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Power cables with extruded insulation and their accessories for rated voltages from 1 kV (U_m = 1,2 kV) up to 30 kV (U_m = 36 kV) – Part 2: Cables for rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

FOREWORD 11
1 Scope 13
2 Normative references 13
3 Terms and definitions 15
3.1 Definitions of dimensional values (thicknesses, cross-sections, etc.) 15
3.2 Definitions concerning the tests 16
4 Voltage designations and materials 16
4.1 Rated voltages 16
4.2 Insulating compounds 17
4.3 Sheathing compounds 18
5 Conductors 19
6 Insulation 19
6.1 Material 19
6.2 Insulation thickness 19
7 Screening 20
7.1 General 20
7.2 Conductor screen 20
7.3 Insulation screen 20
8 Assembly of three-core cables, inner coverings and fillers 21
8.1 General 21
8.2 Inner coverings and fillers 21
8.2.1 Construction 21
8.2.2 Material 21
8.2.3 Thickness of extruded inner covering 21
8.2.4 Thickness of lapped inner covering 21
8.3 Cables having a collective metal layer (see Clause 9) 22
8.4 Cables having a metal layer over each individual core (see Clause 10) 22
9 Metal layers for single-core and three-core cables 22
10 Metal screen 22
10.1 Construction 22
10.2 Requirements 23
10.3 Metal screens not associated with semi-conducting layers 23
11 Concentric conductor 23
11.1 Construction 23
11.2 Requirements 23
11.3 Application 23
12 Metal sheath 23
12.1 Lead sheath 23
12.2 Other metal sheaths 23
13 Metal armour 24
13.1 Types of metal armour 24
13.2 Materials 24
13.3 Application of armour 24
13.3.1 Single-core cables 24
13.3.2 Three-core cables 24

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

13.3.3 Separation sheath 24
13.3.4 Lapped bedding under armour for lead sheathed cables 25
13.4 Dimensions of the armour wires, ~~and~~ armour tapes and armour strips 25
13.5 Correlation between cable diameters and armour dimensions 25
13.6 Round or flat wire armour 26
13.7 Double tape armour 26
13.8 Interlock metal tape armour 27
14 Oversheath 27
14.1 General 27
14.2 Material 27
14.3 Thickness 28
15 Test conditions 28
15.1 Ambient temperature 28
15.2 Frequency and waveform of power frequency test voltages 28
15.3 Waveform of impulse test voltages 28
15.4 Determination of the cable conductor temperature 28
16 Routine tests 29
16.1 General 29
16.2 Electrical resistance of conductors 29
16.3 Partial discharge test 29
16.4 Voltage test 29
16.4.1 General 29
16.4.2 Test procedure for single-core cables 30
16.4.3 Test procedure for three-core cables 30
16.4.4 Test voltage 30
16.4.5 Requirement 30
16.5 Electrical test on oversheath of the cable 30
17 Sample tests 30
17.1 General 30
17.2 Frequency of sample tests 31
17.2.1 Conductor examination and check of dimensions 31
17.2.2 Electrical and physical tests 31
17.3 Repetition of tests 31
17.4 Conductor examination 31
17.5 Measurement of thickness of insulation and of non-metal sheaths (including extruded separation sheaths, but excluding inner extruded coverings) 31
17.5.1 General 31
17.5.2 Requirements for the insulation 31
17.5.3 Requirements for the non-metal sheaths 32
17.6 Measurement of thickness of lead sheath 32
17.6.1 General 32
17.6.2 Strip method 32
17.6.3 Ring method 32
17.7 Measurement of armour wires, ~~and~~ tapes and armour strips 33
17.7.1 Measurement on wires 33
17.7.2 Measurement on tapes and armour strips 33
17.7.3 Requirements 33

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

17.8 Measurement of external diameter 33
17.9 Voltage test for 4 h 33
17.9.1 Sampling 33
17.9.2 Procedure 33
17.9.3 Test voltages 33
17.9.4 Requirements 34
17.10 Hot set test for EPR, HEPR and XLPE insulations and elastomeric sheaths 34
17.10.1 Procedure 34
17.10.2 Requirements 34
17.11 Bending test on interlock armour cable followed by examination 34
18 Type tests, electrical 34
18.1 General 34
18.2 Cables having conductor screens and insulation screens 34
18.2.1 General 34
18.2.2 Sequence of tests 35
18.2.3 Special provisions 35
18.2.4 Bending test 35
18.2.5 Partial discharge test 36
18.2.6 Tan δ measurement for cables of rated voltage 6/10 (12) kV and above 36
18.2.7 Heating cycle test 36
18.2.8 Impulse test followed by a voltage test 37
18.2.9 Voltage test for 4 h 37
18.2.10 Resistivity of semi-conducting screens 37
18.3 Cables of rated voltage 3,6/6 (7,2) kV having unscreened insulation 38
18.3.1 General 38
18.3.2 Insulation resistance measurement at ambient temperature 38
18.3.3 Insulation resistance measurement at maximum conductor temperature 39
18.3.4 Voltage test for 4 h 39
18.3.5 Impulse test 39
19 Type tests, non-electrical 40
19.1 General 40
19.2 Measurement of thickness of insulation 40
19.2.1 Sampling 40
19.2.2 Procedure 40
19.2.3 Requirements 40
19.3 Measurement of thickness of non-metal sheaths (including extruded separation sheaths, but excluding inner coverings) 40
19.3.1 Sampling 40
19.3.2 Procedure 40
19.3.3 Requirements 40
19.4 Measurement of thickness of lead sheath 40
19.4.1 Sampling 40
19.4.2 Procedure 40
19.4.3 Requirements 40
19.5 Tests for determining the mechanical properties of insulation before and after ageing 40

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

19.5.1 Sampling 40
19.5.2 Ageing treatments 41
19.5.3 Conditioning and mechanical tests 41
19.5.4 Requirements 41
19.6 Tests for determining the mechanical properties of non-metal sheaths before and after ageing 41
19.6.1 Sampling 41
19.6.2 Ageing treatments 41
19.6.3 Conditioning and mechanical tests 41
19.6.4 Requirements 41
19.7 Additional ageing test on pieces of completed cables 41
19.7.1 General 41
19.7.2 Sampling 41
19.7.3 Ageing treatment 41
19.7.4 Mechanical tests 42
19.7.5 Requirements 42
19.8 Loss of mass test on PVC sheaths of type ST_2 42
19.8.1 Procedure 42
19.8.2 Requirements 42
19.9 Pressure test at high temperature on insulations and non-metal sheaths 42
19.9.1 Procedure 42
19.9.2 Requirements 42
19.10 Test on PVC insulation, ~~and~~ PVC sheaths and halogen free sheaths at low temperatures 42
19.10.1 Procedure 42
19.10.2 Requirements 42
19.11 Test for resistance of PVC insulation and sheaths to cracking (heat shock test) 42
19.11.1 Procedure 42
19.11.2 Requirements 42
19.12 Ozone resistance test for EPR and HEPR insulations 43
19.12.1 Procedure 43
19.12.2 Requirements 43
19.13 Hot set test for EPR, HEPR and XLPE insulations and elastomeric sheaths 43
19.14 Oil immersion test for elastomeric sheaths 43
19.14.1 Procedure 43
19.14.2 Requirements 43
19.15 Water absorption test on insulation 43
19.15.1 Procedure 43
19.15.2 Requirements 43
~~19.16 Flame spread test on single cables ..... 43~~
19.16 Test under fire conditions 43
19.16.1 General 43
19.16.2 Flame spread test for single cables 43
19.16.3 Flame spread test for bunched cables 44
19.16.4 Measurement of smoke density of cables burning under defined conditions 44

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

19.16.5 Determination of acidity (by pH measurement) and conductivity of gases evolved during combustion of the non-metallic materials in the cable 44
19.16.6 Fire performance tests on halogen free oversheath material ST_8 44
19.16.7 Fire performance tests on halogen free oversheath material ST_{12} 45
19.16.8 Measurement of halogen content of gases evolved during combustion of the non-metallic materials in the cable 45
19.17 Measurement of carbon black content of black PE oversheaths 45
19.17.1 Procedure 45
19.17.2 Requirements 45
19.18 Shrinkage test for XLPE insulation 46
19.18.1 Procedure 46
19.18.2 Requirements 46
19.19 Thermal stability test for PVC insulation 46
19.19.1 Procedure 46
19.19.2 Requirements 46
19.20 Determination of hardness of HEPR insulation 46
19.20.1 Procedure 46
19.20.2 Requirements 46
19.21 Determination of the elastic modulus of HEPR insulation 46
19.21.1 Procedure 46
19.21.2 Requirements 46
19.22 Shrinkage test for PE and halogen free oversheaths 46
19.22.1 Procedure 46
19.22.2 Requirements 46
19.23 Strippability test for insulation screen 47
19.23.1 General 47
19.23.2 Procedure 47
19.23.3 Requirements 47
19.24 Water penetration test 47
19.25 Additional tests on halogen free oversheath of type ST_8 48
19.25.1 General 48
19.25.2 Water absorption test for halogen free oversheath of type ST_8 48
19.25.3 Abrasion test on halogen free oversheath of type ST_8 48
19.26 Bending test on interlock armour 48
20 Electrical tests after installation 48
20.1 General 48
20.2 DC voltage test of the oversheath 48
20.3 ~~Insulation test~~ AC voltage test of the insulation 48
Annex A (normative) Fictitious calculation method for determination of dimensions of protective coverings 58
A.1 General 58
A.2 Method 58
A.2.1 Conductors 58
A.2.2 Cores 59
A.2.3 Diameter over laid-up cores 59
A.2.4 Inner coverings 59
A.2.5 Concentric conductors and metal screens 60

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

A.2.6 Lead sheath 61
A.2.7 Separation sheath 61
A.2.8 Lapped bedding 61
A.2.9 Additional bedding for tape-armoured cables (provided over the inner covering) 62
A.2.10 Armour 62
Annex B (informative) Tabulated continuous current ratings for cables having extruded insulation and a rated voltage from 3,6/6 kV up to 18/30 kV 63
B.1 General 63
B.2 Cable constructions 63
B.3 Temperatures 63
B.4 Soil thermal resistivity 64
B.5 Methods of installation 64
B.5.1 General 64
B.5.2 Single-core cables in air 64
B.5.3 Single-core cables buried direct 64
B.5.4 Single-core cables in earthenware ducts 65
B.5.5 Three-core cables 65
B.6 Screen bonding 66
B.7 Cable loading 66
B.8 Rating factors for grouped circuits 66
B.9 Correction factors 66
Annex C (normative) Rounding of numbers 82
C.1 Rounding of numbers for the purpose of the fictitious calculation method 82
C.2 Rounding of numbers for other purposes 82
Annex D (normative) Method of measuring resistivity of semi-conducting screens 83
Annex E (normative) Determination of hardness of HEPR insulations 86
E.1 Test piece 86
E.2 Test procedure 86
E.2.1 General 86
E.2.2 Surfaces of large radius of curvature 86
E.2.3 Surfaces of small radius of curvature 86
E.2.4 Conditioning and test temperature 86
E.2.5 Number of measurements 87
Annex F (normative) Water penetration test 88
F.1 Test piece 88
F.2 Test 88
F.3 Requirements 89
Annex G (informative) Determination of the cable conductor temperature 90
G.1 Purpose 90
G.2 Calibration of the temperature of the main test loop 90
G.2.1 General 90
G.2.2 Installation of cable and temperature sensors 90
G.2.3 Calibration method 92
G.3 Heating for the test 93
G.3.1 Method 1 – Test using a reference cable 93
G.3.2 Method 2 – Test using conductor temperature calculations and measurement of the surface temperature 93

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

Annex H (normative) Test for water penetration in the conductor 95
H.1 General 95
H.2 Test piece 95
H.3 Test 95
H.4 Requirements 95
Annex I (normative) Methods of determining the weighted value of halogen content of the non-metallic materials in the cable 97
I.1 Calculating the weighted value of the cable when the halogen content of individual materials is tested 97
I.2 Preparation of the test sample for measurement of halogen content on a sample representative of the non-metallic materials in the cable 97
Bibliography 98

Figure B.1 – Single-core cables in air 64
Figure B.2 – Single-core cables buried direct 65
Figure B.3 – Single-core cables in earthenware ducts 65
Figure B.4 – Three-core cables 66
Figure D.1 – Preparation of samples for measurement of resistivity of conductor and insulation screens 85
Figure E.1 – Test on surfaces of large radius of curvature 87
Figure E.2 – Test on surfaces of small radius of curvature 87
Figure F.1 – Schematic diagram of apparatus for water penetration test 89
Figure G.1 – Typical test set-up for the reference loop and the main test loop 91
Figure G.2 – Example of an arrangement of the temperature sensors on the conductor of the reference loop 92
Figure H.1 – Schematic diagram of apparatus for water penetration test in the conductor 96

Table 1 – Recommended rated voltages U_0 17
Table 2 – Insulating compounds 17
Table 3 – Maximum conductor temperatures for different types of insulating compound 18
Table 4 – Maximum conductor temperatures for different types of sheathing compound 18
Table 5 – Nominal thickness of PVC/B insulation 19
Table 6 – Nominal thickness of cross-linked polyethylene (XLPE) insulation 19
Table 7 – Nominal thickness of ethylene propylene rubber (EPR) and hard ethylene propylene rubber (HEPR) insulation 20
Table 8 – Thickness of extruded inner covering 21
Table 9 – Nominal diameter of round armour wires 26
Table 10 – Nominal thickness of armour tapes 26
Table 24 – Nominal thickness of armour strips 26
Table 11 – Routine test voltages 30
Table 12 – Number of samples for sample tests 31
Table 13 – Sample test voltages 34
Table 14 – Impulse voltages 37
Table 15 – Electrical type test requirements for insulating compounds 49
Table 16 – Non-electrical type tests (see Table 17 to Table 23 and Table 25) 50

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

Table 17 – Test requirements for mechanical characteristics of insulating compounds (before and after ageing) 51
Table 18 – Test requirements for particular characteristics for PVC insulating compound 52
Table 19 – Test requirements for particular characteristics of various crosslinked insulating compounds 53
Table 20 – Test requirements for mechanical characteristics of sheathing compounds (before and after ageing) 54
Table 21 – Test requirements for particular characteristics for PVC sheathing compounds 54
Table 22 – Test requirements for particular characteristics of PE (thermoplastic polyethylene) sheathing compounds 55
Table 23 – Test requirements for particular characteristics of elastomeric sheathing compound 55
Table 25 – Test requirements for particular characteristics of halogen free sheathing compounds 56
Table A.1 – Fictitious diameter of conductor 59
Table A.2 – Increase of diameter for concentric conductors and metal screens 60
Table A.3 – Increase of diameter for additional bedding 62
Table A.4 – Increase of diameter over interlocked armour 62
Table B.1 – Nominal screen cross-sectional areas 63
Table B.2 – Current ratings for single-core cables with XLPE insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor 67
Table B.3 – Current ratings for single-core cables with XLPE insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor 68
Table B.4 – Current ratings for single-core cables with EPR insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor 69
Table B.5 – Current ratings for single-core cables with EPR insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor 70
Table B.6 – Current rating for three-core XLPE insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor, armoured and unarmoured 71
Table B.7 – Current rating for three-core XLPE insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor, armoured and unarmoured 72
Table B.8 – Current rating for three-core EPR insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor, armoured and unarmoured 73
Table B.9 – Current rating for three-core EPR insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor, armoured and unarmoured 74
Table B.10 – Correction factors for ambient air temperatures other than 30 °C 74
Table B.11 – Correction factors for ambient ground temperatures other than 20 °C 75
Table B.12 – Correction factors for depths of laying other than 0,8 m for direct buried cables 75
Table B.13 – Correction factors for depths of laying other than 0,8 m for cables in ducts 75
Table B.14 – Correction factors for soil thermal resistivities other than 1,5 K·m/W for direct buried single-core cables 76
Table B.15 – Correction factors for soil thermal resistivities other than 1,5 K·m/W single-core cables in buried ducts 76
Table B.16 – Correction factors for soil thermal resistivities other than 1,5 K·m/W for direct buried three-core cables 77

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

Table B.17 – Correction factors for soil thermal resistivities other than 1,5 K·m/W for three-core cables in ducts 77
Table B.18 – Correction factors for groups of three-core cables in horizontal formation laid direct in the ground 78
Table B.19 – Correction factors for groups of three-phase circuits of single-core cables laid direct in the ground 78
Table B.20 – Correction factors for groups of three-core cables in single way ducts in horizontal formation 79
Table B.21 – Correction factors for groups of three-phase circuits of single-core cables in single-way ducts 79
Table B.22 – Reduction factors for groups of more than one multi-core cable in air – To be applied to the current-carrying capacity for one multi-core cable in free air 80
Table B.23 – Reduction factors for groups of more than one circuit of single-core cables (Note 2) – To be applied to the current-carrying capacity for one circuit of single-core cables in free air 81

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

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POWER CABLES WITH EXTRUDED INSULATION AND THEIR ACCESSORIES FOR RATED VOLTAGES FROM 1 kV (U_m = 1,2 kV) UP TO 30 kV (U_m = 36 kV) –

Part 2: Cables for rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)

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.
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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60502-2 edition 3.1 contains the third edition (2014-02) [documents 20/1469A/FDIS and 20/1472/RVD] and its amendment 1 (2024-05) [documents 20/2166/FDIS and 20/2181/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough

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red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60502-2 has been prepared by IEC technical committee 20: Electric cables.

This third edition cancels and replaces the second edition, published in 2005, and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) a simplified calculation procedure for the thickness of the lead sheath and the oversheath;
b) a new subclause for the determination of the cable conductor temperature;
c) a modified procedure for the routine voltage test;
d) a new subclause for a routine electrical test on oversheath;
e) modified requirements for the non-metal sheaths including semi-conductive layer;
f) modified tolerances for the bending test cylinder;
g) the inclusion of a 0,1Hz test after installation.

In addition, the modified structure of the IEC 60811 series has been adopted for this third edition.

The following editorial changes have been made within the English version:

– 'metallic' has been replaced by 'metal';
– 'thermosetting' has been replaced by 'crosslinked'.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60502 series, published under the general title *Power cables with extruded insulation and their accessories for rated voltages from 1kV (U_m = 1,2 kV) up to 30 kV (U_m = 36 kV)*, can be found on the IEC website.

The committee has decided that the contents of this document and its amendment 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, or
- revised.

IMPORTANT – The *'colour inside'* logo on the cover page of this publication 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.

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POWER CABLES WITH EXTRUDED INSULATION AND THEIR ACCESSORIES FOR RATED VOLTAGES FROM 1 kV (U_m = 1,2 kV) UP TO 30 kV (U_m = 36 kV) –

Part 2: Cables for rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)

1 Scope

This part of IEC 60502 specifies the construction, dimensions and test requirements of power cables with extruded solid insulation from 6 kV up to 30 kV for fixed installations such as distribution networks or industrial installations.

When determining applications, it is recommended that the possible risk of radial water ingress is considered. Cable designs with barriers claimed to prevent longitudinal water penetration and an associated test are included in this part of IEC 60502.

Cables for special installation and service conditions are not included, for example cables for overhead networks, the mining industry, nuclear power plants (in and around the containment area) nor for submarine use or shipboard application.

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.

IEC 60038, *IEC standard voltages*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-3, *High-voltage test techniques – Part 3: Definitions and requirements for on-site testing*

IEC 60183, *Guide to the selection of high-voltage cables*

IEC 60228, *Conductors of insulated cables*

IEC 60229:2007, *Tests on cable oversheaths which have a special protective function and are applied by extrusion*

IEC 60230, *Impulse tests on cables and their accessories*

IEC 60287-3-1, Electric cables – *Calculation of the current rating – Part 3: Sections on operating conditions – Section 1: Reference operating conditions and selection of cable type*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

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IEC 60332-3-24, *Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C*

IEC 60684-2, *Flexible insulating sleeving – Part 2: Methods of test*

IEC 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content*

IEC 60754-2, *Test on gases evolved during combustion of materials from cables – Part 2: Determination of acidity (by pH measurement) and conductivity*

IEC 60754-3, *Test on gases evolved during combustion of materials from cables – Part 3: Measurement of low level of halogen content by ion chromatography*

IEC 60811 (all parts), *Electric and optical fibre cables – Test methods for non-metallic materials*

IEC 60811-201, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions*

IEC 60811-401, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven*

IEC 60811-402, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 402: Miscellaneous tests – Water absorption tests*

IEC 60811-403, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 403: Miscellaneous tests – Ozone resistance test on cross-linked compounds*

IEC 60811-404, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for sheaths*

IEC 60811-405, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 405: Miscellaneous tests – Thermal stability test for PVC insulations and PVC sheaths*

IEC 60811-409, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 409: Miscellaneous tests – Loss of mass test for thermoplastic insulations and sheaths*

IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 60811-502, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 502: Mechanical tests – Shrinkage test for insulations*

IEC 60811-503, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 503: Mechanical tests – Shrinkage test for sheaths*

IEC 60811-504, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 504: Mechanical tests – Bending tests at low temperature for insulation and sheaths*

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IEC 60811-505, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths*

IEC 60811-506, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for insulations and sheaths*

IEC 60811-507, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 507: Mechanical tests – Hot set test for cross-linked materials*

IEC 60811-508, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 508: Mechanical tests – Pressure test at high temperature for insulation and sheaths*

IEC 60811-509, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 509: Mechanical tests – Test for resistance of insulations and sheaths to cracking (heat shock test)*

IEC 60811-605, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene compounds*

IEC 60811-606, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 606: Physical tests – Methods for determining the density*

IEC 60853 (all parts), *Calculation of the cyclic and emergency current rating of cables*

IEC 60853-2, *Calculation of the cyclic and emergency current rating of cables – Part 2: Cyclic rating of cables greater than 18/30 (36) kV and emergency ratings for cables of all voltages*

IEC 60885-3, *Electrical test methods for electric cables – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables*

IEC 60986, *Short-circuit temperature limits of electric cables with rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)*

IEC 61034-2, *Measurement of smoke density of cables burning under defined conditions – Part 2: Test procedure and requirements*

ISO 48, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

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CONTENTS

FOREWORD 11
1 Scope 13
2 Normative references 13
3 Terms and definitions 15
3.1 Definitions of dimensional values (thicknesses, cross-sections, etc.) 15
3.2 Definitions concerning the tests 16
4 Voltage designations and materials 16
4.1 Rated voltages 16
4.2 Insulating compounds 17
4.3 Sheathing compounds 18
5 Conductors 19
6 Insulation 19
6.1 Material 19
6.2 Insulation thickness 19
7 Screening 20
7.1 General 20
7.2 Conductor screen 20
7.3 Insulation screen 20
8 Assembly of three-core cables, inner coverings and fillers 21
8.1 General 21
8.2 Inner coverings and fillers 21
8.2.1 Construction 21
8.2.2 Material 21
8.2.3 Thickness of extruded inner covering 21
8.2.4 Thickness of lapped inner covering 21
8.3 Cables having a collective metal layer (see Clause 9) 22
8.4 Cables having a metal layer over each individual core (see Clause 10) 22
9 Metal layers for single-core and three-core cables 22
10 Metal screen 22
10.1 Construction 22
10.2 Requirements 23
10.3 Metal screens not associated with semi-conducting layers 23
11 Concentric conductor 23
11.1 Construction 23
11.2 Requirements 23
11.3 Application 23
12 Metal sheath 23
12.1 Lead sheath 23
12.2 Other metal sheaths 23
13 Metal armour 24
13.1 Types of metal armour 24
13.2 Materials 24
13.3 Application of armour 24
13.3.1 Single-core cables 24
13.3.2 Three-core cables 24

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

13.3.3 Separation sheath 24
13.3.4 Lapped bedding under armour for lead sheathed cables 25
13.4 Dimensions of the armour wires, armour tapes and armour strips 25
13.5 Correlation between cable diameters and armour dimensions 25
13.6 Round or flat wire armour 26
13.7 Double tape armour 26
13.8 Interlock metal tape armour 27
14 Oversheath 27
14.1 General 27
14.2 Material 27
14.3 Thickness 28
15 Test conditions 28
15.1 Ambient temperature 28
15.2 Frequency and waveform of power frequency test voltages 28
15.3 Waveform of impulse test voltages 28
15.4 Determination of the cable conductor temperature 28
16 Routine tests 28
16.1 General 28
16.2 Electrical resistance of conductors 29
16.3 Partial discharge test 29
16.4 Voltage test 29
16.4.1 General 29
16.4.2 Test procedure for single-core cables 29
16.4.3 Test procedure for three-core cables 29
16.4.4 Test voltage 30
16.4.5 Requirement 30
16.5 Electrical test on oversheath of the cable 30
17 Sample tests 30
17.1 General 30
17.2 Frequency of sample tests 30
17.2.1 Conductor examination and check of dimensions 30
17.2.2 Electrical and physical tests 30
17.3 Repetition of tests 31
17.4 Conductor examination 31
17.5 Measurement of thickness of insulation and of non-metal sheaths (including extruded separation sheaths, but excluding inner extruded coverings) 31
17.5.1 General 31
17.5.2 Requirements for the insulation 31
17.5.3 Requirements for the non-metal sheaths 32
17.6 Measurement of thickness of lead sheath 32
17.6.1 General 32
17.6.2 Strip method 32
17.6.3 Ring method 32
17.7 Measurement of armour wires, tapes and armour strips 32
17.7.1 Measurement on wires 32
17.7.2 Measurement on tapes and armour strips 33
17.7.3 Requirements 33

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

17.8 Measurement of external diameter 33
17.9 Voltage test for 4 h 33
17.9.1 Sampling 33
17.9.2 Procedure 33
17.9.3 Test voltages 33
17.9.4 Requirements 33
17.10 Hot set test for EPR, HEPR and XLPE insulations and elastomeric sheaths 34
17.10.1 Procedure 34
17.10.2 Requirements 34
17.11 Bending test on interlock armour cable followed by examination 34
18 Type tests, electrical 34
18.1 General 34
18.2 Cables having conductor screens and insulation screens 34
18.2.1 General 34
18.2.2 Sequence of tests 34
18.2.3 Special provisions 35
18.2.4 Bending test 35
18.2.5 Partial discharge test 36
18.2.6 Tan δ measurement for cables of rated voltage 6/10 (12) kV and above 36
18.2.7 Heating cycle test 36
18.2.8 Impulse test followed by a voltage test 36
18.2.9 Voltage test for 4 h 37
18.2.10 Resistivity of semi-conducting screens 37
18.3 Cables of rated voltage 3,6/6 (7,2) kV having unscreened insulation 37
18.3.1 General 37
18.3.2 Insulation resistance measurement at ambient temperature 38
18.3.3 Insulation resistance measurement at maximum conductor temperature 38
18.3.4 Voltage test for 4 h 39
18.3.5 Impulse test 39
19 Type tests, non-electrical 39
19.1 General 39
19.2 Measurement of thickness of insulation 39
19.2.1 Sampling 39
19.2.2 Procedure 39
19.2.3 Requirements 40
19.3 Measurement of thickness of non-metal sheaths (including extruded separation sheaths, but excluding inner coverings) 40
19.3.1 Sampling 40
19.3.2 Procedure 40
19.3.3 Requirements 40
19.4 Measurement of thickness of lead sheath 40
19.4.1 Sampling 40
19.4.2 Procedure 40
19.4.3 Requirements 40
19.5 Tests for determining the mechanical properties of insulation before and after ageing 40

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

19.5.1 Sampling 40
19.5.2 Ageing treatments 40
19.5.3 Conditioning and mechanical tests 40
19.5.4 Requirements 40
19.6 Tests for determining the mechanical properties of non-metal sheaths before and after ageing 41
19.6.1 Sampling 41
19.6.2 Ageing treatments 41
19.6.3 Conditioning and mechanical tests 41
19.6.4 Requirements 41
19.7 Additional ageing test on pieces of completed cables 41
19.7.1 General 41
19.7.2 Sampling 41
19.7.3 Ageing treatment 41
19.7.4 Mechanical tests 41
19.7.5 Requirements 41
19.8 Loss of mass test on PVC sheaths of type ST_2 42
19.8.1 Procedure 42
19.8.2 Requirements 42
19.9 Pressure test at high temperature on insulations and non-metal sheaths 42
19.9.1 Procedure 42
19.9.2 Requirements 42
19.10 Test on PVC insulation, PVC sheaths and halogen free sheaths at low temperatures 42
19.10.1 Procedure 42
19.10.2 Requirements 42
19.11 Test for resistance of PVC insulation and sheaths to cracking (heat shock test) 42
19.11.1 Procedure 42
19.11.2 Requirements 42
19.12 Ozone resistance test for EPR and HEPR insulations 42
19.12.1 Procedure 42
19.12.2 Requirements 42
19.13 Hot set test for EPR, HEPR and XLPE insulations and elastomeric sheaths 43
19.14 Oil immersion test for elastomeric sheaths 43
19.14.1 Procedure 43
19.14.2 Requirements 43
19.15 Water absorption test on insulation 43
19.15.1 Procedure 43
19.15.2 Requirements 43
19.16 Test under fire conditions 43
19.16.1 General 43
19.16.2 Flame spread test for single cables 43
19.16.3 Flame spread test for bunched cables 43
19.16.4 Measurement of smoke density of cables burning under defined conditions 43
19.16.5 Determination of acidity (by pH measurement) and conductivity of gases evolved during combustion of the non-metallic materials in the cable 44

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

19.16.6 Fire performance tests on halogen free oversheath material ST_8 44
19.16.7 Fire performance tests on halogen free oversheath material ST_{12} 44
19.16.8 Measurement of halogen content of gases evolved during combustion of the non-metallic materials in the cable 45
19.17 Measurement of carbon black content of black PE oversheaths 45
19.17.1 Procedure 45
19.17.2 Requirements 45
19.18 Shrinkage test for XLPE insulation 45
19.18.1 Procedure 45
19.18.2 Requirements 45
19.19 Thermal stability test for PVC insulation 46
19.19.1 Procedure 46
19.19.2 Requirements 46
19.20 Determination of hardness of HEPR insulation 46
19.20.1 Procedure 46
19.20.2 Requirements 46
19.21 Determination of the elastic modulus of HEPR insulation 46
19.21.1 Procedure 46
19.21.2 Requirements 46
19.22 Shrinkage test for PE and halogen free oversheaths 46
19.22.1 Procedure 46
19.22.2 Requirements 46
19.23 Strippability test for insulation screen 46
19.23.1 General 46
19.23.2 Procedure 47
19.23.3 Requirements 47
19.24 Water penetration test 47
19.25 Additional tests on halogen free oversheath of type ST_8 47
19.25.1 General 47
19.25.2 Water absorption test for halogen free oversheath of type ST_8 48
19.25.3 Abrasion test on halogen free oversheath of type ST_8 48
19.26 Bending test on interlock armour 48
20 Electrical tests after installation 48
20.1 General 48
20.2 DC voltage test of the oversheath 48
20.3 AC voltage test of the insulation 48
Annex A (normative) Fictitious calculation method for determination of dimensions of protective coverings 57
A.1 General 57
A.2 Method 57
A.2.1 Conductors 57
A.2.2 Cores 58
A.2.3 Diameter over laid-up cores 58
A.2.4 Inner coverings 58
A.2.5 Concentric conductors and metal screens 59
A.2.6 Lead sheath 60
A.2.7 Separation sheath 60

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

A.2.8 Lapped bedding 60
A.2.9 Additional bedding for tape-armoured cables (provided over the inner covering) 61
A.2.10 Armour 61
Annex B (informative) Tabulated continuous current ratings for cables having extruded insulation and a rated voltage from 3,6/6 kV up to 18/30 kV 62
B.1 General 62
B.2 Cable constructions 62
B.3 Temperatures 62
B.4 Soil thermal resistivity 63
B.5 Methods of installation 63
B.5.1 General 63
B.5.2 Single-core cables in air 63
B.5.3 Single-core cables buried direct 63
B.5.4 Single-core cables in earthenware ducts 64
B.5.5 Three-core cables 64
B.6 Screen bonding 65
B.7 Cable loading 65
B.8 Rating factors for grouped circuits 65
B.9 Correction factors 65
Annex C (normative) Rounding of numbers 81
C.1 Rounding of numbers for the purpose of the fictitious calculation method 81
C.2 Rounding of numbers for other purposes 81
Annex D (normative) Method of measuring resistivity of semi-conducting screens 82
Annex E (normative) Determination of hardness of HEPR insulations 85
E.1 Test piece 85
E.2 Test procedure 85
E.2.1 General 85
E.2.2 Surfaces of large radius of curvature 85
E.2.3 Surfaces of small radius of curvature 85
E.2.4 Conditioning and test temperature 85
E.2.5 Number of measurements 86
Annex F (normative) Water penetration test 87
F.1 Test piece 87
F.2 Test 87
F.3 Requirements 88
Annex G (informative) Determination of the cable conductor temperature 89
G.1 Purpose 89
G.2 Calibration of the temperature of the main test loop 89
G.2.1 General 89
G.2.2 Installation of cable and temperature sensors 89
G.2.3 Calibration method 91
G.3 Heating for the test 92
G.3.1 Method 1 – Test using a reference cable 92
G.3.2 Method 2 – Test using conductor temperature calculations and measurement of the surface temperature 92
Annex H (normative) Test for water penetration in the conductor 94
H.1 General 94

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

H.2 Test piece 94
H.3 Test 94
H.4 Requirements 94
Annex I (normative) Methods of determining the weighted value of halogen content of the non-metallic materials in the cable 96
I.1 Calculating the weighted value of the cable when the halogen content of individual materials is tested 96
I.2 Preparation of the test sample for measurement of halogen content on a sample representative of the non-metallic materials in the cable 96
Bibliography 97

Figure B.1 – Single-core cables in air 63
Figure B.2 – Single-core cables buried direct 64
Figure B.3 – Single-core cables in earthenware ducts 64
Figure B.4 – Three-core cables 65
Figure D.1 – Preparation of samples for measurement of resistivity of conductor and insulation screens 84
Figure E.1 – Test on surfaces of large radius of curvature 86
Figure E.2 – Test on surfaces of small radius of curvature 86
Figure F.1 – Schematic diagram of apparatus for water penetration test 88
Figure G.1 – Typical test set-up for the reference loop and the main test loop 90
Figure G.2 – Example of an arrangement of the temperature sensors on the conductor of the reference loop 91
Figure H.1 – Schematic diagram of apparatus for water penetration test in the conductor 95

Table 1 – Recommended rated voltages U_0 17
Table 2 – Insulating compounds 17
Table 3 – Maximum conductor temperatures for different types of insulating compound 18
Table 4 – Maximum conductor temperatures for different types of sheathing compound 18
Table 5 – Nominal thickness of PVC/B insulation 19
Table 6 – Nominal thickness of cross-linked polyethylene (XLPE) insulation 19
Table 7 – Nominal thickness of ethylene propylene rubber (EPR) and hard ethylene propylene rubber (HEPR) insulation 20
Table 8 – Thickness of extruded inner covering 21
Table 9 – Nominal diameter of round armour wires 26
Table 10 – Nominal thickness of armour tapes 26
Table 24 – Nominal thickness of armour strips 26
Table 11 – Routine test voltages 30
Table 12 – Number of samples for sample tests 31
Table 13 – Sample test voltages 33
Table 14 – Impulse voltages 37
Table 15 – Electrical type test requirements for insulating compounds 49
Table 16 – Non-electrical type tests (see Table 17 to Table 23 and Table 25) 49
Table 17 – Test requirements for mechanical characteristics of insulating compounds (before and after ageing) 50

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

Table 18 – Test requirements for particular characteristics for PVC insulating compound 51
Table 19 – Test requirements for particular characteristics of various crosslinked insulating compounds 52
Table 20 – Test requirements for mechanical characteristics of sheathing compounds (before and after ageing) 53
Table 21 – Test requirements for particular characteristics for PVC sheathing compounds 53
Table 22 – Test requirements for particular characteristics of PE (thermoplastic polyethylene) sheathing compounds 54
Table 23 – Test requirements for particular characteristics of elastomeric sheathing compound 54
Table 25 – Test requirements for particular characteristics of halogen free sheathing compounds 55
Table A.1 – Fictitious diameter of conductor 58
Table A.2 – Increase of diameter for concentric conductors and metal screens 59
Table A.3 – Increase of diameter for additional bedding 61
Table A.4 – Increase of diameter over interlocked armour 61
Table B.1 – Nominal screen cross-sectional areas 62
Table B.2 – Current ratings for single-core cables with XLPE insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor 66
Table B.3 – Current ratings for single-core cables with XLPE insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor 67
Table B.4 – Current ratings for single-core cables with EPR insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor 68
Table B.5 – Current ratings for single-core cables with EPR insulation – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor 69
Table B.6 – Current rating for three-core XLPE insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor, armoured and unarmoured 70
Table B.7 – Current rating for three-core XLPE insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor, armoured and unarmoured 71
Table B.8 – Current rating for three-core EPR insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Copper conductor, armoured and unarmoured 72
Table B.9 – Current rating for three-core EPR insulated cables – Rated voltage 3,6/6 kV to 18/30 kV * – Aluminium conductor, armoured and unarmoured 73
Table B.10 – Correction factors for ambient air temperatures other than 30 °C 73
Table B.11 – Correction factors for ambient ground temperatures other than 20 °C 74
Table B.12 – Correction factors for depths of laying other than 0,8 m for direct buried cables 74
Table B.13 – Correction factors for depths of laying other than 0,8 m for cables in ducts 74
Table B.14 – Correction factors for soil thermal resistivities other than 1,5 K·m/W for direct buried single-core cables 75
Table B.15 – Correction factors for soil thermal resistivities other than 1,5 K·m/W single-core cables in buried ducts 75
Table B.16 – Correction factors for soil thermal resistivities other than 1,5 K·m/W for direct buried three-core cables 76
Table B.17 – Correction factors for soil thermal resistivities other than 1,5 K·m/W for three-core cables in ducts 76

This is a preview of IEC 60502-2 Ed. 3.1 en:2024. Click here to purchase the full version from the ANSI store.

Table B.18 – Correction factors for groups of three-core cables in horizontal formation laid direct in the ground 77
Table B.19 – Correction factors for groups of three-phase circuits of single-core cables laid direct in the ground 77
Table B.20 – Correction factors for groups of three-core cables in single way ducts in horizontal formation 78
Table B.21 – Correction factors for groups of three-phase circuits of single-core cables in single-way ducts 78
Table B.22 – Reduction factors for groups of more than one multi-core cable in air – To be applied to the current-carrying capacity for one multi-core cable in free air 79
Table B.23 – Reduction factors for groups of more than one circuit of single-core cables (Note 2) – To be applied to the current-carrying capacity for one circuit of single-core cables in free air 80

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

POWER CABLES WITH EXTRUDED INSULATION AND THEIR ACCESSORIES FOR RATED VOLTAGES FROM 1 kV (U_m = 1,2 kV) UP TO 30 kV (U_m = 36 kV) –

Part 2: Cables for rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)

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.
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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60502-2 edition 3.1 contains the third edition (2014-02) [documents 20/1469A/FDIS and 20/1472/RVD] and its amendment 1 (2024-05) [documents 20/2166/FDIS and 20/2181/RVD].

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

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International Standard IEC 60502-2 has been prepared by IEC technical committee 20: Electric cables.

This third edition cancels and replaces the second edition, published in 2005, and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) a simplified calculation procedure for the thickness of the lead sheath and the oversheath;
b) a new subclause for the determination of the cable conductor temperature;
c) a modified procedure for the routine voltage test;
d) a new subclause for a routine electrical test on oversheath;
e) modified requirements for the non-metal sheaths including semi-conductive layer;
f) modified tolerances for the bending test cylinder;
g) the inclusion of a 0,1Hz test after installation.

In addition, the modified structure of the IEC 60811 series has been adopted for this third edition.

The following editorial changes have been made within the English version:

– 'metallic' has been replaced by 'metal';
– 'thermosetting' has been replaced by 'crosslinked'.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60502 series, published under the general title *Power cables with extruded insulation and their accessories for rated voltages from 1kV (U_m = 1,2 kV) up to 30 kV (U_m = 36 kV)*, can be found on the IEC website.

The committee has decided that the contents of this document and its amendment 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, or
- revised.

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POWER CABLES WITH EXTRUDED INSULATION AND THEIR ACCESSORIES FOR RATED VOLTAGES FROM 1 kV (U_m = 1,2 kV) UP TO 30 kV (U_m = 36 kV) –

Part 2: Cables for rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)

1 Scope

This part of IEC 60502 specifies the construction, dimensions and test requirements of power cables with extruded solid insulation from 6 kV up to 30 kV for fixed installations such as distribution networks or industrial installations.

When determining applications, it is recommended that the possible risk of radial water ingress is considered. Cable designs with barriers claimed to prevent longitudinal water penetration and an associated test are included in this part of IEC 60502.

Cables for special installation and service conditions are not included, for example cables for overhead networks, the mining industry, nuclear power plants (in and around the containment area) nor for submarine use or shipboard application.

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.

IEC 60038, *IEC standard voltages*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-3, *High-voltage test techniques – Part 3: Definitions and requirements for on-site testing*

IEC 60183, *Guide to the selection of high-voltage cables*

IEC 60228, *Conductors of insulated cables*

IEC 60229:2007, *Tests on cable oversheaths which have a special protective function and are applied by extrusion*

IEC 60230, *Impulse tests on cables and their accessories*

IEC 60287-3-1, Electric cables – *Calculation of the current rating – Part 3: Sections on operating conditions – Section 1: Reference operating conditions and selection of cable type*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

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IEC 60332-3-24, *Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C*

IEC 60684-2, *Flexible insulating sleeving – Part 2: Methods of test*

IEC 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content*

IEC 60754-2, *Test on gases evolved during combustion of materials from cables – Part 2: Determination of acidity (by pH measurement) and conductivity*

IEC 60754-3, *Test on gases evolved during combustion of materials from cables – Part 3: Measurement of low level of halogen content by ion chromatography*

IEC 60811 (all parts), *Electric and optical fibre cables – Test methods for non-metallic materials*

IEC 60811-201, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions*

IEC 60811-401, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven*

IEC 60811-402, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 402: Miscellaneous tests – Water absorption tests*

IEC 60811-403, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 403: Miscellaneous tests – Ozone resistance test on cross-linked compounds*

IEC 60811-404, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for sheaths*

IEC 60811-405, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 405: Miscellaneous tests – Thermal stability test for PVC insulations and PVC sheaths*

IEC 60811-409, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 409: Miscellaneous tests – Loss of mass test for thermoplastic insulations and sheaths*

IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 60811-502, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 502: Mechanical tests – Shrinkage test for insulations*

IEC 60811-503, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 503: Mechanical tests – Shrinkage test for sheaths*

IEC 60811-504, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 504: Mechanical tests – Bending tests at low temperature for insulation and sheaths*

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IEC 60811-505, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths*

IEC 60811-506, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for insulations and sheaths*

IEC 60811-507, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 507: Mechanical tests – Hot set test for cross-linked materials*

IEC 60811-508, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 508: Mechanical tests – Pressure test at high temperature for insulation and sheaths*

IEC 60811-509, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 509: Mechanical tests – Test for resistance of insulations and sheaths to cracking (heat shock test)*

IEC 60811-605, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene compounds*

IEC 60811-606, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 606: Physical tests – Methods for determining the density*

IEC 60853 (all parts), *Calculation of the cyclic and emergency current rating of cables*

IEC 60853-2, *Calculation of the cyclic and emergency current rating of cables – Part 2: Cyclic rating of cables greater than 18/30 (36) kV and emergency ratings for cables of all voltages*

IEC 60885-3, *Electrical test methods for electric cables – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables*

IEC 60986, *Short-circuit temperature limits of electric cables with rated voltages from 6 kV (U_m = 7,2 kV) up to 30 kV (U_m = 36 kV)*

IEC 61034-2, *Measurement of smoke density of cables burning under defined conditions – Part 2: Test procedure and requirements*

ISO 48, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)*