### BS EN 60507:2014



## **BSI Standards Publication**

Artificial pollution tests on high-voltage ceramic and glass insulators to be used on a.c. systems



BS EN 60507:2014 BRITISH STANDARD

### **National foreword**

This British Standard is the UK implementation of EN 60507:2014. It is identical to IEC 60507:2013. It supersedes BS EN 60507:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/36, Insulators for power systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014. Published by BSI Standards Limited 2014

ISBN 978 0 580 75470 8 ICS 29.080.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2014.

Amendments/corrigenda issued since publication

Date Text affected

## **EUROPEAN STANDARD**

## EN 60507

## NORME EUROPÉENNE EUROPÄISCHE NORM

March 2014

ICS 29.080.10

Supersedes EN 60507:1993

English version

# Artificial pollution tests on high-voltage ceramic and glass insulators to be used on a.c. systems

(IEC 60507:2013)

Essais sous pollution artificielle des isolateurs haute tension en céramique et en verre destinés aux réseaux à courant alternatif (CEI 60507:2013)

Fremdschichtprüfungen an Hochspannungs-Isolatoren aus Keramik und Glas zur Anwendung in Wechselspannungssystemen (IEC 60507:2013)

This European Standard was approved by CENELEC on 2014-01-17. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **CENELEC**

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

### **Foreword**

The text of document 36/337/FDIS, future edition 3 of IEC 60507, prepared by IEC/TC 36 "Insulators" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60507:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the document have to be withdrawn

This document supersedes EN 60507:1993.

EN 60507:2014 includes the following significant technical changes with respect to EN 60507:1993:

- a) Corrections and the addition of explanatory material;
- b) The addition of Clause 4.4.2 on atmospheric correction;
- c) The change of the upper limit of conductivity of water to 0.1 S/m; and
- d) The extension to UHV voltages.

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

### **Endorsement notice**

The text of the International Standard IEC 60507:2013 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 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.

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

Publication IEC 60060-1	<u>Year</u> -	<u>Title</u> High-voltage test techniques - Part 1: General definitions and test requirements	<u>EN/HD</u> EN 60060-1	<u>Year</u> -
IEC 60071-1	-	Insulation co-ordination - Part 1: Definitions, principles and rules	EN 60071-1	-
IEC/TS 60815-1	-	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles	-	-
IEC/TS 60815-2	-	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 2: Ceramic and glass insulators for a.c. systems		-

### CONTENTS

1	Scope	7				
2	Normati	tive references7				
3	Terms a	and definitions				
4	General test requirements					
	4.1	General				
	4.2		hod			
	4.3					
		4.3.1	Test configuration			
		4.3.2	Cleaning of insulator			
	4.4	Requiren	nents for the testing plant	11		
		4.4.1	Test voltage	11		
		4.4.2	Atmospheric corrections	11		
		4.4.3	Minimum short-circuit current	12		
5	Salt fog	method		13		
	5.1	General	information	13		
	5.2	Salt solu	tion	13		
	5.3	Spraying	system	15		
	5.4	Condition	ns before starting the test	18		
	5.5	Precondi	itioning process	18		
	5.6	Withstan	d test	19		
	5.7	•	nce criterion for the withstand test			
6	Solid la	yer metho	ds	19		
	6.1	General	information	19		
	6.2	Main cha	aracteristics of inert materials	20		
	6.3	Composi	tion of the contaminating suspension			
		6.3.1	General	20		
		6.3.2	Kieselguhr composition			
		6.3.3	Kaolin (or Tonoko) composition			
	6.4	Application of the pollution layer22				
	6.5		nation of the degree of pollution of the tested insulator			
			General			
		6.5.2	Layer conductivity (K)			
		6.5.3	Salt deposit density (SDD)			
	6.6		requirements for the wetting of the pollution layer			
	6.7		cedures			
		6.7.1	General			
		6.7.2	Procedure A – Wetting before and during energization			
	6.0	6.7.3	Procedure B – Wetting after energization	26		
	6.8		d test and acceptance criterion (common to both Procedures A	27		
Ann	ex A (inf	,	Supplementary information on the assessment of the			
			sting plant	28		
Ann	ex B (inf	ormative)	Determination of the withstand characteristics of insulators	29		
	B.1					

B.2	Determination of the maximum withstand salinity at a given test voltage29				
B.3	Determination of the maximum withstand voltage, or of the 50 %				
	withstand voltage, at a given reference layer conductivity, or at a given				
	reference salt deposit density				
	B.3.1 Maximum withstand voltage				
5.4	B.3.2 50 % withstand voltage				
B.4	Withstand values of reference suspension insulators	30			
	nformative) Measurement of layer conductivity for checking the uniformity of	32			
	nformative) Additional recommendations concerning the solid layer method	34			
D.1	General				
D.2	Contamination practice				
D.3	Drying of the pollution layer				
D.4	Check of the wetting action of the fog				
D.5	Checking fog uniformity for large or complex test objects				
D.6	Fog input in the test chamber				
D.7	Minimum duration of the withstand test				
D.8	Evaluation of the reference salt deposit density (SDD)	36			
	nformative) Supplementary information on artificial pollution tests on or voltage systems of 800 kV and above (solid layer method procedure B)	37			
E.1	Introduction	37			
E.2	Test chamber				
E.3	Fog generator	37			
E.4	Wetting action and uniformity of fog density	37			
Bibliograph	y	38			
Figure 1 – I	Minimum short-circuit current, $I_{SC\ min}$ , required for the testing plant as a				
	the unified specific creepage distance (USCD) of the insulator under test	13			
Figure 2 – \	Value of factor $b$ as a function of solution temperature	15			
Figure 3 –	Typical construction of fog spray nozzle	17			
	Test layout for inclined insulators				
	Typical arrangement of steam-fog generator				
	- Arrangement of the probe electrodes (all dimensions in mm)				
•	, , , , , , , , , , , , , , , , , , , ,				
_	Circuit diagram of the meter	33			
	<ul> <li>Control of the wetting action of the steam fog: Layer conductance uring the test on the chosen dummy insulator (standard type of Table B.1)</li> </ul>	36			
	salt-fog method: correspondence between the value of salinity, volume y and density of the solution at a temperature of 20 °C	14			
Table 2 – M	Main characteristics of the inert materials used in solid layer suspensions	20			
reference d	Geselguhr composition: approximate correspondence between the egrees of pollution on the insulator and the volume conductivity of the at a temperature of 20 °C	21			
Table 4 – K reference d	(aolin (or Tonoko) composition: approximate correspondence between the egrees of pollution on the insulator and the volume conductivity of the at a temperature of 20 °C				
•	- Expected /b values related to different USCD values	28			

Table B.1 – Ranges o	of values of withstand characteristics of reference suspension	
insulators in artificial <sub>l</sub>	pollution tests	31

# ARTIFICIAL POLLUTION TESTS ON HIGH-VOLTAGE CERAMIC AND GLASS INSULATORS TO BE USED ON A.C. SYSTEMS

### 1 Scope

This International Standard is applicable for the determination of the power frequency withstand characteristics of ceramic and glass insulators to be used outdoors and exposed to polluted atmospheres, on a.c. systems with the highest voltage of the system greater than 1 000 V.

These tests are not directly applicable to polymeric insulators, to greased insulators or to special types of insulators (insulators with semiconducting glaze or covered with any organic insulating material).

The object of this International Standard is to prescribe procedures for artificial pollution tests applicable to insulators for overhead lines, substations and traction lines and to bushings

It may also be applied to hollow insulators with suitable precautions to avoid internal flashover. In applying these procedures to apparatus incorporating hollow insulators, the relevant technical committees should consider their effect on any internal equipment and the special precautions which may be necessary.

#### 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.

IEC 60071-1, Insulation co-ordination – Part 1: Definitions, principles and rules

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

IEC/TS 60815-2, Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 2: Ceramic and glass insulators for a.c. systems

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

### 3 Terms and definitions

For the purpose of this standard, the following terms and definitions apply.

#### 3.1

#### test voltage

the r.m.s. value of the voltage with which the insulator is continuously energized throughout the test

### 3.2

### short-circuit current $(I_{sc})$ of the testing plant

the r.m.s. value of the current delivered by the testing plant when the test object is short-circuited at the test voltage