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

Kabel und Leitungen - Erweiterte Anwendung von Prüfergebnissen

Câbles électriques - Application étendue des résultats d'essai

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29.060.20	Kabli	Cables

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

Câbles électriques - Application étendue des résultats
d'essai

Kabel und Leitungen - Erweiterte Anwendung von
Prüfergebnissen

This Technical Specification was approved by CENELEC on 2016-10-10.

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

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CLC/TS 50576:2016 (E)**European foreword**

This document (CLC/TS 50576:2016) has been prepared by CLC/TC 20 “Electric cables”.

The following date is proposed:

- latest date by which the existence of (doa) [2017-04-10]
this document has to be announced
at national level

This document supersedes CLC/TS 50576:2014.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

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

NOTE For the purposes of this Technical Specification, the term 'electric cables' also covers optical fibre cables.

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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 Technical Specification.

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 have been used as the basis for the 2016 revision of this Technical Specification.

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

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CLC/TS 50576:2016 (E)

1 Scope

This Technical Specification gives 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 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.

Cables of diameter 5,0 mm and less should be tested as bundles according to EN 50399. Bundled cables are not included in the EXAP rules applying to EN 50399 test results.

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 the most common generic power cable families and optical fibre cables. A general EXAP rule has been developed for any power cable families. The general EXAP rule is not applicable to communication or optical fibre cables.

NOTE 1 Multicore power cables with more than 5 cores are sometimes referred to as control cables with a rated voltage but for the purposes of this Technical Specification are considered as power cables.

The general EXAP rule may be applied in the case of hybrid cables provided that the conditions of 6.1 are fulfilled.

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 defined family as defined in this Technical Specification.

NOTE 2 No EXAP procedure and rules have been developed in respect of 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.

2 Normative references

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

EN 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 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.

3.1

classification

process defined in EN 13501, 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

[SOURCE: EN 15725]

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]

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

Note 1 to entry: May also contain metallic conductors.

[SOURCE: IEC 731-04-01]

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]

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Standards together with any coverings and protective layers, used for the transmission of control, measuring and indication signals in electric installations
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CLC/TS 50576:2016 (E)**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

[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]

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4 Extended application of test results (EXAP)

4.1 Product families for EXAP

4.1.1 General

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

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

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

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 voltage rating.

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

An armour or concentric layer shall not be considered solely as a conductor in determining a product family. An armoured or a concentric construction shall be considered as a different family to a construction without such armour or concentric layer. An armour and a concentric conductor are different design elements.

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) and varying only in conductor size and number of cores.

NOTE 1 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.

If the cable family falls under one of the generic power cable families:

- single core unsheathed;
- single core sheathed (unarmoured);
- multicore sheathed (unarmoured);
- armoured single or multicore;

the specific EXAP with safety margin as a function of classification parameter and class may be applied.

NOTE 2 Concentric constructions are considered as part of the generic armoured family.

4.1.3 Product families for communication cable

For the application of these EXAP rules and procedure, 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 number of conductors and number of units.

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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).

The cable family shall fall under one of the generic communication cable families:

- U/UTP unscreened overall / unscreened twisted pair;
- F/UTP screened overall / unscreened twisted pair;
- SF/UTP metallic braid and screened overall / unscreened twisted pair;
- U/FTP unscreened overall / screened twisted pair;
- F/FTP screened overall / screened twisted pair;
- S/FTP metallic braid overall / screened twisted pair;
- SF/FTP metallic braid and screened overall / screened twisted pair.

4.1.4 Product families for optical fibre cables

For the application of these EXAP rules and procedure, 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 number of optical fibres and number of units.

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).

The following properties are considered to have a negligible influence on the fire behaviour and therefore differences in these properties only do not mean that the cables belong to different families:

- Fibre glass type;
- Fibre type (e.g. single mode or multimode);
- Fibre colour.

4.2 Specific and general EXAP

A specific EXAP rule has been developed for the most common generic power cable and optical fibre cable families and a general EXAP rule has been developed for other power cable families.

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

5 Specific EXAP with safety margin for power cables**5.1 Rules for specific EXAP for EN 50399 test**

These rules apply for the classification parameters peak HRR, THR, FIGRA, FS, peak SPR and TSP.

These rules apply to circular and non-circular cables within the limits of the EN 50399 test.

The EXAP is based on two tests. The parameter χ is used as a cable parameter.