

New VFD Cable Requirements Added to 2018 Edition of NFPA 79 Electrical Standard for Industrial Machinery



There are multiple industry standards for Variable Frequency Drive (VFD) cables, and consequently, a number of different designs available in the market. But ultimately, the long term performance of any motor/drive system is dependent on the cable. In recent years, manufacturers have focused on the insulation material for an important reason: The dielectric of the insulation plays a key role in designing a VFD cable that works properly. Selecting the wrong cable with the wrong insulation can cause problems that range from high charging currents wasting energy due to heat dissipation, to complete cable failure, which is a safety hazard.

An important standard is the *NFPA 79 Electrical Standard for Industrial Machinery* and it is updated every three years by the National Fire Protection Agency (NFPA). The new version for 2018 has been finalized and includes a significant change for VFD cable that is used on machinery in an NFPA 79 environment. Paragraph 4.4.2.8 in the NFPA 79 2018 edition states:

“Electrical conductors and equipment supplied by power conversion equipment as part of adjustable speed drive systems and servo drive systems shall be listed flexible motor supply cable marked RHH, RHW, RHW-2, XHH, XHHW, or XHHW-2”

Source: NFPA.ORG/NFPA79 2018 archived revision information.

This new paragraph appears in Chapter 4, “General Operating Conditions,” and not in Chapter 12, “Conductors, Cables and Flexible Cords,” where you might expect to find cable-related information.

The likely goal of this language is to increase safety by reducing the use of thermoplastic wiring insulation that cannot withstand the output voltages and currents from a VFD using pulse width modulation. Thermoplastic insulation, such as PVC/nylon, can create problems in moist environments or in long cable runs from VFD to motor. Ultimately, thermoplastic PVC can melt and deform when exposed to heat generated by short circuits.

So how can you comply with this new language?

Simply check the cable print legend or the spec sheet. If the cable is UL-listed, there should be information about the conductor insulation material available to you. The requirements include RHH, RHW, RHW-2, XHH, XHHW, XHHW-2, or XLPE. These are common designations in the USA and all of them refer to Thermoset material per UL 44, versus thermoplastic.

What do these conductor insulation designations mean?

Type	Description	Heat Resistance
XLPE	Cross Linked Polyethylene is a thermoset insulation material	Rubber High Heat resistant
RHW	Rubber Heat and Water resistant	
RHW-2	Rubber Heat and Water resistant 90°C dry and 90°C wet locations	Crosslinked (Polyethylene) High Heat resistant
XHHW	Crosslinked (Polyethylene) High Heat and Water resistant	
XHHW-2	Crosslinked (Polyethylene) High Heat and Water resistant 90°C dry and 90°C wet locations	

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