BS EN IEC 63248:2022

BSI Standards Publication

Conductors for overhead lines — Coated or cladded metallic wire for concentric lay stranded conductors

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

National foreword

This British Standard is the UK implementation of EN IEC 63248:2022. It is identical to IEC 63248:2022. It supersedes BS EN 61232:1997 and BS EN 50189:2000, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/7, Overhead electrical conductors.

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

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2022
Published by BSI Standards Limited 2022

ISBN 978 0 539 04933 6

ICS 29.060.01; 29.240.20

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 2022.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 63248

May 2022

ICS 29.060.01; 29.240.20

Supersedes EN 61232:1995/corrigendum Feb. 1996, EN 50189:2000, EN 61232:1995 + A11:2000

English Version

Conductors for overhead lines - Coated or cladded metallic wire for concentric lay stranded conductors (IEC 63248:2022)

Conducteurs pour lignes aériennes - Fil métallique revêtu ou recouvert pour conducteurs toronnés à couches concentriques (IEC 63248:2022)

Leiter für Freileitungen - Beschichtete oder ummantelte Metalldrähte für Leiter aus konzentrisch verseilten Drähten (IEC 63248:2022)

This European Standard was approved by CENELEC on 2022-04-08. CENELEC 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 CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2022 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN IEC 63248:2022 E

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 63248:2022

European foreword

The text of document 7/715/FDIS, future edition 1 of IEC 63248, prepared by IEC/TC 7 "Overhead electrical conductors" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63248:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023-04-11
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-04-11

This document supersedes EN 61232:1995 and EN 50189:2000, and all of their amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 63248:2022 was approved by CENELEC as a European Standard without any modification.

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Material 9
4.1 Steel 9
4.2 Aluminium 9
4.3 Zinc 9
4.4 Zinc-aluminium alloy 9
4.5 Advanced zinc-aluminium alloy 9
5 Freedom from defects 9
6 Joints 10
7 Tests 10
7.1 General 10
7.2 Place of testing 10
7.3 Sampling rate 10
7.4 Test methods 10
7.4.1 Visual test 10
7.4.2 Diameter 10
7.4.3 Stress at 1 % extension, tensile strength and elongation 11
7.4.4 Ductility tests 12
7.4.5 Coating or cladding tests 13
7.4.6 Coefficient of linear expansion 14
7.4.7 Resistivity 14
7.4.8 Coating adherence heat resistance test 15
8 Acceptance and rejection 15
9 Certificate of compliance 15
10 Packaging 15
10.1 Type of packaging 15
10.2 Length and tolerance on length 15
Annex A (normative) Tables of properties for recommended IEC wire materials 16
Annex B (informative) Properties of wire for calculation purposes 31
Annex C (informative) Method to measure the equivalent diameter by volume 33
Annex D (informative) Ratio of aluminium and steel or FeNi36 cross-sectional areas 35
D.1 Standard ratio in cross-section 35
D.2 Average aluminium thickness 35
Bibliography 37

Figure C.1 – Optical ground wire (OPGW) composed of formed aluminium-clad steel wires 33
Figure C.2 – Example of density measurement apparatus 33

Table A.1 – Wire designation 16
Table A.2 – Schedule of tests 17

AVA Documents
Document Sharing Hub
Full document details: BS EN IEC 63248:2022

Table A.3 – Zinc-aluminium alloy ingot composition (group 4 and group 5) 18
Table A.4 – Requirements for zinc and zinc-aluminium alloy coated steel wires (group 1, group 4 and group 5) 19
Table A.5 – Requirements for aluminium-clad FeNi36 wires (group 2) 23
Table A.6 – Requirements for aluminium-clad steel wires (group 3) 24
Table A.7 – Initial setting for determining stress at 1 % extension 27
Table A.8 – Coating requirements for zinc and zinc-aluminium alloy coated wires 28
Table A.9 – Cladding requirements for group 2 and group 3 wire 29
Table A.10 – Coating heat resistance test for group 4 and group 5 wire 29
Table A.11 – Temperatures for linear expansion test for group 2 wire 29
Table A.12 – Minimum number of dips for zinc and zinc alloy coatings (group 1, group 4, group 5) 30
Table B.1 – Properties of wire for calculation purposes 31
Table D.1 – Standard aluminium and steel or FeNi36 ratio in the cross section for group 2 and group 3 wires 35
Table D.2 – Average aluminium thickness 36

Documents
Document Sharing Hub
Full document details: BS EN IEC 63248:2022

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONDUCTORS FOR OVERHEAD LINES – COATED OR CLADDED METALLIC WIRE FOR CONCENTRIC LAY STRANDED CONDUCTORS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 63248 has been prepared by IEC technical committee 7: Overhead electrical conductors. It is an International Standard.

This first edition cancels and replaces the first edition of IEC 61232 published in 1993 and the first edition of IEC 60888 published in 1987. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous editions of IEC 61232 and IEC 60888:

a) wire designations have been modified and grouped;
b) wires with zinc coating class 2 were removed;
c) new wire designations have been added;
d) aluminium-clad FeNi36 wires have been added;
e) advanced zinc-aluminium alloy coated steel wires have been added.

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

The text of this International Standard is based on the following documents:

Draft	Report on voting
7/715/FDIS	7/720/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

INTRODUCTION

The purpose of this document is to group together similar wire materials that share the same general characteristics and therefore the same test procedures and requirements. Included in this document are existing wire types from IEC 60888 and IEC 61232 as well as new wire materials that are already in use around the world in new types of conductors.

Zinc coating class 2 according to IEC 60888 has not been included in this document, as the demand for this class of zinc coating is extremely rare. Extra corrosion protection can be provided by other means, including the use of zinc-aluminium alloy coatings.

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

CONDUCTORS FOR OVERHEAD LINES – COATED OR CLADDED METALLIC WIRE FOR CONCENTRIC LAY STRANDED CONDUCTORS

1 Scope

This document specifies the properties of wires in the diameter range of, but not limited to, 1,25 mm to 5,50 mm. This document is applicable to coated or cladded metallic wires before stranding used either as concentric lay overhead stranded conductors, or in the manufacture of cores for concentric lay overhead stranded conductors, for power transmission purposes.

The various wire types and their designations are listed in Table A.1. For calculation purposes the values listed in Annex B are used.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electro-technical Vocabulary (IEV)* (available at www.electropedia.org)

IEC 60468, *Method of measurement of resistivity of metallic materials*

ISO 752, *Zinc ingots*

ISO 6892-1, *Metallic materials – Tensile testing – Part 1: Method of test at room temperature*

ISO 7500-1, *Metallic materials – Calibration and verification of static uniaxial testing machines – Part 1: Tension/compression testing machines – Calibration and verification of the force-measuring system*

ISO 7800, *Metallic materials – Wire – Simple torsion test*

ISO 7801, *Metallic materials – Wire – Reverse bend test*

ISO 7802, *Metallic materials – Wire – Wrapping test*

ISO 7989-2, *Steel wire and wire products – Non-ferrous metallic coatings on steel wire – Part 2: Zinc or zinc-alloy coating*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050 (all parts) and the following apply.

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
cladded metallic wire
result of a process by which a metal is bonded under high pressure by co-rolling, co-extrusion, or other, onto a wire creating a metallic bond between them

3.2
class
number attributed to aluminium-clad wires for the purpose of providing an approximate conductivity value

3.3
coated metallic wire
result of a process by which a metal is deposited onto a wire by hot-dip or electrolytic process, creating a chemical or metallic bond between them

3.4
equivalent diameter
diameter of a round wire, which would have the same cross sectional area as a given formed wire

3.5
formed wire
drawn or rolled metal wire having a constant non-circular cross-section

3.6
group
designation given to wire types that share a common coating or cladding, or property, for a similar purpose

3.7
FeNi36
grade of steel-nickel alloy designed to have a very low coefficient of thermal expansion

3.8
lot
group of production units of one type and size of wire, which was manufactured by the same manufacturer during the same time period under similar conditions of production

Note 1 to entry: A lot can consist of part or all of a purchased quantity.

3.9
nominal
value of a measurable property to which tolerance is applied

Note 1 to entry: Nominal values are target values.

3.10
production unit
coil, reel, spool, or other package of wire that represents a single usable length

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

3.11
sample
specimen or specimens removed from a production unit or units and considered to have properties representative of a lot

3.12
specimen
length of wire removed for test purposes

3.13
zinc-aluminium alloy
mixture of zinc and aluminium coating applied onto the wire for the purpose of protecting it against corrosion

Note 1 to entry: Some of these alloys with particular mixture are called mischmetal.

3.14
advanced zinc-aluminium alloy
zinc-aluminium alloy reaching specific requirements as specified in ISO7989-2

Note 1 to entry: Examples of advanced zinc-aluminium alloys are Zn90 % + 10 % aluminium and Zn95 % + 5 % aluminium with 0,2 % to 0,5 % magnesium.

4 Material

4.1 Steel

The base metal shall be steel produced by the open hearth, electric furnace, or basic oxygen process and shall be of such composition that the finished wire shall have the properties and characteristics given in this document.

4.2 Aluminium

The aluminium used for coating or cladding shall have a minimum purity of 99,5 % and be of sufficient quality to meet the thickness and electrical resistance requirements of this document.

4.3 Zinc

The ingot of zinc used for coating shall meet the requirements of ZN-3 in accordance with ISO 752.

The zinc coating shall be applied by either the hot-dip or electroplating method. Unless agreed between the purchaser and the manufacturer, the method of coating shall be at the discretion of the manufacturer.

4.4 Zinc-aluminium alloy

The ingot of zinc-aluminium alloy used for coating shall be in accordance with Table A.3.

4.5 Advanced zinc-aluminium alloy

The ingot of advanced zinc-aluminium alloy used for coating shall be in accordance with Table A.3.

5 Freedom from defects

The wires shall be smooth and free from all imperfections such as cracks, roughness, grooves, inclusions and other defects which can compromise the performance of the final product.

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022

6 Joints

No joints shall be made in the finished coated or cladded wire.

Joints may be made at any stage of processing prior to final cold drawing by the electric butt-weld or flash-welding process.

Welding equipment and procedure shall be such that it can be demonstrated that the ultimate tensile strength of a finished wire specimen containing the welded section shall be not less than 96 % of the specified minimum stress at 1 % extension.

A welded section shall not be required to meet the stress at 1 % extension, elongation, torsion, bend, and wrap tests. All other requirements need to be met.

No joints are allowed after heat treatment on wires, which will be used in single-wire conductors.

7 Tests

7.1 General

Tests shall be made by the manufacturer on the wires to demonstrate their conformity to this document. Tests shall be made in accordance with Table A.2.

Tests shall be performed between 10 °C and 30 °C.

7.2 Place of testing

Unless otherwise agreed between the purchaser and the manufacturer at time of ordering, all tests shall be carried out at the manufacturer's premises.

7.3 Sampling rate

The specimen for tests specified in 7.4 shall be taken by the manufacturer from samples of at least 10 % of each lot.

Alternatively, if a quality assessment procedure is in place and implemented, the sampling rate shall be subject to agreement between the manufacturer and purchaser.

7.4 Test methods

7.4.1 Visual test

The surface of the wire shall be visually examined to ensure that it is smooth and free from all imperfections including, but not limited to, cracks, unevenness, holes and inclusion of impurities.

7.4.2 Diameter

7.4.2.1 Unit for diameter

The nominal diameter of a wire shall be expressed in millimetres to two decimal places.

7.4.2.2 Diameter from direct measurements

The diameter of a round wire shall be the mean of two measurements at right angle taken at the same cross-section. The measurement apparatus shall have an accuracy of at least 0,001 mm.

Documents
Document Sharing Hub

Full document details: BS EN IEC 63248:2022