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Električni kabli - Razširjena uporaba rezultatov preskusov odziva na ogenj

Electric cables - Extended application of test results for reaction to fire

Erweiterte Anwendung von Prüfergebnissen bezüglich Brandverhalten

Câbles électriques - Application étendue des résultats d'essai pour la réaction au feu

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Electric cables - Extended application of test results for reaction to fire

Câbles électriques - Application étendue des résultats d'essai pour la réaction au feu

Kabel und Leitungen - Erweiterte Anwendung von Prüfergebnissen bezüglich Brandverhalten

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

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EN 50576:2022 (E)

European foreword

This document (EN 50576:2022) has been prepared by CLC/TC 20 “Electric cables”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023-12-12
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2025-12-12

This document supersedes CLC/TS 50576:2016 and all of its amendments and corrigenda (if any).

EN 50576:2022 includes the following significant technical changes with respect to CLC/TS 50576:2016:

- Inclusion of EXAP rule for single core unsheathed power cables with a diameter of less than or equal to 5,0 mm [8];
- simplification of the choice of samples to the EXAP rule for EN 60332-1-2 for classes B_{2ca}, C_{ca} and D_{ca} for electric cables;
- simplification of the choice of samples due to the changes in the test standard to the EXAP rule for EN 61034-2;
- implementation of a direct application rule for EN 60754-2;
- improvement of d_{min} to the Table 2.

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.

This document is read in conjunction with EN 50575 in order to evaluate the reaction to fire performance of power, control and communication cables.

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.

Introduction

The original project “CEMAC – CE marking of cables” was carried out over a three-year period. It brought together cable manufacturers, research and testing laboratories, and research establishments in creating the technical background and developing rules and procedures for extended application of test results (EXAP). More than 200 tests to EN 50399 on more than 100 cables were carried out as part of the project. The final report [1] was published in 2010 and the EXAP rules and procedures developed by the CEMAC project have been used as the basis for this document.

A specific EXAP procedure and rules based on the use of safety margins and a cable parameter derived from the extensive CEMAC tests was developed for the most common generic types of power cables used in the European market.

A general EXAP procedure and rules based upon a statistical treatment of the actual test results obtained from a cable family was also developed for any power cables. However, the use of this general procedure and rules will generally require more tests to be carried out than the use of the specific procedure and rules.

Since the CEMAC project report was completed in 2010, the project has been extended to further investigate the performance of optical fibre cables and rules and procedures developed for extended application of test results for these products. An additional report [2] was published in 2015 and the EXAP rules and procedures developed by the further CEMAC project work was used as the basis for CLC/TS 50576:2016.

Since 2016, the project has been extended to further investigate the performance of communication cables and rules and procedures developed for extended application of test results for these products. The work [7] was published in 2016 and has been included in this document.

In addition, this edition includes editorial improvements and re-arrangements.

General guidance on direct and extended application can be found in CEN/TS 15117 [3].

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EN 50576:2022 (E)**1 Scope**

This document describes the procedure and rules for extended application of results of tests carried out according to the test methods described in EN 50399, EN 60332-1-2 and EN 61034-2.

The EXAP rules described apply to EN 50399 test results used for classification according to EN 13501-6 in classes B_{2ca}, C_{ca} and D_{ca}, additional smoke production classes s1, s2 and s3 and flaming droplets/particles, to EN 60332-1-2 test results used for classification in classes B_{2ca}, C_{ca}, D_{ca} and E_{ca} and to EN 61034-2 test results used for classification in classes s1a and s1b.

No EXAP procedure and rules have been developed in respect to the results of tests carried out according to the test method described in EN 60754-2. As the parameters (pH and conductivity) for each cable in a family are determined based upon calculation using material test results, this is considered as a matter of direct application. Material test results taken from any one sample of finished cable from a family are sufficient to calculate the parameters for each cable in the family.

Cables with a diameter of 5,0 mm or less are expected to be tested as bundles according to EN 50399. Cables with a diameter of less than or equal to 5,0 mm are included in the specific and general EXAP rules for single core unsheathed power cables only. The rules apply to circular and non-circular cables provided that they fall within the scope of the relevant test method.

A specific EXAP rule has been developed for any of the types of electric cable families as defined in this document. A general EXAP rule has been developed for all electric cable families unless otherwise stated elsewhere in this document.

NOTE 1 Multicore power cables are sometimes referred to as control cables with a rated voltage but for the purposes of this document are considered as power cables. For multipair, multitruple and multiquad control cables, either the general EXAP rule or the specific EXAP rule for power cables or the specific EXAP rule for communication cables can be applied.

The use of the specific EXAP rule gives benefit in the lower number of cables to be tested for a range of cable constructions (product family).

An EXAP is only possible when cables belong to a family as defined in this document.

NOTE 2 For the purposes of this document, the term "electric cables" also covers optical fibre cables.

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.

EN 13501-6, *Fire classification of construction products and building elements - Part 6: Classification using data from reaction to fire tests on power, control and communication cables*

EN 50399, *Common test methods for cables under fire conditions - Heat release and smoke production measurement on cables during flame spread test - Test apparatus, procedures, results*

EN 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 (IEC 60332-1-2)*

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

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

3 Terms and definitions

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

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

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

3.1

classification

process defined in EN 13501-6, whereby the fire performance parameters obtained from the results of one test, or a set of tests, or from a process of extended application, are compared with limiting values for those parameters that are set as criteria for achieving a certain classification

3.2

electric cable

all power, control and communication cables, including optical fibre cables and hybrid cables which are a combination of two or more of these cable types

[SOURCE: EN 50575]

3.3

power cable

assembly comprising one or more insulated conductor(s), together with any coverings and protective layers, used for the transmission or supply of electrical energy

[SOURCE: EN 50575]

3.4

control cable

assembly comprising insulated conductors, together with any coverings and protective layers, used for the transmission of control, measuring and indication signals in electric installations

[SOURCE: EN 50575]

3.5

communication cable

assembly of suitably insulated coaxial conductors or twisted pairs of insulated conductors fabricated to meet transmission, mechanical and environmental requirements, and sufficient to allow conveyance of information between two points with the minimum of radiation

[SOURCE: EN 50575]

Note 1 to entry: For this document, only communication cables with copper conductors are considered.

3.6

optical fibre cable

assembly comprising one or more optical fibres or fibre bundles inside a common covering designed to protect them against mechanical stresses and other environmental influences while retaining the transmission quality of the fibres

[SOURCE: IEC 731-04-01]

EN 50576:2022 (E)**3.7****product family**

group of products produced by one manufacturer for which the test results for one or more characteristics from one product within the family are considered to be representative for that same characteristic for all other products within this family

[SOURCE: EN 50575]

3.8**extended application of test results****EXAP**

outcome of a process (involving the application of defined rules that may incorporate calculation procedures) that attributes, for a cable family, a test result on the basis of one or more test results to the same test standard

3.9**heat release rate****HRR**

thermal energy released per unit time by an item during combustion under specified conditions

[SOURCE: EN 50399]

3.10**total heat release****THR**

integrated value of the heat release rate over a defined period

[SOURCE: EN 50399]

3.11**smoke production rate****SPR**

smoke production per unit time standards.iteh.ai/catalog/standards/sist/03e90d7a-e1ae-4f7b-881f-308e04ff99fd/sist-en-50576-2023

[SOURCE: EN 50399]

3.12**total smoke production****TSP**

integrated value of the smoke production rate over a defined period

[SOURCE: EN 50399]

3.13**flame spread****FS**

propagation of a flame front

[SOURCE: EN 50399]

3.14**fire growth rate index****FIGRA**

highest value of the quotient between HRR and time

[SOURCE: EN 50399]

3.15

flaming droplet/particle

material separating from the specimen during the test and continuing to flame for a minimum period as described in the test method

[SOURCE: EN 50399]

3.16

armour

covering consisting of a metal tape(s) or wires, generally used to protect the cable from external mechanical defects

Note 1 to entry: For the purpose of this document, metallic tape thicker than or equal 0,10 mm thickness is considered an armour.

Note 2 to entry: Examples for wire coverings are concentric conductors or braids.

[SOURCE: IEC 461-05-06]

3.17

non-circular cable

cable where the measured difference between any two values of the overall diameter of the cable at the same cross-section exceeds 15 % of the largest overall diameter

Note 1 to entry: So-called figure of 8 cables, consisting of two exactly identical circular cables connected together with a very small, extruded interconnecting link are considered to be non-circular cables.

[SOURCE: EN 50399]

4 Extended application of test results (EXAP)

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4.1 Product families for EXAP

4.1.1 General

4.1.1.1 Introduction

An EXAP is only possible when cables belong to a defined family.

The cable family shall be produced by the same manufacturer using the same materials and the same design rules (for instance International standard, National standard, Company standard based on National or International standard), subject to the provisions of 4.1.2 to 4.1.4.

NOTE A common design rule is that the thickness of the design elements (for instance insulation and/or sheath thickness) increase with conductor size and cable diameter. These cables, using this common design rule, belong to the same cable family.

The full constructional and material details for the family shall be submitted to the certification body prior to the EXAP being applied.

4.1.1.2 Colour and marking of design elements

A change to the colour of design elements (for instance insulation, fibre and/or sheath) or to the marking on insulation and/or sheath does not constitute a different cable family.

EN 50576:2022 (E)**4.1.1.3 Centre filler and interstitial fillers**

It is common that part of the cables in a product range have a centre filler (depending on number of cores and/or cross section) and part of the cables in that product range are without centre filler.

If the volume of the centre filler is equal to or less than 10 % of the total non-metallic volume, the cable with centre filler belongs to the same family as the cables without centre filler (on the condition that all other requirements of this document are fulfilled).

If the volume of the centre filler is greater than 10 % of the total non-metallic volume, the cable with centre filler constitutes a different family than the cables without centre filler.

The volume of the centre filler shall in any case be taken into account in the calculation of the cable parameter.

For cables with and without interstitial fillers, other than centre filler and/or filling compound, the cables are considered to belong to different product families.

4.1.1.4 Tapes

Cables with or without tapes are to be treated as follows:

- a) with/without metallic or metallized tape: different families;
- b) with/without non-combustible tapes (such as mica tapes and glass tapes): different family;
- c) with/without combustible tapes (such as separator tapes like polyester, polypropylene): in case the total volume of the tape(s) is(are) less than 2 % of the total non-metallic volume, the cables belong to the same family.

NOTE For the types of tapes that fall under b) and c) it is not possible to mention all different types of materials. Therefore, only some examples are given.

4.1.1.5 Cable diameter

The nominal tabulated cable diameter, calculated by the producer, shall be used for the selection of the cables and for classification.

For the tests, the measured cable diameter shall be used.

A difference between the nominal cable diameter calculated by the producer and the measured cable diameter is acceptable under the condition that the measured cable diameter does not differ more than $\pm 10\%$ from this nominal cable diameter.

NOTE Under this condition, it is acceptable that number of cables in the test is different from the number of cables calculated on the basis of the nominal diameter.

4.1.1.6 Cable parameter χ

χ is the cable parameter, which shall be rounded to the nearest integer. In case the rounded cable parameter is the same in all or part of a family, the cables are considered the same and two test samples shall be chosen according to specific EXAP and at least three according to general EXAP.

The samples to test should be agreed between the manufacturer and the Notified Body and/or testing laboratory.

4.1.2 Product families for power cables

For the application of these EXAP rules and procedures, a cable family shall be defined as follows:

A family of cables is a specific range of products of the same general construction (design elements) and varying only in conductor size and number of cores.

A change to the conductor construction (rigid or flexible) or form (circular or shaped) or metal (such as copper or aluminium) shall constitute a different family. EN 60228 Class 1 and Class 2 are rigid conductors and Class 5 and Class 6 are flexible conductors.