IECEE OPERATIONAL DOCUMENT

IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System)

Committee of Testing Laboratories (CTL)

Guide on Product Families, Family Ranges or Series of Products
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Document Owner

CTL WG 4 “Coordination”

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<td>Document transferred into new design.</td>
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1. Introduction

The IECEE CMC has identified the need to define a Family Range or a Series of Products as a means to improve the acceptance of CB Test Certificates among IECEE member NCBs. It was noted that inconsistencies in the range of products that may be covered by one CBTC and in the scope of evaluation of a product family often result in NCBs questioning CB Test Certificates and Test Reports.

The objective of this Guide is to assist NCBs and CBTLs in the decisions on the coverage of a CB Test Certificate and on the selection of appropriate samples from a product family for evaluation and testing. It provides a general definition of a product family and, in Annex A, some specific examples of product families and sample selection criteria in various IECEE product categories.

For the purpose of this Guide, the terms Product Family, Family Range or Product Series are considered synonymous.

2. Issues to be noted

A number of issues have been identified in the CTL and CMC discussions on the subject of Family Ranges. They are provided here for guidance to the application of the Family Range concept.

First and foremost, it must be noted that the concept of a product family may vary significantly among the different product categories in the IECEE, and even among different types of products within one category.

Furthermore, product families may be defined differently among the same products in the fields of Electrical Safety as compared to EMC. Clearly, this is related to the different compliance criteria in these fields and the different product features that must be evaluated to verify compliance.

Secondly, the CTL has emphasized that the examples compiled by each of the CTL Expert Task Forces (ETFs) are provided primarily to illustrate the product family concept, and that they apply only to the specific product types in the examples.

3. Definition of Product Family

Having considered the identified objectives and concerns, the CTL has developed the following definition of a Product Family.

“A product family can be defined by the maximum configuration, a list of components/sub-assemblies plus a description of how the models are constructed from the maximum configuration and list. All models which are included in the family typically have common design, construction, parts, or assemblies essential to ensure conformity with applicable requirements. For the same products, there may be differences in defined product families that are contingent upon the nature or type of compliance criteria applied (e.g. safety, EMC, performance, efficacy, etc.). If a product standard defined a product family, in the context of the specific standard, this definition takes over.”

This definition is provided for use in the decisions on the range of products that may appear on one CB Test Certificate and in the accompanying CB Test Report.
The examples provided in Annex A apply only to the specified types of products. However, they can be of some help for similar products when deciding on the number and type of samples to be selected from a product family for evaluation and testing.
Annex A: Examples of Product Families and Sample Selection Criteria

A.1 Product Category: HOUS, TOOL (CTL ETF 01)

Heating Appliances
The test results stated on the CB Test Report should make reference to all of the models in addition to clarify differences among those models.

a) Oil-filled radiators with different input and different number of elements (IEC 60335-2-30) as follows: 600 W with 5 elements / 1000 W with 6 elements / 1500 W with 7 elements / 2000 W with 10 elements / 2500 W with 12 elements / 3000 W with 14 elements
Considering the specific input for each element (input/number of elements) the models giving the most unfavourable result should be the models of 1500 W and 3000 W in general.
In the first page of the Test Report, it should be declared that only the models of 1500 W and 3000 W was tested considering most severe condition.

b) Flexible sheet heating elements for room heating with same heat dissipation/area (construction of heating elements) but with different input and size (IEC60335-2-96) as follows: 752 W / 1,126 W / 1,470 W / 2,010 W / 2,470 W / 2,836 W
Considering the construction that all models have the same heat dissipation/area (construction of heating elements), only the smallest size of unit or minimum size required by standard should be tested in general.
In the first page of the Test Report, it should be declared that only the models of 752 W Type were tested because the test covers all the models quoted.

Motor-Operated Appliances, Power Tools
The test results stated on the CB Test Report should make reference to all of the models in addition to clarify differences among those models.

a) Refrigerators with same refrigerant circuit having the same motor compressor, same mass of the refrigerant, same input (and same defrosting input, if any) but with different internal volume (capacity) (IEC 60335-2-24) as follows:
150 W 100 litres / 150 W 120 litres / 150 W 140 litres / 150 W 160 litres
Considering that the motor compressor operates more frequently for model with 160 litres, this one should be considered for the tests in general.
In the first page of the Test Report, it should be clarified that only the model with 160 litres was tested because it gives most unfavourable result.

b) Fan with same type of motor (permanent split capacitor motor) and its housing but with different numbers of turn of coils and with different rated frequency (IEC 60335-2-80) as follows: 6.0 W / 7.0 W (50Hz / 60 Hz), 9.5 W / 10.5 W (50Hz / 60 Hz), 12.5 W / 15.0 W (50Hz / 60 Hz) 16.5 W / 19.0 W (50Hz / 60 Hz)
Considering that the number of turn of coil was simply increased without changing its housing among models, “16.5 W / 19.0 W (50Hz / 60 Hz)” models should be tested in general.
At the first page of the Test Report, it should be clarified that only the models of “16.5 W / 19.0 W (50 Hz / 60 Hz)” was tested because it gives most unfavourable result.
Note: It is necessary to be more careful to check the construction of winding in order to include in the same family"
c) Angle grinders with the same type and size of motor (e.g. series motor or brushless motor) and enclosure including the handles but with different voltage and input power ratings, different types of wheel fixtures, wheel sizes, wheel guards and auxiliary handles:
Grinder/sander/polisher with 115 mm or 125 mm diameter; with grinding disc or sanding pad; with family members for 230 V / 50 Hz or for 100 V / 60 Hz; auxiliary handles all should be tested for vibration and drop test, while the longest is considered worst case for the torque test. For other tests motors equal in construction but only different (e.g. for marketing purposes) in power rating, the highest power rating could be used. For motors with different windings but equal in dimensions and power rating, all should be considered to be tested.
In the section “Product information” of the Test Report, the exact differences between the models should be explained. The report should also mention which models have been used as representative for which tests and why this is deemed to ensure the most unfavourable test result.

A.2 Product Category: OFF, TRON (CTL ETF 02)

IT Component Power Supplies
Series of ratings
1. Different output ratings, number of outputs, component ratings.
2. Same enclosure, same MAINS layout,
   Same style and insulation system of transformer.
   It may be possible to select a few models to represent the series and repeat partially the tests on the selected models.
PC’s with different combinations of sub-assemblies (disk-drives, DVD-drives etc.)
1. Same power supplies
2. Same enclosure

Power Amplifiers
1. Same enclosure, same MAINS lay out.
2. Different output ratings (100W, 200W, 300W)
3. Power transformer: Different ratings, sizes same insulation system.
   In this case (as a minimum, Input, Heating and some Fault Tests would be repeated for multiple models.

Video Recorders (VHS and/or DVD and/or hard disk)
Different features for different TV systems and different feature for recording and storing (e.g. Size of hard disk)
1. Same MAINS lay out.
2. Basically, same sub-assemblies

TV-Sets
Having different screen dimensions.
1. Same MAINS layout, same style and insulation system of transformer.
2. If equipped with CRT than same high voltage layout.
3. Different output ratings.
A.3  Product Category: MEAS, MED (CTL ETF 03)

MED
In this product category it would be inappropriate to provide specific examples of product families, since product families are either already included in the standards or are manufacturer-specific.

MEAS
In the product category MEAS:

simple motor driven laboratory equipment, like mixers, grinders, etc.:

1. Same enclosure, same MAINS lay out.
2. Different output ratings (100W, 200W, 300W).
3. Power transformer - different ratings, sizes same insulation system.

In this case worst case shall be selected and for Input, Heating and some Fault Tests would be repeated for selected models.

For the other equipment, the same approach as the MED category.

A.4  Product Category: INST, CONT, CAP, MISC (CTL ETF 04)

In this product category it would be inappropriate to provide specific examples of product families, since product families are either already included in the standards or are manufacturer-specific.

An example for a detailed definition of a product family can be found in IEC 61058-1 for switches for appliances in Annex M:

M.1  Overview
Annex M gives an example system for grouping switch types into switch families, as relates to tests specified in L.3.2. Other grouping systems may be appropriate for this purpose. As used in Annex M, a "switch family" refers to a single grouping of different switch types that are representative of one another in construction and performance.

M.2  General
Switch types may be grouped into switch families in such a way that the most severe case for the switch family can be represented by the tests each time the tests are conducted.

Alternatively, when switch families include switch types with different ratings, the switches should be selected for test in proportion to production volume, and, the severest rating of the selected switch type should be tested each time.

A switch family may include the following variations:

a) different electrical ratings for switches that employ
   1) the same basic contact construction, except for the diameter, thickness or material of the contacts;
   2) the same configuration of internal contacts, base and actuator; and
   3) the same number of poles;

b) different external parts such as terminals and actuating members;
c) one-way, two-way, and multiway types;
d) normally open and normally closed biased types of switches;

e) different contact constructions under the following conditions: switches with the same or with different
electrical ratings that employ the same basic contact construction, except for the diameter, thickness, or
material of the contacts, may be included in the same switch family, provided the switches have the same
configuration of internal contacts, base and actuator, and the same number of poles;
f) single-pole, double-pole, and multiple-pole types when the electrical rating is the same and there is a
similar configuration of internal contacts, base and actuator;
g) different combinations of electrical rating, temperature and number of operating cycles within identical
constructions.

M.3 Guidelines for selection of switches in switch families for testing
M.3.1 One-way / two-way; or biased switches in same switch family: selection should be made on an as-
available basis.
M.3.2 Different number of poles in same switch family: selection should be rotated in proportion to production
volume.
M.3.3 Different operating cycle ratings for the same electrical rating within identical constructions and different
combinations of electrical, temperature and operating cycle ratings: rotate selection in proportion to relative
production volume of each type.
M.3.4 Same contacts but different electrical ratings in same switch family: if the switch family includes various
ratings, rotate selection in proportion to relative production volume of each type. The endurance test should
be conducted at the maximum volt-ampere rating at the highest voltage applicable to the selected switch type
and the heating test should be conducted at the highest current rating applicable to the selected switch type.
M.3.5 Different contacts and different ratings in same switch family: selection of switch types for test should be
rotated based on production volume of each contact type used. The endurance test should be conducted at
the maximum volt-ampere rating at the highest applicable voltage applicable to the selected contact each
time. The heating test should be conducted at the highest applicable current rating applicable to the selected
contact type each time.
M.3.6 Co-ordinated electrical ratings (i.e., same volt-ampere ratings with different voltage and ampere ratings)
in same switch family: selection should be rotated on the basis of production volume, considering maximum
ratings in the switch family as specified in M.3.4.
A.5 Product Category: LITE, SAFE (CTL ETF 05)

The examples of product families and appropriate sample selection criteria are given in the following documents:

**Luminaires – IEC 60598 series**
Normative Annex S shall be considered. Generally, when selecting type test sample(s) from arrange of luminaires of similar construction for type test verification, the luminaire(s) chosen shall be those which represent the most unfavourable combination of components and housing.
Additional remark on S.2 b): When having the same lamp holder for different light sources no additional tests are necessary on the different light sources. The most onerous situation shall be evaluated.
Additional remark on mounting position (ceiling, wall): For example, thermal test and IP test should be considered.

**Lamps – IEC 62560 (LED lamp > 50 V)**
Regarding subclause 4.3: In general, all tests are carried out on each type of lamp or, where a range of similar lamps is involved, for each wattage in the range or on a representative selection form the range, as agreed with the manufacturer.
- Water contact, non-water contact
- Caps, envelope
- Technology: LED chip, LED COB, LED filament
- Non-smart, smart control – may have different type of smart connections.

**Lamps – IEC 62838 (LED lamp < 50 V)**
- Semi-integrated LED lamp, non-integrated LED lamp
- Water contact, non-water contact
- Caps, envelope
- Non-smart, smart control – may have different type of smart connections.

**Lamps – IEC 62031 (LED module)**
- non-integrated LED modules (LEDni modules), semi-integrated LED modules (LEDsi modules)
- integral, built-in, independent (see luminaire Annex S)
- Technology: LED chip, LED COB
- Connections (e.g. screw terminals, screwless terminals, connecting leads, Zhaga connector)
- Insulation: with touchable insulated parts, non-touchable parts
- Moisture protection
- Non-smart, smart control – may have different type of smart connections.

**Control gear – IEC 61347 series**
- Same part 2, same type of load technology
- integral, built-in, independent (see luminaire Annex S)
- Same class of protection against electric shock
- Maximum Uout
- Same insulation type for outputs (ELV, SELV, LV,...)
- Non-smart, smart control - may have different type of smart connections

*Additional considerations based on decision sheets 1006, 1012 and 1017*
Control gear (ballast) – IEC 61347-2-8/2-9 / IEC 60921 / IEC 60923
Ballast for tubular fluorescent lamps and discharge lamps. In general it is necessary to carry out the tests on all the types of ballasts with the following exceptions:

- Resistance to heat, fire and tracking - it is possible to test only one type of ballast if the materials used are identical;
- Thermal endurance of winding, (clause 13 IEC 61347-2-8/2-9) – for ballasts of the same series is sufficient to carry out the test on samples of minimum rated wattages and on the maximum one. All the intermediate wattages are considered extensions.

The ballasts are considered of the same series if:

- They are covered by the same standard, (e.g. IEC 61347-2-8/2-9);
- They are of the same construction. It means that they have laminations or cores with identical pattern range, with the same insulating material;
- They have an equal assembly technology;
- They have the same "tw" value. In some cases of ballasts for discharge lamps, for different types of lamps, (e.g. Hg, HPS, MH) may be of the same series.

Control gear (step-down converters) – IEC 61347-2-2 / IEC 61047
Step-down convertors, (d.c. - a.c.) (IEC 61347-2-2 / 61047) – Normally the tests are provided on all the types of convertors with the following exceptions:

- Resistance to heat, fire and tracking tests, if materials used are the same;
- Heating and overload tests. It is possible to check the convertor with the maximum output if:
  - The convertors with lower wattages are identical to the maximum one (same circuit, electronic components, lay out, external enclosure);
  - The convertors with lower wattages are provided with the same "tc" and "ta" values as the maximum one.

Control gear – IEC 61347 series except IEC 61347-2-2/2-8/2-9
For electronic control gears, generally it is accepted to do the tests on all types of electronic control gears with the exception of the resistance to heat, fire and tracking tests, if the used materials are the same.

A.6 Product Category: CABL (CTL ETF 06)
The examples of product families and appropriate sample selection criteria are given in the following documents:

- IEC 60227 & IEC 60245 (see also CTL DSH 0660 and 0661)
Each particular type of cable specified in the different parts of IEC 60227 and IEC 60245 is considered a product family. These types, together with their code designations are listed in Annex A of the standards IEC 60227-1 and IEC 60245-1.

- IEC 60502-1 (see also CTL DSH 0764A)
“Each type of cable” is considered a product family, where “Each type of cable” means the same material (i.e. insulation, metal screen, separation, armor and sheath), the same structure and same manufacturing process are used, which has the same fire retardant properties.
“Each type of cable” is considered a product family, where “Each type of cable” means the same material (i.e. semi-conducting screen, insulation, metal screen, separation, armor and sheath), the same structure and same manufacturing process are used.

A.7 Product Category: POW, PROT, GMEE (CTL ETF 07)

The examples of product families, appropriate sample selection criteria and retesting guidelines are given in the following documents:


C.1 Test sequences
The tests are made according to Table C.1 where the tests in each sequence are carried out in the order indicated.
## Table C.1 – Test sequences

<table>
<thead>
<tr>
<th>Test sequence</th>
<th>Clause or subclause</th>
<th>Test (or inspection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>6</td>
<td>Marking</td>
</tr>
<tr>
<td></td>
<td>8.1.1</td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>8.1.2</td>
<td>Mechanism</td>
</tr>
<tr>
<td></td>
<td>9.3</td>
<td>Indelibility of marking</td>
</tr>
<tr>
<td></td>
<td>8.1.3</td>
<td>Clearances and creepage distances (external parts only)</td>
</tr>
<tr>
<td></td>
<td>8.1.6</td>
<td>Non-interchangeability</td>
</tr>
<tr>
<td></td>
<td>9.4</td>
<td>Reliability of screws, current-carrying parts and connections</td>
</tr>
<tr>
<td></td>
<td>9.5</td>
<td>Reliability of screw-type terminals for external conductors</td>
</tr>
<tr>
<td></td>
<td>9.6</td>
<td>Protection against electric shock</td>
</tr>
<tr>
<td></td>
<td>9.14</td>
<td>Resistance to heat</td>
</tr>
<tr>
<td></td>
<td>9.16</td>
<td>Resistance to rusting</td>
</tr>
<tr>
<td>A2</td>
<td>9.15</td>
<td>Resistance to abnormal heat and to fire</td>
</tr>
<tr>
<td>B</td>
<td>9.7.5.4</td>
<td>Verification of resistance of the insulation of open contacts and basic insulation against an impulse voltage in normal conditions</td>
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<tr>
<td></td>
<td>9.7.1</td>
<td>Resistance to humidity</td>
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<tr>
<td></td>
<td>9.7.2</td>
<td>Insulation resistance of the main circuit</td>
</tr>
<tr>
<td></td>
<td>9.7.3</td>
<td>Dielectric strength of the main circuit</td>
</tr>
<tr>
<td></td>
<td>9.7.4</td>
<td>Insulation resistance and dielectric strength of auxiliary circuit</td>
</tr>
<tr>
<td></td>
<td>9.7.5.2</td>
<td>Verification of clearances with the impulse withstand voltage</td>
</tr>
<tr>
<td></td>
<td>9.8</td>
<td>Temperature rise</td>
</tr>
<tr>
<td></td>
<td>9.9</td>
<td>28-day test</td>
</tr>
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<td>C</td>
<td>C1</td>
<td>Mechanical and electrical endurance</td>
</tr>
<tr>
<td></td>
<td>9.11</td>
<td>Performance at reduced short-circuit currents</td>
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<td></td>
<td>9.12.11.2.1</td>
<td>Verification of the circuit-breaker after short-circuit tests</td>
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<td>9.12.12</td>
<td></td>
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<td>C2</td>
<td></td>
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<tr>
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<td>Short-circuit test for verifying the suitability of circuit-breakers for use in IT systems</td>
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<td></td>
<td>9.12.12</td>
<td>Verification of the circuit-breaker after short-circuit tests</td>
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<tr>
<td>D</td>
<td>D0</td>
<td>Tripping characteristic</td>
</tr>
<tr>
<td>D1</td>
<td>9.13</td>
<td>Resistance to mechanical shock and impact</td>
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<tr>
<td></td>
<td>9.12.11.3 and 9.12.12</td>
<td>Short-circuit performance at 1 500 A</td>
</tr>
<tr>
<td></td>
<td>9.12.12</td>
<td>Verification of circuit-breaker after short-circuit tests</td>
</tr>
<tr>
<td>E</td>
<td>E1</td>
<td>Service short-circuit capacity (I_{sc})</td>
</tr>
<tr>
<td></td>
<td>9.12.11.4.2 and 9.12.12</td>
<td>Verification of circuit-breaker after short-circuit tests</td>
</tr>
<tr>
<td></td>
<td>E2</td>
<td>Performance at rated short-circuit capacity (I_{cn})</td>
</tr>
<tr>
<td></td>
<td>9.12.11.4.3 and 9.12.12</td>
<td>Verification of circuit-breaker after short-circuit tests</td>
</tr>
<tr>
<td></td>
<td>E3</td>
<td>Performance at rated making and breaking capacity (I_{ont}) on an individual pole of multipole circuit-breakers</td>
</tr>
</tbody>
</table>
### 9.12.12 Verification of circuit-breaker after short-circuit tests

**NOTE** With the agreement of the manufacturer the same samples can be used for more than one test sequence.

#### C.2 Number of samples to be submitted for full test procedure and acceptance criteria

If only one rating (i.e. one set of rated quantities, see 5.2) of one type (number of poles, instantaneous tripping) of circuit-breaker is submitted for test, the number of samples to be submitted to the different test sequences are those indicated in Table C.2 in which the acceptance criteria are given.

If all the samples submitted according to the second column of Table C.2 pass the tests, compliance with the standard is met. If only the minimum number given in the third column passes the tests, additional samples as shown in the fourth column shall be tested and shall satisfactorily complete the test sequence.

For circuit-breakers having more than one rated current, two separate sets of circuit-breakers shall be submitted to each test sequence: one set adjusted at the maximum rated current, the other set at the minimum rated current. In addition one sample of all other rated currents shall be submitted for test sequence D₀ of Table C.1.

### Table C.2 – Number of samples for full test procedure

<table>
<thead>
<tr>
<th>Test sequence</th>
<th>Number of samples</th>
<th>Minimum number of samples which shall pass the tests</th>
<th>Number of samples for repeated tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₁</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>A₂</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₁</td>
<td>3</td>
<td>2&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>C₂&lt;sup&gt;f&lt;/sup&gt;</td>
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<td>2&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td>E₁</td>
<td>3 + 3&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2&lt;sup&gt;e&lt;/sup&gt; + 2&lt;sup&gt;d,e&lt;/sup&gt;</td>
<td>3 + 4&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>E₂</td>
<td>3 + 4&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2&lt;sup&gt;e&lt;/sup&gt; + 2&lt;sup&gt;d,e&lt;/sup&gt;</td>
<td>3 + 4&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>E₃</td>
<td>3</td>
<td>2&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3</td>
</tr>
</tbody>
</table>

<sup>a</sup> In total, a maximum of two test sequences may be repeated.

<sup>b</sup> It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

<sup>c</sup> In the case of repeated tests, all results shall be acceptable.

<sup>d</sup> Supplementary samples in the case of single-pole circuit-breakers rated 230/400 V or 240/415 V (see Table 1).

<sup>e</sup> All samples shall meet the test requirements of 9.12.10, 9.12.11.2, 9.12.11.3 and 9.12.11.4, as appropriate.

<sup>f</sup> For this sequence read "number of protected poles" instead of "number of samples".

<sup>g</sup> For four-pole circuit-breakers without dedicated neutral pole, four samples are required for the test in 9.12.11.3.
C.3 Number of samples to be submitted for simplified test procedure

C.3.1 This part of the standard applies when submitting simultaneously a range of circuit-breakers of the same fundamental design.

C.3.2 For a series of circuit-breakers of the same fundamental design, the number of samples to be tested may be reduced according to C.3.3 and C.3.4.

For subsequent additions (e.g. further values of rated currents, different classification of instantaneous tripping, different number of poles) to such a series of circuit-breakers the same reductions apply.

NOTE When a series of circuit-breakers presenting minor variations with respect to an already approved series of circuit-breakers is submitted to type tests, a further reduction of the number of samples and tests can be agreed upon.

Circuit-breakers can be considered to be of the same fundamental design if the following conditions are met:

- they have the same basic design;
- they have the same external physical dimensions per pole;
- the materials, finish and dimensions of the internal current carrying parts are identical, other than the variations given in a) below;
- the terminals are of similar design, (see d) below);
- the contact size, material, configuration and method of attachment are identical;
- the manual operating mechanisms (materials and physical characteristics) are identical;
- the moulding and insulating materials are identical;
- the method, materials and construction of the arc extinction device are identical;
- the basic design of the overcurrent tripping device is identical, other than the variations given in b) below;
- the basic design of the instantaneous tripping device is identical, other than the variations given in c) below;
- their voltage rating is intended for the same type of distribution circuit (see Table 1);
- multipole circuit-breakers are either composed of single-pole circuit-breakers or built up from the same components as the single-pole circuit-breakers, having the same overall dimensions per pole, with the exception of external barriers between poles.

The following variations are permitted:

a) cross-sectional areas of the internal current-carrying connections;
b) dimensions and material of the overcurrent tripping device;
c) number of turns and cross-sectional area of the operating coil of the instantaneous tripping device;
d) dimensions of terminals.

C.3.3 For circuit-breakers having the same instantaneous tripping classification according to 4.6 the number of samples to be tested may be reduced, according to Table C.3.
Table C.3 – Reduction of samples for series of circuit-breakers having different numbers of poles

<table>
<thead>
<tr>
<th>Test sequence</th>
<th>Number of samples depending on number of poles a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One pole b</td>
</tr>
<tr>
<td>A1</td>
<td>1 maximum rated current</td>
</tr>
<tr>
<td>A2</td>
<td>3 maximum rated current</td>
</tr>
<tr>
<td>B</td>
<td>3 maximum rated current</td>
</tr>
<tr>
<td>C</td>
<td>C1</td>
</tr>
<tr>
<td></td>
<td>3 maximum rated current</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>D0 + D1</td>
<td>3 maximum rated current</td>
</tr>
<tr>
<td>D0</td>
<td>1 of all other rated currents</td>
</tr>
<tr>
<td>E1</td>
<td>3+3 \textsuperscript{f} maximum rated current</td>
</tr>
<tr>
<td></td>
<td>3+3 \textsuperscript{f} minimum rated current</td>
</tr>
<tr>
<td>E2</td>
<td>3+3 \textsuperscript{f} maximum rated current</td>
</tr>
<tr>
<td></td>
<td>3+4 \textsuperscript{f} minimum rated current</td>
</tr>
<tr>
<td>E3</td>
<td>\textsuperscript{k}</td>
</tr>
</tbody>
</table>

\textsuperscript{a} If a test is to be repeated according to the acceptance criteria of Clause C.2, a new set of samples is used for the relevant test sequence. In repeated tests all results shall be satisfactory.

\textsuperscript{b} If only multipole circuit-breakers are submitted, this column applies to the set of samples having the smallest number of poles (instead of the relevant column).
c) Applicable to two-pole circuit-breakers whether with two protected poles or with one protected pole.

d) This series is omitted when four-pole circuit-breakers are also tested.

e) Also applicable to circuit-breakers with three protected poles and a neutral pole.

f) Supplementary samples in case of single-pole circuit-breakers of 9.12.11.4.2 d) or 9.12.11.4.3 b).

g) This test sequence is omitted when three-pole or four-pole circuit-breakers have been tested.

h) This test sequence shall be omitted for two-pole circuit breakers with two protected poles, when three-pole or four-pole circuit-breakers have been tested.

i) When multipole circuit-breakers are submitted, a maximum of four screw-type terminals for external conductors are subjected to the tests of 9.5, i.e. two supply and two load terminals.

j) If each pole of the multipole is identical to the individual pole tested in E2, this test is omitted. If not, this test is carried out on an individual protected pole, taken at random, of the circuit-breaker with the highest number of poles.

k) Covered by test sequence E2.

C.3.4 For an additional series of circuit-breakers of the same fundamental design as described in C.3.2 but of a different instantaneous tripping classification according to 4.6 the test sequences to be applied may be limited to those given in Table C.4, the number of samples being those given in Table C.3.

Table C.4 – Test sequences for a series of circuit-breakers being of different instantaneous tripping classifications

<table>
<thead>
<tr>
<th>Circuit-breaker type-tested first</th>
<th>Subsequent test sequences for circuit-breakers of B-type</th>
<th>C-type</th>
<th>D-type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-type</td>
<td>-</td>
<td>(D₀ + D₁) + E</td>
<td>(D₀ + D₁) + E</td>
</tr>
<tr>
<td>C-type</td>
<td>D₀ + B</td>
<td>-</td>
<td>(D₀ + D₁) + E</td>
</tr>
<tr>
<td>D-type</td>
<td>D₀ + B</td>
<td>D₀ + B_{a,b}</td>
<td>-</td>
</tr>
</tbody>
</table>

a) For these test sequences only the tests of 9.8 and 9.10.3 are required.

b) When conformity assessment is requested at the same time for B-type, C-type and D-type circuit-breakers having the same rated short-circuit capacity, only test sequence Do is required if B-type and D-type samples have been tested.
A.8  Product Category: PV (CTL ETF 09)

The examples of product families, appropriate sample selection criteria and retesting guidelines are given in the following documents:

- IEC 61215-1
- IEC 61730-1
- IEC TS 62915

Each product family requires case-by-case consideration, but typically consists of identical PV modules with different power ratings. The range of product family must be made by the same manufacturer, under the same quality assurance system. The type variants of the range must be essentially identical in respect to materials or components used, as well as manufacturing process.

Changes to design or materials require specific tests to be repeated as described in IEC TS 62915. Type test samples should be selected by the cooperation of the manufacturer and testing laboratory.

A.9  Product Category: EMC (CTL ETF 10)

In this product category it would be inappropriate to provide specific examples of product families, since product families are either already included in the standards or are manufacturer-specific.

However, where apparatus can take different configurations, the EMC assessment shall confirm that the apparatus meets the requirements regarding emission and immunity (in EU EMC directive called “essential requirements”) defined in the applied standards in all of the configurations foreseeable by the manufacturer as representative of normal use in intended applications.

A.10  Product Category: MISC (CTL ETF 11)

In this product category it would be inappropriate to provide specific examples of product families, since product families are either already included in the standards or are manufacturer-specific.

A.11  Product Category: BATT (CTL ETF 13)

The examples of product families, appropriate sample selection criteria and retesting guidelines are given in the following documents:

- DSH 1037, published 2014
- UN 38.3

In general, cells and batteries can be regarded to be in the same product family, if all of the following are met:

1. They are with same dimensions, chemistry, voltage, and from the same manufacturer.
2. Their capacity difference does not exceed 20%.
3. There is no difference as noted below:
   A. A difference in the material of the anode, the cathode, the separator or the electrolyte.
   B. A difference of protective devices, including hardware and software.
   C. A difference of safety design in cells or batteries, such as a venting valve.
   D. A difference in the number of component cells.
   E. A difference in connecting mode of component cells.
A.12 Product Category: ELVH (CTL ETF 14)

The examples of product families, appropriate sample selection criteria and retesting guidelines are given in the following documents:


In general, if a range of IC-CPDs of the same fundamental design, or additions to such a range of IC-CPDs, are submitted for conformity assessment, the number of samples to be tested may be reduced according to Table A.3 of IEC 62752.

A.13 Product Category: HIGH/MEDIUM VOLTAGE COMPONENTS COORDINATION (CTL ETF 15)

In this product category it would be inappropriate to provide specific examples of product families, since product families are already included in the standards, for example, IEC 60282-1 High-voltage fuses-Part 1: Current-limiting fuses and IEC 60282-2 High-voltage fuses-Part 2: Expulsion fuses.

A.14 Product Category: CYBER SECURITY (CTL ETF 16)

In this product category it would be inappropriate to provide specific examples of product families, since product families are either already included in the standards or are manufacturer-specific.