

## The 1000 Volt Cable Rating

### Introduction

One significant change to UL 44 (Standard for Safety for Thermoset-Insulated Wires and Cable) in the 2018 release is the addition of the 1000 Volt rating of US type designations. Now XHHW, in addition to having a 600 Volt rating, can be rated 1000 Volt. RHH and RHW cables, which had 600 V and 2000 V ratings now can be rated 1000 Volts. The 1000 Volt rating was added to further harmonize the US electrical standards with Canada and Mexico. This harmonization effort commenced following the 1992 passage of the North American Free Trade Agreement (NAFTA)

The harmonization of cable standards in North America simplifies things for both cable manufacturers and OEMs serving these countries. Many cable manufacturers are updating the listing of their 600 Volt thermoset cables to be both 600 Volt and 1000 Volt rated. Some customers are expressing concern that new 1000 Volt cables may cost more than the 600 Volt cables they purchase today. This concern stems from a lack of understanding about what the new 1000 Volt rating requires. This application note was developed to help alleviate that concern.

Traditionally, higher voltage ratings require cables to have a thicker insulation wall. This thicker wall increases cable cost and cable diameter. Using larger cables may result in larger system components (like conduit, glands, tray, etc.) further increasing costs. For example, compare insulation wall thicknesses between XL insulated 600 Volt and 2000 Volt rated RHW cable in Table 1 below:

**TABLE 1**

Cable Size	Minimum Average Thickness (mils)	
	600V or 1000V	2000V
14 – 10	45	60
8 – 2	60	70
1 – 4/0	80	90
250 – 500	95	105
550 – 1000	110	120
1100 – 2000	125	140



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This 1000 Volt rating does not require any increase in wall thickness over the 600 V rating levels. The cable insulation wall thicknesses stay the same; what does change are the testing requirements. Table 2 shows that 1000 Volt rated cables have the same insulation thickness as 600 Volt rated cable but must pass voltage tests at the same level as 2000 Volt cable.

TABLE 2

Cable Size	Minimum Average Thickness (mils)		Test Voltage in kV (AC Dielectric/RMS Spark)	
	600V or 1000V	2000V	600V or 1000V	2000V
14 – 10	45	60	3.0 / 7.5	6.0 / 10.0
8 – 2	60	70	3.5 / 10.0	7.5 / 12.5
1 – 4/0	80	90	4.0 / 12.5	9.0 / 15.0
250 – 500	95	105	5.0 / 15.0	10.0 / 17.5
550 – 1000	110	120	6.0 / 17.5	11.0 / 20.0
1100 – 2000	125	140	7.0 / 20.0	13.5 / 22.5

The new 1000 Volt rating gives customers the best of both worlds, it keeps costs at the same level as 600 Volt cable and helps provide extra assurance that cables will not fail in applications involving higher than normal voltages. One such application is the inverter to motor cables in variable frequency drive applications where the cable can see reflected waveforms much higher than 600 Volts.