

Table 310-13. Conductor Application and Insulations

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation		Outer Covering ¹	
					AWG or kcmil	Mils		
Fluorinated ethylene propylene	FEP or FEPB	90°C 194°F	Dry and damp locations	Fluorinated ethylene propylene	14-10 8-2	20 30	None	
		200°C 392°F	Dry locations — special applications ²	Fluorinated ethylene propylene	14-8	14	Glass braid	
					6-2	14	Asbestos or other suitable braid material	
Mineral insulation (metal sheathed)	MI	90°C 194°F	Dry and wet locations	Magnesium oxide	18-16 ³ 16-10	23 36	Copper or alloy steel	
		250°C 482°F	For special applications ²		9-4 3-500	50 55		
Moisture-, heat-, and oil-resistant thermoplastic	MTW	60°C 140°F	Machine tool wiring in wet locations as permitted in NFPA 79 (see Article 670)	Flame-retardant moisture-, heat-, and oil-resistant thermoplastic	22-12	(A) 30 (B) 15	(A) None (B) Nylon jacket or equivalent	
		90°C 194°F	Machine tool wiring in dry locations as permitted in NFPA 79 (see Article 670)		10	30		20
					8	45		30
					6	60		30
					4-2	60		40
					1-4/0	80		50
					213-500	95		60
591-1000	110	70						
Paper		85°C 185°F	For underground service conductors, or by special permission	Paper			Lead sheath	

¹Some insulations do not require an outer covering.

²Where design conditions require maximum conductor operating temperatures above 90°C (194°F).

³For signaling circuits permitting 300-volt insulation.

Table 310-13. (Continued)

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation		Outer Covering ¹
					AWG or kcmil	Mils	
Perfluoroalkoxy	PFA	90°C 194°F	Dry and damp locations	Perfluoroalkoxy	14-10	20	None
		200°C 392°F	Dry locations — special applications ²		8-2 1-4/0	30 45	
Perfluoroalkoxy	PFAH	250°C 482°F	Dry locations only. Only for leads within apparatus or within raceways connected to apparatus (Nickel or nickel-coated copper only)	Perfluoroalkoxy	14-10 8-2 1-4/0	20 30 45	None
Thermoset	RH	75°C 167°F	Dry and damp locations	Flame-retardant thermoset	14-12 ⁴	30	Moisture-resistant, flame-retardant, non-metallic covering ¹
Thermoset	RHH	90°C 194°F	Dry and damp locations		10 8-2 1-4/0 213-500 501-1000 1001-2000 For 601-2000, see Table 310-62	45 60 80 95 110 125	
Moisture-resistant thermoset	RHW ⁵	75°C 167°F	Dry and wet locations Where over 2000 volts insulation, shall be ozone-resistant	Flame-retardant, moisture-resistant thermoset	14-10 8-2 1-4/0 213-500 501-1000 1001-2000 For 601-2000 volts, see Table 310-62	45 60 80 95 110 125	Moisture-resistant, flame-retardant, non-metallic covering ⁶
Moisture-resistant thermoset	RHW-2	90°C 194°F	Dry and wet locations	Flame-retardant moisture-resistant thermoset	14-10 8-2 1-4/0 213-500 501-1000 1001-2000 For 601-2000 volts, see Table 310-62	45 60 80 95 110 125	Moisture-resistant, flame-retardant, non-metallic covering ⁶
Silicone	SA	90°C 194°F	Dry and damp locations	Silicone rubber	14-10 8-2 1-4/0 213-500 501-1000 1001-2000	45 60 80 95 110 125	Glass or other suitable braid material
		200°C 392°F	For special application ²				
Thermoset	SIS	90°C 194°F	Switchboard wiring only	Flame-retardant thermoset	14-10 8-2 1-4/0	30 45 95	None
Thermoplastic and fibrous outer braid	TBS	90°C 194°F	Switchboard wiring only	Thermoplastic	14-10 8 6-2 1-4/0	30 45 60 80	Flame-retardant, nonmetallic covering

¹Some insulations do not require an outer covering.

²Where design conditions require maximum conductor operating temperatures above 90°C (194°F).

⁴For size Nos. 14-12, RHH insulation shall be 45 mils thickness.

⁵Listed wire types designated with the suffix "-2," such as RHW-2, shall be permitted to be used at a continuous 90°C (194°F) operating temperature, wet or dry.

⁶Some rubber insulations do not require an outer covering.

Table 310-13. (Continued)

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation		Outer Covering ¹
					AWG or kcmil	Mils	
Extended polytetrafluoroethylene	TFE	250°C 482°F	Dry locations only. Only for leads within apparatus or within raceways connected to apparatus, or as open wiring (Nickel or nickel-coated copper only)	Extruded polytetrafluoroethylene	14-10 8-2 1-4/0	20 30 45	None
Heat-resistant thermoplastic	THHN	90°C 194°F	Dry and damp locations	Flame-retardant, heat-resistant thermoplastic	14-12 10 8-6 4-2 1-4/0 250-500 501-1000	15 20 30 40 50 60 70	Nylon jacket or equivalent
Moisture- and heat-resistant thermoplastic	THHW	75°C 167°F 90°C 194°F	Wet location Dry location	Flame-retardant, moisture- and heat-resistant thermoplastic	14-10 8 6-2 1-4/0 213-500 501-1000	30 45 60 80 95 110	None
Moisture- and heat-resistant thermoplastic	THW ⁵	75°C 167°F 90°C 194°F	Dry and wet locations Special applications within electric discharge lighting equipment. Limited to 1000 open-circuit volts or less (Size 14-8 only as permitted in Section 410-31)	Flame-retardant, moisture- and heat-resistant thermoplastic	14-10 8 6-2 1-4/0 213-500 501-1000 1001-2000	30 45 60 80 95 110 125	None
Moisture- and heat-resistant thermoplastic	THWN ⁵	75°C 167°F	Dry and wet locations	Flame-retardant, moisture- and heat-resistant thermoplastic	14-12 10 8-6 4-2 1-4/0 250-500 501-1000	15 20 30 40 50 60 70	Nylon jacket or equivalent
Moisture-resistant thermoplastic	TW	60°C 140°F	Dry and wet locations	Flame-retardant, moisture-resistant thermoplastic	14-10 8 6-2 1-4/0 213-500 501-1000 1001-2000	30 45 60 80 95 110 125	None
Underground feeder and branch-circuit cable — single conductor (For Type UF cable employing more than one conductor, see Article 339).	UF	60°C 140°F 75°C 167°F ⁸	See Article 339	Moisture-resistant Moisture- and heat-resistant	14-10 8-2 1-4/0	60 ⁷ 80 ⁷ 95 ⁷	Integral with insulation

¹Some insulations do not require an outer covering.

⁵Listed wire types designated with the suffix "-2," such as RHW-2, shall be permitted to be used at a continuous 90°C (194°F) operating temperature, wet or dry.

⁷Includes integral jacket.

⁸For ampacity limitation, see Section 339-5.

Table 310-13. (Continued)

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation		Outer Covering ¹
					AWG or kcmil	Mils	
Underground service-entrance cable — single conductor (For Type USE cable employing more than one conductor, see Article 338)	USE ⁵	75°C 167°F	See Article 338	Heat- and moisture-resistant	14-10 8-2 1-4/0 213-500 501-1000 1001-2000	45 60 80 95 ⁹ 110 125	Moisture-resistant nonmetallic covering [see Section 338-1(b)]
Thermoset	XHH	90°C 194°F	Dry and damp locations	Flame-retardant thermoset	14-10 8-2 1-4/0 213-500 501-1000 1001-2000	30 45 55 65 80 95	None
Moisture-resistant thermoset	XHHW ⁵	90°C 194°F 75°C 167°F	Dry and damp locations Wet locations	Flame-retardant, moisture-resistant thermoset	14-10 8-2 1-4/0 213-500 501-1000 1001-2000	30 45 55 65 80 95	None
Moisture-resistant thermoset	XHHW-2	90°C 194°F	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14-10 8-2 1-4/0 213-500 501-1000 1001-2000	30 45 55 65 80 95	None
Modified ethylene tetrafluoroethylene	Z	90°C 194°F 150°C 302°F	Dry and damp locations Dry locations — special applications ²	Modified ethylene-tetrafluoroethylene	14-12 10 8-4 3-1 1/0-4/0	15 20 25 35 45	None
Modified ethylene tetrafluoroethylene	ZW ⁵	75°C 167°F 90°C 194°F 150°C 302°F	Wet locations Dry and damp locations Dry locations — special applications ²	Modified ethylene tetrafluoroethylene	14-10 8-2	30 45	None

¹Some insulations do not require an outer covering.

²Where design conditions require maximum conductor operating temperatures above 90°C (194°F).

⁵Listed wire types designated with the suffix "-2," such as RHW-2, shall be permitted to be used at a continuous 90°C (194°F) operating temperature, wet or dry.

⁹Insulation thickness shall be permitted to be 80 mils for listed Type USE conductors that have been subjected to special investigations. The nonmetallic covering over individual rubber-covered conductors of aluminum-sheathed cable and of lead-sheathed or multiconductor cable shall not be required to be flame retardant. For Type MC cable, see Section 334-20. For nonmetallic-sheathed cable, see Section 336-30. For Type UF cable, see Section 339-1.