UL 486F

STANDARD FOR SAFETY

Bare and Covered Ferrules

UL Standard for Safety for Bare and Covered Ferrules, UL 486F

Second Edition, Dated September 9, 2019

Summary of Topics

The revision of ANSI/UL 486F dated December 29, 2021 includes the addition of Stranding Table: 9.1.1 and Annex A

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated October 22, 2021.

No Text on This Page

CSA Group
CSA C22.2 No. 291:19
Second Edition

Underwriters Laboratories Inc.
UL 486F
Second Edition

Bare and Covered Ferrules

September 9, 2019

(Title Page Reprinted: December 29, 2021)

Approved American National Standard

ANSI/UL 486F-2021

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

ISBN 978-1-4883-2063-7 © 2019 Canadian Standards Association

This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

To purchase CSA Group Standards and related publications, visit CSA Group's Online Store at www.csagroup.org/store/ or call toll-free 1-800-463-6727 or 416-747-4044.

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through December 29, 2021. The most recent designation of ANSI/UL 486F as an American National Standard (ANSI) occurred on December 29, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

To purchase UL Standards, visit UL's Standards Sales Site at http://www.shopulstandards.com/HowToOrder.aspx or call toll-free 1-888-853-3503.

CONTENTS

PREFACE **5**

1 Scope 7
2 Reference Publications 7
2.1 Normative references 7
3 Units of Measurement 8
4 Definitions 8
5 Symbols and Abbreviations 8
6 Construction 9
6.1 General 9
6.2 Materials 9
6.3 Flammability 9
6.4 Thermal properties 9
7 Test Requirements 9
7.1 General 9
7.2 Tensile test 10
7.3 Mold stress relief 10
7.4 Dielectric voltage-withstand 10
8 Sampling Requirements 10
8.1 General 10
8.2 Tensile test 10
8.3 Mold stress test 10
8.4 Dielectric voltage-withstand 10
9 Test Methods 10
9.1 General 10
9.2 Tensile test 11
9.3 Mold stress test 11
9.4 Dielectric voltage withstand test 11
10 Marking, Labeling, and Packaging 11
10.1 General 11
TABLES 11
FIGURES 20

ANNEX A – Conductor Stranding (Informative)

No Text on This Page

PREFACE

This is the harmonized CSA Group and UL standard for Bare and Covered Ferrules. It is the second edition of CSA C22.2 No. 291 and the second edition of UL 486F. This edition of CSA C22.2 No. 291 supersedes the previous edition published in 2014. This harmonized standard has been jointly revised on December 29, 2021. For this purpose, CSA Group and UL are issuing revision pages dated December 29, 2021.

The major differences between this edition and the previous edition include editorial updates to Tables 1 – 6, clarification to dielectric voltage withstand test, addition of wire gauge to marking requirements, expansion of the scope to include wire ranges covered by this standard and updates to the referenced publications.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Subcommittee, CANENA Technical Harmonization Committee 99 – Electrical Connectors of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the CSA Integrated Committee on Electrical Connectors, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of Harmonization

This standard uses the IEC format but is not based on, nor is it considered equivalent to, an IEC standard.

This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

At present there is no IEC standard for bare and covered ferrules. Therefore, this standard does not employ any IEC standard for base requirements.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

1 Scope

1.1 These requirements cover bare and covered ferrules intended for field wiring and factory wiring for use in accordance with the National Electrical Code, ANSI/NFPA-70 and Canadian Electrical Code, Part I, CSA C22.1.

1.2 These ferrules are intended to facilitate the connection of stranded wire on to devices, such as terminal blocks. Their purpose is to treat stripped wire and prevent turned back strands during installation. They are intended to be used to attach to one stranded copper conductor or two stranded copper conductors of the same size.

1.3 When intended for use with one conductor, these ferrules are suitable for use with 1/0 – 26 AWG, 50 – 0.14 mm^2 , stranded copper conductors.

1.4 When intended for use with two conductors, these ferrules are suitable for use with (2) 6 – (2) 26 AWG, (2) 16 – (2) 0.25 mm^2, stranded copper conductors.

1.5 These ferrules are intended to be terminated in wire connection devices rated for solid conductors.

1.6 Ferrules are not intended for use in IDC (insulation displacement connection) terminal blocks.

1.7 This standard does not apply to wire connectors such as pin adapters covered in CSA C22.2 No. 65 or UL 486A-486B.

1.8 In Canada, general requirements applicable to this Standard are provided in CAN/CSA-C22.2 No. 0.

2 Reference Publications

2.1 Normative references

Where reference is made to any Standards, such reference shall be considered to refer to the latest editions and revisions thereto available at the time of printing, unless otherwise specified.

2.1.1 CSA Group Standards

C22.1-18
Canadian Electrical Code, Part I

CAN/CSA-C22.2 No. 0-10 (R2015)
General Requirements – Canadian Electrical Code, Part II

CAN/CSA-C22.2 No. 0.17-00 (R2018)
Evaluation of Properties of Polymeric Materials

2.1.2 UL Standards

UL 94
Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

UL 746C
Polymeric Materials – Use in Electrical Equipment Evaluations

UL 1694
Tests for Flammability of Small Polymeric Component Materials

2.1.3 NFPA Standards

ANSI/NFPA 70-2011
National Electrical Code (NEC)

3 Units of Measurement

3.1 The values given in SI (metric) units shall be normative, except for AWG conductor sizes. Any other values given are for information only.

3.2 AWG is the normative wire size of the standard. The mm^2 is the closest equivalent to that size.

4 Definitions

For the purpose of this Standard, the following terms and definitions apply.

4.1 Covered – Encased within material of composition or thickness that is not recognized as electrical insulation.

4.2 Covered ferrule – A ferrule provided with a plastic sleeve.

4.3 Ferrule – A conductive sleeve used to facilitate the termination of stranded wire in devices used to terminate solid conductors.

4.4 Plastic sleeve – A non-conductive plastic material used for identification purposes. The term "covering" is also referred to in the Standard as a "plastic sleeve".

5 Symbols and Abbreviations

5.1 ° – Degree

5.2 AWG – American Wire Gage/gauge

5.3 C – Celsius

5.4 mm^2 – Squared millimeters

5.5 V – Volts

6 Construction

6.1 General

6.1.1 A ferrule shall be provided with one opening to accept one or two stranded type copper conductors applied with compression tooling.

6.1.2 A ferrule shall comply with the dimensional requirements in Table 1 – Table 8 and Figure 1 – Figure 10 and the following:

a) Dimensions for the length of the ferrules in all Tables and Figures represent common sizes and longer lengths are permissible as these dimensions are indicated as minimum values. For Table 3 and Table 5, which specify “strip length”, any increase in overall length of the ferrule shall include an equal amount of increase in the strip length specified by the manufacturer.

b) Dimensions for the diameter and thickness for plastic sleeves in Table 6 and Table 7 and Figure 8 and Figure 10 represent common sizes. Wider dimensions and thicker materials for the plastic sleeves are permissible, as these dimensions are indicated as minimum values.

6.2 Materials

6.2.1 A ferrule shall be of copper or a copper alloy containing at least 80% copper and be coated with tin.

6.3 Flammability

6.3.1 The covering material shall comply with one of the following requirements for flammability:

a) have a minimum flammability classification of HB as determined by tests described in UL 94 or CAN/CSA-C22.2 No. 0.17. This flammability classification may be determined at the minimum thickness employed in the construction or a nominal thickness of 0.8 mm (0.031 in), whichever is greater;

b) meet the glow wire test as specified in UL 746C or CSA C22.2 No 0.17 for a temperature of 650°C; or

c) be evaluated and classed with a flammability rating of SC-0, SC-1, SC-TC 0, or SC-TC 1 in accordance with UL 1694.

6.4 Thermal properties

6.4.1 A polymeric material used for covering shall have a minimum relative thermal index (RTI) of 80 °C (176°F) (electrical only). The material shall be evaluated using the specimen thickness employed in the covering or a nominal thickness of 0.8 mm (0.031 in), whichever is greater. The electrical RTI value may be determined regardless of the color used for the plastic sleeve.

7 Test Requirements

7.1 General

7.1.1 All ferrules shall comply with the test requirements in 7.2. Covered ferrules shall additionally comply with the test requirements in 7.3 – 7.4.

7.2 Tensile test

7.2.1 During testing in accordance with 9.2, the conductor shall not visibly move (with normal or corrected to normal vision) within the ferrule or be pulled out of the ferrule.

7.3 Mold stress relief

7.3.1 As a result of conditioning as specified in 9.3, there shall not be any warpage, shrinkage, or other distortion that results in interference with the operation, function, or installation of the device.

7.4 Dielectric voltage-withstand

7.4.1 The plastic sleeve of a covered ferrule shall withstand the applied potential without breakdown when tested in accordance with 9.4.

8 Sampling Requirements

8.1 General

8.1.1 The number of samples required for each test shall be as described in 8.2 – 8.4.

8.2 Tensile test

8.2.1 Three samples shall be tested for each of the assemblies in 9.1.1 and 9.1.2.

8.2.2 Testing on shorter ferrule lengths represent longer ferrules when all other dimensions are identical.

8.3 Mold stress test

8.3.1 Six samples shall be tested for each of the assemblies in 9.1.1 and 9.1.2.

8.4 Dielectric voltage-withstand

8.4.1 The same samples subjected to the mold stress test shall then be subjected to the dielectric voltage-withstand test.

9 Test Methods

9.1 General

9.1.1 A ferrule shall be assembled to the following conductors in the intended manner using the identified tooling and strip length [see 10.1.1 (e) and (f), and Annex A for Conductor Stranding]:

a) largest size conductor with highest stranding count;

b) largest size conductor with lowest stranding count;

c) smallest size conductor with highest stranding count; and

d) smallest size conductor with lowest stranding count.

9.1.2 A two conductor (twin) ferrule shall be assembled to the following conductors in the intended manner using the identified tooling and strip length [see 10.1.1 (e) and (f)]:

a) largest size conductors with highest stranding count;

b) largest size conductors with lowest stranding count;

c) smallest size conductors with highest stranding count; and

d) smallest size conductors with lowest stranding count.

9.2 Tensile test

9.2.1 The conductor shall be inserted through a punched hole in a plate which is securely fastened to a tensile machine. A minimum force in accordance with Table 8 shall be applied at a rate not to exceed 25.4 mm per min (1 in per min). The force shall be applied for 1 min.

9.3 Mold stress test

9.3.1 Fully assembled ferrules shall be placed in a full-draft circulating-air oven for 7 h. The temperature shall be maintained at a uniform temperature of not less than 90 °C (194 °F).

9.3.2 The assembled ferrules shall be removed from the oven and allowed to cool to room temperature before determining compliance.

9.3.3 The connector shall be subjected to and comply with the dielectric voltage withstand test in 9.4.

9.4 Dielectric voltage withstand test

9.4.1 After completing the mold stress test, assembled samples shall be subjected to an ac test potential of 1000 V for a period of 1 min. Each sample shall be embedded in No. 7-1/2 conductive shot that is to serve as the outer electrode (see Figure 11). Only that portion of the plastic sleeve that covers uninsulated current-carrying parts shall be covered with the outer electrode. A smaller than No. 7-1/2 (higher size number) shot may be used with the concurrence of those concerned. Conductive metal foil shall be used as the outer electrode when the ferrule has openings that will allow entry of the shot.

10 Marking, Labeling, and Packaging

10.1 General

10.1.1 The following shall appear on or with the smallest package:

a) manufacturer's name, trademark or trade name;

b) a distinctive catalog number or the equivalent;

c) wire type (CU or Copper) and size (AWG / mm^2);

d) stranding type, (i.e. Class B, C...);

e) installation tool, manufacturer's name and catalog number;

f) strip length; and

g) for covered ferrules only: "Plastic sleeve for covered ferrules is for identification purposes only and it is not electrical insulation", or equivalent.

TABLES

Table 1
Ferrules without plastic sleeve, Form A

Nominal size		Conductor cross-section		d_1		d_2		l_1		l_2		s	
Conductor cross-section, mm²	Length l_1	AWG	mm²		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance
0,25	5 7	24	0,25	0,8	±0,14	1,7	-0,2	5 7	-0,4	4,7 6,7	-0.4	0,15	±0,05
0,34	5 7	22	0,34	0,9		1,8		5 7		4,7 6,7			
0,5	6 8 10	20	0,5	1		2,1		6 8 10		5,7 7,7 9,7			
0,75	6 10	18	0,75	1,2		2,3		6 10		5,7 9,7			
1	6 10	–	1	1,4		2,5		6 10		5,7 9,7			
1,5	7 10 12 18	16	1,5	1,7		2,8		7 10 12 18		6,4 9,4 11,4 17,4			
2,5	7 10 12 18	14	2,5	2,2	±0,25	3,4		7 10 12 18		6,4 9,4 11,4 17,4			
4	9 12 15 18	12	4	2,8		4		9 12 15 18		8,4 11,4 14,4 17,4		0,2	
6	10 12	10	6	3,5	±0,3	4,7		10 12		9,4 11,4			

Table 1 Continued on Next Page

Table 1 Continued

Nominal size		Conductor cross-section		d_1		d_2		l_1		l_2		s	
Conductor cross-section, mm²	Length l_1	AWG	mm²		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance
	15							15		14,4			
	18							18		17,4			
10	12	8	10	4,5		5,8		12		11,2			
	15							15		14,2			
	18							18		17,2			
16	12	6	16	5,8		7,5		12		10,9			
	15							15		13,9			
	18							18		16,9			
	25							25	-0,6	23,9			
	32							32		30,9			
25	15	4	25	7,3		9,5		15	-0,4	13,4			
	18							18		16,4			
	25							25	-0,6	23,4			
	32							32		29,4			
35	18	2	35	8,3	±0,4	11	-0,5	18	-0,4	16,4			
	25							25	-0,6	23,4			
	32							32		30,4			
50	18	1/0	50	10,3		13		18	-0,4	15,4			
	25							25	-0,6	22,4		0,3	
	32							32		29,4			

Note – All dimensions in mm unless otherwise stated.

Table 2
Crimp-type ferrules with and without wire insulation grip, Forms B and C (Figure 2 and Figure 3)

Nominal size		Conductor cross section		a_1	a_2	b_1	b_2	h_1	h_2	l_1	s
Conductor cross section, mm^2	Length l_1 -0,4 mm	AWG	mm^2	-0,5	±0,5	±0,5	±0,5	±0,5	±0,5	-0,5	±0,05
1	7 10	20 – 18	0,5 – 1	11 14	2,5	2,5	3,7	2,6	3,8	7 10	0,3
1,5	7 10	18 – 16	1 and 1,5	11 14		3		3,3	4,2	7 10	
2,5	7 10	16 – 14	1,5 and 2,5	11 14		3,8	5	4,1	5,2	7 10	
4	8,5 12	14 – 12	2,5 and 4	14 17,5	3,5	4	5,6	4,8	6,3	8,5 12	0,4
6	8,5 12 15	12 – 10	4 and 6	14 17,5 20,5	3,5	4,8	6,4	5,4	7,8	8,5 12 15	
Note – All units are in mm unless otherwise stated.											

Table 3
Assembled crimp-type ferrules with and without wire insulation grip, Forms B and C (Figure 2 and Figure 3)

Nominal size		Conductor Cross section		Conductor strip length l_2	b_3	d	h_3
Cross section of conductor mm^2	Length l_1 -0,4 mm	AWG	mm^2	max		max	max
1	7 10	20 – 18	0.5 – 1	8 11	2	2,7	1,2
1,5	7 10	18 – 16	1 and 1,5	8 11	2,4	3,1	1,5
2,5	7 10	16 – 14	1.5 and 2.5	8 11	2,8	3,6	2,4
4	8,5 12	14 – 12	2.5 and 4	10 13,5	3,6	4,2	3,1
6	8,5 12 15	12 – 10	4 and 6	10 13,5 15,5	4,3	5,2	4
Note – All units are in millimeters unless otherwise stated.							

Table 4
Conductor-embracing ferrules without wire insulation grip, Form D

Nominal size		Conductor cross-section		*b*	*h*	l_1
Conductor cross section	Length l_1 -0,4 mm	AWG	mm^2	±0,5	±0,5	
1	7 10	20 – 18	0,5 – 1	2,5	2,6	7 10
1,5	7 10	16	1,5	2,5	2,8	7 10
2,5	7 10	14	2,5	3	3,2	7 10
Note – All units are in millimeters unless otherwise stated.						

Table 5
Conductor-embracing ferrules without wire insulation grip, Form D

Nominal size		Conductor Cross section		*d*	Strip length l_2
Conductor cross section mm^2	Length l_1 -0,4 mm	AWG	mm^2	max	
1	7 10	20 – 18	0,5 – 1	1,8	8 11
1,5	7 10	16	1,5	2	8 11
2,5	7 10	14	2,5	2,5	8 11
Note – All units are in millimeters unless otherwise stated.					

Table 6
Tubular ferrules with plastic sleeve, Form E

Nominal size		Conductor cross-section		d_1		d_2		l_1		l_2		s_1		s_2		Color identification code for plastic sleeve (Informative only)
Conductor cross section mm²	Length	AWG	mm²		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance	
0,14	6 8	26	0,14	0,8	±0,14	1,9	-0,2	10,5 12,5	-1,5	6 8	-0,4	0,15	±0,05	0,25	-0,1	grey
0,25	6 8	24	0,25	0,8	±0,14	1,9	-0,2	10,5 12,5	-1,5	6 8	-0,4	0,15	±0,05	0,25	-0,1	yellow
0,34	6 8 10 12	22	0,34	0,8	±0,14	1,9	-0,2	10,5 12,5 14,5 16,5	-1,5	6 8 10 12	-0,4	0,15	±0,05	0,25	-0,1	turquoise
0,5	6 8 10	20	0,5	1	±0,14	2,6	-0,2	12 14 16	-1,5	6 8 10	-0,4	0,15	±0,05	0,25	-0,1	white
0,75	6 8 10 12	18	0,75	1,2	±0,14	2,8	-0,2	12 14 16 18	-1,5	6 8 10 12	-0,4 -0,6	0,15	±0,05	0,25	-0,1	grey
1	6 8 10 12	–	1	1,4	±0,14	3	-0,2	12 14 16 18	-1,5	6 8 10 12	-0,4 -0,6	0,15	±0,05	0,25	-0,1	red
1,5	8 10 12 18	16	1,5	1,7	±0,25	3,5	-0,2	14 16 18 24	-1,5 -2	8 10 12 18	-0,4 -0,6	0,15	±0,05	0,25	-0,1	black
2,5	8 12	14	2,5	2,2	±0,25	4,2	-0,2	14 18	-1,5	8 12	-0,4 -0,6	0,15	±0,05	0,25	-0,1	blue

Table 6 Continued on Next Page

Table 6 Continued

Nominal size		Conductor cross-section		d_1		d_2		l_1		l_2		s_1		s_2		Color identification code for plastic sleeve (Informative only)
Conductor cross section mm²	Length	AWG	mm²		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance	
	18							24	-2	18						
4	10 12 18	12	4	2,8	±0,25	4,8	-0,4	17 20 26	-1,5 -2	10 12 18	-0,4 -0,6	0,2	±0,05	0,3	-0,1	grey
6	12 18	10	6	3,5	±0 3	6,3	-0,4	20 26	-1,5 -2	12 18	-0,6	0,2	±0,05	0,3	-0,1	yellow
10	12 18	8	10	4,5	±0,3	7,6	-0,4	22 28	-2	12 18	-0,6	0,2	±0,05	0,4	-0,15	red
16	12 18	6	16	5,8	±0,3	8,8	-0,4	24 28	-2	12 18	-0,6	0,2	±0,05	0,4	-0,15	blue
25	16 18 22	4	25	7,3	±0,4	11,2	-0,5	30 30 36	-2	16 18 22	-0,6	0,2	±0,05	0,4	-0,15	yellow
35	16 18 25	2	35	8,3	±0,4	12,7	-0,5	30 30 39	-2	16 18 25	-0,6	0,2	±0,05	0,4	-0,15	red
50	20 25	1/0	50	10,3	±0,4	15	-1	36 40	-2	20 25	-0,6	0,3	±0,05	0,5	-0,15	blue

Note – All dimensions in mm unless otherwise stated.

Table 7
Two conductor (Twin) ferrules, Form F

Nominal size		Conductor cross-section		d_1		d_2		d_3		l_1		l_2		s_1		s_2		Color identification code for plastic sleeve (Informative only)
Conductor cross section	Length l_2	AWG	mm^2		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance		Tolerance	
2 × 0,25	8	2 × 24	2 × 0,25	1,15	±0,14	1,8	-0,2	3,4	-0,2	15	-1,5	8	-0,4	0,15	±0,05	0,25	-0,1	Any
2 × 0,34	8	2 × 22	2 × 0,34	1,15		1,8		3,4		15		8		0,15		0,25		Any
2 × 0,50	8	2 × 20	2 × 0,50	1,40		2,5		4,7	-0,3	15		8		0,15		0,25		White
2 × 0,75	8 10	2 × 18	2 × 0,75	1,7	±0,25	2,8		5	-0,4	15 17		8 10		0,15		0,25		Grey
2 × 1	8 10 12 18	2 × 18	2 × 1	1,95		3,4		5,4		15 17 19 25	-0,2	8 10 12 18	-0,6	0,15		0,3		Red
2 × 1,5	8 12 18	2 × 16	2 × 1,5	2,2		3,6		6,6		16 20 26	-1,5 -0,2	8 12 18	-0,4 -0,6	0,15		0,3		Black
2 × 2,5	10 13	2 × 14	2 × 2,5	2,8		4,2		7,8		18,5 21,5	-1,5	10 13	-0,4 -0,6	0,2		0,3		Blue
2 × 4	12	2 × 12	2 × 4	3,7	±0,3	4,9	-0,4	8,8	-0,5	23	-0,2	12	-0,6	0,2		0,4	-0,15	Grey
2 × 6	14	2 × 10	2 × 6	4,8		6,9		10		26		14		0,2		0,4		Yellow
2 × 10	14	2 × 8	2 × 10	6,4	±0,4	7,2		13		26		14		0,2		0,4		Red
2 × 16	14	2 × 6	2 × 16	8,2		9,6		18,4	-1	30		12		0,2		0,4		Blue

Note – All dimensions in mm unless otherwise stated.

Table 8
Tensile force

Conductor cross section		Force	
AWG	mm^2	lb	N
26	0,14	1,6	7
24	0,25	2,2	10
22	0,34	3,4	15
20	0,5	4,5	20
18	0.75	6,7	30
–	1	7,9	35
16	1,5	9	40
14	2,5	11,2	50
12	4	13,5	60
10	6	18	80
8	10	20,2	90
6	16	22,5	100
4	25	30,3	135
2 – 1/0	35 – 50	42,7	190

FIGURES

Figure 1

Tubular ferrules without plastic sleeve, Form A

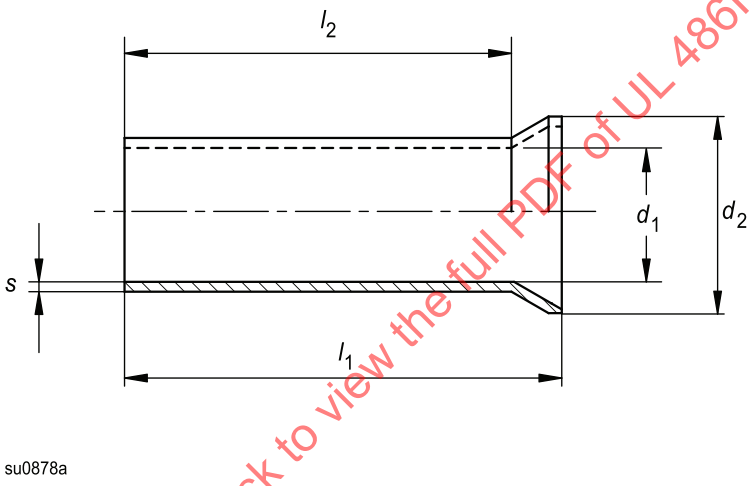

Figure 2

Crimp-type ferrule with wire insulation grip, Form B

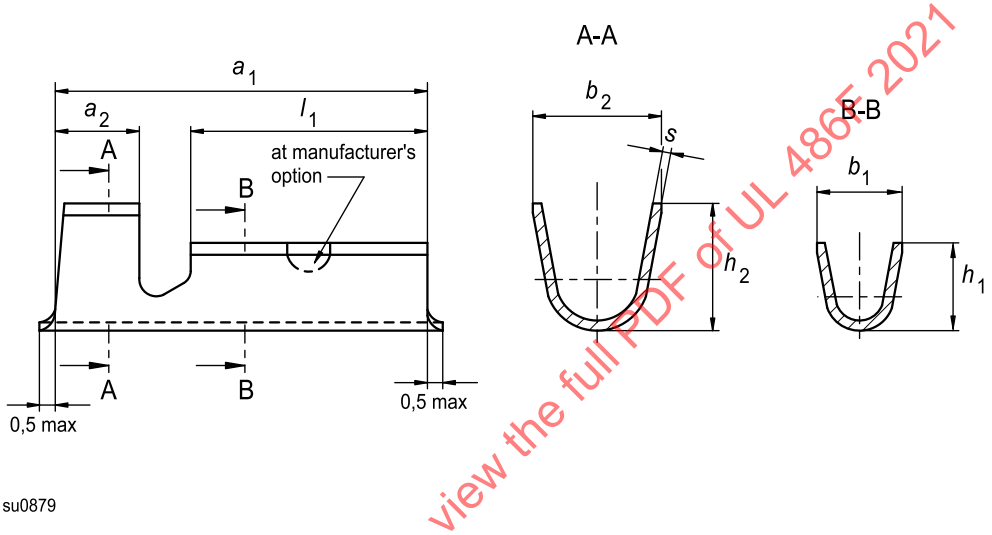

Figure 3

Crimp-type ferrule without wire insulation grip, Form C

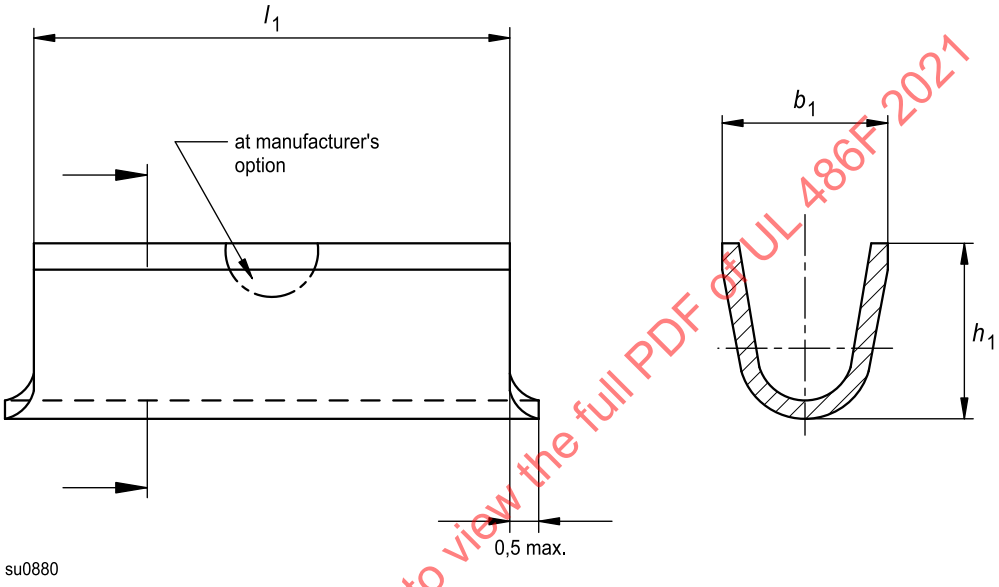

Figure 4

Crimp dimensions for Form B

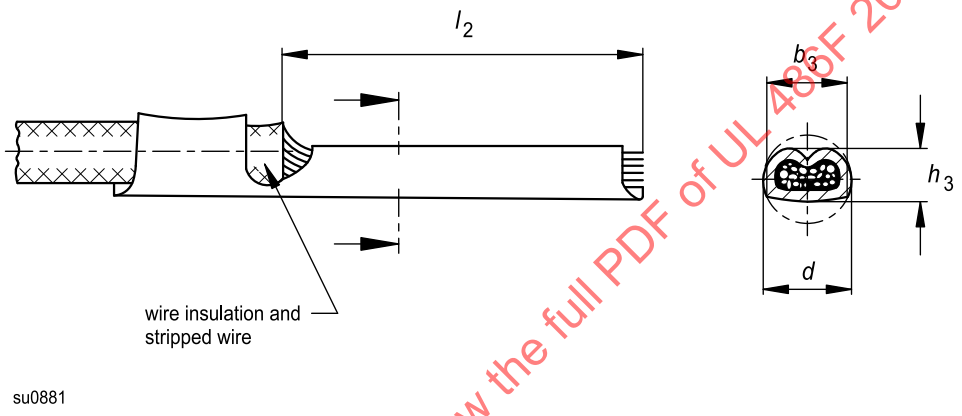

Figure 5

Crimp dimensions for Form C

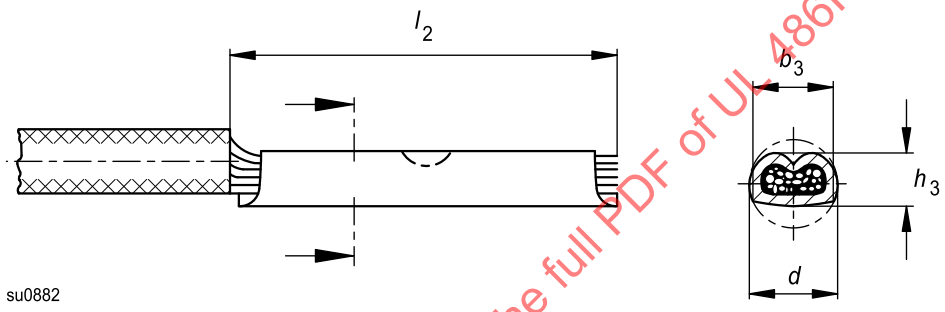

Figure 6

Form D

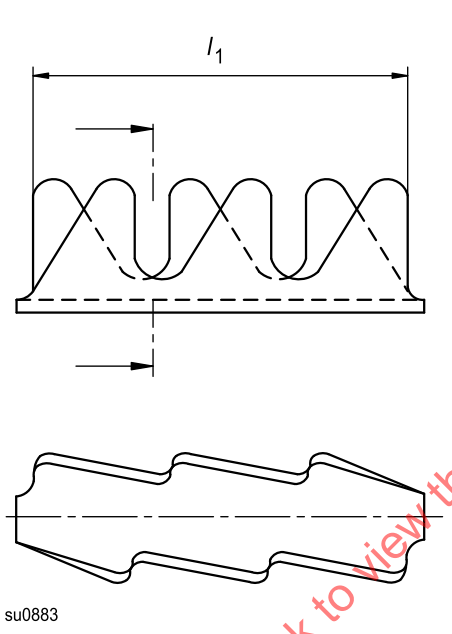

Figure 7

Form D