IEC 60099-8

Edition 2.0 2017-11

INTERNATIONAL STANDARD

colour inside

Surge arresters –
Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV

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Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV

FOREWORD

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International Standard IEC 60099-8 has been prepared by IEC technical committee 37: Surge arresters.

This second edition cancels and replaces the first edition published in 2011. This edition constitutes a technical revision.

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

a) The Lightning discharge capability test has been completely re-written and re-named to Test to verify the repetitive charge transfer rating, Qrs with lightning discharges to reflect changes introduced in IEC 60099-4 Ed. 3 (2014) regarding new methods for rating the energy and charge handling capability of metal-oxide arresters. In addition to testing to

evaluate the performance of the MO resistors, procedures for evaluating the performance of the EGLA series gaps have been introduced.

b) Omissions from Ed. 1 of this standard have been included, notably an RIV test and a means for determining the thermal time constant of the SUV portion of the EGLA.

c) Definitions for new terms have been added

d) A number of NOTES in Ed. 1 have been converted to normative requirements

A number of editorial changes have been made throughout the document to improve grammar and general flow of information.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
37/436/FDIS	37/438/RVD

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

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

A list of all parts of IEC 60098 series, under the general title *Surge arresters*, can be found on the IEC website.

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

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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.

INTRODUCTION

This part of IEC 60099 applies to the externally gapped line arrester (EGLA)

This type of surge arrester is connected directly in parallel with an insulator assembly. It comprises a series varistor unit (SVU), made up from non-linear metal-oxide resistors encapsulated in a polymer or porcelain housing, and an external series gap (see Figure 1).

The purpose of an EGLA is to protect the parallel-connected insulator assembly from lightning-caused over-voltages. The external series gap, therefore, should spark over only due to fast-front over-voltages. The gap should withstand all power-frequency and slow-front over-voltages occurring on the system.

In the event of SVU failure, the external series gap should be able to isolate the SVU from the system.

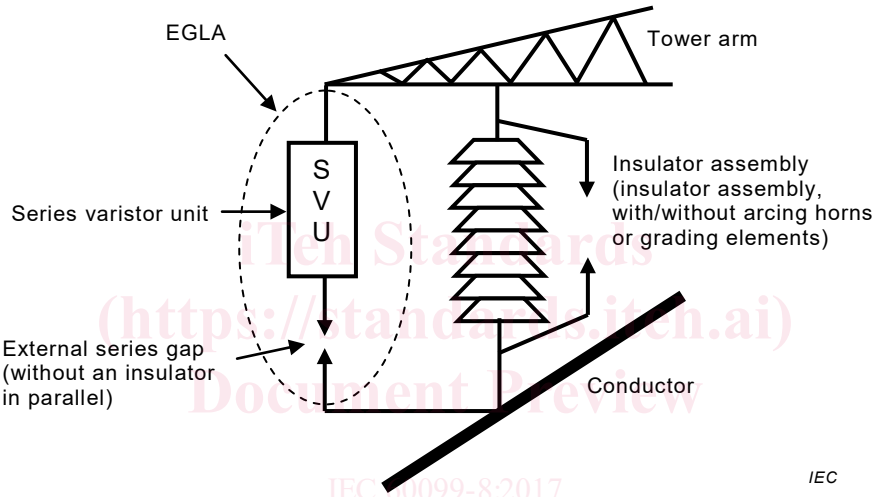

Figure 1 – Configuration of an EGLA with insulator and arcing horn

SURGE ARRESTERS –

Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV

1 Scope

This part of IEC 60099 covers metal-oxide surge arresters with external series gap (externally gapped line arresters (EGLA)) that are applied on overhead transmission and distribution lines, only to protect insulator assemblies from lightning-caused flashovers.

This document defines surge arresters to protect the insulator assembly from lightning-caused over-voltages only. Therefore, and since metal-oxide resistors are not permanently connected to the line, the following items are not considered for this document:

- switching impulse spark-over voltage;
- residual voltage at steep current and switching current impulse;
- thermal stability;
- long-duration current impulse withstand duty;
- power-frequency voltage versus time characteristics of an arrester;
- disconnector test;
- aging duties by power-frequency voltage.

Considering the particular design concept and the special application on overhead transmission and distribution lines, some unique requirements and tests are introduced, such as the verification test for coordination between insulator withstand and EGLA protective level, the follow current interrupting test, mechanical load tests, etc.

Designs with the EGLA's external series gap installed in parallel to an insulator are not covered by this document.

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.

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2:2010, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60068-2-11:1981, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60099-4:2014, *Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems*

IEC 60270:2000, *High-voltage test techniques – Partial discharge measurements*

IEC 60507:2013, *Artificial pollution tests on high-voltage ceramic and glass insulators to be used on a.c. systems*

IEC TS 60815-1:2008, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles*

IEC 62217:2012, *Polymeric HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria*

ISO 4287, *Geometrical Product Specifications (GPS) – Surface texture: Profile method – Terms, definitions and surface texture parameters*

ISO 4892-1, *Plastics – Methods of exposure to laboratory light sources – Part 1: General Guidance*

ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc sources*

ISO 4892-3, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

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:

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

3.1
externally gapped line arrester
EGLA
arrester designed for installation on overhead lines to protect an insulator assembly from lightning-caused fast-front over-voltages only

Note 1 to entry: This is accomplished by raising the spark-over level of the external series gap to a level that isolates the arrester from power-frequency over-voltages and from the worst case slow-front over-voltages due to switching and fault events expected on the line to which it is applied.

3.2
series varistor unit
SVU
non-linear metal-oxide resistor part, contained in a housing, which must be connected with an external series gap to construct the complete arrester

Note 1 to entry: The series varistor unit may include several units.

3.3
section of an EGLA
complete, suitably assembled part of a complete EGLA necessary to represent the behaviour of a complete EGLA with respect to a particular test

3.4
section of an SVU
complete, suitably assembled part of an SVU unit necessary to represent the behaviour of an SVU with respect to a particular test

3.5
unit of an SVU
completely housed part of an SVU which may be connected in series and/or in parallel with other units of an SVU to construct, in combination with the external series gap, an EGLA of higher voltage and/or current rating

3.6
rated voltage of an EGLA
U_r
maximum permissible r.m.s. value of power-frequency voltage that can be applied continuously between the EGLA terminals, and at which it is designed to operate correctly

Note 1 to entry: The rated voltage is used as a reference parameter for the specification of operating and current interrupting characteristics.

Note 2 to entry: The rated voltage of an EGLA is comparable to Uc of all other types of MO-arresters.

3.7
reference voltage of an SVU
U_{ref}
peak value of power-frequency voltage divided by √2, which should be applied to the SVU to obtain the reference current

Note 1 to entry: The reference voltage of a multi-unit SVU is the sum of the reference voltages of the individual units.

3.8
reference current of an SVU
I_{ref}
peak value (the higher peak value of the two polarities if the current is asymmetrical) of the resistive component of a power-frequency current used to determine the reference voltage of the SVU

Note 1 to entry: The reference current should be high enough to make the effects of stray capacitances at the measured reference voltage of the SVU units negligible. It is to be specified by the manufacturer.

Note 2 to entry: Depending on the nominal discharge current of the EGLA, the reference current will be typically in the range of 0,05 mA to 1,0 mA per square centimetre of metal-oxide resistor area for a single column SVU.

3.9
rated short-circuit current of an SVU
I_s
r.m.s. value of the highest short-circuit current under which the SUV will not fail in a manner that causes violent shattering of the housing and under which self-extinguishing of open flames (if any) will occur within a defined period of time

3.10
residual voltage of an EGLA
peak value of voltage that appears across the terminal-to-terminal length of the EGLA including series gap and connection leads during the passage of discharge current

3.11
residual voltage of an SVU
peak value of voltage that appears between the terminals of the SVU during the passage of discharge current

3.12
surface leakage current of an SVU
current that flows on the surface of the SVU

3.13
follow current
I_{follow}
the current immediately following an impulse through an EGLA with the power-frequency voltage as the source

3.14
specified long-term load of an SVU
SLL
mechanical force perpendicular to the longitudinal axis of an SVU, allowed to be continuously applied during service without causing any mechanical damage to the SVU

3.15
specified short-term load of an SVU
SSL
greatest mechanical force perpendicular to the longitudinal axis of an SVU, allowed to be applied during service for short periods and for relatively rare events (for example, short-circuit current loads and extreme wind gusts) without causing any mechanical damage to the SVU

3.16
mean breaking load of an SVU
MBL
average breaking load for porcelain or cast resin-housed SVUs determined from tests

3.17
high current impulse
peak value of discharge current having a 4/10 or 2/20 impulse shape, which is used to test the withstand capability of the SVU on extreme lightning occasions

3.18
salt deposit density
SDD
amount of salt in the deposit on a given surface of the SVU housing, divided by the area of this surface; generally expressed in mg/cm^2

3.19
verification test for coordination between insulator withstand and EGLA protective level
test used to verify that the EGLA will exhibit correct sparkover operation and clamp the overvoltage caused by lightning considerably lower than the flashover voltage of the parallel-connected insulator assembly

3.20
vibration withstand test
test to verify that the SVU and its connectors can withstand the specified mechanical vibration levels

3.21
lightning impulse discharge
approximately sine half-wave current impulse having a time duration within 200 µs to 230 µs during which the instantaneous value of the impulse current is between 5 % and 100 % of its peak value