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## Solutions for Industrial Automation North America

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USA/CANADA



VFD and Servo Cables  
Power and Control Cables  
BUS, Network and Hybrid Cables  
ANSI/US Safety Labels

## Solvtek is the web application with which it is possible to calculate:

- the voltage drop of the conductor
- the maximum length of the conductor
- the maximum load of the conductor
- the sizes of the conductors
- the diameter of the cables' bundle
- the dimensions of the most suitable heat shrink tubing
- the size of the raceways or the cable trays
- the distance of the supports

and finally, it is possible to validate intrinsically **safe systems**.

**Solvtek simplifies the work of technical offices and designers**

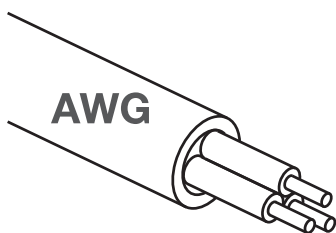
by providing calculation methods based on the main standards and on the various regulatory editions.

These are some of the utilities.

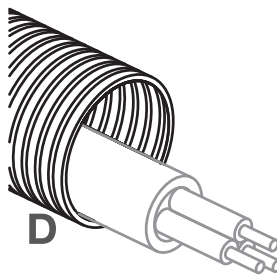


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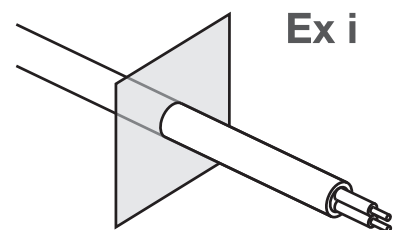
Calculation of the conductor size and the maximum load applicable according to the NFPA 79, NFPA 70 (NEC), CSA C22.1 (CE Code), UL 2011 standards.



Sizing of the rigid or flexible tubing, metallic and non-metallic according to the requirements of the NFPA 70 (NEC) and NFPA 79 standards



Validation of the intrinsically safe system according to the requirements of EN 60079 e ANSI/UL 60079 standards





# Index

## Industrial cables

Series	Product	Page	Insulation	Jacket	Voltage rating	Temperature rating	USA and Canada Certification	Use
911	Single core cables style 1015	12	PVC	-	600 V 450/750V	-40°C +70°C/+90°C/+105°C		Fixed
1070	Single core cables type THHW/TFF MTW AWM TEW	14	PVC	-	450/750V 600V 1000V	-40°C/-5°C, +70°C/+90°C/+105°C		Fixed
361S	Low capacity VFD 3xG cables, AWM	16	TKblend®-YP	PVC	600 V 600/1000 V	40°C/-5°C +90°C		Fixed
361S	Low capacity VFD 1xG cables, AWM	18	TKblend®-YP	PVC	600 V 600/1000 V	40°C/-5°C +90°C		Fixed
365S	Low capacity VFD 3xG cables, TC-ER/CIC/MTW/WTTC, Direct Burial, Sun Res	20	Special XLPE	PVC	600 V 1000 V 600/1000 V	-40°C/-5°C +90°C		Fixed
365S	Low capacity VFD 1xG cables, TC-ER/CIC/MTW/WTTC, Direct Burial, Sun Res	22	Special XLPE	PVC	600 V 1000 V 600/1000 V	-40°C/-5°C +90°C		Fixed
8110 8110S	Power and Control Tray Cable, TC-ER-HL/CIC/MTW/WTTC/AWM Direct Burial, Sun Res	24	TKblend®-R	PVC	600 V 1000 V 600/1000 V	-40°C/-5°C, +75°C/+90°C		Fixed
71000	Profibus data communication cables	28	TKblend®-L	PVC	300 V	-10°C, +80°C		Fixed
71100	Profibus data communication cables	29	TKblend®-L	PVC	30 V	-10°C, +80°C		80 m/min 7 m/s <sup>2</sup>
71140	High performances Profibus data communication cables	30	TKblend®-L	PUR	300 V	-10°C, +80°C		180 m/min 3 m/s <sup>2</sup>
71600	High performances Profibus CMX data communication cables	31	TKblend®-L	PUR	300 V	-40°C/-30°C +70°C/+75°C		180 m/min 3 m/s <sup>2</sup>
73000	DeviceNet data communication cables	32	TKblend®-L	PVC	300 V	-40°C, +80°C		Fixed
73100	DeviceNet data communication cables	33	TKblend®-L	PUR	300 V	-40°C, +80°C		180 m/min 5 m/s <sup>2</sup>
74100	CanOpen data communication cables	34	TKblend®-L	PVC	300 V	-40°C, +80°C		Fixed
74000	CanOpen data communication cables	35	TKblend®-L	PUR	300 V	-40°C, +80°C		180 m/min 5 m/s <sup>2</sup>
75000	Industrial Ethernet data transmission cables	36	TKblend®-L	PVC	300 V	-30°C, +80°C		Fixed
75500	Industrial Ethernet CMR data communication cables	37	TKblend®-L	PVC	125 V	-30°C, +75°C		Fixed
75200	Industrial Ethernet data transmission cables Cat. 6	38	TKblend®-L	PUR	1000 V (work 50 V)	-40°C/-30°C +80°C		300 m/min 5 m/s <sup>2</sup>
75600	Industrial Ethernet CMX data communication cables	39	TKblend®-L	PUR	125 V	-30°C/-40°C, +70°C/+75°C		180 m/min 3 m/s <sup>2</sup>
75700	Industrial Ethernet CMX data communication cables Cat.6	40	TKblend®-L	PUR	300 V (work 50 V)	-40°C/-20°C +75°C/+80°C		300 m/min 5 m/s <sup>2</sup>
77000	Profinet data transmission cables	41	TKblend®-L	PVC	300 V	-30°C, +80°C		Fixed
77100	Profinet data transmission cables	42	TKblend®-L	TPE/PUR	300 V	-40°C/-20°C +60°C/+80°C		180 m/min 5 m/s <sup>2</sup>
78000	DRIVE-CLiQ data transmission cables	43	TKblend®-YP	PUR	300 V	-50°C/-25°C +80°C		Fixed
78100	DRIVE-CLiQ data transmission cables	44	TKblend®-YP	PUR	300 V	-50°C/-25°C/+5°C +60°C/+80°C		220 m/min 10 m/s <sup>2</sup>
DATA	Encoder, resolver and data transmission cables	45	Various	Various	Various	Various		Fixed
HYBRID	Multi-conductor "Hybrid" cables	48				Various		

## Safety labels

Product	Page	Material	Application	Temperature rating
Safety labels	52	PVC with adhesive layer and protective lamination or Anodized aluminum	Indoor and outdoor	-40°C, +95°C /+100°C

## Appendix

	Page		Page
Appendix A. Wires, Sizes and AWG diameters	60	K.3 Conversion between degrees of protection	160
A.1 AWG and kcmil wires' sizes measurement	60	Appendix L. Hazardous locations	162
A.2 Wires according to EN 60228	62	Appendix M. Cables and wires' flame resistance tests	165
A.3 Wires, correlations between AWG and IEC Sizes	65	Appendix N. Flammability rating for plastic materials	170
A.4 Minimum cross-sectional areas of copper conductors according to EN 60204-1	66	Appendix O. Cables' transportation, storage and handling	172
Appendix B. Wire capacity	67	O.1 Transportation and storage	172
B.1 Wires ampacities according to UL 508a	67	O.2 Handling	173
B.2 Ampacity of conductors according to CSA C22.2 No. 286	70	O.3 Use of cables in drag-chain	174
B.3 Ampacities of conductors according to NFPA 79	71	Appendix P. Tables of Color	176
B.4 Ampacities of conductors according to NFPA 70 (NEC)	82	P.1 Colors of conductors according to their function	176
B.5 Ampacities of Flexible Cords and Cables according to NFPA 70 (NEC)	88	P.2 Colors of conductors according to DIN 47100	176
B.6 Ampacity of conductors according to CSA C22.1 (CE Code)	97	P.3 Colors of conductors according to CEI UNEL 00722	177
B.7 Current-carrying capacity of conductors according to EN 60204-1	111	P.4 Colors of conductors according to UL508a	177
B.8 Ampacities of conductors according to VDE 0298-4	116	P.5 Colors of conductors according to NFPA 79	178
B.9 Ampacities of conductors according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8	123	P.6 Colors of conductors according to EN 60204-1	178
Appendix C. Wire bending space at filed wiring terminals	136	P.7 Colors of conductors according to ICEA (Insulated Cable Engineers Association)	178
Appendix D. Motors' full-load currents	137	P.8 Colors of conductors according to internal specification Type 1-P	179
D.1 Motors' full-load currents with alternate current according to UL 508a	137	P.9 Colors of conductors according to internal specification Type 1-C	179
D.2 Motors' full-load currents with direct current according to UL 508a	138	P.10 Colors of conductors according to internal specification Type 1-T	180
Appendix E. Conductors for general wiring according to NFPA 70	139	P.11 Colors of conductors according to internal specification Type 2-C	180
Appendix F. Flexible cords and cables according to NFPA 70	141	P.12 Colors of conductors according to internal specification Type 3-P	180
Appendix G. Wires and cables marking according to UL	147	P.13 Colors of conductors according to internal specification Type 4-C	180
Appendix H. Style, definition and reference	152	P.14 Colors of conductors according to internal specification Type 5-P	181
Appendix I. Ethernet cables' naming	155	P.15 Colors of conductors according to internal specification Type 6-T	181
Appendix J. Listed or Recognized products	156	P.16 Colors of conductors according to internal specification Type 7-P	181
J.1 Listed products	156	P.17 Colors of conductors according to internal specification Type 8-C	182
J.2 Recognized products	156	P.18 Colors of conductors according to internal specification Type 9-P	182
J.3 Difference between Listed products and Recognized products	156	P.19 Colors of conductors according to internal specification Type 10-P	182
J.4 Interchangeable product certification marks	157	Appendix Q. Standard refere	183
Appendix K. Degrees of protection provided by enclosures	158	Appendix R. Definitions	185
K.1 Degree of protection IP	158	Appendix S. Symbols and marks	188
K.2 Degree of protection NEMA	159	Appendix T. Unites of measurement	189

## Index based on installation area

Product		Installation area				
		Area A1	Area A2	Area A3	Area Q1	Area Q2
		Installation inside cable trays or inside raceways in direct contact with the structures of the buildings (ceiling, walls, floors).	Installation in cable trays or in raceways on the machinery.	Exposed installation on the machinery.	Installation in control panel.	Installation in control panel on the machinery.
Family	Series	Standards reference if installation is possible				
Single core cables	911		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	1070			NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
Cables for fixed applications	361S, 365S		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	8110, 8110S	NFPA 70 (NEC) CSA C22.1 (CE Code)	NFPA 79 CSA C22.1 (CE Code)	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
Data transmission cables	71000		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	71100		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	71600	NFPA 70 (NEC) CSA C22.1 (CE Code)	NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	73000		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	73100		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	74100		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	74000		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	75000		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	75500	NFPA 70 (NEC) CSA C22.1 (CE Code)	NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	75200		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	75600, 75700	NFPA 70 (NEC) CSA C22.1 (CE Code)	NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	77000		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	77100		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	78000		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	78100		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286
	DATA		NFPA 79 CSA C22.1 (CE Code) <sup>(1)</sup>	NFPA 79 CSA C22.1 (CE Code)	UL 508a CSA C22.2 No. 286	UL 508a CSA C22.2 No. 286

Note 1. The above table contains general suggestions that must be verified by qualified person and must be according to local regulations and standards.

Note 2. More details on the installation areas are in the image at the end of the table.

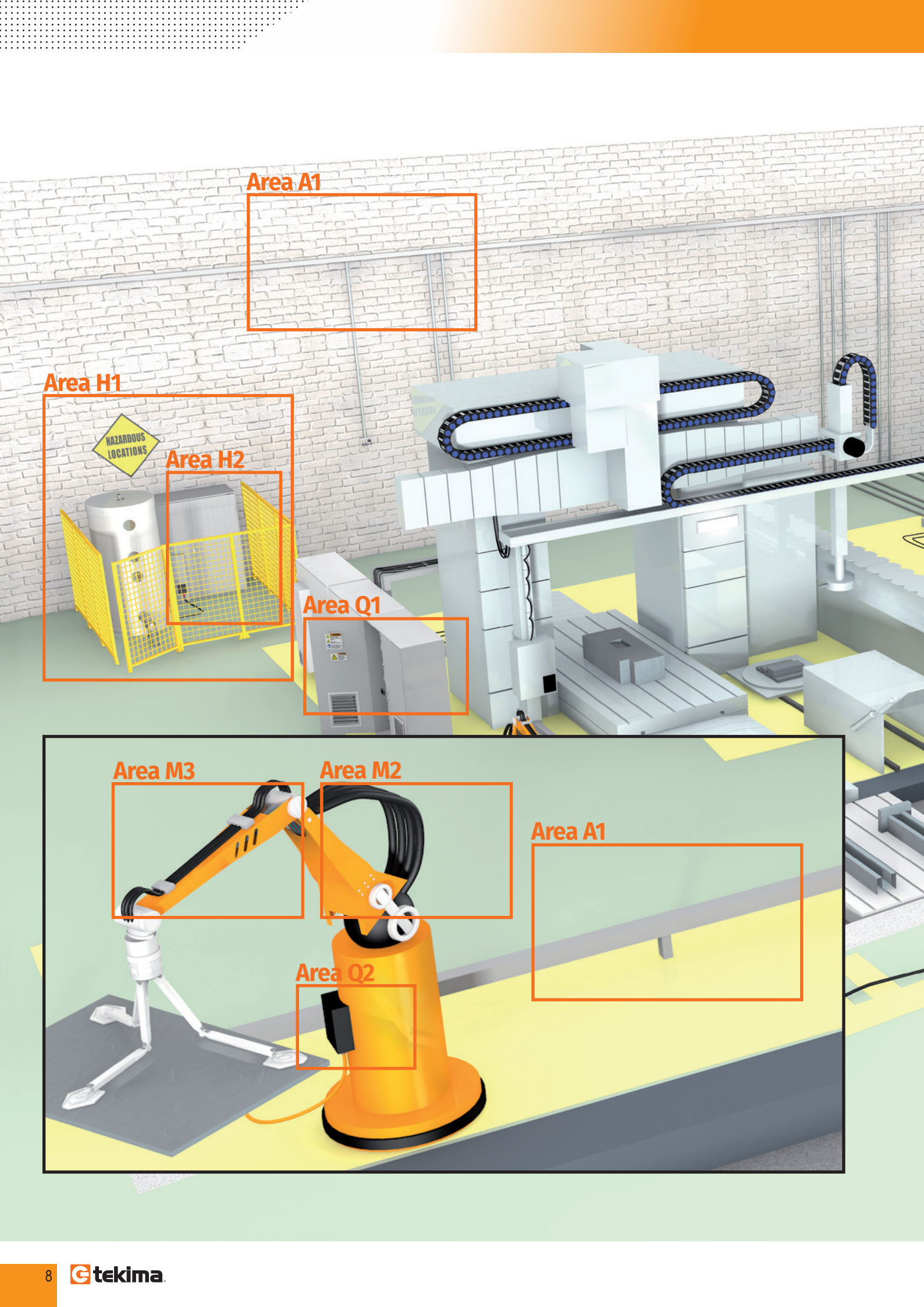
Installation area					Product	Series	Family
Area M1	Area M2	Area M3	Area H1	Area H2			
Installation in drag chains.	Exposed installation on moving parts on machinery.	Installation on moving parts in direct contact with the machinery.	Installation in hazardous locations.	Installation in control panel in hazardous locations.			
Standards reference if installation is possible							
						911	Single core cables
						1070	
						361S, 365S	Cables for fixed applications
				NFPA 70 (NEC) CSA C22.1		8110, 8110S	
						71000	Data transmission cables
CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)				71100	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)	NFPA 70 (NEC) <sup>(4)</sup>	NFPA 70 (NEC) CSA C22.1		71600	
						73000	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)				73100	
						74100	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)				74000	
						75000	
			NFPA 70 (NEC) <sup>(4)</sup>	NFPA 70 (NEC) CSA C22.1		75500	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)				75200	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)	NFPA 70 (NEC) <sup>(4)</sup>	NFPA 70 (NEC) CSA C22.1		75600, 75700	
						77000	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)				77100	
		NFPA 79 CSA C22.1 (CE Code)				78000	
NFPA 79 CSA C22.1 (CE Code)	NFPA 79 <sup>(3)</sup> CSA C22.1 (CE Code) <sup>(3)</sup>	NFPA 79 CSA C22.1 (CE Code)				78100	
						DATA	

Note 1. The above table contains general suggestions that must be verified by qualified person and must be according to local regulations and standards.

Note 2. More details on the installation areas are in the image at the end of the table.

- (1) If the installation is in cable tray, the cable must be protected in a raceway.
- (2) Only if protected in raceway.
- (3) Only after verification of the type of movement (flexion and/or torsion).
- (4) Only if protected in raceway for hazardous locations.





Area A1

Area H1

Area H2

Area Q1

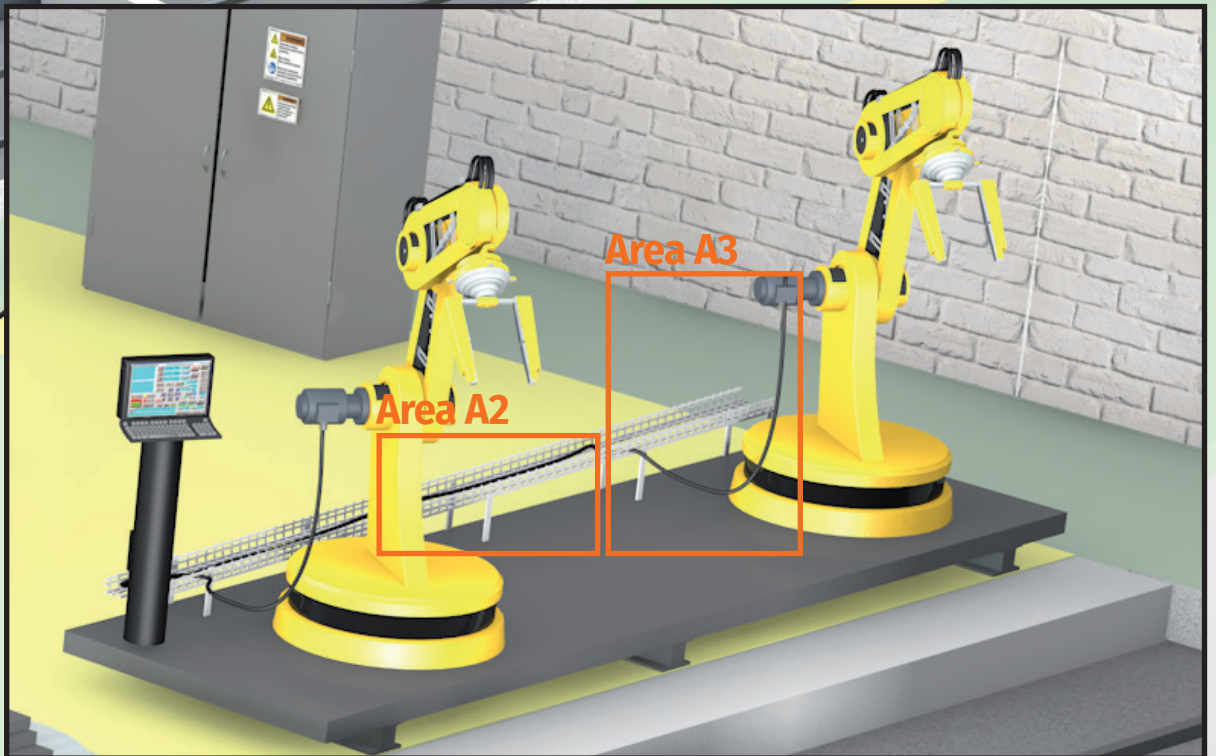
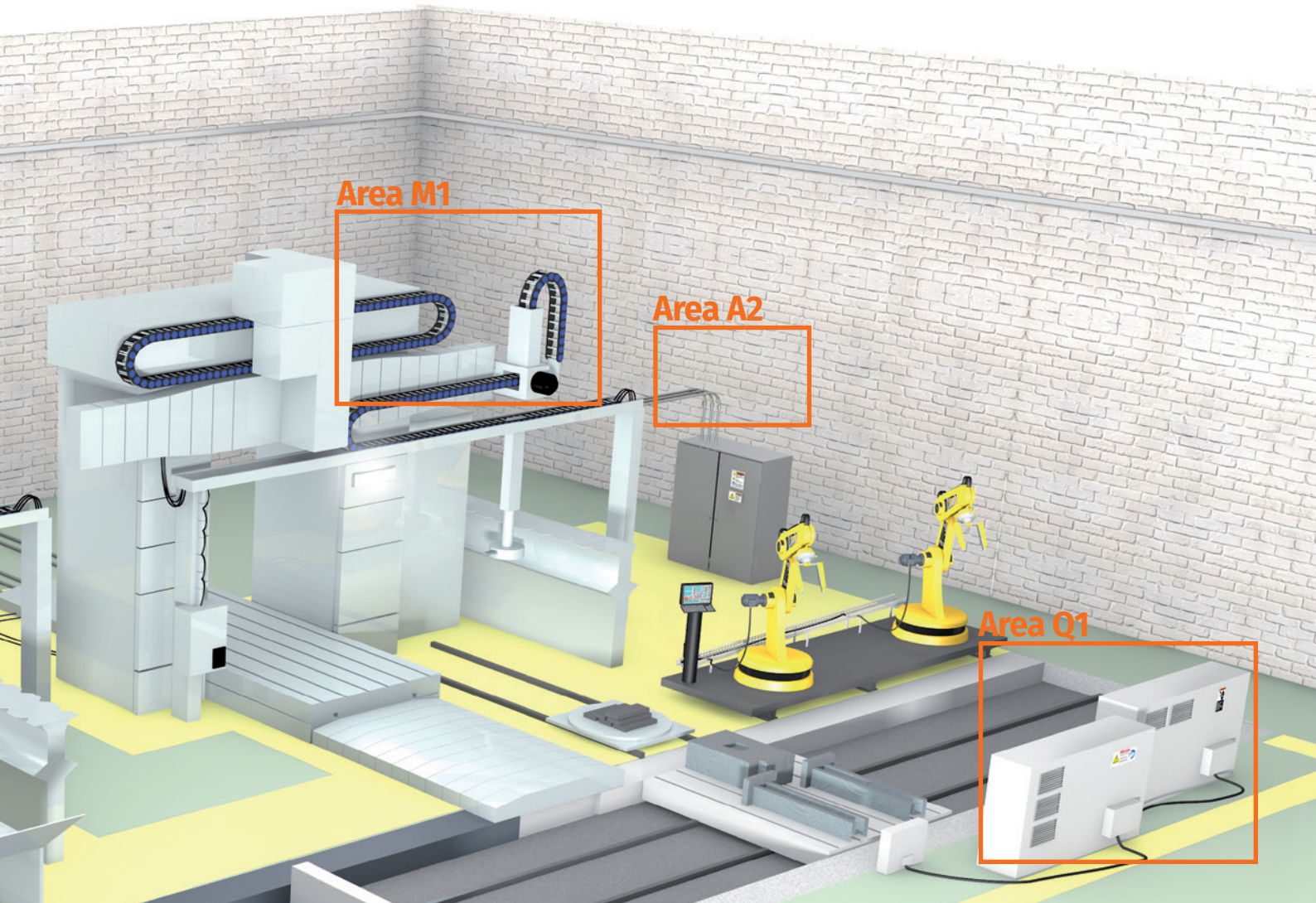
Area M3

Area M2

Area A1

Area Q2







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## **Industrial cables**

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**SERIES**  
**911**

## Single core cables Style 1015



Fixed application, unshielded



### Use

Single core cables for Internal Wiring of Appliances. The product has a double certification, IEC for uses up to 90°C and voltages 450/750 and UL for uses up to 105°C and voltages of 600V.



Packaging "Cable Box"  
L400xL400xH500 mm

### Technical data

Characteristics	Value/property
Conductor	Red or tinned copper flexible strand
Insulation	PVC according to with UL 758
Temperature range	+105°C (AWM), +90°C (IEC), +90°C (HAR H05V2-K/H07V2-K <50 mm <sup>2</sup> ), +70°C (HAR H07V-K ≥50 mm <sup>2</sup> ) -40°C (fixed); -5°C (not fixed)
Voltage rating	600 Vac, 750 Vdc (AWM); 300/500 V ≤1 mm <sup>2</sup> , 450/750 V >1 mm <sup>2</sup> (HAR); 300/500V ≤0,34 mm <sup>2</sup> , 450/750 V >0,34 mm <sup>2</sup> (IEC)
Spark test	6000 V
Bending radius	4 x cable outer diameter (13 x cable outer diameter for non-cyclical mobile uses)
Standards of construction	UL 758   Flame res.: Test B acc. to DIN VDE 0472 part 804, IEC 60332-1-2, UL VW-1, UL/CSA FT1   Other: CEI EN 50525-2-31 and HD 21.3 S3:1995+A1:1999+A2:2008, CSA AWM I A/B, cURus AWM Style 1015
Standards of use	ANSI/NFPA 79, UL 508a, Style 1015

### Marking

TEKIMA 09110 – H07V2-K IEMMEQU <HAR> 90°C CE 2,5 mm<sup>2</sup> 90°C 450/750V IEC 60332-1-2 RoHS c(UR)us E314444 14 AWG 600V 105°C VW-1 AWM Style 1015 AWM I A/B 105°C 600V FT1 – (prod.reference)

NOTE: For "Cable Box" packaging the marking is by engraving and is neutral while for reels and spool it is by ink jet.

### Coding and dimensions

Code	Size [mm <sup>2</sup> ]	Size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]	Reel/spool packaging [m (ft)]	Packaging "Cable Box" [m (ft)]
CVC034_09110_□□ <sup>(1)</sup>	0,34	22	2,3 (0.091)	9 (6)	500 (1640)	3000 (9843)
CVC050_09110_□□	0,5	21	2,5 (0.098)	11 (7)	500 (1640)	2500 (8202)
CVC075_09110_□□	0,75	19	2,7 (0.106)	14 (9)	100 (328)	2000 (6562)
CVC100_09110_□□	1	18	2,8 (0.110)	16 (11)	100 (328)	2000 (6562)
CVC150_09110_□□	1,5	16	3,1 (0.122)	22 (15)	100 (328)	1500 (4921)
CVC250_09110_□□	2,5	14	3,5 (0.138)	32 (22)	100 (328)	1000 (3281)
CVC400_09110_□□	4	12	4,2 (0.165)	48 (32)	100 (328)	500 (1640)
CVC600_09110_□□	6	10	4,7 (0.185)	68 (46)	100 (328)	400 (1312)
CVCB10_09110_□□	10	8	6,5 (0.256)	119 (80)	100 (328)	-
CVCB16_09110_□□	16	6	8,2 (0.323)	191 (128)	50 (164)	-
CVCB25_09110_□□	25	4	9,7 (0.382)	285 (192)	50 (164)	-
CVCB35_09110_□□	35	2	10,9 (0.429)	383 (257)	50 (164)	-
CVCB50_09110_□□	50	1	13,7 (0.539)	567 (381)	500* (1640*)	-
CVCB70_09110_□□	70	2/0	15,1 (0.594)	748 (503)	500* (1640*)	-
CVCB95_09110_□□	95	3/0	17,3 (0.681)	1008 (677)	500* (1640*)	-
CVCL12_09110_□□	120	4/0	18,4 (0.724)	1223 (822)	500* (1640*)	-

Code	Size [mm <sup>2</sup> ]	Size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]	Reel/spool packaging [m (ft)]	Packaging "Cable Box" [m (ft)]
CVCL15_09110_□□	150	250	20,7 (0.815)	1542 (1036)	500* (1640*)	-
CVCL18_09110_□□	185	350	22,5 (0.886)	1862 (1251)	500* (1640*)	-
CVCL24_09110_□□	240	450	25,4 (1.000)	2415 (1623)	500* (1640*)	-

\* For this article, an additional UL certified cut-to-length service is carried out on request ("Processed Wire").

(1) This article is not HAR.

## Code composition

CVC	□□□	_09110_	□□	□□□□						
<table border="1"> <thead> <tr> <th>Packaging</th> <th>To be inserted</th> </tr> </thead> <tbody> <tr> <td>Reel/spool</td> <td>&lt;keep this field empty&gt;</td> </tr> <tr> <td>"Cable Box"</td> <td>_CB</td> </tr> </tbody> </table>					Packaging	To be inserted	Reel/spool	<keep this field empty>	"Cable Box"	_CB
Packaging	To be inserted									
Reel/spool	<keep this field empty>									
"Cable Box"	_CB									

Size	To be inserted
0,34, 0,5, ..., 6 mm <sup>2</sup>	034, 050, ..., 600
10, 16, ..., 95 mm <sup>2</sup>	B10, B16, ..., B95
120, 150, ..., 240 mm <sup>2</sup>	L12, L15, ..., L24

Color	To be inserted
Orange	AR
White	BI
White/orange	BA**
White/blue**	BB**
Blue	BU
Blue Ral 5015	BL
Yellow*	GI*
Yellow/green	GV
Gray	GR
Brown	MR
Black	NE
Pink	RS
Red	RO
Green*	VE*
Violet	VI

\* For these colors the product is not HAR.

\*\* For these colors the product is not HAR for sizes > 1 mm<sup>2</sup>.

Note. The double color is such that one of the colours covers at least 30% and not more than 70% of the surface, the other colour covering the remainder of that surface.

**SERIES**  
**1070**

## Single core cables type THHW/TFF MTW AWM TEW



Fixed application, unshielded



<HAR>



### Use

Oil resistant single core cables suitable for machine tools subjected to medium mechanical stresses, for fixed or flexible installation, where free movement is required without tensile stresses and without forced guidance systems. The THHW/TFF MTW single core cables are in accordance with the ANSI/NFPA 79 and ANSI/NFPA 70 "National Electrical Code" (NEC) Art. 310 and 402.

### Technical data

Characteristics	Value/property
Conductor	Flexible bare copper strand, class 5
Insulation	PVC compound
Temperature range	+90°C (MTW), +105°C (AWM/TEW), +90°C (IEC), +90°C (HAR H05V2-K/H07V2-K <50 mm <sup>2</sup> ), +70°C (HAR H07V-K ≥50 mm <sup>2</sup> ), -40°C (fixed); -5°C (not fixed)
Voltage rating	1000 V (AWM), 600 V (MTW), 300/500 V (IEC/HAR H05V2-K ≤1 mm <sup>2</sup> ), 450/750 V (IEC/HAR H07V2-K/H07V-K >1 mm <sup>2</sup> )
Spark test	6000 V
Bending radius	4 x cable outer diameter (13 x cable outer diameter for wwnon-cyclical mobile uses)
Standards of construction	Nec Art. 310, 402 - Oil res.: UL 1277, UL 1063, TFF (≤1,5 mm <sup>2</sup> ) / THHW (≥2,5 mm <sup>2</sup> ), TEW (≤4/0 AWG)   Flame res.: Test B acc. to DIN VDE 0472 part 804, IEC 60332-1-2, UL/CSA FT1, Other: CEI EN 50525-2-31 and HD 21.3 S3:1995+A1:1999+A2:2008, CSA AWM I A/B TEW, cURus AWM Style 10269, MTW
Standards of use	ANSI/NFPA 70 (NEC), ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 10269

### Marking

TEKIMA 10700 – H07V2-K IEMMEQU <HAR> 90°C CE 1x2,5 mm<sup>2</sup> 90°C 450/750V IEC 60332-1-2 RoHS (UL) E361260 MTW 1x14 AWG 600V or THHW or AWM Style 10269 c(UR) AWM I A/B 1000V or TEW 105°C 600V FT1 14 AWG – (prod.reference) = (metric) =

### Coding and dimensions

Code	Size [mm <sup>2</sup> ]	Size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]	Packaging [m (ft)]	Large packaging [m (ft)]
CVC034_10700_00_000 <sup>(1)</sup>	0,34	22 AWG	2,3 (0.091)	8 (5)	500 (1640)	-
CVC050_10700_00_000 <sup>(2)</sup>	0,5	21	2,5 (0.098)	11 (7)	500 (1640)	-
CVC075_10700_00_000 <sup>(2)</sup>	0,75	19	2,7 (0.106)	14 (9)	100 (328)	-
CVC100_10700_00_000	1	18	2,9 (0.114)	16 (11)	100 (328)	153 (500)
CVC150_10700_00_000	1,5	16	3,2 (0.126)	23 (15)	100 (328)	153 (500)
CVC250_10700_00_000	2,5	14	3,6 (0.142)	33 (22)	100 (328)	153 (500)
CVC400_10700_00_000	4	12	4,3 (0.169)	49 (33)	100 (328)	153 (500)
CVC600_10700_00_000	6	10	4,8 (0.189)	69 (46)	100 (328)	153 (500)
CVCB10_10700_00_000	10	8	6,5 (0.256)	118 (79)	100 (328)	153 (500)
CVCB16_10700_00_000	16	6	8,3 (0.327)	191 (128)	50 (164)	-
CVCB25_10700_00_000	25	4	9,8 (0.386)	284 (191)	500* (1640*)	-
CVCB35_10700_00_000	35	2	11,0 (0.433)	382 (257)	500* (1640*)	-
CVCB50_10700_00_000	50	1	13,7 (0.539)	564 (379)	500* (1640*)	-
CVCB70_10700_00_000	70	2/0	15,8 (0.622)	774 (520)	500* (1640*)	-
CVCB95_10700_00_000	95	3/0	17,3 (0.681)	1003 (674)	500* (1640*)	-
CVCL12_10700_00_000	120	4/0	18,4 (0.724)	1221 (820)	500* (1640*)	-
CVCL15_10700_00_000	150	250 kcmil	20,8 (0.819)	1537 (1033)	500* (1640*)	-

Code	Size [mm <sup>2</sup> ]	Size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]	Packaging [m (ft)]	Large packaging [m (ft)]
CVCL18_10700_□□_□□□	185	350	22,6 (0.890)	1869 (1256)	500* (1640*)	-
CVCL24_10700_□□_□□□	240	450	27,4 (1.079)	2528 (1699)	500* (1640*)	-

\* For this article, an additional UL certified cut-to-length service is carried out on request ("Processed Wire").

(1) This article is not HAR and is not THHW/TFF.

(2) This article is not THHW/TFF.

## Code composition

CVC	□□□	_10700_	□□	_	□□□□
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Size	To be inserted
1, 1,5, ..., 6 mm <sup>2</sup>	100, 150, ..., 600
10, 16, ..., 95 mm <sup>2</sup>	B10, B16, ..., B95
120, 150, ..., 240 mm <sup>2</sup>	L12, L15, ..., L24

Color	To be inserted
Orange	AR
White/orange**	BA**
White	BI
White/blue**	BB**
White/yellow**	BG**
Blue	BU
Yellow*	GI*
Yellow/green	GV
Gray	GR
Brown	MR
Black	NE
Pink	RS
Red	RO
Green*	VE*

Packaging	To be inserted
Standard reel/spool	<keep this field empty>
Large reel	_LR

\* For these colors the product is not HAR.

\*\* For these colors the product is not HAR for sizes > 1 mm<sup>2</sup>.

Note. The double color is such that one of the colours covers at least 30% and not more than 70% of the surface, the other colour covering the remainder of that surface.

**SERIES  
361S**

## Low capacity VFD 3xG cables, AWM



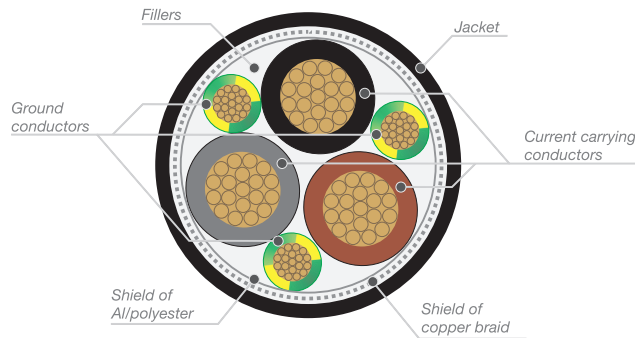
Fixed application, shielded



### Use

These are low capacitance servo motor (Variable Frequency Driver) cables planned for fixed application but also for occasional non-cyclical mobile uses. They are normally used wherever the potential for electromagnetic interference due to drives, frequency converter and motor is high. These cables are different than the traditional ones for their constructive peculiarities, including the double screen, the compounds used for the insulation and the constructive geometry. It is thanks to these and many other factors that this range of cables is able to ensure a low operational capacity, to limit overvoltage peaks which often cause damage to connected equipment and, not least, a consequent reduction of the losses. These cables are produced to meet the requirements of the European (EC), North American and Canadian markets. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Flexible copper strand, class 5
Insulation	TKblend®-YP
Conductor distinction	3 wires gray, black, brown + 3 wires yellow/green (acc. to DIN VDI 0293)
Fillers	Central or side fillers, if any
Shield	Aluminum/polyester foil, coverage 100% + Tinned copper braid, nom. coverage 70%
Jacket	PVC compound, oil-resistant, black or RAL 7001 gray color on request. Metric marking.
Temperature range	+90°C (IEC), +80°C (UL/CSA) -40°C (fixed); -5°C (not fixed)
Voltage rating	600 V (UL-CSA), 600/1000V (IEC)
Test voltage	6000 V
Bending radius	4 x cable outer diameter (fixed) 15 x cable outer diameter (not fixed)
Standards of construction	Flame res.: IEC 60332-1-2, IEC 60332-3-24, NBN C30-004 cat. F2, UL VW-1, CSA FT1   UV res.: UNI EN ISO 4892-3 (gray), UNI EN ISO 4892-2 (black)   Oil res.: DIN EN 50290-2-22, VDE 0819-102   Other: CEI EN 60228, DIN VDE 0295, IEC 60228, DIN VDE 0293, UL 758, CSA AWM I/II A/B, cURus AWM Style 2570, Low Voltage, Directive (LVD) 2006/95/EC
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 2570

### Marking

TEKIMA 0361S – CE VFD (3x2,5+3G0,5) mm<sup>2</sup> 90°C 600/1000 V IEC 60332-1-2 – c(UR)us E314444 AWM Style 2570 (3x14+3x21) AWG 80°C 1000 V AWM Class I/II A/B – (prod. reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x size [mm <sup>2</sup> ]	Num. conductors x size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFM0015_0361S_NE	(3x1,5+3G0,25)	(3x16+3G24)	8,7 (0.343)	117 (79)
CVFM0001_0361S_NE	(3x2,5+3G0,5)	(3x14+3G21)	10,1 (0.398)	168 (113)
CVFM0002_0361S_NE	(3x4+3G0,75)	(3x12+3G19)	11,3 (0.445)	228 (153)
CVFM0003_0361S_NE	(3x6+3G1)	(3x10+3G18)	12,4 (0.488)	302 (203)
CVFM0004_0361S_NE	(3x10+3G1,5)	(3x8+3G16)	15,2 (0.598)	470 (316)
CVFM0005_0361S_NE	(3x16+3G2,5)	(3x8+3G14)	18,3 (0.720)	719 (483)
CVFM0006_0361S_NE	(3x25+3G4)	(3x4+3G12)	22,5 (0.886)	1089 (732)
CVFM0007_0361S_NE	(3x35+3G6)	(3x2+3G10)	25,5 (1.004)	1467 (986)
CVFM0008_0361S_NE	(3x50+3G10)	(3x1+3G8)	30,8 (1.213)	2130 (1431)
CVFM0009_0361S_NE	(3x70+3G10)	(3x2/0+3G8)	36,1 (1.421)	2828 (1900)
CVFM0010_0361S_NE	(3x95+3G16)	(3x3/0+3G6)	41,0 (1.614)	3844 (2583)
CVFM0011_0361S_NE	(3x120+3G16)	(3x4/0+3G6)	43,8 (1.724)	4556 (3061)
CVFM0012_0361S_NE	(3x150+3G25)	(3x250+3G4)	48,7 (1.917)	5811 (3905)
CVFM0013_0361S_NE	(3x185+3G35)	(3x350+3G2)	54,2 (2.134)	7226 (4856)
CVFM0014_0361S_NE	(3x240+3G50)	(3x450+3G1)	61,4 (2.417)	9478 (6369)

## Code composition

CVFM □□□□ \_0361S\_ □□

Color	To be inserted
Gray	GR
Black	NE

### Construction

Identifier code of the special cable construction.

**SERIES  
361S**

## Low capacity VFD 1xG cables, AWM



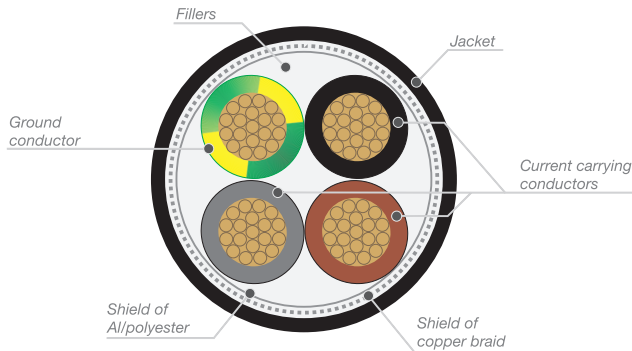
Fixed application, shielded



### Use

These are low capacitance servo motor (Variable Frequency Driver) cables planned for fixed application but also for occasional non-cyclical mobile uses. They are normally used wherever the potential for electromagnetic interference due to drives, frequency converter and motor is high. These cables are different than the traditional ones for their constructive peculiarities, including the double screen, the compounds used for the insulation and the constructive geometry. It is thanks to these and many other factors that this range of cables is able to ensure a low operational capacity, to limit overvoltage peaks which often cause damage to connected equipment and, not least, a consequent reduction of the losses. These cables are produced to meet the requirements of the European (EC), North American and Canadian markets. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Flexible copper strand, class 5
Insulation	TKblend®-YP
Conductor distinction	Wires gray, black, brown, wires yellow/green (acc. to DIN VDI 0293)
Fillers	Central or side fillers, if any
Shield	Aluminum/polyester foil, coverage 100% + Tinned copper braid, nom. coverage 70%
Jacket	PVC compound, oil-resistant, black or RAL 7001 gray color on request. Metric marking.
Temperature range	+90°C (IEC), +80°C (UL/CSA) -40°C (fixed); -5°C (not fixed)
Voltage rating	600 V (UL-CSA), 600/1000V (IEC)
Test voltage	6000 V
Bending radius	4 x cable outer diameter (fixed) 15 x cable outer diameter (not fixed)
Standards of construction	Flame res.: IEC 60332-1-2, IEC 60332-3-24, NBN C30-004 cat. F2, UL VW-1, CSA FT1   UV res.: UNI EN ISO 4892-3 (gray), UNI EN ISO 4892-2 (black)   Oil res.: DIN EN 50290-2-22, VDE 0819-102   Other: CEI EN 60228, DIN VDE 0295, IEC 60228, DIN VDE 0293, UL 758, CSA AWM I/II A/B, cURus AWM Style 2570, Low Voltage, Directive (LVD) 2006/95/EC
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 2570

### Marking

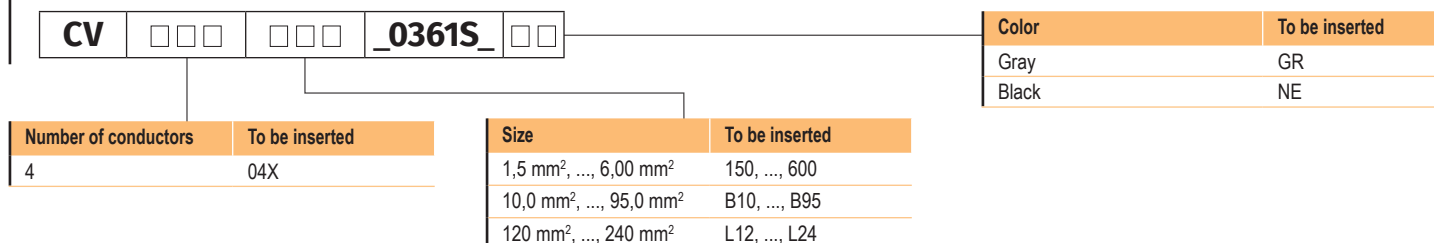
TEKIMA 0361S – CE VFD (4G1,5) mm<sup>2</sup> 90°C 600/1000 V IEC 60332-1-2 – c(UR)us E314444 AWM Style 2570 (4x16) AWG 80°C 1000 V AWM Class I/II A/B – (prod. reference) = (metric) =

### Coding and dimensions

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV04G150_0361S_□□	4	1,5	16 AWG	8,8 (0.346)	112 (75)
CV04G250_0361S_□□	4	2,5	14	10,1 (0.398)	164 (110)
CV04G400_0361S_□□	4	4	12	11,7 (0.461)	232 (156)
CV04G600_0361S_□□	4	6	10	13,5 (0.531)	327 (220)
CV04GB10_0361S_□□	4	10	8	16,5 (0.650)	523 (351)
CV04GB16_0361S_□□	4	16	6	20,0 (0.787)	793 (533)
CV04GB25_0361S_□□	4	25	4	24,5 (0.965)	1211 (814)
CV04GB35_0361S_□□	4	35	2	27,9 (1.098)	1636 (1099)
CV04GB50_0361S_□□	4	50	1	33,9 (1.335)	2365 (1589)
CV04GB70_0361S_□□	4	70	2/0	39,7 (1.563)	3241 (2178)
CV04GB95_0361S_□□	4	95	3/0	44,8 (1.764)	4308 (2895)
CV04GL12_0361S_□□	4	120	4/0	47,8 (1.882)	5229 (3514)

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV04GL15_0361S_□□	4	150	250 kcmil	53,3 (2.098)	6531 (4389)
CV04GL18_0361S_□□	4	185	350	59,3 (2.335)	7998 (5374)
CV04GL24_0361S_□□	4	240	450	68,0 (2.677)	10399 (6988)

## Code composition





**SERIES  
365S**

# Low capacity VFD 3xG cables, TC-ER/CIC/MTW/WTTC Direct Burial, Sun Res

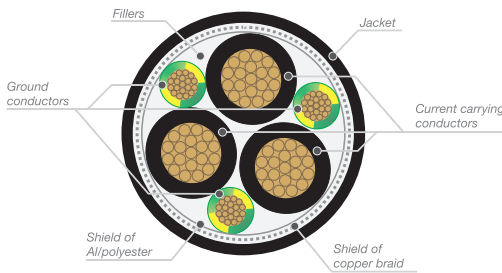
Fixed application, shielded



## Use

These are UL Listed, oil resistant, low capacitance servo motor cables (Variable Frequency Drive) planned for fixed application but also for occasional non-cyclical mobile uses. They are used wherever the potential for electromagnetic interference due to drives, frequency converter and motor is high. These cables are different than the traditional ones for their constructive peculiarities, including the double screen, the compounds used for the insulation and the constructive geometry. It is thanks to these and many other factors that this range of cables is able to ensure a low operational capacity, to limit overvoltage peaks which often cause damage to connected equipment and, not least, a consequent reduction of the losses. They are Type TC-ER (Exposed Run) cables suitable for the uses specified by ANSI/NFPA 79 and by articles 336, 392, 501 of the ANSI/NFPA 70 "National Electrical Code" (NEC) and suitable for use in Class I, Division 2, Hazardous Locations. They are certified Flexible Motor Supply Cable for variable speed drives and Wind Turbine Tray Cable (WTTC) for wind applications. They are also Type TC-ER/CIC for uses in accordance with CSA C22.1 (CE Code). The cables identified with Type TC-ER (Exposed Run) can be installed in the industrial plants for the connections between the cable trays and the equipment without the employment of metal conduits. These cables can be used in the presence of humidity also buried (they are certified Direct Burial according UL 1277) and are produced to meet the requirements of the European (EC) and North American markets. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Flexible copper strand, class 5
Insulation	Special XLPE (type XHHW-2)
Conductor distinction	Black numbered + yellow/green
Fillers	Central or side fillers, if any
Shield	Aluminum/polyester foil, coverage 100% + Tinned copper braid + Drain wire
Jacket	PVC compound, oil-resistant, RAL 7001 gray color. Metric marking.
Temperature range	-40°C (fixed); -5°C (not fixed), +90°C
Voltage rating	600 V (TC/CIC/MTW), 1000 V (WTTC), 600/1000 V (IEC)
Test voltage	6000 V
Bending radius	6 x cable outer diameter (fixed) 20 x cable outer diameter (not fixed)
Standards of construction	UL/CSA approvals: (UL) Type TC-ER, MTW, WTTC, Dir Bur, Sun Res Oil Res I, c(UL) Type CIC/TC-ER, Dir Bur, Sun Res, Oil Res I, Type RW90 (≥14 AWG); NFPA 79; Class 1, Div. 2 NEC Art. 336, 392, 501, CSA C22.1 Tab.19; UL 1063, UL 1277, UL 2277, CSA C22.2 No.239-09   Flame res.: FT4/IEEE UL 1685   UV res.: UNI EN ISO 4892-3 (gray)   Oil res.: Oil Res I UL 1277; Water res.: 90°C UL 1277; Other: Direct Burial UL 1277, Low Voltage Directive (LVD) 2014/35/EU
Standards of use	NFPA 79, NFPA 70 (NEC), UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286

## Marking

TEKIMA 0365S – CE VFD (3x16+3G2,5) mm<sup>2</sup> 600/1000 V - (UL) E361258 TC-ER (3x6+3x14) AWG DIR BUR SUN RES OIL RES I 600V XHHW-2 90°C Dry / 90°C Wet FT4/IEEE 1202 or WTTC or FLEXIBLE MOTOR SUPPLY CABLE 1000V 90°C Dry or MTW 600V c(UL) CONTROL CABLE CIC/TC-ER DIR BUR SUN RES OIL RES I 600V 90°C Dry / 90°C Wet FT4 or RW90 – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x size [mm <sup>2</sup> ]	Num. conductors x size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFM0003_0365S_NE	(3x6+3G1)	((3x10+3G18)	14,9 (0.587)	343 (230)
CVFM0004_0365S_NE	(3x10+3G1,5)	(3x8+3G16)	16,7 (0.657)	489 (329)
CVFM0005_0365S_NE	(3x16+3G2,5)	(3x6+3G14)	20,1 (0.791)	798 (536)
CVFM0006_0365S_NE	(3x25+3G4)	(3x4+3G12)	24,4 (0.961)	1203 (808)
CVFM0007_0365S_NE	(3x35+3G6)	(3x2+3G10)	27,0 (1.063)	1572 (1056)
CVFM0008_0365S_NE	(3x50+3G10)	(3x1+3G8)	32,0 (1.260)	2272 (1527)
CVFM0009_0365S_NE	(3x70+3G10)	(3x2/0+3G8)	36,5 (1.437)	2915 (1959)
CVFM0010_0365S_NE	(3x95+3G16)	(3x3/0+3G6)	39,8 (1.567)	3804 (2556)
CVFM0011_0365S_NE	(3x120+3G16)	(3x4/0+3G6)	44,7 (1.760)	4698 (3157)

Code	Num. conductors x size [mm <sup>2</sup> ]	Num. conductors x size [AWG/kcmil]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFM0012_0365S_NE	(3x150+3G25)	(3x250+3G4)	48,2 (1.898)	5837 (3922)
CVFM0013_0365S_NE	(3x185+3G35)	(3x350+3G2)	52,1 (2.051)	7116 (4782)
CVFM0014_0365S_NE	(3x240+3G50)	(3x450+3G1)	58,5 (2.303)	9221 (6196)

## Code composition

<b>CVFM</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<b>_0365S_</b>	<input type="text"/>	<input type="text"/>	<b>Color</b>	<b>To be inserted</b>
								Black	NE

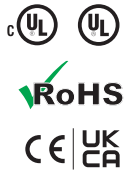
### Construction

Identifier code of the special cable construction.

**SERIES  
365S**

# Low capacity VFD 1xG cables, TC-ER/CIC/MTW/WTTC, Direct Burial, Sun Res

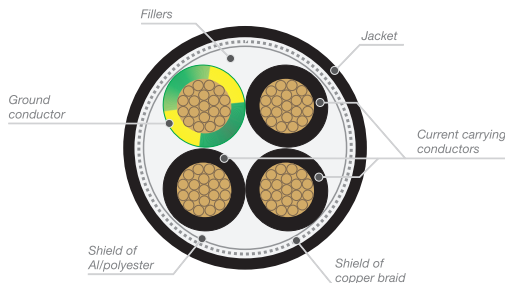
Fixed application, shielded



## Use

These are UL Listed, oil resistant, low capacitance servo motor cables (Variable Frequency Drive) planned for fixed application but also for occasional non-cyclical mobile uses. They are used wherever the potential for electromagnetic interference due to drives, frequency converter and motor is high. These cables are different than the traditional ones for their constructive peculiarities, including the double screen, the compounds used for the insulation and the constructive geometry. It is thanks to these and many other factors that this range of cables is able to ensure a low operational capacity, to limit overvoltage peaks which often cause damage to connected equipment and, not least, a consequent reduction of the losses. They are Type TC-ER (Exposed Run) cables suitable for the uses specified by ANSI/NFPA 79 and by articles 336, 392, 501 of the ANSI/NFPA 70 "National Electrical Code" (NEC) and suitable for use in Class I, Division 2, Hazardous Locations. They are certified Flexible Motor Supply Cable for variable speed drives and Wind Turbine Tray Cable (WTTC) for wind applications. They are also Type TC-ER/CIC for uses in accordance with CSA C22.1 (CE Code). The cables identified with Type TC-ER (Exposed Run) can be installed in the industrial plants for the connections between the cable trays and the equipment without the employment of metal conduits. These cables can be used in the presence of humidity also buried (they are certified Direct Burial according UL 1277) and are produced to meet the requirements of the European (EC) and North American markets. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Flexible copper strand, class 5
Insulation	Special XLPE (type XHHW-2)
Conductor distinction	Black numbered + yellow/green
Fillers	Central or side fillers, if any
Shield	Aluminum/polyester foil, coverage 100% + Tinned copper braid + Drain wire
Jacket	PVC compound, oil-resistant, RAL 7001 gray color. Metric marking.
Temperature range	-40°C (fixed); -5°C (not fixed), +90°C
Voltage rating	600 V (TC/CIC/MTW), 1000 V (WTTC), 600/1000 V (IEC)
Test voltage	6000 V
Bending radius	6 x cable outer diameter (fixed) 20 x cable outer diameter (not fixed)
Standards of construction	UL/CSA approvals: (UL) Type TC-ER, MTW, WTTC, Dir Bur, Sun Res Oil Res I, c(UL) Type CIC/TC-ER, Dir Bur, Sun Res, Oil Res I, Type RW90 (≥14 AWG); NFPA 79; Class 1, Div. 2 NEC Art. 336, 392, 501, CSA C22.1 Tab.19; UL 1063, UL 1277, UL 2277, CSA C22.2 No.239-09   Flame res.: FT4/IEEE UL 1685   UV res.: UNI EN ISO 4892-3 (gray)   Oil res.: Oil Res I UL 1277; Water res.: 90°C UL 1277; Other: Direct Burial UL 1277, Low Voltage Directive (LVD) 2014/35/EU
Standards of use	NFPA 79, NFPA 70 (NEC), UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286

## Marking

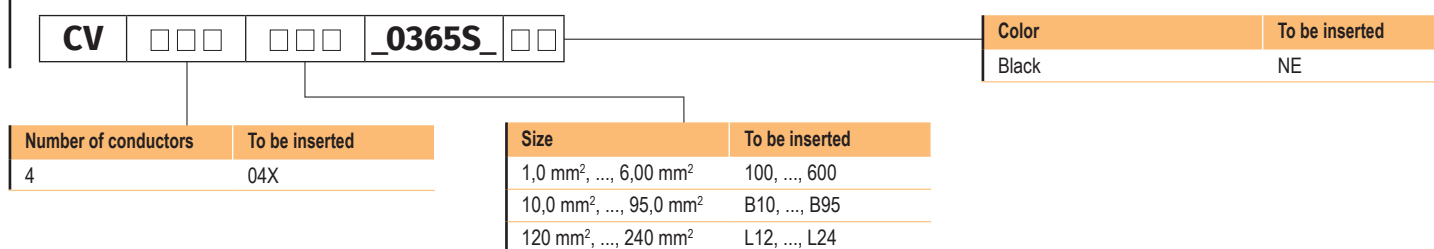
TEKIMA 0365S – CE VFD (4G16) mm<sup>2</sup> 600/1000 V - (UL) E361258 TC-ER (4x6) AWG DIR BUR SUN RES OIL RES I 600V XHHW-2 90°C Dry / 90°C Wet FT4/IEEE 1202 or WTTC or FLEXIBLE MOTOR SUPPLY CABLE 1000V 90°C Dry or MTW 600V c(UL) CONTROL CABLE CIC/TC-ER DIR BUR SUN RES OIL RES I 600V 90°C Dry / 90°C Wet FT4 or RW90 – (prod.reference) = (metric) =

## Coding and dimensions

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV04G100_0365S_NE	4	1	18	9,7 (0.382)	129 (87)
CV04G150_0365S_NE	4	1,5	16	10,4 (0.409)	157 (105)
CV04G250_0365S_NE	4	2,5	14	11,3 (0.445)	207 (139)
CV04G400_0365S_NE	4	4	12	13,1 (0.516)	293 (197)
CV04G600_0365S_NE	4	6	10	15,1 (0.594)	414 (278)
CV04GB10_0365S_NE	4	10	8	19,2 (0.756)	656 (441)
CV04GB16_0365S_NE	4	16	6	22,7 (0.894)	976 (656)
CV04GB25_0365S_NE	4	25	4	26,2 (1.031)	1388 (933)
CV04GB35_0365S_NE	4	35	2	29,1 (1.146)	1811 (1217)
CV04GB50_0365S_NE	4	50	1	34,5 (1.358)	2544 (1709)

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV04GB70_0365S_NE	4	70	2/0	37,8 (1.488)	3425 (2301)
CV04GB95_0365S_NE	4	95	3/0	44,5 (1.752)	4563 (3066)
CV04GL12_0365S_NE	4	120	4/0	48,3 (1.902)	5569 (3742)
CV04GL15_0365S_NE	4	150	250	52,1 (2.051)	6761 (4543)
CV04GL18_0365S_NE	4	185	350	56,4 (2.220)	8112 (5451)
CV04GL24_0365S_NE	4	240	450	63,2 (2.488)	10400 (6988)

## Code composition



**SERIES  
8110**

# Power and Control Tray Cable, TC-ER-HL/CIC/MTW/WTTC/AWM Direct Burial, Sun Res, Hazardous Locations



Fixed application, unshielded



## Use

Unshielded UL Listed cables built for the uses specified by ANSI/NFPA 79, by Art. 336, 392, 501 of ANSI/NFPA 70 "National Electrical Code" (NEC) and by CSA C22.1 (CE Code). For applications in Hazardous Locations, the TC-ER version is suitable for use in Class I, Division 2 while the TC-ER-HL\* version is suitable for use in Class I, Division 1. They can be used for fixed and occasional and non-cyclical mobile use also in drag-chains up to 5 meters and for sizes from 0.5 mm<sup>2</sup> to 2.5 mm<sup>2</sup> with a maximum of 6 conductors without tensile stress. The cables identified with Type TC-ER (Exposed Run) can be installed in the industrial plants for the connections between the cable trays and the equipment without the employment of metal conduits or reinforced cables Type MC (Metal Clad Cable); this type of connection is called Open Wiring. The TC-ER / MTW type cables must comply with the impact resistance requirements required for MC type cables, they are oil resistant, sun resistant and can be used in the presence of humidity also buried (they are certified Direct Burial according UL 1277). These cables are also certified Flexible Motor Supply Cable for variable speed drives and Wind Turbine Tray Cable (WTTC) for wind turbine applications.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").

\* Important. The TC-ER-HL version for installations in Hazardous Locations Class I, Division 1 is upon specific request.

## Technical data

Characteristics	Value/property
Conductor	Flexible copper strand, class 5
Insulation	TKblend®-R
Conductor distinction	Black numbered + yellow/green (beginning from 3 conductors)
Fillers	Central or side fillers, if any
Jacket	PVC compound, oil-resistant, RAL 7001 gray color. Metric marking.
Temperature range	+90°C (dry conditions), +75°C (wet conditions) -40°C (fixed); -5°C (not fixed)
Voltage rating	600 V (TC/CIC/MTW), 1000 V (AWM/WTTC), 600/1000 V (IEC)
Spark test	6000 V
Bending radius	4 x cable outer diameter (15 x cable outer diameter for non-cyclical mobile uses)
Standards of construction	UL/CSA approvals: (UL) Type TC-ER-HL (18 AWG-1000 kcmil), MTW, WTTC, Dir Bur, Sun Res, Oil Res I, c(UL) Type CIC/TC-ER (18 AWG-4/0 AWG), Dir Bur, Sun Res, Oil Res I, cURus AWM Style 21179, AWM I/II A/B; Class 1, Div.1* or Div.2 NEC Art. 336, 392, 501; CSA C22.1 Tab.19; UL 1581, UL 758, UL 1277, UL 1063, UL 2277, CSA C22.2 No.230-09 e No. 239-09   Flame res.: FT1, FT4, IEC 60332-1-2, IEC 60332-3-24   UV res.: UNI EN ISO 4892-3 (grigio/gray), UNI EN ISO 4892-2 (black)   Other: Low Voltage Directive (LVD) 2014/35/EU
Standards of use	NFPA 79, NFPA 70 (NEC), CSA C22.1 (CE Code), CSA C22.2 No.286, Style 21179

## Marking

TEKIMA 81100 – CE 4G2,5 mm<sup>2</sup> (UL) E361258 TC-ER-HL 4x14 AWG DIR BUR SUN RES OIL RES I 600V THHW 90°C Dry / 75°C Wet FT4/IEEE 1202 or WTTC or FLEXIBLE MOTOR SUPPLY CABLE 1000V 90°C Dry or MTW 600V or AWM 21179 90°C 1000V c(UL) CONTROL CABLE CIC/TC-ER DIR BUR SUN RES OIL RES I 600V 90°C Dry / 75°C Wet PVC FT4 or AWM I/II A/B 90°C 1000V FT1 14 AWG – (prod.reference) = (metric) =

## Coding and dimensions

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV02X100_81100_GR**	2	1	18	7,9 (0.311)	87 (58)
CV02X150_81100_GR**	2	1,5	16	8,5 (0.335)	106 (71)
CV02X250_81100_GR**	2	2,5	14	9,3 (0.366)	137 (92)
CV03G100_81100_GR	3	1	18	8,3 (0.327)	102 (69)
CV03G150_81100_GR	3	1,5	16	9,0 (0.354)	127 (85)
CV03G250_81100_GR	3	2,5	14	9,8 (0.386)	166 (112)
CV03G400_81100_GR	3	4	12	11,2 (0.441)	231 (155)
CV03G600_81100_GR	3	6	10	12,5 (0.492)	310 (208)
CV03GB10_81100_GR	3	10	8	17,0 (0.669)	547 (368)
CV03GB16_81100_GR	3	16	6	20,7 (0.815)	838 (563)
CV04G100_81100_GR	4	1	18	9,1 (0.358)	125 (84)
CV04G150_81100_GR	4	1,5	16	9,8 (0.386)	155 (104)
CV04G250_81100_GR	4	2,5	14	10,7 (0.421)	205 (138)
CV04G400_81100_GR	4	4	12	12,3 (0.484)	290 (195)

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV04G600_81100_GR	4	6	10	14,4 (0.567)	410 (276)
CV04GB10_81100_GR	4	10	8	18,5 (0.728)	679 (456)
CV04GB16_81100_GR	4	16	6	23,7 (0.933)	1109 (745)
CV04GB25_81100_GR	4	25	4	27,2 (1.071)	1569 (1054)
CV04GB35_81100_GR	4	35	2	30,1 (1.185)	2041 (1371)
CV04GB50_81100_GR	4	50	1	36,6 (1.441)	2967 (1994)
CV04GB70_81100_GR	4	70	2/0	41,7 (1.642)	3971 (2668)
CV04GB95_81100_GR	4	95	3/0	46,7 (1.839)	5198 (3493)
CV04GL12_81100_GR	4	120	4/0	49,3 (1.941)	6169 (4145)
CV04GL15_81100_GR	4	150	250	54,9 (2.161)	7700 (5174)
CV04GL18_81100_GR	4	185	350	59,2 (2.331)	9190 (6175)
CV04GL24_81100_GR	4	240	450	65,9 (2.594)	11735 (7886)
CV05G100_81100_GR	5	1	18	9,9 (0.390)	150 (101)
CV05G150_81100_GR	5	1,5	16	10,7 (0.421)	187 (126)
CV05G250_81100_GR	5	2,5	14	11,8 (0.465)	251 (169)
CV05G400_81100_GR	5	4	12	14,3 (0.563)	379 (255)
CV05G600_81100_GR	5	6	10	15,8 (0.622)	501 (337)
CV05GB10_81100_GR	5	10	8	20,5 (0.807)	840 (564)
CV05GB16_81100_GR	5	16	6	26,1 (1.028)	1362 (915)
CV05GB25_81100_GR	5	25	4	30,3 (1.193)	1953 (1312)
CV05GB35_81100_GR	5	35	2	33,5 (1.319)	2539 (1706)
CV05GB50_81100_GR	5	50	1	40,8 (1.606)	3697 (2484)
CV05GB70_81100_GR	5	70	2/0	47,9 (1.886)	5106 (3431)
CV05GB95_81100_GR	5	95	3/0	51,9 (2.043)	6460 (4341)
CV05GL12_81100_GR	5	120	4/0	54,9 (2.161)	7683 (5163)
CV07G100_81100_GR	7	1	18	10,8 (0.425)	185 (124)
CV07G150_81100_GR	7	1,5	16	11,7 (0.461)	234 (157)
CV07G250_81100_GR	7	2,5	14	12,8 (0.504)	315 (212)
CV07G400_81100_GR	7	4	12	15,6 (0.614)	480 (323)
CV09G150_81100_GR	9	1,5	16	n.a.	n.a.
CV12G100_81100_GR	12	1	18	14,7 (0.579)	335 (225)
CV12G150_81100_GR	12	1,5	16	15,9 (0.626)	421 (283)
CV12G250_81100_GR	12	2,5	14	17,5 (0.689)	568 (382)
CV18G100_81100_GR	18	1	18	17,1 (0.673)	466 (313)
CV18G150_81100_GR	18	1,5	16	18,6 (0.732)	594 (399)
CV18G250_81100_GR	18	2,5	14	20,5 (0.807)	807 (542)
CV25G100_81100_GR	25	1	18	19,5 (0.768)	617 (415)
CV25G150_81100_GR	25	1,5	16	22,3 (0.878)	847 (569)

\*\* According to NFPA 70 (NEC) and CSA C22.1 (CEC) cables with 2 conductors are not Exposed Run (ER).

## Code composition

CV □□ X □□□ \_81100\_GR

Number of conductors	To be inserted
2	02X
3, ..., 25	03G, ..., 25G

Size	To be inserted
1,00 mm <sup>2</sup> , ..., 6,00 mm <sup>2</sup>	100, ..., 600
10,0 mm <sup>2</sup> , ..., 95,0 mm <sup>2</sup>	B10, ..., B95
120 mm <sup>2</sup> , ..., 185 mm <sup>2</sup>	L12, ..., L18

**SERIES  
8110S**

# Power and Control Tray Cable, TC-ER-HL/CIC/MTW/WTTC/AWM Direct Burial, Sun Res



Fixed application, shielded



## Use

Shielded UL Listed cables built for the uses specified by ANSI/NFPA 79, by Art. 336, 392, 501 of ANSI/NFPA 70 "National Electrical Code" (NEC) and by CSA C22.1 (CE Code). For applications in Hazardous Locations, the TC-ER version is suitable for use in Class I, Division 2 while the TC-ER-HL\* version is suitable for use in Class I, Division 1. The cables identified with Type TC-ER (Exposed Run) can be installed in the industrial plants for the connections between the cable trays and the equipment without the employment of metal conduits or reinforced cables MC type (Metal Clad Cable); this type of connection is called Open Wiring. The TC-ER / MTW type cables must comply with the impact resistance requirements required for MC type cables, they are oil resistant, sun resistant and can be used in the presence of humidity also buried (they are certified Direct Burial according UL 1277). These cables are also certified Flexible Motor Supply Cable for variable speed drives and Wind Turbine Tray Cable (WTTC) for wind turbine applications.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").

\* Important. The TC-ER-HL version for installations in Hazardous Locations Class I, Division 1 is upon specific request.

## Technical data

Characteristics	Value/property
Conductor	Flexible copper strand, class 5
Insulation	TKblend®-R
Conductor distinction	Black numbered + yellow/green (beginning from 3 conductors)
Fillers	Central or side fillers, if any
Shield	Tinned copper braid, nom. coverage 85%
Jacket	PVC compound, oil-resistant, RAL 7001 gray color. Metric marking.
Temperature range	+90°C (dry conditions), +75°C (wet conditions) -40°C (fixed); -5°C (not fixed)
Voltage rating	600 V (TC/CIC/MTW), 1000 V (AWM/WTTC), 600/1000 V (IEC)
Spark test	6000 V
Bending radius	6 x cable outer diameter (20 x cable outer diameter for non-cyclical mobile uses)
Standards of construction	UL/CSA approvals: (UL) Type TC-ER-HL (18 AWG-1000 kcmil), MTW, WTTC, Dir Bur, Sun Res, Oil Res I, c(UL) Type CIC/TC-ER (18 AWG-4/0 AWG), Dir Bur, Sun Res, Oil Res I, cURus AWM Style 21179, AWM I/II A/B; Class 1, Div.1* or Div.2 NEC Art. 336, 392, 501; CSA C22.1 Tab.19; UL 1581, UL 758, UL 1277, UL 1063, UL 2277, CSA C22.2 No.230-09 e No. 239-09   Flame res.: FT1, FT4, IEC 60332-1-2, IEC 60332-3-24   UV res.: UNI EN ISO 4892-3 (gray), UNI EN ISO 4892-2 (black)   Other: Low Voltage Directive (LVD) 2014/35/EU
Standards of use	NFPA 79, NFPA 70 (NEC), CSA C22.1 (CE Code), CSA C22.2 No.286, Style 21179

## Marking

TEKIMA 8110S – CE 4G2,5 mm<sup>2</sup> (UL) E361258 TC-ER-HL 4x14 AWG DIR BUR SUN RES OIL RES I 600V THHW 90°C Dry / 75°C Wet FT4/IEEE 1202 or WTTC or FLEXIBLE MOTOR SUPPLY CABLE 1000V 90°C Dry or MTW 600V or AWM 21179 90°C 1000V c(UL) CONTROL CABLE CIC/TC-ER DIR BUR SUN RES OIL RES I 600V 90°C Dry / 75°C Wet PVC SHIELDED FT4 or AWM I/II A/B 90°C 1000V FT1 14 AWG – (prod.reference) = (metric) =

## Coding and dimensions

Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV02X100_8110S_GR**	2	1	18	8,5 (0.335)	98 (66)
CV02X150_8110S_GR**	2	1,5	16	9,1 (0.358)	118 (79)
CV02X250_8110S_GR**	2	2,5	14	9,9 (0.390)	143 (96)
CV03G100_8110S_GR	3	1	18	8,9 (0.350)	120 (81)
CV03G150_8110S_GR	3	1,5	16	9,6 (0.378)	141 (95)
CV03G250_8110S_GR	3	2,5	14	10,4 (0.409)	181 (122)
CV03G400_8110S_GR	3	4	12	11,8 (0.465)	242 (163)
CV03G600_8110S_GR	3	6	10	13,9 (0.547)	354 (238)
CV04G100_8110S_GR	4	1	18	9,7 (0.382)	142 (95)
CV04G150_8110S_GR	4	1,5	16	10,4 (0.409)	177 (119)
CV04G250_8110S_GR	4	2,5	14	11,3 (0.445)	228 (153)
CV04G400_8110S_GR	4	4	12	13,9 (0.547)	350 (235)
CV04G600_8110S_GR	4	6	10	15,2 (0.598)	450 (302)



Code	Number of conductors	Size [mm <sup>2</sup> ]	Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CV04GB10_8110S_GR	4	10	8	19,3 (0.760)	718 (482)
CV04GB16_8110S_GR	4	16	6	24,7 (0.972)	1162 (781)
CV04GB25_8110S_GR	4	25	4	28,2 (1.110)	1616 (1086)
CV04GB35_8110S_GR	4	35	2	31,1 (1.224)	2059 (1384)
CV04GB50_8110S_GR	4	50	1	37,6 (1.480)	2938 (1974)
CV04GB70_8110S_GR	4	70	2/0	44,2 (1.740)	4397 (2955)
CV04GB95_8110S_GR	4	95	3/0	47,7 (1.878)	5566 (3740)
CV04GL12_8110S_GR	4	120	4/0	50,3 (1.980)	6652 (4470)
CV04GL15_8110S_GR	4	150	250	55,9 (2.201)	8250 (5544)
CV04GL18_8110S_GR	4	185	350	60,0 (2.362)	8953 (6016)
CV05G100_8110S_GR	5	1	18	10,5 (0.413)	171 (115)
CV05G150_8110S_GR	5	1,5	16	11,3 (0.445)	210 (141)
CV05G250_8110S_GR	5	2,5	14	12,4 (0.488)	273 (183)
CV05G400_8110S_GR	5	4	12	15,1 (0.594)	418 (281)
CV05G600_8110S_GR	5	6	10	16,6 (0.654)	539 (362)
CV05GB10_8110S_GR	5	10	8	22,3 (0.878)	917 (616)
CV05GB16_8110S_GR	5	16	6	27,1 (1.067)	1398 (939)
CV05GB25_8110S_GR	5	25	4	31,1 (1.224)	2059 (1384)
CV07G100_8110S_GR	7	1	18	11,4 (0.449)	225 (151)
CV07G150_8110S_GR	7	1,5	16	12,3 (0.484)	278 (187)
CV07G250_8110S_GR	7	2,5	14	14,4 (0.567)	402 (270)
CV07G400_8110S_GR	7	4	12	16,4 (0.646)	557 (374)
CV09G150_8110S_GR	9	1,5	16	n.a.	n.a.
CV12G100_8110S_GR	12	1	18	15,5 (0.610)	365 (245)
CV12G150_8110S_GR	12	1,5	16	16,7 (0.657)	451 (303)
CV12G250_8110S_GR	12	2,5	14	18,3 (0.720)	593 (398)
CV18G100_8110S_GR	18	1	18	17,9 (0.705)	507 (341)
CV18G150_8110S_GR	18	1,5	16	19,4 (0.764)	632 (425)
CV18G250_8110S_GR	18	2,5	14	22,3 (0.878)	893 (600)
CV25G100_8110S_GR	25	1	18	20,3 (0.799)	638 (429)
CV25G150_8110S_GR	25	1,5	16	23,1 (0.909)	865 (581)

\*\* According to NFPA 70 (NEC) and CSA C22.1 (CEC) cables with 2 conductors are not Exposed Run (ER).

## Code composition

CV □□ X □□□ \_8110S\_GR

Number of conductors	To be inserted
2	02X
3, ..., 25	03G, ..., 25G

Size	To be inserted
1,00 mm <sup>2</sup> , ..., 6,00 mm <sup>2</sup>	100, ..., 600
10,0 mm <sup>2</sup> , ..., 95,0 mm <sup>2</sup>	B10, ..., B95
120 mm <sup>2</sup> , ..., 185 mm <sup>2</sup>	L12, ..., L18



**SERIES  
71000**

## Profibus data communication cables



Fixed application

cULUS



RoHS

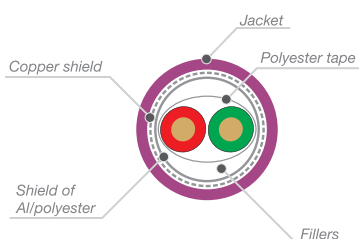
CE UK CA



### Use

Machine tool wire field BUS cable. The double shielding (electrostatic and electromagnetic) makes it suitable for environments with electromagnetic compatibility (EMC). The special PVC jacket grants very good mechanical performance, a good abrasion resistance and a very good resistance to the most common industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Rigid bare copper 1x0,64 mm
Insulation	TKblend®-L
Conductors	Twisted, green/red colors
Taping	Polyester tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	PVC compound, oil-resistant and flame-resistant, Desina RAL 4001 violet color
Temperature range	-10°C, +80°C
Voltage rating	300 V
Max DC resistance	57,5 Ω/km
Max DC loop resistance	115,0 Ω/km
Characteristic impedance	150 Ω
Capacitance	29 nF/km @ 800 Hz
Dielectric strength	1500 V x 1 min (cond./cond. - cond./shield)
Bending radius	15 x cable outer diameter
Standards of construction	Flame res.: IEC 60332-1, UL 1581 par. 1060-1061, CSA FT2   Oil res.: IEC 60811-2-1, EN 50363-4-1   Other: UL 1581, UL 758, CSA AWM I/II A/B, cURus AWM Style 20601
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20601

### Marking

TEKIMA 71010 "PROFIBUS" – CE (1x2x0,35) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20601 (1x2x22) AWG 80°C 300 V AWM Class I/II A/B FT2 – 150 Ohm – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_71010_D3	((1x2x0,35))	((1x2x22))	7,8 (0.307)	78 (52)

**SERIES**  
**71100**

## Profibus data communication cables



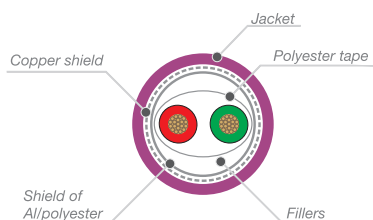
Dynamic application



### Use

Filed BUS cable planned for mobile installation on a cable holder chain. The double shielding (electrostatic and electromagnetic) makes it suitable for environments with electromagnetic compatibility (EMC). The special PVC jacket grants very good mechanical performance, a good abrasion resistance and a very good resistance to the most common industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Flexible copper strand 19X0,13 mm (0,25 mm <sup>2</sup> )
Insulation	TKblend®-L
Conductors	Twisted, green/red colors
Taping	Polyester tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%, rip cord
Jacket	PVC, oil-resistant and flame-resistant, Desina RAL 4001 violet color
Temperature range	-10°C, +80°C
Voltage rating	30 V
Characteristic impedance	150 Ω
Capacitance	30 pF/m (cond./cond.), 50 pF/m (cond./shield)
Dielectric strength	500 V x 1 min (cond./cond. - cond./shield)
Bending radius	10 x cable outer diameter
Speed	80 m/min
Acceleration	7 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1, CEI 20-35, UL VW-1, CSA FT1   Oil res.: UL 1581   Other: CSA C22.2 No. 210, CSA AWM I/II A/B, cUR AWM Style 2919
Standards of use	CSA C22.1 (CE Code), CSA C22.2 No.286, Style 2919

### Marking

TEKIMA 71100 "PROFIBUS" – CE (1x2x0,25) mm<sup>2</sup> 80°C 30 V CEI 20-35 IEC 60332-1 – c(UR)us E314444 AWM Style 2919 (1x2x24) AWG 80°C 30 V VW-1 Class I/II A/B FT1 – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_71100_D3	(1x2x0,25)	(1x2x24)	8,0 (0.315)	71 (48)

**SERIES**  
**71140**

# High performances Profibus data communication cables



Dynamic application

cUL US



RoHS

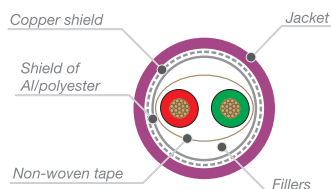
CE UK CA



## Use

Field BUS cable planned for mobile installation on a cable holder chain, even with great length (continuous motion on Cartesian axis). The double shielding (electrostatic and electromagnetic) makes it suitable for environments with electromagnetic compatibility (EMC) problems. The special polyurethane jacket grants very good mechanical performance, a very good abrasion resistance and a very good resistance to the most common industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Flexible copper strand 19X0,13 mm (0,25 mm <sup>2</sup> )
Insulation	TKblend®-L
Conductors	Twisted, green/red colors
Taping	Non-woven tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	Polyurethane, oil-resistant and flame-resistant, Desina RAL 4001 violet color
Temperature range	-10°C, +80°C
Voltage rating	300 V
Max DC resistance	72,5 Ω/km
Max DC loop resistance	145,0 Ω/km
Characteristic impedance	150 Ω
Capacitance	29 nF/km @ 800 Hz
Dielectric strength	1500 V x 1 min (cond. - shield)
Bending radius	10 x cable outer diameter
Speed	180 m/min
Acceleration	3 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1, CSA FT1   Oil res.: IEC 60811-2-1, ASTM-oil-1   Other: VDE 0472 par. 1, VDE 0282/10, NEK 606, EN 50267-2-1, IEC 60754-1-2, UL 758, CSA AWM I/II A/B, cURus AWM Style 20233
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20233

## Marking

TEKIMA 71140 "PROFIBUS" – CE (1x2x0,25) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20233 (1x2x24) AWG 80°C 300 V AWM Class I/II A/B FT1 – 150 Ohm – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_71140_D3	(1x2x0,25)	(1x2x24)	7,9 (0.311)	65 (44)

**SERIES**  
**71600**

## High performances Profibus CMX data communication cables



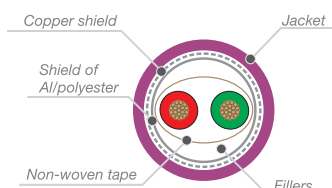
Dynamic application



### Use

UL Listed field BUS cable produced according to UL 444 Standard and designed for mobile installation on a cable holder chain, even with great length (continuous motion on Cartesian axis) and for the uses specified by Art. 800 of ANSI/NFPA 70 "National Electrical Code" (NEC). The double shielding (electrostatic and electromagnetic) makes it suitable for environments with electromagnetic compatibility (EMC) problems. The special polyurethane jacket grants very good mechanical performance, a very good abrasion resistance and a very good resistance to the most common industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Flexible copper strand 19X0,13 mm (0,25 mm <sup>2</sup> )
Insulation	TKblend®-L
Conductors	Twisted, green/red colors
Taping	Non-woven tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	Polyuretane, oil-, flame- and UV-resistant. Desina RAL 4001 violet color
Temperature range	-30°C, +70°C (dynamic); -40°C, +75°C (fixed)
Voltage rating	300 V
Max DC conductor resistance	74 Ω/km
Characteristic impedance	150 Ω
Capacitance	30 nF/km @ 800 Hz
Dielectric strength	1500 V x 1 min (cond. - shield)
Bending radius	6 x cable outer diameter (fixed) 12 x cable outer diameter (dynamic)
Speed	180 m/min
Acceleration	3 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1-2, UL 1581 par. 1080   Oil res.: IEC 60811-2-1, ASTM-oil-1, ICEA S-82-552   UV res.: UL 1581 par. 1200   Other: VDE 0472 par. 1, VDE 0282/10, NEK 606, EN 50267-2-1, EN 50267-2-2, IEC 60754-1, IEC 60754-2, UL 444
Standards of use	UL 444 (type CMX), NFPA 70 (Art. 800)

### Marking

TEKIMA 71640 "PROFIBUS" – CE (1x2x0,25) mm<sup>2</sup> IEC 60332-1 – c(UL)us E501447 CMX 75°C (1x2x24) AWG VW-1 150 Ohm – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_71640_D3	(1x2x0,25)	(1x2x24)	8,2 (0.323)	72 (48)

**SERIES  
73000**

# DeviceNet data communication cables



Fixed application



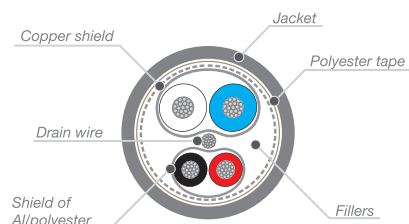
DeviceNet™



## Use

The DeviceNet field BUS cable has been planned for the fixed application connection of industrial equipment, and is made of two couples of connectors, the first for the power supply made with red and black conductors, the second for the signal made with blue and white conductors. The range of cables includes a Trunk type used for the main lines of DeviceNet network and Drop type, connecting the devices to the main line through derivation. The jacket, made of a special PVC compound, grants very good mechanical performance.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Tinned copper strand. Drop type: signal conductor 19x0,13 mm (0,25 mm <sup>2</sup> ), power conductor 19x0,16 mm (0,35 mm <sup>2</sup> ) Trunk type: signal conductor 19x0,25 mm (0,93 mm <sup>2</sup> ), power conductor 19x0,36 mm (1,93 mm <sup>2</sup> )
Insulation	TKblend®-L
Conductors	Twisted, black/red colors (power), blue/white (signal)
Shield	Aluminum/polyester tape on pairs (coverage 100%), overall tinned copper braid, nom. coverage 65%. Drain wire 22/19 AWG.
Jacket	PVC compound, oil-resistant and flame-resistant RAL 7001 gray color.
Temperature range	-40°C, +80°C
Voltage rating	300 V
Characteristic impedance	120 Ω
Capacitance	40 nF/km @ 800 Hz
Dielectric strength	2000 V x 1 min (cond. - shield)
Bending radius	10 x cable outer diameter
Standards of construction	Flame res.: IEC 60332-1, UL 1581, CSA FT2   Oil res.: IEC 60811-2-1, ICEA S-82-552   Other: UL 1581, UL 758, CSA AWM I/II A/B, cURus AWM Style 2571 or Style 20601
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 2571 or Style 20601

## Marking

TEKIMA 73010 "DEVICENET" – CE ((2x0,25)+(2x0,35)) mm<sup>2</sup> 80°C IEC 60332-1 – c(UR)us E314444 AWM Style 2571 ((2x24)+(2x22)) AWG 80°C 300 V AWM I/II A/B FT2 – 120 Ohm – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Type	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]	Max DC resistance [Ω/km]
CVFD0001_73010_GR	[(2x0,25)+(2x0,35)]	[(2x24)+(2x22)]	Drop	6,9 (0.272)	71 (48)	78,0 (data), 54,0 (power)
CVFD0002_73010_GR	[(2x1)+(2x1,5)]	[(2x18)+(2x15)]	Trunk	12,0 (0.472)	220 (148)	23,2 (data), 11,3 (power)

**SERIES**  
**73100**

## DeviceNet data communication cables

Dynamic application



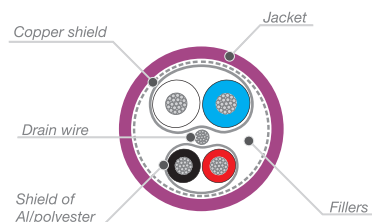
DeviceNet™



### Use

The DeviceNet field BUS cable for mobile installation has been planned for the mobile application connection of industrial equipment and is normally installed on cable holder chains, even with great length (continuous motion on Cartesian axis). The cable is made of two couples of conductors, the first one for power supply with red and black conductors, the second one for the signal with blue and white conductors. The range of cables includes the Trunk cable used for the main lines of the DeviceNet network, and the Drop cable connecting the devices to the main line through a derivation. The polyuretan jacket grants very good mechanical performances and a very good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Drop type: signal conductor 19x0,13 mm (0,25 mm <sup>2</sup> ), power conductor 19x0,16 mm (0,35 mm <sup>2</sup> )
Insulation	TKblend®-L
Conductors	Twisted, black/red colors (power), blue/white (signal)
Shield	Aluminum/polyester tape on pairs (coverage 100%), overall tinned copper braid, nom. coverage 65%. Drain wire 22/19 AWG.
Jacket	Polyuretan, oil-resistant and flame-resistant and halogen, free. Desina RAL 4001 violet color
Temperature range	-40°C, +80°C
Voltage rating	300 V
Max DC resistance	78,0 Ω/km (data), 54,0 Ω/km (power)
Characteristic impedance	120 Ω
Capacitance	40 nF/km @ 800 Hz
Dielectric strength	2000 V x 1 min (cond. - shield)
Bending radius	10 x cable outer diameter
Speed	180 m/min
Acceleration	5 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1, UL 1581, CSA FT2   Oil res.: IEC 60811-2-1, ICEA S-82-552, ASTM-oil-1   Other: EN 50267-2-1, IEC 60754-1-2, NEK 606, VDE 0472 par. 1, VDE 0282/10, UL 758, CSA AWM I/II A/B, cURus AWM Style 20978
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20978

### Marking

TEKIMA 73130 "DEVICENET" – CE ((2x0,25)+(2x0,35)) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20978 ((2x24)+(2x22)) AWG 80°C 300 V AWM Class I/II A/B FT2 – 120 Ohm – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Type	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_73130_D3	[(2x0,25)+(2x0,35)]	[(2x24)+(2x22)]	Drop	6,9 (0.272)	68 (46)

**SERIES**  
**74100**

# CanOpen data communication cables



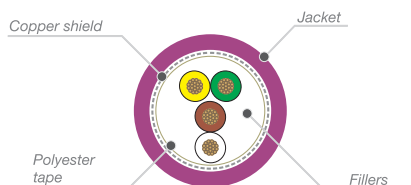
Fixed application



## Use

The CanOpen (Control Area Network) field BUS cable, at first planned for the automotive sector, is now employed also in the industrial one. This cable has been planned for fixed installation use, and is suitable for environments with electromagnetic compatibility (EMC) problems. The special PVC jacket grants good mechanical performances, a good abrasion resistance and a very good resistance to the most used industrial oils and lubricants.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Size 0,34 mm <sup>2</sup> strand 7x0,25 mm Size 0,22 mm <sup>2</sup> strand 7x0,20 mm
Insulation	TKblend®-L
Conductors	Twisted, DIN 47100 colors (white, brown, green, yellow)
Taping	Polyester tape
Shield	Tinned copper braid, nom. coverage 85%
Jacket	PVC compound, oil-resistant and flame-retardant. Desina RAL 4001 violet color
Temperature range	-20°C, +80°C
Voltage rating	300 V
Characteristic impedance	120 Ω
Capacitance	40 pF/m
Dielectric strength	1000 V x 1 min (cond./shield)
Bending radius	10 x cable outer diameter
Standards of construction	Flame res.: IEC 60332-1, UL 1581, CSA FT2   Other: UL 758, CSA AWM I/II A/B, cURus AWM Style 20601
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20601

## Marking

TEKIMA 74100 "CanTek" – CE (1x2x0,34) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20601 (1x2x22) AWG 80°C 300 V AWM Class I/II A/B FT2 – 120 Ohm – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_74100_D3	[2x(2x0,22)]	[2x(2x24)]	7,5 (0.295)	69 (46)
CVFD0002_74100_D3	[2x(2x0,34)]	[2x(2x22)]	8,5 (0.335)	78 (52)
CVFD0003_74100_D3	[1x(2x0,34)]	[1x(2x22)]	6,5 (0.256)	48 (32)
CVFD0004_74100_D3	[3x(2x0,34)]	[3x(2x22)]	9,0 (0.354)	105 (71)



**SERIES**  
**74000**

## CanOpen data transmission cables



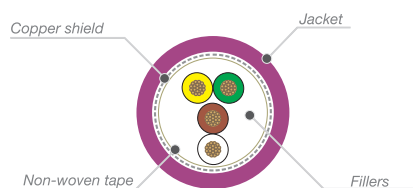
Dynamic application



### Use

The CanOpen (Control Area Network) field BUS cable, at first planned for the automotive sector, is now employed also in the industrial one. This cable has been planned for the use in mobile installations on Cartesian axis, and is suitable for environments with electromagnetic compatibility (EMC) problems. The special polyuretan jacket grants very good mechanical performances, a very good abrasion resistance and a good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	0,25 mm <sup>2</sup> (32x0,10 mm)
Insulation	TKblend®-L
Conductors	Twisted, DIN 47100 colors (white, brown, green, yellow)
Taping	Non-woven tape
Shield	Tinned copper braid, nom. coverage 85%
Jacket	PUR halogen free. Desina RAL 4001 violet color.
Temperature range	-40°C, +80°C
Voltage rating	300 V
Max DC resistance	79,0 Ω/km
Characteristic impedance	120 Ω
Dielectric strength	1000 V x 1 min (cond./shield)
Bending radius	10 x cable outer diameter
Speed	180 m/min
Acceleration	5 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1, UL 1581, CSA FT2   Oil res.: IEC 60811-2-1, ICEA S-82-552, ASTM-oil-1   Other: VDE 0472 par. 1, VDE 0282/10, NEK 606, UL 758, CSA AWM I/II A/B, cURus AWM Style 20978
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20978

### Marking

TEKIMA 74000 "CanTek" – CE (1x2x0,25) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20978 (1x2x24) AWG 80°C 300 V AWM Class I/II A/B FT2 – 120 Ohm – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_74000_D3	[1x(2x0,25)]	[1x(2x24)]	6,2 (0.244)	49 (33)
CVFD0002_74000_D3	[2x(2x0,25)]	[2x(2x24)]	8,4 (0.331)	76 (51)



**SERIES  
75000**

# Industrial Ethernet data transmission cables



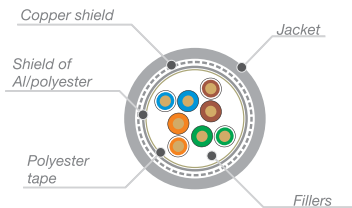
Fixed application



## Use

The Ethernet networks and the TCP/IP protocol are among the most widespread data communication systems of the industrial automation. These are powerful communication technologies which permit integration with the Office environment, IT functionality, Internet/Intranet, remote configuration. The cable is planned for fixed application and is suitable for environments with electromagnetic compatibility (EMC) problems. The special PVC jacket grants good mechanical performances, a good abrasion resistance and a very good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Category	Ethernet SF/UTP Cat.5e
Conductor	Rigid bare copper 0,22 mm <sup>2</sup>
Insulation	TKblend®-L
Conductors	Twisted, colored in rings or stripes. 4 pairs cable (White/Blue+Blue); (White/Orange+Orange);(White/Green+Green), (White/Brown+Brown) 2 pairs cable (White/Orange+Orange), (White/Green+Green)
Taping	Polyester tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	PVC compound, oil-resistant, flame retardant and UV resistant. Gray color.
Temperature range	-30°C, +80°C
Voltage rating	300 V
Max DC resistance	93,8 Ω/km
Characteristic impedance	100 Ω
Capacitance	48 pF/m
Dielectric strength	1000 V x 1 min (cond) 700 V x 1 min (shield)
Bending radius	10 x cable outer diameter
Standards of construction	Flame res.: IEC 60332-1-2, UL 1581, CSA FT2   Oil res.: IEC 60811-2-1   UV res.: UL 1581 par.1200   Other: UL 1581, UL 758, EN 61156-5, EN 50288-2-1, CSA AWM I/II A/B, cURus AWM Style 20601
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20601

## Marking

TEKIMA 75020 "Industrial Ethernet" SF/UTP CAT.5e – CE (2x2x0,21) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20601 (2x2x24) AWG 80°C AWM Class I/II A/B 80°C 300 V FT2 – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_75020_GR	[2x(2x0,21)]	[2x(2x24)]	6,0 (0.236)	44 (30)
CVFD0002_75020_GR	[4x(2x0,21)]	[4x(2x24)]	6,4 (0.252)	58 (39)

**SERIES**  
**75500**

## Industrial Ethernet CMR data transmission cables



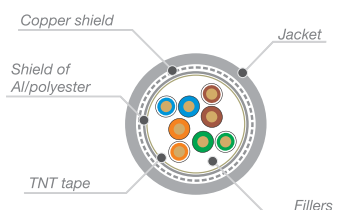
Fixed application



### Use

UL Listed Ethernet cable produced according to UL 444. The Ethernet networks and the TCP/IP protocol are among the most widespread data communication systems of the industrial automation. These are powerful communication technologies which permit integration with the Office environment, IT functionality, Internet/Intranet, remote configuration. The cable is planned for fixed application and is suitable for environments with electromagnetic compatibility (EMC) problems. The special PVC jacket grants good mechanical performances, a good abrasion resistance and a very good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Category	Ethernet S/FTP o SF/UTP Cat.5e
Conductor	Rigid bare copper 0,22 mm <sup>2</sup>
Insulation	TKblend®-L
Conductors	Twisted, colored in rings or stripes. 4 pairs cable (White/Blue+Blue); (White/Orange+Orange);(White/ Green+Green), (White/Brawn+Brawn) 2 pairs cable (White/Orange+Orange), (White/Green+Green)
Nastratura Taping	Non-woven tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	PVC compound, oil-resistant, flame retardant and UV resistant. Gray color.
Temperature range	-30°C, +75°C
Voltage rating	125 V
Max DC resistance	86,0 Ω/km
Characteristic impedance	100 Ω
Capacitance	48 pF/m
Dielectric strength	1000 V x 1 min (cond), 700 V x 1 min (shield)
Bending radius	8 x cable outer diameter
Standards of construction	Flame res.: IEC 60332-1, UL 1666   Oil res.: IEC 60811-2-1, EN 50363-4-1, DIN VDE 0472-803, ICEA S-82-552, NEMA WC55   UV res.: UL 1581 par. 1200   Other: UL 1581, EN 61156-5, EN 50288-1, ISO/IEC 11801
Standards of use	UL 444 (type CMR), NFPA 70 (Art. 800)

### Marking

TEKIMA 75530 "Industrial Ethernet" S/FTP CAT.5e – CE (2x2x0,21) mm<sup>2</sup> 60°C 125 V IEC 60332-1 – c(UL)us CMR E501447 (2x2x24) AWG 60°C 125 V – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_75530_GR	[2x(2x0,22)]	[2x(2x24)]	6,6 (0.260)	57 (38)
CVFD0002_75530_GR	(4x2x0,22)	(4x2x24)	6,8 (0.268)	67 (45)

**SERIES**  
**75200**

# Industrial Ethernet data transmission cables Cat.6



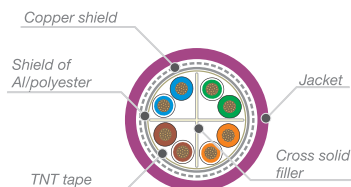
Dynamic application



## Use

The Ethernet networks and the TCP/IP protocol are among the most widespread data communication systems of the industrial automation. These are powerful communication technologies which permit integration with the Office environment, IT functionality, Internet/Intranet, remote configuration. The cable has been planned for dynamic application and is suitable for environments with electromagnetic compatibility (EMC) problems. The special thermoplastic polyurethane (TPU) jacket grants good mechanical performances, a good abrasion resistance and a very good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Category	Ethernet SF/UTP Cat.6
Conductor	0,15 mm <sup>2</sup>
Insulation	TKblend®-L
Conductors	Twisted, colored in rings or stripes. 4 pairs cable (White/Blue+ Blue), (White/Orange+Orange), (White/Green+Green), (White/Brown+Brown)
Taping	Non-woven tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	Polyurethane halogen free and UV-resistant. Violet color.
Temperature range	-30°C, +80°C (dynamic); -40°C, +80°C (fixed)
Voltage rating	1000 V (work 50 V)
Max DC loop resistance	290,0 Ω/km
Characteristic impedance	100 Ω
Capacitance	47 pF/m
Dielectric strength	1000 Vac x 1 min
Bending radius	6 x cable outer diameter (fixed) 8 x cable outer diameter (dynamic)
Speed	300 m/min
Acceleration	5 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1-2, UL 1581 par. 1100 (FT2), 1090   Oil res.: IEC 60811-2-1, ICEA S-82-552, ASTM Oil 1   UV res.: UL 1581 par. 1200   Other: VDE 0472 par.1, NEK 606, VDE 0282/10, EN 50267-2-1, IEC 60754-1, EN 50267-2-2, IEC 60754-2, IEC 61156-6, EN 50288-5-2, EN 50173-1, ISO/IEC 11801, UL 758, cURus AWM Style 21576
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 21576

## Marking

TEKIMA 75220 "Industrial Ethernet" SF/UTP CAT.6 – CE (4x2x0,15) mm<sup>2</sup> 80°C IEC 60332-1-2 – c(UR)us E314444 AWM Style 21576 (4x2x26) AWG 80°C 1000 V AWM Class I/II A/B FT2 – (prod.reference) = (metric) =

## Coding and dimensions

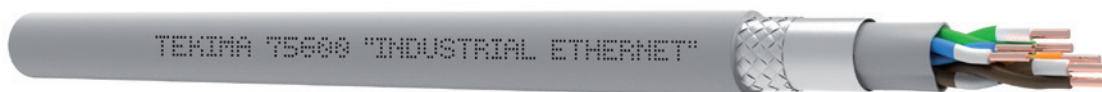
Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_75220_D3	[4x(2x0,15)]	[4x(2x26)]	7,2 (0.283)	64 (43)

**SERIES**  
**75600**

## Industrial Ethernet CMX data transmission cables



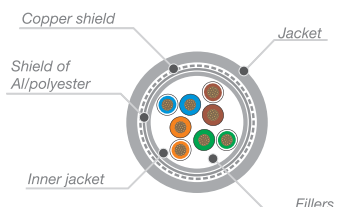
Dynamic application



### Use

UL Listed Ethernet cable produced according to UL 444. The Ethernet networks and the TCP/IP protocol are among the most widespread data communication systems of the industrial automation. These are powerful communication technologies which permit integration with the Office environment, IT functionality, Internet/Intranet, remote configuration. The cable has been planned for dynamic application and is suitable for environments with electromagnetic compatibility (EMC) problems. The special PUR jacket grants good mechanical performances, a good abrasion resistance and a very good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Category	Ethernet S/FTP Cat.5e
Conductor	0,15 mm <sup>2</sup> (19x0,10 mm)
Insulation	TKblend®-L
Conductors	Twisted, colored in rings or stripes. 4 pairs cable (White/Blue+ Blue), (White/Orange+Orange), (White/Green+Green), (White/Brown+Brown)
Internal jacket	TPE halogen free
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	Flame retardant, halogen free polyurethane and UV-resistant. Gray color.
Temperature range	-30°C, +70°C (dynamic); -40°C, +75°C (fixed)
Voltage rating	125 V
Max DC conductor resistance	142,0 Ω/km
Characteristic impedance	100 Ω
Capacitance	48 pF/m
Dielectric strength	1000 V x 1 min (cond./cond.), 700 V x 1 min (cond./shield)
Bending radius	10 x cable outer diameter (fixed) 15 x cable outer diameter (dynamic)
Speed	180 m/min
Acceleration	3 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1-2, UL 1581 par. 1080   Oil res.: IEC 60811-2-1, ASTM-oil-1, ICEA S-82-552   UV res.: UL 1581 par. 1200   Other: VDE 0472 par. 1, VDE 0282/10, NEK 606, EN 50267-2-1, EN 50267-2-2, IEC 60754-1, IEC 60754-2, UL 444
Standards of use	UL 444 (type CMX), NFPA 70 (Art. 800)

### Marking

TEKIMA 75620 "Industrial Ethernet" S/FTP CAT.5e – CE (4x2x0,15) mm<sup>2</sup> 75°C 125 V IEC 60332-1 – c(UL)us CMX E501447 (4x2x26) AWG 75°C 125 V – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_75620_GR	(4x2x0,15)	(4x2x26)	7,4 (0.291)	76 (51)

**SERIES**  
**75700**

# Industrial Ethernet CMX data transmission cables Cat.6



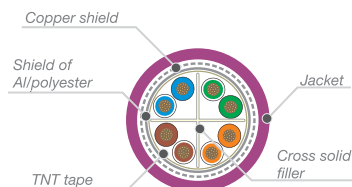
Dynamic application



## Use

UL Listed Ethernet cable produced according to UL 444. The Ethernet networks and the TCP/IP protocol are among the most widespread data communication systems of the industrial automation. These are powerful communication technologies which permit integration with the Office environment, IT functionality, Internet/Intranet, remote configuration. The cable has been planned for dynamic application and is suitable for environments with electromagnetic compatibility (EMC) problems. The special PUR jacket grants good mechanical performances, a good abrasion resistance and a very good resistance to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Category	Ethernet SF/UTP Cat.6
Conductor	0,15 mm <sup>2</sup>
Insulation	TKblend®-L
Conductors	Twisted, colored in rings or stripes. 4 pairs cable (White/Blue+ Blue), (White/Orange+Orange), (White/Green+Green), (White/Brown+Brown)
Taping	Non-woven tape
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	Polyurethane halogen free and UV-resistant. Violet color.
Temperature range	+80°C (AWM/IEC), +75°C (CMX) -20°C (dynamic); -40°C (fixed)
Voltage rating	300 V (work 50 V)
Max DC loop resistance	290,0 Ω/km
Characteristic impedance	100 Ω
Capacitance	47 pF/m
Dielectric strength	1000 Vac x 1 min
Bending radius	6 x cable outer diameter (fixed) 8 x cable outer diameter (dynamic)
Speed	300 m/min
Acceleration	5 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1-2, UL 1581 par. 1100 (FT2), 1090   Oil res.: IEC 60811-2-1, ICEA S-82-552, ASTM IRM 901 IRM 902   UV res.: UL 1581 par. 1200   Other: VDE 0472 par.1, NEK 606, VDE 0282/10, EN 50267-2-1, IEC 60754-1, IEC 60754-1, IEC 61156-6, EN 50288-5-2, EN 50173-1, ISO/IEC 11801, UL 444, UL 758, cURus AWM Style 20549
Standards of use	UL 444 (type CMX), NFPA 70 (Art. 800), ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20549

## Marking

TEKIMA 75720 "Industrial Ethernet" SF/UTP CAT.6 – CE (4x2x0,15) mm<sup>2</sup> 80°C IEC 60332-1-2 – c(UL)us CMX E501447 (4x2x26) AWG 75°C VW-1 or AWM Style 20549 80°C 300V AWM Class I/II A/B FT2 – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_75720_D3	[4x(2x0,15)]	[4x(2x26)]	7,2 (0.283)	64 (43)

**SERIES**  
**77000**

## Profinet data transmission cables



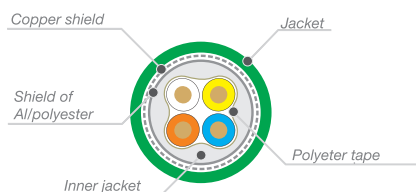
Fixed application



### Use

Profinet is the Ethernet industrial standard of Profibus and Profinet association. This system employs the TCP/IP protocol permitting a real-time communication with advanced industrial devices. The cable has been planned for fixed application, it exhibits a good resistance to the mechanical stress, to the low temperatures and to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Category	Profinet S/FTP Cat.5e
Conductor	Rigid bare copper 1x0,64 mm
Insulation	TKblend®-L
Conductors	Twisted (White, Blue, Yellow, Orange)
Taping	Polyester tape
Internal jacket	PVC compound
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	PVC compound, oil-resistant, flame-retardant and UV-resistant. RAL 6018 green color
Temperature range	-30°C, +80°C
Voltage rating	300 V
Max DC resistance	56,40 Ω/km
Characteristic impedance	100 Ω
Capacitance	52 pF/m
Dielectric strength	1500 Vac x 1 min (cond. - shield)
Bending radius	8 x cable outer diameter
Standards of construction	Flame res.: IEC 60332-1-2, UL 1581 par. 1090, 1100 (FT2)   Oil res.: IEC 60811-2-1, EN 50363-4-1 type TM5, ASTM IRM902   UV res.: UL 1581 par. 1200   Other: IEC 61156-5, EN 50288-2-1, UL 758, CSA AWM I/II, A/B, cURus AWM Style 20601 or 2464
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20601 or 2464

### Marking

TEKIMA 77010 "PROFINET" – CE (1x4x0,34) mm<sup>2</sup> 80°C 300 V IEC 60332-1-2 – c(UR)us E314444 AWM Style 20601 (1x4x22) AWG 80°C 300 V AWM Class I/II A/B FT2 – 100 Ohm – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_77010_VE	[1X(4X0,35)]	[1X(4X22)]	6,5 (0.256)	74 (50)



**SERIES**  
**77100**

# Profinet data transmission cables

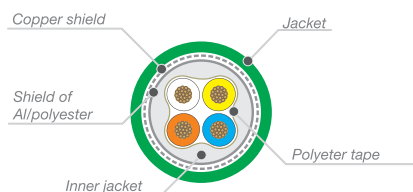
Dynamic application



## Use

Profinet is the Ethernet industrial standard of Profibus and Profinet association. This system employs the TCP/IP protocol permitting a real-time communication with advanced industrial devices. The cable has been planned for dynamic application, it exhibits a good resistance to the mechanical stress, to the low temperatures and to the most used industrial oils and fluids.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Category	Profinet SF/UTP Cat.5e
Conductor	Bare copper 0,38 mm <sup>2</sup> (19x0,16 mm)
Insulation	TKblend®-L
Conductors	Twisted (White, Blue, Yellow, Orange)
Internal jacket	TPE
Shield	Aluminum/polyester tape and tinned copper braid, nom. coverage 85%
Jacket	PUR oil-resistant, flame-retardant and UV-resistant. RAL 6018 green color
Temperature range	-40°C, +80°C (fixed application); -20°C, +60°C (dynamic application)
Voltage rating	300 V
Max DC resistance	59,4 Ω/km
Characteristic impedance	100 Ω
Capacitance	52 pF/m
Bending radius	8 x cable outer diameter (fixed), 12 x cable outer diameter (not fixed)
Speed	180 m/min
Acceleration	3 m/s <sup>2</sup>
Standards of construction	Flame res.: IEC 60332-1, UL 1581 par. 1090 and par. 1100 (FT2)   Oil res.: IEC 60811-2-1, ICEA S-82-552, IRM 901, 902   Other: UL 1581, IEC 61156-6, EN 50288-1, EN 50288-2-2, ISO/IEC 11801, UL 758, CSA AWM I/II A/B, cURus AWM Style 20978 or Style 20549
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20978 or Style 20549

## Marking

TEKIMA 77100 "PROFINET" – CE (1x4x0,38) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us E314444 AWM Style 20978 (1x4x22) AWG 80°C 300 V AWM Class I/II A/B FT2 – 100 Ohm – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_77100_VE	[1X(4X0,38)]	[1X(4X22)]	6,7 (0.264)	63 (42)

**SERIES  
78000**

## DRIVE-CLiQ data transmission cables



Fixed application

cULus

RoHS

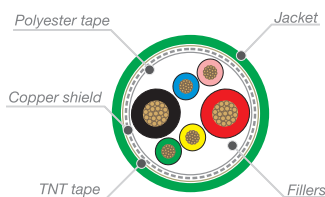
CE UKCA



### Use

The DRIVE-CLiQ data communication cable for fixed application is used in connection of industrial equipment. DRIVE-CLiQ is an open encoder interface that allows users to select the right measuring system for their application. With this interface it is possible to connect encoders to magnetic/inductive, magnetostrictive sensors, lasers measuring systems. This cable, made of a polyurethane jacket, grants very good mechanical performance, oil and flame resistance.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Bare copper. Conductors 0,14 mm <sup>2</sup> (7x0,16 mm) acc. to VDE 0295 Cl.5. Conductors 0,35 mm <sup>2</sup> (7x0,254 mm) acc. to VDE 0295 Cl.2.
Insulation	TKblend®-YP
Conductors	Twisted, red/black colors (0,35 mm <sup>2</sup> ), yellow/green and pink/blue (0,14 mm <sup>2</sup> )
Inner taping	PET tape under shield
Shield	Tinned copper braid, nom. coverage 85%
Outer taping	TNT tape over shield
Jacket	PUR, oil-resistant and flame-resistant. Similar to RAL 6018 green color.
Temperature range	-50°C, +80°C (fixed); -25°C, +80°C (not fixed)
Voltage rating	300 V
Test voltage	1500 V x 1 min
Bending radius	5 x cable outer diameter (fixed), 10 x cable outer diameter (not fixed)
Standards of construction	Flame res.: UL FT1   Oil res.: EN 50363-10   Other: IEC 60754-1, EN 50267-2-1, VDE 0472-815, UL 1581, EN 50396, UL 758, CSA AWM I/II A/B, cURus AWM Style 20233
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20233

### Marking

TEKIMA 78000 – CE (2x2x0,14+2x0,35) mm<sup>2</sup> 80°C 300 V – c(UR)us E314444 AWM Style 20233 (2x2x26+2x22) AWG 80°C 300 V AWM Class I/II A/B FT1 – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/100ft)]
CVFD0001_78000_VE	(2x2x0,14+2x0,35)	(2x2x26+2x22)	6,8 (0.268)	65 (44)

**SERIES**  
**78100**

## DRIVE-CLiQ data transmission cables



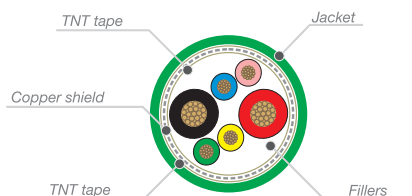
Dynamic application



### Use

The DRIVE-CLiQ data communication cable for mobile application is used in connection of industrial equipment. DRIVE-CLiQ is an open encoder interface that allows users to select the right measuring system for their application. With this interface it is possible to connect encoders to magnetic/inductive, magnetostrictive sensors, lasers measuring systems. This cable, made of a polyurethane jacket, grants very good mechanical performance, oil and flame resistance.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Bare copper. Conductors 0,15 mm <sup>2</sup> (19x0,10 mm) acc. to VDE 0295 Cl.6. Conductors 0,34 mm <sup>2</sup> (19x0,15 mm) acc. to VDE 0295 Cl.5.
Insulation	TKblend®-YP
Conductors	Twisted, red/black colors (0,34 mm <sup>2</sup> ), yellow/green and pink/blue (0,15 mm <sup>2</sup> )
Inner taping	TNT tape under shield
Shield	Tinned copper braid, nom. coverage 85%
Outer taping	TNT tape over shield
Jacket	PUR, oil-resistant and flame-resistant. Similar to RAL 6018 green color.
Temperature range	-50°C, +80°C (fixed); -25°C, +80°C (not fixed); -5°C, +60°C (drag chain)
Voltage rating	300 V
Test voltage	1500 V x 1 min
Speed	220 m/s
Acceleration	10 m/s <sup>2</sup>
Bending radius	5 x cable outer diameter (fixed), 10 x cable outer diameter (not fixed)
Standards of construction	Flame res.: UL FT1   Oil res.: EN 50363-10   Other: IEC 60754-1, EN 50267-2-1, VDE 0472-815, UL 1581, EN 50396, UL 758, CSA AWM I/II A/B, cURus AWM Style 20233
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 20233

### Marking

TEKIMA 78100 – CE (2x2x0,15+2x0,34) mm<sup>2</sup> 80°C (fix) 60°C (mobile) 300 V – c(UR)us E314444 AWM Style 20233 (2x2x26+2x22) AWG 80°C (fix) 60°C (mobile) 300 V AWM Class I/II A/B FT1 – (prod.reference) = (metric) =

### Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFD0001_78100_VE	(2x2x0,15+2x0,34)	(2x2x26+2x22)	6,8 (0.268)	69 (46)

DATA

## Encoder, resolver and data transmission cables



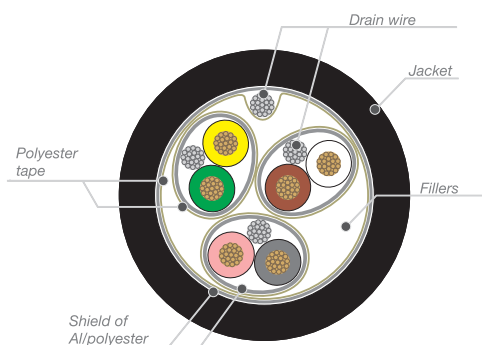
Fixed application



### Use

Machine tool wire cables produced for fixed applications or not-cyclical and not-repetitive mobile uses. They are used for equipment meant for the European (EC) and North American (UL) markets. Their good oil and abrasion resistance permit their use in static connections without particular protections and without compromising the original electrical and mechanical properties. The good flame resistance makes them suitable for the installation in any industrial environment. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



### Technical data

Characteristics	Value/property
Conductor	Bare copper
Insulation	TKblend®-R
Conductor distinction	Twisted: (White, Brown); (Green, Yellow); (Gray, Pink)
Pairs shield	Aluminum/polyester (coverage 100%), drain wire 14x0,15 mm and protective PET tape.
Total shield	Protective PET tape, drain wire 14x0,15 mm and aluminum/polyester (coverage 100%).
Jacket	PVC compound. Black color.
Temperature range	+80°C -25°C (fixed); -5°C (not fixed <sup>(1)</sup> )
Voltage rating	300 V
Test voltage	2000 V x 1 min
Electrical resistance	<75,37 Ω/km
Bending radius	5 x cable outer diameter
Standards of construction	Flame res.: UL VW-1, CSA FT1, IEC 60332-1, CEI 20-35   Oil res.: ISO 6722   Other: CEI 20-52, IEC 60344, IEC 60885-1, UL 758, AWM I/II A/B, UL AWM Style 2464
Standards of use	ANSI/NFPA 79, UL 508a, Style 2464

(1) For mobile use with scarcely repetitive and non-cyclical movements.

### Marking

TEKIMA CVFS0001\_0301S\_NE – CE (3x2x0,25) mm<sup>2</sup> 80°C 300 V CEI 20-35 IEC 60332-1– c(UR)us E314444 AWM Style 2464 (3x2x24) AWG 80°C 300 V VW-1 - Class I/II A/B FT1 – (prod.reference) = (metric) =

### Coding and dimensions

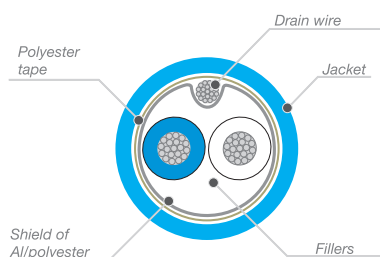
Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFS0001_0301S_NE	(3x(2x0,25))	(3x(2x24))	7,0 (0.276)	58 (39)



## Use

Machine tool wire cables produced for fixed applications or not-cyclical and not-repetitive mobile uses. They are used for equipment meant for the European (EC), North American (UL) and Canadian (CSA) markets. Their good oil and abrasion resistance permit their use in static connections without particular protections and without compromising the original electrical and mechanical properties. The good flame resistance makes them suitable for the installation in any industrial environment. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Tin copper
Insulation	TKblend®-L
Conductor distinction	Twisted: (Blue, Natural)
Total shield	Aluminum/polyester (coverage 100%), drain wire 7x0,25 mm and protective PET tape.
Jacket	PVC compound. Blue color RAL 5015.
Temperature range	+80°C -20°C (fixed); -5°C (not fixed <sup>(1)</sup> )
Voltage rating	300 V
Electrical resistance	<87,2 Ω/km
Nominal impedance	120 Ω
Capacitance	40 pF/m
Bending radius	10 x cable outer diameter
Standards of construction	Flame res.: UL HFT, CSA FT1, IEC 60332-1   Oil res.: ISO 6722   Other: IEC 60344, UL 758, CSA AWM I/II A/B, cURus AWM Style 2095
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 2095

(1) For mobile use with scarcely repetitive and non-cyclical movements.

## Marking

TEKIMA CVFS0050\_0301S – CE (2x0,22) mm<sup>2</sup> 80°C 300 V IEC 60332-1 – c(UR)us AWM Style 2095 (2x24) AWG 80°C 300 V E314444 – AWM Class I/II A/B 80°C 300V FT1 – (prod.reference) = (metric) =

## Coding and dimensions

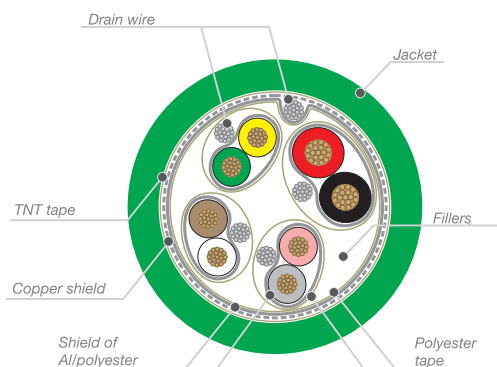
Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFS0050_0301S_BL	(2x0,22)	(2x24)	6,1 (0.240)	34 (23)



## Use

Machine tool wire cables produced for fixed applications or not-cyclical and not-repetitive mobile uses. They are used for equipment meant for the European (EC), North American (UL) and Canadian (CSA) markets. Their good oil and abrasion resistance permit their use in static connections without particular protections and without compromising the original electrical and mechanical properties. The good flame resistance makes them suitable for the installation in any industrial environment. The metric marked on the jacket allows an easier processing and installation of the cable.

Information. An additional UL certified cut-to-length service is carried out on request ("Processed Wire").



## Technical data

Characteristics	Value/property
Conductor	Bare copper
Insulation	TKblend®-L
Conductor distinction	Twisted pair 0,5 mm <sup>2</sup> : (Red, Black) Twisted pair 0,22 mm <sup>2</sup> : (White, Brown); (Green, Yellow); (Gray, Pink)
Pairs shield	Aluminum/polyester (coverage 100%), drain wire 7x0,20 mm and protective PET tape.
Total shield	Protective aluminum/polyester (coverage 100%), drain wire 7x0,20 mm and tin copper shield (nom. coverage 85%). TNT tape over total assembly.
Jacket	PVC compound. Green color RAL 6018.
Temperature range	-25°C <sup>(2)</sup> (fixed); -5°C (not fixed <sup>(1)</sup> )
Voltage rating	300 V
Test voltage	2000 V x 1 min
Electrical resistance	Pair 0,5 mm <sup>2</sup> : <37,10Ω/km; Pair 0,22 mm <sup>2</sup> : <84,79 Ω/km
Bending radius	5 x cable outer diameter
Standards of construction	Flame res.: UL Vertical flame, CSA FT2 or FT1, IEC 60332-1, CEI 20-35   Oil res.: ISO 6722   Other: CEI 20-52, UL 758, CSA AWM I/II A/B, cURus AWM Style 2464 or 20601
Standards of use	ANSI/NFPA 79, UL 508a, CSA C22.1 (CE Code), CSA C22.2 No.286, Style 2464 or 20601

(1) For mobile use with scarcely repetitive and non-cyclical movements.  
(2) On request special product up to -40°C.

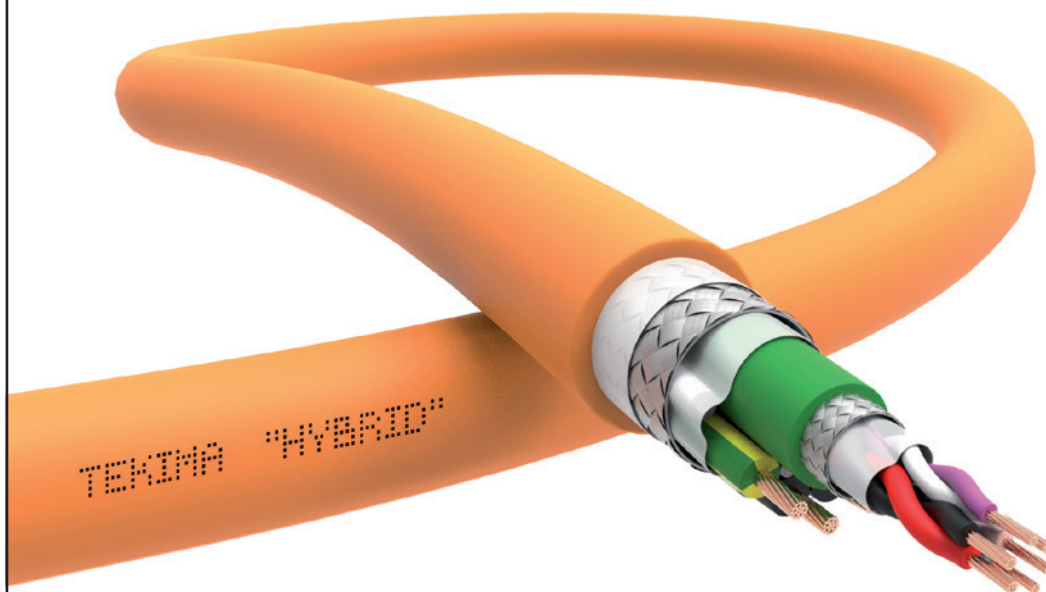
## Marking

TEKIMA 0321S – CE (2x0,5 + 3x(2x0,22)) mm<sup>2</sup> 80°C 300 V CEI 20-35/IEC 60332-1 – c(UR)us E314444 AWM Style 20601 (2x21 + 3x(2x24)) AWG 80°C 300 V – AWM Class I/II A/B 80°C 300V FT2 – (prod.reference) = (metric) =

## Coding and dimensions

Code	Num. conductors x Size [mm <sup>2</sup> ]	Num. conductors x Size [AWG]	Diameter [mm (inch)]	Weight [kg/km (lb/mft)]
CVFS0003_0321S_D1	((2x0,50)+3x(2x0,22))	((2x21)+3x(2x24))	9,5 (0.374)	116 (78)





## Use

The use of digital technologies in motors' control for industrial automation is undergoing a decisive acceleration.

The integration of the two essential components (power and control) necessary for the operation of a latest generation electric motor, involves the aggregation in a single cable of the power supply conductors and those necessary for digital communications.

Combining very different electrical quantities and extremely reliable electrical parameters in a single product represents today the new goal in the construction of hybrid cables.

We create your own cables. Customizable in:

- > Type of communication
- > Certifications
- > Installation, fixed / mobile installation
- > Operating conditions
- > Dimensions
- > Colors



For more information please contact [sales-USA@tekima.com](mailto:sales-USA@tekima.com)





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## Safety labels

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## Use

The safety of the employees comes always first in the planning and realization of a plant, machinery or equipment. In an industrial environment there are many hazards: mechanical parts in motion, electric energy, pneumatic power, water power, hot surfaces, noise, and the employees must be protected from these dangers but also trained and informed about them. Even if safety barriers, protections or mechanical devices are supplied to reduce the hazards for the employees, there are always residual risks, and exactly towards them the safety signs and labels play an important role. The article 1910.145 of OSHA (Occupational Safety & Health Administration), representing the American legislation for safety and health, requires the use of specific signs to indicate and define possible hazards that, without identification, could cause injuries and property damage. The reference standard for the American market is ANSI Z535.4 "Product Safety Signs and Labels", which regulates the safety signs and gives a guide for their application with the aim of indicating potential or imminent hazards during the use of the product.

## Technical data

Characteristics	Value/property
Material	PVC with adhesive layer and protective lamination or Anodized aluminum 0.5 mm thickness with white background and 3.5 mm holes on the edges
Hazard level	Caution, Warning, Danger, Notice
Standard languages <sup>(1)</sup>	English, French, Spanish
Size	According to the article code
Use	Indoor and outdoor
Minimum working temperature	-40°C <sup>(2)</sup>
Maximum working temperature	PVC: +95°C <sup>(3)</sup> , Aluminium: +100°C
Standard packaging	PVC: 12 pcs, Aluminium: 6 pcs
Standards of construction	ANSI Z535, UL 969, CSA C22.2 No.0.15, ISO 3864, RoHS
Standards of use	ANSI Z535, OSHA Art. 1910.145, NFPA 70 (NEC), NFPA 79, UL 508A, CSA C22.1 (CE Code), CSA C22.2 No.286
Certifications	c(UL)us Recognized - File# PDGQ2.MH60136, PGDQ8.MH60136

(1) Other languages available on request and for minimum quantities apply.

(2) The minimum application temperature is +0°C.

(3) Maximum working temperature for UL is +60°C.

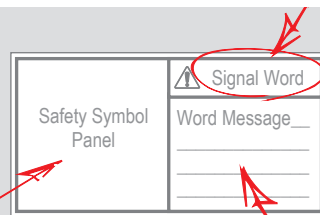
## Range

The range consists of hundreds of safety labels, some of which are already made in languages other than English, French and Spanish. You can search for the labels available through our website by going to the dedicated section using the QR Code.



[www.tekima.com/us/safety-labels](http://www.tekima.com/us/safety-labels)

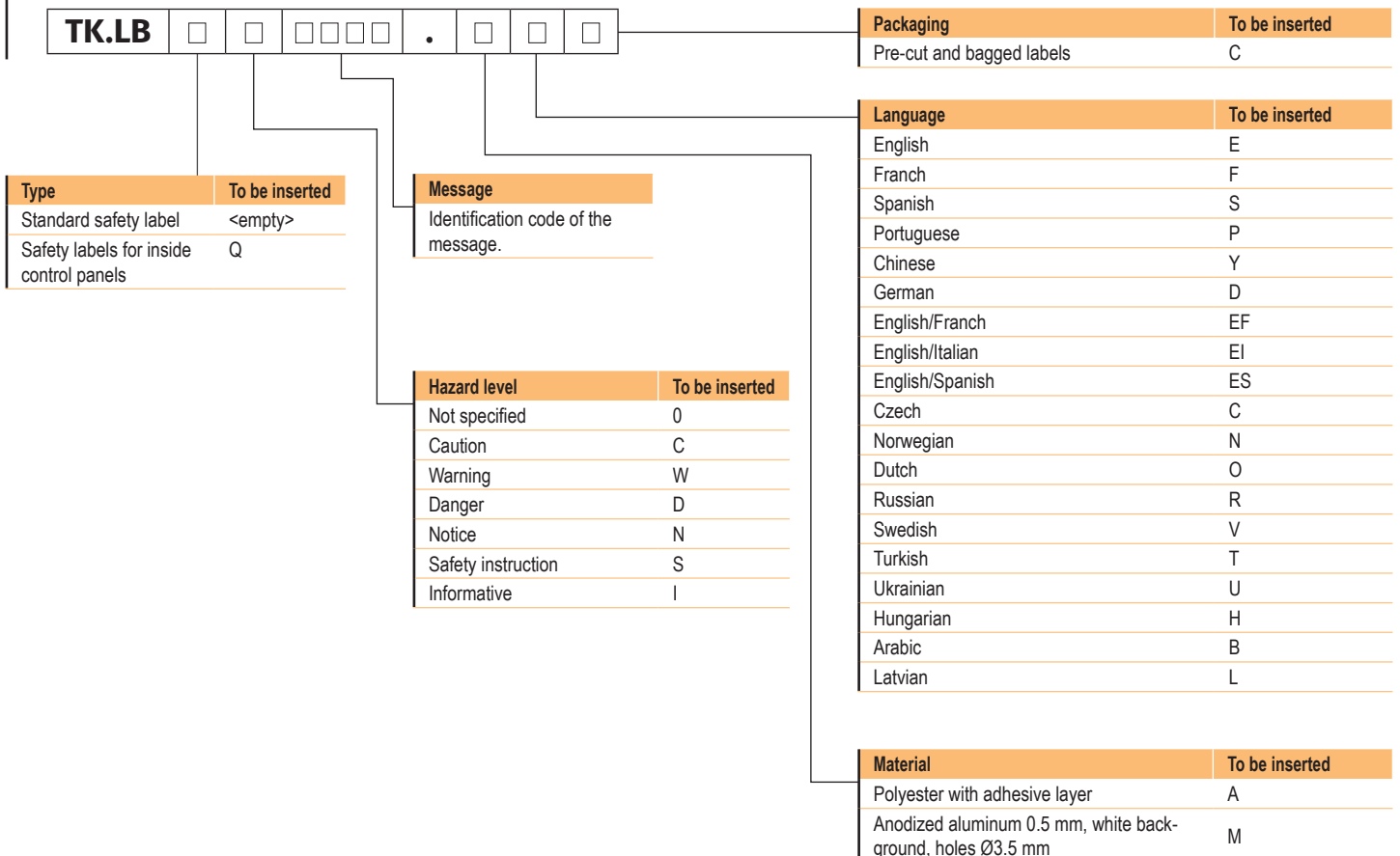
Did not find the safety label you are looking for or you need it in a specific language, please contact our commercial office. We can create custom safety labels to meet your specific system requirements.



*Crash hazard - Stay clear of this area during operation -*

**+1 (937) 800 4398**  
**sales-USA@tekima.com**

## Code composition



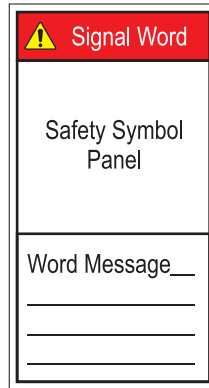
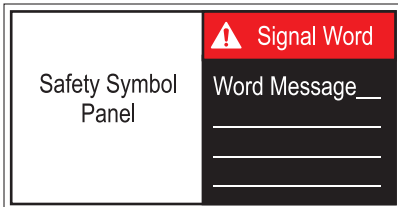


## Production and use of safety labels

### Safety labels' layout

The ANSI Z535.4, "Product Safety Signs and Labels" regulates safety labels' production and provides guidance for the application of these signals that must be capable of indicating the potential or imminent dangers. The safety labels must inform the person about the type of hazard, level of risk, how to avoid the hazard and the consequences in not respecting the rules. The American Standard specifies how to communicate efficiently and effectively all of this information. The Standard also classifies safety labels according to the level of risk of a situation and in particular on the probability and severity of the damage this can cause if not avoided. A safety label consists of three distinct main parts: the signal word that defines the level of risk, the word message and the safety symbol panel.

#### Examples of safety labels typical structure



#### Signal word

It is the text that identifies the level of risk and must contain the symbol of physical risk to persons in case it exists. The signal word is composed of an exclamation mark within a triangle and of the text of the risk level. The meaning of the signal word is to alert the user about potential personal injury that may arise from the misuse of the product and in case the instructions for use and maintenance are not observed. Its meaning is: "Obey all safety messages that follow this symbol to avoid possible injury or death". Each signal word is indicated with special colors and always with uppercase text, however there are safety labels that do not indicate risk but which have a purely informative meaning.

#### Types of Signal Word



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE is used to address practices not related to physical injury.



SAFETY INSTRUCTION (or equivalent) signs indicate specific safety-related instructions or procedures.

## Word Message

This is the message that identifies the hazard and indicates how to avoid it and what are the implications if it is not avoided. The information contained in the word message should be presented taking into account some basic rules .

1. The information must be concise and easily understood. This means choosing words that accurately identify the risk and actions to be taken and that are understandable by the people to whom the message is addressed .
2. The order in which the content appears is not fixed and depends on the target audience to whom it is addressed and the level of responsiveness required to avoid the risk. As a general rule, the hazard message should come first when there are many actions to avoid it. In other cases it is possible to put an action to avoid the hazard before the hazard message and that's when you need to communicate immediately the precautions to be taken .
3. Avoid using the subject "you" or "your", then always place the subject followed by the verb , and then the object.
4. When the text is composed by more messages these can be separated by enough space to make it easily readable. The use of bullets may be considered to help separate portions of the word message and to make it easier to read (eg. black circles before each sentence).
5. It is preferable to align the text to the left and is not recommended the use of justified text .
6. It is not recommended to use text fully capitalized as difficult to read.
7. The message should be with black letters on white background or white on black background.

## Safety Symbol Panel

The safety symbol panel contains the safety symbol and is used to graphically communicate the content of the message. It is important that the symbol is easily understandable and that actually communicates the message.

It is essential that the safety labels are easily understandable by those who use the machinery or makes maintenance. The Standard, however, suggests to include in the instructions of the machinery all the necessary information to understand the meaning of the signals and the messages used in safety labels. This allows the user to recognize instantly the meaning of the safety labels used.

## Translation of Signal Words

For some languages, the translation of the Signal Words is suggested in the following table.

### Translation of Signal Words

English	DANGER	WARNING	CAUTION	NOTICE
Danish	FARE	ADVARSEL	FORSIGTIG	VARSEL
Dutch	GEVAAR	WAAESCHUWING	VOORZICHTIG	LET OP
Estonian	OHT	HOIATUS	ETTEVAATUST	TEATE
Finnish	VAARA	VAROITUS	VAROITUS	ILMOITUS
French	DANGER	AVERTISSEMENT	ATTENTION	AVIS
German	GEFHAR	WARNUNG	VORSICHT	HINWEIS
Italian	PERICOLO	AVVERTENZA	ATTENZIONE	AVVISO
Norwegian	FARE	ADVARSEL	FORSIKTIG	VARSEL
Portuguese	PERIGO	AVISO	CUIDADO	AVISO
Slovenian	NEVARNOST	OPOZORILO	POZOR	OBVESTILO
Spanish	PELIGRO	ADVERTENCIA	ATENCIÓN	AVISO
Swedish	FARA	VARNING	VARNING	MEDDELANDE

## Safe viewing distance

Particular attention should be given to the readability of the message in terms of safe viewing distance defined as the distance at which a person can read the safety label and have the time to follow the message to avoid the hazard. The safe viewing distance is related to the size of the letters used and in particular to their height that depends on several factors including the lack of light, unfavorable reading conditions, the need to give greater prominence to the message, making the message readable at distances greater than the minimum, to make the message readable to people with reading difficulties. The table shows the relation between the height of the characters and the safe viewing distance recommended for favorable and unfavorable conditions.

### Safe viewing distance and letter height

Safe viewing distance [m]	Letter height for favorable reading conditions [mm]	Letter height for unfavorable reading conditions [mm]
0,5	3,3	3,5
0,75	4,4	5,3
1	5,0	7,0
1,25	5,7	8,8
1,5	6,3	10,5
1,75	6,9	12,3
2	7,5	14,0
2,25	8,2	15,8
2,5	8,8	17,5

## Application of safety labels






### Use of safety labels

For the application of the safety labels, it is recommended to verify the existence of guidelines, rules, regulations or government, state or federal laws that can integrate ANSI standards. The safety labels are to be applied in areas where they are easily visible and legible by anyone who approaches and at a point such that the person can react quickly to take the necessary action to avoid the danger. When possible, they should be applied in areas protected from the risk of damage, abrasion, chemical attack, dust or anything else that would affect the visibility and reading. The temperature range of use of standard safety labels is from -40°C to +60°C (versions are available for use at higher temperatures) provided that there is not an unequal distribution of temperatures that negatively affects the thermal expansion of the material. The surfaces on which the safety labels are applied must be clean, smooth and free of grease, oil or chemicals that will reduce adhesion. The Standard requires that the safety labels are regularly checked and cleaned to ensure good readability at a safe distance. When the products are subjected to extreme environmental conditions or when the safety labels no longer fulfill the conditions of visibility required they must be replaced.

### Selection of safety labels

Signal words are selected based on the risk that results from not following the safety message. The level of risk determines the signal word and its color. This appendix provides a guidance for selecting signal words. There are two classifications for severity of harm: death or serious injury, and moderate or minor injury. Death or serious injury: permanent loss of function or significant disfigurement, substantial and prolonged medical treatment required, long periods of disability, considerable pain and suffering over long periods of time (ie amputations, severe burns, loss or impairment of vision or hearing). Moderate or minor injury: does not include death or serious injury, typically does not result in permanent disability, significant disfigurement or pain. Moderate or minor injury are, for example, cuts, scratches and irritation. When the outcome of an event includes results falling into more than one of the severity classifications, the most severe classification should be used. For example, an event that results in both minor injury to one body part and serious injury to another should be classified as "serious injury or death". When the outcome of an event is included in more than one of the classifications of severity of harm, the most severe classification should be used. For example, an event that causes both minor injury to a body part and a serious injury to another must be classified as "death or serious injury."

#### Selection scheme of Signal Words

Physical injury is a credible possibility.				Physical injury is not a credible possibility.
Death or serious injury is a credible possibility.		Death or serious injury is not a credible possibility. Minor or moderate injury is possible.		
If the hazardous situation is not avoided the accident is expected to happen with near certainty.	If the hazardous situation is not avoided the accident is possible but not nearly certain.			
If accident occurs death or serious injury is expected to happen with near certainty.	If accident occurs death or serious injury is possible but not nearly certain.	If the hazardous situation is not avoided the accident is possible but not nearly certain.	Death or serious injury is not a credible possibility. Minor or moderate injury is possible.	
				

### The symbol of the Signal Word

The symbol contained in the Signal Word indicates a hazard. It is composed of an equilateral triangle surrounding an exclamation mark. The safety alert symbol is only used on hazard alerting labels, it is not used on notice and instruction labels. The symbol can be printed in different ways in relation with the type of safety label. The symbol made from a triangle with a yellow background and black exclamation mark is used to allow compatibility with some international standards including ISO 3864-1 and ISO 3864-2.

#### Safe viewing distance and letter height



Options for DANGER safety labels.



Options for WARNING safety labels.



Options for CAUTION safety labels.





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## **Appendix**

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## Appendix A. Wires, Sizes and AWG diameters

### A.1 AWG and kcmil wires' sizes measurement

The American Wire Gauge (AWG) is used in the United States and in other countries as a standard method of denoting wire diameter. Increasing gauge numbers give decreasing wire diameters; the use of this unit of measure derives from the type of processing carried out on the wire; very fine wire (for example 30 AWG) requires far more passes through the drawing dies than greater wires which, consequently, have a lower AWG identifying them. By definition, 36 AWG has the same value of a wire with 0,005 inches diameter, while 4/0 AWG has the same value of a 0,46 inches diameter. The diameters increase of  $0,46/0,005 = 92$  times regularly divided in 39 Sizes. Therefore, the diameter of a wire with a x AWG Size is given as follows:

$$d_n = 0,005 \cdot 92^{\frac{36-x}{39}} \text{ [inch]}$$

while the Size is

$$A_n = \frac{\pi}{4} \cdot d_n^2 = 0,000019635 \cdot 92^{\frac{36-x}{19,5}} \text{ [inch}^2\text{]}$$

for m/0 AWG Size, use  $x = -(m-1)$  in the above formulas.

Table A.1a. AWG Size and conversion mm<sup>2</sup>

AWG	Diameter		Area [mm <sup>2</sup> ]
	[inch]	[mm]	
40	0,0031	0,07987	0,00501
39	0,0035	0,08969	0,00632
38	0,0040	0,1007	0,00797
37	0,0045	0,1131	0,0100
36	0,0050	0,1270	0,0127
35	0,0056	0,1426	0,0160
34	0,0063	0,1601	0,0201
33	0,0071	0,1798	0,0254
32	0,0080	0,2019	0,0320
31	0,0089	0,2268	0,0404
30	0,0100	0,2546	0,0509
29	0,0113	0,2859	0,0642
28	0,0126	0,3211	0,081
27	0,0142	0,3606	0,102
26	0,0159	0,4049	0,129
25	0,0179	0,4547	0,162
24	0,0201	0,5106	0,205
23	0,0226	0,5733	0,258
22	0,0253	0,6438	0,326
21	0,0285	0,7229	0,410
20	0,0320	0,8118	0,518
19	0,0359	0,9116	0,653
18	0,0403	1,024	0,823
17	0,0453	1,150	1,04
16	0,0508	1,291	1,31
15	0,0571	1,450	1,65
14	0,0641	1,628	2,08
13	0,0720	1,828	2,62
12	0,0808	2,053	3,31
11	0,0907	2,305	4,17
10	0,1019	2,588	5,26
9	0,1144	2,906	6,63
8	0,1285	3,264	8,37
7	0,1443	3,665	10,5
6	0,1620	4,115	13,3
5	0,1819	4,621	16,8
4	0,2043	5,189	21,2
3	0,2294	5,827	26,7
2	0,2576	6,544	33,6
1	0,2893	7,348	42,4
0(1/0)	0,3249	8,251	53,5
00(2/0)	0,3648	9,266	67,4
000(3/0)	0,4096	10,40	85
0000(4/0)	0,4600	11,68	107

AWG	Diameter		Area [mm <sup>2</sup> ]
	[inch]	[mm]	
00000(5/0)	0,5165	13,12	135
00000(6/0)	0,5800	14,73	170

The larger Sizes are given in kcmil according to the following table:

Table A.1b. kcmil Sizes and conversion in mm<sup>2</sup>

kcmil	Diameter		Area [mm <sup>2</sup> ]
	[inch]	[mm]	
250	0,50	12,7	127
300	0,55	13,9	152
350	0,59	15,0	177
400	0,63	16,1	203
450	0,67	17,0	228
500	0,71	17,9	253
550	0,74	18,8	279
600	0,77	19,7	304
650	0,81	20,5	329
700	0,84	21,3	355
750	0,87	22,0	380
800	0,89	22,7	405
900	0,95	24,1	456
1000	1,00	25,4	507
1200	1,10	27,8	608
1250	1,12	28,4	633
1500	1,22	31,1	760
1750	1,32	33,6	887
2000	1,41	35,9	1010

## A.2 Wires according to EN 60228

The EN 60228 "Conductors of insulated cables" standard defines the characteristics of the solid conductors (class 1), stranded conductors (class 2) and flexible conductors (class 5 and 6) as follow.

### Solid conductors (class 1)

- Solid conductors are made of bare or tinned copper.
- Solid copper conductors shall be of circular cross-section.
- The resistance of each conductor at 20°C must not exceed the value given in the Table A.2a.

### Stranded conductors (class 2)

- The stranded circular conductors are made of bare or tinned copper.
- The wires in each conductor must have the same nominal diameter.
- The number of wires in each conductor shall be not less than the value given in the Table A.2b.
- The resistance of each conductor at 20°C must not exceed the value given in the Table A.2b.

### Flexible conductors (class 5 and 6)

- The flexible conductors are made of bare or tinned copper.
- The wires in each conductor must have the same nominal diameter.
- The diameter of the wires in each conductor must not exceed the value given in the Table A.2c and Table A.2d.
- The resistance of each conductor at 20°C must not exceed the value given in the Table A.2c and Table A.2d.

Table A.2a. Characteristics of the copper solid conductors, class 1, for the production of cables according to CEI EN 60228:2005

Nominal Size	Maximum resistance of the wire at 20°C [ $\Omega$ /km]	
	Bare copper	Tinned copper
0,5	36,0	36,7
0,75	24,5	24,8
1,0	18,1	18,2
1,5	12,1	12,2
2,5	7,41	7,56
4	4,61	4,70
6	3,08	3,11
10	1,83	1,84
16	1,15	1,16
25	0,727	-
35	0,524	-
50	0,387	-
70	0,268	-
95	0,193	-
120	0,153	-
150	0,124	-
185	0,101	-
240	0,0775	-
300	0,0620	-
400	0,0465	-

Table A.2b. Characteristics of the copper stranded conductors, class 2, for the production of cables according to CEI EN 60228:2005

Nominal Size [mm <sup>2</sup> ]	Minimum number of wires in the conductor	Maximum resistance of the wire at 20°C [ $\Omega$ /km]	
		Bare copper	Tinned copper
0,5	7	36,0	36,7
0,75	7	24,5	24,8
1,0	7	18,1	18,2
1,5	7	12,1	12,2
2,5	7	7,41	7,56
4	7	4,61	4,70
6	7	3,08	3,11
10	7	1,83	1,84
16	7	1,15	1,16
25	7	0,727	0,734
35	7	0,524	0,529
50	19	0,387	0,391
70	19	0,268	0,270
95	19	0,193	0,195
120	37	0,153	0,154
150	37	0,124	0,126
185	37	0,0991	0,100
240	37	0,0754	0,0762
300	61	0,0601	0,0607
400	61	0,0470	0,0475
500	61	0,0366	0,0369
630	91	0,0283	0,0286
800	91	0,0221	0,0224
1000	91	0,0176	0,0177

Table A.2c. Characteristics of the copper flexible conductors, class 5, for the production of cables according to CEI EN 60228:2005

Nominal Size [mm <sup>2</sup> ]	Maximum diameter of the wires in conductor	Maximum resistance of the wire at 20°C [ $\Omega$ /km]	
		Bare copper	Tinned copper
0,5	0,21	39,0	40,1
0,75	0,21	26,0	26,7
1,0	0,21	19,5	20,0
1,5	0,26	13,3	13,7
2,5	0,26	7,98	8,21
4	0,31	4,95	5,09
6	0,31	3,30	3,39
10	0,41	1,91	1,95
16	0,41	1,21	1,24
25	0,41	0,780	0,795
35	0,41	0,554	0,565
50	0,41	0,386	0,393
70	0,51	0,272	0,277
95	0,51	0,206	0,210
120	0,51	0,161	0,164
150	0,51	0,129	0,132
185	0,51	0,106	0,108
240	0,51	0,0801	0,0817
300	0,51	0,0641	0,0654
400	0,51	0,0486	0,0495
500	0,61	0,0384	0,0391
630	0,61	0,0287	0,0292

Table A.2d. Characteristics of the copper flexible conductors, class 6, for the production of cables according to CEI EN 60228:2005

Nominal Size [mm <sup>2</sup> ]	Maximum diameter of the wires in conductor [mm]	Maximum resistance of the wire at 20°C [Ω /km]	
		Bare copper	Tinned copper
0,5	0,16	39,0	40,1
0,75	0,16	26,0	26,7
1,0	0,16	19,5	20,0
1,5	0,16	13,3	13,7
2,5	0,16	7,98	8,21
4	0,16	4,95	5,09
6	0,21	3,30	3,39
10	0,21	1,91	1,95
16	0,21	1,21	1,24
25	0,21	0,780	0,795
35	0,21	0,554	0,565
50	0,31	0,386	0,393
70	0,31	0,272	0,277
95	0,31	0,206	0,210
120	0,31	0,161	0,164
150	0,31	0,129	0,132
185	0,41	0,106	0,108
240	0,41	0,0801	0,0817
300	0,41	0,0641	0,0654

### A.3 Wires, correlations between AWG and IEC Sizes

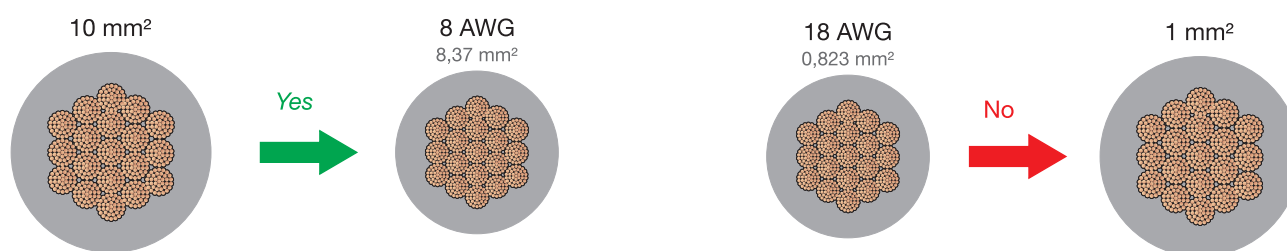
Table A.3. Correlation between mm<sup>2</sup> (IEC) and AWG cable Sizes

Sizes		Equivalent area		
[mm <sup>2</sup> ]	[AWG]	[mm <sup>2</sup> ]	[inch <sup>2</sup> ]	[kcmil]
0,2		0,196	0,000304	387
	24	0,205	0,000317	404
0,3		0,283	0,000438	558
	22	0,324	0,000504	640
0,5		0,5	0,000775	987
	20	0,519	0,000802	1020
0,75		0,75	0,001162	1480
	18	0,823	0,001272	1620
1		1	0,00155	1973
	16	1,31	0,002026	2580
1,5		1,5	0,002325	2960
	14	2,08	0,003228	4110
2,5		2,5	0,003875	4934
	12	3,31	0,005129	6530
4		4	0,0062	7894
	10	5,26	0,008152	10380
6		6	0,0092	11841
	8	8,37	0,012967	16510
10		10	0,0155	19735
	6	13,3	0,02061	26240
16		16	0,0248	31576
	4	21,1	0,03278	41641
25		25	0,0388	49338
	2	33,6	0,0521	66310
35		35	0,0542	69073
	1	42,4	0,0657	83677
50		47	0,0728	92756

#### Example

A 10 mm<sup>2</sup> wire can be used as an 8 AWG wire because its size is 10 mm<sup>2</sup> > 8,37 mm<sup>2</sup>.

On the contrary, a 18 AWG wire cannot be used as a 1 mm<sup>2</sup> wire because its equivalent size is 0,823 mm<sup>2</sup> < 1 mm<sup>2</sup>.



## A.4 Minimum cross-Sizeal areas of copper conductors according to EN 60204-1

Table A.4. Minimum cross-Sizeal areas of copper conductors by application according to IEC 60204-1:2018

Location	Application	Minimum cross-Sizeal area [mm <sup>2</sup> ] by type of cable				
		Single core		Multicore		
		Flexible Calss 5 or 6	Solid (Class 1) or stranded (Class 2)	Two cores, shielded	Two cores, not shielded	Three or more cores, shielded or not
Wiring outside protecting enclosures	Power circuits, fixed	1,0	1,5	0,75	0,75	0,75
	Power circuits, subjected to frequent movements	1,0	-	0,75	0,75	0,75
	Control circuits	1,0	1,0	0,2	0,5	0,2
	Data communication	-	-	-	-	0,08
Wiring inside enclosures	Power circuits (connections and moved)	0,75	0,75	0,75	0,75	0,75
	Control circuits	0,2	0,2	0,2	0,2	0,2
	Data communication	-	-	-	-	0,08



## Appendix B. Ampacities of wires

### B.1 Wires ampacities according to UL 508a

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

#### Size of equipment grounding conductor terminal according to UL 508a

Tabella B.1a. Earth wire capacities according to UL 508a - Rev. 2007-2018 (15 Grounding – Size of Terminal or Bonding Conductor)

Maximum current [A]	Minimum Size of the earth wire			
	Copper wire		Aluminium wire	
	[AWG/kcmil]	[mm <sup>2</sup> ]	[AWG/kcmil]	[mm <sup>2</sup> ]
15	14 AWG	2,1	12 AWG	3,3
20	12	3,3	10	5,3
30	10	5,3	8	8,4
40	10	5,3	8	8,4
60	10	5,3	8	8,4
100	8	8,4	6	13,3
200	6	13,3	4	21,2
300	4	21,2	2	33,6
400	3	26,7	1	42,4
500	2	33,6	1/0	53,5
600	1	42,4	2/0	67,4
800	1/0	53,5	3/0	85,0
1000	2/0	67,4	4/0	107,2
1200	3/0	85,0	250 kcmil	127
1600	4/0	107,2	350	177
2000	250 kcmil	127	400	203
2500	350	177	600	304
3000	400	203	600	304
4000	500	253	800	405
5000	700	355	1200	608
6000	800	506	1200	608

### Ampacities of power conductors according to UL 508a

Table B.1b. Ampacities of field installed or internal power insulated conductors according to UL 508a – Rev. 2007-2018 (28.3 & 29.6 Sizing)

Wire Size		Insulated conductor ampacity at 60°C (140°F) [A]		Insulated conductor ampacity at 75°C (167°F) [A]	
[AWG/kcmil]	[mm <sup>2</sup> ]	Copper wire	Aluminium wire	Aluminium wire	Aluminium wire
14 AWG	2,1	15	–	15	–
12	3,3	20	15	20	15
10	5,3	30	25	30	25
8	8,4	40	30	50	40
6	13,3	55	40	65	50
4	21,2	70	55	85	65
3	26,7	85	65	100	75
2	33,6	95	75	115	90
1	42,4	110	85	130	100
1/0	53,5	–	–	150	120
2/0	67,4	–	–	175	135
3/0	85,0	–	–	200	155
4/0	107,2	–	–	230	180
250 kcmil	127	–	–	255	205
300	152	–	–	285	230
350	177	–	–	310	250
400	203	–	–	335	270
500	253	–	–	380	310
600	304	–	–	420	340

Wire Size		Insulated conductor ampacity at 60°C (140°F) [A]		Insulated conductor ampacity at 75°C (167°F) [A]	
[AWG/kcmil]	[mm <sup>2</sup> ]	Copper wire	Aluminium wire	Aluminium wire	Aluminium wire
700	355	–	–	460	375
750	380	–	–	475	385
800	405	–	–	490	395
900	456	–	–	520	425
1000	506	–	–	545	445
1250	633	–	–	590	485
1500	760	–	–	625	520
1750	887	–	–	650	545
2000	1013	–	–	665	560

These values of ampacity apply only when not more than three conductors are intended to be field-installed in the conduit. When four or more conductors, other than a neutral that carries the unbalanced current, are intended to be installed in a conduit, the ampacity of each of the conductors is: 80 percent of these values if 4 – 6 conductors are involved, 70 percent of these values if 7 – 24 conductors, 60 percent of these values if 25 – 42 conductors, and 50 percent of these values if 43 or more conductors

## Ampacities of field installed control circuit conductors according to UL 508a

Table B.1c. Ampacities of field installed control circuit conductors according to UL 508a – Rev. 2007-2018 (37.2 Sizing)

Wire Size		Conductor ampacity [A]	Conductor marking required?
[AWG]	[mm <sup>2</sup> ]		
16	1,3	10	Yes
16 ÷ 14	1,3 ÷ 2,1	10	No
18	0,82	7	Yes
18 ÷ 14	0,82 ÷ 2,1	7	No
20 ÷ 18	0,52 ÷ 0,82	5	Yes
20 ÷ 14	0,52 ÷ 2,1	5	No
22 ÷ 18	0,32 ÷ 0,82	3	Yes
22 ÷ 14	0,32 ÷ 2,1	3	No
24 ÷ 18	0,20 ÷ 0,82	2	Yes
24 ÷ 14	0,20 ÷ 2,1	2	No
26 ÷ 18	0,13 ÷ 0,82	1	Yes
26 ÷ 14	0,13 ÷ 2,1	1	No
28 ÷ 18	0,08 ÷ 0,82	0,8	Yes
28 ÷ 14	0,08 ÷ 2,1	0,8	No
30 ÷ 18	0,05 ÷ 0,82	0,5	Yes
30 ÷ 14	0,05 ÷ 2,1	0,5	No

## Ampacities of internal control circuit conductors according to UL 508a

Table B.1d. Ampacities of internal control circuit conductors according to UL 508a - Rev. 2007-2018 (38.2 Sizing of internal control circuit conductors)

Size		Conductor ampacity [A]
[AWG]	[mm <sup>2</sup> ]	
16	1,3	10
18	0,82	7
20 <sup>(b)</sup>	0,52	5
22 <sup>(b)</sup>	0,32	3
24 <sup>(b)</sup>	0,20	2
26 <sup>(b)</sup>	0,13	1
28 <sup>(a) (b)</sup>	0,08	0,8
30 <sup>(a) (b)</sup>	0,05	0,5

(a) Where these conductors are contained in a jacketed multi-conductor cable assembly.

<sup>(b)</sup> These sizes of conductors are only for connection of control circuits for electronic programmable input/output and static control (having no moving parts).

## B.2 Ampacity of conductors according to CSA C22.2 No. 286

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.2a. Allowable ampacities of insulated copper conductors inside industrial control equipment enclosures (ambient temperature 40°C) according to CSA C22.2 No.286 – Ed. 2015-2017 (Clause 4.6.2, Table 7)

Wire Size [AWG/kcmil]	Copper conductor's ampacity with 90 °C insulation [A]		Copper conductor's ampacity with 105 °C insulation [A]	
	Non-ventilated enclosure	Open or in ventilated enclosure	Non-ventilated enclosure	Open or in ventilated enclosure
24 AWG	1	2	1	2
22	2	3	2	3
20	3	4	3	4
18	4	6	4	6
16	6	9	6	9
14	9	13	10	15
12	12	17	15	22
10	18	27	22	35
8	31	47	35	55
6	45	67	52	80
4	61	91	71	108
3	70	104	80	121
2	80	120	90	140
1	94	141	107	164
0	110	164	133	190
00	128	191	148	221
000	148	221	171	257
0000	173	258	200	300
250 kcmil	194	285	221	340
300	214	322	250	384
350	242	355	276	420
400	262	385	299	449
500	298	442	343	515

Table B.2b. Ampacity adjustment factors based on the number of c conductors according CSA C22.2 No.286 – Ed. 2015-2017 (Clause 4.6.2, Table 8)

Number of conductors	Correction factor
1÷3	1,00
4÷6	0,80
7÷24	0,70
25÷42	0,60
>42	0,50

### B.3 Ampacities of conductors according to NFPA 79

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.3a. Ampacities of conductors with 60°C insulation temperature according to NFPA 79 – Ed. 2007 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], Insulation temperature 60°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	-	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	-	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	-	-
18	7,3	7,0	6,5	6,1	5,7	5,2	4,6	4,0	-	-
16	10,5	10,0	9,4	8,8	8,2	7,5	6,7	5,8	-	-
14	15,7	15,0	14,1	13,2	12,3	11,2	10,0	8,7	-	-
12	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	-	-
10	31,5	30,0	28,2	26,4	24,6	22,5	20,1	17,4	-	-
8	42,0	40,0	37,6	35,2	32,8	30,0	26,8	23,2	-	-
6	57,7	55,0	51,7	48,4	45,1	41,2	36,8	31,9	-	-
4	73,5	70,0	65,8	61,6	57,4	52,5	46,9	40,6	-	-
3	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	-	-
2	99,7	95,0	89,3	83,6	77,9	71,2	63,6	55,1	-	-
1	115,5	110,0	103,4	96,8	90,2	82,5	73,7	63,8	-	-
1/0	131,2	125,0	117,5	110,0	102,5	93,7	83,7	72,5	-	-
2/0	152,2	145,0	136,3	127,6	118,9	108,7	97,1	84,1	-	-
3/0	173,2	165,0	155,1	145,2	135,3	123,7	110,5	95,7	-	-
4/0	204,7	195,0	183,3	171,6	159,9	146,2	130,6	113,1	-	-
250 kcmil	225,7	215,0	202,1	189,2	176,3	161,2	144,0	124,7	-	-
300	252,0	240,0	225,6	211,2	196,8	180,0	160,8	139,2	-	-
350	273,0	260,0	244,4	228,8	213,2	195,0	174,2	150,8	-	-
400	294,0	280,0	263,2	246,4	229,6	210,0	187,6	162,4	-	-
500	336,0	320,0	300,8	281,6	262,4	240,0	214,4	185,6	-	-
600	372,7	355,0	333,7	312,4	291,1	266,2	237,8	205,9	-	-
700	404,2	385,0	361,9	338,8	315,7	288,7	257,9	223,3	-	-
750	420,0	400,0	376,0	352,0	328,0	300,0	268,0	232,0	-	-
800	430,5	410,0	385,4	360,8	336,2	307,5	274,7	237,8	-	-
900	456,7	435,0	408,9	382,8	356,7	326,2	291,4	252,3	-	-
1000	477,7	455,0	427,7	400,4	373,1	341,2	304,8	263,9	-	-

Table B.3b. Ampacities of conductors with 75°C insulation temperature according to NFPA 79 – Ed. 2007 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 75°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,2	0,1	-
28	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,4	0,2	-
26	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,5	0,3	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	0,6	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	0,9	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	1,6	-
18	7,3	7,0	6,5	6,1	5,7	5,2	4,6	4,0	2,3	-
16	10,5	10,0	9,4	8,8	8,2	7,5	6,7	5,8	3,3	-
14	15,7	15,0	14,1	13,2	12,3	11,2	10,0	8,7	4,9	-
12	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	6,6	-
10	31,5	30,0	28,2	26,4	24,6	22,5	20,1	17,4	9,9	-
8	52,5	50,0	47,0	44,0	41,0	37,5	33,5	29,0	16,5	-
6	68,2	65,0	61,1	57,2	53,3	48,7	43,5	37,7	21,4	-
4	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	28,0	-
3	105,0	100,0	94,0	88,0	82,0	75,0	67,0	58,0	33,0	-
2	120,7	115,0	108,1	101,2	94,3	86,2	77,0	66,7	37,9	-
1	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	42,9	-
1/0	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	49,5	-
2/0	183,7	175,0	164,5	154,0	143,5	131,2	117,2	101,5	57,7	-
3/0	210,0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	66,0	-
4/0	241,5	230,0	216,2	202,4	188,6	172,5	154,1	133,4	75,9	-
250 kcmil	267,7	255,0	239,7	224,4	209,1	191,2	170,8	147,9	84,1	-
300	299,2	285,0	267,9	250,8	233,7	213,7	190,9	165,3	94,0	-
350	325,5	310,0	291,4	272,8	254,2	232,5	207,7	179,8	102,3	-
400	351,7	335,0	314,9	294,8	274,7	251,2	224,4	194,3	110,5	-
500	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	125,4	-
600	441,0	420,0	394,8	369,6	344,4	315,0	281,4	243,6	138,6	-
700	483,0	460,0	432,4	404,8	377,2	345,0	308,2	266,8	151,8	-
750	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	156,7	-
800	514,5	490,0	460,6	431,2	401,8	367,5	328,3	284,2	161,7	-
900	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	171,6	-
1000	572,2	545,0	512,3	479,6	446,9	408,7	365,1	316,1	179,8	-

Table B.3c. Ampacities of conductors with 60°C insulation temperature according to NFPA 79 – Ed. 2012 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 60°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	-	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	-	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	-	-
18	7,3	7,0	6,5	6,1	5,7	5,2	4,6	4,0	-	-
16	10,5	10,0	9,4	8,8	8,2	7,5	6,7	5,8	-	-
14	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	-	-
12	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	-	-
10	31,5	30,0	28,2	26,4	24,6	22,5	20,1	17,4	-	-
8	42,0	40,0	37,6	35,2	32,8	30,0	26,8	23,2	-	-
6	57,7	55,0	51,7	48,4	45,1	41,2	36,8	31,9	-	-
4	73,5	70,0	65,8	61,6	57,4	52,5	46,9	40,6	-	-
3	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	-	-
2	99,7	95,0	89,3	83,6	77,9	71,2	63,6	55,1	-	-
1	115,5	110,0	103,4	96,8	90,2	82,5	73,7	63,8	-	-
1/0	131,2	125,0	117,5	110,0	102,5	93,7	83,7	72,5	-	-
2/0	152,2	145,0	136,3	127,6	118,9	108,7	97,1	84,1	-	-
3/0	173,2	165,0	155,1	145,2	135,3	123,7	110,5	95,7	-	-
4/0	204,7	195,0	183,3	171,6	159,9	146,2	130,6	113,1	-	-
250 kcmil	225,7	215,0	202,1	189,2	176,3	161,2	144,0	124,7	-	-
300	252,0	240,0	225,6	211,2	196,8	180,0	160,8	139,2	-	-
350	273,0	260,0	244,4	228,8	213,2	195,0	174,2	150,8	-	-
400	294,0	280,0	263,2	246,4	229,6	210,0	187,6	162,4	-	-
500	336,0	320,0	300,8	281,6	262,4	240,0	214,4	185,6	-	-
600	372,7	355,0	333,7	312,4	291,1	266,2	237,8	205,9	-	-
700	404,2	385,0	361,9	338,8	315,7	288,7	257,9	223,3	-	-
750	420,0	400,0	376,0	352,0	328,0	300,0	268,0	232,0	-	-
800	430,5	410,0	385,4	360,8	336,2	307,5	274,7	237,8	-	-
900	456,7	435,0	408,9	382,8	356,7	326,2	291,4	252,3	-	-
1000	477,7	455,0	427,7	400,4	373,1	341,2	304,8	263,9	-	-



Table B.3d. Ampacities of conductors with 75°C insulation temperature according to NFPA 79 – Ed. 2012 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 75°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,2	0,1	-
28	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,4	0,2	-
26	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,5	0,3	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	0,6	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	0,9	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	1,6	-
18	7,3	7,0	6,5	6,1	5,7	5,2	4,6	4,0	2,3	-
16	10,5	10,0	9,4	8,8	8,2	7,5	6,7	5,8	3,3	-
14	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	6,6	-
12	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	8,2	-
10	36,7	35,0	32,9	30,8	28,7	26,2	23,4	20,3	11,5	-
8	52,5	50,0	47,0	44,0	41,0	37,5	33,5	29,0	16,5	-
6	68,2	65,0	61,1	57,2	53,3	48,7	43,5	37,7	21,4	-
4	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	28,0	-
3	105,0	100,0	94,0	88,0	82,0	75,0	67,0	58,0	33,0	-
2	120,7	115,0	108,1	101,2	94,3	86,2	77,0	66,7	37,9	-
1	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	42,9	-
1/0	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	49,5	-
2/0	183,7	175,0	164,5	154,0	143,5	131,2	117,2	101,5	57,7	-
3/0	210,0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	66,0	-
4/0	241,5	230,0	216,2	202,4	188,6	172,5	154,1	133,4	75,9	-
250 kcmil	267,7	255,0	239,7	224,4	209,1	191,2	170,8	147,9	84,1	-
300	299,2	285,0	267,9	250,8	233,7	213,7	190,9	165,3	94,0	-
350	325,5	310,0	291,4	272,8	254,2	232,5	207,7	179,8	102,3	-
400	351,7	335,0	314,9	294,8	274,7	251,2	224,4	194,3	110,5	-
500	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	125,4	-
600	441,0	420,0	394,8	369,6	344,4	315,0	281,4	243,6	138,6	-
700	483,0	460,0	432,4	404,8	377,2	345,0	308,2	266,8	151,8	-
750	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	156,7	-
800	514,5	490,0	460,6	431,2	401,8	367,5	328,3	284,2	161,7	-
900	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	171,6	-
1000	572,2	545,0	512,3	479,6	446,9	408,7	365,1	316,1	179,8	-

Table B.3e. Ampacities of conductors with 90°C insulation temperature according to NFPA 79 – Ed. 2012 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 90°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,2	0,1	-
28	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,4	0,2	-
26	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,5	0,3	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	0,6	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	0,9	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	1,6	-
18	14,7	14,0	13,1	12,3	11,4	10,5	9,3	8,1	4,6	-
16	18,9	18,0	16,9	15,8	14,7	13,5	12,0	10,4	5,9	-
14	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	8,2	-
12	31,5	30,0	28,2	26,4	24,6	22,5	20,1	17,4	9,9	-
10	42,0	40,0	37,6	35,2	32,8	30,0	26,8	23,2	13,2	-
8	57,7	55,0	51,7	48,4	45,1	41,2	36,8	31,9	18,1	-
6	78,7	75,0	70,5	66,0	61,5	56,2	50,2	43,5	24,7	-
4	99,7	95,0	89,3	83,6	77,9	71,2	63,6	55,1	31,3	-
3	115,5	110,0	103,4	96,8	90,2	82,5	73,7	63,8	36,3	-
2	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	42,9	-
1	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	49,5	-
1/0	178,5	170,0	159,8	149,6	139,4	127,5	113,9	98,6	56,1	-
2/0	204,7	195,0	183,3	171,6	159,9	146,2	130,6	113,1	64,3	-
3/0	236,2	225,0	211,5	198,0	184,5	168,7	150,7	130,5	74,2	-
4/0	273,0	260,0	244,4	228,8	213,2	195,0	174,2	150,8	85,8	-
250 kcmil	304,5	290,0	272,6	255,2	237,8	217,5	194,3	168,2	95,7	-
300	336,0	320,0	300,8	281,6	262,4	240,0	214,4	185,6	105,6	-
350	367,5	350,0	329,0	308,0	287,0	262,5	234,5	203,0	115,5	-
400	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	125,4	-
500	451,5	430,0	404,2	378,4	352,6	322,5	288,1	249,4	141,9	-
600	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	156,7	-
700	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	171,6	-
750	561,7	535,0	502,9	470,8	438,7	401,2	358,4	310,3	176,5	-
800	582,7	555,0	521,7	488,4	455,1	416,2	371,8	321,9	183,1	-
900	614,2	585,0	549,9	514,8	479,7	438,7	391,9	339,3	193,0	-
1000	645,7	615,0	578,1	541,2	504,3	461,2	412,0	356,7	202,9	-

Table B.3f. Ampacities of conductors with 60°C insulation temperature according to NFPA 79 – Ed. 2015-2018 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 60°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
24	2,1	2,0	1,8	1,6	1,4	1,1	0,8	-	-	-
22	3,1	3,0	2,7	2,4	2,1	1,7	1,2	-	-	-
20	5,2	5,0	4,5	4,1	3,5	2,9	2,0	-	-	-
18	7,3	7,0	6,3	5,7	4,9	4,0	2,8	-	-	-
16	10,5	10,0	9,1	8,2	7,1	5,8	4,1	-	-	-
14	21,0	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-
12	26,2	25,0	22,7	20,5	17,7	14,5	10,2	-	-	-
10	31,5	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-
8	42,0	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-
6	57,7	55,0	50,0	45,1	39,0	31,9	22,5	-	-	-
4	73,5	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-
3	89,2	85,0	77,3	69,7	60,3	49,3	34,8	-	-	-
2	99,7	95,0	86,4	77,9	67,4	55,1	38,9	-	-	-
1	115,5	110,0	100,1	90,2	78,1	63,8	45,1	-	-	-
1/0	131,2	125,0	113,7	102,5	88,7	72,5	51,2	-	-	-
2/0	152,2	145,0	131,9	118,9	102,9	84,1	59,4	-	-	-
3/0	173,2	165,0	150,1	135,3	117,1	95,7	67,6	-	-	-
4/0	204,7	195,0	177,4	159,9	138,4	113,1	79,9	-	-	-
250 kcmil	225,7	215,0	195,6	176,3	152,6	124,7	88,1	-	-	-
300	252,0	240,0	218,4	196,8	170,4	139,2	98,4	-	-	-
350	273,0	260,0	236,6	213,2	184,6	150,8	106,6	-	-	-
400	294,0	280,0	254,8	229,6	198,8	162,4	114,8	-	-	-
500	336,0	320,0	291,2	262,4	227,2	185,6	131,2	-	-	-
600	372,7	355,0	323,0	291,1	252,0	205,9	145,5	-	-	-
700	404,2	385,0	350,3	315,7	273,3	223,3	157,8	-	-	-
750	420,0	400,0	364,0	328,0	284,0	232,0	164,0	-	-	-
800	430,5	410,0	373,1	336,2	291,1	237,8	168,1	-	-	-
900	456,7	435,0	395,8	356,7	308,8	252,3	178,3	-	-	-
1000	477,7	455,0	414,0	373,1	323,0	263,9	186,5	-	-	-

Table B.3g. Ampacities of conductors with 75°C insulation temperature according to NFPA 79 – Ed. 2015-2018 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 75°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,2	0,1	-
28	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,4	0,2	-
26	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,5	0,3	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	0,6	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	0,9	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	1,6	-
18	7,3	7,0	6,5	6,1	5,7	5,2	4,6	4,0	2,3	-
16	10,5	10,0	9,4	8,8	8,2	7,5	6,7	5,8	3,3	-
14	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	6,6	-
12	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	8,2	-
10	36,7	35,0	32,9	30,8	28,7	26,2	23,4	20,3	11,5	-
8	52,5	50,0	47,0	44,0	41,0	37,5	33,5	29,0	16,5	-
6	68,2	65,0	61,1	57,2	53,3	48,7	43,5	37,7	21,4	-
4	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	28,0	-
3	105,0	100,0	94,0	88,0	82,0	75,0	67,0	58,0	33,0	-
2	120,7	115,0	108,1	101,2	94,3	86,2	77,0	66,7	37,9	-
1	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	42,9	-
1/0	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	49,5	-
2/0	183,7	175,0	164,5	154,0	143,5	131,2	117,2	101,5	57,7	-
3/0	210,0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	66,0	-
4/0	241,5	230,0	216,2	202,4	188,6	172,5	154,1	133,4	75,9	-
250 kcmil	267,7	255,0	239,7	224,4	209,1	191,2	170,8	147,9	84,1	-
300	299,2	285,0	267,9	250,8	233,7	213,7	190,9	165,3	94,0	-
350	325,5	310,0	291,4	272,8	254,2	232,5	207,7	179,8	102,3	-
400	351,7	335,0	314,9	294,8	274,7	251,2	224,4	194,3	110,5	-
500	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	125,4	-
600	441,0	420,0	394,8	369,6	344,4	315,0	281,4	243,6	138,6	-
700	483,0	460,0	432,4	404,8	377,2	345,0	308,2	266,8	151,8	-
750	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	156,7	-
800	514,5	490,0	460,6	431,2	401,8	367,5	328,3	284,2	161,7	-
900	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	171,6	-
1000	572,2	545,0	512,3	479,6	446,9	408,7	365,1	316,1	179,8	-

Table B.3h. Ampacities of conductors with 90°C insulation temperature according to NFPA 79 – Ed. 2015-2018 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 90°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,4	0,3	0,3	0,2	0,2
28	0,8	0,8	0,7	0,7	0,6	0,6	0,6	0,5	0,4	0,3
26	1,0	1,0	0,9	0,9	0,8	0,8	0,7	0,7	0,5	0,4
24	2,0	2,0	1,9	1,8	1,7	1,6	1,5	1,4	1,1	0,8
22	3,1	3,0	2,8	2,7	2,6	2,4	2,2	2,1	1,7	1,2
20	5,2	5,0	4,8	4,5	4,3	4,1	3,8	3,5	2,9	2,0
18	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	8,1	5,7
16	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	10,4	7,3
14	26,0	25,0	24,0	22,7	21,7	20,5	19,0	17,7	14,5	10,2
12	31,2	30,0	28,8	27,3	26,1	24,6	22,8	21,3	17,4	12,3
10	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	23,2	16,4
8	57,2	55,0	52,8	50,0	47,8	45,1	41,8	39,0	31,9	22,5
6	78,0	75,0	72,0	68,2	65,2	61,5	57,0	53,2	43,5	30,7
4	98,8	95,0	91,2	86,4	82,6	77,9	72,2	67,4	55,1	38,9
3	114,4	110,0	105,6	100,1	95,7	90,2	83,6	78,1	63,8	45,1
2	135,2	130,0	124,8	118,3	113,1	106,6	98,8	92,3	75,4	53,3
1	156,0	150,0	144,0	136,5	130,5	123,0	114,0	106,5	87,0	61,5
1/0	176,8	170,0	163,2	154,7	147,9	139,4	129,2	120,7	98,6	69,7
2/0	202,8	195,0	187,2	177,4	169,6	159,9	148,2	138,4	113,1	79,9
3/0	234,0	225,0	216,0	204,7	195,7	184,5	171,0	159,7	130,5	92,2
4/0	270,4	260,0	249,6	236,6	226,2	213,2	197,6	184,6	150,8	106,6
250 kcmil	301,6	290,0	278,4	263,9	252,3	237,8	220,4	205,9	168,2	118,9
300	332,8	320,0	307,2	291,2	278,4	262,4	243,2	227,2	185,6	131,2
350	364,0	350,0	336,0	318,5	304,5	287,0	266,0	248,5	203,0	143,5
400	395,2	380,0	364,8	345,8	330,6	311,6	288,8	269,8	220,4	155,8
500	447,2	430,0	412,8	391,3	374,1	352,6	326,8	305,3	249,4	176,3
600	494,0	475,0	456,0	432,2	413,2	389,5	361,0	337,2	275,5	194,7
700	540,8	520,0	499,2	473,2	452,4	426,4	395,2	369,2	301,6	213,2
750	556,4	535,0	513,6	486,8	465,4	438,7	406,6	379,8	310,3	219,3
800	577,2	555,0	532,8	505,0	482,8	455,1	421,8	394,0	321,9	227,5
900	608,4	585,0	561,6	532,3	508,9	479,7	444,6	415,3	339,3	239,8
1000	639,6	615,0	590,4	559,6	535,0	504,3	467,4	436,6	356,7	252,1

Table B.3i. Ampacities of conductors with 60°C insulation temperature according to NFPA 79 – Ed. 2021 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 60°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
24	2,1	2,0	1,8	1,6	1,4	1,1	0,8	-	-	-
22	3,1	3,0	2,7	2,4	2,1	1,7	1,2	-	-	-
20	5,2	5,0	4,5	4,1	3,5	2,9	2,0	-	-	-
18	7,3	7,0	6,3	5,7	4,9	4,0	2,8	-	-	-
16	10,5	10,0	9,1	8,2	7,1	5,8	4,1	-	-	-
14	15,7	15,0	13,6	12,3	10,6	8,7	6,1	-	-	-
12	21,0	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-
10	31,5	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-
8	42,0	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-
6	57,7	55,0	50,0	45,1	39,0	31,9	22,5	-	-	-
4	73,5	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-
3	89,2	85,0	77,3	69,7	60,3	49,3	34,8	-	-	-
2	99,7	95,0	86,4	77,9	67,4	55,1	38,9	-	-	-
1	115,5	110,0	100,1	90,2	78,1	63,8	45,1	-	-	-
1/0	131,2	125,0	113,7	102,5	88,7	72,5	51,2	-	-	-
2/0	152,2	145,0	131,9	118,9	102,9	84,1	59,4	-	-	-
3/0	173,2	165,0	150,1	135,3	117,1	95,7	67,6	-	-	-
4/0	204,7	195,0	177,4	159,9	138,4	113,1	79,9	-	-	-
250 kcmil	225,7	215,0	195,6	176,3	152,6	124,7	88,1	-	-	-
300	252,0	240,0	218,4	196,8	170,4	139,2	98,4	-	-	-
350	273,0	260,0	236,6	213,2	184,6	150,8	106,6	-	-	-
400	294,0	280,0	254,8	229,6	198,8	162,4	114,8	-	-	-
500	336,0	320,0	291,2	262,4	227,2	185,6	131,2	-	-	-
600	372,7	355,0	323,0	291,1	252,0	205,9	145,5	-	-	-
700	404,2	385,0	350,3	315,7	273,3	223,3	157,8	-	-	-
750	420,0	400,0	364,0	328,0	284,0	232,0	164,0	-	-	-
800	430,5	410,0	373,1	336,2	291,1	237,8	168,1	-	-	-
900	456,7	435,0	395,8	356,7	308,8	252,3	178,3	-	-	-
1000	477,7	455,0	414,0	373,1	323,0	263,9	186,5	-	-	-

Table B.3j. Ampacities of conductors with 75°C insulation temperature according to NFPA 79 – Ed. 2021 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 75°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,3	0,3	0,2	0,1	-
28	0,8	0,8	0,7	0,7	0,6	0,6	0,5	0,4	0,2	-
26	1,0	1,0	0,9	0,8	0,8	0,7	0,6	0,5	0,3	-
24	2,1	2,0	1,8	1,7	1,6	1,5	1,3	1,1	0,6	-
22	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	0,9	-
20	5,2	5,0	4,7	4,4	4,1	3,7	3,3	2,9	1,6	-
18	7,3	7,0	6,5	6,1	5,7	5,2	4,6	4,0	2,3	-
16	10,5	10,0	9,4	8,8	8,2	7,5	6,7	5,8	3,3	-
14	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	6,6	-
12	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	8,2	-
10	36,7	35,0	32,9	30,8	28,7	26,2	23,4	20,3	11,5	-
8	52,5	50,0	47,0	44,0	41,0	37,5	33,5	29,0	16,5	-
6	68,2	65,0	61,1	57,2	53,3	48,7	43,5	37,7	21,4	-
4	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	28,0	-
3	105,0	100,0	94,0	88,0	82,0	75,0	67,0	58,0	33,0	-
2	120,7	115,0	108,1	101,2	94,3	86,2	77,0	66,7	37,9	-
1	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	42,9	-
1/0	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	49,5	-
2/0	183,7	175,0	164,5	154,0	143,5	131,2	117,2	101,5	57,7	-
3/0	210,0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	66,0	-
4/0	241,5	230,0	216,2	202,4	188,6	172,5	154,1	133,4	75,9	-
250 kcmil	267,7	255,0	239,7	224,4	209,1	191,2	170,8	147,9	84,1	-
300	299,2	285,0	267,9	250,8	233,7	213,7	190,9	165,3	94,0	-
350	325,5	310,0	291,4	272,8	254,2	232,5	207,7	179,8	102,3	-
400	351,7	335,0	314,9	294,8	274,7	251,2	224,4	194,3	110,5	-
500	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	125,4	-
600	441,0	420,0	394,8	369,6	344,4	315,0	281,4	243,6	138,6	-
700	483,0	460,0	432,4	404,8	377,2	345,0	308,2	266,8	151,8	-
750	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	156,7	-
800	514,5	490,0	460,6	431,2	401,8	367,5	328,3	284,2	161,7	-
900	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	171,6	-
1000	572,2	545,0	512,3	479,6	446,9	408,7	365,1	316,1	179,8	-



Table B.3k. Ampacities of conductors with 90°C insulation temperature according to NFPA 79 – Ed. 2021 - Table 12.5.1

Size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A] Insulation temperature 90°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
30 AWG	0,5	0,5	0,4	0,4	0,4	0,4	0,3	0,3	0,2	0,2
28	0,8	0,8	0,7	0,7	0,6	0,6	0,6	0,5	0,4	0,3
26	1,0	1,0	0,9	0,9	0,8	0,8	0,7	0,7	0,5	0,4
24	2,0	2,0	1,9	1,8	1,7	1,6	1,5	1,4	1,1	0,8
22	3,1	3,0	2,8	2,7	2,6	2,4	2,2	2,1	1,7	1,2
20	5,2	5,0	4,8	4,5	4,3	4,1	3,8	3,5	2,9	2,0
18	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	8,1	5,7
16	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	10,4	7,3
14	26,0	25,0	24,0	22,7	21,7	20,5	19,0	17,7	14,5	10,2
12	31,2	30,0	28,8	27,3	26,1	24,6	22,8	21,3	17,4	12,3
10	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	23,2	16,4
8	57,2	55,0	52,8	50,0	47,8	45,1	41,8	39,0	31,9	22,5
6	78,0	75,0	72,0	68,2	65,2	61,5	57,0	53,2	43,5	30,7
4	98,8	95,0	91,2	86,4	82,6	77,9	72,2	67,4	55,1	38,9
3	119,6	115,0	110,4	104,6	100,0	94,3	87,4	81,6	66,7	47,1
2	135,2	130,0	124,8	118,3	113,1	106,6	98,8	92,3	75,4	53,3
1	150,8	145,0	139,2	131,9	126,1	118,9	110,2	102,9	84,1	59,4
1/0	176,8	170,0	163,2	154,7	147,9	139,4	129,2	120,7	98,6	69,7
2/0	202,8	195,0	187,2	177,4	169,6	159,9	148,2	138,4	113,1	79,9
3/0	234,0	225,0	216,0	204,7	195,7	184,5	171,0	159,7	130,5	92,2
4/0	270,4	260,0	249,6	236,6	226,2	213,2	197,6	184,6	150,8	106,6
250 kcmil	301,6	290,0	278,4	263,9	252,3	237,8	220,4	205,9	168,2	118,9
300	332,8	320,0	307,2	291,2	278,4	262,4	243,2	227,2	185,6	131,2
350	364,0	350,0	336,0	318,5	304,5	287,0	266,0	248,5	203,0	143,5
400	395,2	380,0	364,8	345,8	330,6	311,6	288,8	269,8	220,4	155,8
500	447,2	430,0	412,8	391,3	374,1	352,6	326,8	305,3	249,4	176,3
600	494,0	475,0	456,0	432,2	413,2	389,5	361,0	337,2	275,5	194,7
700	540,8	520,0	499,2	473,2	452,4	426,4	395,2	369,2	301,6	213,2
750	556,4	535,0	513,6	486,8	465,4	438,7	406,6	379,8	310,3	219,3
800	577,2	555,0	532,8	505,0	482,8	455,1	421,8	394,0	321,9	227,5
900	608,4	585,0	561,6	532,3	508,9	479,7	444,6	415,3	339,3	239,8
1000	639,6	615,0	590,4	559,6	535,0	504,3	467,4	436,6	356,7	252,1

Table B.3l. Adjustment factors based on the number of current-carrying conductors according to NFPA 79 - Ed. 2007-2021 - Table 12.5.5(b)

Number of current-carrying conductors	Ampacities adjustment factors
1÷3	1,00
4÷6	0,80
7÷9	0,70
10÷20	0,50
21÷30	0,45
31÷40	0,40
>40	0,35

## B.4 Ampacities of conductors according to NFPA 70 (NEC)

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.4a. Ampacities of conductors with 60°C insulation temperature according to NFPA 70 (NEC) - Ed. 2008 - Table 310.16

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], not more than three current-carrying conductors in Raceway or Cable Insulation temperature 60°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
18 AWG	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-
14	21,6	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-
12	27,0	25,0	22,7	20,5	17,7	14,5	10,2	-	-	-
10	32,4	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-
8	43,2	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-
6	59,4	55,0	50,0	45,1	39,0	31,9	22,5	-	-	-
4	75,6	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-
3	91,8	85,0	77,3	69,7	60,3	49,3	34,8	-	-	-
2	102,6	95,0	86,4	77,9	67,4	55,1	38,9	-	-	-
1	118,8	110,0	100,1	90,2	78,1	63,8	45,1	-	-	-
1/0	135,0	125,0	113,7	102,5	88,7	72,5	51,2	-	-	-
2/0	156,6	145,0	131,9	118,9	102,9	84,1	59,4	-	-	-
3/0	178,2	165,0	150,1	135,3	117,1	95,7	67,6	-	-	-
4/0	210,6	195,0	177,4	159,9	138,4	113,1	79,9	-	-	-
250 kcmil	232,2	215,0	195,6	176,3	152,6	124,7	88,1	-	-	-
300	259,2	240,0	218,4	196,8	170,4	139,2	98,4	-	-	-
350	280,8	260,0	236,6	213,2	184,6	150,8	106,6	-	-	-
400	302,4	280,0	254,8	229,6	198,8	162,4	114,8	-	-	-
500	345,6	320,0	291,2	262,4	227,2	185,6	131,2	-	-	-
600	383,4	355,0	323,0	291,1	252,0	205,9	145,5	-	-	-
700	415,8	385,0	350,3	315,7	273,3	223,3	157,8	-	-	-
750	432,0	400,0	364,0	328,0	284,0	232,0	164,0	-	-	-
800	442,8	410,0	373,1	336,2	291,1	237,8	168,1	-	-	-
900	469,8	435,0	395,8	356,7	308,8	252,3	178,3	-	-	-
1000	491,4	455,0	414,0	373,1	323,0	263,9	186,5	-	-	-
1250	534,6	495,0	450,4	405,9	351,4	287,1	202,9	-	-	-
1500	561,6	520,0	473,2	426,4	369,2	301,6	213,2	-	-	-
1750	588,6	545,0	495,9	446,9	386,9	316,1	223,4	-	-	-
2000	604,8	560,0	509,6	459,2	397,6	324,8	229,6	-	-	-

Table B.4b. Ampacities of conductors with 75°C insulation temperature according to NFPA 70 (NEC) - Ed. 2008 - Table 310.16

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], not more than three current-carrying conductors in Raceway or Cable Insulation temperature 75°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
18 AWG	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-
14	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	6,6	-
12	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	8,2	-
10	36,7	35,0	32,9	30,8	28,7	26,2	23,4	20,3	11,5	-
8	52,5	50,0	47,0	44,0	41,0	37,5	33,5	29,0	16,5	-
6	68,2	65,0	61,1	57,2	53,3	48,7	43,5	37,7	21,4	-
4	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	28,0	-
3	105,0	100,0	94,0	88,0	82,0	75,0	67,0	58,0	33,0	-
2	120,7	115,0	108,1	101,2	94,3	86,2	77,0	66,7	37,9	-
1	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	42,9	-
1/0	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	49,5	-
2/0	183,7	175,0	164,5	154,0	143,5	131,2	117,2	101,5	57,7	-
3/0	210,0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	66,0	-
4/0	241,5	230,0	216,2	202,4	188,6	172,5	154,1	133,4	75,9	-
250 kcmil	267,7	255,0	239,7	224,4	209,1	191,2	170,8	147,9	84,1	-
300	299,2	285,0	267,9	250,8	233,7	213,7	190,9	165,3	94,0	-
350	325,5	310,0	291,4	272,8	254,2	232,5	207,7	179,8	102,3	-
400	351,7	335,0	314,9	294,8	274,7	251,2	224,4	194,3	110,5	-
500	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	125,4	-
600	441,0	420,0	394,8	369,6	344,4	315,0	281,4	243,6	138,6	-
700	483,0	460,0	432,4	404,8	377,2	345,0	308,2	266,8	151,8	-
750	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	156,7	-
800	514,5	490,0	460,6	431,2	401,8	367,5	328,3	284,2	161,7	-
900	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	171,6	-
1000	572,2	545,0	512,3	479,6	446,9	408,7	365,1	316,1	179,8	-
1250	619,5	590,0	554,6	519,2	483,8	442,5	395,3	342,2	194,7	-
1500	656,2	625,0	587,5	550,0	512,5	468,7	418,7	362,5	206,2	-
1750	682,5	650,0	611,0	572,0	533,0	487,5	435,5	377,0	214,5	-
2000	698,2	665,0	625,1	585,2	545,3	498,7	445,5	385,7	219,4	-

Table B.4c. Ampacities of conductors with 90°C insulation temperature according to NFPA 70 (NEC) - Ed. 2008 - Table 310.16

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], not more than three current-carrying conductors in Raceway or Cable Insulation temperature 90°C									
	Ambient temperature Ta									
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷70°C	71÷80°C
18 AWG	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	8,1	5,7
16	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	10,4	7,3
14	26,0	25,0	24,0	22,7	21,7	20,5	19,0	17,7	14,5	10,2
12	31,2	30,0	28,8	27,3	26,1	24,6	22,8	21,3	17,4	12,3
10	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	23,2	16,4
8	57,2	55,0	52,8	50,0	47,8	45,1	41,8	39,0	31,9	22,5
6	78,0	75,0	72,0	68,2	65,2	61,5	57,0	53,2	43,5	30,7
4	98,8	95,0	91,2	86,4	82,6	77,9	72,2	67,4	55,1	38,9
3	114,4	110,0	105,6	100,1	95,7	90,2	83,6	78,1	63,8	45,1
2	135,2	130,0	124,8	118,3	113,1	106,6	98,8	92,3	75,4	53,3
1	156,0	150,0	144,0	136,5	130,5	123,0	114,0	106,5	87,0	61,5
1/0	176,8	170,0	163,2	154,7	147,9	139,4	129,2	120,7	98,6	69,7
2/0	202,8	195,0	187,2	177,4	169,6	159,9	148,2	138,4	113,1	79,9
3/0	234,0	225,0	216,0	204,7	195,7	184,5	171,0	159,7	130,5	92,2
4/0	270,4	260,0	249,6	236,6	226,2	213,2	197,6	184,6	150,8	106,6
250 kcmil	301,6	290,0	278,4	263,9	252,3	237,8	220,4	205,9	168,2	118,9
300	332,8	320,0	307,2	291,2	278,4	262,4	243,2	227,2	185,6	131,2
350	364,0	350,0	336,0	318,5	304,5	287,0	266,0	248,5	203,0	143,5
400	395,2	380,0	364,8	345,8	330,6	311,6	288,8	269,8	220,4	155,8
500	447,2	430,0	412,8	391,3	374,1	352,6	326,8	305,3	249,4	176,3
600	494,0	475,0	456,0	432,2	413,2	389,5	361,0	337,2	275,5	194,7
700	540,8	520,0	499,2	473,2	452,4	426,4	395,2	369,2	301,6	213,2
750	556,4	535,0	513,6	486,8	465,4	438,7	406,6	379,8	310,3	219,3
800	577,2	555,0	532,8	505,0	482,8	455,1	421,8	394,0	321,9	227,5
900	608,4	585,0	561,6	532,3	508,9	479,7	444,6	415,3	339,3	239,8
1000	639,6	615,0	590,4	559,6	535,0	504,3	467,4	436,6	356,7	252,1
1250	691,6	665,0	638,4	605,1	578,5	545,3	505,4	472,1	385,7	272,6
1500	733,2	705,0	676,8	641,5	613,3	578,1	535,8	500,5	408,9	289,0
1750	764,4	735,0	705,6	668,8	639,4	602,7	558,6	521,8	426,3	301,3
2000	780,0	750,0	720,0	682,5	652,5	615,0	570,0	532,5	435,0	307,5

Table B.4d. Ampacities of conductors with 60°C insulation temperature according to NFPA 70 (NEC) - Ed. 2011-2017 - Table 310.15(B)(16) and Ed. 2020-2023 - Table 310.16

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], not more than three current-carrying conductors in Raceway or Cable Insulation temperature 60°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81-85°C
18 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-
14	16,2	15,0	13,6	12,3	10,6	8,7	6,1	-	-	-	-	-	-
12	21,6	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-	-	-	-
10	32,4	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-	-	-	-
8	43,2	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-	-	-	-
6	59,4	55,0	50,0	45,1	39,0	31,9	22,5	-	-	-	-	-	-
4	75,6	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-	-	-	-
3	91,8	85,0	77,3	69,7	60,3	49,3	34,8	-	-	-	-	-	-
2	102,6	95,0	86,4	77,9	67,4	55,1	38,9	-	-	-	-	-	-
1	118,8	110,0	100,1	90,2	78,1	63,8	45,1	-	-	-	-	-	-
1/0	135,0	125,0	113,7	102,5	88,7	72,5	51,2	-	-	-	-	-	-
2/0	156,6	145,0	131,9	118,9	102,9	84,1	59,4	-	-	-	-	-	-
3/0	178,2	165,0	150,1	135,3	117,1	95,7	67,6	-	-	-	-	-	-
4/0	210,6	195,0	177,4	159,9	138,4	113,1	79,9	-	-	-	-	-	-
250 kcmil	232,2	215,0	195,6	176,3	152,6	124,7	88,1	-	-	-	-	-	-
300	259,2	240,0	218,4	196,8	170,4	139,2	98,4	-	-	-	-	-	-
350	280,8	260,0	236,6	213,2	184,6	150,8	106,6	-	-	-	-	-	-
400	302,4	280,0	254,8	229,6	198,8	162,4	114,8	-	-	-	-	-	-
500	345,6	320,0	291,2	262,4	227,2	185,6	131,2	-	-	-	-	-	-
600	378,0	350,0	318,5	287,0	248,5	203,0	143,5	-	-	-	-	-	-
700	415,8	385,0	350,3	315,7	273,3	223,3	157,8	-	-	-	-	-	-
750	432,0	400,0	364,0	328,0	284,0	232,0	164,0	-	-	-	-	-	-
800	442,8	410,0	373,1	336,2	291,1	237,8	168,1	-	-	-	-	-	-
900	469,8	435,0	395,8	356,7	308,8	252,3	178,3	-	-	-	-	-	-
1000	491,4	455,0	414,0	373,1	323,0	263,9	186,5	-	-	-	-	-	-
1250	534,6	495,0	450,4	405,9	351,4	287,1	202,9	-	-	-	-	-	-
1500	567,0	525,0	477,7	430,5	372,7	304,5	215,2	-	-	-	-	-	-
1750	588,6	545,0	495,9	446,9	386,9	316,1	223,4	-	-	-	-	-	-
2000	599,4	555,0	505,0	455,1	394,0	321,9	227,5	-	-	-	-	-	-

Table B.4e. Ampacities of conductors with 75°C insulation temperature according to NFPA 70 (NEC) - Ed. 2011-2017 - Table 310.15(B)(16) and Ed. 2020-2023 - Table 310.16

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], not more than three current-carrying conductors in Raceway or Cable Insulation temperature 75°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81-85°C
18 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-
14	21,0	20,0	18,8	17,6	16,4	15,0	13,4	11,6	9,4	6,6	-	-	-
12	26,2	25,0	23,5	22,0	20,5	18,7	16,7	14,5	11,7	8,2	-	-	-
10	36,7	35,0	32,9	30,8	28,7	26,2	23,4	20,3	16,4	11,5	-	-	-
8	52,5	50,0	47,0	44,0	41,0	37,5	33,5	29,0	23,5	16,5	-	-	-
6	68,2	65,0	61,1	57,2	53,3	48,7	43,5	37,7	30,5	21,4	-	-	-
4	89,2	85,0	79,9	74,8	69,7	63,7	56,9	49,3	39,9	28,0	-	-	-
3	105,0	100,0	94,0	88,0	82,0	75,0	67,0	58,0	47,0	33,0	-	-	-
2	120,7	115,0	108,1	101,2	94,3	86,2	77,0	66,7	54,0	37,9	-	-	-
1	136,5	130,0	122,2	114,4	106,6	97,5	87,1	75,4	61,1	42,9	-	-	-
1/0	157,5	150,0	141,0	132,0	123,0	112,5	100,5	87,0	70,5	49,5	-	-	-
2/0	183,7	175,0	164,5	154,0	143,5	131,2	117,2	101,5	82,2	57,7	-	-	-
3/0	210,0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	94,0	66,0	-	-	-
4/0	241,5	230,0	216,2	202,4	188,6	172,5	154,1	133,4	108,1	75,9	-	-	-
250 kcmil	267,7	255,0	239,7	224,4	209,1	191,2	170,8	147,9	119,8	84,1	-	-	-
300	299,2	285,0	267,9	250,8	233,7	213,7	190,9	165,3	133,9	94,0	-	-	-
350	325,5	310,0	291,4	272,8	254,2	232,5	207,7	179,8	145,7	102,3	-	-	-
400	351,7	335,0	314,9	294,8	274,7	251,2	224,4	194,3	157,4	110,5	-	-	-
500	399,0	380,0	357,2	334,4	311,6	285,0	254,6	220,4	178,6	125,4	-	-	-
600	441,0	420,0	394,8	369,6	344,4	315,0	281,4	243,6	197,4	138,6	-	-	-
700	483,0	460,0	432,4	404,8	377,2	345,0	308,2	266,8	216,2	151,8	-	-	-
750	498,7	475,0	446,5	418,0	389,5	356,2	318,2	275,5	223,2	156,7	-	-	-
800	514,5	490,0	460,6	431,2	401,8	367,5	328,3	284,2	230,3	161,7	-	-	-
900	546,0	520,0	488,8	457,6	426,4	390,0	348,4	301,6	244,4	171,6	-	-	-
1000	572,2	545,0	512,3	479,6	446,9	408,7	365,1	316,1	256,1	179,8	-	-	-
1250	619,5	590,0	554,6	519,2	483,8	442,5	395,3	342,2	277,3	194,7	-	-	-
1500	656,2	625,0	587,5	550,0	512,5	468,7	418,7	362,5	293,7	206,2	-	-	-
1750	682,5	650,0	611,0	572,0	533,0	487,5	435,5	377,0	305,5	214,5	-	-	-
2000	698,2	665,0	625,1	585,2	545,3	498,7	445,5	385,7	312,5	219,4	-	-	-

Table B.4f. Ampacities of conductors with 90°C insulation temperature according to NFPA 70 (NEC) - Ed. 2011-2017 - Table 310.15(B)(16) and Ed. 2020-2023 - Table 310.16

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], not more than three current-carrying conductors in Raceway or Cable Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81-85°C
18 AWG	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	9,1	8,1	7,0	5,7	4,0
16	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	11,7	10,4	9,0	7,3	5,2
14	26,0	25,0	24,0	22,7	21,7	20,5	19,0	17,7	16,2	14,5	12,5	10,2	7,2
12	31,2	30,0	28,8	27,3	26,1	24,6	22,8	21,3	19,5	17,4	15,0	12,3	8,7
10	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	26,0	23,2	20,0	16,4	11,6
8	57,2	55,0	52,8	50,0	47,8	45,1	41,8	39,0	35,7	31,9	27,5	22,5	15,9
6	78,0	75,0	72,0	68,2	65,2	61,5	57,0	53,2	48,7	43,5	37,5	30,7	21,7
4	98,8	95,0	91,2	86,4	82,6	77,9	72,2	67,4	61,7	55,1	47,5	38,9	27,5
3	119,6	115,0	110,4	104,6	100,0	94,3	87,4	81,6	74,7	66,7	57,5	47,1	33,3
2	135,2	130,0	124,8	118,3	113,1	106,6	98,8	92,3	84,5	75,4	65,0	53,3	37,7
1	150,8	145,0	139,2	131,9	126,1	118,9	110,2	102,9	94,2	84,1	72,5	59,4	42,0
1/0	176,8	170,0	163,2	154,7	147,9	139,4	129,2	120,7	110,5	98,6	85,0	69,7	49,3
2/0	202,8	195,0	187,2	177,4	169,6	159,9	148,2	138,4	126,7	113,1	97,5	79,9	56,5
3/0	234,0	225,0	216,0	204,7	195,7	184,5	171,0	159,7	146,2	130,5	112,5	92,2	65,2
4/0	270,4	260,0	249,6	236,6	226,2	213,2	197,6	184,6	169,0	150,8	130,0	106,6	75,4
250 kcmil	301,6	290,0	278,4	263,9	252,3	237,8	220,4	205,9	188,5	168,2	145,0	118,9	84,1
300	332,8	320,0	307,2	291,2	278,4	262,4	243,2	227,2	208,0	185,6	160,0	131,2	92,8
350	364,0	350,0	336,0	318,5	304,5	287,0	266,0	248,5	227,5	203,0	175,0	143,5	101,5
400	395,2	380,0	364,8	345,8	330,6	311,6	288,8	269,8	247,0	220,4	190,0	155,8	110,2
500	447,2	430,0	412,8	391,3	374,1	352,6	326,8	305,3	279,5	249,4	215,0	176,3	124,7
600	494,0	475,0	456,0	432,2	413,2	389,5	361,0	337,2	308,7	275,5	237,5	194,7	137,7
700	540,8	520,0	499,2	473,2	452,4	426,4	395,2	369,2	338,0	301,6	260,0	213,2	150,8
750	556,4	535,0	513,6	486,8	465,4	438,7	406,6	379,8	347,7	310,3	267,5	219,3	155,1
800	577,2	555,0	532,8	505,0	482,8	455,1	421,8	394,0	360,7	321,9	277,5	227,5	160,9
900	608,4	585,0	561,6	532,3	508,9	479,7	444,6	415,3	380,2	339,3	292,5	239,8	169,6
1000	639,6	615,0	590,4	559,6	535,0	504,3	467,4	436,6	399,7	356,7	307,5	252,1	178,3
1250	691,6	665,0	638,4	605,1	578,5	545,3	505,4	472,1	432,2	385,7	332,5	272,6	192,8
1500	733,2	705,0	676,8	641,5	613,3	578,1	535,8	500,5	458,2	408,9	352,5	289,0	204,4
1750	764,4	735,0	705,6	668,8	639,4	602,7	558,6	521,8	477,7	426,3	367,5	301,3	213,1
2000	780,0	750,0	720,0	682,5	652,5	615,0	570,0	532,5	487,5	435,0	375,0	307,5	217,5

Table B.4g. Adjustment factors for more than three current-carrying conductors according to NFPA 70 (NEC) – Ed. 2008/2011 - Ed. 2008 - Table 310.15(B)(2)(a), Ed. 2011-2017 - Table 310.15(B)(3)(a) and Ed. 2020-2023 - Table 310.15(C)(1)

Number of current-carrying conductors in cable, in raceway or in cable tray	Ampacities adjustment factors
4÷6	0,80
7÷9	0,70
10÷20	0,50
21÷30	0,45
31÷40	0,40
>40	0,35



## B.5 Ampacities of Flexible Cords and Cables according to NFPA 70 (NEC)

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.5a. Ampacities of Flexible Cords and Cables type S, SJ, SJT with 60°C insulation temperature and 2 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type S, SJ, SJT with 2 current-carrying conductors [A], Insulation temperature 60°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	2,1	2,0	1,8	1,6	1,4	1,1	0,8	-	-	-	-	-	-
18	10,8	10,0	9,1	8,2	7,1	5,8	4,1	-	-	-	-	-	-
17	12,9	12,0	10,9	9,8	8,5	6,9	4,9	-	-	-	-	-	-
16	14,0	13,0	11,8	10,6	9,2	7,5	5,3	-	-	-	-	-	-
15	17,2	16,0	14,5	13,1	11,3	9,2	6,5	-	-	-	-	-	-
14	19,4	18,0	16,3	14,7	12,7	10,4	7,3	-	-	-	-	-	-
13	22,6	21,0	19,1	17,2	14,9	12,1	8,6	-	-	-	-	-	-
12	27,0	25,0	22,7	20,5	17,7	14,5	10,2	-	-	-	-	-	-
11	29,1	27,0	24,5	22,1	19,1	15,6	11,0	-	-	-	-	-	-
10	32,4	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-	-	-	-
9	36,7	34,0	30,9	27,8	24,1	19,7	13,9	-	-	-	-	-	-
8	43,2	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-	-	-	-
7	50,7	47,0	42,7	38,5	33,3	27,2	19,2	-	-	-	-	-	-
6	59,4	55,0	50,0	45,1	39,0	31,9	22,5	-	-	-	-	-	-
5	66,9	62,0	56,4	50,8	44,0	35,9	25,4	-	-	-	-	-	-
4	75,6	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-	-	-	-
3	88,5	82,0	74,6	67,2	58,2	47,5	33,6	-	-	-	-	-	-
2	102,6	95,0	86,4	77,9	67,4	55,1	38,9	-	-	-	-	-	-

Table B.5b. Ampacities of Flexible Cords and Cables type S, SJ, SJT with 60°C insulation temperature and 3 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type S, SJ, SJT with 3 current-carrying conductors [A], Insulation temperature 60°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	7,5	7,0	6,3	5,7	4,9	4,0	2,8	-	-	-	-	-	-
17	9,7	9,0	8,1	7,3	6,3	5,2	3,6	-	-	-	-	-	-
16	10,8	10,0	9,1	8,2	7,1	5,8	4,1	-	-	-	-	-	-
15	12,9	12,0	10,9	9,8	8,5	6,9	4,9	-	-	-	-	-	-
14	16,2	15,0	13,6	12,3	10,6	8,7	6,1	-	-	-	-	-	-
13	18,3	17,0	15,4	13,9	12,0	9,8	6,9	-	-	-	-	-	-
12	21,6	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-	-	-	-
11	24,8	23,0	20,9	18,8	16,3	13,3	9,4	-	-	-	-	-	-
10	27,0	25,0	22,7	20,5	17,7	14,5	10,2	-	-	-	-	-	-
9	31,3	29,0	26,3	23,7	20,5	16,8	11,8	-	-	-	-	-	-
8	37,8	35,0	31,8	28,7	24,8	20,3	14,3	-	-	-	-	-	-
7	43,2	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-	-	-	-
6	48,6	45,0	40,9	36,9	31,9	26,1	18,4	-	-	-	-	-	-
5	56,1	52,0	47,3	42,6	36,9	30,1	21,3	-	-	-	-	-	-
4	64,8	60,0	54,6	49,2	42,6	34,8	24,6	-	-	-	-	-	-
3	75,6	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-	-	-	-
2	86,4	80,0	72,8	65,6	56,8	46,4	32,8	-	-	-	-	-	-

Table B.5c. Ampacities of Flexible Cords and Cables type S, SJ, SJT with 60°C insulation temperature and 4+6 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type S, SJ, SJT with 4+6 current-carrying conductors [A], Insulation temperature 60°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	6,0	5,6	5,0	4,5	3,9	3,2	2,2	-	-	-	-	-	-
17	7,7	7,2	6,5	5,9	5,1	4,1	2,9	-	-	-	-	-	-
16	8,6	8,0	7,2	6,5	5,6	4,6	3,2	-	-	-	-	-	-
15	10,3	9,6	8,7	7,8	6,8	5,5	3,9	-	-	-	-	-	-
14	12,9	12,0	10,9	9,8	8,5	6,9	4,9	-	-	-	-	-	-
13	14,6	13,6	12,3	11,1	9,6	7,8	5,5	-	-	-	-	-	-
12	17,2	16,0	14,5	13,1	11,3	9,2	6,5	-	-	-	-	-	-
11	19,8	18,4	16,7	15,0	13,0	10,6	7,5	-	-	-	-	-	-
10	21,6	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-	-	-	-
9	25,0	23,2	21,1	19,0	16,4	13,4	9,5	-	-	-	-	-	-
8	30,2	28,0	25,4	22,9	19,8	16,2	11,4	-	-	-	-	-	-
7	34,5	32,0	29,1	26,2	22,7	18,5	13,1	-	-	-	-	-	-
6	38,8	36,0	32,7	29,5	25,5	20,8	14,7	-	-	-	-	-	-
5	44,9	41,6	37,8	34,1	29,5	24,1	17,0	-	-	-	-	-	-
4	51,8	48,0	43,6	39,3	34,0	27,8	19,6	-	-	-	-	-	-
3	60,4	56,0	50,9	45,9	39,7	32,4	22,9	-	-	-	-	-	-
2	69,1	64,0	58,2	52,4	45,4	37,1	26,2	-	-	-	-	-	-

Table B.5d. Ampacities of Flexible Cords and Cables type SOOW, SJOOW, STOW, SJTOW with 90°C insulation temperature and 2 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type SOOW, SJOOW, STOW, SJTOW with 2 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	2,0	2,0	1,9	1,8	1,7	1,6	1,5	1,4	1,3	1,1	1,0	0,8	0,5
18	10,4	10,0	9,6	9,1	8,7	8,2	7,6	7,1	6,5	5,8	5,0	4,1	2,9
17	12,4	12,0	11,5	10,9	10,4	9,8	9,1	8,5	7,8	6,9	6,0	4,9	3,4
16	13,5	13,0	12,4	11,8	11,3	10,6	9,8	9,2	8,4	7,5	6,5	5,3	3,7
15	16,6	16,0	15,3	14,5	13,9	13,1	12,1	11,3	10,4	9,2	8,0	6,5	4,6
14	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	11,7	10,4	9,0	7,3	5,2
13	21,8	21,0	20,1	19,1	18,2	17,2	15,9	14,9	13,6	12,1	10,5	8,6	6,0
12	26,0	25,0	24,0	22,7	21,7	20,5	19,0	17,7	16,2	14,5	12,5	10,2	7,2
11	28,0	27,0	25,9	24,5	23,4	22,1	20,5	19,1	17,5	15,6	13,5	11,0	7,8
10	31,2	30,0	28,8	27,3	26,1	24,6	22,8	21,3	19,5	17,4	15,0	12,3	8,7
9	35,3	34,0	32,6	30,9	29,5	27,8	25,8	24,1	22,1	19,7	17,0	13,9	9,8
8	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	26,0	23,2	20,0	16,4	11,6
7	48,8	47,0	45,1	42,7	40,8	38,5	35,7	33,3	30,5	27,2	23,5	19,2	13,6
6	57,2	55,0	52,8	50,0	47,8	45,1	41,8	39,0	35,7	31,9	27,5	22,5	15,9
5	64,4	62,0	59,5	56,4	53,9	50,8	47,1	44,0	40,3	35,9	31,0	25,4	17,9
4	72,8	70,0	67,2	63,7	60,9	57,4	53,2	49,7	45,5	40,6	35,0	28,7	20,3
3	85,2	82,0	78,7	74,6	71,3	67,2	62,3	58,2	53,3	47,5	41,0	33,6	23,7
2	98,8	95,0	91,2	86,4	82,6	77,9	72,2	67,4	61,7	55,1	47,5	38,9	27,5

Table B.5e. Ampacities of Flexible Cords and Cables type SOOW, SJOOW, STOW, SJTOW with 90°C insulation temperature and 3 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type <b>SOOW, SJOOW, STOW, SJTOW</b> with 3 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	7,2	7,0	6,7	6,3	6,0	5,7	5,3	4,9	4,5	4,0	3,5	2,8	2,0
17	9,3	9,0	8,6	8,1	7,8	7,3	6,8	6,3	5,8	5,2	4,5	3,6	2,6
16	10,4	10,0	9,6	9,1	8,7	8,2	7,6	7,1	6,5	5,8	5,0	4,1	2,9
15	12,4	12,0	11,5	10,9	10,4	9,8	9,1	8,5	7,8	6,9	6,0	4,9	3,4
14	15,6	15,0	14,4	13,6	13,0	12,3	11,4	10,6	9,7	8,7	7,5	6,1	4,3
13	17,6	17,0	16,3	15,4	14,7	13,9	12,9	12,0	11,0	9,8	8,5	6,9	4,9
12	20,8	20,0	19,2	18,2	17,4	16,4	15,2	14,2	13,0	11,6	10,0	8,2	5,8
11	23,9	23,0	22,0	20,9	20,0	18,8	17,4	16,3	14,9	13,3	11,5	9,4	6,6
10	26,0	25,0	24,0	22,7	21,7	20,5	19,0	17,7	16,2	14,5	12,5	10,2	7,2
9	30,1	29,0	27,8	26,3	25,2	23,7	22,0	20,5	18,8	16,8	14,5	11,8	8,4
8	36,4	35,0	33,6	31,8	30,4	28,7	26,6	24,8	22,7	20,3	17,5	14,3	10,1
7	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	26,0	23,2	20,0	16,4	11,6
6	46,8	45,0	43,2	40,9	39,1	36,9	34,2	31,9	29,2	26,1	22,5	18,4	13,0
5	54,0	52,0	49,9	47,3	45,2	42,6	39,5	36,9	33,8	30,1	26,0	21,3	15,0
4	62,4	60,0	57,6	54,6	52,2	49,2	45,6	42,6	39,0	34,8	30,0	24,6	17,4
3	72,8	70,0	67,2	63,7	60,9	57,4	53,2	49,7	45,5	40,6	35,0	28,7	20,3
2	83,2	80,0	76,8	72,8	69,6	65,6	60,8	56,8	52,0	46,4	40,0	32,8	23,2

Table B.5f. Ampacities of Flexible Cords and Cables type SOOW, SJOOW, STOW, SJTOW with 90°C insulation temperature and 4+6 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type <b>SOOW, SJOOW, STOW, SJTOW</b> with 4+6 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	5,8	5,6	5,3	5,0	4,8	4,5	4,2	3,9	3,6	3,2	2,8	2,2	1,6
17	7,4	7,2	6,9	6,5	6,2	5,9	5,4	5,1	4,6	4,1	3,6	2,9	2,0
16	8,3	8,0	7,6	7,2	6,9	6,5	6,0	5,6	5,2	4,6	4,0	3,2	2,3
15	9,9	9,6	9,2	8,7	8,3	7,8	7,2	6,8	6,2	5,5	4,8	3,9	2,7
14	12,4	12,0	11,5	10,9	10,4	9,8	9,1	8,5	7,8	6,9	6,0	4,9	3,4
13	14,1	13,6	13,0	12,3	11,8	11,1	10,3	9,6	8,8	7,8	6,8	5,5	3,9
12	16,6	16,0	15,3	14,5	13,9	13,1	12,1	11,3	10,4	9,2	8,0	6,5	4,6
11	19,1	18,4	17,6	16,7	16,0	15,0	13,9	13,0	11,9	10,6	9,2	7,5	5,3
10	20,8	20,0	19,2	18,2	17,4	16,4	15,2	14,2	13,0	11,6	10,0	8,2	5,8
9	24,1	23,2	22,2	21,1	20,1	19,0	17,6	16,4	15,0	13,4	11,6	9,5	6,7
8	29,1	28,0	26,8	25,4	24,3	22,9	21,2	19,8	18,2	16,2	14,0	11,4	8,1
7	33,2	32,0	30,7	29,1	27,8	26,2	24,3	22,7	20,8	18,5	16,0	13,1	9,2
6	37,4	36,0	34,5	32,7	31,3	29,5	27,3	25,5	23,4	20,8	18,0	14,7	10,4
5	43,2	41,6	39,9	37,8	36,1	34,1	31,6	29,5	27,0	24,1	20,8	17,0	12,0
4	49,9	48,0	46,0	43,6	41,7	39,3	36,4	34,0	31,2	27,8	24,0	19,6	13,9
3	58,2	56,0	53,7	50,9	48,7	45,9	42,5	39,7	36,4	32,4	28,0	22,9	16,2
2	66,5	64,0	61,4	58,2	55,6	52,4	48,6	45,4	41,6	37,1	32,0	26,2	18,5

Table B.5g. Ampacities of Flexible Cords and Cables type SOOW, STOW with 90°C insulation temperature and 7+9 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type SOOW, STOW with 7+9 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	5,0	4,9	4,7	4,4	4,2	4,0	3,7	3,4	3,1	2,8	2,4	2,0	1,4
17	6,5	6,3	6,0	5,7	5,4	5,1	4,7	4,4	4,0	3,6	3,1	2,5	1,8
16	7,2	7,0	6,7	6,3	6,0	5,7	5,3	4,9	4,5	4,0	3,5	2,8	2,0
15	8,7	8,4	8,0	7,6	7,3	6,8	6,3	5,9	5,4	4,8	4,2	3,4	2,4
14	10,9	10,5	10,0	9,5	9,1	8,6	7,9	7,4	6,8	6,0	5,2	4,3	3,0
13	12,3	11,9	11,4	10,8	10,3	9,7	9,0	8,4	7,7	6,9	5,9	4,8	3,4
12	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	9,1	8,1	7,0	5,7	4,0
11	16,7	16,1	15,4	14,6	14,0	13,2	12,2	11,4	10,4	9,3	8,0	6,6	4,6
10	18,2	17,5	16,8	15,9	15,2	14,3	13,3	12,4	11,3	10,1	8,7	7,1	5,0
9	21,1	20,3	19,4	18,4	17,6	16,6	15,4	14,4	13,1	11,7	10,1	8,3	5,8
8	25,4	24,5	23,5	22,2	21,3	20,0	18,6	17,3	15,9	14,2	12,2	10,0	7,1
7	29,1	28,0	26,8	25,4	24,3	22,9	21,2	19,8	18,2	16,2	14,0	11,4	8,1
6	32,7	31,5	30,2	28,6	27,4	25,8	23,9	22,3	20,4	18,2	15,7	12,9	9,1
5	37,8	36,4	34,9	33,1	31,6	29,8	27,6	25,8	23,6	21,1	18,2	14,9	10,5
4	43,6	42,0	40,3	38,2	36,5	34,4	31,9	29,8	27,3	24,3	21,0	17,2	12,1
3	50,9	49,0	47,0	44,5	42,6	40,1	37,2	34,7	31,8	28,4	24,5	20,0	14,2
2	58,2	56,0	53,7	50,9	48,7	45,9	42,5	39,7	36,4	32,4	28,0	22,9	16,2

Table B.5h. Ampacities of Flexible Cords and Cables type SOOW, STOW with 90°C insulation temperature and 10+20 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type SOOW, STOW with 10+20 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	3,6	3,5	3,3	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	1,4	1,0
17	4,6	4,5	4,3	4,0	3,9	3,6	3,4	3,1	2,9	2,6	2,2	1,8	1,3
16	5,2	5,0	4,8	4,5	4,3	4,1	3,8	3,5	3,2	2,9	2,5	2,0	1,4
15	6,2	6,0	5,7	5,4	5,2	4,9	4,5	4,2	3,9	3,4	3,0	2,4	1,7
14	7,8	7,5	7,2	6,8	6,5	6,1	5,7	5,3	4,8	4,3	3,7	3,0	2,1
13	8,8	8,5	8,1	7,7	7,3	6,9	6,4	6,0	5,5	4,9	4,2	3,4	2,4
12	10,4	10,0	9,6	9,1	8,7	8,2	7,6	7,1	6,5	5,8	5,0	4,1	2,9
11	11,9	11,5	11,0	10,4	10,0	9,4	8,7	8,1	7,4	6,6	5,7	4,7	3,3
10	13,0	12,5	12,0	11,3	10,8	10,2	9,5	8,8	8,1	7,2	6,2	5,1	3,6
9	15,0	14,5	13,9	13,1	12,6	11,8	11,0	10,2	9,4	8,4	7,2	5,9	4,2
8	18,2	17,5	16,8	15,9	15,2	14,3	13,3	12,4	11,3	10,1	8,7	7,1	5,0
7	20,8	20,0	19,2	18,2	17,4	16,4	15,2	14,2	13,0	11,6	10,0	8,2	5,8
6	23,4	22,5	21,6	20,4	19,5	18,4	17,1	15,9	14,6	13,0	11,2	9,2	6,5
5	27,0	26,0	24,9	23,6	22,6	21,3	19,7	18,4	16,9	15,0	13,0	10,6	7,5
4	31,2	30,0	28,8	27,3	26,1	24,6	22,8	21,3	19,5	17,4	15,0	12,3	8,7
3	36,4	35,0	33,6	31,8	30,4	28,7	26,6	24,8	22,7	20,3	17,5	14,3	10,1
2	41,6	40,0	38,4	36,4	34,8	32,8	30,4	28,4	26,0	23,2	20,0	16,4	11,6

Table B.5i. Ampacities of Flexible Cords and Cables type SOOW, STOW with 90°C insulation temperature and 21÷30 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type <b>SOOW, STOW</b> with 21÷30 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	3,2	3,2	3,0	2,8	2,7	2,5	2,3	2,2	2,0	1,8	1,5	1,2	0,9
17	4,2	4,1	3,8	3,6	3,5	3,3	3,0	2,8	2,6	2,3	2,0	1,6	1,1
16	4,6	4,5	4,3	4,0	3,9	3,6	3,4	3,1	2,9	2,6	2,2	1,8	1,3
15	5,6	5,4	5,1	4,9	4,6	4,4	4,1	3,8	3,5	3,1	2,7	2,2	1,5
14	7,0	6,8	6,4	6,1	5,8	5,5	5,1	4,7	4,3	3,9	3,3	2,7	1,9
13	7,9	7,7	7,3	6,9	6,6	6,2	5,8	5,4	4,9	4,4	3,8	3,1	2,2
12	9,3	9,0	8,6	8,1	7,8	7,3	6,8	6,3	5,8	5,2	4,5	3,6	2,6
11	10,7	10,4	9,9	9,4	9,0	8,4	7,8	7,3	6,7	6,0	5,1	4,2	3,0
10	11,7	11,3	10,8	10,2	9,7	9,2	8,5	7,9	7,3	6,5	5,6	4,6	3,2
9	13,5	13,1	12,5	11,8	11,3	10,7	9,9	9,2	8,4	7,5	6,5	5,3	3,7
8	16,3	15,8	15,1	14,3	13,7	12,9	11,9	11,1	10,2	9,1	7,8	6,4	4,5
7	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	11,7	10,4	9,0	7,3	5,2
6	21,0	20,3	19,4	18,4	17,6	16,6	15,3	14,3	13,1	11,7	10,1	8,3	5,8
5	24,3	23,4	22,4	21,2	20,3	19,1	17,7	16,6	15,2	13,5	11,7	9,5	6,7
4	28,0	27,0	25,9	24,5	23,4	22,1	20,5	19,1	17,5	15,6	13,5	11,0	7,8
3	32,7	31,5	30,2	28,6	27,4	25,8	23,9	22,3	20,4	18,2	15,7	12,9	9,1
2	37,4	36,0	34,5	32,7	31,3	29,5	27,3	25,5	23,4	20,8	18,0	14,7	10,4

Table B.5i. Ampacities of Flexible Cords and Cables type SOOW, STOW with 90°C insulation temperature and 31÷40 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type <b>SOOW, STOW</b> with 31÷40 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	2,9	2,8	2,6	2,5	2,4	2,2	2,1	1,9	1,8	1,6	1,4	1,1	0,8
17	3,7	3,6	3,4	3,2	3,1	2,9	2,7	2,5	2,3	2,0	1,8	1,4	1,0
16	4,1	4,0	3,8	3,6	3,4	3,2	3,0	2,8	2,6	2,3	2,0	1,6	1,1
15	4,9	4,8	4,6	4,3	4,1	3,9	3,6	3,4	3,1	2,7	2,4	1,9	1,3
14	6,2	6,0	5,7	5,4	5,2	4,9	4,5	4,2	3,9	3,4	3,0	2,4	1,7
13	7,0	6,8	6,5	6,1	5,9	5,5	5,1	4,8	4,4	3,9	3,4	2,7	1,9
12	8,3	8,0	7,6	7,2	6,9	6,5	6,0	5,6	5,2	4,6	4,0	3,2	2,3
11	9,5	9,2	8,8	8,3	8,0	7,5	6,9	6,5	5,9	5,3	4,6	3,7	2,6
10	10,4	10,0	9,6	9,1	8,7	8,2	7,6	7,1	6,5	5,8	5,0	4,1	2,9
9	12,0	11,6	11,1	10,5	10,0	9,5	8,8	8,2	7,5	6,7	5,8	4,7	3,3
8	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	9,1	8,1	7,0	5,7	4,0
7	16,6	16,0	15,3	14,5	13,9	13,1	12,1	11,3	10,4	9,2	8,0	6,5	4,6
6	18,7	18,0	17,2	16,3	15,6	14,7	13,6	12,7	11,7	10,4	9,0	7,3	5,2
5	21,6	20,8	19,9	18,9	18,0	17,0	15,8	14,7	13,5	12,0	10,4	8,5	6,0
4	24,9	24,0	23,0	21,8	20,8	19,6	18,2	17,0	15,6	13,9	12,0	9,8	6,9
3	29,1	28,0	26,8	25,4	24,3	22,9	21,2	19,8	18,2	16,2	14,0	11,4	8,1
2	33,2	32,0	30,7	29,1	27,8	26,2	24,3	22,7	20,8	18,5	16,0	13,1	9,2

Table B.5m. Ampacities of Flexible Cords and Cables type SOOW, STOW with 90°C insulation temperature and 41+60 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(1)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type <b>SOOW, STOW with 41+60 current-carrying conductors [A]</b> , Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
20 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
18	2,5	2,5	2,3	2,2	2,1	2,0	1,8	1,7	1,5	1,4	1,2	1,0	0,7
17	3,2	3,2	3,0	2,8	2,7	2,5	2,3	2,2	2,0	1,8	1,5	1,2	0,9
16	3,6	3,5	3,3	3,1	3,0	2,8	2,6	2,4	2,2	2,0	1,7	1,4	1,0
15	4,3	4,2	4,0	3,8	3,6	3,4	3,1	2,9	2,7	2,4	2,1	1,7	1,2
14	5,4	5,3	5,0	4,7	4,5	4,3	3,9	3,7	3,4	3,0	2,6	2,1	1,5
13	6,1	6,0	5,7	5,4	5,1	4,8	4,5	4,2	3,8	3,4	2,9	2,4	1,7
12	7,2	7,0	6,7	6,3	6,0	5,7	5,3	4,9	4,5	4,0	3,5	2,8	2,0
11	8,3	8,1	7,7	7,3	7,0	6,6	6,1	5,7	5,2	4,6	4,0	3,3	2,3
10	9,1	8,8	8,4	7,9	7,6	7,1	6,6	6,2	5,6	5,0	4,3	3,5	2,5
9	10,5	10,2	9,7	9,2	8,8	8,3	7,7	7,2	6,5	5,8	5,0	4,1	2,9
8	12,7	12,3	11,7	11,1	10,6	10,0	9,3	8,6	7,9	7,1	6,1	5,0	3,5
7	14,5	14,0	13,4	12,7	12,1	11,4	10,6	9,9	9,1	8,1	7,0	5,7	4,0
6	16,3	15,8	15,1	14,3	13,7	12,9	11,9	11,1	10,2	9,1	7,8	6,4	4,5
5	18,9	18,2	17,4	16,5	15,8	14,9	13,8	12,9	11,8	10,5	9,1	7,4	5,2
4	21,8	21,0	20,1	19,1	18,2	17,2	15,9	14,9	13,6	12,1	10,5	8,6	6,0
3	25,4	24,5	23,5	22,2	21,3	20,0	18,6	17,3	15,9	14,2	12,2	10,0	7,1
2	29,1	28,0	26,8	25,4	24,3	22,9	21,2	19,8	18,2	16,2	14,0	11,4	8,1

Table B.5n. Ampacities of Flexible Cords and Cables type W, G, G-GC with 90°C insulation temperature and 1 current-carrying conductor according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(2)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type <b>W, G, G-GC with 1 current-carrying conductor [A]</b> , Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
12 AWG	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-
8	83,2	80,0	76,8	72,8	69,6	65,6	60,8	56,8	52,0	46,4	40,0	32,8	23,2
6	109,2	105,0	100,8	95,5	91,3	86,1	79,8	74,5	68,2	60,9	52,5	43,0	30,4
4	145,6	140,0	134,4	127,4	121,8	114,8	106,4	99,4	91,0	81,2	70,0	57,4	40,6
3	171,6	165,0	158,4	150,1	143,5	135,3	125,4	117,1	107,2	95,7	82,5	67,6	47,8
2	197,6	190,0	182,4	172,9	165,3	155,8	144,4	134,9	123,5	110,2	95,0	77,9	55,1
1	228,8	220,0	211,2	200,2	191,4	180,4	167,2	156,2	143,0	127,6	110,0	90,2	63,8
1/0	270,4	260,0	249,6	236,6	226,2	213,2	197,6	184,6	169,0	150,8	130,0	106,6	75,4
2/0	312,0	300,0	288,0	273,0	261,0	246,0	228,0	213,0	195,0	174,0	150,0	123,0	87,0
3/0	364,0	350,0	336,0	318,5	304,5	287,0	266,0	248,5	227,5	203,0	175,0	143,5	101,5
4/0	421,2	405,0	388,8	368,5	352,3	332,1	307,8	287,5	263,2	234,9	202,5	166,0	117,4
250	473,2	455,0	436,8	414,0	395,8	373,1	345,8	323,0	295,7	263,9	227,5	186,5	131,9
300	525,2	505,0	484,8	459,5	439,3	414,1	383,8	358,5	328,2	292,9	252,5	207,0	146,4
350	592,8	570,0	547,2	518,7	495,9	467,4	433,2	404,7	370,5	330,6	285,0	233,7	165,3
400	639,6	615,0	590,4	559,6	535,0	504,3	467,4	436,6	399,7	356,7	307,5	252,1	178,3
500	728,0	700,0	672,0	637,0	609,0	574,0	532,0	497,0	455,0	406,0	350,0	287,0	203,0
600	811,2	780,0	748,8	709,8	678,6	639,6	592,8	553,8	507,0	452,4	390,0	319,8	226,2
700	889,2	855,0	820,8	778,0	743,8	701,1	649,8	607,0	555,7	495,9	427,5	350,5	247,9
750	920,4	885,0	849,6	805,3	769,9	725,7	672,6	628,3	575,2	513,3	442,5	362,8	256,6
800	956,8	920,0	883,2	837,2	800,4	754,4	699,2	653,2	598,0	533,6	460,0	377,2	266,8
900	1024,4	985,0	945,6	896,3	856,9	807,7	748,6	699,3	640,2	571,3	492,5	403,8	285,6
1000	1097,2	1055,0	1012,8	960,0	917,8	865,1	801,8	749,0	685,7	611,9	527,5	432,5	305,9

Table B.5o. Ampacities of Flexible Cords and Cables type W, G, G-GC with 90°C insulation temperature and 2 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(2)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type W, G, G-GC with 2 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
12 AWG	43,6	42,0	40,3	38,2	36,5	34,4	31,9	29,8	27,3	24,3	21,0	17,2	12,1
10	61,3	59,0	56,6	53,6	51,3	48,3	44,8	41,8	38,3	34,2	29,5	24,1	17,1
8	76,9	74,0	71,0	67,3	64,3	60,6	56,2	52,5	48,1	42,9	37,0	30,3	21,4
6	102,9	99,0	95,0	90,0	86,1	81,1	75,2	70,2	64,3	57,4	49,5	40,5	28,7
4	135,2	130,0	124,8	118,3	113,1	106,6	98,8	92,3	84,5	75,4	65,0	53,3	37,7
3	158,0	152,0	145,9	138,3	132,2	124,6	115,5	107,9	98,8	88,1	76,0	62,3	44,0
2	180,9	174,0	167,0	158,3	151,3	142,6	132,2	123,5	113,1	100,9	87,0	71,3	50,4
1	210,0	202,0	193,9	183,8	175,7	165,6	153,5	143,4	131,3	117,1	101,0	82,8	58,5
1/0	243,3	234,0	224,6	212,9	203,5	191,8	177,8	166,1	152,1	135,7	117,0	95,9	67,8
2/0	281,8	271,0	260,1	246,6	235,7	222,2	205,9	192,4	176,1	157,1	135,5	111,1	78,5
3/0	325,5	313,0	300,4	284,8	272,3	256,6	237,8	222,2	203,4	181,5	156,5	128,3	90,7
4/0	375,4	361,0	346,5	328,5	314,0	296,0	274,3	256,3	234,6	209,3	180,5	148,0	104,6
250	418,0	402,0	385,9	365,8	349,7	329,6	305,5	285,4	261,3	233,1	201,0	164,8	116,5
300	466,9	449,0	431,0	408,5	390,6	368,1	341,2	318,7	291,8	260,4	224,5	184,0	130,2
350	514,8	495,0	475,2	450,4	430,6	405,9	376,2	351,4	321,7	287,1	247,5	202,9	143,5
400	556,4	535,0	513,6	486,8	465,4	438,7	406,6	379,8	347,7	310,3	267,5	219,3	155,1
500	637,5	613,0	588,4	557,8	533,3	502,6	465,8	435,2	398,4	355,5	306,5	251,3	177,7
600	-	-	-	-	-	-	-	-	-	-	-	-	-
700	-	-	-	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-	-	-	-
800	-	-	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B.5p. Ampacities of Flexible Cords and Cables type W, G, G-GC with 90°C insulation temperature and 3 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(2)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type W, G, G-GC with 3 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
12 AWG	36,4	35,0	33,6	31,8	30,4	28,7	26,6	24,8	22,7	20,3	17,5	14,3	10,1
10	50,9	49,0	47,0	44,5	42,6	40,1	37,2	34,7	31,8	28,4	24,5	20,0	14,2
8	67,6	65,0	62,4	59,1	56,5	53,3	49,4	46,1	42,2	37,7	32,5	26,6	18,8
6	90,4	87,0	83,5	79,1	75,6	71,3	66,1	61,7	56,5	50,4	43,5	35,6	25,2
4	118,5	114,0	109,4	103,7	99,1	93,4	86,6	80,9	74,1	66,1	57,0	46,7	33,0
3	138,3	133,0	127,6	121,0	115,7	109,0	101,0	94,4	86,4	77,1	66,5	54,5	38,5
2	158,0	152,0	145,9	138,3	132,2	124,6	115,5	107,9	98,8	88,1	76,0	62,3	44,0
1	184,0	177,0	169,9	161,0	153,9	145,1	134,5	125,6	115,0	102,6	88,5	72,5	51,3
1/0	213,2	205,0	196,8	186,5	178,3	168,1	155,8	145,5	133,2	118,9	102,5	84,0	59,4
2/0	246,4	237,0	227,5	215,6	206,1	194,3	180,1	168,2	154,0	137,4	118,5	97,1	68,7
3/0	284,9	274,0	263,0	249,3	238,3	224,6	208,2	194,5	178,1	158,9	137,0	112,3	79,4
4/0	328,6	316,0	303,3	287,5	274,9	259,1	240,1	224,3	205,4	183,2	158,0	129,5	91,6
250	366,0	352,0	337,9	320,3	306,2	288,6	267,5	249,9	228,8	204,1	176,0	144,3	102,0
300	408,7	393,0	377,2	357,6	341,9	322,2	298,6	279,0	255,4	227,9	196,5	161,1	113,9
350	450,3	433,0	415,6	394,0	376,7	355,0	329,0	307,4	281,4	251,1	216,5	177,5	125,5
400	486,7	468,0	449,2	425,8	407,1	383,7	355,6	332,2	304,2	271,4	234,0	191,8	135,7
500	557,4	536,0	514,5	487,7	466,3	439,5	407,3	380,5	348,4	310,8	268,0	219,7	155,4
600	-	-	-	-	-	-	-	-	-	-	-	-	-
700	-	-	-	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-	-	-	-
800	-	-	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-	-	-	-



Table B.5q. Ampacities of Flexible Cords and Cables type W, G, G-GC with 90°C insulation temperature and 4+6 current-carrying conductors according to NFPA 70 (NEC) - Ed. 2020-2023 – Table 400.5(A)(2)

Conductor's size [AWG/kcmil]	Allowable ampacities of Flexible Cords and Cables type W, G, G-GC with 4+6 current-carrying conductors [A], Insulation temperature 90°C												
	Ambient temperature Ta												
	21÷25°C	26÷30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C	81÷85°C
12 AWG	29,1	28,0	26,8	25,4	24,3	22,9	21,2	19,8	18,2	16,2	14,0	11,4	8,1
10	40,7	39,2	37,6	35,6	34,1	32,1	29,7	27,8	25,4	22,7	19,6	16,0	11,3
8	54,0	52,0	49,9	47,3	45,2	42,6	39,5	36,9	33,8	30,1	26,0	21,3	15,0
6	72,3	69,6	66,8	63,3	60,5	57,0	52,8	49,4	45,2	40,3	34,8	28,5	20,1
4	94,8	91,2	87,5	82,9	79,3	74,7	69,3	64,7	59,2	52,8	45,6	37,3	26,4
3	110,6	106,4	102,1	96,8	92,5	87,2	80,8	75,5	69,1	61,7	53,2	43,6	30,8
2	126,4	121,6	116,7	110,6	105,7	99,7	92,4	86,3	79,0	70,5	60,8	49,8	35,2
1	147,2	141,6	135,9	128,8	123,1	116,1	107,6	100,5	92,0	82,1	70,8	58,0	41,0
1/0	170,5	164,0	157,4	149,2	142,6	134,4	124,6	116,4	106,6	95,1	82,0	67,2	47,5
2/0	197,1	189,6	182,0	172,5	164,9	155,4	144,0	134,6	123,2	109,9	94,8	77,7	54,9
3/0	227,9	219,2	210,4	199,4	190,7	179,7	166,5	155,6	142,4	127,1	109,6	89,8	63,5
4/0	262,9	252,8	242,6	230,0	219,9	207,2	192,1	179,4	164,3	146,6	126,4	103,6	73,3
250	292,8	281,6	270,3	256,2	244,9	230,9	214,0	199,9	183,0	163,3	140,8	115,4	81,6
300	326,9	314,4	301,8	286,1	273,5	257,8	238,9	223,2	204,3	182,3	157,2	128,9	91,1
350	360,2	346,4	332,5	315,2	301,3	284,0	263,2	245,9	225,1	200,9	173,2	142,0	100,4
400	389,3	374,4	359,4	340,7	325,7	307,0	284,5	265,8	243,3	217,1	187,2	153,5	108,5
500	445,9	428,8	411,6	390,2	373,0	351,6	325,8	304,4	278,7	248,7	214,4	175,8	124,3
600	-	-	-	-	-	-	-	-	-	-	-	-	-
700	-	-	-	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-	-	-	-
800	-	-	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-	-	-	-

## B.6 Ampacity of conductors according to CSA C22.1 (CE Code)

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

### Ampacity of conductors in free air according to CSA C22.1 (CE Code)

Table B.6a. Ampacities of conductors in free air with 60°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 1)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in free air Insulation temperature 60°C										
	Ambient temperature Ta										
	30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C
14 AWG	25,0	22,7	20,5	17,7	14,5	10,2	-	-	-	-	-
12	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-	-	-
10	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-	-	-
8	60,0	54,6	49,2	42,6	34,8	24,6	-	-	-	-	-
6	80,0	72,8	65,6	56,8	46,4	32,8	-	-	-	-	-
4	105,0	95,5	86,1	74,5	60,9	43,0	-	-	-	-	-
3	120,0	109,2	98,4	85,2	69,6	49,2	-	-	-	-	-
2	140,0	127,4	114,8	99,4	81,2	57,4	-	-	-	-	-
1	165,0	150,1	135,3	117,1	95,7	67,6	-	-	-	-	-
1/0	195,0	177,4	159,9	138,4	113,1	79,9	-	-	-	-	-
2/0	220,0	200,2	180,4	156,2	127,6	90,2	-	-	-	-	-
3/0	260,0	236,6	213,2	184,6	150,8	106,6	-	-	-	-	-
4/0	300,0	273,0	246,0	213,0	174,0	123,0	-	-	-	-	-
250 kcmil	340,0	309,4	278,8	241,4	197,2	139,4	-	-	-	-	-
300	370,0	336,7	303,4	262,7	214,6	151,7	-	-	-	-	-
350	425,0	386,7	348,5	301,7	246,5	174,2	-	-	-	-	-
400	455,0	414,0	373,1	323,0	263,9	186,5	-	-	-	-	-
500	520,0	473,2	426,4	369,2	301,6	213,2	-	-	-	-	-
600	580,0	527,8	475,6	411,8	336,4	237,8	-	-	-	-	-
700	630,0	573,3	516,6	447,3	365,4	258,3	-	-	-	-	-
750	655,0	596,0	537,1	465,0	379,9	268,5	-	-	-	-	-
800	680,0	618,8	557,6	482,8	394,4	278,8	-	-	-	-	-
900	730,0	664,3	598,6	518,3	423,4	299,3	-	-	-	-	-
1000	785,0	714,3	643,7	557,3	455,3	321,8	-	-	-	-	-
1250	890,0	809,9	729,8	631,9	516,2	364,9	-	-	-	-	-
1500	985,0	896,3	807,7	699,3	571,3	403,8	-	-	-	-	-
1750	1070,0	973,7	877,4	759,7	620,6	438,7	-	-	-	-	-
2000	1160,0	1055,6	951,2	823,6	672,8	475,6	-	-	-	-	-

Table B.6b. Ampacities of conductors in free air with 75°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 1)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in free air Insulation temperature 75°C										
	Ambient temperature Ta										
	30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C
14 AWG	30,0	28,2	26,4	24,6	22,5	20,1	17,4	14,1	9,9	-	-
12	35,0	32,9	30,8	28,7	26,2	23,4	20,3	16,4	11,5	-	-
10	50,0	47,0	44,0	41,0	37,5	33,5	29,0	23,5	16,5	-	-
8	70,0	65,8	61,6	57,4	52,5	46,9	40,6	32,9	23,1	-	-
6	95,0	89,3	83,6	77,9	71,2	63,6	55,1	44,6	31,3	-	-
4	125,0	117,5	110,0	102,5	93,7	83,7	72,5	58,7	41,2	-	-
3	145,0	136,3	127,6	118,9	108,7	97,1	84,1	68,1	47,8	-	-
2	170,0	159,8	149,6	139,4	127,5	113,9	98,6	79,9	56,1	-	-
1	195,0	183,3	171,6	159,9	146,2	130,6	113,1	91,6	64,3	-	-
1/0	230,0	216,2	202,4	188,6	172,5	154,1	133,4	108,1	75,9	-	-
2/0	265,0	249,1	233,2	217,3	198,7	177,5	153,7	124,5	87,4	-	-
3/0	310,0	291,4	272,8	254,2	232,5	207,7	179,8	145,7	102,3	-	-
4/0	360,0	338,4	316,8	295,2	270,0	241,2	208,8	169,2	118,8	-	-
250 kcmil	405,0	380,7	356,4	332,1	303,7	271,3	234,9	190,3	133,6	-	-
300	445,0	418,3	391,6	364,9	333,7	298,1	258,1	209,1	146,8	-	-
350	505,0	474,7	444,4	414,1	378,7	338,3	292,9	237,3	166,6	-	-
400	545,0	512,3	479,6	446,9	408,7	365,1	316,1	256,1	179,8	-	-
500	620,0	582,8	545,6	508,4	465,0	415,4	359,6	291,4	204,6	-	-
600	690,0	648,6	607,2	565,8	517,5	462,3	400,2	324,3	227,7	-	-
700	755,0	709,7	664,4	619,1	566,2	505,8	437,9	354,8	249,1	-	-
750	785,0	737,9	690,8	643,7	588,7	525,9	455,3	368,9	259,0	-	-
800	815,0	766,1	717,2	668,3	611,2	546,0	472,7	383,0	268,9	-	-
900	870,0	817,8	765,6	713,4	652,5	582,9	504,6	408,9	287,1	-	-
1000	935,0	878,9	822,8	766,7	701,2	626,4	542,3	439,4	308,5	-	-
1250	1065,0	1001,1	937,2	873,3	798,7	713,5	617,7	500,5	351,4	-	-
1500	1175,0	1104,5	1034,0	963,5	881,2	787,2	681,5	552,2	387,7	-	-
1750	1280,0	1203,2	1126,4	1049,6	960,0	857,6	742,4	601,6	422,4	-	-
2000	1385,0	1301,9	1218,8	1135,7	1038,7	927,9	803,3	650,9	457,0	-	-

Table B.6c. Ampacities of conductors in free air with 90°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 1)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in free air Insulation temperature 90°C										
	Ambient temperature Ta										
	30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C
14 AWG	35,0	33,6	31,8	30,4	28,7	26,6	24,8	22,7	20,3	17,5	14,3
12	40,0	38,4	36,4	34,8	32,8	30,4	28,4	26,0	23,2	20,0	16,4
10	55,0	52,8	50,0	47,8	45,1	41,8	39,0	35,7	31,9	27,5	22,5
8	80,0	76,8	72,8	69,6	65,6	60,8	56,8	52,0	46,4	40,0	32,8
6	105,0	100,8	95,5	91,3	86,1	79,8	74,5	68,2	60,9	52,5	43,0
4	140,0	134,4	127,4	121,8	114,8	106,4	99,4	91,0	81,2	70,0	57,4
3	165,0	158,4	150,1	143,5	135,3	125,4	117,1	107,2	95,7	82,5	67,6
2	190,0	182,4	172,9	165,3	155,8	144,4	134,9	123,5	110,2	95,0	77,9
1	220,0	211,2	200,2	191,4	180,4	167,2	156,2	143,0	127,6	110,0	90,2
1/0	260,0	249,6	236,6	226,2	213,2	197,6	184,6	169,0	150,8	130,0	106,6
2/0	300,0	288,0	273,0	261,0	246,0	228,0	213,0	195,0	174,0	150,0	123,0
3/0	350,0	336,0	318,5	304,5	287,0	266,0	248,5	227,5	203,0	175,0	143,5
4/0	405,0	388,8	368,5	352,3	332,1	307,8	287,5	263,2	234,9	202,5	166,0
250 kcmil	455,0	436,8	414,0	395,8	373,1	345,8	323,0	295,7	263,9	227,5	186,5
300	500,0	480,0	455,0	435,0	410,0	380,0	355,0	325,0	290,0	250,0	205,0
350	570,0	547,2	518,7	495,9	467,4	433,2	404,7	370,5	330,6	285,0	233,7
400	615,0	590,4	559,6	535,0	504,3	467,4	436,6	399,7	356,7	307,5	252,1
500	700,0	672,0	637,0	609,0	574,0	532,0	497,0	455,0	406,0	350,0	287,0
600	780,0	748,8	709,8	678,6	639,6	592,8	553,8	507,0	452,4	390,0	319,8
700	850,0	816,0	773,5	739,5	697,0	646,0	603,5	552,5	493,0	425,0	348,5
750	885,0	849,6	805,3	769,9	725,7	672,6	628,3	575,2	513,3	442,5	362,8
800	920,0	883,2	837,2	800,4	754,4	699,2	653,2	598,0	533,6	460,0	377,2
900	980,0	940,8	891,8	852,6	803,6	744,8	695,8	637,0	568,4	490,0	401,8
1000	1055,0	1012,8	960,0	917,8	865,1	801,8	749,0	685,7	611,9	527,5	432,5
1250	1200,0	1152,0	1092,0	1044,0	984,0	912,0	852,0	780,0	696,0	600,0	492,0
1500	1325,0	1272,0	1205,7	1152,7	1086,5	1007,0	940,7	861,2	768,5	662,5	543,2
1750	1445,0	1387,2	1314,9	1257,1	1184,9	1098,2	1025,9	939,2	838,1	722,5	592,4
2000	1560,0	1497,6	1419,6	1357,2	1279,2	1185,6	1107,6	1014,0	904,8	780,0	639,6

Table B.6d. Ampacities of conductors in free air with 110°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 1)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in free air, Ambient temperature Ta, Insulation temperature 110°C																
	Ambient temperature Ta																
	30°C	31+35°C	36+40°C	41+45°C	46+50°C	51+55°C	56+60°C	61+65°C	66+70°C	71+75°C	76+80°C	81+90°C	91+100°C	101+110°C	111+120°C	121+130°C	131+140°C
14 AWG	40,0	38,8	37,6	36,0	34,8	33,2	31,6	30,0	28,4	26,4	24,4	20,0	14,0	-	-	-	-
12	45,0	43,6	42,3	40,5	39,1	37,3	35,5	33,7	31,9	29,7	27,4	22,5	15,7	-	-	-	-
10	65,0	63,0	61,1	58,5	56,5	53,9	51,3	48,7	46,1	42,9	39,6	32,5	22,7	-	-	-	-
8	90,0	87,3	84,6	81,0	78,3	74,7	71,1	67,5	63,9	59,4	54,9	45,0	31,5	-	-	-	-
6	120,0	116,4	112,8	108,0	104,4	99,6	94,8	90,0	85,2	79,2	73,2	60,0	42,0	-	-	-	-
4	160,0	155,2	150,4	144,0	139,2	132,8	126,4	120,0	113,6	105,6	97,6	80,0	56,0	-	-	-	-
3	185,0	179,4	173,9	166,5	160,9	153,5	146,1	138,7	131,3	122,1	112,8	92,5	64,7	-	-	-	-
2	215,0	208,5	202,1	193,5	187,0	178,4	169,8	161,2	152,6	141,9	131,1	107,5	75,2	-	-	-	-
1	245,0	237,6	230,3	220,5	213,1	203,3	193,5	183,7	173,9	161,7	149,4	122,5	85,7	-	-	-	-
1/0	290,0	281,3	272,6	261,0	252,3	240,7	229,1	217,5	205,9	191,4	176,9	145,0	101,5	-	-	-	-
2/0	335,0	324,9	314,9	301,5	291,4	278,0	264,6	251,2	237,8	221,1	204,3	167,5	117,2	-	-	-	-
3/0	390,0	378,3	366,6	351,0	339,3	323,7	308,1	292,5	276,9	257,4	237,9	195,0	136,5	-	-	-	-
4/0	455,0	441,3	427,7	409,5	395,8	377,6	359,4	341,2	323,0	300,3	277,5	227,5	159,2	-	-	-	-
250 kcmil	510,0	494,7	479,4	459,0	443,7	423,3	402,9	382,5	362,1	336,6	311,1	255,0	178,5	-	-	-	-
300	560,0	543,2	526,4	504,0	487,2	464,8	442,4	420,0	397,6	369,6	341,6	280,0	196,0	-	-	-	-
350	640,0	620,8	601,6	576,0	556,8	531,2	505,6	480,0	454,4	422,4	390,4	320,0	224,0	-	-	-	-
400	690,0	669,3	648,6	621,0	600,3	572,7	545,1	517,5	489,9	455,4	420,9	345,0	241,5	-	-	-	-
500	785,0	761,4	737,9	706,5	682,9	651,5	620,1	588,7	557,3	518,1	478,8	392,5	274,7	-	-	-	-
600	870,0	843,9	817,8	783,0	756,9	722,1	687,3	652,5	617,7	574,2	530,7	435,0	304,5	-	-	-	-
700	955,0	926,3	897,7	859,5	830,8	792,6	754,4	716,2	678,0	630,3	582,5	477,5	334,2	-	-	-	-
750	990,0	960,3	930,6	891,0	861,3	821,7	782,1	742,5	702,9	653,4	603,9	495,0	346,5	-	-	-	-
800	1030,0	999,1	968,2	927,0	896,1	854,9	813,7	772,5	731,3	679,8	628,3	515,0	360,5	-	-	-	-
900	1100,0	1067,0	1034,0	990,0	957,0	913,0	869,0	825,0	781,0	726,0	671,0	550,0	385,0	-	-	-	-
1000	1180,0	1144,6	1109,2	1062,0	1026,6	979,4	932,2	885,0	837,8	778,8	719,8	590,0	413,0	-	-	-	-
1250	1345,0	1304,6	1264,3	1210,5	1170,1	1116,3	1062,5	1008,7	954,9	887,7	820,4	672,5	470,7	-	-	-	-
1500	1485,0	1440,4	1395,9	1336,5	1291,9	1232,5	1173,1	1113,7	1054,3	980,1	905,8	742,5	519,7	-	-	-	-
1750	1620,0	1571,4	1522,8	1458,0	1409,4	1344,6	1279,8	1215,0	1150,2	1069,2	988,2	810,0	567,0	-	-	-	-
2000	1750,0	1697,5	1645,0	1575,0	1522,5	1452,5	1382,5	1312,5	1242,5	1155,0	1067,5	875,0	612,5	-	-	-	-

Table B.6e. Ampacities of conductors in free air with 125°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 1)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in free air, Ambient temperature Ta, Insulation temperature 125°C																
	Temperatura ambiente Ta Ambient temperature Ta																
	30°C	31+35°C	36+40°C	41+45°C	46+50°C	51+55°C	56+60°C	61+65°C	66+70°C	71+75°C	76+80°C	81+90°C	91+100°C	101+110°C	111+120°C	121+130°C	131+140°C
14 AWG	40,0	38,8	38,0	36,8	35,6	34,4	33,2	31,6	30,4	29,2	27,6	24,4	20,4	16,0	9,2	-	-
12	45,0	43,6	42,7	41,4	40,0	38,7	37,3	35,5	34,2	32,8	31,0	27,4	22,9	18,0	10,3	-	-
10	65,0	63,0	61,7	59,8	57,8	55,9	53,9	51,3	49,4	47,4	44,8	39,6	33,1	26,0	14,9	-	-
8	95,0	92,1	90,2	87,4	84,5	81,7	78,8	75,0	72,2	69,3	65,5	57,9	48,4	38,0	21,8	-	-
6	130,0	126,1	123,5	119,6	115,7	111,8	107,9	102,7	98,8	94,9	89,7	79,3	66,3	52,0	29,9	-	-
4	170,0	164,9	161,5	156,4	151,3	146,2	141,1	134,3	129,2	124,1	117,3	103,7	86,7	68,0	39,1	-	-
3	195,0	189,1	185,2	179,4	173,5	167,7	161,8	154,0	148,2	142,3	134,5	118,9	99,4	78,0	44,8	-	-
2	230,0	223,1	218,5	211,6	204,7	197,8	190,9	181,7	174,8	167,9	158,7	140,3	117,3	92,0	52,9	-	-
1	265,0	257,0	251,7	243,8	235,8	227,9	219,9	209,3	201,4	193,4	182,8	161,6	135,1	106,0	60,9	-	-
1/0	310,0	300,7	294,5	285,2	275,9	266,6	257,3	244,9	235,6	226,3	213,9	189,1	158,1	124,0	71,3	-	-
2/0	355,0	344,3	337,2	326,6	315,9	305,3	294,6	280,4	269,8	259,1	244,9	216,5	181,0	142,0	81,6	-	-
3/0	420,0	407,4	399,0	386,4	373,8	361,2	348,6	331,8	319,2	306,6	289,8	256,2	214,2	168,0	96,6	-	-
4/0	485,0	470,4	460,7	446,2	431,6	417,1	402,5	383,1	368,6	354,0	334,6	295,8	247,3	194,0	111,5	-	-
250 kcmil	545,0	528,6	517,7	501,4	485,0	468,7	452,3	430,5	414,2	397,8	376,0	332,4	277,9	218,0	125,3	-	-
300	600,0	582,0	570,0	552,0	534,0	516,0	498,0	474,0	456,0	438,0	414,0	366,0	306,0	240,0	138,0	-	-
350	680,0	659,6	646,0	625,6	605,2	584,8	564,4	537,2	516,8	496,4	469,2	414,8	346,8	272,0	156,4	-	-
400	735,0	712,9	698,2	676,2	654,1	632,1	610,0	580,6	558,6	536,5	507,1	448,3	374,8	294,0	169,0	-	-
500	835,0	809,9	793,2	768,2	743,1	718,1	693,0	659,6	634,6	609,5	576,1	509,3	425,8	334,0	192,0	-	-
600	930,0	902,1	883,5	855,6	827,7	799,8	771,9	734,7	706,8	678,9	641,7	567,3	474,3	372,0	213,9	-	-
700	1020,0	989,4	969,0	938,4	907,8	877,2	846,6	805,8	775,2	744,6	703,8	622,2	520,2	408,0	234,6	-	-
750	1060,0	1028,2	1007,0	975,2	943,4	911,6	879,8	837,4	805,6	773,8	731,4	646,6	540,6	424,0	243,8	-	-
800	1100,0	1067,0	1045,0	1012,0	979,0	946,0	913,0	869,0	836,0	803,0	759,0	671,0	561,0	440,0	253,0	-	-
900	1175,0	1139,7	1116,2	1081,0	1045,7	1010,5	975,2	928,2	893,0	857,7	810,7	716,7	599,2	470,0	270,2	-	-
1000	1260,0	1222,2	1197,0	1159,2	1121,4	1083,6	1045,8	995,4	957,6	919,8	869,4	768,6	642,6	504,0	289,8	-	-
1250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B.6f. Ampacities of conductors in free air with 200°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 1)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in free air, Ambient temperature Ta, Insulation temperature 200°C																
	Ambient temperature Ta																
	30°C	31+35°C	36+40°C	41+45°C	46+50°C	51+55°C	56+60°C	61+65°C	66+70°C	71+75°C	76+80°C	81+90°C	91+100°C	101+110°C	111+120°C	121+130°C	131+140°C
14 AWG	50,0	49,5	48,5	47,5	47,0	46,0	45,5	44,5	43,5	43,0	42,0	40,0	38,5	36,5	34,5	32,0	29,5
12	55,0	54,4	53,3	52,2	51,7	50,6	50,0	48,9	47,8	47,3	46,2	44,0	42,3	40,1	37,9	35,2	32,4
10	80,0	79,2	77,6	76,0	75,2	73,6	72,8	71,2	69,6	68,8	67,2	64,0	61,6	58,4	55,2	51,2	47,2
8	115,0	113,8	111,5	109,2	108,1	105,8	104,6	102,3	100,0	98,9	96,6	92,0	88,5	83,9	79,3	73,6	67,8
6	155,0	153,4	150,3	147,2	145,7	142,6	141,0	137,9	134,8	133,3	130,2	124,0	119,3	113,1	106,9	99,2	91,4
4	205,0	202,9	198,8	194,7	192,7	188,6	186,5	182,4	178,3	176,3	172,2	164,0	157,8	149,6	141,4	131,2	120,9
3	240,0	237,6	232,8	228,0	225,6	220,8	218,4	213,6	208,8	206,4	201,6	192,0	184,8	175,2	165,6	153,6	141,6
2	280,0	277,2	271,6	266,0	263,2	257,6	254,8	249,2	243,6	240,8	235,2	224,0	215,6	204,4	193,2	179,2	165,2
1	320,0	316,8	310,4	304,0	300,8	294,4	291,2	284,8	278,4	275,2	268,8	256,0	246,4	233,6	220,8	204,8	188,8
1/0	375,0	371,2	363,7	356,2	352,5	345,0	341,2	333,7	326,2	322,5	315,0	300,0	288,7	273,7	258,7	240,0	221,2
2/0	435,0	430,6	421,9	413,2	408,9	400,2	395,8	387,1	378,4	374,1	365,4	348,0	334,9	317,5	300,1	278,4	256,6
3/0	510,0	504,9	494,7	484,5	479,4	469,2	464,1	453,9	443,7	438,6	428,4	408,0	392,7	372,3	351,9	326,4	300,9
4/0	590,0	584,1	572,3	560,5	554,6	542,8	536,9	525,1	513,3	507,4	495,6	472,0	454,3	430,7	407,1	377,6	348,1
250 kcmil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B.6g. Adjustment factors for the ampacities indicated in the previous tables and based on the number of c conductors.  
It applies when the space between cables is less than 25% of the largest cable diameter. Values according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 5B)

Number of conductors	Correction factor
2	0,90
3	0,85
4	0,80

Note. Where more than four conductors are in contact, the ratings for conductors in raceways shall be used.



## Ampacity of conductors in raceway or cable according to CSA C22.1 (CE Code)

Table B.6h. Ampacities of conductors in raceway or cable with 60°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 2)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in raceway or cable Insulation temperature 60°C										
	Ambient temperature Ta										
	30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C
14 AWG	15,0	13,6	12,3	10,6	8,7	6,1	-	-	-	-	-
12	20,0	18,2	16,4	14,2	11,6	8,2	-	-	-	-	-
10	30,0	27,3	24,6	21,3	17,4	12,3	-	-	-	-	-
8	40,0	36,4	32,8	28,4	23,2	16,4	-	-	-	-	-
6	55,0	50,0	45,1	39,0	31,9	22,5	-	-	-	-	-
4	70,0	63,7	57,4	49,7	40,6	28,7	-	-	-	-	-
3	85,0	77,3	69,7	60,3	49,3	34,8	-	-	-	-	-
2	95,0	86,4	77,9	67,4	55,1	38,9	-	-	-	-	-
1	110,0	100,1	90,2	78,1	63,8	45,1	-	-	-	-	-
1/0	125,0	113,7	102,5	88,7	72,5	51,2	-	-	-	-	-
2/0	145,0	131,9	118,9	102,9	84,1	59,4	-	-	-	-	-
3/0	165,0	150,1	135,3	117,1	95,7	67,6	-	-	-	-	-
4/0	195,0	177,4	159,9	138,4	113,1	79,9	-	-	-	-	-
250 kcmil	215,0	195,6	176,3	152,6	124,7	88,1	-	-	-	-	-
300	240,0	218,4	196,8	170,4	139,2	98,4	-	-	-	-	-
350	260,0	236,6	213,2	184,6	150,8	106,6	-	-	-	-	-
400	280,0	254,8	229,6	198,8	162,4	114,8	-	-	-	-	-
500	320,0	291,2	262,4	227,2	185,6	131,2	-	-	-	-	-
600	350,0	318,5	287,0	248,5	203,0	143,5	-	-	-	-	-
700	385,0	350,3	315,7	273,3	223,3	157,8	-	-	-	-	-
750	400,0	364,0	328,0	284,0	232,0	164,0	-	-	-	-	-
800	410,0	373,1	336,2	291,1	237,8	168,1	-	-	-	-	-
900	435,0	395,8	356,7	308,8	252,3	178,3	-	-	-	-	-
1000	455,0	414,0	373,1	323,0	263,9	186,5	-	-	-	-	-
1250	495,0	450,4	405,9	351,4	287,1	202,9	-	-	-	-	-
1500	525,0	477,7	430,5	372,7	304,5	215,2	-	-	-	-	-
1750	545,0	495,9	446,9	386,9	316,1	223,4	-	-	-	-	-
2000	555,0	505,0	455,1	394,0	321,9	227,5	-	-	-	-	-

Table B.6i. Ampacities of conductors in raceway or cable with 75°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 2)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in raceway or cable Insulation temperature 75°C										
	Ambient temperature Ta										
	30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C
14 AWG	20,0	18,8	17,6	16,4	15,0	13,4	11,6	9,4	6,6	-	-
12	25,0	23,5	22,0	20,5	18,7	16,7	14,5	11,7	8,2	-	-
10	35,0	32,9	30,8	28,7	26,2	23,4	20,3	16,4	11,5	-	-
8	50,0	47,0	44,0	41,0	37,5	33,5	29,0	23,5	16,5	-	-
6	65,0	61,1	57,2	53,3	48,7	43,5	37,7	30,5	21,4	-	-
4	85,0	79,9	74,8	69,7	63,7	56,9	49,3	39,9	28,0	-	-
3	100,0	94,0	88,0	82,0	75,0	67,0	58,0	47,0	33,0	-	-
2	115,0	108,1	101,2	94,3	86,2	77,0	66,7	54,0	37,9	-	-
1	130,0	122,2	114,4	106,6	97,5	87,1	75,4	61,1	42,9	-	-
1/0	150,0	141,0	132,0	123,0	112,5	100,5	87,0	70,5	49,5	-	-
2/0	175,0	164,5	154,0	143,5	131,2	117,2	101,5	82,2	57,7	-	-
3/0	200,0	188,0	176,0	164,0	150,0	134,0	116,0	94,0	66,0	-	-
4/0	230,0	216,2	202,4	188,6	172,5	154,1	133,4	108,1	75,9	-	-
250 kcmil	255,0	239,7	224,4	209,1	191,2	170,8	147,9	119,8	84,1	-	-
300	285,0	267,9	250,8	233,7	213,7	190,9	165,3	133,9	94,0	-	-
350	310,0	291,4	272,8	254,2	232,5	207,7	179,8	145,7	102,3	-	-
400	335,0	314,9	294,8	274,7	251,2	224,4	194,3	157,4	110,5	-	-
500	380,0	357,2	334,4	311,6	285,0	254,6	220,4	178,6	125,4	-	-
600	420,0	394,8	369,6	344,4	315,0	281,4	243,6	197,4	138,6	-	-
700	460,0	432,4	404,8	377,2	345,0	308,2	266,8	216,2	151,8	-	-
750	475,0	446,5	418,0	389,5	356,2	318,2	275,5	223,2	156,7	-	-
800	490,0	460,6	431,2	401,8	367,5	328,3	284,2	230,3	161,7	-	-
900	520,0	488,8	457,6	426,4	390,0	348,4	301,6	244,4	171,6	-	-
1000	545,0	512,3	479,6	446,9	408,7	365,1	316,1	256,1	179,8	-	-
1250	590,0	554,6	519,2	483,8	442,5	395,3	342,2	277,3	194,7	-	-
1500	625,0	587,5	550,0	512,5	468,7	418,7	362,5	293,7	206,2	-	-
1750	650,0	611,0	572,0	533,0	487,5	435,5	377,0	305,5	214,5	-	-
2000	665,0	625,1	585,2	545,3	498,7	445,5	385,7	312,5	219,4	-	-

Table B.6I. Ampacities of conductors in raceway or cable with 90°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 2)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in raceway or cable Insulation temperature 90°C										
	Ambient temperature Ta										
	30°C	31÷35°C	36÷40°C	41÷45°C	46÷50°C	51÷55°C	56÷60°C	61÷65°C	66÷70°C	71÷75°C	76÷80°C
14 AWG	25,0	24,0	22,7	21,7	20,5	19,0	17,7	16,2	14,5	12,5	10,2
12	30,0	28,8	27,3	26,1	24,6	22,8	21,3	19,5	17,4	15,0	12,3
10	40,0	38,4	36,4	34,8	32,8	30,4	28,4	26,0	23,2	20,0	16,4
8	55,0	52,8	50,0	47,8	45,1	41,8	39,0	35,7	31,9	27,5	22,5
6	75,0	72,0	68,2	65,2	61,5	57,0	53,2	48,7	43,5	37,5	30,7
4	95,0	91,2	86,4	82,6	77,9	72,2	67,4	61,7	55,1	47,5	38,9
3	115,0	110,4	104,6	100,0	94,3	87,4	81,6	74,7	66,7	57,5	47,1
2	130,0	124,8	118,3	113,1	106,6	98,8	92,3	84,5	75,4	65,0	53,3
1	145,0	139,2	131,9	126,1	118,9	110,2	102,9	94,2	84,1	72,5	59,4
1/0	170,0	163,2	154,7	147,9	139,4	129,2	120,7	110,5	98,6	85,0	69,7
2/0	195,0	187,2	177,4	169,6	159,9	148,2	138,4	126,7	113,1	97,5	79,9
3/0	225,0	216,0	204,7	195,7	184,5	171,0	159,7	146,2	130,5	112,5	92,2
4/0	260,0	249,6	236,6	226,2	213,2	197,6	184,6	169,0	150,8	130,0	106,6
250 kcmil	290,0	278,4	263,9	252,3	237,8	220,4	205,9	188,5	168,2	145,0	118,9
300	320,0	307,2	291,2	278,4	262,4	243,2	227,2	208,0	185,6	160,0	131,2
350	350,0	336,0	318,5	304,5	287,0	266,0	248,5	227,5	203,0	175,0	143,5
400	380,0	364,8	345,8	330,6	311,6	288,8	269,8	247,0	220,4	190,0	155,8
500	430,0	412,8	391,3	374,1	352,6	326,8	305,3	279,5	249,4	215,0	176,3
600	475,0	456,0	432,2	413,2	389,5	361,0	337,2	308,7	275,5	237,5	194,7
700	520,0	499,2	473,2	452,4	426,4	395,2	369,2	338,0	301,6	260,0	213,2
750	535,0	513,6	486,8	465,4	438,7	406,6	379,8	347,7	310,3	267,5	219,3
800	555,0	532,8	505,0	482,8	455,1	421,8	394,0	360,7	321,9	277,5	227,5
900	585,0	561,6	532,3	508,9	479,7	444,6	415,3	380,2	339,3	292,5	239,8
1000	615,0	590,4	559,6	535,0	504,3	467,4	436,6	399,7	356,7	307,5	252,1
1250	665,0	638,4	605,1	578,5	545,3	505,4	472,1	432,2	385,7	332,5	272,6
1500	705,0	676,8	641,5	613,3	578,1	535,8	500,5	458,2	408,9	352,5	289,0
1750	735,0	705,6	668,8	639,4	602,7	558,6	521,8	477,7	426,3	367,5	301,3
2000	750,0	720,0	682,5	652,5	615,0	570,0	532,5	487,5	435,0	375,0	307,5

Table B.6m. Ampacities of conductors in raceway or cable with 110°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 2)

Conductor's size [AWG/kcmil]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in raceway or cable, Ambient temperature Ta, Insulation temperature 110°C																
	Ambient temperature Ta																
	30°C	31+35°C	36+40°C	41+45°C	46+50°C	51+55°C	56+60°C	61+65°C	66+70°C	71+75°C	76+80°C	81+90°C	91+100°C	101+110°C	111+120°C	121+130°C	131+140°C
14 AWG	25.0	24.2	23.5	22.5	21.7	20.7	19.7	18.7	17.7	16.5	15.2	12.5	8.7	-	-	-	-
12	30.0	29.1	28.2	27.0	26.1	24.9	23.7	22.5	21.3	19.8	18.3	15.0	10.5	-	-	-	-
10	45.0	43.6	42.3	40.5	39.1	37.3	35.5	33.7	31.9	29.7	27.4	22.5	15.7	-	-	-	-
8	65.0	63.0	61.1	58.5	56.5	53.9	51.3	48.7	46.1	42.9	39.6	32.5	22.7	-	-	-	-
6	80.0	77.6	75.2	72.0	69.6	66.4	63.2	60.0	56.8	52.8	48.8	40.0	28.0	-	-	-	-
4	105.0	101.8	98.7	94.5	91.3	87.1	82.9	78.7	74.5	69.3	64.0	52.5	36.7	-	-	-	-
3	125.0	121.2	117.5	112.5	108.7	103.7	98.7	93.7	88.7	82.5	76.2	62.5	43.7	-	-	-	-
2	145.0	140.6	136.3	130.5	126.1	120.3	114.5	108.7	102.9	95.7	88.4	72.5	50.7	-	-	-	-
1	165.0	160.0	155.1	148.5	143.5	136.9	130.3	123.7	117.1	108.9	100.6	82.5	57.7	-	-	-	-
1/0	190.0	184.3	178.6	171.0	165.3	157.7	150.1	142.5	134.9	125.4	115.9	95.0	66.5	-	-	-	-
2/0	220.0	213.4	206.8	198.0	191.4	182.6	173.8	165.0	156.2	145.2	134.2	110.0	77.0	-	-	-	-
3/0	255.0	247.3	239.7	229.5	221.8	211.6	201.4	191.2	181.0	168.3	155.5	127.5	89.2	-	-	-	-
4/0	290.0	281.3	272.6	261.0	252.3	240.7	229.1	217.5	205.9	191.4	176.9	145.0	101.5	-	-	-	-
250 kcmil	320.0	310.4	300.8	288.0	278.4	265.6	252.8	240.0	227.2	211.2	195.2	160.0	112.0	-	-	-	-
300	360.0	349.2	338.4	324.0	313.2	298.8	284.4	270.0	255.6	237.6	219.6	180.0	126.0	-	-	-	-
350	390.0	378.3	366.6	351.0	339.3	323.7	308.1	292.5	276.9	257.4	237.9	195.0	136.5	-	-	-	-
400	425.0	412.2	399.5	382.5	369.7	352.7	335.7	318.7	301.7	280.5	259.2	212.5	148.7	-	-	-	-
500	480.0	465.6	451.2	432.0	417.6	398.4	379.2	360.0	340.8	316.8	292.8	240.0	168.0	-	-	-	-
600	530.0	514.1	498.2	477.0	461.1	439.9	418.7	397.5	376.3	349.8	323.3	265.0	185.5	-	-	-	-
700	580.0	562.6	545.2	522.0	504.6	481.4	458.2	435.0	411.8	382.8	353.8	290.0	203.0	-	-	-	-
750	600.0	582.0	564.0	540.0	522.0	498.0	474.0	450.0	426.0	396.0	366.0	300.0	210.0	-	-	-	-
800	620.0	601.4	582.8	558.0	539.4	514.6	489.8	465.0	440.2	409.2	378.2	310.0	217.0	-	-	-	-
900	655.0	635.3	615.7	589.5	569.8	543.6	517.4	491.2	465.0	432.3	399.5	327.5	229.2	-	-	-	-
1000	690.0	669.3	648.6	621.0	600.3	572.7	545.1	517.5	489.9	455.4	420.9	345.0	241.5	-	-	-	-
1250	745.0	722.6	700.3	670.5	648.1	618.3	588.5	558.7	528.9	491.7	454.4	372.5	260.7	-	-	-	-
1500	790.0	766.3	742.6	711.0	687.3	655.7	624.1	592.5	560.9	521.4	481.9	395.0	276.5	-	-	-	-
1750	820.0	795.4	770.8	738.0	713.4	680.6	647.8	615.0	582.2	541.2	500.2	410.0	287.0	-	-	-	-
2000	840.0	814.8	789.6	756.0	730.8	697.2	663.6	630.0	596.4	554.4	512.4	420.0	294.0	-	-	-	-

Table B.6n. Ampacities of conductors in raceway or cable with 125°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 2)

Conductor's size [AWG/(cmil)]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in raceway or cable, Ambient temperature Ta, Insulation temperature 125°C																
	Ambient temperature Ta																
	30°C	31+35°C	36+40°C	41+45°C	46+50°C	51+55°C	56+60°C	61+65°C	66+70°C	71+75°C	76+80°C	81+90°C	91+100°C	101+110°C	111+120°C	121+130°C	131+140°C
14 AWG	30,0	29,1	28,5	27,6	26,7	25,8	24,9	23,7	22,8	21,9	20,7	18,3	15,3	12,0	6,9		
12	35,0	33,9	33,2	32,2	31,1	30,1	29,0	27,6	26,6	25,5	24,1	21,3	17,8	14,0	8,0		
10	45,0	43,6	42,7	41,4	40,0	38,7	37,3	35,5	34,2	32,8	31,0	27,4	22,9	18,0	10,3		
8	65,0	63,0	61,7	59,8	57,8	55,9	53,9	51,3	49,4	47,4	44,8	39,6	33,1	26,0	14,9		
6	90,0	87,3	85,5	82,8	80,1	77,4	74,7	71,1	68,4	65,7	62,1	54,9	45,9	36,0	20,7		
4	115,0	111,5	109,2	105,8	102,3	98,9	95,4	90,8	87,4	83,9	79,3	70,1	58,6	46,0	26,4		
3	135,0	130,9	128,2	124,2	120,1	116,1	112,0	106,6	102,6	98,5	93,1	82,3	68,8	54,0	31,0		
2	155,0	150,3	147,2	142,6	137,9	133,3	128,6	122,4	117,8	113,1	106,9	94,5	79,0	62,0	35,6		
1	175,0	169,7	166,2	161,0	155,7	150,5	145,2	138,2	133,0	127,7	120,7	106,7	89,2	70,0	40,2		
1/0	200,0	194,0	190,0	184,0	178,0	172,0	166,0	158,0	152,0	146,0	138,0	122,0	102,0	80,0	46,0		
2/0	235,0	227,9	223,2	216,2	209,1	202,1	195,0	185,6	178,6	171,5	162,1	143,3	119,8	94,0	54,0		
3/0	270,0	261,9	256,5	248,4	240,3	232,2	224,1	213,3	205,2	197,1	186,3	164,7	137,7	108,0	62,1		
4/0	310,0	300,7	294,5	285,2	275,9	266,6	257,3	244,9	235,6	226,3	213,9	189,1	158,1	124,0	71,3		
250 kcmil	345,0	334,6	327,7	317,4	307,0	296,7	286,3	272,5	262,2	251,8	238,0	210,4	175,9	138,0	79,3		
300	385,0	373,4	365,7	354,2	342,6	331,1	319,5	304,1	292,6	281,0	265,6	234,8	196,3	154,0	88,5		
350	420,0	407,4	399,0	386,4	373,8	361,2	348,6	331,8	319,2	306,6	289,8	256,2	214,2	168,0	96,6		
400	450,0	436,5	427,5	414,0	400,5	387,0	373,5	355,5	342,0	328,5	310,5	274,5	229,5	180,0	103,5		
500	510,0	494,7	484,5	469,2	453,9	438,6	423,3	402,9	387,6	372,3	351,9	311,1	260,1	204,0	117,3		
600	565,0	548,0	536,7	519,8	502,8	485,9	468,9	446,3	429,4	412,4	389,8	344,6	288,1	226,0	129,9		
700	620,0	601,4	589,0	570,4	551,8	533,2	514,6	489,8	471,2	452,6	427,8	378,2	316,2	248,0	142,6		
750	640,0	620,8	608,0	588,8	569,6	550,4	531,2	505,6	486,4	467,2	441,6	390,4	326,4	256,0	147,2		
800	660,0	640,2	627,0	607,2	587,4	567,6	547,8	521,4	501,6	481,8	455,4	402,6	336,6	264,0	151,8		
900	700,0	679,0	665,0	644,0	623,0	602,0	581,0	553,0	532,0	511,0	483,0	427,0	357,0	280,0	161,0		
1000	735,0	712,9	698,2	676,2	654,1	632,1	610,0	580,6	558,6	536,5	507,1	448,3	374,8	294,0	169,0		

Table B.6o. Ampacities of conductors in raceway or cable with 200°C insulation temperature according to CSA C22.1 (CE Code) – Ed. 2015-2021 (Table 2)

Conductor's size [AWG/(kcmil)]	Allowable ampacities of insulated copper conductors [A], rated not more than 5000V, in raceway or cable, Ambient temperature Ta, Insulation temperature 200°C																
	Ambient temperature Ta																
	30°C	31+35°C	36+40°C	41+45°C	46+50°C	51+55°C	56+60°C	61+65°C	66+70°C	71+75°C	76+80°C	81+90°C	91+100°C	101+110°C	111+120°C	121+130°C	131+140°C
14 AWG	35,0	34,6	33,9	33,2	32,9	32,2	31,8	31,1	30,4	30,1	29,4	28,0	26,9	25,5	24,1	22,4	20,6
12	40,0	39,6	38,8	38,0	37,6	36,8	36,4	35,6	34,8	34,4	33,6	32,0	30,8	29,2	27,6	25,6	23,6
10	60,0	59,4	58,2	57,0	56,4	55,2	54,6	53,4	52,2	51,6	50,4	48,0	46,2	43,8	41,4	38,4	35,4
8	80,0	79,2	77,6	76,0	75,2	73,6	72,8	71,2	69,6	68,8	67,2	64,0	61,6	58,4	55,2	51,2	47,2
6	110,0	108,9	106,7	104,5	103,4	101,2	100,1	97,9	95,7	94,6	92,4	88,0	84,7	80,3	75,9	70,4	64,9
4	140,0	138,6	135,8	133,0	131,6	128,8	127,4	124,6	121,8	120,4	117,6	112,0	107,8	102,2	96,6	89,6	82,6
3	165,0	163,3	160,0	156,7	155,1	151,8	150,1	146,8	143,5	141,9	138,6	132,0	127,0	120,4	113,8	105,6	97,3
2	190,0	188,1	184,3	180,5	178,6	174,8	172,9	169,1	165,3	163,4	159,6	152,0	146,3	138,7	131,1	121,6	112,1
1	215,0	212,8	208,5	204,2	202,1	197,8	195,6	191,3	187,0	184,9	180,6	172,0	165,5	156,9	148,3	137,6	126,8
1/0	245,0	242,5	237,6	232,7	230,3	225,4	222,9	218,0	213,1	210,7	205,8	196,0	188,6	178,8	169,0	156,8	144,5
2/0	290,0	287,1	281,3	275,5	272,6	266,8	263,9	258,1	252,3	249,4	243,6	232,0	223,3	211,7	200,1	185,6	171,1
3/0	330,0	326,7	320,1	313,5	310,2	303,6	300,3	293,7	287,1	283,8	277,2	264,0	254,1	240,9	227,7	211,2	194,7
4/0	380,0	376,2	368,6	361,0	357,2	349,6	345,8	338,2	330,6	326,8	319,2	304,0	292,6	277,4	262,2	243,2	224,2
250 kcmil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B.6p. Adjustment factors of ampacities indicated in the previous tables based on the number of c conductors in raceway or cable according CSA C22.1 (CE Code)– Ed. 2015-2021 (Table 5C)

Number of conductors	Correction factor
1÷3	1,00
4÷6	0,80
7÷24	0,70
25÷42	0,60
>42	0,50

## B.7 Current-carrying capacity of conductors according to EN 60204-1

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.7a. Current-carrying capacity of conductors according to IEC 60204-1:2016.- Conductors or single core cables in conduits.

Size [mm <sup>2</sup> ]	Current-carrying capacity [A] for PVC insulated copper conductors or single core cables				
	Installation in conduits or in cable trays				
	Ambient temperature Ta				
	40°C	45°C	50°C	55°C	60°C
0,2 <sup>(a)</sup>	4,5	4,1	3,7	3,2	2,6
0,5 <sup>(a)</sup>	7,9	7,2	6,5	5,6	4,6
0,75 <sup>(a)</sup>	9,5	8,6	7,8	6,7	5,5
0,75 <sup>(b)</sup>	8,6	7,8	7,1	6,1	5,0
1 <sup>(b)</sup>	10,3	9,4	8,4	7,3	6,0
1,5 <sup>(b)</sup>	13,5	12,3	11,1	9,6	7,8
2,5 <sup>(b)</sup>	18,3	16,7	15,0	13,0	10,6
4 <sup>(b)</sup>	24,0	21,8	19,7	17,0	13,9
6 <sup>(b)</sup>	31,0	28,2	25,4	22,0	18,0
10 <sup>(b)</sup>	44,0	40,0	36,1	31,2	25,5
16 <sup>(b)</sup>	59,0	53,7	48,4	41,9	34,2
25 <sup>(b)</sup>	77,0	70,1	63,1	54,7	44,7
35 <sup>(b)</sup>	96,0	87,4	78,7	68,2	55,7
50 <sup>(b)</sup>	117,0	106,5	95,9	83,1	67,9
70 <sup>(b)</sup>	149,0	135,6	122,2	105,8	86,4
95 <sup>(b)</sup>	180,0	163,8	147,6	127,8	104,4
120 <sup>(b)</sup>	208,0	189,3	170,6	147,7	120,6

<sup>(a)</sup> The values of the current-carrying capacity are based on one control circuit pari for size between 0,2 mm<sup>2</sup> and 0,75 mm<sup>2</sup>.

<sup>(b)</sup> The values of the current-carrying capacity are based one symmetrical three-phase circuit for size 0,75 mm<sup>2</sup> and greater.



Table B.7b. Current-carrying capacity of conductors according to IEC 60204-1:2016. Multicore cables in conduits.

Size [mm <sup>2</sup> ]	Current-carrying capacity [A] for PVC insulated copper cables				
	Installation in conduits or in cable trays				
	Ambient temperature T <sub>a</sub>				
	40°C	45°C	50°C	55°C	60°C
0,2 <sup>(a)</sup>	4,3	3,9	3,5	3,1	2,5
0,5 <sup>(a)</sup>	7,5	6,8	6,2	5,3	4,4
0,75 <sup>(a)</sup>	9	8,2	7,4	6,4	5,2
0,75 <sup>(b)</sup>	8,5	7,7	7,0	6,0	4,9
1 <sup>(b)</sup>	10,1	9,2	8,3	7,2	5,9
1,5 <sup>(b)</sup>	13,1	11,9	10,7	9,3	7,6
2,5 <sup>(b)</sup>	17,4	15,8	14,3	12,4	10,1
4 <sup>(b)</sup>	23,0	20,9	18,9	16,3	13,3
6 <sup>(b)</sup>	30,0	27,3	24,6	21,3	17,4
10 <sup>(b)</sup>	40,0	36,4	32,8	28,4	23,2
16 <sup>(b)</sup>	54,0	49,1	44,3	38,3	31,3
25 <sup>(b)</sup>	70,0	63,7	57,4	49,7	40,6
35 <sup>(b)</sup>	86,0	78,3	70,5	61,1	49,9
50 <sup>(b)</sup>	103,0	93,7	84,5	73,1	59,7
70 <sup>(b)</sup>	130,0	118,3	106,6	92,3	75,4
95 <sup>(b)</sup>	156,0	142,0	127,9	110,8	90,5
120 <sup>(b)</sup>	179,0	162,9	146,8	127,1	103,8

<sup>(a)</sup> The values of the current-carrying capacity are based on one control circuit pari for size between 0,2 mm<sup>2</sup> and 0,75 mm<sup>2</sup>.

<sup>(b)</sup> The values of the current-carrying capacity are based one symmetrical three-phase circuit for size 0,75 mm<sup>2</sup> and greater.

Table B.7c. Current-carrying capacity of conductors according to IEC 60204-1:2016. Multicore cables installed in free air, horizontal or vertical without gap between cables on walls.

Size [mm <sup>2</sup> ]	Current-carrying capacity [A] for PVC insulated copper cables				
	Installation in free air, horizontal or vertical without gap between cables on walls				
	Ambient temperature Ta				
	40°C	45°C	50°C	55°C	60°C
0,2 <sup>(a)</sup>	4,4	4,0	3,6	3,1	2,6
0,5 <sup>(a)</sup>	7,5	6,8	6,2	5,3	4,4
0,75 <sup>(a)</sup>	9,5	8,6	7,8	6,7	5,5
0,75 <sup>(b)</sup>	9,8	8,9	8,0	7,0	5,7
1 <sup>(b)</sup>	11,7	10,6	9,6	8,3	6,8
1,5 <sup>(b)</sup>	15,2	13,8	12,5	10,8	8,8
2,5 <sup>(b)</sup>	21,0	19,1	17,2	14,9	12,2
4 <sup>(b)</sup>	28,0	25,5	23,0	19,9	16,2
6 <sup>(b)</sup>	36,0	32,8	29,5	25,6	20,9
10 <sup>(b)</sup>	50,0	45,5	41,0	35,5	29,0
16 <sup>(b)</sup>	66,0	60,1	54,1	46,9	38,3
25 <sup>(b)</sup>	84,0	76,4	68,9	59,6	48,7
35 <sup>(b)</sup>	104,0	94,6	85,3	73,8	60,3
50 <sup>(b)</sup>	125,0	113,8	102,5	88,8	72,5
70 <sup>(b)</sup>	160,0	145,6	131,2	113,6	92,8
95 <sup>(b)</sup>	194,0	176,5	159,1	137,7	112,5
120 <sup>(b)</sup>	225,0	204,8	184,5	159,8	130,5

(a) The values of the current-carrying capacity are based on one control circuit pari for size between 0,2 mm<sup>2</sup> and 0,75 mm<sup>2</sup>.

(b) The values of the current-carrying capacity are based one symmetrical three-phase circuit for size 0,75 mm<sup>2</sup> and greater.

Table B.7d. Current-carrying capacity of conductors according to IEC 60204-1:2016. Multicore cables installed in free air, horizontal or vertical laid on open cable trays.

Size [mm <sup>2</sup> ]	Current-carrying capacity [A] for PVC insulated copper cables				
	Installation in free air, horizontal or vertical laid on open trays				
	Ambient temperature Ta				
	40°C	45°C	50°C	55°C	60°C
0,2 <sup>(a)</sup>	4,4	4,0	3,6	3,1	2,6
0,5 <sup>(a)</sup>	7,8	7,1	6,4	5,5	4,5
0,75 <sup>(a)</sup>	10	9,1	8,2	7,1	5,8
0,75 <sup>(b)</sup>	10,4	9,5	8,5	7,4	6,0
1 <sup>(b)</sup>	12,4	11,3	10,2	8,8	7,2
1,5 <sup>(b)</sup>	16,1	14,7	13,2	11,4	9,3
2,5 <sup>(b)</sup>	22,0	20,0	18,0	15,6	12,8
4 <sup>(b)</sup>	30,0	27,3	24,6	21,3	17,4
6 <sup>(b)</sup>	37,0	33,7	30,3	26,3	21,5
10 <sup>(b)</sup>	52,0	47,3	42,6	36,9	30,2
16 <sup>(b)</sup>	70,0	63,7	57,4	49,7	40,6
25 <sup>(b)</sup>	88,0	80,1	72,2	62,5	51,0
35 <sup>(b)</sup>	110,0	100,1	90,2	78,1	63,8
50 <sup>(b)</sup>	133,0	121,0	109,1	94,4	77,1
70 <sup>(b)</sup>	171,0	155,6	140,2	121,4	99,2
95 <sup>(b)</sup>	207,0	188,4	169,7	147,0	120,1
120 <sup>(b)</sup>	240,0	218,4	196,8	170,4	139,2

(a) The values of the current-carrying capacity are based on one control circuit pari for size between 0,2 mm<sup>2</sup> and 0,75 mm<sup>2</sup>.

(b) The values of the current-carrying capacity are based one symmetrical three-phase circuit for size 0,75 mm<sup>2</sup> and greater.

Table B.7e. Derating factors based on the number loaded conductors or pairs in multicore cables according to EN 60204-1:2016.

Number of loaded conductors or pairs	Conductors' sizes > 1 mm <sup>2</sup>	Pairs' sizes 0,25 mm <sup>2</sup> to 0,75 mm <sup>2</sup>
1	-	1,0
3	1,0	-
5	0,75	0,39
7	0,65	0,34
10	0,55	0,29
24	0,40	0,21

Table B.7f. Derating factors for cables grouping according to IEC 60204-1:2016.

Method of installation	Number of loaded circuits/cables			
	2	4	6	9
Control circuit pairs < 0,5 mm <sup>2</sup> independent of methods of installation	0,76	0,57	0,48	0,40
Conductors, single core cables or multicore cables in conduits.	0,80	0,65	0,57	0,50
Multicore cables installed in free air, horizontal or vertical without gap between cables and walls (single layer).	0,85	0,75	0,72	0,70
Multicore cables installed in free air, horizontal or vertical on one perforated tray <sup>(a)</sup> without gap between cables (single layer).	0,88	0,77	0,73	0,72
Multicore cables installed in free air, horizontal or vertical on one perforated tray <sup>(a)</sup> without gap between cables (2 or 3 trays, with a vertical spacing between each tray of 300 mm).	0,86	0,76	0,71	0,66

<sup>(a)</sup> A perforated cable tray is a tray where the holes occupy more than 30 % of the area of the base.

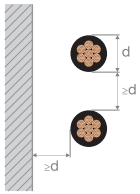

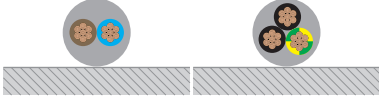
**Nota 1.** These factors are applicable to cables, all equally loaded, the circuit itself symmetrically loaded or to groups of circuits of insulated conductors or cables having the same allowable maximum open Temperature range.

**Nota 2.** The same factors are applied to groups of two or three single core or multicore cables.

## B.8 Ampacities of conductors according to VDE 0298-4

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.8a. Ampacities of conductors with rated voltage up to 1000V according to VDE 0298-4 – Ed. 2013 - Table 11

Conductor's size [mm <sup>2</sup> ]	Cable's type and method of installation					
	Single core cables (rubber, PVC, TPE insulated; heat resistant(3)) free in air	Multicore cables (rubber, PVC, TPE insulated) for home- and portable apparatus, on surfaces			Multicore cables (rubber, PVC, TPE insulated; heat resistant(3)) excluded for home- and portable apparatus, on surfaces	
						
	Number of current carrying conductors					
	1	2	3	2	3	
	Allowable ampacity [A]					
0,08 <sup>(1)</sup>	1,5	-	-	1	1	
0,14 <sup>(1)</sup>	3	-	-	2	2	
0,25 <sup>(1)</sup>	5	-	-	4	4	
0,34 <sup>(1)</sup>	8	-	-	6	6	
0,5	12 <sup>(2)</sup>	3	3	9 <sup>(2)</sup>	9 <sup>(2)</sup>	
0,75	15	6	6	12	12	
1	19	10	10	15	15	
1,5	24	16	16	18	18	
2,5	32	25	20	26	26	
4	42	32	25	34	34	
6	54	40	-	44	44	
10	73	63	-	61	61	
16	98	-	-	82	82	
25	129	-	-	108	108	
35	158	-	-	135	135	
50	198	-	-	168	168	
70	245	-	-	207	207	
95	292	-	-	250	250	
120	344	-	-	292	292	
150	391	-	-	335	335	
185	448	-	-	382	382	
240	528	-	-	453	453	
300	608	-	-	523	523	
400	726	-	-	-	-	
500	830	-	-	-	-	
Factor	Reference table for the correction factors for the ampacities indicated above					
Ambient temperature	Table B.8b	Table B.8b	Table B.8b	Table B.8b	Table B.8b	
Circuits of single-core cables	Table B.8c	-	-	-	-	
Circuits of multi-cores cables	-	Table B.8d	Table B.8d	Table B.8d	Table B.8d	
Factor	Reference table for the correction factors for the ampacities indicated above					
Cables wound in spool, reel, drum or helix-type coiled	Table B.8e	Table B.8e	Table B.8e	Table B.8e	Table B.8e	
Installation on surfaces, in raceways or conduits	Table B.8f	Table B.8f	Table B.8f	Table B.8f	Table B.8f	
Installation in cable trays	Table B.8g	Table B.8h	Table B.8h	Table B.8h	Table B.8h	

(1) According to VDE 0891-1, values not included in VDE 0298-4.

(2) According to VDE 0100-523, values not included in VDE 0298-4.

(3) Heat resistant cables are typically with at least 90°C insulation temperature (see VDE 0298-4 for more details).

**Table B.8b. Correction factors for the ampacities indicated in the table B.8a for different ambient temperatures and different insulation temperatures of cables according to VDE 0298-4 Ed. 2013 - Table 17-18**

Ambient temperature Ta	Insulation temperature						
	60°C	70°C	80°C	90°C <sup>(1)</sup>	110°C <sup>(1)</sup>	135°C <sup>(1)</sup>	180°C <sup>(1)</sup>
	Correction factor						
30	1,00	1,00	1,00	1,00	1,00	1,00	1,00
35	0,91	0,94	0,95	1,00	1,00	1,00	1,00
40	0,82	0,87	0,89	1,00	1,00	1,00	1,00
45	0,71	0,79	0,84	1,00	1,00	1,00	1,00
50	0,58	0,71	0,77	1,00	1,00	1,00	1,00
55	0,41	0,61	0,71	0,94	1,00	1,00	1,00
60	-	0,50	0,63	0,87	1,00	1,00	1,00
65	-	0,35	0,55	0,79	1,00	1,00	1,00
70	-	-	0,45	0,71	1,00	1,00	1,00
75	-	-	0,32	0,61	1,00	1,00	1,00
80	-	-	-	0,50	1,00	1,00	1,00
85	-	-	-	0,35	0,91	1,00	1,00
90	-	-	-	-	0,82	1,00	1,00
95	-	-	-	-	0,71	1,00	1,00
100	-	-	-	-	0,58	0,94	1,00
105	-	-	-	-	0,41	0,87	1,00
110	-	-	-	-	-	0,79	1,00
115	-	-	-	-	-	0,71	1,00
120	-	-	-	-	-	0,61	1,00
125	-	-	-	-	-	0,50	1,00
130	-	-	-	-	-	0,35	1,00
135	-	-	-	-	-	-	1,00
140	-	-	-	-	-	-	1,00
145	-	-	-	-	-	-	1,00
150	-	-	-	-	-	-	1,00
155	-	-	-	-	-	-	0,91
160	-	-	-	-	-	-	0,82
165	-	-	-	-	-	-	0,71
170	-	-	-	-	-	-	0,58
175	-	-	-	-	-	-	0,41

(1) Heat resistant cables (see VDE 0298-4 for more details).

**Table B.8c. Correction factors for single-core cables' circuits according to VDE 0298-4 – Ed. 2013 - Table 10 – Note a**

Ambient temperature Ta	Type of installation for single core cables	
	Clusters of single core cables in touch to each other or bundled installed on surfaces	Clusters of single core cables in touch to each other or bundled installed free in air or in cable trays
	Correction factor	
A.C. single-phase circuits or D.C. circuits	0,76	0,80
A.C. three-phase circuits	0,67	0,70

Attention: for single core cables installed in conduits or in ducts please see rule of Table 10 of VDE 0298-4 standard.

**Table B.8d. Correction factors for multi core cables' circuits up to 10 mm<sup>2</sup> size according to VDE 0298-4 – Ed. 2013 - Table 26**

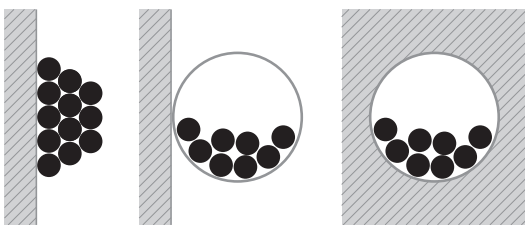
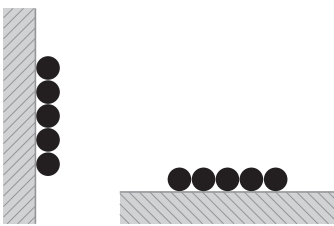
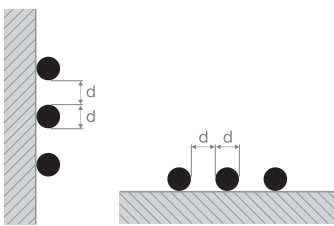
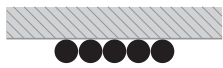
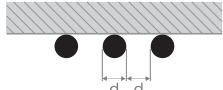
Number of current carrying conductors	Correction factor for cables in free air	Correction factor for cables in earth (burial)
5	0,75	0,70
7	0,65	0,60
10	0,55	0,50
14	0,50	0,45
19	0,45	0,40
24	0,40	0,35
40	0,35	0,30
61	0,30	0,25

Table B.8e. Correction factors for cables wound in spool, reel, drum or helix-type coiled according to VDE 0298-4 – Ed. 2013 - Tabelle 27

Number of layers on spool, reel or drum	1	2	3	4	5
Correction factor	0,80 <sup>(1)</sup>	0,61	0,49	0,42	0,38

(1) Use this correction factor for spiral cables (in one layer).

Table B.8f. Correction factors for single-core and multicore cables' circuits on surfaces, walls, ceiling or in conduits according to VDE 0298-4 – Ed. 2013 - Table 21

Installation method	Number of multi-core cables or number of A.C. or three-phase circuits of single-core cables (2 or 3 current-carrying conductors)														
	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
<p>Bunched directly and in touch between each other on floors, on walls, in conduits or in wireways or in the wall.</p> 	1,00	0,80	0,70	0,65	0,60	0,57	0,54	0,52	0,50	0,48	0,45	0,43	0,41	0,39	0,38
<p>In one layer in touch between each other on floors or attached to walls.</p> 	1,00	0,85	0,79	0,75	0,73	0,72	0,72	0,71	0,70	0,70	0,70	0,70	0,70	0,70	0,70
<p>In one layer with a clearance equal to the external diameter "d" on floors or attached to walls</p> 	1,00	0,94	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90
<p>In one layer in touch between each other under the ceiling.</p> 	0,95	0,81	0,72	0,68	0,66	0,64	0,63	0,62	0,61	0,61	0,61	0,61	0,61	0,61	0,61
<p>In one layer with a clearance equal to the external diameter "d" under the ceiling.</p> 	0,95	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85

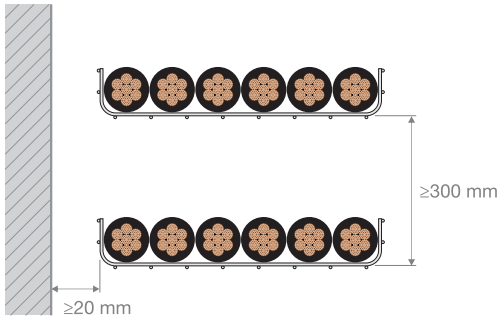
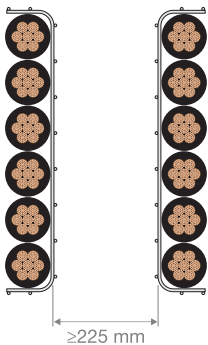
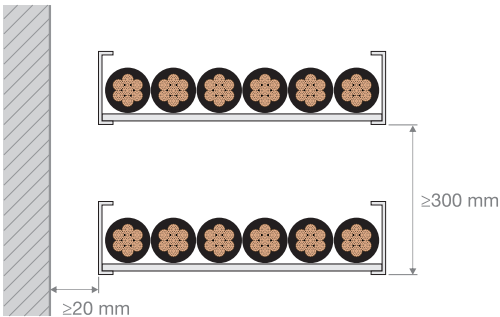
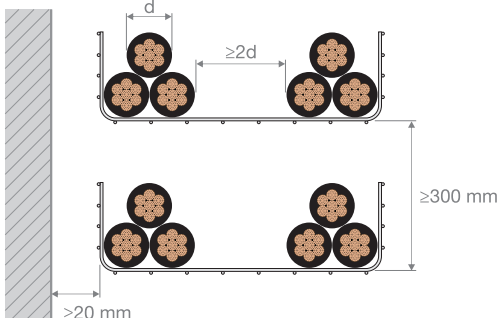
Note 1. Correction factors can be applied only to similar loaded cables of a similar type of installation and nominal cross sections differ one step only.

Note 2. If the actual horizontal-space between adjacent cables is more than double of the outer diameter, no correction factor is necessary.

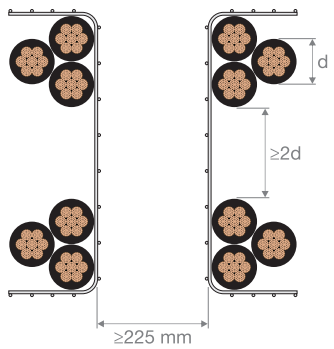
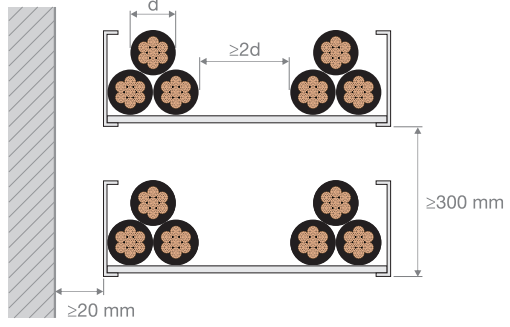
Note 3. For a system consisting of multicore cables, the number of circuits have to be considered. The correction factor has to be applied to the ampacity of the two or three current carrying conductors in the cables.

Note 4. If the grouping of single core cables consists of n loaded single core cables, the correction factor shall be determinate for n/2 or n/3 circuits depending on the number of current-carrying conductors.

Table B.8g. Correction factors for single-core cables' circuits installed in cable trays according to VDE 0298-4 – Ed. 2013 - Tabelle 23

Installation method	Number of cable trays	Number of three-phase circuits of single-core cables		
		1	2	3
Single layer in touch between each other in ventilated cable trays in a horizontal plane arrangement.				
	1	0,98	0,91	0,87
	2	0,96	0,87	0,81
	3	0,95	0,85	0,78
Single layer between each other in ventilated cable trays in a vertical plane arrangement.				
	1	0,96	0,86	-
	2	0,95	0,84	-
Single layer between each other in cable ladders in a horizontal plane arrangement.				
	1	1,00	0,97	0,96
	2	0,98	0,93	0,89
	3	0,97	0,90	0,86
Delta configuration in ventilated cable trays in a horizontal plane arrangement.				
	1	1,00	0,98	0,96
	2	0,97	0,93	0,89
	3	0,96	0,92	0,86

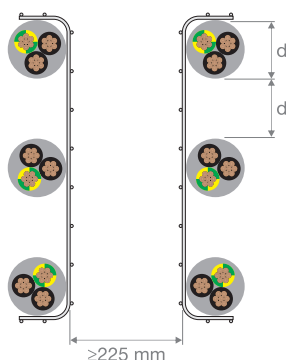
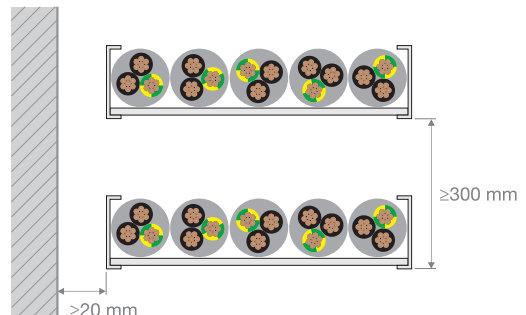
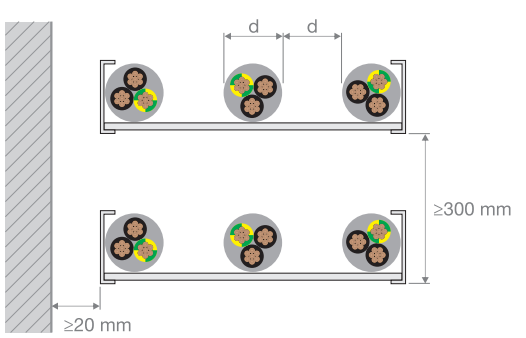


Installation method	Number of cable trays	Number of three-phase circuits of single-core cables		
		1	2	3
Correction factor				
<p>Delta configuration in ventilated cable trays in a vertical plane arrangement.</p> 	1	1,00	0,91	0,89
	2	1,00	0,90	0,86
<p>Delta configuration in cable ladders in a horizontal plane arrangement.</p> 	1	1,00	1,00	1,00
	2	0,97	0,95	0,93
	3	0,96	0,94	0,90

Note 1. If the cables are lying on top to each other as well as if minimum distance required is not guaranteed, extra correction factors must be applied, i.e. correction factors of table B.8f.

Table B.8h. Correction factors for multicore cables installed in cable trays according to VDE 0298-4 – Ed. 2013 - Table 22

Installation method	Number of cable trays	Number of multicore cables					
		1	2	3	4	6	9
		Correction factor					
<p>Single layer in touch between each other in non ventilated cable trays in a horizontal plane arrangement.</p> 	1	0,97	0,84	0,78	0,75	0,71	0,68
	2	0,97	0,83	0,76	0,72	0,68	0,63
	3	0,97	0,82	0,75	0,71	0,66	0,61
	6	0,97	0,81	0,73	0,69	0,63	0,58
<p>Single layer in touch between each other in ventilated cable trays in a horizontal plane arrangement.</p> 	1	1,00	0,88	0,82	0,79	0,76	0,73
	2	1,00	0,87	0,80	0,77	0,73	0,68
	3	1,00	0,86	0,79	0,76	0,71	0,66
	6	1,00	0,84	0,77	0,73	0,68	0,64
<p>Single layer with a clearance equal to the external diameter "d" in ventilated cable trays in a horizontal plane arrangement.</p> 	1	1,00	1,00	0,98	0,95	0,91	-
	2	1,00	0,99	0,96	0,92	0,87	-
	3	1,00	0,98	0,95	0,91	0,85	-
<p>Single layer between each other in ventilated cable trays in a vertical plane arrangement.</p> 	1	1,00	0,88	0,82	0,78	0,73	0,72
	2	1,00	0,88	0,81	0,76	0,71	0,70

Installation method	Number of cable trays	Number of multicore cables					
		1	2	3	4	6	9
		Correction factor					
<p>Single layer with a clearance equal to the external diameter "d" in ventilated cable trays in a vertical plane arrangement.</p> 	1	1,00	0,91	0,89	0,88	0,87	-
2	1,00	0,91	0,88	0,87	0,85	-	
<p>Single layer between each other in cable ladders in a horizontal plane arrangement.</p> 	1	1,00	0,87	0,82	0,80	0,79	0,78
2	1,00	0,86	0,81	0,78	0,76	0,73	
3	1,00	0,85	0,79	0,76	0,73	0,70	
6	1,00	0,83	0,76	0,73	0,69	0,66	
<p>Single layer with a clearance equal to the external diameter "d" in cable ladders in a horizontal plane arrangement.</p> 	1	1,00	1,00	1,00	1,00	1,00	-
2	1,00	0,99	0,98	0,97	0,96	-	
3	1,00	0,98	0,97	0,96	0,93	-	

Note 1. If the cables are lying on top to each other as well as if minimum distance required is not guaranteed, extra correction factors must be applied, i.e. correction factors of table B.8f.

## B.9 Ampacities of conductors according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

The tables show the ampacities of the conductors published in the standard to which reference must always be made.

Table B.9a. Ampacities of single-core cables with thermoplastic insulation at 30°C ambient temperature according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

Conductor's size [mm <sup>2</sup> ]	Type of cable									
	Single core cables with thermoplastic insulation such as PVC 60°C, PVC 75°C and PVC 80°C with voltage rating up to 1000V a.c. or 1500V d.c. ambient temperature 30°C									
	Base method of installation									
	Trefoil cables in air	Cables in conduit in air			Cables on a surface in contact with each other in air		Cables on a horizontal surface at a distance between them in air		Cables on a vertical surface at a distance between them in air	
	Reference to the installation methods indicated in the standards									
	UNEL 35024-1/CEI 64-8 Met. 11, 12, 21, 25, 43, 52, 53	UNEL 35024-1/CEI 64-8 Met. 3, 4, 5, 22, 23, 24, 31, 32, 33, 34, 41, 42, 72			UNEL 35024-1/CEI 64-8 Met. 13, 14, 15, 16, 17		UNEL 35024-1/CEI 64-8 Met. 14, 15, 16		UNEL 35024-1/CEI 64-8 Met. 13, 14, 15, 16	
	IEC 60364-5-52 Met. F Tab. B.52.10 (5)	IEC 60364-5-52 Met. B1 Tab. B.52.2 (4), B.52.4 (4)			IEC 60364-5-52 Met. F Tab. B.52.10 (4), B.52.10 (6)		IEC 60364-5-52 Met. G Tab. B.52.10 (7)		IEC 60364-5-52 Met. G Tab. B.52.10 (8)	
	Reference to other installation methods <sup>(1)</sup>									
	Diagrams U1-3	Diagrams U2-2	Diagrams U2-3	Diagrams U3-2	Diagrams U3-3	Diagrams U4-2	Diagrams U4-3	Diagrams U5-2	Diagrams U5-3	
Number of current carrying conductors										
3			2		3		2		3	
Allowable ampacity [A] <sup>(2)</sup>										
0,5	8	9	8	11	9	12	12	10	10	
0,75	11	11	10	14	11	16	16	13	13	
1	13	13,5	12	17	14	19	19	16	16	
1,5	19,5	17,5	15,5	22	19,5	24	24	21	21	
2,5	26	24	21	30	26	34	34	29	29	
4	35	32	28	40	35	45	45	39	39	
6	46	41	36	52	46	59	59	51	51	
10	63	57	50	71	63	81	81	71	71	
16	85	76	68	96	85	110	110	97	97	
25	110	101	89	131	114	146	146	130	130	
35	137	125	110	162	143	181	181	162	162	
50	167	151	134	196	174	219	219	197	197	
70	216	192	171	251	225	281	281	254	254	
95	264	232	207	304	275	341	341	311	311	
120	308	269	239	352	321	396	396	362	362	
150	356	309	275	406	372	456	456	419	419	
185	409	353	314	463	427	521	521	480	480	
240	485	415	369	546	507	615	615	569	569	
300	561	477	426	629	587	709	709	659	659	
400	656	571	510	754	689	852	852	795	795	
500	759	656	587	868	789	982	982	920	920	
630	855	758	678	1005	905	1138	1138	1070	1070	

(1) Refer to Table B.9c and to the standards for more details.

(2) The values not published in the Standards have been calculated using the interpolation curves suggested by the IEC 60364-5-52 norm.

Table B.9b. Ampacities of single-core cables with elastomeric insulation at 30°C ambient temperature according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

Conductor's size [mm <sup>2</sup> ]	Type of cable									
	Single-core cables with thermoplastic insulation such as XLPE, TPE, PUR, Silicon, Rubber or PVC 90°C with voltage rating up to 1000V a.c. or 1500V d.c. ambient temperature 30°C									
	Base method of installation									
	Trefoil cables in air	Cables in conduit in air		Cables on a surface in contact with each other in air		Cables on a horizontal surface at a distance between them in air		Cables on a vertical surface at a distance between them in air		
	Reference to the installation methods indicated in the standards									
	UNEL 35024-1/CEI 64-8 Met. 11, 12, 21, 25, 43, 52, 53	UNEL 35024-1/CEI 64-8 Met. 3, 4, 5, 22, 23, 24, 31, 32, 33, 34, 41, 42, 72		UNEL 35024-1/CEI 64-8 Met. 13, 14, 15, 16, 17		UNEL 35024-1/CEI 64-8 Met. 14, 15, 16		UNEL 35024-1/CEI 64-8 Met. 13, 14, 15, 16		
	IEC 60364-5-52 Met. F Tab. B.52.12 (5)	IEC 60364-5-52 Met. B1 Tab. B.52.3 (4), B.52.5 (4)		IEC 60364-5-52 Met. F Tab. B.52.12 (4), B.52.12 (6)		IEC 60364-5-52 Met. G Tab. B.52.12 (7)		IEC 60364-5-52 Met. G Tab. B.52.12 (8)		
	Reference to other installation methods <sup>(1)</sup>									
	Diagrams U1-3	Diagrams U2-2	Diagrams U2-3	Diagrams U3-2	Diagrams U3-3	Diagrams U4-2	Diagrams U4-3	Diagrams U5-2	Diagrams U5-3	
3	2	3	2	3	2	3	2	3		
Number of current carrying conductors										
Allowable ampacity [A] <sup>(2)</sup>										
0,5	10	12	10	13	10	15	15	12	12	
0,75	13	15	13	17	14	19	19	16	16	
1	16	17	15	21	17	23	23	19	19	
1,5	24	23	20	27	24	30	30	25	25	
2,5	33	31	28	37	33	41	41	35	35	
4	45	42	37	50	45	56	56	48	48	
6	58	54	48	64	58	73	73	63	63	
10	80	75	66	88	80	101	101	88	88	
16	107	100	88	119	107	137	137	120	120	
25	135	133	117	161	141	182	182	161	161	
35	169	164	144	200	176	226	226	201	201	
50	207	198	175	242	216	275	275	246	246	
70	268	253	222	310	279	353	353	318	318	
95	328	306	269	377	342	430	430	389	389	
120	383	354	312	437	400	500	500	454	454	
150	444	402	355	504	464	577	577	527	527	
185	510	472	417	575	533	661	661	605	605	
240	607	555	490	679	634	781	781	719	719	
300	703	628	553	783	736	902	902	833	833	
400	823	751	661	940	868	1085	1085	1008	1008	
500	946	864	760	1083	998	1253	1253	1169	1169	
630	1088	998	879	1254	1151	1454	1454	1362	1362	

(1) Refer to Table B.9c and to the standards for more details.

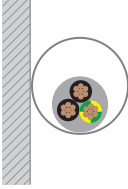
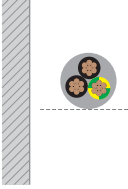
(2) The values not published in the Standards have been calculated using the interpolation curves suggested by the IEC 60364-5-52 norm.

Table B.9c. Other methods of installation of single-core cables according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

Diagram	Representative images	Note
U1-3		<p>Trefoil installation on open cable trays (wire mesh, ventilated or ladder) in vertical or horizontal position.</p> <p>Installation on non-ventilated cable trays without cover in vertical or horizontal position.</p> <p>Installation in cavities of structures or in open or ventilated tunnels with horizontal or vertical path for maximum lengths of 0.5 m for cables up to 10 mm<sup>2</sup>, 1 m for cables up to 95 mm<sup>2</sup> and 1.5 m for cables over 95 mm<sup>2</sup>.</p>
U2-2		<p>Installation in conduits laid on or spaced from walls.</p> <p>Installation in cable trunking on a wall in vertical or horizontal position.</p> <p>Installation in circular or non-circular conduits laid in cavities of structures.</p>
U2-3		<p>Installation in conduits laid on or spaced from walls.</p> <p>Installation in cable trunking on a wall in vertical or horizontal position.</p> <p>Installation in circular or non-circular conduits laid in cavities of structures.</p>

Diagram	Representative images	Note
U3-2		Installation on open cable trays (wire mesh, ventilated or ladder) in vertical or horizontal position.
U3-3		Installation on open cable trays (wire mesh, ventilated or ladder) in vertical or horizontal position.
U4-2		Installation at a distance on open cable trays (wire mesh, ventilated or ladder) in horizontal position.
U4-3		Installation at a distance on open cable trays (wire mesh, ventilated or ladder) in horizontal position.
U5-2		Installation at a distance on open cable trays (wire mesh, ventilated or ladder) in vertical position.
U5-3		Installation at a distance on open cable trays (wire mesh, ventilated or ladder) in vertical position.

Table B.9d. Ampacities of multi-core cables with thermoplastic insulation at 30°C ambient temperature according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

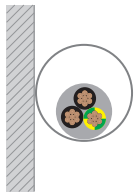
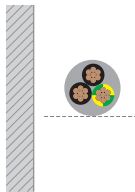
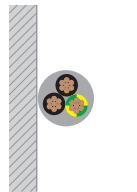
Conductor's size [mm <sup>2</sup> ]	Type of cable					
	Multi-core cables with thermoplastic insulation such as PVC 60°C, PVC 75°C and PVC 80°C with voltage rating up to 1000V a.c. or 1500V d.c. ambient temperature 30°C					
	Base method of installation					
	Cables in conduit in air		Cables on a surface in air		Cables on wall/ceiling in air	
						
	Reference to the installation methods indicated in the standards					
	UNEL 35024-1/CEI 64-8 Met. 3A, 4A, 5A, 21, 22A, 24A, 25, 31, 32, 33A, 34A, 43		UNEL 35024-1/CEI 64-8 Met. 13, 14, 15, 16, 17		UNEL 35024-1/CEI 64-8 Met. 11, 11A, 12, 52, 53	
	IEC 60364-5-52 Met. B2 Tab. B.52.2 (5), B.52.4 (5)		IEC 60364-5-52 Met. E Tab. B.52.10 (2), B.52.10 (3)		IEC 60364-5-52 Met. C Tab. B.52.2 (6), B.52.4 (6)	
	Reference to other installation methods <sup>(1)</sup>					
	Diagrams M1-2	Diagrams M1-3	Diagrams M2-2	Diagrams M2-3	Diagrams M3-2	Diagrams M3-3
2	3	2	3	2	3	
Number of current carrying conductors						
2		3		3		
Allowable ampacity [A] <sup>(2)</sup>						
0,5	9	8	11	9	10	9
0,75	11	10	14	12	13	11
1	13,5	12	15	13,6	15	13,5
1,5	16,5	15	22	18,5	19,5	17,5
2,5	23	20	30	25	27	24
4	30	27	40	34	36	32
6	38	34	51	43	46	41
10	52	46	70	60	63	57
16	69	62	94	80	85	76
25	90	80	119	101	112	96
35	111	99	148	126	138	119
50	133	118	180	153	168	144
70	168	149	232	196	213	184
95	201	179	282	238	258	223
120	232	206	328	276	299	259
150	258	225	379	319	344	299
185	294	255	434	364	392	341
240	344	297	514	430	461	403
300	394	339	593	497	530	464
400	477	425	715	597	634	557
500	545	486	826	689	729	642
630	626	559	958	798	843	743

(1) Refer to Table B.9f and to the standards for more details.

(2) The values not published in the Standards have been calculated using the interpolation curves suggested by the IEC 60364-5-52 norm.



Table B.9e. Ampacities of multi-core cables with elastomeric insulation at 30°C ambient temperature according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

Conductor's size [mm <sup>2</sup> ]	Type of cable					
	Multi-core cables with thermoplastic insulation such as XLPE, TPE, PUR, Silicon, Rubber or PVC 90°C with voltage rating up to 1000V a.c. or 1500V d.c. ambient temperature 30°C					
	Base method of installation					
	Cables in conduit in air		Cables on a surface in air		Cables on wall/ceiling in air	
						
	Reference to the installation methods indicated in the standards					
	UNEL 35024-1/CEI 64-8 Met. 3A, 4A, 5A, 21, 22A, 24A, 25, 31, 32, 33A, 34A, 43		UNEL 35024-1/CEI 64-8 Met. 13, 14, 15, 16, 17		UNEL 35024-1/CEI 64-8 Met. 11, 11A, 12, 52, 53	
	IEC 60364-5-52 Met. B2 Tab. B.52.3 (5), B.52.5 (5)		IEC 60364-5-52 Met. E Tab. B.52.12 (2), B.52.12 (3)		IEC 60364-5-52 Met. C Tab. B.52.3 (6), B.52.5 (6)	
	Reference to other installation methods <sup>(1)</sup>					
	Diagrams M1-2		Diagrams M1-3		Diagrams M3-2	
Diagrams M2-2		Diagrams M2-3		Diagrams M3-3		
Number of current carrying conductors						
2		3		3		
Allowable ampacity [A] <sup>(2)</sup>						
0,5	11	10	13	12	11	
0,75	15	13	17	15	14	
1	17	15	19	17	17	
1,5	22	19,5	26	23	22	
2,5	30	26	36	32	30	
4	40	35	49	42	40	
6	51	44	63	54	52	
10	69	60	86	75	71	
16	91	80	115	100	96	
25	119	105	149	127	119	
35	146	128	185	158	147	
50	175	154	225	192	179	
70	221	194	289	246	229	
95	265	233	352	298	278	
120	305	268	410	346	322	
150	334	300	473	399	371	
185	384	340	542	456	424	
240	459	398	641	538	500	
300	532	455	741	621	576	
400	628	552	892	745	710	
500	718	631	1030	859	816	
630	825	725	1196	995	943	

(1) Refer to Table B.9f and to the standards for more details.

(2) The values not published in the Standards have been calculated using the interpolation curves suggested by the IEC 60364-5-52 norm.

Table B.9f. Other methods of installation of single-core cables according to IEC 60364-5-52/CEI UNEL 35024-1/CEI 64-8

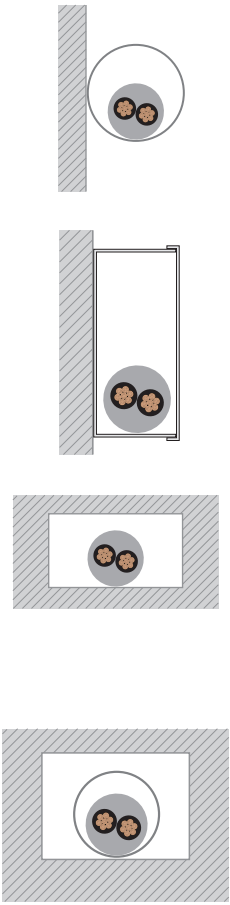
Diagram	Representative images	Note
M1-2		<p>Installation in conduits laid on or spaced from walls.</p> <p>Installation in cable trunking on a wall in vertical or horizontal position.</p> <p>Installation in cavities of structures or in open or ventilated tunnels with horizontal or vertical path for maximum lengths of 0.5 m for cables up to 10 mm<sup>2</sup>, 1 m for cables up to 95 mm<sup>2</sup> and 1.5 m for cables over 95 mm<sup>2</sup>.</p> <p>Installation in conduits laid in cavities of structures or in open or ventilated tunnels with horizontal or vertical path for maximum lengths of 0.5 m for cables up to 10 mm<sup>2</sup>, 1 m for cables up to 95 mm<sup>2</sup> and 1.5 m for cables over 95 mm<sup>2</sup>.</p>
M1-3		<p>Installation in conduits laid on or spaced from walls.</p> <p>Installation in cable trunking on a wall in vertical or horizontal position.</p> <p>Installation in cavities of structures or in open or ventilated tunnels with horizontal or vertical path for maximum lengths of 0.5 m for cables up to 10 mm<sup>2</sup>, 1 m for cables up to 95 mm<sup>2</sup> and 1.5 m for cables over 95 mm<sup>2</sup>.</p> <p>Installation in conduits laid in cavities of structures or in open or ventilated tunnels with horizontal or vertical path for maximum lengths of 0.5 m for cables up to 10 mm<sup>2</sup>, 1 m for cables up to 95 mm<sup>2</sup> and 1.5 m for cables over 95 mm<sup>2</sup>.</p>

Diagram	Representative images	Note
M2-2		Installation on open cable trays (wire mesh, ventilated or ladder) in vertical or horizontal position.
M2-3		Installation on open cable trays (wire mesh, ventilated or ladder) in vertical or horizontal position.
M3-2		Installation on or spaced from walls.  Installation on non-ventilated cable trays without cover in vertical or horizontal position.
M3-3		Installation on or spaced from walls.  Installation on non-ventilated cable trays without cover in vertical or horizontal position.

To the ampacities indicated in the previous tables it is necessary to apply the correction factors that take into account the installation configuration and in particular the ambient temperature and the number of circuits. By circuit we mean a three-core or two-core cable or three single-core cables in a three-phase system or two single-core cables in a phase-phase or phase-ground system.

For ambient temperatures other than 30°C use Table B.9g.

For installations of single-core or multi-core cable circuits on walls, floors, ceilings, non-ventilated cable trays or conduits use Table B.8f.

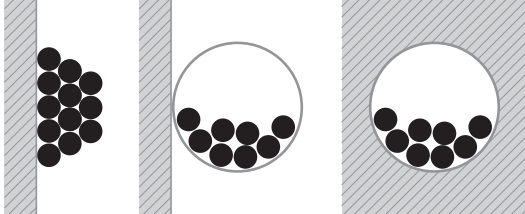
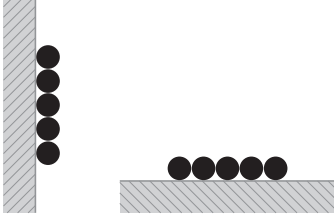
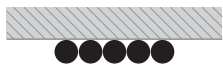
For installations of single-core cable circuits in cable trays use Table B.8g.

For installations of multi-core cables in cable trays use Table B.8h.

**Table B.9g. Correction factors for the ampacities for different ambient temperatures and different insulation temperatures of cables**

Ambient temperature	Insulation temperature				
	60°C	70°C	75°C	80°C	90°C
Correction factor					
10	1,29	1,22	1,20	1,18	1,15
15	1,22	1,17	1,15	1,14	1,12
20	1,15	1,12	1,11	1,10	1,08
25	1,08	1,06	1,05	1,05	1,04
30	1,00	1,00	1,00	1,00	1,00
35	0,91	0,94	0,94	0,95	0,96
40	0,82	0,87	0,88	0,89	0,91
45	0,71	0,79	0,82	0,84	0,87
50	0,58	0,71	0,75	0,77	0,82
55	0,41	0,61	0,67	0,71	0,76
60	-	0,50	0,58	0,63	0,71
65	-	0,35	0,47	0,55	0,65
70	-	-	0,33	0,45	0,58
75	-	-	-	0,32	0,50
80	-	-	-	-	0,41
85	-	-	-	-	0,29

**Table B.9h. Correction factors for single-core and multicore cables' circuits on surfaces, walls, ceiling, non-ventilated cable trays or in conduits**

Installation method	Number of multi-core cables or number of circuits of single-core cables (2 or 3 current-carrying conductors)														
	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
Correction factor															
Bunched directly and in touch between each other on floors, on walls, in conduits or in wireways or in the wall. 	1,00	0,80	0,70	0,65	0,60	0,57	0,54	0,52	0,50	0,48	0,45	0,43	0,41	0,39	0,38
In one layer in touch between each other on floors or attached to walls. 	1,00	0,85	0,79	0,75	0,73	0,72	0,72	0,71	0,70	0,70	0,70	0,70	0,70	0,70	0,70
In one layer in touch between each other under the ceiling. 	0,95	0,81	0,72	0,68	0,66	0,64	0,63	0,62	0,61	0,61	0,61	0,61	0,61	0,61	0,61

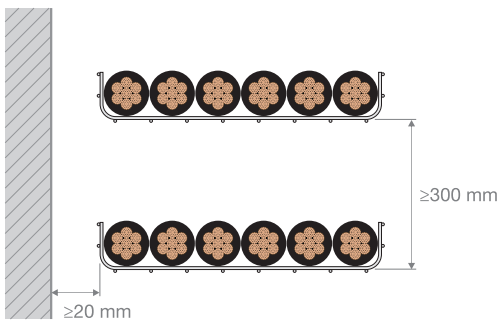
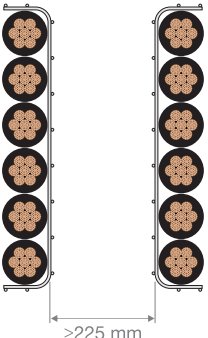
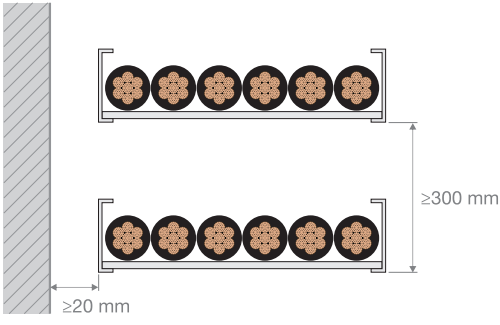
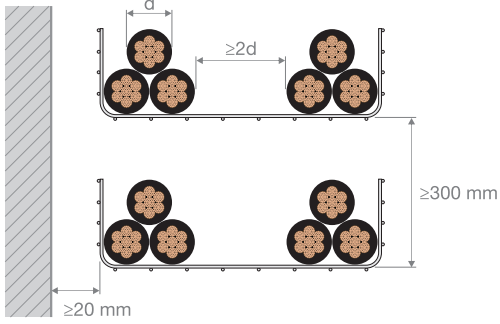
Note 1. Correction factors can be applied only to similar loaded cables of a similar type of installation and nominal cross sections differ one step only.

Note 2. If the actual horizontal-space between adjacent cables is more than double of the outer diameter, no correction factor is necessary.

Note 3. For a system consisting of multicore cables, the number of circuits have to be considered. The correction factor has to be applied to the ampacity of the two or three current carrying conductors in the cables.

Note 4. If the grouping of single core cables consists of n loaded single core cables, the correction factor shall be determinate for n/2 or n/3 circuits depending on the number of current-carrying conductors.

Table B.9i. Correction factors for single-core cables' circuits installed in cable trays

Installation method	Number of cable trays	Number of three-phase circuits of single-core cables		
		1	2	3
Correction factor				
<p>Single layer in touch between each other in <b>ventilated cable trays</b> in a horizontal plane arrangement.</p> 	1	0,98	0,91	0,87
	2	0,96	0,87	0,81
	3	0,95	0,85	0,78
<p>Single layer between each other in <b>ventilated cable trays</b> in a vertical plane arrangement.</p> 	1	0,96	0,86	-
	2	0,95	0,84	-
<p>Single layer between each other in <b>cable ladders</b> in a horizontal plane arrangement.</p> 	1	1,00	0,97	0,96
	2	0,98	0,93	0,89
	3	0,97	0,90	0,86
<p>Delta configuration in <b>ventilated cable trays</b> in a horizontal plane arrangement.</p> 	1	1,00	0,98	0,96
	2	0,97	0,93	0,89
	3	0,96	0,92	0,86

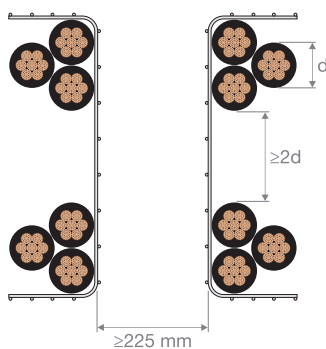
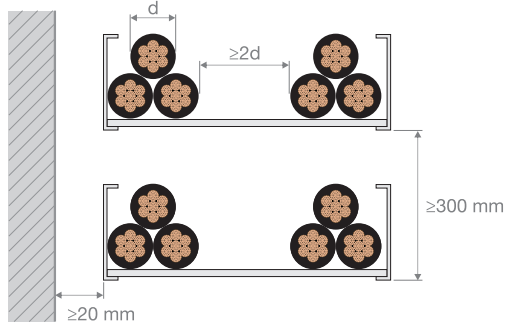
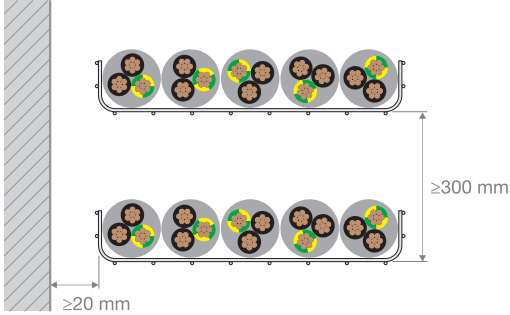
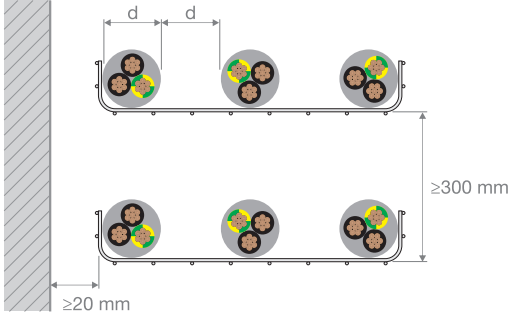
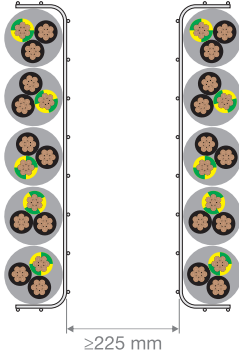
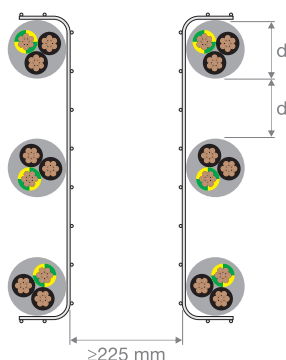
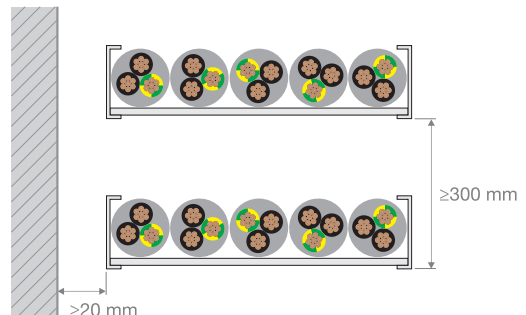
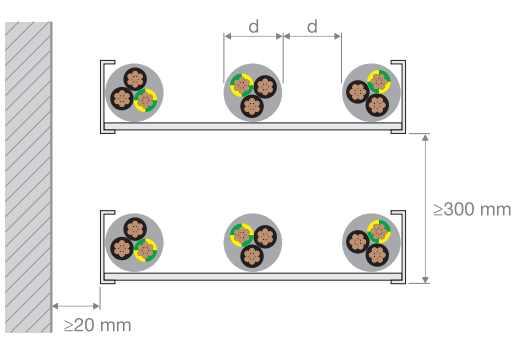
Installation method	Number of cable trays	Number of three-phase circuits of single-core cables		
		1	2	3
		Correction factor		
<p>Delta configuration in ventilated <b>cable trays</b> in a vertical plane arrangement.</p> 	1	1,00	0,91	0,89
2	1,00	0,90	0,86	
<p>Delta configuration in <b>cable ladders</b> in a horizontal plane arrangement.</p> 	1	1,00	1,00	1,00
2	0,97	0,95	0,93	
3	0,96	0,94	0,90	

Table B.9I. Correction factors for multicore cables installed in cable trays

Installation method	Number of cable trays	Number of multicore cables					
		1	2	3	4	6	9
		Correction factor					
Single layer in touch between each other in <b>ventilated cable trays</b> in a horizontal plane arrangement. 	1	1,00	0,88	0,82	0,79	0,76	0,73
	2	1,00	0,87	0,80	0,77	0,73	0,68
	3	1,00	0,86	0,79	0,76	0,71	0,66
	6	1,00	0,84	0,77	0,73	0,68	0,64
Single layer with a clearance equal to the external diameter "d" in <b>ventilated cable trays</b> in a horizontal plane arrangement. 	1	1,00	1,00	0,98	0,95	0,91	-
	2	1,00	0,99	0,96	0,92	0,87	-
	3	1,00	0,98	0,95	0,91	0,85	-
Single layer between each other in <b>ventilated cable trays</b> in a vertical plane arrangement. 	1	1,00	0,88	0,82	0,78	0,73	0,72
	2	1,00	0,88	0,81	0,76	0,71	0,70

Installation method	Number of cable trays	Number of multicore cables					
		1	2	3	4	6	9
Correction factor							
<p>Single layer with a clearance equal to the external diameter "d" in <b>ventilated cable trays</b> in a vertical plane arrangement.</p> 	1	1,00	0,91	0,89	0,88	0,87	-
	2	1,00	0,91	0,88	0,87	0,85	-
<p>Single layer between each other in <b>cable ladders</b> in a horizontal plane arrangement.</p> 	1	1,00	0,87	0,82	0,80	0,79	0,78
	2	1,00	0,86	0,81	0,78	0,76	0,73
	3	1,00	0,85	0,79	0,76	0,73	0,70
	6	1,00	0,83	0,76	0,73	0,69	0,66
<p>Single layer with a clearance equal to the external diameter "d" in <b>cable ladders</b> in a horizontal plane arrangement.</p> 	1	1,00	1,00	1,00	1,00	1,00	-
	2	1,00	0,99	0,98	0,97	0,96	-
	3	1,00	0,98	0,97	0,96	0,93	-



## Appendix C. Wire bending space at filed wiring terminals

Table C.1. Minimum bending space, terminal to wall, according to UL 508a – Rev. 2007-2018 (25 Wire Bending Space)

Wire Size		Minimum bending space d* [inch] & [mm]							
[AWG/kcmil]	[mm <sup>2</sup> ]	1 wire		2 wires		3 wires		4 or more wires	
14 ÷ 10 AWG	2,1 ÷ 5,3	Not specified		**		**		**	
8 ÷ 6	8,4 ÷ 13,3	1-1/2	38	**		**		**	
4 ÷ 3	21,2 ÷ 26,7	2	51	**		**		**	
2	33,6	2-1/2	64	**		**		**	
1	42,4	3	76	**		**		**	
1/0	53,5	5	127	5	127	7	178	n.a.	
2/0	67,4	6	152	6	152	7-1/2	191	n.a.	
3/0	85	7	178	7	178	8	203	n.a.	
4/0	107,2	7	178	7	178	8-1/2	216	n.a.	
250 kcmil	127	8	203	8	203	9	229	10	254
300	152	10	254	10	254	11	279	12	305
350	177	12	305	12	305	13	330	14	356
400	203	12	305	12	305	14	356	15	381
500	253	12	305	12	305	15	381	16	406
600	304	14	356	16	406	18	457	19	483
700	355	14	356	16	406	20	508	22	559
750 ÷ 800	380 ÷ 405	18	457	19	483	22	559	24	610
900	456	18	457	19	483	24	610	24	610
1000	506	20	508	n.a.		n.a.		n.a.	
1250	633	22	559	n.a.		n.a.		n.a.	
1500 ÷ 2000	760 ÷ 1013	24	610	n.a.		n.a.		n.a.	

\* The distance between the end of a pressure wire connector or terminal block for connection of a field installed wire, and the wall of the enclosure toward which the wire is to be directed.

\*\* Conductors smaller than 1/0 AWG shall not be connected in parallel.

n.a. Values not available.

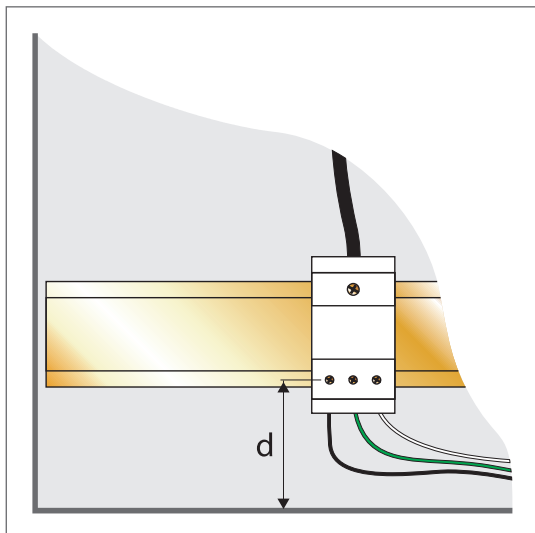


Figure C.1. Definition of bending space

## Appendix D. Motors' full-load currents

### D.1 Motors' full-load currents with alternate current according to UL 508a

Table D.1. Motors' full-load currents with alternate current related to the power in according to UL 508a – Rev. 2018 (50 Individual Load Ratings)

Power [HP]	110 – 120 V		200 V		208 V		220 – 240 V		380 – 415 V		440 – 480 V		550 – 600 V	
	Phase: 1	Phase: 3	Phase: 1	Phase: 3	Phase: 1	Phase: 3	Phase: 1	Phase: 3	Phase: 1	Phase: 3	Phase: 1	Phase: 3	Phase: 1	Phase: 3
1/10	3,0	–	–	–	–	–	1,5	–	1	–	–	–	–	–
1/8	3,8	–	–	–	–	–	1,9	–	1,2	–	–	–	–	–
1/6	4,4	–	2,5	–	2,4	–	2,2	–	1,4	–	–	–	–	–
1/4	5,8	–	3,3	–	3,2	–	2,9	–	1,8	–	–	–	–	–
1/3	7,2	–	4,1	–	4,0	–	3,6	–	2,3	–	–	–	–	–
1/2	9,8	4,4	5,6	2,5	5,4	2,4	4,9	2,2	3,2	1,3	2,5	1,1	2	0,9
3/4	13,8	6,4	7,9	3,7	7,6	3,5	6,9	3,2	4,5	1,8	3,5	1,6	2,8	1,3
1	16,0	8,4	9,2	4,8	8,8	4,6	8	4,2	5,1	2,3	4	2,1	3,2	1,7
1-1/2	20,0	12	11,5	6,9	11,0	6,6	10	6	6,4	3,3	5	3	4	2,4
2	24,0	13,6	13,8	7,8	13,2	7,5	12	6,8	7,7	4,3	6	3,4	4,8	2,7
3	34,0	19,2	19,6	11,0	18,7	10,6	17	9,6	10,9	6,1	8,5	4,8	6,8	3,9
5	56,0	30,4	32,2	17,5	30,8	16,7	28	15,2	17,9	9,7	14	7,6	11,2	6,1
7-1/2	80,0	44,0	46,0	25,3	44,0	24,2	40	22	27	14	21	11	16	9
10	100,0	56,0	57,5	32,2	55,0	30,8	50	28	33	18	26	14	20	11
15	135,0	84,0	–	48,3	–	46,2	56	42	44	27	34	21	27	17
20	–	108,0	–	62,1	–	59,4	88	54	56	34	44	27	35	22
25	–	136,0	–	78,2	–	74,8	110	68	70	44	55	34	44	27
30	–	160,0	–	92,0	–	88,0	136	80	87	51	68	40	54	32
40	–	208,0	–	120,0	–	114,0	176	104	112	66	88	52	70	41
50	–	260,0	–	150,0	–	143,0	216	130	139	83	108	65	86	52
60	–	–	–	177,0	–	169,0	–	154	–	103	–	77	–	62
75	–	–	–	221,0	–	211,0	–	192	–	128	–	96	–	77
100	–	–	–	285,0	–	273,0	–	248	–	165	–	124	–	99
125	–	–	–	359,0	–	343,0	–	312	–	208	–	156	–	125
150	–	–	–	414,0	–	396,0	–	360	–	240	–	180	–	144
200	–	–	–	552,0	–	528,0	–	480	–	320	–	240	–	192
250	–	–	–	–	–	–	–	604	–	403	–	302	–	242
300	–	–	–	–	–	–	–	722	–	482	–	361	–	289
350	–	–	–	–	–	–	–	828	–	560	–	414	–	336
400	–	–	–	–	–	–	–	954	–	636	–	477	–	382
450	–	–	–	–	–	–	–	1030	–	–	–	515	–	412
500	–	–	–	–	–	–	–	1180	–	786	–	590	–	472

\* To obtain full-load currents for 265 V and 277 V motors, decrease corresponding 220 – 240 volt ratings by 13% and 17% respectively.

## D.2 Motors' full-load currents with direct current according to UL 508a

Table D.2. Motors' full-load currents with direct current related to the power in according to UL 508a – Rev. 2018 (50 Individual Load Ratings)

Power [HP]	90 V	110 – 120 V	180 V	220 – 240 V	500 V	550 – 600 V
1/10	–	2,0	–	1,0	–	–
1/8	–	2,2	–	1,1	–	–
1/6	–	2,4	–	1,2	–	–
1/4*	4,0	3,1	2,0	1,6	–	–
1/3	5,2	4,1	2,6	2,0	–	–
1/2	6,8	5,4	3,4	2,7	–	–
3/4	9,6	7,6	4,8	3,8	–	1,6
1	12,2	9,5	6,1	4,7	–	2,0
1-1/2	–	13,2	8,3	6,6	–	2,7
2	–	17,0	10,8	8,5	–	3,6
3	–	25,0	16,0	12,2	–	5,2
5	–	40,0	27,0	20,0	–	8,3
7-1/2	–	58,0	–	29,0	13,6	12,2
10	–	76,0	–	38,0	18,0	16,0
15	–	110,0	–	55,0	27,0	24,0
20	–	148,0	–	72,0	34,0	31,0
25	–	184,0	–	89,0	43,0	38,0
30	–	220,0	–	106,0	51,0	46,0
40	–	292,0	–	140,0	67,0	61,0
50	–	360,0	–	173,0	83,0	75,0
60	–	–	–	206,0	99,0	90,0
75	–	–	–	255,0	123,0	111,0
100	–	–	–	341,0	164,0	148,0
125	–	–	–	425,0	205,0	185,0
150	–	–	–	506,0	246,0	222,0
200	–	–	–	675,0	330,0	294,0

\* The full-load current for a 1/4 HP, 32 Vdc motor is 8.6 A.

## Appendix E. Conductors for general wiring according to NFPA 70

In the table below types and applications for conductors for general wiring are specified.

Table E.1. Conductors for general wiring according to Art. 310 of NFPA 70 (NEC) – Ed. 2020 - Table 310.4(A)

Trade Name	Type	Maximum operating temperature	Application	Insulation	Size [AWG/kcmil]	Outer Covering
Fluorinated ethylene propylene	FEP or FEPB	90°C	Dry and damp locations	Fluorinated ethylene propylene	14÷2	None
		200°C	Dry locations special applications	Fluorinated ethylene propylene	14÷8	Glass braid
					6÷2	Glass or other suitable braid material
Mineral insulation (metal sheathed)	MI	90°C	Dry and wet locations	Magnesium oxide	18÷500	Copper or alloy steel
		250°C	For special applications			
Moisture-, heat-, and oil-resistant thermoplastic	MTW	60°C	Machine tool wiring in wet locations	Flame-retardant, moisture-, heat-, and oil-resistant thermoplastic	22÷1000	None or Nylon jacket or equivalent
		90°C	Machine tool wiring in dry locations Informational Note: See NFPA 79.			
Paper		85°C	For underground service conductors, or by special permission	Paper		Lead sheath
Perfluoro-alkoxy	PFA	90°C	Dry and damp locations	Perfluoro-alkoxy	14÷4/0	None
		200°C	Dry locations special applications			
Perfluoro-alkoxy	PFAH	250°C	Dry locations only. Only for leads within apparatus or within raceways connected to apparatus (nickel or nickel-coated copper only)	Perfluoro-alkoxy	14÷4/0	None
Thermoset	RHH	90°C	Dry and damp locations		14÷2000	Moisture-resistant, flame-retardant, nonmetallic covering
Moisture-resistant thermoset	RHW	75°C	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14÷2000	Moisture-resistant, flame-retardant, nonmetallic covering
	RHW-2	90°C				
Silicone	SA	90°C	Dry and damp locations	Silicone rubber	14÷2000	Glass or other suitable braid material
		200°C	For special application			
Thermoset	SIS	90°C	Switchboard and switchgear wiring only	Flame-retardant thermoset	14÷4/0	None
Thermoplastic and fibrous outer braid	TBS	90°C	Switchboard and switchgear wiring only	Thermoplastic	14÷4/0	Flame-retardant, nonmetallic covering
Extended polytetrafluoro-ethylene	TFE	250°C	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 polytetra-fluoro-ethylene	14÷4/0	None
Heat-resistant thermoplastic	THHN	90°C	Dry and damp locations	Flame-retardant, heat-resistant thermoplastic	14÷1000	Nylon jacket or equivalent
Moisture- and heat-resistant thermoplastic	THHW	75°C	Wet location	Flame-retardant, moisture- and heat-resistant thermoplastic	14÷2000	None
		90°C	Dry location			

Trade Name	Type	Maximum operating temperature	Application	Insulation	Size [AWG/kcmil]	Outer Covering
Moisture- and heat-resistant thermoplastic	THW	75°C	Dry and wet locations	Flame-retardant, moisture- and heat-resistant thermoplastic	14÷2000	None
		90°C	Special applications within electric discharge lighting equipment. Limited to 1000 open-circuit volts or less. (Size 14-8 only as permitted in 410.68.)			
	THW-2	90°C	Dry and wet locations			
Moisture- and heat-resistant thermoplastic	THWN	75°C	Dry and wet locations	Flame-retardant, moisture- and heat-resistant thermoplastic	14÷1000	Nylon jacket or equivalent
	THWN-2	90°C				
Moisture-resistant thermoplastic	TW	60°C	Dry and wet locations	Flame-retardant, moisture-resistant thermoplastic	14÷2000	None
Underground feeder and branch-circuit cable - single conductor (for Type UF cable employing more than one conductor, see Article 340).	UF	60°C	See Article 340.	Moisture-resistant	14÷4/0	Integral with insulation
		75°C		Moisture- and heat-resistant		
Underground service-entrance cable - single conductor (for Type USE cable employing more than one conductor, see Article 338).	USE	75°C	See Article 338.	Heat- and moisture-resistant	14÷2000	Moisture-resistant nonmetallic covering (See 338.2.)
	USE-2	90°C	Dry and wet locations			
Thermoset	XHH	90°C	Dry and damp locations	Flame-retardant thermoset	14÷2000	None
Thermoset	XHHN	90°C	Dry and damp locations	Flame-retardant thermoset	14÷1000	Nylon jacket or equivalent
Moisture-resistant thermoset	XHHW	90°C	Dry and damp locations	Flame-retardant, moisture-resistant thermoset	14÷2000	None
		75°C	Wet locations			
Moisture-resistant thermoset	XHHW-2	90°C	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14÷2000	None
Moisture-resistant thermoset	XHWN	75°C	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14÷1000	Nylon jacket or equivalent
	XHWN-2	90°C				
Modified ethylene tetrafluoro-ethylene	Z	90°C	Dry and damp locations	Modified ethylene tetrafluoro-ethylene	14÷4/0	None
		150°C	Dry locations special applications			
Modified ethylene tetrafluoro-ethylene	ZW	75°C	Wet locations	Modified ethylene tetrafluoro-ethylene	14÷2	None
		90°C	Dry and damp locations			
		150°C	Dry locations — special applications			
	ZW-2	90°C	Dry and wet locations			

## Appendix F. Flexible cords and cables according to NFPA 70

In the tables below identification letters for coding and types for Flexible cords and cables are specified.

Table F.1. Letters used for Flexible cords and cables coding specified in the Art. 400 of NFPA 70 (NEC)

Letter	Description
E	As first letter: Elevator cable.
E	After first letter: Thermoplastic elastomer insulation.
H	Heater cord.
NI	"Non-integral" used for parallel cords such as Type NISPT-1 to denote insulated conductors and jacket are separate.
O	The jacket is oil resistant.
OO	The jacket and the conductor insulation are oil resistant.
P	Parallel conductor cord.
S	Extra hard usage Flexible Cord.
SJ	Hard usage Flexible Cord.
SV	Not hard usage Flexible Cord.
T	As first letter: Tinsel cord. Single flattened No. 27 AWG conductor wound around insulating core, for very low current, highly flexible application.
T	After first letter: Thermoplastic insulation.
-1, -2, -3	Insulation thickness for parallel cords, thinnest to thickest. Actual insulation thickness varies with cord type and AWG size.
XTW	Parallel cord for decorative lighting strings.
CXTW	Twisted pair cord or single conductor for decorative lighting strings.
W	As last letter: Moisture and sunlight resistant.
W	As the only letter: Portable Power Cable.

### Examples

SOOW – Extra hard usage, jacket and conductor insulation are oil resistant, moisture and sunlight resistant

SJTO – Hard usage, thermoplastic insulation, jacket is oil resistant

Table F2: Flexible cords and cables according to Art. 400 of NFPA 70 (NEC) - Ed. 2020 - Table 400.4

Trade name	Type	Family code TEK/IMA	Use	Voltage [V]	Size [AWG/kcmil]	Number of conductors	Insulation	Outer covering																																																																																							
Lamp cord	C	80160	Pendant or portable. Dry locations. Not hard usage.	300	18÷16	min. 2	Thermoset or thermoplastic	None																																																																																							
				600	15÷10				Elevator cable	E	80170	Elevator lighting and control. Unclassified locations.	300 o 600	20÷2	min. 2	Thermoset	Three cotton, Outer one flame-retardant & moisture-resistant	Elevator cable	EO	80180	Elevator lighting and control. Unclassified locations.	300 o 600	20÷2	min. 2	Thermoset	Three cotton, Outer one flame-retardant & moisture-resistant	Elevator cable	EO	80190	Elevator lighting and control. Hazardous (classified) locations.	300 o 600	20÷2	min. 2	Thermoset	One cotton and a neoprene jacket.	Elevator cable	ETP	80200	Hazardous (classified) locations.	300 o 600	-	-	-	Thermoplastic	300 o 600	-	-	-	One cotton or equivalent and a thermoplastic jacket	EV	EVJ	80220	Electric vehicle charging. Wet location. Extra hard usage.	1000	18÷500	min. 2 plus grounding conductor(s), plus optional hybrid data, signal communications, and optical fiber cables.	Thermoset with optional nylon	Thermoset	300	18÷12	Electric vehicle cable	EVE	80240	Electric vehicle charging. Wet location. Extra hard usage.	1000	18÷500	min. 2 plus grounding conductor(s), plus optional hybrid data, signal communications, and optical fiber cables.	Thermoplastic elastomer with optional nylon	Thermoplastic elastomer	300	18÷12	EVT	EVT	80260	Electric vehicle charging. Wet location. Extra hard usage.	1000	18÷500	min. 2 plus grounding conductor(s), plus optional hybrid data, signal communications, and optical fiber cables.	Thermoplastic with optional nylon	Thermoplastic	300	18÷12	Portable power cable	G	80155	Portable and extra hard usage.	2000	12÷500	2÷6 plus grounding conductor(s)	Thermoset	Oil-resistant thermoset	2000	12÷500	Heater cord	HPD
Elevator cable	E	80170	Elevator lighting and control. Unclassified locations.	300 o 600	20÷2	min. 2	Thermoset	Three cotton, Outer one flame-retardant & moisture-resistant																																																																																							
Elevator cable	EO	80180	Elevator lighting and control. Unclassified locations.	300 o 600	20÷2	min. 2	Thermoset	Three cotton, Outer one flame-retardant & moisture-resistant																																																																																							
Elevator cable	EO	80190	Elevator lighting and control. Hazardous (classified) locations.	300 o 600	20÷2	min. 2	Thermoset	One cotton and a neoprene jacket.																																																																																							
Elevator cable	ETP	80200	Hazardous (classified) locations.	300 o 600	-	-	-	Thermoplastic																																																																																							
				300 o 600	-	-	-	One cotton or equivalent and a thermoplastic jacket																																																																																							
EV	EVJ	80220	Electric vehicle charging. Wet location. Extra hard usage.	1000	18÷500	min. 2 plus grounding conductor(s), plus optional hybrid data, signal communications, and optical fiber cables.	Thermoset with optional nylon	Thermoset																																																																																							
				300	18÷12																																																																																										
Electric vehicle cable	EVE	80240	Electric vehicle charging. Wet location. Extra hard usage.	1000	18÷500	min. 2 plus grounding conductor(s), plus optional hybrid data, signal communications, and optical fiber cables.	Thermoplastic elastomer with optional nylon	Thermoplastic elastomer																																																																																							
				300	18÷12																																																																																										
EVT	EVT	80260	Electric vehicle charging. Wet location. Extra hard usage.	1000	18÷500	min. 2 plus grounding conductor(s), plus optional hybrid data, signal communications, and optical fiber cables.	Thermoplastic with optional nylon	Thermoplastic																																																																																							
				300	18÷12																																																																																										
Portable power cable	G	80155	Portable and extra hard usage.	2000	12÷500	2÷6 plus grounding conductor(s)	Thermoset	Oil-resistant thermoset																																																																																							
				2000	12÷500																																																																																										
Heater cord	HPD	80280	Portable heaters. Dry locations. Not hard usage.	300	18÷12	2, 3 or 4	Thermoset	Cotton or rayon																																																																																							

Trade name	Type	Family code TEKIMA	Use	Voltage [V]	Size [AWG/kcmil]	Number of conductors	Insulation	Outer covering
Parallel heater cord	HPN	80290	Portable. Damp locations. Not hard usage.	300	18÷12	2 or 3	Oil-resistant thermoset	Oil-resistant thermoset
	HSJ	80300		300	18÷12		Thermoset	Cotton and thermoset
Thermoset jacketed heater cords	HSJO	80310	Portable or portable heater. Damp locations. Hard usage.	300	18÷12	2, 3 or 4	Thermoset	Cotton and oil-resistant thermoset
	HSJOO	80320		300	18÷12		Oil-resistant thermoset	
Nonintegral parallel cords	NISP-1	80330		300	20÷18		Thermoset	Thermoset
	NISP-2	80340		300	18÷16			
	NISPE-1	80350	Pendant or portable. Damp locations.	300	20÷18	2 or 3	Thermoplastic elastomer	Thermoplastic elastomer
	NISPE-2	80360	Not hard usage.	300	18÷16			
	NISPT-1	80370		300	20÷18		Thermoplastic	Thermoplastic
	NISPT-2	80380		300	18÷16			
Twisted porta- ble cord	PD	80390	Pendant or portable. Dry locations. Not hard usage.	300	18÷16	min. 2	Thermoset or thermoplastic	Cotton or rayon
				600	14÷10			
Portable power cable	PPE	80400	Portable, extra hard usage.	2000	12÷500	1÷6 plus optional grounding conductor(s)	Thermoplastic elastomer	Oil-resistant thermoplastic elastomer
Hard service cord	S	80010	Pendant or portable. Damp locations. Extra hard usage.	600	18÷12	min. 2	Thermoset	Thermoset
	SC	80410		600			Thermoset	Thermoset
Flexible stage and lighting power cable	SCE	80420	Portable, extra hard usage.	600	8÷250	min. 1	Thermoplastic elastomer	Thermoplastic elastomer
	SCT	80430		600			Thermoplastic	Thermoplastic
Hard service cord	SE	80440	Pendant or portable. Damp locations. Extra hard usage.	600				Thermoplastic elastomer
	SEW	80450	Pendant or portable. Damp locations and wet locations. Extra hard usage.	600			Thermoplastic elastomer	
	SEO	80460	Pendant or portable. Damp locations. Extra hard usage	600		min. 2	Thermoplastic elastomer	
	SEOW	80470	Pendant or portable. Damp locations and wet locations. Extra hard usage.	600				Oil-resistant thermoplastic elastomer
	SEOO	80480	Pendant or portable. Damp locations. Extra hard usage.	600			Oil-resistant thermoplastic elastomer	
	SEOOW	80490	Pendant or portable. Damp locations and wet locations. Extra hard usage.	600				



Trade name	Type	Family code TEKIMA	Use	Voltage [V]	Size [AWG/kcmil]	Number of conductors	Insulation	Outer covering
	SJ	80020	Pendant or portable. Damp locations. Hard usage.	300			Thermoset	Thermoset
	SJE	80500		300				
	SJEW	80510	Pendant or portable. Damp and wet locations. Hard usage.	300			Thermoplastic elastomer	Thermoplastic elastomer
	SJEO	80520	Pendant or portable. Damp locations. Hard usage.	300				
	SJEOW	80530	Pendant or portable. Damp and wet locations. Hard usage.	300				
	SJEOO	80540	Pendant or portable. Damp locations. Hard usage.	300			Oil-resistant thermoplastic elastomer	Oil-resistant thermoplastic elastomer
	SJEOOW	80550	Pendant or portable. Damp and wet locations. Hard usage.	300			Oil-resistant thermoplastic elastomer	
	SJO	80030	Pendant or portable. Damp locations. Hard usage.	300			Thermoset	
	SJOW	80560	Pendant or portable. Damp and wet locations. Hard usage.	300	18÷10	2÷6		Oil-resistant thermoset
	SJOO	80570	Pendant or portable. Damp locations. Hard usage.	300				
	SJOOW	80140	Pendant or portable. Damp and wet locations. Hard usage.	300			Oil-resistant thermoset	
Junior hard service cord	SJT	80050	Pendant or portable. Damp locations. Hard usage.	300				Thermoplastic
	SJTW	80580	Pendant or portable. Damp and wet locations. Hard usage.	300				
	SJTO	80590	Pendant or portable. Damp locations. Hard usage.	300				
	SJTOW	80060	Pendant or portable. Damp and wet locations. Hard usage.	300				
	SJTOO	80600	Pendant or portable. Damp locations. Hard usage.	300			Oil-resistant thermoplastic	Oil-resistant thermoplastic
	SJTOOW	80610	Pendant or portable. Damp and wet locations. Hard usage.	300			Oil-resistant thermoplastic	
	SO	80070	Pendant or portable. Damp locations. Extra hard usage.	600				
	SOW	80620	Pendant or portable. Damp and wet locations. Extra hard usage.	600			Thermoset	
	SOO	80630	Pendant or portable. Damp locations. Extra hard usage.	600	18÷2	min. 2		Oil-resistant thermoset
	SOOW	80120	Pendant or portable. Damp and wet locations. Extra hard usage.	600			Oil-resistant thermoset	
	SP-1	80640	Pendant or portable. Damp locations.	300	20÷18			
	SP-2	80650	Not hard usage. Refrigerators, room air conditioners, and as permitted in 422.16(B). Damp locations. Not hard usage.	300	18÷16	2 or 3	Thermoset	None
	SP-3	80660		300	18÷10			
All thermoset parallel cord								

Trade name	Type	Family code TEKIMA	Use	Voltage [V]	Size [AWG/kcmil]	Number of conductors	Insulation	Outer covering
All elastomer (thermoplastic) parallel cord	SPE-1	80670	Pendant or portable. Damp locations. Not hard usage.	300	20÷18			
	SPE-2	80680		300	18÷16	2 or 3	Thermoplastic elastomer	None
	SPE-3	80690	Refrigerators, room air conditioners, and as permitted in 422.16(B). Damp locations. Not hard usage.	300	18÷10			
All plastic parallel cord	SPT-1	80700	Pendant or portable. Damp locations. Not hard usage.	300		2 or 3		
	SPT-1W	80710	Pendant or portable. Damp and wet loca- tions. Not hard usage.	300	20÷18	2		
	SPT-2	80720	Pendant or portable. Damp locations. Not hard usage.	300		2 or 3	Thermoplastic	None
	SPT-2W	80730	Pendant or portable. Damp and wet loca- tions. Not hard usage.	300	18÷16	2		
	SPT-3	80740	Refrigerators, room air conditioners, and as permitted in 422.16(B). Damp locations. Not hard usage.	300	18÷10	2 or 3		
	SRD	80750		300	10÷4	3 or 4	Thermoset	Thermoset
Range, dryer cable	SRDE	80760	Portable. Damp locations. Ranges, dryers.	300	10÷4	3 or 4	Thermoplastic elastomer	Thermoplastic elastomer
	SRDT	80770		300	10÷4	3 or 4	Thermoplastic	Thermoplastic
	ST	80780	Pendant or portable. Damp locations. Extra hard usage.	600				
Hard service cord	STW	80790	Pendant or portable. Damp and wet loca- tions. Extra hard usage.	600			Thermoplastic	Thermoplastic
	STO	80800	Pendant or portable. Damp locations. Extra hard usage.	600		min. 2	Thermoplastic	
	STOW	80080	Pendant or portable. Damp and wet loca- tions. Extra hard usage.	600	18÷2			Oil-resistant thermoplastic
	STOO	80810	Pendant or portable. Damp locations. Extra hard usage.	600				
	STOOW	80820	Pendant or portable. Damp and wet locations. Extra hard usage.	600			Oil-resistant thermoplastic	

Trade name	Type	Family code TEKIMA	Use	Voltage [V]	Size [AWG/kcmil]	Number of conductors	Insulation	Outer covering
Vacuum cleaner cord	SV	80090		300			Thermoset	Thermoset
	SVE	80830		300			Thermoplastic elastomer	Thermoplastic elastomer
	SVEO	80840		300			Oil-resistant thermoplastic elastomer	Oil-resistant thermoplastic elastomer
	SVO	80850	Pendant or portable. Damp locations. Not hard usage.	300	18÷16	2 o 3	Thermoset	Oil-resistant thermoset
	SVEOO	80860		300			Oil-resistant thermoset	Oil-resistant thermoset
	SVOO	80870		300			Thermoplastic	Thermoplastic
	SVT	80100		300			Thermoplastic	Thermoplastic
	SVTO	80880		300			Oil-resistant thermoplastic	Oil-resistant thermoplastic
	SVTOO	80890		300			Oil-resistant thermoplastic	Oil-resistant thermoplastic
Parallel tinsel cord	TPT	80900	Attached to an appliance. Damp locations. Not hard usage.	300	27	2	Thermoplastic	Thermoplastic
Jacketed tinsel cord	TST	80910	Attached to an appliance. Damp locations. Not hard usage.	300	27	2	Thermoplastic	Thermoplastic
Portable power- cable	W	80130	Portable, extra hard usage.	2000	12÷500	1÷6	Thermoset	Oil-resistant thermoset
					501÷1000	1	Thermoset	Oil-resistant thermoset

## Appendix G. Wires and cables marking according to UL

### Notes used in Table G.1

- (A) CCN is the Category Control Number as defined by UL.
- (B) Indicates whether the UL Mark ("UL" in a circle) is required (R), optional (O) or prohibited (P) on the product.
- (C) Temperature rating for the wire and cable when exposed to water or moisture such as in wet and damp locations.
- (3) Flexible Cords evaluated for water resistance have a "W" in the Type designation, i.e. Type SJTW. The terms "water resistant" or "water resistant 60°C" may also be marked in addition to the "W" designation.
- (4) The wire or cable has been investigated for the temperature rating marked on the product, tag, reel or smallest unit container.
- (6) Cable evaluated for wet-location use is marked "WET-LOCATIONS CABLE" or "WET-LOCS CABLE.". Cable containing conductors evaluated for wet-location use may be marked, but such marking is not required.
- (7) 250°C for special applications in locations where environmental conditions require operation at above 90°C temperature. Temperatures of fittings are limited to 85°C in dry locations and 60°C in wet locations.
- (8) Wire or cable evaluated for wet-location use is marked "60°C WET" or "75°C WET".
- (9) Temperature rating may be indicated on the product by colored marker threads located under either the insulation or separator.
- (10) The cable is marked with predefined temperature ratings or codes (example: marking with temperature rating "60°C dry 60°C wet" or marking with code "BC-1W1").
- (12) 90°C dry and damp location. 150°C dry locations for special applications in locations where environmental conditions require maximum conductor opeTemperature ranges above 90°C.
- (13) 200°C in dry locations for special applications.
- (14) The temperature rating of the cable is the rating marked on the cable or implied by the conductor type in the cable.
- (15) Indicates minimum temperature rating. Suitable for use at higher temperatures if marked on the cable or cord. The higher temperatures (above 60°C) only apply to dry applications.
- (16) May be rated 600 volts when employing 45-mil insulation.
- (17) Cable evaluated for wet location use is marked "wet" or "wet location".
- (22) Type designation indicates suitability for use in accordance with the appropriate NEC Article, with respect to voltage and power limitations.
- (24) Rating is indicated by number in the Type designations, "-1" defines 300V, "-2" defines 600V.
- (27) Some Mineral-Insulated cable may be rated 300V for use in Class 1 remote control and signaling circuits not exceeding 300V.
- (30) A product evaluated for outdoor use has a "W" in its Type designation (example: SJTW).
- (32) Cable evaluated for outdoor use is marked "outdoor" or "outdoor use".
- (33) Cable evaluated for outdoor use is marked "SUNLIGHT RESISTANT" or "SUN. RES." plus "60°C WET" or "75°C WET".
- (35) A product evaluated for sunlight resistance is marked "SUNLIGHT RESISTANT", "SUN. RES.", or "SR".
- (40) When evaluated for use in cable trays, the product is marked "for cable tray use," "for CT use" or "for use in cable trays".
- (45) A product evaluated for 60°C oil resistance is marked "OIL RESISTANT I", "OIL RES I", "OIL RESISTANT", or "PR1". A product evaluated for 75°C oil resistance is marked "OIL RESISTANT II", "OIL RES II", or "PR2".
- (46) A product evaluated for 60°C oil resistance and for gasoline resistance is marked "GASOLINE AND OIL RESISTANT I", or "GR1". Similarly, for 75°C oil and for gasoline resistance, the product is marked "GASOLINE AND OIL RESISTANT II" or "GR2".
- (47) When evaluated for gasoline resistance only, the insulated conductors are marked "GASOLINE RESISTANT". If this marking appears on the outer covering of the cable, "GASOLINE RESISTANT" is followed by "CDRS," "CONDS" or "CONDUCTORS".
- (50) When evaluated for direct burial use, the product is marked "FOR DIRECT BURIAL," "DIRECT BURIAL," "DIR BUR" or "DIR BURIAL".
- (51) When evaluated, the product is marked "PUMP CABLE" or "SUBMERSIBLE PUMP CABLE".
- (70) "OO" indicates oil resistant insulation and jacket. "O" indicates oil resistant jacket only.

Table G.1. Wires and cables marking according to UL

Characteristic	Type	NEC article	CCN <sup>(M)</sup>	UL Mark <sup>(R)</sup>	Temperature Dry [°C]	Temperature Wet <sup>(C)</sup> [°C]	Voltage [V]	Outdoor use	Sunlight Resistance	Cable Tray Use	Oil Resistance	Gasoline Resistance	Direct Burial	Submersible Pump Use
Thermoset insulation	RHH	310	ZKST	R	90	-	600/2000	-	(39)	(40)	(45)	(46)	-	-
Thermoset insulation	RHW	310	ZKST	R	75	75	600/2000	-	(39)	(40)	(45)	(46)	-	(51)
Thermoset insulation	RHW	310	ZKST	R	90	90	600/2000	-	(39)	(40)	(45)	(46)	-	(51)
Thermoset insulation	RHW-2	310	ZKST	R	90 <sup>(3)</sup>	-	600	-	-	(40)	-	-	-	-
Thermoset insulation	SA, SF	310	ZKST	O	90	-	600	-	-	-	-	-	-	-
Thermoset insulation	SIS	310	ZKST	R	90	-	600	-	(39)	(40)	(45)	(46)	-	-
Thermoset insulation	XHH	310	ZKST	R	90	75	600	-	(39)	(40)	(45)	(46)	-	(51)
Thermoset insulation	XHHW	310	ZKST	R	90	90	600	-	(39)	(40)	(45)	(46)	-	(51)
Thermoset insulation	XHHW-2	310	ZKST	R	90	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	FEP, FEPB	310	ZLGR	R	90 <sup>(3)</sup>	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	PFA	310	ZLGR	R	250	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	PFAH	310	ZLGR	R	90	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	TBS	310	ZLGR	O	90	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	TFE	310	ZLGR	R	250	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	THHN	310	ZLGR	R	90	-	600	-	(39)	(40)	(45)	-	-	-
Thermoplastic insulation	THHW	310	ZLGR	R	90	75	600	-	(39)	(40)	(45)	-	-	(51)
Thermoplastic insulation	THW	310	ZLGR	R	75	75	600	-	(39)	(40)	(45)	-	-	(51)
Thermoplastic insulation	THW-2	310	ZLGR	R	90	90	600	-	(39)	(40)	(45)	-	-	(51)
Thermoplastic insulation	THWN	310	ZLGR	R	75	75	600	-	(39)	(40)	(45)	(46)	-	(51)
Thermoplastic insulation	THWN-2	310	ZLGR	R	90	90	600	-	(39)	(40)	(45)	(46)	-	(51)
Thermoplastic insulation	TW	310	ZLGR	R	60	60	600	-	(39)	(40)	(45)	(46)	-	(51)
Thermoplastic insulation	Z	310	ZLGR	R	90 <sup>(12)</sup>	-	600	-	-	-	-	-	-	-
Thermoplastic insulation	ZW	310	ZLGR	R	90 <sup>(12)</sup>	75	600	-	(39)	-	-	-	-	(51)
Armored	ACTH	320	AWEZ	O	75	-	600	-	-	(40)	-	-	-	-
Armored	ACHH, ACTHH	320	AWEZ	O	90	-	600	-	-	-	-	-	-	-
Flat cable	FC	322	GQKT	R	75 <sup>(3)</sup>	-	300	-	-	-	-	-	-	-
Flat conductor	FCC	324	IKKT	R	(4)	-	300/600	-	-	-	-	-	-	-
Instrumentation Tray Cable	ITC	727	NYTT	R	(4)	(17)	(22)	-	Yes	Yes	-	-	(60)	-
Metal-Clad	MC	330	PJAZ	R	(14)	(6)	600 / 2000	Yes	Yes	Yes	Yes	Yes	Yes	-
Metal-Clad Hazardous Location	MC-HL	330	PJPP	R	(14)	(6)	600 / 2000	Yes	Yes	Yes	Yes	Yes	Yes	-

BUILDING WIRES

BUILDING CABLES

Characteristic	Type	NEC article	CCN <sup>(A)</sup>	UL Mark <sup>(B)</sup>	Temperature Dry [°C]	Temperature Wet <sup>(C)</sup> [°C]	Voltage [V]	Outdoor use	Sunlight Resistance	Cable Tray Use	Oil Resistance	Gasoline Resistance	Direct Burial	Submersible Pump Use
BUILDING CABLES	Mineral Insulated Metal Sheathed Cable	MI	332	PPKV	90 <sup>(7)</sup>	90 <sup>(7)</sup>	600 <sup>(27)</sup>	Yes	<sup>(55)</sup>	<sup>(40)</sup>	Yes	Yes	Yes	-
	Power and Control Tray Cable	TC	336	QPOR	<sup>(14)</sup>	<sup>(8)</sup>	600 / 2000	-	<sup>(55)</sup>	Yes	<sup>(45)</sup>	<sup>(46)</sup>	<sup>(60)</sup>	-
	Flexible Cords	C, PD	400	ZJ CZ	<sup>(4)</sup>	-	300 <sup>(16)</sup>	-	-	-	-	-	-	-
	Flexible Cords	E, ETP, ETT	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-
	Flexible Cords	EO	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	Yes	-	-	-
	Flexible Cords	HPD	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-
	Flexible Cords	HPN	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	Yes	-	-	-
	Flexible Cords	HS, HSJ	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-
	Flexible Cords	HSD, HSJO	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	Yes	-	-	-
	Flexible Cords	NISP-1, NISP-2	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-
	Flexible Cords	NISPE-1, NISPE-2	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-
	Flexible Cords	NISPT-1, NISPT-2	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-
	Flexible Cords	S, ST	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	600	<sup>(30)</sup>	-	-	-	-	-	-
	Flexible Cords	SE	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	600	<sup>(30)</sup>	-	-	-	-	-	-
	Flexible Cords	SEO	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	600	<sup>(30)</sup>	-	-	Yes	-	-	-
	Flexible Cords	SJ, SJT	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	300	<sup>(30)</sup>	-	-	-	-	-	-
	Flexible Cords	SJE	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	300	<sup>(30)</sup>	-	-	-	-	-	-
	Flexible Cords	SJEO	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	300	<sup>(30)</sup>	-	-	Yes	-	-	-
	Flexible Cords	SJO, SJO0, SJTO, SJTO0	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	300	<sup>(30)</sup>	-	-	Yes <sup>(70)</sup>	-	-	-
	Flexible Cords	SO, SOO, STO, STOO	400	ZJ CZ	<sup>(4)</sup>	<sup>(3)</sup>	600	<sup>(30)</sup>	-	-	Yes <sup>(70)</sup>	-	-	-
	Flexible Cords	SP-1, SP-2, SP-3, SRD, SRDT	400	ZJ CZ	<sup>(4)</sup>	-	300	-	-	-	-	-	-	-

LOW VOLTAGE CABLES, FLEXIBLE CORD AND FIXTURE CABLES

Characteristic	Type	NEC article	CCN <sup>(A)</sup>	UL Mark <sup>(B)</sup>	Temperature Dry [°C]	Temperatur Wet <sup>(C)</sup> [°C]	Voltage [V]	Outdoor use	Sunlight Resistance	Cable Tray Use	Oil Resistance	Gasoline Resistance	Direct Burial	Submersible Pump Use
Flexible Cords	SPE-1, SPE-2, SPE-3, SRDE	400	ZJCZ	R	(4)	-	300	-	-	-	-	-	-	-
Flexible Cords	SPT-1, SPT-2, SPT-3	400	ZJCZ	R	(4)	-	600	(30)	-	-	-	-	-	-
Flexible Cords	SV, SVT	400	ZJCZ	R	(4)	-	300	-	-	-	-	-	-	-
Flexible Cords	SVE	400	ZJCZ	R	(4)	-	300	-	-	-	-	-	-	-
Flexible Cords	SVEO	400	ZJCZ	R	(4)	-	300	-	-	-	Yes	-	-	-
Flexible Cords	SVO, SVOO, SVTO, SVTOO	400	ZJCZ	R	(4)	-	300	-	-	-	Yes <sup>(70)</sup>	-	-	-
Flexible Cords	TPT, TS, TST	400	ZJCZ	R	(4)	-	300	-	-	-	-	-	-	-
Fixture Wire	KF-1, KF-2, KFF-1, KFF-2	402	ZIPR	O	200 <sup>(9)</sup>	-	(24)	-	-	-	-	-	-	-
Fixture Wire	PAF	402	ZIPR	R	250 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	PAFF	402	ZIPR	R	150 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	PF, PGF	402	ZIPR	O	200 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	PFF, PGFF	402	ZIPR	O	150 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	PTF	402	ZIPR	R	250	-	600	-	-	-	-	-	-	-
Fixture Wire	PTFF	402	ZIPR	R	150	-	600	-	-	-	-	-	-	-
Fixture Wire	RFH-2, FFH-2	402	ZIPR	O	75 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	SF-1, SF-2	402	ZIPR	O	200 <sup>(9)</sup>	-	(24)	-	-	-	-	-	-	-
Fixture Wire	SFF-1, SFF-2	402	ZIPR	O	150 <sup>(9)</sup>	-	(24)	-	-	-	-	-	-	-
Fixture Wire	TF, TFF	402	ZIPR	R	60	-	600	-	-	-	(45)	(46)	-	-
Fixture Wire	RFHH-2, RFHH-3	402	ZIPR	R	90 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	TFN, TFFN	402	ZIPR	R	90 <sup>(9)</sup>	-	600	-	-	-	(45)	(46)	-	-
Fixture Wire	XF, XFF	402	ZIPR	R	150 <sup>(9)</sup>	-	300	-	-	-	-	-	-	-
Fixture Wire	ZF, ZFF	402	ZIPR	R	150 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-
Fixture Wire	ZHF	402	ZIPR	R	200 <sup>(9)</sup>	-	600	-	-	-	-	-	-	-

Characteristic	Type	NEC article	CCN <sup>(A)</sup>	UL Mark <sup>(B)</sup>	Temperature Dry [°C]	Temperature Wet <sup>(C)</sup> [°C]	Voltage [V]	Outdoor use	Sunlight Resistance	Cable Tray Use	Oil Resistance	Gasoline Resistance	Direct Burial	Submersible Pump Use
Boat Cable	-	-	BDFX	R	<sup>(10)</sup>	-	<sup>(10)</sup>	<sup>(25)</sup>	-	-	-	<sup>(45)</sup>	-	-
Bus Drop Cable	-	368	ZIMX	R	60 <sup>(15)</sup>	<sup>(6)</sup>	600	<sup>(32)</sup>	-	-	<sup>(45)</sup>	-	-	-
Festoon Cable	-	610	ZIPF	R	60 <sup>(15)</sup>	-	600	<sup>(32)</sup>	-	-	<sup>(45)</sup>	-	-	-
Flexible Motor Supply Cable	-	-	ZJFH	R	90	-	1000/2000	-	<sup>(35)</sup>	Yes	<sup>(46)</sup>	<sup>(47)</sup>	<sup>(60)</sup>	-
Heat-Resistant Wire	TGT, TGS, TMGT, KGS, KGT, TGGT, ITFL	-	ZNNA	O	<sup>(4)</sup>	-	300	-	<sup>(35)</sup>	<sup>(40)</sup>	Yes	<sup>(46)</sup>	-	-
Machine Tool Wires	MTW	670	ZKHZ	R	90	60	600	-	-	-	-	-	-	-
Pendant Cable	-	610	ZKKA	O	60	-	300/600	<sup>(32)</sup>	-	-	<sup>(45)</sup>	-	-	-
Photovoltaic Wire	-	690	ZKLA	R	90/150	90	600/2000	Yes	Yes	-	-	-	-	-
Portable Power Cables	W, G, G-GC, PPE	400	QPMU	R	75	<sup>(6)</sup>	2000	<sup>(33)</sup>	<sup>(35)</sup>	-	Yes	-	-	-
Submersible Pump Cable (TPE Insulation)	-	-	ZMHX	R	<sup>(4)</sup>	60	600	-	-	-	-	-	Yes	-

## SPECIAL PURPOSE WIRES AND CABLES



## Appendix H. Style, definition and reference

The manufacture of each wire is specified by a "style number" identifying a chart with all the manufacturing aspects of the wire. The chart includes the allowed temperatures and voltages, the wiring dimensions and material, the insulation material and thickness, the material and thickness of the possible conduit, possible jackets and shields, the reference standard and the use. Underwriters Laboratories Inc. divides the "style numbers" in 5 sections from 1 to 5. Inside them are classified the Appliance Wiring Materials.

Sections 1 and 2 include products manufactured with insulation and conduit made of a thermoplastic material such as the polyvinyl chloride PVC, the polyethylene PE, the polypropylene PP; sections 3 and 4 include products manufactured with thermosetting material such as the rubber, the cross-linked polyethylene XLPE. Section 5 includes products which can be either single core or multicore, while insulation and conduit can be made of composite materials or with protection bands.

Table H.1. Classification of styles

Style	Size	Type
1000 – 1999 e 10000	1	Single conductor, thermoplastic - insulated wire
2000 – 2999 e 20000	2	Multi-conductor, thermoplastic - insulated and jacketed wire
3000 – 3999	3	Single conductor, thermosetting - insulated wire
4000 – 4999	4	Multi-conductor, thermosetting - insulated and jacketed wire
5000 – 5999	5	Single and multiple conductor specialty items

Here are resumed the main manufacturing characteristics specified in the respective "style numbers" of the electrical cables described in this document.

Table H.2. Manufacturing aspects recalled by the styles

Style	Product	Temperature Voltage	Conductor's section Insulation	Assembly	Jacket Shield	Braid Conduit	Use
1015	PVC Insulated Wire	80°C, 90°C or 105°C 600Vac, 750Vdc	30 AWG + 2000 kcmil. PVC insulation.	-	-	-	Internal Wiring of Appliances; or Internal Wiring of Appliances where exposed to oil at a temperature not exceeding 60°C or 80°C (whichever is applicable). Tags may also indicate the following: 2.500 V peak - for electronic use only.
1284	Thermoplastic (PVC) - Insulated Wire for Appliance Hook-Up Use	105°C 600V	8 AWG + 1000 MCM. Tinned or bare copper. PVC Insulation.	-	-	-	Internal wiring of appliances; or internal wiring of appliances where exposed to oil at a temperature not exceeding 60°C or 80°C (whichever is applicable).
2464	PVC Jacketed Cable	80°C 300 V	- Labeled or complying with manufacturer's AWM Procedure having a minimum rating of 80°C and 300 V	Two or more singles, twisted pairs of groups of twisted singles twisted together or singles or groups of singles may be laid parallel to form flat, oval or round cable. Lay not specified. Barrier layer and/or fillers optional. Manufacturer shall maintain a complete description of each assembly. May use same or mixed AWG size.	Optional	Optional	Internal wiring or external interconnection of electronic equipment (such as desk-type calculators, dictating machines, or x-ray equipment).
2570	PVC Jacketed Cable	80°C 600 or 1000V	40 AWG minimum Labeled or complying with Manufacturer's AWM Procedure having a minimum rating of 80°C, 600 or 1000V.	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.	Optional: a 6 mil or heavier PVC covering may be extruded over the conductor assembly Optional	PVC, Class 43	External interconnection or internal wiring of electronic equipment.
2587	PVC Jacketed Cable	90°C 600V	40 AWG minimum Labeled or complying with Manufacturer's AWM Procedure having a minimum rating of 90°C, 600V.	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.	Optional: a 6 mil or heavier PVC covering may be extruded over the conductor assembly Optional	PVC, Class 43	External interconnection or internal wiring of electronic equipment.
2919	Low Voltage Computer Cable	80°C 30V	40 AWG minimum Labeled or complying with Manufacturer's AWM Procedure having a minimum rating of 80°C, 30V.	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.	Optional: a 6 mil or heavier PVC covering may be extruded over the conductor assembly Optional	PVC, Class 43	As internal wiring or external interconnection in Class 2 Circuits of electronic computers and electric business machines.

Style	Product	Temperature Voltage	Conductor's section Insulation	Assembly	Jacket Shield	Braid Conduit	Use
20233	Multi-Conductor Jacketed Cable	80°C	36 AWG minimum. Solid or Stranded.  Labeled or complying with manufacturer's AWM Procedure and Having a min rating of 80°C and 300V. The designations of all styles of individual conductors used in making up the cable assembly shall be available.	Two or more individually insulated conductors or groups of insulated conductors cabled together to form a round cable. A flat or oval cable may also be constructed with not more than three rows of single conductors or groups of conductors. The length of lay of the twisted conductors or groups is not specified. Fillers may be used in a cable but are not required. A barrier layer, if employed, may be a fibrous wrap serving, or braid, paper, nylon, oriented polyethylene terephthalate, or thermoplastic-tape wrap. Such a barrier layer would serve to protect the cable during further processing and would be applied immediately over the twisted assembly of individual conductors or groups of conductors.	Optional	Optional	External interconnection of electronic equipment.
		300V			Optional	Poly-urethane	
20234	Thermoplastic Polyurethane Jacketed Cable	80°C	36 AWG minimum. Solid or stranded	Two or more individually insulated conductors or groups of insulated conductors cabled together to form a round cable. A flat or oval cable may also be constructed with not more than three rows of single conductors or groups of conductors. The length of lay of the twisted conductors or groups is not specified. Fillers may be used in a cable but are not required. A barrier layer, if employed, may be a fibrous wrap serving, or braid, paper, nylon, oriented polyethylene terephthalate, or thermoplastic-tape wrap. Such a barrier layer would serve to protect the cable during further processing and would be applied immediately over the twisted assembly of individual conductors or groups of conductors.	Optional	Optional	External interconnection of electronic equipment.
		600 or 1000V	Labeled or complying with manufacturer's AWM Procedure and having a minimum rating of 80°C and 600V or 1000V respectively.		Optional	Poly-urethane	
20236	Polyurethane Jacketed Cable	80°C	36 AWG minimum. Solid or stranded	Two or more individually insulated conductors or groups of insulated conductors cabled together to form a round cable. A flat or oval cable may also be constructed with not more than three rows of single conductors or groups of conductors. The length of lay of the twisted conductors or groups is not specified. Fillers may be used in a cable but are not required. A barrier layer, if employed, may be a fibrous wrap serving, or braid, paper, nylon, oriented polyethylene terephthalate, or thermoplastic covering, or thermoplastic-tape wrap.	Optional: 4 mil or heavier wall of PVC or other thermoplastic covering may be extruded over the conductor assembly or groups of conductors (with or without shields)	-	Internal wiring or external interconnection of electronic equipment.
		30V	Labeled or complying with manufacturer's AWM Procedure and having a min rating of 80°C and 30V. The designations of all styles of individual conductors used in making up the cable assembly shall be available.		Optional	Poly-urethane	
20554	Polyurethane Jacketed Cable	80°C	40 AWG minimum	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 conductor 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.	Optional: a 6 mil or heavier covering may be extruded over the conductor assembly	-	Internal wiring of electronic equipment and appliances.
		30V	Labeled or complying with Manufacturer's AWM Procedure having a minimum rating of 80°C, 30V.		Optional	Poly-urethane	
20886	PVC Jacketed Cable	80°C, 90°C or 105°C	40 AWG minimum	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. May use same or mixed AWG size.	Optional: a 6 mil or heavier PVC covering may be extruded over the conductor assembly	-	External interconnection or internal wiring of electronic equipment.
		1000Vac, 1200Vdc	Labeled or complying with 1000Vac, 1200Vdc and a temperature rating equalling or exceeding the rating of the cable.		Optional	PVC, Class 43	

## Appendix I. Ethernet cables' naming

The table shows the nomenclature of the Ethernet cables and the meaning of the abbreviations used.

Table I.1. Ethernet cables' naming

Naming	Shield on cable	Shield on pairs
U/UTP	None	None
U/FTP	None	Foil shield
F/UTP	Foil shield	None
S/UTP	Braid shield	None
SF/UTP	Foil and braid shield	None
F/FTP	Foil shield	Foil shield
S/FTP	Braid shield	Foil shield
SF/FTP	Foil and braid shield	Foil shield
	TP = Twisted Pair	
	U = Unshielded	
	F = Foiled	
	S = Shielded	

## Appendix J. Listed or Recognized products

During the daily research of components to be installed in the automation systems, we often find various components which differ as concerns standard approvals. Some products are classified as "Recognized" and others as "Listed"; here are the differences as follows:

### J.1 Listed products

UL Listed mark is for sure the most commonly used mark for the equipment assigned to final users, but it is not the only one available on the market. There are other marks such as ETL Listed and CSA Listed, having the same value from the normative point of view. If a product has one of these marks, it means that it complies with the safety requirements based on the Safety Standards published by ANSI (American National Standard Institute), that is, the American national standard institute which acknowledges, in its turn, the rules of various institutes such as UL, ETL, CSA, NEMA or other reliable authorities. Furthermore, it means that the product has been verified through a series of tests and analysis carried out at NRTL (National Recognized Testing Laboratories) laboratories, such as UL, CSA, TUV, ETL, which are institutes recognized by OSHA (Occupational Safety and Health Administration), the American national institute dealing with safety at work.

This mark can be seen usually on finished products addressed to the users, such as electric household appliances, equipment for computers, ovens, smoke and carbon monoxide alarms, fire extinguishers, life jackets, bullet-proof glass and thousands of other products.

Typical examples of products belonging to the industrial automation sector are the industrial computers, the actuators for electrical motors, fuses and fuseholders, or the flexible metal conduits and pertinent fittings intended to protect the cables for the connection of motors or equipment. Besides, there are tray cables, which are cables made for the connection of cable trays with the equipment; they are all products whose use is specified by reference standards.

The UL Listed mark on a product can be recognized through a fundamental feature: the round UL mark and the name of the manufacturer, the trade name or a number identifying the manufacturer, which can be followed by other two elements: the "LISTED" word in capital letters and the name of the product (e.g. "portable lamp", "fuseholders", etc.).

UL Listed mark with before a "C" letter, means that the product is specific for the Canadian market. Products with this kind of mark have been evaluated and tested in compliance with the Canadian safety requirements which, in some respects, can differ from the ones applied in the United States.

UL Listed mark with before a "C" letter and the "US" abbreviation after, indicates the product compliance with both Canadian and United States requirements.

A similar marking structure is issued by the Canadian certification institute CSA.



### J.2 Recognized products

The UL Recognized mark can be hardly seen by the user, as it is used in particular for components being the basic elements of greater products or systems. Being basic components, they can have restricted functional characters or incomplete structure. They differ from the Listed products for the fact that in their own standard a "condition of acceptability" is always reported: that means, that their suitability depends on how the manufacturer uses them, for instance how he measures them as regards the system they are inserted in.

This mark can be found on several products such as feeders, switches, printed circuits and some types of industrial control equipment and other numerous products. A typical example is the one of the single core cables style 1015/1284 for the internal wire harness of equipment or lamps; they are products whose destination is not specified by reference standards and their use covers a wide range of possibilities.

Also in case of a Recognized product, the UL Recognized mark can be recognized through some fundamental elements: the UR mark, the name of the manufacturer, the trade name or a number identifying the manufacturer.

The products for the Canadian markets show the UL Recognized mark with a "C" letter before. Also for the UL Recognized mark there is the possibility of a simultaneous compliance with the Canadian and the United States requirements, and in this case the mark has a "C" letter before and a "US" abbreviation after.

A similar marking structure is issued by the Canadian certification institute CSA.



### J.3 Difference between Listed products and Recognized products

As an example, see a hydromassage tub: if there is a label with a UL Listed mark on it and all the other previously mentioned information, it means that the hydromassage tub, which is the end product, meets the requirements of UL 1563 standard, Electric Spas, Equipment Assemblies and Associated Equipment.

If, otherwise, the UL Listed mark cannot be found on the product, after a careful consideration, it could be possible to find out that some components of the hydromassage tub, such as the pump, the control system or the filter show the UL Recognized mark. Some manufacturers could say that, as the components are UL Recognized marked, the product they are installed in meets the necessary requirements. This is not always true, because the UL Recognized mark means that the single component meets the requirements for a specific and limited use, and just the UL Listed mark applied on the product, in this case on the hydromassage tub, indicates that the product as a whole meets the standard requirements.

To sum up, we can say that the UL Recognized mark covers the check and evaluation of components which are incomplete or have reduced functionalities. They could be suitable if used as components of a certain machine, but they are unfit if that same machine is installed in a burst hazard location or in a place where the installation must follow specific standards. These components will be used with complete finished products or UL Listed systems. In any case, the finished products can be always subject to evaluation by AHJs (Authorities Having Jurisdiction), that is, the American inspection institutions for installations. When the finished product is Listed, the inspection is limited to recognition of the mark presence and right installation; in case the product is not Listed, the inspection can include also the verification of suitability for each single component as regards functionality, use and installation of the end-item.







The distinction between a component and the end-item is the critical point between the certification of one component and the certification of the end-item, where the component is used. So, going back to the example of the hydromassage tub, the use of UL Recognized components within an end-item does not mean neither that the product is UL Listed, nor that it is in compliance with the reference standard regarding that kind of product.

## J.4 Interchangeable product certification marks

In USA and Canada there are several independent organizations working on national standards that are sometimes in direct competition. The most known organizations\* that are working on electrical standards, product approvals and certifications for the American and Canadian markets are UL "Underwriters Laboratories Inc." in U.S. and CSA "Canadian Standards Association" in Canada. Both companies, CSA and UL signed a Memorandum of Understanding (latest update: April 2006) which defines the mutually acceptance for tests and investigations in accordance to defined standards.

The Memorandum of Understanding agreement between the two organizations simplifies the certification process for companies who desire U.S. and/or Canadian marks. If a company requires the CSA or the UL mark, it can ask for the approval by the CSA "Canadian Standards Association" or by the UL "Underwriters Laboratories Inc.".

It is important to demystify the certification marks. The certification mark provides visual evidence that the product has been tested and certified to meet the applicable standard for a specific market. All products (i.e. the luminaires, the tray cables, the fuses, etc.) certified for a specific market have been tested to the same standard, regardless of whether they carry a UL or CSA mark. Hence, as you can see in the following table, UL and CSA marks are interchangeable and are equally accepted today.

		Market of destination		
		USA	Canada	USA+Canada
Certification organization	UL	 <p>Products bearing these marks are certified by American Organization (UL) for the U.S. market according to the applicable U.S. standards.</p>	 <p>Products bearing this marks are certified by American Organization (UL) for the Canadian ("c" on the left of the logo) market according to the applicable Canadian standards.</p>	 <p>Products bearing this marks are certified by American Organization (UL) for both the U.S. ("us" on the right of the logo) and Canadian ("c" on the left of the logo) markets according to the applicable U.S. and Canadian standards.</p>
	CSA	 <p>Products bearing this mark are certified by Canadian Organization (CSA) for the U.S. market ("us" on the right of the logo) according to the applicable U.S. standards.</p>	 <p>Products bearing this mark are certified by Canadian Organization (CSA) for the Canadian market according to the applicable Canadian standards.</p>	 <p>Products bearing this mark are certified by Canadian Organization (CSA) for both the U.S. ("us" on the right of the logo) and Canadian ("c" on the left of the logo) markets according to the applicable U.S. and Canadian standards.</p>

Some frequently asked questions.

- 1) Isn't the CSA mark only for Canadian products? No, although CSA is often perceived as only for Canadian products, this organization can test and certify products according for both Canada and USA markets.
- 2) Tray Cable marked with the c(UL) mark can be used on the Canadian market? Yes, this product has been produced according to Canadian standards (identified by the "c" on the left of UL) and certified by the American Organization (UL) to be used in the Canadian market.
- 3) I understand that your Series 1060 single core cable is marked with the c(UR)us mark but I need a cable marked CSA because my installation is in Canada! Our product has been produced according to both U.S. and Canadian standards (identified by "c" on the left and "us" on the right of UR) and certified by the American Organization (UL) to be used in the U.S. and Canadian market.
- 4) I understand that your product has been tested to a UL standard but it carries a CSA mark, how can this be possible? If the standard is UL, doesn't the mark also have to come from UL? Certification organization such as UL and CSA are involved in both standards publication and testing. It is a common misperception that because an organization's name appears on a particular standard, that organization must exclusively perform product testing against the standard. The fact is that the standards publication and testing roles must be performed independently in order to avoid a conflict of interest. The standards are available for the manufacturer's use in design and manufacturing process but are also available to all accredited certification organizations for product testing. The manufacturer can choose to certify his product by any of the certification organizations.

\* Other Organizations (NRTL Nationally Recognized Testing Laboratory) recognized by OSHA (Occupational Safety and Health Administration) are QPS, CCL, FM, ETL, MET, NSF, TÜV, etc.

\*\* Not necessarily the mark is printed or stamped on the product, it could also be on the packaging, it depends on the type of product and on the requirements of the specific standard.

# Appendix K. Degrees of protection provided by enclosures

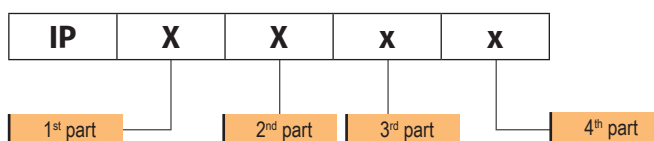
Herewith will be analysed all the reference standards specifying the degrees of protection provided by enclosures for electrical equipment and materials both for the European and for the North American markets, with the aim of clarifying the definition of the degrees of protection and a correlation, if possible, between the European and the American requirements.

## K.1 Degree of protection IP

The European EN 60529 standard and the German DIN 40050 standard, part 9, are, combined, an exhaustive document as concerns the degrees of protection provided by enclosures. The object of this standard is to give:

- 1) Definitions for the degrees of protection provided by enclosures for electrical equipment as regards:
  - a) Protection of persons against contact with hazardous parts inside the enclosures;
  - b) Protection of the equipment inside the enclosures against ingress of solid foreign objects;
  - c) Protection of the equipment inside the enclosures against the harmful effects due to the ingress of water.
- 2) Designations and classification for the degrees of protection
- 3) Requirements for each designation
- 4) Tests to be performed

These Standards classify the degree of protection of the enclosures with the IP code. The IP code (International Protection or Ingress Protection) is made by 4 parts which identify and characterize the degree of protection provided by the enclosure.



**First part** indicates the protection of the equipment against the ingress of solid foreign objects and the protection against access to hazardous parts also by means of tools in the hands of a person.

Table K.1. Definition of the first part of the IP code

Level	Definition	Effects
IP0_	Non-protected.	Non-protected.
IP1_	Protected against solid foreign objects $\geq 50$ mm in diameter.	Protected against access with the back of hand.
IP2_	Protected against solid foreign objects $\geq 12,5$ mm in diameter.	Protected against access with a finger.
IP3_	Protected against solid foreign objects $\geq 2,5$ mm in diameter.	Protected against access with a tool, for instance with a screwdriver.
IP4_	Protected against solid foreign objects $\geq 1$ mm in diameter.	Protected against access with a wire.
IP5_	Partially dust-protected. Ingress of dust is not totally prevented, but the dust must not enter in sufficient quantity to interface with satisfactory operation of the equipment or compromise its safety.	Ingress of dust is not totally prevented, protected against access with a thin wire.
IP6_	Protection against ingress of dust.	No ingress of dust, complete protection against contact (dust tight).

**Second part** indicates the degree of protection against the harmful effects due to the ingress of water inside the enclosure. If a protection against the ingress of water is not foreseen, the characteristic numeral must be replaced by letter X. This part may consist of additional levels contained in the DIN 40050-9 standard.

Table K.2. Definition of the second part of the IP code

Level	Definition	Standard
IP_0	Non-protected.	EN 60529, DIN 40050-9
IP_1	Protected against the vertical water dripping.	EN 60529, DIN 40050-9
IP_2	Protected against the water dripping when the enclosure is tilted at an angle up to to 15°.	EN 60529, DIN 40050-9
IP_3	Protected against rain (enclosure tilted up to 60°).	EN 60529, DIN 40050-9
IP_4	Protected against spraying (water sprayed from any direction).	EN 60529, DIN 40050-9
IP_4K	Protected against high-pressure water spray (from any direction).	DIN 40050-9
IP_5	Protected against water jets (from any direction).	EN 60529, DIN 40050-9
IP_6	Protected against powerful water jets (from any direction).	EN 60529, DIN 40050-9
IP_6K	Protected against powerful high-pressure jetting (from any direction).	DIN 40050-9
IP_7	Protected against the effects of temporary immersion (up to 1 m).	EN 60529, DIN 40050-9
IP_8	Protected against the effects of continuous immersion (beyond 1 m).	EN 60529, DIN 40050-9
IP_9K	Protected against high-pressure jets or steam (from any direction).	DIN 40050-9

The integration with DIN standard allows additional designations which permit to identify the products with high qualitative standards, such as the corrugated plastic conduits for the protec-

tion of cables and pertinent fittings. The test with high-pressure jets (about 80 bar) permits to define the product as IP 69K degree of protection (6 = total protection against dust and access with a wire, 9K = Protection against the harmful effects due to the high-pressure jets).

**Third part** is the first additional letter and indicates the degree of protection for persons against the access to hazardous parts. It is used when the protection for persons against access to hazardous parts is higher than the one indicated by the first part, usually when there is no coincidence between the degree of protection for persons and the degree of protection against the ingress of solid foreign objects; when the degree of protection against solid foreign objects is not indicated (the first part is replaced by a X), but only the degree of protection for persons.

**Table K.3. Definition of the third part of the IP code**

Level	Definition
a	Protected against access with the back of hand.
b	Protected against access with a finger.
c	Protected against access with a tool, for instance with a screwdriver.
d	Protected against access with a wire.

**Fourth part**, after the second part or after the supplementary letter, an additional letter can be appended to provide further information related to the protection of the device.

**Table K.4. Definition of the fourth part of the IP code**

Level	Definition
f	Oil resistant.
H	High-voltage equipment.
M	Tested against the harmful effects due to the ingress of water when its movable parts are in motion.
S	Tested against the harmful effects due to the ingress of water when its movable parts are not in motion.
W	Suitable for use under specific atmospheric conditions and provided with additional protective measures or proceedings.

## K.2 Degree of protection NEMA

On the USA market the enclosures' degrees of protection is defined by the "Type" (type of enclosure) according to NEMA (National Electrical Manufacturers Association) classification. NEMA, unlike the European standards, includes specific conditions such as corrosion, rust, ice, oils and coolants; the NEMA classification takes also into consideration uses for indoor, outdoor and hazardous locations. In the following tables are indicated the Types of Enclosure and the conditions under which they provide protection in nonhazardous and hazardous locations.

**Table K.5. Type of enclosure for use in nonhazardous locations**

Provides protection against the following conditions	Type of Enclosure															
	1 <sup>(a)</sup>	2 <sup>(a)</sup>	3	3X	3R <sup>(a)</sup>	3RX <sup>(a)</sup>	3S	3SX	4	4X	5	6	6P	12	12K	13
Indoor	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Outdoor			•	•	•	•	•	•	•	•	•	•	•			
Access to hazardous parts	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ingress of solid foreign objects (falling dirt)	•	•							•	•	•	•	•	•	•	•
Ingress of solid foreign objects (settling airborne dust, lint, fibers, and flyings <sup>(b)</sup> )									•	•	•	•	•	•	•	•
Ingress of solid foreign objects (circulating dust, lint, fibers, and flyings <sup>(b)</sup> )									•	•	•	•	•	•	•	•
Ingress of solid foreign objects (windblown dust, lint, fibers, and flyings <sup>(b)</sup> )			•	•			•	•	•	•		•	•			
Ingress of water (dripping and light splashing)		•							•	•	•	•	•	•	•	•
Ingress of water (rain, snow, and sleet <sup>(c)</sup> )			•	•	•	•	•	•	•	•		•	•			
Ingress of water (hosedown and splashing water)									•	•		•	•			
Sleet <sup>(d)</sup>							•	•								
Ingress of water (occasional temporary submersion)												•	•			
Ingress of water (occasional prolonged submersion)													•			
Oil and coolant seepage														•	•	•
Oil or coolant spraying and splashing																•
Corrosive agents				•		•		•		•			•			

(a) These enclosures may be ventilated.

(b) These fibers and flyings are nonhazardous materials and are not considered Class III type ignitable fibers or combustible flyings. For Class III type ignitable fibers or combustible flyings see the National Electrical Code, Article 500.

(c) External operating mechanisms are not required to be operable when the enclosure is ice covered.

(d) External operating mechanisms are operable when the enclosure is ice covered.



Table K6. Type of enclosure for use in hazardous locations

Provides protection against the following typical chemicals contained in atmosphere and for the specified ambient type <sup>(a)</sup>	Related hazardous locations	Type of Enclosure <sup>(b)</sup>			
		7	8	9	10
Indoor	-	•	•	•	cfr. <sup>(d)</sup>
Outdoor	-		•		cfr. <sup>(d)</sup>
Acetylene	Class I Group A	•	•		
Hydrogen, manufactured gas	Class I Group B	•	•		
Diethyl ether, ethylene, cyclopropane	Class I Group C	•	•		
Gasoline, hexane, butane, naphtha, propane, acetone, toluene, isoprene	Class I Group D	•	•		
Metal dust	Class I Group E			•	
Carbon black, coal dust, coke dust	Class II Group F			•	
Flour, starch, grain dust	Class II Group G			•	
Fibers, flyings (c)	Class III Group G			•	
Methane with or without coal dust	MSHA <sup>(d)</sup>				•

(a) If the installation of Type 7, 8, 9 and 10 is outdoors and/or additional protection is required by Table K.5, a combination-type enclosure is required.

(b) Due to the characteristics of the gas, vapor, or dust, a product suitable for one Class or Group may not be suitable for another Class or Group unless marked on the product.

(c) For Class III type ignitable fibers or combustible flyings see the National Electrical Code, Article 500.

(d) Mine Safety and Health Administration, 30 CFR, Part 18.

### K.3 Conversion between degrees of protection

The NEMA standard n.250 (Appendix A) gives a correlation among the recognized enclosures and the degrees of protection of the enclosures according to IP classification. As the European standard does not specify degrees of protection against the mechanical damage of equipment, risk of explosion or particular conditions such as moisture, corrosive vapors, etc., the correlation with the IP degrees of protection is not univocal and binding. The IEC designation consists of the letters IP followed by two numerals. The first characteristic numeral indicates the degree of protection provided by the enclosure with respect to persons and solid foreign objects entering the enclosure. The second characteristic numeral indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

The following tables provide an equivalent conversion from the enclosure NEMA Type numbers to the IEC enclosure classification designations IP. The enclosure type numbers meet or exceed the test requirements for the associated IEC classification; for this reason the tables cannot be used to convert from IEC classifications to enclosure NEMA Type numbers.

Table K.7. Conversion of NEMA enclosures with the first part of the IP code.

First part of the IP code	NEMA Type of Enclosure																
	1	2	3	3X	3R	3RX	3S	3SX	4	4X	5	6	6P	12	12K	13	
IP0_	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP1_	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP2_	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP3_			•	•			•	•	•	•	•	•	•	•	•	•	•
IP4_			•	•			•	•	•	•	•	•	•	•	•	•	•
IP5_			•	•			•	•	•	•	•	•	•	•	•	•	•
IP6_									•	•		•	•				

Table K.8. Conversion of NEMA enclosures with the second part of the IP code.

Second part of the IP code	NEMA Type of Enclosure																
	1	2	3	3X	3R	3RX	3S	3SX	4	4X	5	6	6P	12	12K	13	
IP_0	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP_1		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP_2		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP_3			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
IP_4			•	•	•	•	•	•	•	•		•	•	•	•	•	•
IP_5			•	•			•	•	•	•		•	•				
IP_6									•	•		•	•				
IP_7												•	•				
IP_8												•	•				

For convenience, the table below sets the NEMA Types of enclosures and the correspondent maximum degree of protection IP.

Table K.9. Conversion of NEMA enclosures with the correspondent maximum degree of protection IP.

NEMA Type of Enclosure	1	2	3	3X	3R	3RX	3S	3SX	4	4X	5	6	6P	12	12K	13
IP Degree of protection	IP20	IP22	IP55	IP55	IP24	IP24	IP55	IP55	IP66	IP66	IP53	IP67	IP68	IP54	IP54	IP54

Example

A IP65 degree of protection is defined, what are the types (Type) of NEMA enclosures that meet or exceed the requirements for this degree of protection?

Using table K.7 identifies the NEMA types of enclosures that satisfy the first part of the IP code, with table K.8 those which satisfy the second part of the IP code.

Conversion	1	2	3	3X	3R	3RX	3S	3SX	4	4X	5	6	6P	12	12K	13
IP6_									•	•		•	•			
IP_5			•	•			•	•	•	•		•	•			
On the row below only the common type of enclosures are listed																
IP65									•	•		•	•			

Finally the NEMA types 4, 4X, 6 and 6P meet or exceed the requirements for the degree of protection IP65.

## Appendix L. Hazardous locations

The ANSI/NFPA 70 "National Electrical Code" (NEC) defines the Hazardous Locations as locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings. The NEC pays attention to the hazardous locations because the electrical equipment can become source of ignition in these volatile areas. Articles 500 through 504, and 510 through 517 provide classification and installation standards for the use of electrical equipment in these locations.

Hazardous locations are classified in three ways: location types, danger condition and nature of the material in the location.

There are three types of hazardous locations.

The first type of location, Class I, is an area where flammable gases or vapours in the air are present in concentrations suitable to produce, which could be ignited if an electrical or other source of ignition is present.

The second type of location, Class II, is the area made hazardous by the presence of combustible dust, suspended in the atmosphere, which can cause an explosion.

The third type of location, Class III, is the area where there are easily-ignitable fibers or flyings present, due to the types of materials being handled, stored or processed. In this case the fibers or the flyings can collect around machinery where heat, a spark or hot metals parts can ignite them.

In addition to the types of hazardous locations, the NEC concerns itself with the kind of conditions under which the hazard is present. The hazardous materials may exist in several different kinds of conditions which, for simplicity, the NEC describe as normal conditions, Division 1, and abnormal conditions, Division 2. In the normal condition, the hazard would be expected to be present in everyday production operations or during frequent repair and maintenance activity. While, when the hazardous material is expected to be confined within closed systems (e.g. containers) and is present in the atmosphere only through accidental rupture, breakage or unusual faulty operation, the situation could be called abnormal.

Finally, the NEC defines the nature of the hazardous materials which are present in the location, grouping them according to the ignition temperature, the explosion pressure and other flammable characteristics (Group A, B, C, D, E, F, G).

An example: how would we classify a storage area where LP gas is contained in closed containers? LP gas is a Class I substance; the gas would be present in the atmosphere only if a leakage or an accidental rupture of one or more containers occurred, so it is an abnormal condition, Division 2. Finally, the material, liquid petroleum gas, belongs to Group D material, as shown in the following table.

In Europe the hazardous locations are classified by EN 60079-10 standard, and in Canada by the Canadian Electrical Code.

Table L.1. Hazardous locations according to Art. 500 of NFPA 70 (NEC) - Ed. 2008/2011

Type of location	Hazardous condition	Nature of the material	Examples
<p><b>Class I (Art. 501 of NEC)</b> Locations in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.</p>	<p><b>Division 1</b> Locations in which ignitable concentrations of flammable gases or vapors can exist under normal operating conditions. Or in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage. Or in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.</p> <p><b>Division 2</b> Locations in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment. Or in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation and which might become hazardous through failure or abnormal operation of the ventilating equipment. Or that is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.</p>	<p><b>Group A</b> Atmospheres containing acetylene.</p> <p><b>Group B</b> Atmospheres containing hydrogen or other materials with similar characteristics.</p> <p><b>Group C</b> Atmospheres containing ethylene or other materials with similar characteristics.</p> <p><b>Group D</b> Atmospheres containing butane, gasoline, natural gas and propane.</p>	<p>Within this classifications there are the petroleum refineries, petrol pumps and stowages; plants for dry cleaning where could be present vapours coming out from the cleaning fluids; hangars for airplanes and petrol stations; areas for the stowage and distribution of LP gas or natural gas.</p> <p>All these areas require special equipments and components homologated in Class I.</p>
<p><b>Class II (Art. 502 of NEC)</b> Locations hazardous because of the presence of combustible dust.</p>	<p><b>Division 1</b> Locations in which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures. Or where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, through operation of protection devices, or from other causes. Or in which Group E combustible dusts may be present in quantities sufficient to be hazardous.</p> <p><b>Division 2</b> Locations in which combustible dust due to abnormal operations may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Or where combustible dust accumulations are present but are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but could as a result of infrequent malfunctioning of handling or processing equipment become suspended in the air. Or in which combustible dust accumulations on, in, or in the vicinity of the electrical equipment could be sufficient to interfere with the safe dissipation of heat from electrical equipment, or could be ignitable by abnormal operation or failure of electrical equipment.</p>	<p><b>Group E</b> Atmospheres containing metal dusts such as aluminium or magnesium dust.</p> <p><b>Group F</b> Atmospheres containing explosive dusts such as carbon dust.</p> <p><b>Group G</b> Atmospheres containing flour, starch, grain and similar materials.</p>	<p>Within this classification are transport systems for grain, mills, system for flour production; systems for the production, the use of the storage of aluminium or magnesium dusts; machinery for the manufacturing of plastics, medicinal, fireworks; systems for sweets production and sugar processing; plants for carbon treatment and transformation.</p>

Type of location	Hazardous condition	Nature of the material	Examples
<b>Class III (Art. 503 of NEC)</b> Locations hazardous because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.	<b>Division 1</b> Locations in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.  <b>Division 2</b> Locations in which easily ignitable fibers are stored or handled other than in the process of manufacture.	No group.	Within this classifications are included the systems for the production of fabrics or for cotton processing; machinery for wood processing or cutting and for the production of sawdust or fiber glass.

With explicit reference to the chapter concerning the degrees of protection of the enclosures, the standards concerning the hazardous locations define the TYPE of enclosures which can be used for such locations.

Table L.2. NEMA classification of enclosures to be used in the hazardous locations

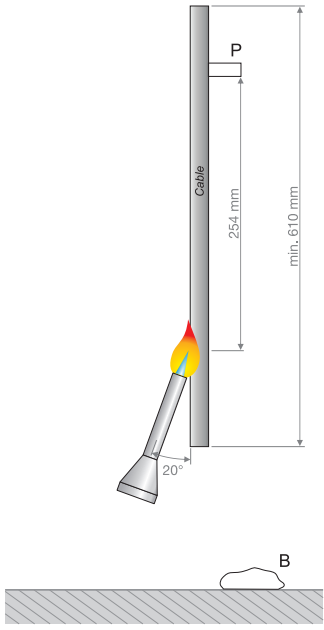
Type	Type of enclosures for indoor use in hazardous locations
NEMA 7	Enclosures for indoor use in locations classified as Class I, Division 1, Group A, B, C or D. Enclosures constructed to contain internal explosions without causing external damages.
NEMA 8	Enclosures for indoor or outdoor use in locations classified as Class I, Division 1, Group A, B, C or D. Enclosures constructed to prevent the combustion through the use oil-immersed equipment.
NEMA 9	Enclosures for indoor or outdoor use in locations classified as Class I, Division 1, Group A, B, C or D. Enclosures constructed to prevent the combustion through the use oil-immersed equipment.
NEMA 10	Enclosures meeting the requirements of the Mine Safety and Health Administration, 30 CFR, Part. 18. Enclosures constructed to contain internal explosions without causing external damages.

## Appendix M. Cables and wires' flame resistance tests

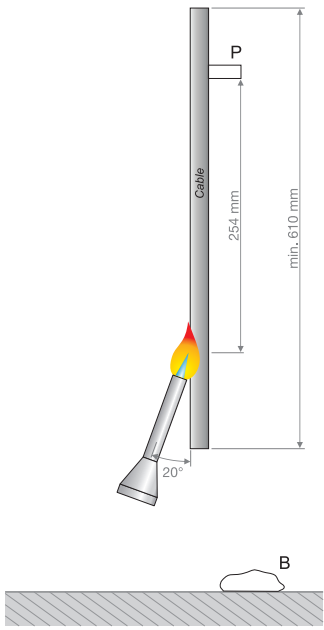
Flammability tests and determination of combustion products are vital to cable technology. They provide information on how fire spreads along the cable as well as on the potential threats to people and materials in the event of a cable fire.

In order to make sure that a particular cable meets the necessary flammability requirements, a wide range of different testing procedures are often used. These procedures are typically performed in either the vertical or horizontal orientation, on single cables or on group cables.

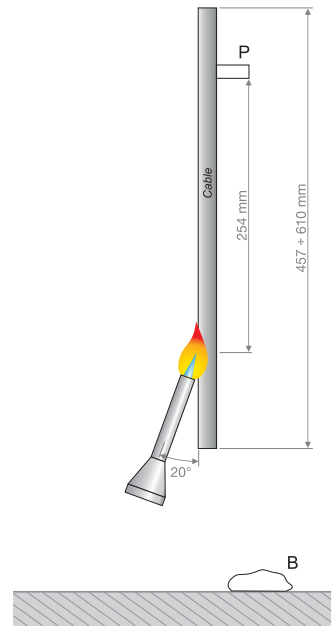
Test method	<b>UL 1581 - Par. 1080 - VW-1 (Vertical Specimen) Flame test</b> <b>UL 2556 - Par. 9.4 - FV-2/VW-1</b>
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.
Duration	15 s of flame application and 15 s of pause for 5 cycles. When flaming of the specimen persists longer than 15 s after removal of the burner flame, the burner flame shall not be re-applied until immediately after the flaming ceases.
Compliance	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material shall not ignite the cotton wool underneath (B).



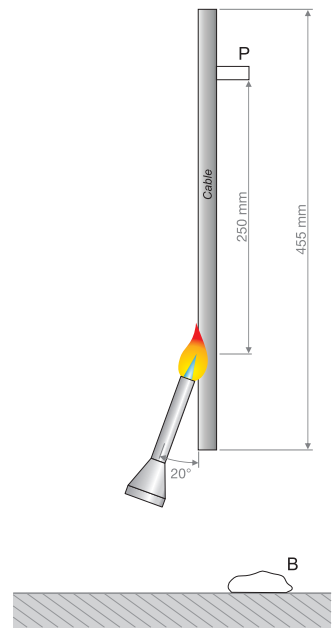
Test method	<b>UL 1581 - Par. 1060 - Vertical Flame</b> <b>UL 2556 - Par. 9.5 - FV-1/Vertical flame</b>
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.
Duration	15 s of flame application and 15 s of pause for 5 cycles. The burner flame shall be reapplied after 15 s, regardless of whether flaming of the specimen persists longer than 15 s.
Compliance	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material shall not ignite the cotton wool underneath (B).



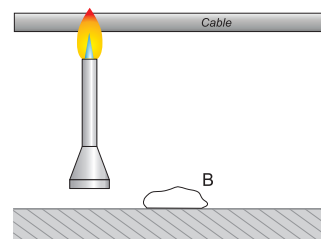
<b>Test method</b>	<b>UL 1581 – Par. 1060 – FT1</b> <b>UL 2556 – Par. 9.3 – FT1</b>
<b>Description</b>	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.
<b>Duration</b>	15 s of flame application and 15 s of pause for 5 cycles. The burner flame shall be reapplied after 15 s, regardless of whether flaming of the specimen persists longer than 15 s.
<b>Compliance</b>	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material or the ignition of the cotton wool underneath (B) are ignored for the compliance of this test.



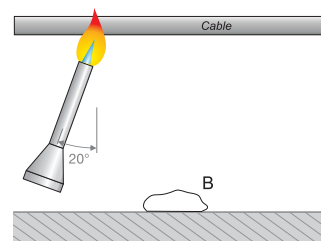
<b>Test method</b>	<b>UL 1581 – Par. 1061 – Cable Flame test</b>
<b>Description</b>	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.
<b>Duration</b>	60 s of flame application and 30 s of pause for 3 cycles. The burner flame shall be reapplied after 30 s, regardless of whether flaming of the specimen persists longer than 30 s.
<b>Compliance</b>	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material shall not ignite the cotton wool underneath (B).



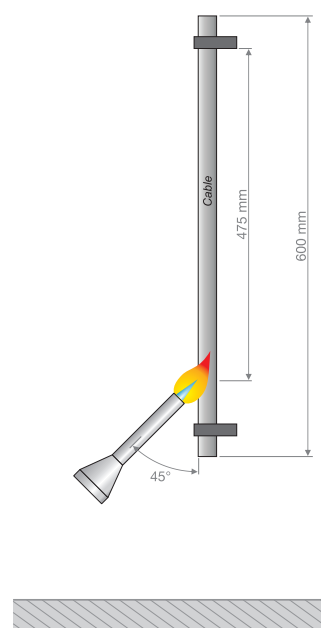
<b>Test method</b>	<b>UL 1581 – Par. 1090 – Horizontal-Specimen Appliance-Wire Flame Test</b>
<b>Description</b>	The cable is secured horizontally. A burner is used to apply the flame and it is secured vertically.
<b>Duration</b>	30 s of flame application.
<b>Compliance</b>	The flame propagation speed must not exceed 25 mm/min. Dripping material shall not ignite the cotton wool (B) placed next to the burner.



<b>Test method</b>	<b>UL 1581 – Par. 1100 – Horizontal-Specimen / FT2 Flame Test UL 2556 – Par. 9.1 – FT2/FH/Horizontal flame</b>
<b>Description</b>	The cable is secured horizontally. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.
<b>Duration</b>	30 s of flame application.
<b>Compliance</b>	The length of the carbonized specimen has to be no greater than 100 mm. Dripping material shall not ignite the cotton wool (B) placed next to the burner.

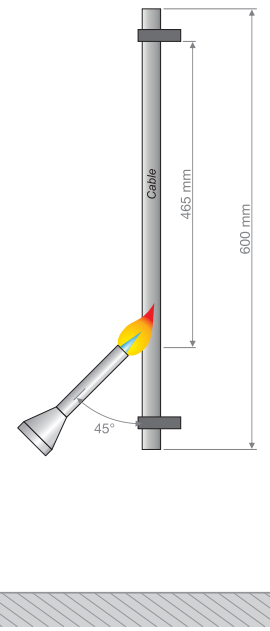


<b>Test method</b>	<b>IEC 60332-1-2 / EN 60332-1-2</b>
<b>Description</b>	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 45° in respect to the vertical.
<b>Duration</b>	Based on the cable diameter: 60 s ( $D \leq 25$ mm), 120 s ( $25 < D \leq 50$ mm), 240 s ( $50 < D \leq 75$ mm), 480 s ( $D > 75$ mm)
<b>Compliance</b>	The fire damage must end at least 50 mm below the upper fixing clamp. The cable must be self-extinguishing.

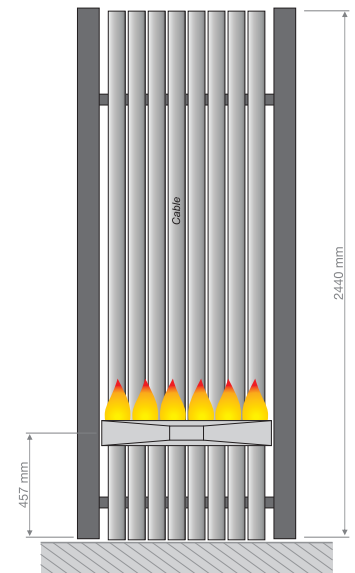




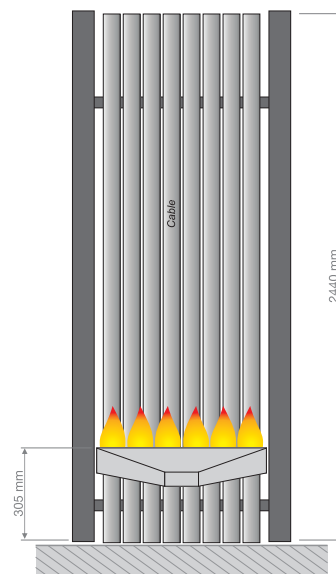
<b>Test method</b>	<b>IEC 60332-2-2 / EN 60332-2-2</b>	
<b>Description</b>	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 45° in respect to the vertical.	
<b>Duration</b>	20 s	
<b>Compliance</b>	The fire damage must end at least 50 mm below the upper fixing clamp. The cable must be self-extinguishing	



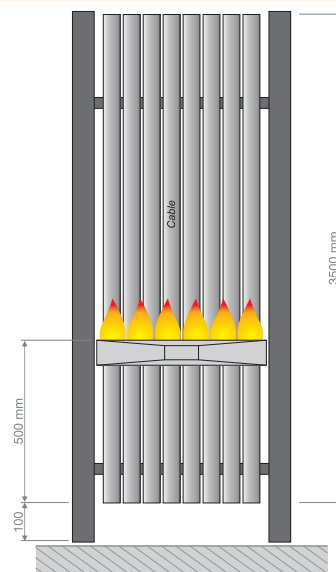
<b>Test method</b>	<b>UL 2556 - Par. 9.6 - Vertical tray (Method 1)</b> <b>UL 1581 - Par. 1160 - Vertical Tray Flame Test</b> <b>UL 1685</b>	
<b>Description</b>	The cables are secured vertically to a ladder in a single layer. A burner is used to apply the flame and it is secured horizontally.	
<b>Duration</b>	20 min of flame application for 2 tests.	
<b>Compliance</b>	The damage height of all specimens shall be less than 2440 mm when measured from the bottom of the tray.	



<b>Test method</b>	<b>UL 2556 - Par. 9.6 - FT4 (Method 2)</b>
<b>Description</b>	The cables are secured vertically to a ladder in a single layer. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.
<b>Duration</b>	20 min of flame application for 2 tests.
<b>Compliance</b>	The damage height of all specimens shall be less than 1500 mm when measured from the bottom edge of the burner.



<b>Test method</b>	<b>IEC 60332-3-24 / EN 60332-3-24</b>
<b>Description</b>	The cables are secured vertically to a ladder also in several layers. A burner is used to apply the flame and it is secured horizontally.
<b>Duration</b>	20 min
<b>Compliance</b>	The damage height of all specimens shall be less than 2500 mm when measured from the bottom of the tray.



## Appendix N. Flammability rating for plastic materials

UL 94 is the Standard which defines the tests for flammability of plastic materials for parts in devices and appliances.

The standard classifies plastics according to how they burn in various orientations and thicknesses, from the least flame-retardant to most flame-retardant.

### Class HB – Horizontal burning test

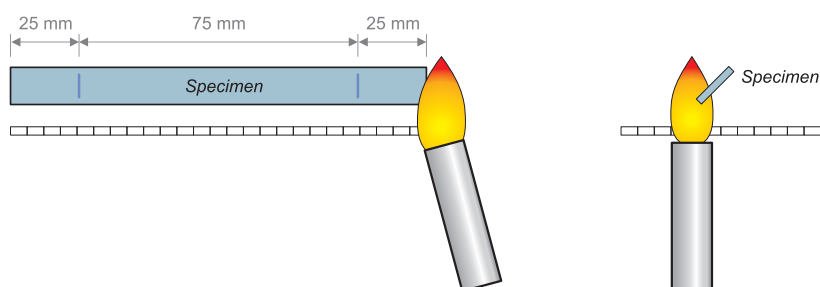
The specimen is placed horizontally and exposed to a Bunsen burner flame ( $h = 20\text{ mm}$ ) for 30 seconds.

Any ignition or burning is noted. A HB classification is awarded on the basis of the burning rate of specimens (6 test specimens  $125\text{ mm} \times 13\text{ mm}$ ) up to 13 mm thick.

Assessment criteria for UL 94 HB are:

- burning rate of specimens between 3 and 13 mm thick over a distance of 75 mm is  $\leq 40\text{ mm/min}$  or
- burning rate of specimens up to 3 mm thick over a distance of 75 mm is  $\leq 75\text{ mm/min}$  or
- burning must cease before the 100 mm mark.

Figure N.1. Horizontal burning test

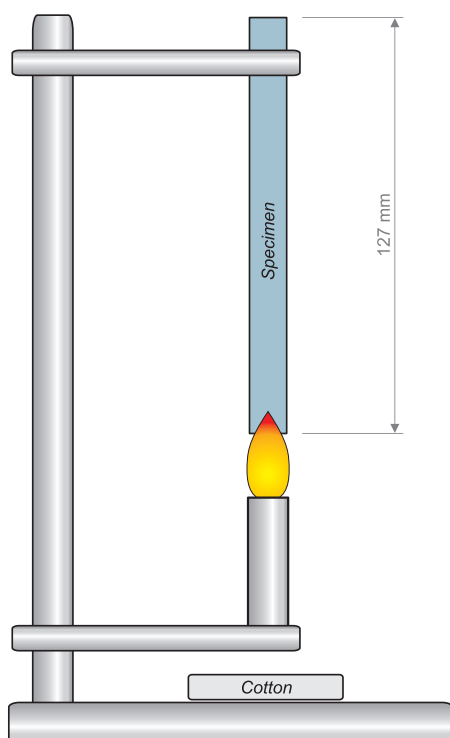


### Class V0, V1 e V2 – Vertical burning test

In this test the specimen is placed vertically and exposed to a Bunsen burner flame ( $h = 20$ ) for two periods of 10 seconds (the second period is applied after extinction). The assessment criteria are burning time, total burning time and the dropping of burning particles of specimens (10 test specimens 125 mm x 13 mm) up to 13 mm thick as follows.

Classification	V0	V1	V2
Burning time after each flame application	$\leq 10$ sec	$\leq 30$ sec	$\leq 30$ sec
Total burning time per batch	$\leq 50$ sec	$\leq 250$ sec	$\leq 250$ sec
Burning up to the clamp	No	No	No
Burning and glowing time after second flame application	$\leq 30$ sec	$\leq 60$ sec	$\leq 60$ sec
Ignition of cotton wadding	No	No	Yes

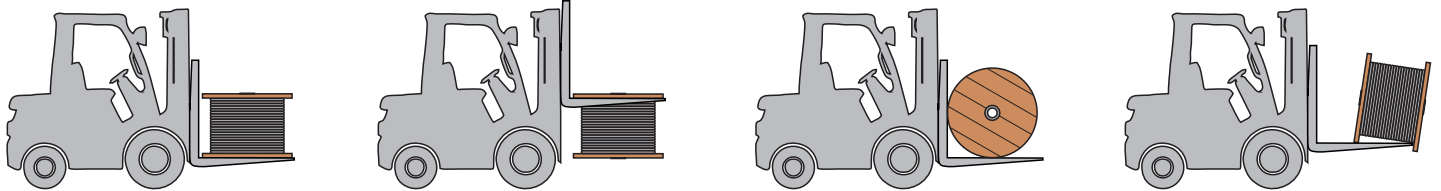
Figure N.2. Vertical burning test



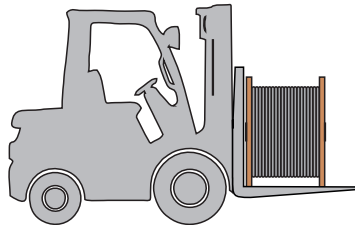
## Appendix O. Cables' transportation, storage and handling

### 0.1 Transportation and storage

Reasonable precautions must be taken in consideration to avoid damage to the cable and injury to people. Lifting and moving operations must be carried out in accordance with the relevant local regulations or codes of practice. Always pay attention to the weight of the drum, the method and direction of rolling and the method of handling and lifting. All reels or drums must be transported on their sides and are not allowed to lie on the flange.

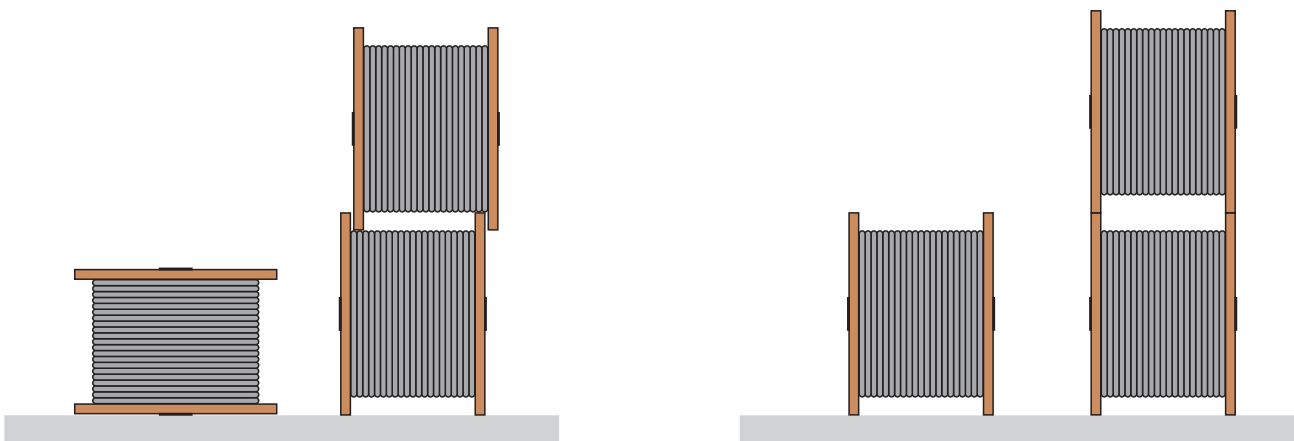


Wrong



Correct

Cable drums should be stored so that the drum flanges do not contact cable on another drum. Drums should be stored on a level surface, on the flange edges (not with the flange flat on the ground) and restricted from rolling.



Wrong

Correct

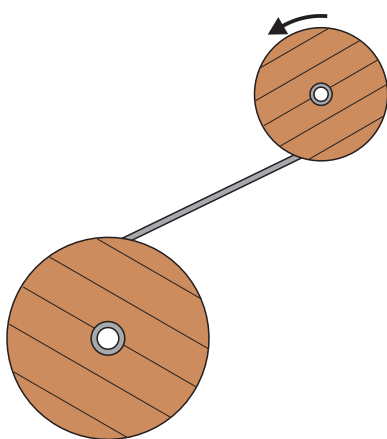
Cables should not be exposed to large temperature fluctuations and wherever possible must be stored indoor. Cables stored in wet location must be protected by sealing the exposed end with heat shrinkable end caps. Cables stored at temperatures below the ones recommended for installation, should not be subject to any mechanical stress, impacts, bending or torsions. Cables should be stored in a dry and frost-free locations. Cables with colored outer jacket should not be stored in direct sunlight to prevent damages and fading of the color. Cables should be protected against direct sun light with suitable protection package such as black plastic lagging. The cables must not be placed in contact with chemicals and corrosive media.

## 0.2 Handling

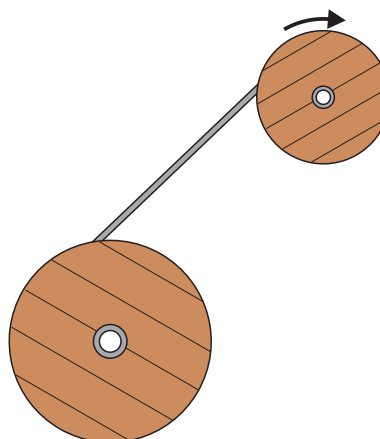
Prior to installation, the cables must be kept in-house storage for at least 24 hours to reach the temperature recommended for installation. Cables should be operated on clean floor without metal or wooden parts, nails, etc. to avoid any damage.

At very cold temperatures the material stiffens and becomes inflexible and irreparable damage can occur. Since the mechanical strain on the cable in its laid form is significantly less than the one during laying and use, the permissible minimum temperature is lower than the temperature valid for the installation period. Unless otherwise specified, minimum laying temperature is  $-5^{\circ}\text{C}$  for PVC jacketed cables,  $-20^{\circ}\text{C}$  for PE jacketed cables and it is  $+5^{\circ}\text{C}$  for winding/unwinding process.

Spooling from the top of one reel to the bottom of the other will induce a twist in the cable. Always maintain direction of cable wraps throughout spooling system. Unless otherwise specified, the maximum tensile stress of the copper conductors during installation should be  $50\text{ N/mm}^2$  which as to be considered as the sum of the static and dynamic stress; residual stress after installation for fixed application should be  $10\text{ N/mm}^2$ . Cables must never be bend to a radius tighter than the minimum bending radius specified in the technical datasheets.

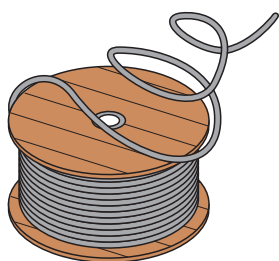


Wrong

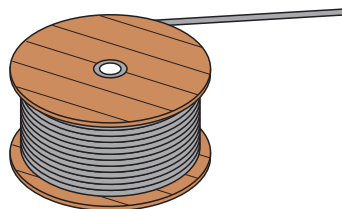


Correct

During unwinding, a straight torsion-free guiding has to be observed and the cable has to be fixed and connected torsion-free. Cables must never be unwound off over the drum flange, this will causes kinks and may results in cable damages.



Wrong



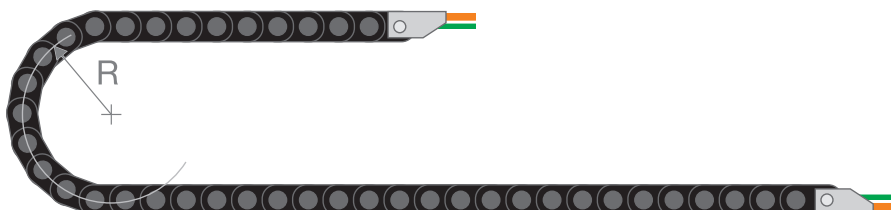
Correct

### 0.3 Use of cables in drag-chain

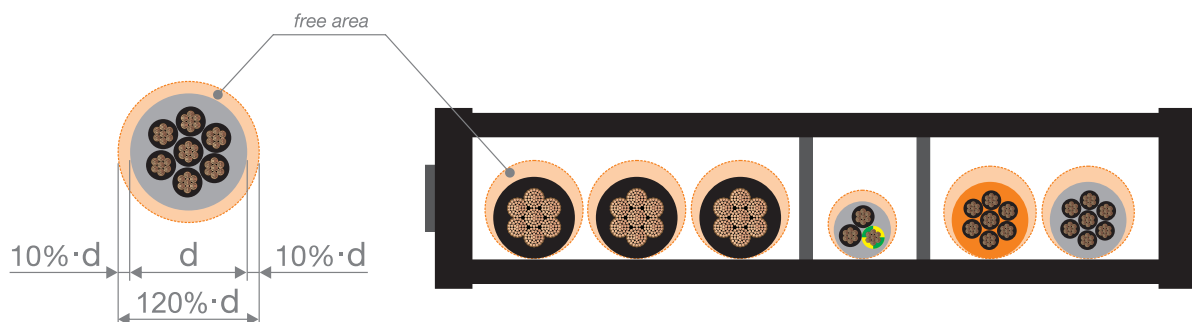
For dynamic applications, cables in drag-chain (also called energy chain, cable track, cable carrier) can be used. A drag-chain is a mechanical system designed to carry, protect and guide power, control, signal cables and hydraulic or pneumatic hoses in dynamic applications to transfer power and signal between two points in relative movement (translation, rotation or both) to each other.

Following instructions are suggested for a proper installation of cables in drag-chain.

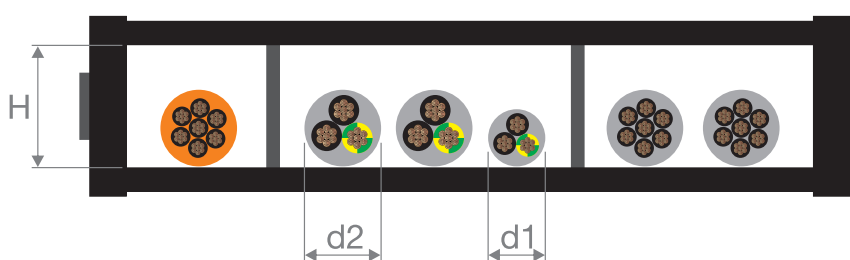
- The cables must be selected extremely carefully. Always use only cables which are suitable for the specific drag-chain application.
- Cables should be stored in closed space and within the temperature range given in the technical datasheet. The cable temperature should not be below +5°C during installation.
- The minimum bending radius  $R$  must always be respected. The cable with the largest diameter must be used for dimensioning the minimum bending radius of the drag-chain.



- The total cross-section of the drag-chain should be filled not more than 80%. Allow a free space around the cable of at least 10% of the diameter.



- The cable must not cross another and must not be placed on top of another. Single layer of cables should be preferred over multi-layer arrangement. Dividing bars should be installed between the layers of multi-layer cable arrangement. Cables with different diameters, jacket material or conducting material should be installed separately with dividing bars (separators). If this is not possible verify that the internal space of the drag-chain does not allow cables to be twisted ( $H < d1 + d2$ ).

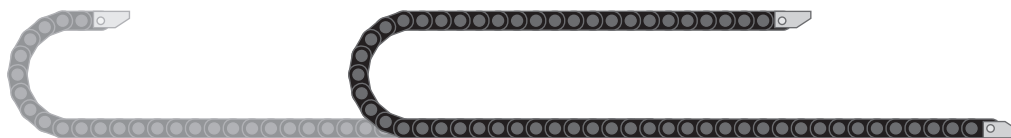


- Cables must be able to move freely also around the bending radius. The cables must never be fixed or tied together in the chain.
- Cables must be laid in drag chains without any inducted torsion (twisting) or load. It is suggested to lay or, better, hang the cables before use in order to release any possible twist.
- Before and after fixing cables, it is suggested to operate the drag-chain for few cycles in order to verify free movements, spaces around the cables and to bring the cables in a neutral position.
- A certain amount of loose cable (reserve) must be guaranteed on both ends of the drag-chain. Avoid keeping the movement up to the utility. Install cable fixation devices (cable clamps, cable ties, fixation profiles) at the moving end and at the fixed point.
- Verify periodically the cables: check overlaps, torsions or stretching. Replace all the cables after failure of a drag-chain.

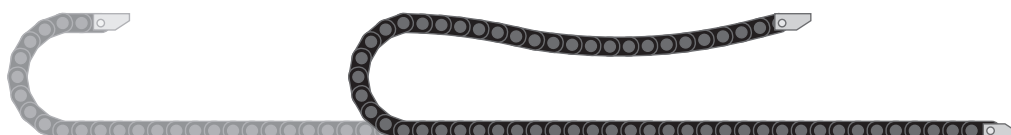
The drag-chain configurations are depending on the travel distance, the fill weight, the drag-chain type and the applications.

**Unsupported (or self-supported).**

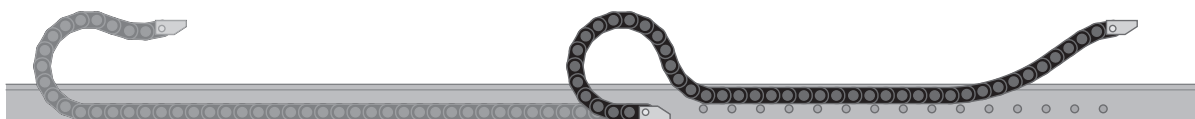
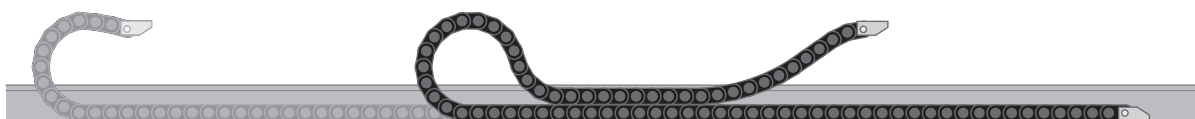
When the upper run of the drag-chain operates without touching the lower run along the entire travel. This configuration allow higher speed and acceleration and less cable and drag-chain stress, lifetime is longer.

**Unsupported with sag (or self-supported with sag).**

When the upper run of the drag-chain operates with a sag. This configuration allow longer travel distances but must be operated with lower speed and acceleration and the lifetime is reduced.

**Gliding (or sliding).**

In the case of long travel lengths, the upper run of the drag-chain glides on its lower run. Beyond the fixed point the drag-chain glides on the sliding surface (support) of the guide channel which is required to prevent the upper run from slipping off the lower run.





## Appendix P. Tables of Color

### P.1 Colors of conductors according to their function

Table P.1. Colors of conductors according to their function

Function	International codification	North American codification
N-Neutral (Neutral)	Light blue	White
L-Live (Phase)	Brown	Black
E-Earth or Ground	Yellow/Green	Green or Yellow /Green

### P.2 Colors of conductors according to DIN 47100

Table P.2a. Colors of conductors according to DIN 47100 – Multicore cables

Conductor ID	Color
1	White
2	Brown
3	Green
4	Yellow
5	Gray
6	Pink
7	Blue
8	Red
9	Black
10	Violet
11	Gray/Pink
12	Red/Blue
13	White/Green
14	Brown/Green
15	White/Yellow
16	Yellow/Brown
17	White/Gray
18	Gray/Brown
19	White/Pink
20	Pink/Brown
21	White/Blue
22	Brown/Blue
23	White/Red
24	Brown/Red
25	White/Black
26	Brown/Black
27	Gray/Green
28	Yellow/Gray
29	Pink/Green
30	Yellow/Pink
31	Green/Blue
32	Yellow/Blue
33	Green/Red
34	Yellow/Red
35	Green/Black
36	Yellow/Black
37	Gray/Blue
38	Pink/Blue
39	Gray/Red
40	Pink/Red
41	Gray/Black
42	Pink/Black
43	Blue/Black
44	Red/Black

Table P.2b. Colors of conductors according to DIN 47100 – Muticore cables in pairs

Pairs ID	Conductor 1 color	Conductor 2 color
1	White	Brown
2	Green	Yellow
3	Gray	Pink
4	Blue	Red
5	Black	Violet
6	Gray/Pink	Red/Blue
7	White/Green	Brown/Green
8	White/Yellow	Yellow/Brown
9	White/Gray	Gray/Brown
10	White/Pink	Pink/Brown
11	White/Blue	Brown/Blue
12	White/Red	Brown/Red
13	White/Black	Brown/Black
14	Gray/Green	Yellow/Gray
15	Pink/Green	Yellow/Pink
16	Green/Blue	Yellow/Blue
17	Green/Red	Yellow/Red
18	Green/Black	Yellow/Black
19	Gray/Blue	Pink/Blue
20	Gray/Red	Pink/Red
21	Gray/Black	Pink/Black
22	Blue/Black	Red/Black

### P.3 Colors of conductors according to CEI UNEL 00722

Table P.3a. Colors of conductors according to CEI UNEL 00722:2002 – Multicore cables without Yellow/Green conductor

Num. of conductors	Conductor 1	Conductor 2	Conductor 3	Conductor 4	Conductor 5	Conductor 6÷n
2	Blue	Brown				
3	Brown	Black	Gray			
4	Blue	Brown	Black	Gray		
5	Blue	Brown	Black	Gray	Black	
>5			Black numbered			

Table P.3b. Colors of conductors according to CEI UNEL 00722:2002 – Multicore cables with Yellow/Green conductor

Num. of conductors	Conductor 1	Conductor 2	Conductor 3	Conductor 4	Conductor 5	Conductor 6÷n
3	Yellow/Green	Blue	Brown			
4	Yellow/Green	Brown	Black	Gray		
5	Yellow/Green	Blue	Brown	Black	Gray	
>5			Black numbered + Yellow/Green			

### P.4 Colors of conductors according to UL508a

Table P.4a. Colors of conductors according to UL 508a - Rev. 2007-2018, requirements for all kind of control panels (17.3 Identification of Grounding and Grounded Circuit Conductors and Terminals)

Color	Function
Green (or Yellow/Green)	Ground conductor

Table P.4b. Colors of conductors according to UL 508a - Rev. 2007-2018, requirements for power circuit conductors of control panels (66.5 Internal wiring - power circuits)

Color	Function
Black	Ungrounded power circuit conductors
White or gray or three continuous white stripes on other than green, blue, orange or yellow	Grounded alternate current power circuit conductors

Table P.4c. Colors of conductors according to UL 508a - Rev. 2007-2018, requirements for control circuit conductors of control panels (66.9 Internal wiring of control circuit)

Color	Function
Black	All ungrounded control circuit conductors operating at the supply voltage
Red	Ungrounded alternate current control circuits operating at a voltage less than the supply voltage
Blue	Ungrounded direct current control circuit conductor
Yellow or Orange	Ungrounded control circuits or other wiring, such as for cabinet lighting, that remain energized when the main disconnect is in the "off" position.
White or gray or three white stripes on other than green, blue, orange or yellow	Grounded alternate current control circuit conductor
White with blue stripe	Grounded direct current control circuit conductor

## P.5 Colors of conductors according to NFPA 79

Table P.5. Colors of conductors according to NFPA 79 - Ed. 2007-2018 - 13.2 Identification of Conductors

Color	Function
Black	Ungrounded alternate and direct current power conductors
Red	Ungrounded alternate current control circuit conductors
Blue	Ungrounded direct current control circuit conductors
Orange	Ungrounded conductors that remain energized when the main supply circuit disconnecting means is in the "off" position
Green (or Yellow/Green)	Grounded conductors
White with orange stripes	Grounded alternate current circuit conductors that remain energized when the main supply circuit disconnecting means is in the "off" position
White or gray or three white stripes on other than green, blue or orange	Grounded alternate current control circuit conductor
White with blue stripe	Grounded direct current control circuit conductor

## P.6 Colors of conductors according to EN 60204-1

Table P.6. Colors of conductors according to IEC 60204-1:2016

Color	Function
Black	Ungrounded alternate and direct current power conductors
Red	Ungrounded alternate current control circuit conductors
Blue	Ungrounded direct current control circuit conductors
Yellow/Green	Grounded conductors

## P.7 Colors of conductors according to ICEA (Insulated Cable Engineers Association)

Table P.7a. Colors of conductors according to ICEA (Insulated Cable Engineers Association) – Method 1, table E-1

Conductor ID	Color	Conductor ID	Color	Conductor ID	Color	Conductor ID	Color	Conductor ID	Color
1	Black	11	Blue/Black	21	Orange/Green	31	Green/Black/Orange	41	Green/White/Blue
2	White	12	Black/White	22	Black/White/Red	32	Orange/Black/Green	42	Orange/Red/Green
3	Red	13	Red/White	23	White/Black/Red	33	Blue/White/Orange	43	Blue/Red/Green
4	Green	14	Green/White	24	Red/Black/White	34	Black/White/Orange	44	Black/White/Blue
5	Orange	15	Blue/White	25	Green/Black/White	35	White/Red/Orange	45	White/Black/Blue
6	Blue	16	Black/Red	26	Orange/Black/White	36	Orange/White/Blue	46	Red/White/Blue
7	White/Black	17	White/Red	27	Blue/Black/White	37	White/Red/Blue	47	Green/Orange/Red
8	Red/Black	18	Orange/Red	28	Black/Red/Green	38	Black/White/Green	48	Orange/Red/Blue
9	Green/Black	19	Blue/Red	29	White/Red/Green	39	White/Black/Green	49	Blue/Orange/Red
10	Orange/Black	20	Red/Green	30	Red/Black/Green	40	Red/White/Green	50	Black/Orange/Red

Table P.7b. Colors of conductors according to ICEA (Insulated Cable Engineers Association) – Method 1, table E-2

Conductor ID	Color	Wire	Color
1	Black	17	Black/Blue
2	Red	18	Red/Blue
3	Blue	19	Orange/Blue
4	Orange	20	Yellow/Blue
5	Yellow	21	Brown/Blue
6	Brown	22	Black/Orange
7	Red/Black	23	Red/Orange
8	Blu/Black	24	Blue/Orange
9	Orange/Black	25	Yellow/Orange
10	Yellow/Black	26	Brown/Orange
11	Brown/Red	27	Black/Yellow
12	Black/Red	28	Red/Yellow
13	Blue/Red	29	Blue/Yellow
14	Orange/Red	30	Orange/Yellow
15	Yellow/Red	31	Brown/Yellow
16	Brown/Red	32	Black/Brown

## P.8 Colors of conductors according to internal specification Type 1-P

Table P.8. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	White	Blue
2	White	Orange
3	White	Green
4	White	Black
5	White	Red
6	White	Gray
7	White	Brown
8	White	Yellow

## P.9 Colors of conductors according to internal specification Type 1-C

Table P.9. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	Black	Red
2	Black	White
3	Black	Green
4	Black	Blue
5	Black	Yellow
6	Black	Brown

## P.10 Colors of conductors according to internal specification Type 1-T

Table P.10. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	Yellow	Blue
2	Red/White	Black/White
3	Red	Black
4	White	Blue
5	Red	White
6	Red/White	White

## P.11 Colors of conductors according to internal specification Type 2-C

Table P.11a. Colors of pairs 0,35 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Yellow	Pink
2	White	Blue
3	Violet	Brown

Table P.11b. Colors of pairs 0,5 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Red	Black

## P.12 Colors of conductors according to internal specification Type 3-P

Table P.12a. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	Green	White/Green
2	Blue	White/Blue
3	Orange	White/Orange

Table P.12b. Colors of conductors

Conductor ID	Color
1	Red
2	Black
3	Yellow/Green

## P.13 Colors of conductors according to internal specification Type 4-C

Table P.13a. Colors of pairs 0,25 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Brown	Green
2	Gray	Pink
3	Blue	Violet
4	Red	Black

Table P.13b. Colors of pairs 1 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	White	Brown

## P.14 Colors of conductors according to internal specification Type 5-P

Table P.14a. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	Red	Orange
2	Yellow	Green
3	Blue	Violet
4	Brown	Black

Table P.14b. Colors of conductors

Pair ID	Color
1	White/Blue
2	White/Red
3	White/Black
4	White/Yellow

## P.15 Colors of conductors according to internal specification Type 6-T

Table P.15a. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	White	Yellow
2	White	Blue
3	White	Rosso
4	White	Green

## P.16 Colors of conductors according to internal specification Type 7-P

Table P.16a. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	Blue	Black

Table P.16b. Colors of conductors

Conductor ID	Color
1	Black
2	Violet
3	Pink
4	Brown
5	Green
6	Yellow
7	White
8	Blue

## P.17 Colors of conductors according to internal specification Type 8-C

Table P.17a. Colors of pairs 0,14 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Green	Yellow
2	Black	Brown
3	Gray	Pink

Table P.17b. Colors of pairs 0,5 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	White	Brown

## P.18 Colors of conductors according to internal specification Type 9-P

Table P.18a. Colors of pairs 0,14 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Yellow	Green
2	Black	Brown
3	Red	Orange

Table P.18b. Colors of pairs 0,5 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Brown/Blue	Brown/Red

Table P.18c. Colors of pairs 0,14 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Gray	White/Yellow
2	Blue	White/Black

Table P.18d. Colors of pairs 0,25 mm<sup>2</sup>

Pair ID	Conductor 1	Conductor 2
1	Brown/Yellow	Green/Black
2	Brown/Gray	Green/Red

## P.19 Colors of conductors according to internal specification Type 10-P

Table P.19. Colors of pairs

Pair ID	Conductor 1	Conductor 2
1	Black	Green
2	Red	Blue

## Appendix Q. Standard reference

Table Q1. List of the main references standards

Standard	Description
ANSI C37.20	Switch gear assemblies and metal-enclosed bus
ANSI C80.1	Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	Steel Electrical Metallic Tubing (EMT)
ANSI C80.6	Electrical Intermediate Metal Conduit (EIMC)
ANSI Z535-4	Product Safety Signs and Labels
ANSI/NFPA 70	National Electrical Code
ANSI/NFPA 79	Electrical Standard for Industrial Machinery
ASTM A123/123M	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM-D 1000	Standard Test Method for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM-D 149	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM-D 150	Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
ASTM-D 2303	Standard Test Methods for Liquid-Contaminant, Inclined-Plane Tracking and Erosion of Insulating Materials
ASTM-D 257	Standard Test Methods for DC Resistance or Conductance of Insulating Materials
ASTM-D 2671	Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use
ASTM-D 412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
ASTM-D 570	Standard Test Method for Water Absorption of Plastics
ASTM-D 635	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM-D 638	Standard Test Method for Tensile Properties of Plastics
ASTM-D 792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM-E 28	Standard Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus
ASTM-G 21	Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
ASTM-G 53	Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials
CEI 15-26	Electrical insulation. Thermal evaluation and designation
CSA C22.2 No. 227.2.1-04	Liquid-Tight Flexible Nonmetallic Conduit
CSA C22.2 No. 227.3-05	Nonmetallic Mechanical Protection Tubing (NMPT)
CSA C22.2 No. 83.1-07	Electrical Metallic Tubing - Steel
CSA C22.2 No.126.1-09	Metal cable tray systems
DIN 40050	Road vehicles; degrees of protection (IP-code); protection against foreign objects; water and contact; electrical equipment
DIN 53474	Testing of plastics, rubber and elastomers - Determination of the chlorine content
EN 60228	Conductors of insulated cables
EN 60243	Electrical Strength of Insulating Materials – Test Methods
EN 60529	Specification for degrees of protection provided by enclosures (IP code)
EN 60707	Flammability of solid non-metallic materials when exposed to flame sources. List of test methods.
EN 61386	Conduit systems for cable management.
EN 61537	Cable management. Cable tray systems and cable ladder systems.
FMVSS 302	Flammability of Interior Materials - Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses
IEC 60684-2	Flexible insulating sleeving
ISO 180/1C	Plastics - Determination of Izod impact strength
ISO 37	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
ISO 527	Determination of tensile properties
ISO R 1183	Plastics - Methods for determining the density and relative density (specific gravity) of plastics excluding cellular plastics
ISO R 527	Plastics - Determination of tensile properties
ISO-62	Plastics - Determination of water absorption
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA FB1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
NEMA VE 1	Metal Cable Tray Systems
NEMA VE 2	Cable Tray Installation Guidelines
NEMA WD-6	Locking Plugs and Receptacles
UL 1	Flexible Metal Conduit
UL 1063	Machine-Tool Wires and Cables
UL 1242	Electrical Intermediate Metal Conduit - Steel
UL 1563	Metal-Cald Cables
UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
UL 1598	Luminaires
UL 1660	Liquid-Tight Flexible Nonmetallic Conduit



Standard	Description
UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
UL 1696	Nonmetallic Mechanical Protection Tubing (NMPT)
UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
UL 224	Extruded Insulating Tubing
UL 248-4	Low-Voltage Fuses - Part 4: Class CC Fuses
UL 248-6	Low-Voltage Fuses - Part 6: Class H Non-Renewable Fuses
UL 248-8	Low-Voltage Fuses - Part 8: Class J Fuses
UL 248-9	Low-Voltage Fuses - Part 9: Class K Fuses
UL 360	Liquid-Tight Flexible Metal Conduit
UL 4248-12	Fuseholders - Part 12: Class R
UL 4248-4	Fuseholders - Part 4: Class CC
UL 4248-6	Fuseholders - Part 6: Class H
UL 4248-8	Fuseholders - Part 8: Class J
UL 498	Attachment Plugs and Receptacles
UL 50	Enclosures for Electrical Equipment
UL 508	Industrial Control Equipment
UL 508A	Industrial Control Panels
UL 514B	Conduit, Tubing, and Cable Fittings
UL 6	Electrical Rigid Metal Conduit - Steel
UL 758	Appliance Wiring Material
UL 797	Electrical Metallic Tubing - Steel
UL 83	Thermoplastic-Insulated Wires and Cables
UL 886	Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 943	Ground-Fault Circuit-Interrupters
UL 969	Marking and Labeling Systems
VDE 0207	Insulating and sheathing compounds for cables and flexible cords; rubber insulating compound
VDE 0295	Conductors of cables, wires and flexible cords for power installation
VDE 0303	Electric strength of insulating materials
VDE 0472	Testing of cables, wires and flexible cords
VG 95343	Heat shrinkable components

## Appendix R. Definitions

Table R.1. Abbreviations and definitions

Abbreviation	Defintion	Remarks/description
AHJs	Authorities Having Jurisdiction. An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.	
Ampacity	The maximum current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.	Vedi NEC. See NEC.
ANSI	American National Standards Institute	American National Standards Institute
Appliance	A piece of utilization equipment that incorporates both controls and loads (rif. UL 508a).	
Attachment Plugs, Fuseless	This category covers adapters, appliance couplers, appliance and flatiron plugs, attachment plugs, cord connectors, male inlets (equipment inlets, motor attachment plugs), non-separable attachment plugs, separable attachment plugs, shore power inlets and table taps. These devices do not incorporate switches or overcurrent protection.	
AWG	American Wire Gauge size	
AWM	Appliance Wiring Material, multitude of types and constructions for specific applications that may not meet specific or all UL requirements for a given type in a UL standard	
Branch circuit	The conductors and components following the last overcurrent protective device protecting a load (rif. UL 508a).	
Cable Sealing Fittings for Use in Hazardous Locations	This category covers combination termination and sealing fittings for threaded connection of cables to equipment in Class I, Division 1 and Division 2, and/or Class II, Division 1 and 2 hazardous locations, as indicated in the individual Listings. They are intended for use only with sealing compound as specified by the manufacturer in instructions furnished with the fitting. These devices are intended for use in sealing the conductors and outer jackets of Listed cables of the type indicated in the individual Listings. No splices of conductors are intended to be made in the fitting. Restrictions on position and/or location of the sealing fitting are indicated in the manufacturer's instructions.	
Cable Tray System	A unit or assembly of units or sections and associated fittings forming a structural system used to securely fasten or support cables and raceways.	See NEC.
Cable Tray, Ladder	A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).	See NEMA VE 2.
Cable Tray, Solid-bottom or Non-Ventilated	A fabricated structure consisting of a bottom without ventilation openings within integral or separate longitudinal side rails.	See NEMA VE 2.
Cable Tray, Trough or Ventilated	A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and utilizing 75% or less of the plan area of the surface to support cables where the maximum open spacings between cable support surfaces of transverse elements do not exceed 100 millimeter (mm) (4 inch (in)) in the direction parallel to the tray side rails.	See NEMA VE 2.
Cable Tray, Wire Mesh	A manufactured wire mesh tray consisting of steel wires welded at all intersections. Longitudinal wires located on the exterior of the tray are spaced at a maximum of 50 mm (2 in), and transverse wires are spaced at a maximum of 100 mm (4 in).	See NEMA VE 2.
Cartridge Fuses, Nonrenewable	This category covers nonrenewable cartridge-enclosed fuses, rated as follows: 250 V (0 - 600 A), 300 V (0 - 1200 A), 600 V (0 - 6000 A). The fuse classes are further categorized... These fuses are intended for use on ac circuits only, unless also marked with a dc voltage rating. These fuses are suitable for branch circuit, feeder and service overcurrent protection in accordance with ANSI/NFPA 70, "National Electrical Code". The term "current-limiting" indicates that a fuse, when tested on a circuit capable of delivering a specific short-circuit current (rms amps symmetrical) at rated voltage, will start to melt within 90 electrical degrees and will clear the circuit within 180 electrical degrees (1/2 cycle). Because the time required for a fuse to melt is dependent on the available current of the circuit, a fuse that may be current-limiting when subjected to a specific short-circuit current (rms amps symmetrical) may not be current-limiting on a circuit of lower maximum available current. Class K fuses incorporate dimensional features equivalent to, and are thus interchangeable with, Class H fuses. Class R fuses incorporate features that permit their insertion into Class H and K fuseholders. They are also provided with a feature that allows their insertion into rejection-type fuseholders designed to accept only Class RK1 or RK5 fuses. All classes covered under this category (with the exception of Class H) are further classified as to their maximum peak let-through current (IP) and maximum clearing ampere-squared seconds (I <sup>2</sup> t) as follows. These tables indicate the maximum permissible let-through values obtained when the fuse is connected to a circuit capable of providing the indicated available current.	
CEC	Canadian Electrical Code	Canadian Electrical Code reporting the installation standards
CFR	Code of Federal Regulation	American Civil Code
cmil	Circular Mils	Circular Mil is the unit of area specifically used to define the circular section of a conductor or of a cable; it is the equivalent area of a circle with a diameter of 0,001 inches. To change the Circular Mils in square millimetres, multiply by 5,067 · 10 <sup>-4</sup> .

Abbreviation	Defintion	Remarks/description
Conduit Body	A separate portion of a conduit or tubing system that provides access through a removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system.	See NEC.
Control circuit	A circuit that carries the electric signals directing the performance of a controller, and which does not carry the main power circuit. A control circuit is, in most cases, limited to 15 amperes (rif. UL 508a).	
CPR	Canadian Standards Association	Canadian Standards Institute
CSA	Construction Product Regulation	Regolamento sui prodotti da costruzione
EMT	Electrical Metallic Tubing. An unthreaded thinwall raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings. EMT is generally made of steel (ferrous) with protective coatings or aluminum (nonferrous).	See NEC.
Enclosure	The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage.	See NEC.
Field wiring	Conductors to be installed by others to connect the industrial control panel to source(s) of supply, remote control devices, and loads (rif. UL 508a).	
Flexible Metal Conduit, Liquid-tight	This category covers liquid-tight flexible metal conduit in trade sizes 3/8 to 4 (metric designators 16 to 103) inclusive, for installation in accordance with Article 350 of ANSI/NFPA 70, "National Electrical Code" (NEC). Liquid-tight flexible metal conduit is intended for use with conductors in circuits of 600 V nominal or less. This product may also be used for installation of conductors in motor circuits, and for electric signs and outline lighting in accordance with the NEC.	
Flexible Nonmetallic Conduit, Liquid-tight	This category covers liquid-tight flexible nonmetallic conduit, in trade sizes 3/8 in. to 4 (metric designators 16 to 103) inclusive, for installation in accordance with Article 356 of ANSI/NFPA 70, "National Electrical Code" (NEC), for conductors in circuits of 600 V, nominal, or less. This product may also be used for installation of conductors for electric signs and outline lighting in accordance with the NEC.	
FMC	Flexible Metal Conduit. A raceway of circular cross section made of helically wound, formed, interlocked metal strip.	See NEC.
FMT	Flexible Metallic Tubing. A raceway that is circular in cross section, flexible, metallic, and liquidtight without a nonmetallic jacket.	See NEC.
FNMC	Liquid-tight Flexible Nonmetallic Conduit	This is the alternative abbreviation of LFNC.
Fuseholders, Cartridge Fuse	This category covers fuseholders intended for use with Class CC, G, H, J, K, R and T cartridge fuses. A Class CTL (current-limiting) cartridge fuseholders has the physical size, configuration or other means which, in conjunction with the physical means provided in a Class CTL assembly, is designed to prevent the installation of more fuseholder poles than the number for which the assembly is designed and rated. An interrupting rating on a fuseholder included in a piece of equipment does not automatically qualify the equipment in which the fuseholder is installed for use on circuits with higher available currents than the rating of the equipment itself.	
GFCI	Ground-Fault Circuit Interrupter. A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established of time when a current to ground exceeds the values established for a Class A device.	See NEC.
HAR	Harmonized Cordage	
Industrial control panel for general use	A control panel intended to be installed in accordance with the general use requirements in Chapter 4 of the National Electrical Code, ANSI/NFPA 70 (rif. UL 508a).	
Industrial Control Panels - Component	This category covers the following component devices: - Incomplete electrical assemblies of industrial control equipment, including cabinet lighting accessories, cabinet heater accessories, ventilating fan accessories, controllers and interface connectors - Industrial control panel enclosures with standard equipment cutouts - Industrial control panel enclosure kits supplied as unassembled pieces Industrial control panel enclosure accessories, including louver kits, filter kits, observation window kits, hole seals, and gasket materials	
IMC	Intermediate Metal Conduit. A steel threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings.	See NEC.
ITC	Instrumentation Tray Cable	See NEC.
kcmil	Kilo Circular Mils	1 kcmil = 1000 cmil
LFMC	Liquidtight Flexible Metal Conduit. A raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core with associated couplings, connectors, and fittings for the installation of electric conductors.	See NEC.
LFNC	Liquid-tight Flexible Nonmetallic Conduit. A raceway of circular cross section of various types.	See NEC.
LFNC-A	Liquid-tight Flexible Nonmetallic Conduit - Type A. A smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and covers.	

Abbreviation	Defintion	Remarks/description
LFNC-B	Liquid-tight Flexible Nonmetallic Conduit - Type B. A smooth inner surface with integral reinforcement within the conduit wall.	
LFNC-C	Liquid-tight Flexible Nonmetallic Conduit - Type C. A corrugated internal and external surface without integral reinforcement within the conduit wall.	
MC	Metal Clad. Metal clad cable is a factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath	See NEC.
MC-HL	Metal Clad for Hazardous Locations	See NEC.
MCM	Thousands Circular Mils	MCM is an old abbreviation used to identify 1000 Circular Mils, today it is more used the abbreviation kcmil. So 300 MCM = 300 kcmil = 152 mm <sup>2</sup> .
MTW	Machine Tool Wire, 90°C to 105°C, 600 volt rated thermoplastic insulated wire	
NEC	ANSI/NFPA 70 "National Electrical Code"	American Electrical Code reporting the installation standards
NEMA	National Electrical Manufactures Association	
NFPA	National Fire Protection Association	Firemen
NRTL	National Recognized Testing Laboratory	Certified laboratories for the issue of product standards
OSHA	Occupational Safety and Health Association	Federal inspection body for working safety
Overcurrent protection	A device designed to open a circuit when the current through it exceeds a predetermined value. The ampere rating of the device is selected for a circuit to terminate a condition where the current exceeds the rating of conductors and equipment due to overloads, short circuits and faults to ground (rif. UL 508a).	
Overload protection	Protection required for motor circuits that will operate to prohibit excessive heating due to running overloads and failure to start (rif. UL 508a).	
PLTC	Power-limited Tray Cable	See NEC.
Power circuit	Conductors and components of branch and feeder circuits (rif. UL 508a).	
Raceway	An enclosed channel of metallic or nonmetallic materials designed expressly for holding wires, cables, or busbars.	See NEC.
RMC	Rigid Metal Conduit. A threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings.	See NEC.
TC	Tray Cable. Power and control tray cable is a factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors under a non-metallic sheath, for installation in cable tray, in raceways or where supported by a messenger wire.	See NEC.
TC-ER	Tray Cable – Exposed Run	TC cables in compliance with the necessary impact resistance requirements of Type MC cables. These cables can be employed for the connections between cable trays and equipment without using protective Metal Conduits or armored cables (Type MC). These cables can be used without protection.
THHN	Indicates a single conductor having flame-retardant and heat-resistant thermoplastic insulation with a jacket of extruded nylon or equivalent material. The wire is rated 90°C dry only.	
THWN	Indicates a single conductor having flame-retardant, moisture- and heat-resistant thermoplastic insulation with a jacket of extruded nylon or equivalent material. The wire is rated 75°C wet or dry. THWN wire suitable for exposure to mineral oil and to liquid gasoline and gasoline vapors at ordinary ambient temperature is marked "Gasoline and Oil Resistant I" if suitable for exposure to mineral oil at 60°C, or "Gasoline and Oil Resistant II" if the compound is suitable for exposure to mineral oil at 75°C. Gasoline resistant wire has been tested at 23°C when immersed in gasoline. It is considered inherently resistant to gasoline vapors within the limits of the temperature rating.	
Tubing, Mechanical Protection – Component	This category covers tubing that may be used for the support, routing and mechanical protection of insulated wire. The tubing is intended to be used to interconnect separate component assemblies or consoles of electrical devices, such as medical or X-ray equipment. The mechanical protection afforded the internal wiring contained within the tubing is considered equivalent to the protection provided by a type SJT flexible cord.	
UL	Underwriters Laboratories	Certified Laboratory for the issue of product certifications

## Appendix S. Symbols and marks

Symbol	Abbreviation	Description
	CANOPEN	CANopen is a communication protocol and device profile specification for embedded systems used in automation
	CSA	Canadian Standards Association - Canada
	DESINA	DistributEd and Standardised INstAllation technology for machine tools and manufacturing systems
<i>DeviceNet™</i>	DEVICENET	DeviceNet is a network system used in the automation industry to interconnect control devices for data exchange
	ETHERNET	Ethernet is a family of computer networking technologies for local area networks (LANs)
	PROFIBUS	PROFIBUS (Process Field Bus) is a standard for field bus communication in automation technology
	PROFINET	PROFINET is the open industrial Ethernet standard of PROFIBUS & PROFINET International (PI) for automation.
	RoHS	Restriction of Hazardous Substances Directive - Europe
	UL	UL Listed - Underwriters Laboratories - USA
	UR	UL Recognized - Underwriters Laboratories - USA
	EAC	Eurasian Conformity Mark - Russia, Belarus, Kazakhstan
	EHEDG	European Hygienic Engineering & Design Group - Europe
	CPR	Construction Product Regulation - Europe
	CE	The letters CE mean that the manufacturer or importer affirms the goods' conformity with European health, safety, and environmental protection standards. It is not a quality indicator or a certification mark.
	UKCA	UK Conformity Assessed marking is a conformity mark that indicates conformity with the applicable requirements for products sold within Great Britain.

## Appendix T. Measurement units

Table T.1. Lengths

meter	m	1 m = 0,001 km = 39,37 in = 3,28 ft = 1,09 yd
centimetre	cm	1 cm = 0,01 m = 0,3937 in = 0,0328 ft = 0,0109 yd
kilometre	km	1 km = 1000 m = 1093,61 yd = 0,5396 naut mi = 0,62137 mi
inch	1", in	1 in = 0,0833 ft = 0,0278 yd = 2,54 cm = 0,0254 m
foot	1', ft	1 ft = 12 in = 0,333 yd = 30,48 cm = 0,3048 m
yard	yd	1 yd = 3 ft = 36 in = 91,44 cm = 0,9144 m
nautical mile	naut mi	1 naut mi = 1,853 km = 1853,18 m = 2026,67 yd = 1,151 mi
mile	mi	1 mi = 1,609 km = 1609,35 m = 1760 yd = 0,868 naut mi
hand	hand	1 hand = 4 in = 0,3332 ft = 0,111 yd = 10,16 cm = 0,1016 m
span	span	1 span = 9 in = 0,7497 ft = 0,25 yd = 22,86 cm = 0,2286 m

Table T.2. Surface

square meter	m <sup>2</sup>	1 m <sup>2</sup> = 10000 cm <sup>2</sup> = 0,0001 ha = 1550 in <sup>2</sup> = 10,76 ft <sup>2</sup> = 1,196 yd <sup>2</sup>
square centimetre	cm <sup>2</sup>	1 cm <sup>2</sup> = 0,0001 m <sup>2</sup> = 0,155 in <sup>2</sup> = 0,0011 ft <sup>2</sup> = 0,00012 yd <sup>2</sup>
square kilometre	km <sup>2</sup>	1 km <sup>2</sup> = 1000000 m <sup>2</sup> = 100 ha = 0,386 mi <sup>2</sup> = 247,105 ac
are	a	1 a = 100 m <sup>2</sup> = 0,01 ha = 1076,39 ft <sup>2</sup> = 119,599 yd <sup>2</sup> = 0,0000386 mi <sup>2</sup> = 0,024 ac
hectare	ha	1 ha = 100 a = 10000 m <sup>2</sup> = 0,01 km <sup>2</sup> = 107639,1 ft <sup>2</sup> = 0,0039 mi <sup>2</sup> = 2,47 ac
square inch	in <sup>2</sup>	1 in <sup>2</sup> = 0,00694 ft <sup>2</sup> = 6,4516 cm <sup>2</sup>
square foot	ft <sup>2</sup>	1 ft <sup>2</sup> = 0,092 m <sup>2</sup> = 144 in <sup>2</sup> = 0,111 yd <sup>2</sup>
square yard	yd <sup>2</sup>	1 yd <sup>2</sup> = 0,836 m <sup>2</sup> = 8361,27 cm <sup>2</sup> = 9 ft <sup>2</sup> = 1296 in <sup>2</sup> = 0,0002 ac
square mile	mi <sup>2</sup>	1 mi <sup>2</sup> = 2,59 km <sup>2</sup> = 259 ha = 640 ac
acre	ac	1 ac = 4046,86 m <sup>2</sup> = 0,0040 km <sup>2</sup> = 0,40 ha = 40,47 a = 43.560 ft <sup>2</sup> = 4840 yd <sup>2</sup> = 0,00156 mi <sup>2</sup>

Table T.3. Volume

cubic meter	m <sup>3</sup>	1 m <sup>3</sup> = 1000 dm <sup>3</sup> = 35,3146 ft <sup>3</sup> = 61023,744 in <sup>3</sup> = 1,308 yd <sup>3</sup> = 264,20 galUS = 219,97 galUK
cubic decimetre; litre	dm <sup>3</sup>	1 dm <sup>3</sup> = 1 l = 0,001 m <sup>3</sup> = 61,024 in <sup>3</sup> = 0,0353 ft <sup>3</sup> = 0,00131 yd <sup>3</sup> = 0,26417 galUS = 0,21997 galUK
cubic centimetre	cm <sup>3</sup> , cc	1 cm <sup>3</sup> = 0,001 dm <sup>3</sup> = 0,001 l = 0,061 in <sup>3</sup> = 0,000264 galUS = 0,00022 galUK
cubic inch	in <sup>3</sup>	1 in <sup>3</sup> = 0,0000164 m <sup>3</sup> = 0,0164 dm <sup>3</sup> = 0,0005787 ft <sup>3</sup> = 0,0043 galUS = 0,0036 galUK
cubic foot	ft <sup>3</sup>	1 ft <sup>3</sup> = 0,02832 m <sup>3</sup> = 28,32 dm <sup>3</sup> = 1728 in <sup>3</sup> = 0,037 yd <sup>3</sup> = 7,48 galUS = 6,23 galUK
cubic yard	yd <sup>3</sup>	1 yd <sup>3</sup> = 0,764 m <sup>3</sup> = 764,55 dm <sup>3</sup> = 46656 in <sup>3</sup> = 27 ft <sup>3</sup> = 201,97 galUS = 168,18 galUK
gallon US	galUS	1 galUS = 0,00378 m <sup>3</sup> = 3,785 dm <sup>3</sup> = 231 in <sup>3</sup> = 0,134 ft <sup>3</sup> = 0,0049 yd <sup>3</sup> = 0,833 galUK
gallon UK	galUK	1 galUK = 0,00455 m <sup>3</sup> = 4,546 dm <sup>3</sup> = 277,42 in <sup>3</sup> = 0,16 ft <sup>3</sup> = 0,0059 yd <sup>3</sup> = 1,2 galUS

Table T.4. Pressure

pascal	Pa	1 Pa = 1 N/m <sup>2</sup> , 1 kPa = 0,01 bar = 0,1 N/cm <sup>2</sup> = 0,10 mH <sub>2</sub> O = 7,5 mmHg = 0,0099 atm = 0,145 psi = 0,02088 lbf/ft <sup>2</sup> = 0,334 ftH <sub>2</sub> O
bar	bar	1 bar = 100000 Pa = 100 kPa = 1,0197 kg/cm <sup>2</sup> = 10,198 mH <sub>2</sub> O = 750 mmHg = 0,987 atm = 14,5 psi = 33,455 ftH <sub>2</sub> O
millibar	mbar	1 mbar = 100 Pa = 0,010 mH <sub>2</sub> O = 0,750 mmHg = 0,00102 kg/cm <sup>2</sup> = 0,0145 psi = 2,088 lbf/ft <sup>2</sup> = 0,033 ftH <sub>2</sub> O
millimetres of mercury	mmHg	1 mmHg = 133,322 Pa = 0,133 kPa = 0,00133 bar = 0,0136 mH <sub>2</sub> O = 0,00131 atm = 0,00136 kg/cm <sup>2</sup> = 0,01934 psi = 2,78 lbf/ft <sup>2</sup> = 0,045 ftH <sub>2</sub> O
technical atmosphere=kgf/cm <sup>2</sup>	at, kg/cm <sup>2</sup>	1 at = 1 kg/cm <sup>2</sup> = 735,56 mmHg = 10 mH <sub>2</sub> O = 98066,50 Pa = 98,067 kPa = 0,981 bar = 0,968 atm = 14,22 psi = 2048,16 lbf/ft <sup>2</sup> = 32,81 ftH <sub>2</sub> O
metric atmosphere	atm	1 atm = 101325 Pa = 760 mmHg = 1,033 at = 10,33 mH <sub>2</sub> O = 1,01 bar = 14,696 psi = 2116,22 lbf/ft <sup>2</sup> = 33,9 ftH <sub>2</sub> O
meters column of water	mH <sub>2</sub> O	1 mH <sub>2</sub> O = 9806 Pa = 0,09806 bar = 73,55 mmHg = 0,9806 N/cm <sup>2</sup> = 0,09678 atm = 0,0999 at = 1,4224 psi = 204,8 lbf/ft <sup>2</sup> = 3,28 ftH <sub>2</sub> O
foot of water	ftH <sub>2</sub> O	1 ftH <sub>2</sub> O = 2988,87 Pa = 0,0299 bar = 0,3048 mH <sub>2</sub> O = 22,419 mmHg = 0,0295 atm = 0,03048 kg/cm <sup>2</sup> = 0,4335 psi = 62,42 lbf/ft <sup>2</sup>
pounds per square inch	psi	1 psi = 6894,76 Pa = 6,894 kPa = 0,069 bar = 0,703 mH <sub>2</sub> O = 51,715 mmHg = 0,689 N/cm <sup>2</sup> = 0,068 atm = 0,0703 kg/cm <sup>2</sup> = 144 lbf/ft <sup>2</sup> = 2,31 ftH <sub>2</sub> O
pounds per square foot	lbf/ft <sup>2</sup>	1 lbf/ft <sup>2</sup> = 2988,87 Pa = 2,99 kPa = 0,0299 bar = 0,3048 mH <sub>2</sub> O = 22,418 mmHg = 0,299 N/cm <sup>2</sup> = 0,0295 atm = 0,0305 at = 0,433 psi = 62,424 lbf/ft <sup>2</sup>

Table T.5. Capacity and volume

cubic meters per second	m <sup>3</sup> /s	1 m <sup>3</sup> /s = 60 m <sup>3</sup> /min = 3600 m <sup>3</sup> /ora = 1000 l/s = 60000 l/min = 6102374,42 in <sup>3</sup> /s = 2118,88 ft <sup>3</sup> /min = 15850,32 gpm = 13198,13 l gpm
cubic meters per minute	m <sup>3</sup> /min	1 m <sup>3</sup> /min = 0,0167 m <sup>3</sup> /s = 60 m <sup>3</sup> /h = 16,67 l/s = 1000 l/min = 35,31 ft <sup>3</sup> /min = 264,17 gpm = 219,97 l gpm
cubic meters per hour	m <sup>3</sup> /h	1 m <sup>3</sup> /h = 0,000278 m <sup>3</sup> /s = 0,0167 m <sup>3</sup> /min = 0,28 l/s = 16,67 l/min = 1017,06 in <sup>3</sup> /min = 0,588 ft <sup>3</sup> /min = 4,40 gpm = 3,66 l gpm
litres per second	l/s	1 l/s = 0,001 m <sup>3</sup> /s = 0,06 m <sup>3</sup> /min = 3,6 m <sup>3</sup> /h = 60 l/min = 3661,42 in <sup>3</sup> /min = 2,12 ft <sup>3</sup> /min = 15,85 gpm = 13,198 l gpm

litres per minute	l/min	1 l/min = 0,001 m <sup>3</sup> /min = 0,06 m <sup>3</sup> /h = 0,0167 l/s = 61,024 in <sup>3</sup> /min = 0,035 ft <sup>3</sup> /min = 0,264 gpm = 0,22 lgpm
cubic inch per minute	in <sup>3</sup> /min	1 in <sup>3</sup> /min = 0,00027 l/s = 0,016 l/min = 0,00058 ft <sup>3</sup> /min = 0,0043 gpm = 0,0036 l gpm
cubic foot per minute	ft <sup>3</sup> /min	1 ft <sup>3</sup> /min = 0,00047 m <sup>3</sup> /s = 0,028 m <sup>3</sup> /min = 1,7 m <sup>3</sup> /h = 0,472 l/s = 28,32 l/min = 1728 in <sup>3</sup> /min = 7,48 gpm = 6,23 l gpm
gallon per minute	gpm	1 gpm = 0,0038 m <sup>3</sup> /min = 0,227 m <sup>3</sup> /h = 0,063 l/s = 3,785 l/min = 231 in <sup>3</sup> /min = 0,134 ft <sup>3</sup> /min = 0,833 l gpm
imperial gallon per minute	l gpm	1 l gpm = 0,000076 m <sup>3</sup> /s = 0,00454 m <sup>3</sup> /min = 0,273 m <sup>3</sup> /h = 0,076 l/s = 4,55 l/min = 277,42 in <sup>3</sup> /min = 0,16 ft <sup>3</sup> /min = 1,2 gpm

Table T.6. Speed

meters per second	m/s	1 m/s = 60 m/min = 3,6 km/h = 39,37 in/s = 2362,2 in/min = 3,28 ft/s = 196,85 ft/min = 2,237 mi/h = 1,94 kn
kilometres per hour	km/h	1 km/h = 0,278 m/s = 16,67 m/min = 10,963 in/s = 656,17 in/min = 0,91 ft/s = 54,68 ft/min = 0,62 mi/h = 0,54 kn
meters per minute	m/min	1 m/min = 0,0167 m/s = 0,06 km/h = 0,66 in/s = 39,37 in/min = 0,0547 ft/s = 3,28 ft/min = 196,85 ft/h = 0,037 mi/h = 0,032 kn
inch per second	in/s	1 in/s = 0,0254 m/s = 1,524 m/min = 0,091 km/h = 60 in/min = 0,083 ft/s = 5 ft/min = 300 ft/h = 0,057 mi/h = 0,049 kn
inch per minute	in/min	1 in/min = 0,0254 m/min = 0,001524 km/h = 0,167 in/s = 0,0014 ft/s = 0,083 ft/min = 5 ft/h
foot per second	ft/s	1 ft/s = 0,305 m/s = 18,288 m/min = 1,097 km/h = 12 in/s = 720 in/min = 60 ft/min = 0,68 mi/h = 0,59 kn
foot per minute	ft/min	1 ft/min = 0,00508 m/s = 0,3048 m/min = 0,0183 km/h = 0,2 in/s = 12 in/min = 0,0167 ft/s = 60 ft/h = 0,011 mi/h = 0,0099 kn
foot per hour	ft/h	1 ft/h = 0,005 m/min = 0,0033 in/s = 0,2 in/min = 0,0167 ft/min
mile per hour	mi/h	1 mi/h = 0,447 m/s = 26,82 m/min = 1,609 km/h = 17,6 in/s = 1056 in/min = 1,47 ft/s = 88 ft/min = 0,87 kn
nautical mile per hour = knot	kn	1 kn = 0,51 m/s = 30,89 m/min = 1,85 km/h = 20,27 in/s = 1216 in/min = 1,69 ft/s = 101,33 ft/min = 1,15 mi/h

Table T.7. Angular velocity

radiant per second	rad/s	1 rad/s = 60 rad/min = 0,159 giri/s = 9,55 giri/min
radiant per minute	rad/min	1 rad/min = 0,0167 rad/s = 0,0026 giri/s = 0,159 giri/min
revolutions per second	giri/s	1 giro/s = 60 giri/min = 6,283 rad/s = 376,99 rad/min
revolutions per minute	giri/min	1 giro/min = 0,0167 giri/s = 0,1047 rad/s = 6,283 rad/min

Table T.8. Acceleration

meter per square second	m/s <sup>2</sup>	1 m/s <sup>2</sup> = 100 cm/s <sup>2</sup> = 0,001 km/s <sup>2</sup> = 3,28 ft/s <sup>2</sup> = 39,37 in/s <sup>2</sup> = 0,00062 mi/s <sup>2</sup>
centimetre per square second	cm/s <sup>2</sup>	1 cm/s <sup>2</sup> = 0,01 m/s <sup>2</sup> = 0,00001 km/s <sup>2</sup> = 0,0328 ft/s <sup>2</sup> = 0,394 in/s <sup>2</sup>
kilometre per square second	km/s <sup>2</sup>	1 km/s <sup>2</sup> = 1000 m/s <sup>2</sup> = 100000 cm/s <sup>2</sup> = 3280,84 ft/s <sup>2</sup> = 39370,08 in/s <sup>2</sup> = 0,621 mi/s <sup>2</sup>
foot per square second	ft/s <sup>2</sup>	1 ft/s <sup>2</sup> = 0,3048 m/s <sup>2</sup> = 30,48 cm/s <sup>2</sup> = 12 in/s <sup>2</sup>
inch per square second	in/s <sup>2</sup>	1 in/s <sup>2</sup> = 0,0254 m/s <sup>2</sup> = 2,54 cm/s <sup>2</sup> = 0,083 ft/s <sup>2</sup>
mile per square second	mi/s <sup>2</sup>	1 mi/s <sup>2</sup> = 1609,34 m/s <sup>2</sup> = 1,609 km/s <sup>2</sup> = 5280 ft/s <sup>2</sup> = 63360 in/s <sup>2</sup>

Table T.9. Force - Weight

Newton	N	1 N = 0,102 kgf = 0,0001 t = 0,2248 lbf = 3,597 ozf
kilogram force; kilogram weight	kgf; kgp	1 kgf = 9,81 N = 0,001 t = 2,204 lbf = 35,27 ozf
ton weight	t	1 t = 9'806,65 N = 1'000 kgf = 2'204,62 lbf = 35'274 ozf
kilopound	kp	1 kp = 4'448 N = 453,59 kgf = 1'000 lbf = 16'000 ozf
pound force	lbf	1 lbf = 4,448 N = 0,454 kgf = 16 ozf
ounce force	ozf	1 ozf = 0,278 N = 0,028 kgf = 0,0625 lbf
pound feet	lbf/ft	1 lbf/ft = 1,4881 kg/m

Table T.10. Power

kilowatt	kW	1 kW = 1,36 CV = 1,34 hp = 737,56 lbf-ft/s = 44253,7 lbf-ft/min = 859,84 kcal/h = 3412,14 btu/h = 101,97 kgf-m/s
horsepower	CV	1 CV = 0,735 kW = 0,986 hp = 75 kg-m/s = 542,47 lbf-ft/s = 632,41 kcal/h = 2509,62 btu/h = 75 kgf-m/s
kilogram force per meter per second	kgf-m/s	1 kgf-m/s = 0,01 kW = 0,013 CV = 0,013 hp = 7,23 lbf-ft/s = 433,98 lbf-ft/min = 8,43 kcal/h = 33,46 btu/h
kilogram calorie per hour	kcal/h	1 kcal/h = 0,0012 kW = 0,0016 CV = 0,00156 hp = 0,8578 lbf-ft/s = 51,47 lbf-ft/min = 3,97 btu/h = 0,12 kgf-m/s
horsepower	HP	1 HP = 1,014 CV = 0,746 kW = 550 lbf-ft/s = 33000 lbf-ft/min = 641,19 kcal/h = 2544,43 btu/h = 76,04 kgf-m/s
foot pound force per second	lbf-ft/s	1 lbf-ft/s = 0,0013 kW = 0,0018 CV = 0,0018 hp = 60 lbf-ft/min = 1,166 kcal/h = 4,63 btu/h = 0,138 kgf-m/s
foot pound force per minute	lbf-ft/min	1 lbf-ft/min = 0,000023 kW = 0,0167 lbf-ft/s = 0,019 kcal/h = 0,077 btu/h = 0,0023 kgf-m/s
british thermal unit per hour	BTU/h	1 btu/h = 0,00029 kW = 0,216 lbf-ft/s = 12,97 lbf-ft/min = 0,25 kcal/h = 0,030 kgf-m/s



Table T.11. Work - Energy - Moment – Torque - Heat

joule	J	1 J = 1N·m = 0,102 kgf·m = 0,00024 kcal = 8,85 lbf·in = 0,74 lbf·ft = 0,00095 BTU
kilogram force per meter	kgf·m	1 kgf·m = 9,807 J = 0,0023 kcal = 86,80 lbf·in = 7,233 lbf·ft = 0,0093 BTU
horsepower per hour	CV·h	1 CV·h = 270000 kgf·m = 0,736 kW·h = 632,41 kcal = 2509 BTU
kilogram calorie	kcal	1 kcal = 4,1868 kJ = 426,93 kgf·m = 0,0016 CV·h = 0,0012 kW·h = 37056,3 lbf·in = 3088 lbf·ft = 3,97 BTU
kilowatt per hour	kW·h	1 kW·h = 3600 kJ = 1,36 CV·h = 859,8 kcal = 3412,14 BTU
pound force inch	lbf·in	1 lbf·in = 0,113 J = 0,0115 kgf·m = 0,083 lbf·ft = 0,0001 BTU
pound force foot	lbf·ft	1 lbf·ft = 1,356 J = 0,138 kgf·m = 0,324 cal = 12 lbf·in = 0,0013 BTU
horse power hour	HP·h	1 HP·h = 2,684 MJ = 641,19 kcal = 1,014 CV·h = 0,746 kW·h = 1980000 lbf·ft = 2544,43 BTU
british thermal unit	BTU	1 BTU = 1055,056 J = 107,58 kgf·m = 0,0004 CV·h = 0,252 kcal = 0,00029 kWh = 9338,03 lbf·in = 778,17 lbf·ft

Table T.12. Density

kilogram per cubic meter	kg/m <sup>3</sup>	1 kg/m <sup>3</sup> = 0,001 kg/dm <sup>3</sup> = 0,001 t/m <sup>3</sup> = 0,001 g/cm <sup>3</sup> = 0,062 lb/ft <sup>3</sup> = 0,00075 tn/yd <sup>3</sup> = 0,00084 s tn/yd <sup>3</sup> = 0,133 oz/gal
kilogram per cubic decimetre	kg/dm <sup>3</sup>	1 kg/dm <sup>3</sup> = 1000 kg/m <sup>3</sup> = 0,001 g/cm <sup>3</sup> = 1 t/m <sup>3</sup> = 1 g/cm <sup>3</sup> = 62,42 lb/ft <sup>3</sup> = 0,036 lb/in <sup>3</sup> = 133,53 oz/gal
ton per cubic meter	t/m <sup>3</sup>	1 t/m <sup>3</sup> = 1000 kg/m <sup>3</sup> = 1 kg/dm <sup>3</sup> = 0,001 kg/cm <sup>3</sup> = 1 g/cm <sup>3</sup> = 62,43 lb/ft <sup>3</sup> = 0,036 lb/in <sup>3</sup> = 0,752 tn/yd <sup>3</sup> = 0,843 s tn/yd <sup>3</sup> = 133,53 oz/gal
pound per cubic foot	lb/ft <sup>3</sup>	1 lb/ft <sup>3</sup> = 16,018 kg/m <sup>3</sup> = 0,016 kg/dm <sup>3</sup> = 0,016 t/m <sup>3</sup> = 0,016 g/cm <sup>3</sup> = 0,00058 lb/in <sup>3</sup> = 0,012 tn/yd <sup>3</sup> = 0,0135 s tn/yd <sup>3</sup> = 2,14 oz/gal
pound per cubic inch	lb/in <sup>3</sup>	1 lb/in <sup>3</sup> = 27,68 kg/dm <sup>3</sup> = 0,02768 kg/cm <sup>3</sup> = 27,68 t/m <sup>3</sup> = 27,68 g/cm <sup>3</sup> = 1728 lb/ft <sup>3</sup> = 20,83 tn/yd <sup>3</sup> = 23,33 s tn/yd <sup>3</sup> = 3696 oz/gal
ounce per gallon	oz/gal	1 oz/gal = 7,489 kg/m <sup>3</sup> = 0,00749 kg/dm <sup>3</sup> = 0,00749 t/m <sup>3</sup> = 0,00749 g/cm <sup>3</sup> = 0,467 lb/ft <sup>3</sup> = 0,00027 lb/in <sup>3</sup> = 0,00563 tn/yd <sup>3</sup> = 0,0063 oz/gal

Table T.13. Temperature

Kelvin	K	K = °C + 273,15, K = 1,8 · °R, K = (5/9) · °F + (459,67/1,8)
Centigrade degree	°C	°C = (°F - 32) · 5/9, °C = K - 273,15 °C = (5/9) · °F - (32/1,8)
Fahrenheit degree	°F	°F = 9/5 · °C + 32, °F = °R - 459,67 °F = (9/5) · K - 459,67
Rankine degree	°R	°R = (5/9) K, °R = 491,67 + (9/5) · °C, °R = 459,67 + °F







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