

© Copyright SEK. Reproduction in any form without permission is prohibited.

Avledare –

Del 8: Ventilavledare med metalloxidvaristorer samt ett yttre gnistgap i serie (EGLA) för kraftledningar över 1 kV

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*

Som svensk standard gäller europastandarden EN 60099-8:2011. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60099-8:2011.

Nationellt förord

Europastandarden EN 60099-8:2011

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60099-8, First edition, 2011 - 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**

utarbetad inom International Electrotechnical Commission, IEC.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

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
(IEC 60099-8:2011)

Parafoudres -

Partie 8: Parafoudres à oxyde métallique
avec éclateur extérieur en série (EGLA)
pour lignes aériennes de transmission et
de distribution de réseaux à courant
alternatif de plus de 1 kV
(CEI 60099-8:2011)

Überspannungsableiter – Teil 8:

Metalloxid-Überspannungsableiter mit
externer Serienfunkenstrecke (EGLA) für
Übertragungs- und Verteilungsleitungen
von Wechselstromsystemen über 1 kV
(IEC 60099-8:2011)

This European Standard was approved by CENELEC on 2011-03-03. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 37/370/FDIS, future edition 1 of IEC 60099-8, prepared by IEC TC 37, Surge arresters, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60099-8 on 2011-03-03.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2011-12-03 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2014-03-03 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60099-8:2011 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60060-1	1989	High-voltage test techniques - Part 1: General definitions and test requirements	HD 588.1 S1 ¹⁾	1991
IEC 60060-2	1994	High-voltage test techniques - Part 2: Measuring systems	EN 60060-2 ²⁾	1994
IEC 60068-2-11	1981	Environmental testing - Part 2-11: Tests - Test Ka: Salt mist	EN 60068-2-11	1999
IEC 60068-2-14	2009	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	2009
IEC 60099-4 (mod) + A1 + A2	2004 2006 2009	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems	EN 60099-4 + A1 + A2	2004 2006 2009
IEC 60270	2000	High-voltage test techniques - Partial discharge measurements	EN 60270	2001
IEC 60507	1991	Artificial pollution tests on high-voltage insulators to be used on a.c. systems	EN 60507	1993
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	2005	Polymeric insulators for indoor and outdoor use with a nominal voltage > 1 000 V - General definitions, test methods and acceptance criteria	EN 62217	2006
ISO 3274	-	Geometrical Product Specifications (GPS) - Surface texture: Profile method - Nominal characteristics of contact (stylus) instruments	EN ISO 3274	-
ISO 4287	-	Geometrical Product Specifications (GPS) - Surface texture: Profile method - Terms, definitions and surface texture parameters	EN ISO 4287	-

¹⁾ HD 588.1 S1 is superseded by EN 60060-1:2010, which is based on IEC 60060-1:2010.

²⁾ EN 60060-2 is superseded by EN 60060-2:2011, which is based on IEC 60060-2:2010.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 4892-1	-	Plastics - Methods of exposure to laboratory light sources - Part 1: General guidance	EN ISO 4892-1	-
ISO 4892-2	-	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	EN ISO 4892-2	-
ISO 4892-3	-	Plastics - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps	EN ISO 4892-3	-

CONTENTS

INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 Identification and classification	11
4.1 EGLA identification.....	11
4.2 EGLA classification	12
5 Standard ratings and service conditions	12
5.1 Standard rated voltages	12
5.2 Standard rated frequencies	13
5.3 Standard nominal discharge currents	13
5.4 Service conditions	13
5.4.1 Normal service conditions.....	13
5.4.2 Abnormal service conditions	13
6 Requirements	13
6.1 Insulation withstand of the SVU and the complete EGLA	13
6.1.1 Insulation withstand of the housing of the SVU	13
6.1.2 Insulation withstand of EGLA with shorted (failed) SVU	13
6.2 Residual voltages.....	14
6.3 High current duty.....	14
6.4 Lightning discharge capability	14
6.5 Short-circuit performance of the SVU	14
6.6 Mechanical performance	14
6.7 Weather aging of SVU.....	15
6.8 Reference voltage of the SVU	15
6.9 Internal partial discharges	15
6.10 Coordination between insulator withstand and EGLA protective level	15
6.11 Follow current interrupting.....	15
6.12 Electromagnetic compatibility	15
6.13 End of life.....	16
7 General testing procedure	16
7.1 Measuring equipment and accuracy	16
7.2 Test samples.....	16
8 Type tests	16
8.1 General.....	16
8.2 Insulation withstand tests on the SVU housing and on the EGLA with failed SVU	17
8.2.1 General	17
8.2.2 Insulation withstand test on the SVU housing	17
8.2.3 Insulation withstand tests on EGLA with failed SVU.....	18
8.3 Residual voltage tests	19
8.3.1 General	19
8.3.2 Procedure for correction and calculation of inductive voltages	19
8.3.3 Lightning current impulse residual voltage test	20

8.3.4	High current impulse residual voltage test	21
8.4	Standard lightning impulse sparkover test	21
8.5	High current impulse withstand test	22
8.5.1	Selection of test samples	22
8.5.2	Test procedure	22
8.5.3	Test evaluation	22
8.6	Lightning discharge capability test	23
8.6.1	Selection of test samples	23
8.6.2	Test procedure	23
8.6.3	Test parameters for the lightning impulse discharge capability test	23
8.6.4	Measurements during the lightning impulse discharge capability test	24
8.6.5	Rated lightning impulse discharge capability	24
8.6.6	List of rated charge values	24
8.7	Short-circuit tests	24
8.7.1	General	24
8.7.2	Preparation of the test samples	25
8.7.3	Mounting of the test sample	26
8.7.4	High-current short-circuit tests	27
8.7.5	Low-current short-circuit test	29
8.7.6	Evaluation of test results	29
8.8	Follow current interrupting test	34
8.8.1	General	34
8.8.2	"Test method A"	34
8.8.3	"Test method B"	36
8.9	Mechanical load tests on the SVU	38
8.9.1	Bending test	38
8.9.2	Vibration test	47
8.10	Weather aging tests	48
8.10.1	General	48
8.10.2	Sample preparation	48
8.10.3	Test procedure	48
8.10.4	Test evaluation	48
8.10.5	Additional test procedure for polymer (composite and cast resin) housed SVUs	48
9	Routine tests	49
9.1	General	49
10	Acceptance tests	50
10.1	General	50
10.2	Reference voltage measurement of SVU	50
10.3	Internal partial discharge test of SVU	50
10.4	Radio interference voltage (RIV) test	50
10.5	Test for coordination between insulator withstand and EGLA protective level	51
10.5.1	General	51
10.5.2	Front-of-wave impulse sparkover test	51
10.5.3	Standard lightning impulse sparkover test	51
10.6	Follow current interrupting test	52
10.6.1	General	52
10.6.2	Test procedure	52
10.6.3	Test sequence	52

10.6.4 Test evaluation	52
10.7 Vibration test on the SVU with attached electrode	52
10.7.1 Test procedure and test condition	53
10.7.2 Test evaluation	53
Annex A (informative) Example of a test circuit for the follow current interrupting test	54
Annex B (normative) Mechanical considerations	55
Bibliography	60
Figure 1 – Configuration of an EGLA with insulator and arcing horn	7
Figure 2 – Examples of SVU units	32
Figure 3 – Short-circuit test setup	33
Figure 4 – Example of a test circuit for re-applying pre-failing circuit immediately before applying the short-circuit test current	34
Figure 5 – Thermo-mechanical test	43
Figure 6 – Example of the test arrangement for the thermo-mechanical test and direction of the cantilever load	44
Figure 7 – Test sequence of the water immersion test	45
Figure A.1 – Example of a test circuit for the follow current interrupting test	54
Figure B.1 – Bending moment – Multi-unit SVU	55
Figure B.2 – SVU unit	57
Figure B.3 – SVU dimensions	58
Table 1 – EGLA classification – “Series X” and “Series Y”	12
Table 2 – Steps of rated voltages (r.m.s. values)	12
Table 3 – Type tests (all tests to be performed without insulator assembly)	17
Table 4 – Test requirements	30
Table 5 – Required currents for short-circuit tests	31
Table 6 – Acceptance tests	50
Table 7 – Virtual steepness of wave front of front-of-wave lightning impulses	51

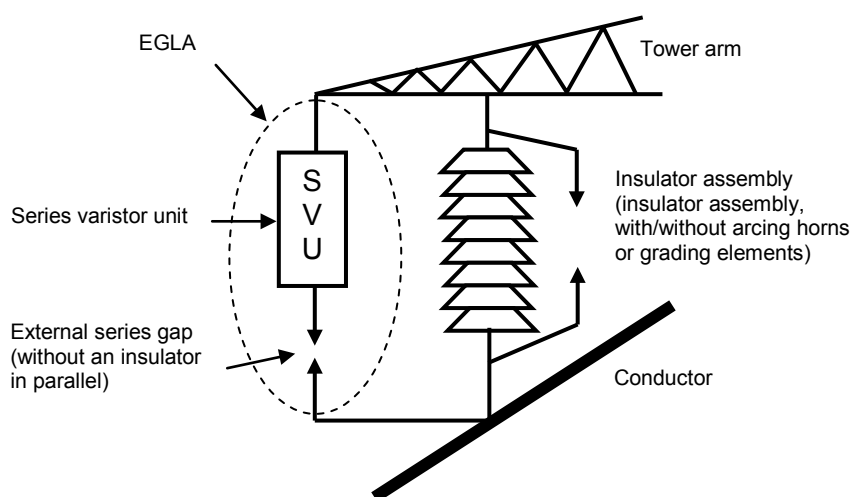
INTRODUCTION

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 overvoltages. The external series gap, therefore, should spark over only due to fast-front overvoltages. The gap should withstand all power-frequency and slow-front overvoltages occurring on the system.

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



IEC 2896/10

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

- switching impulse sparkover 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;
- disconnecter 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 standard.

2 Normative references

The following referenced documents are indispensable for the application 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 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2:1994, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60068-2-11:1981, *Environmental testing – Part 2: Tests. Test kA: Salt mist*

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

IEC 60099-4:2009, *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 60507:1991, *Artificial pollution tests on high-voltage 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 62217:2005, *Polymeric insulators for indoor and outdoor use with a nominal voltage > 1 000 V – General definitions, test methods and acceptance criteria*

ISO 3274, *Geometric product specifications (GPS) – Surface texture: Profile method – Nominal characteristics of contact (stylus) instruments*

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*