

T29: Use of UL-approved Cables and Wires

T 29-1 UL-Marking at Cables & Wires and its intended use

or (UL) UL Listing Mark for listed cables & wires

UL Listed Cables and Wires covered by this category are intended for use as fixed wiring for three general building types: residential, commercial and industrial. Listed wire and cable must not only comply with the applicable individual UL standards but also with requirements indicated under specific Articles of the National Electrical Code.

The National Electrical Code defines specific end use application and where a particular Listed wire or cable is installed. Listed cables and wires are applicable for factory

wired equipment (such as electrical devices, equipment, appliances, as well as machines) as well as for local field wiring purpose (see NEC & NFPA 79).

Typical type designations of Listed cables, wires and flexibel cords:

MTW, TC, PLTC, CM, CL2, THHN, THWN; SO, SOO, ST, STO, SJT, SJTO.

Some Lapp Kabel multi listed/multi approved products:

ÖLFLEX® TRAY II, ÖLFLEX® VFD TC; ÖLFLEX® CONTROL TM/ÖLFLEX® CONTROL M ÖLFLEX® TRAY 3D; ÖLFLEX® AUTO-X; Multi Standard Wiring Cable UL(MTW)-CSA-HAR; UNITRONIC® BUS

Approval mark at the product:

(UL) = UL Listing mark.

UL Recognition Mark for AWM cables and wires

Appliance Wiring Material better known under the abbreviation of „AWM“ covers wire and cable intended for use as factory installed components of a complete equipment, such as elctrical devices, appliances. In control panels or industrial machines only if as a part of a listed assembly (NFPA 79 Edition 2007).

Appliance Wiring Material is not intended for use in direct separate installation in the field. Wire or cable indicating a UL AWM style marking is intended for applications that are unique to each individual style sheet. The usage statement of an individual style sheet will indicate specific end use limitations of the AWM wire or cable.

If a Manufacturer desires to obtain NRTL listing for their new piece of equipment they

must submit their design to the NRTL. The entire listing process will move much more quickly and easily if all internal components used within the equipment design are UL listed or UL recognized.

If the internal components are not UL listed or UL recognized then the Listing process will take much longer and cost more as the individual components now must be tested for compliance. AWM can also be used externally to interconnect the Listed Components such as the data assembly that connects a computer to a printer (see www.ul.com).

Note:

Multinorm cables and wires. Metric- (mm²) and AWG/MCM-conductor sizes of multi-norm cables and wires often do have special conductor strands, so one of both of the

conductor sizes is typically (slightly) oversized regarding its nominal cross section. This may occur a particular wiring problem when clamping range of the terminal is strictly limited to one unique gage size.

Futher informations to that subject:

Table T 11 Conductor resistance and conductor make-up (metric)
Table T 16 Anglo-American Units
Table T 13 Power Ampacity to cables & wires
NFPA 70 (National Electrical Code)
NFPA 79 Electrical Standard of Industrial Machinery

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T 29-2 Use of Cables and Wires in Industrial Machinery (USA)

General requirements regarding design, manufacturing and usage of Industrial Machinery in USA

Machinery may be accepted as being safe if they are designed, manufactured and tested according to federal law issued by the Occupational Safety and Health Administration (OSHA: www.osha.gov) as well as to local (State-, County-, City-) laws and safety has been testified and certified by a Nationally Recognized Testing Laboratory (NRTL). A NRTL listing or -labeling mark at the machine is required as the „visual proof“ to local inspectors (Authorities having Jurisdiction) as being tested and certified.

NFPA 79 Electrical Standard for Industrial Machinery Edition 2007

The National Fire Protection Association (www.nfpa.org) is the authorized issuer of that important Electrical Standard for Industrial Machinery.

NFPA 79 Edition 2007 is the US-American counterpart to the International Standard IEC 60204-1 = European Standard EN 60204-1, regarding safety of machinery. NFPA 79, Chapter 12 covers requirements regarding use of cables & wires for machines.

Conductors, cables and cords shall be listed Type AWM shall be permissible, when part of a listed assembly suitable for the intended application.

Herewith some general requirements:

- Conductors of motor supply cables shall have an ampacity not less than 125% of the motor full-load current rating.
- Minimum conductor size for power circuits is 14AWG.
- Minimum conductor size for lightning and control circuits is 18AWG
- Minimum conductor size for electronic-programmable control circuits (inputs/outputs) is 24AWG.
- The combined cross-sectional area of all conductors and cables shall not exceed 50% of the interior cross-sectional area of the raceway, conduit or wireway.
- Conductors and cables shall not be subject of mechanical, chemical and thermal effects based damages.

A common method of protection is wiring inside of raceways, wireways and conduits along its entire run. Cables on cable trays must have a „cable tray rating“. In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, TC cable having additional approval for „open wiring“ is allowed to be used from tray to a piece of equipment without the use of conduits [NEC 2005, Article 336.10(6)].

In Fall 2003 the requirement of marking „open wiring“ of TC cables have been changed into marking „Exposed Run (-ER)“ by decision of the UL Standards Technical

Panel for power cables. Use of TC cables having „open wiring“ or „exposed run“-approvals, such as Lapp Kabel ÖLFLEX® CONTROL M+TM, ÖLFLEX® TRAY II, ÖLFLEX® VFD CT, ÖLFLEX® AUTO X, ÖLFLEX® AUTO I cables, allows much more faster and cost-saving installations.

NFPA 79 refers in specific aspects to the National Electrical Code (NEC, USA). Chapter 1.4.1. Wiring between component machines of an industrial manufacturing system shall be covered by NFPA 70 (NEC). Especially if machinery wiring is attached to the building. In such cases it has to be done by an adequate wiring method described by relevant articles of the NEC.

NEC (National Electrical Code) Handbook Edition 2005

This code covers the standard NFPA 70. The Handbook Edition offers additional information given by tables, graphics, pictures, comments etc. The NEC Handbook as well as NFPA 79 Standard is available via NFPA's website: www.nfpa.org

UL 508-A Moreover:

Industrial Control Panels can be designed, manufactured and labeled under UL 508-A Standard (www.ul.com).