

TERMINATIONS

TSr Modular Terminations:

Terminal Block up to #4 AWG: Recommend #6 AWG “Rope-Lay” wire (typically terminated at 60A Circuit Breaker/Neutral & Ground Bus)

60A Fused Disconnect: Recommend #6 AWG “Rope-Lay” wire (typically terminated at Phase Busses/Neutral & Ground Bus)

TSn Non-modular Terminations:

Pre-wired at Factory with #10 AWG “Rope-Lay” wire (typically terminated at 30A Circuit Breaker or a 30A Fused Disconnect)

Connection Options:

Compression Lugs, Mechanical Lugs, Circuit Breaker Lugs, Fused Disconnect Lugs

In addition to providing the reference documents, we would be pleased to review and comment on any existing SPD specifications, suggesting changes to bring them in compliance with the new UL 1449 3rd Edition.

Ref. Documents:

TSI 107 Design/Build Spec
TSI 099 Bid Spec
TSI 0119 Site Risk Assessment Spreadsheet

THOR SYSTEMS offers products and services that provide protection from the more *obvious external* to the more *frequent internal* transient voltage sources. Should you have any questions, please feel free to contact us (804.355.1100) or visit our Web site, www.ThorSystems.us.