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Fine Stranded Cable

Application Notes & Data

To correctly apply a circuit breaker to a particular job many factors must be considered. One of these is the wire connector, or lug, used on the circuit breaker. The lug must be matched to the wire that the user is installing. The wire material (aluminum or copper), size, and insulation temperature rating are most often stated, but one other parameter can be just as important – the number of strands that make up that wire.

Stranded Wire Considerations

Fine stranded wire, commonly called "welding cable," is very flexible and easy to install, and these characteristics make it desirable for application where space is tight. However, most pressure lugs used on molded case circuit breakers, including Siemens lugs, are *not listed* for use with this wire.

The number of strands used to assemble a particular wire can affect the ability of a pressure wire connector to be properly tightened and to maintain a firm grip on the wire. If the wire is not firmly secured in the connector, the tremendous magnetic forces present during a short circuit could pull the wire out, or the lug may overheat under load.

Molded case and insulated case circuit breakers are designed and tested to meet Underwriters Laboratories Inc.® (UL) Standard 489. UL 489 requires that a lug comply with the standard that specifically addresses wire connectors, UL 486.

Previously the UL standards did not mention fine stranded wire for use with circuit breakers. However, the standards are presently being revised to allow connectors to be listed not only for the standard Class B and Class C concentric and compressed wire, but also for other classes and strandings. The "other strandings" will include the fine stranded wire commonly referred to as welding cable.

Revised UL 486 Standards

Under the UL revised standards wire connectors must now be specifically tested and marked for use with *any type* of wire other than the "standard" Class B and C stranded wire. Class B and Class C are identified in Table 7.1 of UL 486. The following is an excerpt from that table:

Number of Strands

Conductor Size	Class B	Class C
14 - 2 AWG	7	19
1 AWG - 4/0	19	37
250-500 kcmil	37	61
600-1000 kcmil	61	91
1250-1500 kcmil	91	127

Specific types of wire are mentioned in UL 486 and UL 489 that meet these stranding requirements such as MTW, THHN, THW, and USE, among others. Article 310-13 of the National Electric Code (NEC) also covers requirements for conductors for general wiring. Several tables such as 310-13, 310-16, 310-17, and others list the standard conductor types and their ampacities for general use.

Revision to the UL standards does not really change the way our pressure lugs can be used. They simply have never been tested or recommended for use with fine stranded wire. However, the revision does make clear to anyone installing this type of wire that the lug must be marked for this use. Compression type lugs will probably be among the first to obtain UL listing for use with fine stranded wire.

Ultimately, the user is responsible for making sure that the lug ordered with the circuit breaker is approved for the type cable intended for installation.