

Dear Sir or Madam,

the National Fire Protection Association publishes many Electrical safety standards used in the USA today. Including the standard we discuss in this paper, NFPA 79 – Electrical Standard for Industrial Machinery (2012 edition). Users in the US are not the only reference this standard, but also machine builders throughout the world utilize NFPA 79. The standard's scope basically ensures proper application of electrical systems used in industrial machines and equipment used in the USA. The standard helps designers make these machines safe and provide the highest degree of protection for the operators.

The NFPA revises this standard on a three to four year cycle. Each revision cycle produces an updated standard with changes that reflect current machine requirements in a constantly changing industry.

A major revision was done to *Section 12 - Conductors, Cables and Flexible Cords*. NFPA describes the changes as follows; **“Chapter 12 has received a new section to address user concerns permitting the use of appliance wiring material (AWM) as special cables, with clarifications on determining suitability for use under specific conditions.”** (NFPA 79-2012) The revised section of NFPA 79 Chapter 12 is 12.9 and reads as follows:

#### 12.9 Special Cables and Conductors.

12.9.1 Other listed cables and conductors shall be permitted were identified as suitable for the intended use.

12.9.2 Appliance wiring material (AWM) shall be permitted as follows:

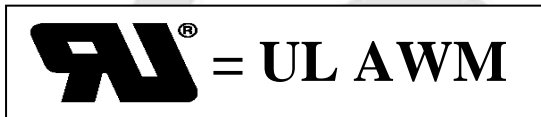
- (1) Where part of an assembly that has been identified for the intended use
- (2) Where the AWM has been identified for use with approved manufacturer's instructions
- (3) Where its construction meets all applicable requirements of Section 12.2 through Section 12.6 with modifications as follows:
  - (a) Stranded conductors with wire sizes smaller than those listed in 12.2.2 shall have a minimum of seven strands.
  - (b) Conductor insulation and cable jacket materials not specified in 12.3.1 shall have flame-resistant properties in compliance with applicable standards for intended use such as FT2 (horizontal wire) flame test or VW-1 (vertical wire) flame test in accordance with ANSI/UL 1581
  - (c) Minimum insulation thickness for single conductor AWM shall be specified in 12.3.2. Minimum insulation thickness for conductors that are part of a multi-conductor jacketed AWM cable shall be as specified by the AWM style number and by the marked voltage rating of the cable.
  - (d) AWM shall be marked in accordance with 12.4.1, 12.4.3, and 12.4.4. The legend shall include manufacturer's name or trademark, AWM style number, voltage rating (unless marking is prohibited by 12.4.2), wire gauge(s), temperature rating, and flame resistance. Additional markings for properties such as oils, water, UV, and chemical resistance identifiers shall be permitted where in compliance with applicable standards for intended use. Where markings alone are insufficient to identify for the intended application, suitable information shall be included with the machine technical documentation.

Excerpt of NFPA 79-2012 Chapter 12.9 –Special cables and Conductors

The code is developed and revised by a technical committee consisted of electrical inspectors, industry professionals and end users. The basis for this type of document is that anyone can comment or request a change. The technical committee responsible for accepting and rejecting changes reviews each proposal and rule accordingly. During the past 10 years the consideration of AWM cable was a heavily debated topic. Prior to the 2012 standard, AWM cable was not allowed per the NFPA 79 standard. However, contrary to the NFPA 79, the industry has used AWM type cables on machines for many years. As a result of users making proposals and gaining the technical committee's acceptance, the standard has finally been revised to include AWM cables. The addition of AWM type cables to this standard allows Machine builders more choices of cable conductor cross-section and number of conductors. As well as cable constructions designed for continuous flexing.



### A Basic overview of the UL 758 Standard for Safety of Appliance Wiring Material

The AWM standard is published and edited by Underwriters Laboratory. UL initially published the AWM standard to control and standardize the cables that are used in UL listed systems.



The AWM standard gives a framework for proper wire construction and testing "The UL AWM standard 758 does not cover wire, cable or cord types that are presently covered in the National Electrical Code NFPA 70" (UL 758, scope). The standard also consists of "style pages" that describe materials, construction and testing of cables used on equipment. All construction and testing requirements are referenced on the "style page". In order to manufacture this type of cable these requirements must be met.

The section below details an actual style page as found on the UL website:

UNDERWRITERS LABORATORIES INC.		APPLIANCE WIRING MATERIAL	
Subj. 758	Section 2	Page 2570	Issued: April 25, 1972
			Revised: Jan. 2, 2002
Style 2570	PVC - Jacketed Cable.		
Rating	80°C, 600 or 1000 Volts.		<b>Temperature &amp; Voltage</b>
Insulated Conductors	No. 40 AWG min. Labeled or complying with manufacturer's AWM Procedure having a minimum rating of 80°C, 600 or 1000 Volts.		
Assembly	Consists of two or more conductors, twisted pairs or groups of twisted conductors twisted together. The conductors or groups of conductors may be laid parallel forming a flat, oval or round cable. The lay of the conductors is not specified. A barrier layer and/or fillers are optional. Manufacturer shall maintain a complete description of each assembly. May use same or mixed AWG size.		
Covering	(Optional) a 6 mil or heavier PVC covering may be extruded over the conductor assembly.		
Shield	Optional.		
Jacket	PVC, Class 43		

UNDERWRITERS LABORATORIES INC.  
 Subj. 758

Section 2 Page 2570A

APPLIANCE WIRING MATERIAL  
 Issued: April 25, 1972  
 Revised: Sept. 25, 2002

Instructions to UL Representative

Detailed Examination of the Cable Assembly and Jacket Wall. Tensile Strength and Elongation of the Jacket, same as for Class 43.

The designations of all Styles of individual conductors used in making up the cable assembly shall be available, and the UL Representative's tag shall indicate if the Style is labeled or not. If they are not labeled, the appropriate Follow-Up Tests shall be conducted.

UL Counter-check Program

**Test program** 

- (4) Detailed Examination.
- (4) Tensile Strength and Elongation of insulation and Jacket.
- (4) Heat Shock on Jacket.
- (4) Deformation on Jacket.
- (4) Cold Bend on Completed Cable.
- (12) Cable Flame Test on Completed Cable.

If the insulated Styles are not labeled, the appropriate Follow-Up Tests shall be conducted.

Marking

General.

Use

External interconnection or internal wiring of electronic equipment.

 **Usage**

Jacket

PVC, Class 43



**Jacket Type & Wall Thickness**

THICKNESS OF PVC JACKET

	Diameter of Cable Under Jacket in Inches	Nominal Thickness of Thickness 64ths of an Inch	Average Thickness in Mils Minimum	Minimum Thickness at Any Point in Mils
	0.700 or less	2	30	24
	0.701 - 1.000	-	60	48
	1.001 - 1.500	-	80	64
*	1.501 - 2.500	-	95	86
*	2.501 - larger	-	110	94

# - Major dia if cable is flat or oval.

\*Standard

Appliance Wiring Material, UL 758.

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Style pages were created to control the basic construction of a cable. Each style page defines the Jacket Type, Temperature and Voltage, Assembly, Test program, Material Class wall thickness and general construction of a cable.

The style page also defines general use. There are many different styles that allow the designer to manufacture small single conductor wire up to large power and control cables.

igus offers a complete line of continuous flexing cables, and complies with all the AWM requirements described in the NFPA 79 standard.

See links below for more information on the various cables we offer.

Best regards,



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<http://www.igus.de>

References:

UL Online-Zertifizierungsverzeichnis  
<http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm>

UL AWM 758

NFPA 79 – 2012  
<http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=79>