IEC 60358-3

Edition 1.0 2013-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Coupling capacitors and capacitor dividers – Part 3: AC or DC coupling capacitor for harmonic-filters applications

Condensateurs de couplage et diviseurs capacitifs – Partie 3: Condensateur de couplage à courant alternatif ou à courant continu pour des applications à filtres harmoniques

IEC 60358-3:2013

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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COUPLING CAPACITORS AND CAPACITOR DIVIDERS –

Part 3: AC or DC coupling capacitor for harmonic-filters applications

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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International Standard IEC 60358-3 has been prepared by IEC technical committee 33: Power capacitors and their applications.

The text of this standard is based on the following documents:

CDV	Report on voting
33/510/CDV	33/526/RVC

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

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

A list of all parts in the IEC 60358 series, published under the general title *Coupling capacitors and capacitor dividers*, can be found on the IEC website.

This standard is Part 3 of IEC 60358, published under the general title Coupling capacitor and capacitor dividers.

This International Standard is to be used in conjunction with the latest edition of IEC 60358-1:2012 and its amendments. It was established on the basis of the first edition (2012) of that standard.

This Part 3 supplements or modifies the corresponding clauses in IEC 60358-1:2012.

When a particular subclause of Part 1 is not mentioned in this Part 3, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

For additional clauses, subclauses, figures, tables or annexes, the following numbering system is used:

- subclauses, tables and figures which are additional to those in Part 1 are numbered starting from 300;
- additional tables or annexes are lettered AA, BB, etc.
- as the notes are integrated into the clauses, their numbering starts from 1 as usual.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

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INTRODUCTION

This series consists of the following parts:

IEC 60358-1:2012, *Coupling capacitor and capacitor dividers – Part 1: General rules*

IEC 60358-2:2013, *Coupling capacitor and capacitor dividers – Part 2: AC or DC single-phase coupling capacitor connected between line and ground for power line carrier-frequency (PLC) application*

IEC 60358-3:2013[1], *Coupling capacitor and capacitor dividers – Part 3: AC or DC coupling capacitor for harmonic-filters applications*

IEC 60358-4: –[2], *Coupling capacitor and capacitor dividers – Part 4: AC or DC single-phase capacitor-divider and RC-divider connected between line and ground* (except for CVTs which belong to IEC 61869 series)

1 To be published.

2 Under consideration.

COUPLING CAPACITORS AND CAPACITOR DIVIDERS –

Part 3: AC or DC coupling capacitor for harmonic-filters applications

1 Scope

Clause 1 of IEC 60358-1:2012 is replaced by the following:

This part of IEC 60358 applies to AC or DC single-phase coupling capacitor, with rated voltage higher than 1 000 V, connected line to ground with the low voltage terminal either permanently earthed or connected to a tuning device for harmonic-filters applications.

NOTE Diagrams of coupling capacitors to which this standard applies are given in Figures AA.1 and AA.2.

2 Normative references

Clause 2 of IEC 60358-1:2012 is replaced by the following:

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 60060-1:2012, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60358-1:2012, *Coupling capacitors and capacitor dividers. – Part 1: General rules*

IEC 60358-2, *Coupling capacitors and capacitor dividers. – Part 2: AC or DC single-phase coupling capacitor connected between line and ground for power line carrier-frequency (PLC) application*

IEC 60481, *Coupling devices for power line carrier systems*

IEC 61869-5, *Instrument transformers – Part 5: Additional requirements for capacitive voltage transformers*

3 Terms and definitions

Clause 3 of IEC 60358-1:2012 is applicable with the following additions:

For the purposes of this document, the terms and definitions given in IEC 60358-1:2012, as well as the following, apply.

3.300 Definition for harmonic filters

3.1.1
filter capacitor
power capacitor intended to form part of a circuit designed to reduce one or more harmonic currents present in a network

[SOURCE: IEC 60050-436:1990, 436-02-06]

3.1.2
tuning device
accessory to the capacitor to improve filtering harmonics on the network. It consists of passive components adjusted to the filter capacitor and the frequencies to be filtered.

3.1.3
voltage limitation device
element connected between low voltage terminal of the filter capacitor and earth to limit the overvoltages which appear across the tuning device in case of:

a) a short circuit between the high-voltage terminal and earth;

b) where an impulse voltage is applied between the high voltage terminal and earth

4 Service conditions

Clause 4 of IEC 60358-1:2012 is applicable.

5 Ratings

Clause 5 of IEC 60358-1:2012 is applicable.

6 Design requirements

Clause 6 of IEC 60358-1:2012 is applicable with the following additions:

6.2.300 Tuning device

The purchaser defines:

- The values and ratings of the components and its electrical circuit.
- The test voltages of the tuning device, however
  - The 50 Hz insulation test voltage shall not be lower than 3 kV.
  - The BIL test voltage shall not be lower than 10 kV.

7 Test conditions

Clause 7 of IEC 60358-1:2012 is applicable.

8 Classification of tests

Clause 8 of IEC 60358-1:2012 is applicable with the following additions:

8.2 Routine tests

Clause 8.2 of IEC 60358-1:2012 is applicable with the following additions:

8.2.300 Routine test for tuning device

a) AC frequency voltage test (9.300.2.1)

b) Impedance measurement (9.300.2.2)

c) Routine voltage test for voltage limitation device (9.300.2.3)

8.3 Type tests

Clause 8.3 of IEC 60358-1:2012 is applicable with the following additions:

8.3.300 Type tests for filter capacitor and tuning device

8.3.300.1 Type tests for filter capacitor

a) High frequency capacitance and equivalent series resistance (10.300.1)

b) Measurement of the stray capacitance and stray conductance of the low voltage terminal (10.300.2)

8.3.300.2 Type tests for tuning device

a) Impulse voltage test (10.301.1)

9 Routine tests

Clause 9 of IEC 60358-1:2012 is applicable with the following additions:

9.300 Electrical tests for coupling capacitor and tuning device

9.300.1 Routine tests for coupling capacitor

The routine tests on the capacitor part are specified in 60358-1:2012, Subclause 8.1. No supplementary test is specified for filter capacitors.

9.300.2 Routine tests for tuning device

9.300.2.1 AC frequency voltage test

The AC-voltage is applied between protective earth and terminal (short-circuited) of the tuning device during one minute according to Figure 300. The voltage level is defined in 6.2.300.

If the voltage limitation device is connected on protective earth, it shall be disconnected during the test.

Neither breakdown nor flashover shall occur during the test.

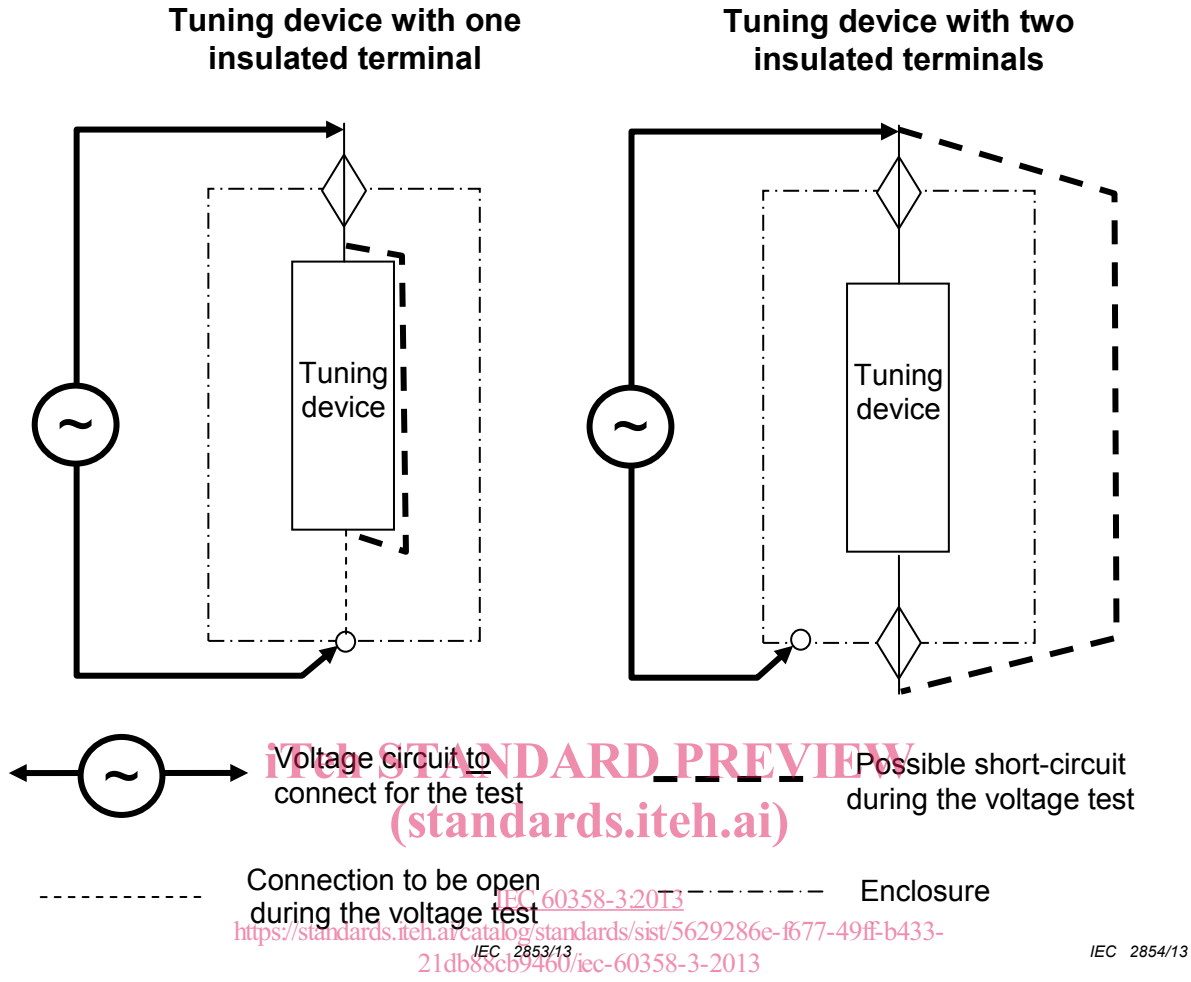

Figure 300 – Connection for voltage test of tuning device

9.300.2.2 Impedance measurement

A measurement of impedance at specified frequencies has to be performed; the filter capacitor can be replaced by a capacitor model.

As acceptance criteria the purchaser shall define the maximum impedance at specified frequencies.

Limitation device to be tested either by subsupplier or by manufacturer

9.300.2.3 Routine voltage test for voltage limitation device

The following routine test is specified according to the cases below:

a) Air-gap arrester

Measurement of the protection level voltage

The voltage AC or DC is increased until breakdown. The breakdown voltage must be within the range specified by the manufacturer

b) Arrester

Measurement of the reference voltage of arrester

The AC voltage is increased on the arrester until the current reach 1mA rms, the measured reference voltage must be within the range specified by the manufacturer.

10 Type tests

Clause 10 of IEC 60358-1:2012 is applicable with the following additions:

10.300 Test on capacitor

10.300.1 High frequency capacitance and equivalent series resistance

The measurements shall be carried out on a capacitor stack or on a capacitor unit.

The capacitance and the equivalent series resistance shall be measured at the two temperatures equal to the limits of the temperature category and at a temperature within the standard range for testing (IEC 60358-1:2012, Clause 7), at frequencies specified from the purchaser.

The purchaser specifies the measuring frequencies and the acceptance criteria in terms of capacitance variation in function of the filter capability

The equivalent series resistance has an influence on the quality of the filter and on the thermal withstand of the capacitor; the acceptance criteria will then be defined between purchaser and manufacturer.

For high frequency characteristics and measuring methods, see Annex BB.

NOTE In the case of practical difficulties in carrying out the measurements at the limits of the temperature category, the purchaser and the manufacturer may agree on measurements over a smaller temperature range, or on measurements performed on a model capacitor containing a limited number of elements.

10.300.2 Measurement of the stray capacitance and stray conductance of the low voltage terminal

The measurements shall be carried out either on a bottom unit or on a model representative of the bottom part of the capacitor under consideration.

This model shall include the earth terminal, the metal parts (e.g. flanges) permanently connected to it, and the low voltage terminal with at least one element connected to it and placed in its proper position. If a model is used, it shall be filled with the insulating liquid used for the capacitor.

The values of the stray capacitance and the stray conductance, measured at frequencies specified from the purchaser, shall not exceed 200 pF and 20 μS respectively.

NOTE By low capacitance value of the filter capacitor and by different frequency range, the purchaser can ask for lower values.

To avoid a harmful increase of the stray conductance in polluted ambient conditions, the low voltage terminal should have a creepage distance in accordance with IEC 60358-1:2012, Subclause 6.2.7.

10.301 Test on tuning device

10.301.1 Impulse voltage test

Five positive and five negative lightning impulses 1,2/50 μs with the test value according to 6.2.300 shall be applied on the high voltage terminal. If this, due to low resistance, is not possible to obtain, the best possible curve with the test equipment may be accepted. In this case, preference shall be given to retaining the front time. The tail time should however, if possible, not be shorter than 5 μs. The other end of the tuning network shall be earthed. The