BS EN 2242:2012

BSI Standards Publication

Aerospace series — Crimping of electric cables with conductors defined by EN 2083, EN 4434 and EN 2346

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National foreword

This British Standard is the UK implementation of EN 2242:2012.

BSI as a member of CEN is obliged to publish EN 2242 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.

The UK committee voted against approval for two reasons:

1. The changes made to the minimum tensile strength of crimped connections provided in Table 1 were not in compliance with ASD standardization protocol.
2. Users of contact size 20 with an enlarged size 18 barrel need to be alerted that the changes introduced in this issue have reduced the minimum tensile strength of crimped connections from the value stated in previous versions of this standard.

The UK participation in its preparation was entrusted to Technical Committee ACE/6, Aerospace avionic electrical and fibre optic technology.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 56420 8

ICS 49.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2013.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 2242

May 2012

ICS 49.060

English Version

Aerospace series - Crimping of electric cables with conductors defined by EN 2083, EN 4434 and EN 2346

Série aérospatiale - Sertissage des câbles électriques avec conducteurs définis par EN 2083, EN 4434 et EN 2346

Luft- und Raumfahrt - Crimpen von elektrischen Leitungen mit Leitern nach EN 2083, EN 4434 und EN 2346

This European Standard was approved by CEN on 11 February 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 2242:2012: E

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Foreword

This document (EN 2242:2012) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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1 Scope

This European Standard specifies the general requirements and procedures to ensure the good quality of crimped connections made with multi-stranded cables with conductor cross-sections ranging from 0,15 mm^2 (AWG 26) to 107 mm^2 (AWG 0000) and all types of connection components [1)].

Electric cables to be used for the tests shall conform to EN 2084, EN 2234, EN 2235, EN 2346 and be stripped according to EN 2812. For conductors see EN 2083, EN 4434 and EN 2346.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2083, *Aerospace series — Copper and copper alloys conductors for electrical cables — Product standard*

EN 2084, *Aerospace series — Cables, electric, single-core, general purpose, with conductors in copper or copper alloy — Technical specification*

EN 2234, *Aerospace series — Cable, electrical, fire resistant — Technical specification*

EN 2235, *Aerospace series — Single and multicore electrical cables, screened and jacketed*

EN 2346, *Aerospace series — Fire resistant electrical cables — Dimensions, conductor resistance and mass* [2)]

EN 2591-417, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 417: Tensile strength (crimped connection)*

EN 2591-503, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 503: Contact deformation after crimping*

EN 2812, *Aerospace series — Stripping of electric cables*

EN 3155-002, *Aerospace series — Electrical contacts used in elements of connection — Part 002: List and utilization of contacts*

EN 4434, *Aerospace series — Copper or copper alloy lightweight conductors for electrical cables — Product standard (Normal and tight tolerances)*

IEC 60050-581, *International Electrotechnical Vocabulary — Part 581*: *Electromechanical components for electronic equipment* [3)]

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1) Barrel, terminal lug, splice.

2) Published as ASD-STAN Prestandard at the date of publication of this standard (www.asd-stan.org).

3) Published by: IEC International International Electrotechnical Commission http://www.iec.ch/.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
crimping mechanism
mechanism controlling the total crimping cycle; fitted with a device which prevents the tool from returning to open position before the completion of this cycle

3.2
test piece
consists of a length of terminated cable

[For further definitions, see IEC 60050-581]

4 General requirements for crimping

The cable cross-section shall be compatible with the crimp barrel and be within the limits defined in the specification for connectors, connection components and tooling being used. It shall be verified that the combination "conductor - crimp tool - crimp barrel" complies with the requirements of the wiring and has been qualified by the responsible authorities.

The crimping of the conductor shall be carried out in a single operation with the aid of the appropriate tooling approved by the manufacturer of the connection components. This operation shall not require any additional heating or cooling.

No additional operation such as brazing, etc. shall be carried out on a crimped connection.

The organization and preparation of the work area shall be such that:

— the tooling is constantly maintained in good condition;

— a check can be made that only the tools and accessories adapted to this type of crimping are used;

— there have been no adjustments to the tooling.

During handling and transport, the crimped connections shall not be subjected to any stress likely to cause deterioration.

5 Tooling

The crimping tools and their accessories shall be approved by the responsible authorities.

6 Procedures

6.1 General

Before manufacturing, test pieces shall be prepared for each combination "conductor - crimp tool - crimp barrel" to be tested to qualify the crimping process.

6.2 Checking of tooling

6.2.1 Stripping tool

Before stripping, ensure that the stripping tool has been inspected and meets the requirements of EN 2812.

6.2.2 Crimping tool

Ensure that the crimping tool has been inspected and that the crimping mechanism is functioning correctly.

6.3 Preparation of test pieces

The test pieces shall be tracable to the electrical cable they represent.

6.4 Inspection prior to crimping

Check that the connection components and the cable conform to the definition documentation.

In addition to the general requirements (see Clause 4), the connection components shall be clean, free from any trace of corrosion and shall not show any defects. However, a uniform and superficial discoloration is tolerated.

The cable shall be stripped in accordance with EN 2812.

Crimping of multiple conductors

In the case of crimping two conductors in one connection component, the following conditions shall be observed:

— the sum of the two actual sections of the conductors shall be compatible with the section permitted by the connection component;

— the stripping lengths of the cable ends shall be identical;

— all the strands of the two conductors, placed parallel to each other, shall enter easily into the connection component;

— the crimping operation shall not cause any offset of one conductor in relation to the other;

— the tensile strength of the crimped connection of each conductor shall conform to the minimum tensile strength value defined for the cross-section of that conductor in Table 1, when tested in accordance with EN 2591-417.

6.5 Crimping

The test pieces shall be made only with the connection components and under the specified manufacturing conditions. Each end of the test piece shall be fitted with an identical barrel.

6.6 Tests after crimping

6.6.1 General

They shall be carried out on five test pieces of the minimum conductor cross-section and five test pieces of the maximum conductor cross-section.

These tests shall be repeated if one of the following conditions changes:

— material of strands of the conductors;

— metallic covering of strands: tin plating, silver or nickel plating, etc.;

— size of connection components;

— types of tools used, with corresponding accessories.

6.6.2 Visual inspection

It shall be carried out on all test pieces [see Annex A (normative) and Annex B (normative)]:

Ensure that:

— the form and location of the crimps are correct, see Figure A.1, Figure A.2 and Figure A.3;

— the stripping length is correct and that the strands of the conductor are all correctly inserted in the barrel (conductor visible through the inspection hole), see Figure A.3;

— the distance between the insulation of the cable and the barrel is such that no bending of the cable can exert stress in the area of the barrel, see Figure A.2;

— the conductor at the rear of the barrel is not deformed, see Figure A.2;

— the connection component shows no defects and no burr, sharp edge, crack or lift off of the protection, or distortions according to EN 2591-503.

Requirement: if the inspection is not satisfactory, the crimping process shall be revised.

6.6.3 Tensile test

Each test piece which has satisfied the visual inspection shall be submitted to the tensile strength test according to EN 2591-417. Insulation grip shall be rendered ineffective, before the test is carried out.

Requirement: if one of the crimped connections fractures at a value lower than that specified in Table 1, the crimping process shall be reviewed.

Table 1

Nominal sections of conductors mm^2	AWG [a]	Nominal contact size [b]	Minimum tensile strength of crimped connections N
0,15 [c]	26	–	39
0,25 [c]	24	–	55
0,40	22	–	60
0,60	20	–	90
1,00	18 [b]	20	120
1,00	18	–	150
1,20	16	–	180
2,00	14	–	300
3,00	12	–	450
5,00	10	–	700
9,00	8	–	1 080
14,00	6	–	1 540
22,00	4	–	1 980
34,00	2	–	2 720
42,00	1	–	3 200
53,00	0	–	4 200
68,00	00	–	5 300
85,00	000	–	6 400
107,00	0000	–	8 400

[a] AWG = American Wire Gage.

[b] For enlarged contact barrel, see EN 3155-002.

[c] High strength copper alloy conductors.

7 Quality assurance

7.1 Production controls

Visual inspection of all crimped connections, requirements as defined in 6.6.2.

7.2 Periodic inspections

According to the number of crimped connections to be manufactured and/or the quality requirements, the responsible authority can check the points enumerated in 6.6.2 and 6.6.3, between 1 000 crimps and 5 000 crimps, or each quarter, with at least two test pieces of the minimum conductor cross-section and at least two test pieces of the maximum conductor cross-section.

Notwithstanding the values specified in Table 1, the tensile strength test may be limited to 500 N for all sections equal to or greater than 5 mm^2, if authorized by the responsible authority, when carrying out periodic qualification tests on crimping tools.

Annex A
(normative)

Correct crimped connections

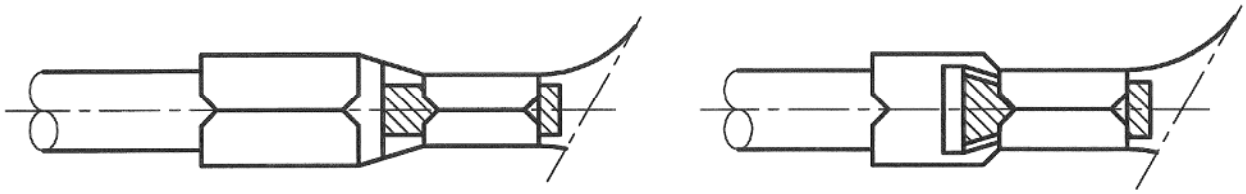


Figure A.1

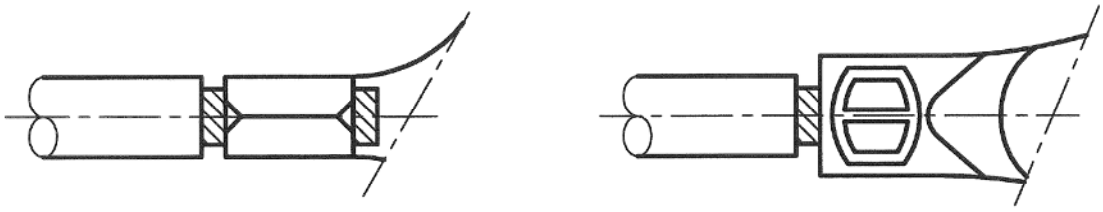
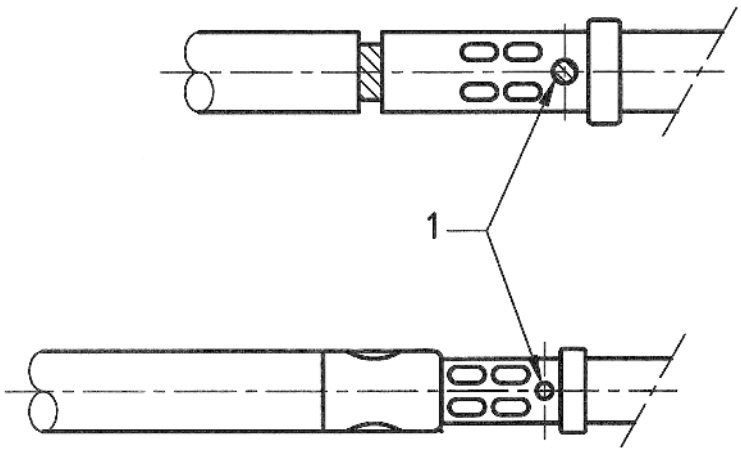


Figure A.2



Key

1 Inspection hole

Figure A.3

Checks to be carried out:

— strands apparent in the inspection hole;

— correct stripping of insulator;

— insulator correctly positioned;

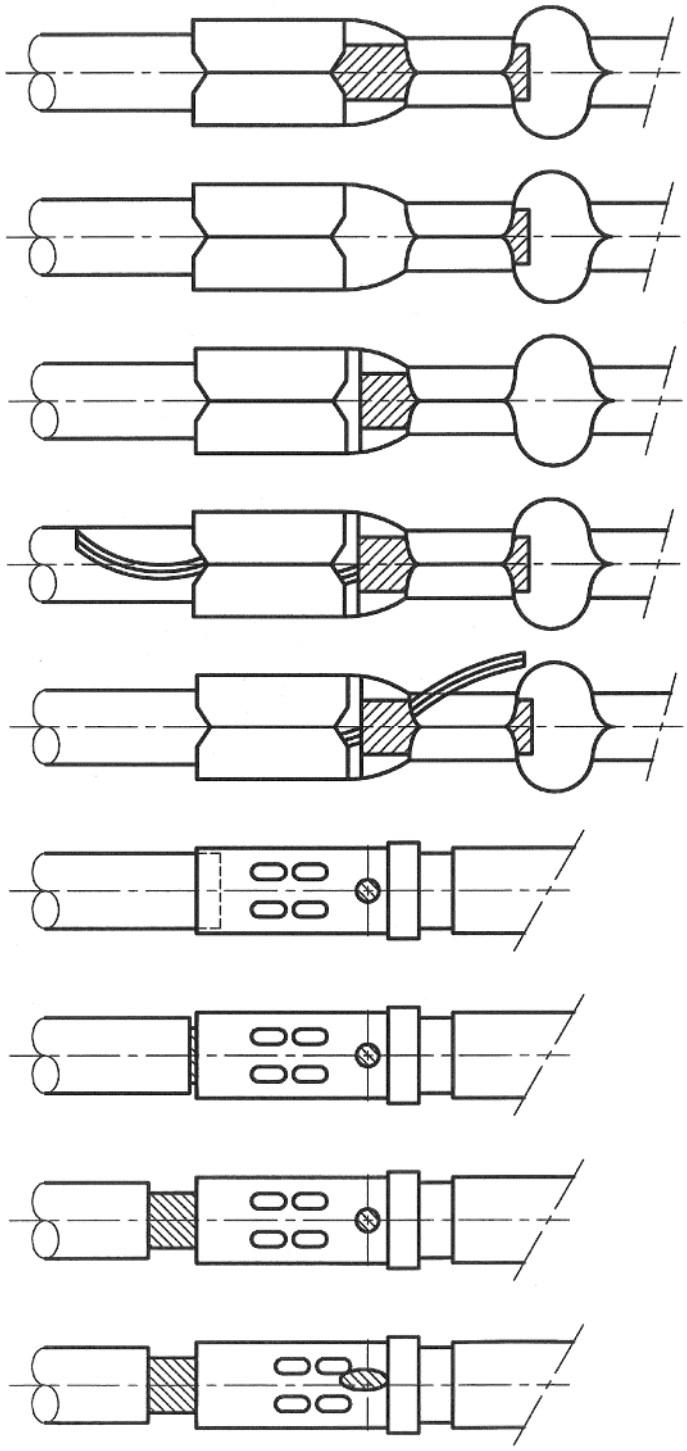
— indentation correctly positioned;

— non-distorted contacts;

— no cracks or lift off of protection.

Annex B
(normative)

Faulty crimped connections (examples)



Insulation stripping too long

Insulation stripping too short and crimping on the insulator

Conductor stripping too short

Strands crimped with the insulation support

One or more strands of the conductor not crimped

Insulation stripping too short the insulation penetrates into the barrel

Insulation stripping too short the conductor not visible through the inspection hole

Insulation stripping too long

Incorrect position of the crimping indentors

Figure B.1

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