

Bushings above 1 kV up to 36 kV and from 250 A to 3,15 kA for liquid filled transformers

The European Standard EN 50180:1997 has the status of a British Standard

ICS 29.080.20

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

National foreword

This British Standard is the English language version of EN 50180:1997 including Corrigendum April 1998. It supersedes BS 7616:1993 which will be withdrawn on 1 December 2000.

The UK participation in its preparation was entrusted by Technical Committee PEL/36, Insulators for power systems, to Subcommittee PEL/36/1, Bushing insulators, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 34, an inside back cover and a back cover.

The BSI copyright notice displayed throughout this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 August 1999

© BSI 08-1999

ISBN 0 580 30503 1

Amendments issued since publication

Amd. No.	Date	Comments

English version

Bushings above 1 kV up to 36 kV and from 250 A to 3,15 kA for liquid filled transformers

Traversées de tensions supérieures à 1 kV jusqu'à 36 kV et de 250 A à 3,15 kA pour transformateurs à remplissage de liquide

Durchführungen über 1 kV bis 36 kV und von 250 A bis 3,15 kA für flüssigkeitsgefüllte Transformatoren

This European Standard was approved by CENELEC on 1996-10-01. 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 standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 36A, Insulated bushings.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50180 on 1996-10-01.

This European Standard supersedes HD 506 S1:1989 and its A1:1992.

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) 1997-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2000-12-01

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Definitions	3
3.1 Open type bushing	3
3.2 Plug-in type bushing	3
3.3 Separable connector	3
3.4 Interface type	3
3.5 Bail holder	3
4 Requirements	3
4.1 Application	3
4.2 Standard values of rated voltage (U_r)	3
4.3 Standard values of rated current (I_r)	3
4.4 Compliance	3
4.5 Common dimensions	3
4.6 Detail dimensions and creepage distances of open type bushings	4
4.6.1 250 A, upright types	5
4.6.2 250 A, inclined types	7
4.6.3 630 A, upright types	9
4.6.4 630 A, inclined types	11
4.6.5 1 250 A types	13
4.6.6 2 000–3 150 A types	15
4.7 Detail dimensions of plug-in type bushings	16
4.7.1 Outside cone types	17
4.7.2 Inside cone types	20
Annex A (normative) Detail drawings of porcelain	23
A.1 250 A upright insulators	23
A.2 250 A inclined insulators	25
A.3 630 A upright insulators	27
A.4 630 A inclined insulators	29
A.5 1 250 A insulators	31
A.6 2 000–3 150 A insulators	33

Introduction

The object of this standard is to specify the requirements to ensure interchangeability of bushings for rated voltages above 1 kV up to 36 kV and rated currents from 250 A up to 3 150 A for insulating liquid filled transformers.

1 Scope

This standard is applicable to ceramic and resin insulated bushings for rated voltages above 1 kV up to 36 kV, rated currents from 250 A up to 3 150 A and frequencies from 15 Hz up to 60 Hz for insulating liquid filled transformers.

This standard establishes essential dimensions, to ensure interchangeability of bushings and to ensure adequate mounting and interchangeability of mating plug-in separable connectors of equivalent ratings.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

HD 329 S1:1977, *Tests on hollow insulators for use in electrical equipment*.

(endorsing IEC 233:1974)

HD 426.3 S1:1987, *Specification for ceramic and glass insulating materials — Part 3: Individual materials*.

(endorsing IEC 672-3:1984)

EN 60137:1996, *Bushings for alternating voltages above 1 000 V*.

IEC 815:1986, *Guide for the selection of insulators in respect of polluted conditions*.

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1

open type bushing

a bushing, one end of which is immersed in an insulating liquid with the other end in ambient air and exposed or not exposed to external atmospheric conditions

3.2

plug-in type bushing

a bushing, one end of which is immersed in an insulating liquid and the other end designed to receive a separable insulated cable connector without which the bushing cannot function

3.3

separable connector

a fully insulated termination permitting the connection and disconnection of the cable to and from the mating plug-in type bushing

3.4

interface type

bushing dimensions that insure mechanical and electrical interchangeability of bushing and separable connector of similar rating and type. Each interface type is designated by a letter or a number

3.5

bail holder

a fixture which facilitates anchoring of an externally mounted device (called the bail) designed to prevent undesirable separation of a separable connector and a bushing. A bail holder may or may not be an integral part of a bushing and is an optional feature

4 Requirements

4.1 Application

Open type bushings covered by this standard shall be suitable for operation with one end fully immersed in an insulating liquid and with the other in air.

Plug-in type bushings covered by this standard shall be suitable for operation with one end partially or fully immersed in an insulating liquid and with the other in a separable connector.

4.2 Standard values of rated voltage (U_r)

The value of U_r of a bushing shall be chosen from the standard values of the highest voltage for equipment U_m as given below, in kilovolts:

12 - 24 - 36

4.3 Standard values of rated current (I_r)

The value of I_r of a bushing shall be chosen from the standard values given below, in amperes:

250 - 400 - 630 - 800 - 1 250 - 2 000 - 3 150

4.4 Compliance

Bushings shall meet the requirements of EN 60137.

4.5 Common dimensions

The dimensions necessary for interchangeability between open and plug-in type bushings shall be as specified in Figure 1 and Table 1.

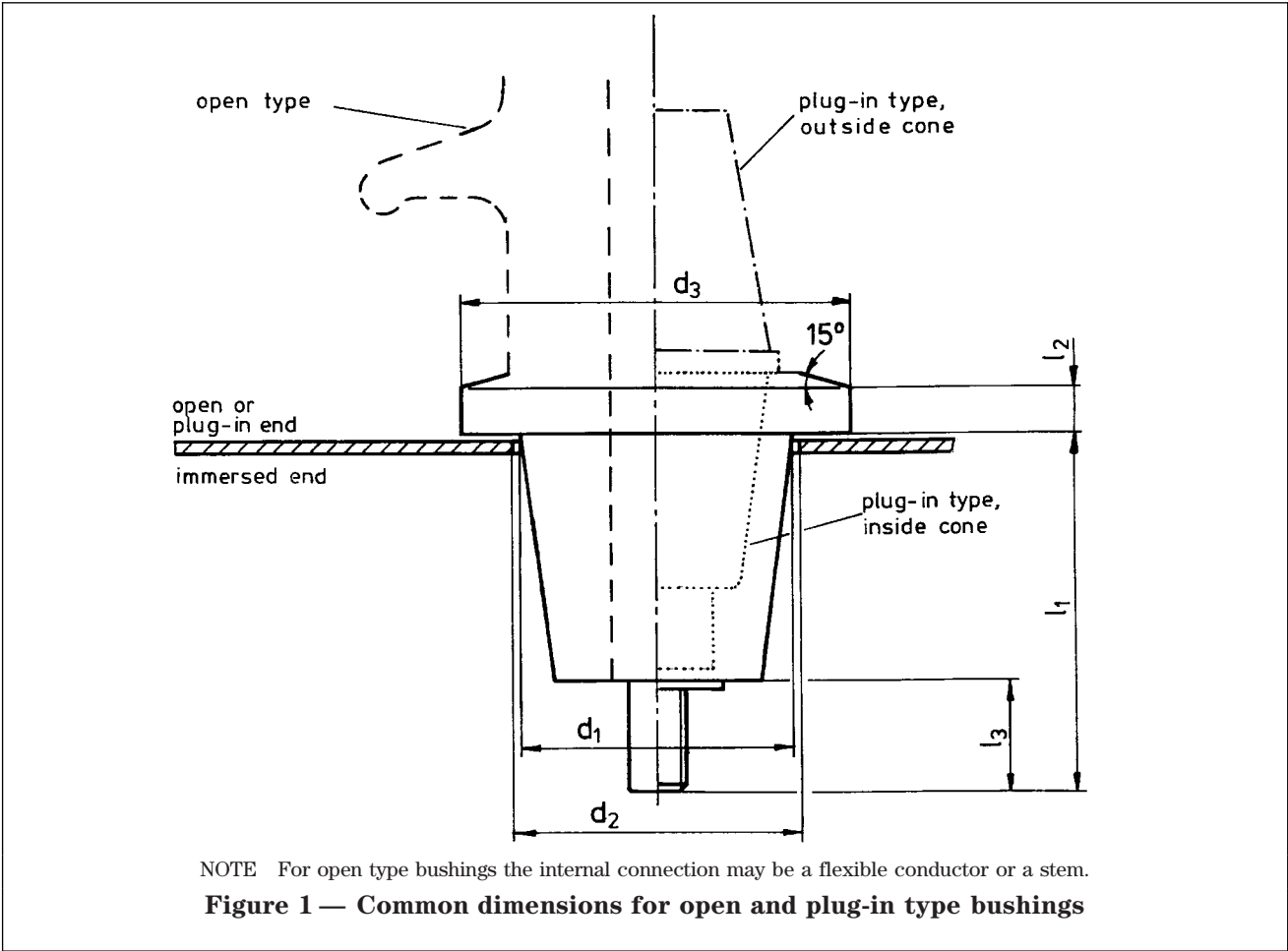


Table 1 — Common dimensions for open and plug-in type bushings

I_r A	d_1 mm	$d_2^{+2}_0$ mm	d_3 mm	l_1 max. mm	l_{2-1}^0 mm	l_3 max. mm
250	77^{0}_{-5}	80	111^{0}_{-7}	145	25	45
400 630	87^{0}_{-6}	90	128^{0}_{-8}	195	25	75
800 1 250	107^{0}_{-7}	110	165^{0}_{-10}	215	30	100
2 000 3 150	132^{0}_{-8}	135	185^{0}_{-11}	215	30	100

4.6 Detail dimensions and creepage distances of open type bushings

The dimensions necessary for interchangeability of open type bushings shall be as specified in the following figures and tables.

These figures do not purport to show constructional details. The provision for arcing horns should be made if required.

The details of the porcelains and the creepage distance AB of each insulator type are given in the normative annex A.

4.6.1 250 A, upright types

Insulator types for 250 A may be clamped to the transformer tank using either the fixation method illustrated or a separate insulation piece on the inside of the tank.

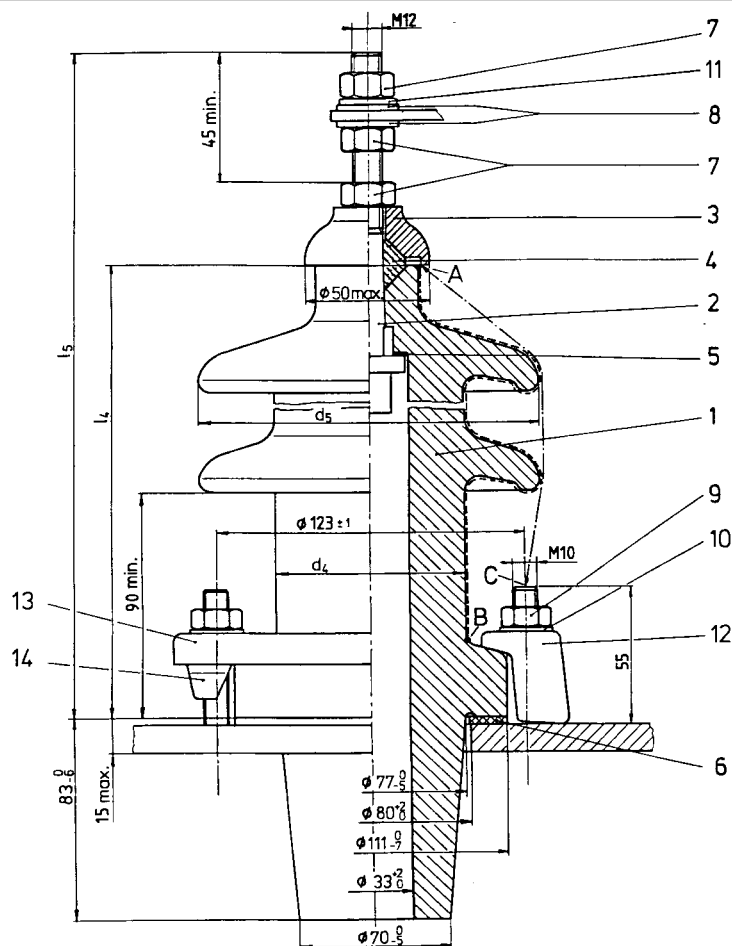


Figure 2 — 250 A upright types

Table 2 — Dimensions, 250 A upright types

Designation	U_r	Min. nominal creepage distance AB				Insulator type	Arcing distance AC	l_4 max.	l_5 max.	d_4 max.	d_5 max.	
	kV	mm						mm	mm	mm	mm	mm
		Pollution level (IEC 815)										
		I	II	III	IV							
12-250/P1	12	192				1	145	190	270	75	140	
12-250/P2	12		240									
12-250/P4	12			300	372	2	260	304	384	80	150	
24-250/P2	24	384	480									
24-250/P3	24			600		3	315	357	437	80	155	
36-250/P1	36	576										
24-250/P4	24				744	4	465	516	596	80	155	
36-250/P3	36		720	900								
36-250/P4	36				1 116	5	485	516	596	80	190	

Table 3 — List of components, 250 A upright types

Item	Quantity									Designation		Remarks
	12-250/P1	12-250/P2	12-250/P4	24-250/P2	24-250/P3	24-250/P4	36-250/P1	36-250/P3	36-250/P4			
1	1	1								Insulator	Type 1	Porcelain
			1	1							Type 2	
					1		1				Type 3	
						1		1			Type 4	
									1		Type 5	
2	1									Terminal stud ^{*)}		Brass
3	1									Cap ^{*)}		Brass
4	1									Gasket ^{*)}		Oil-resistant rubber
5	1									Spacer ^{*)}		
6	1									Packing ^{*)}		Oil-resistant rubber
7	3									Nut		Brass
8	2									Washer		Brass
9	as required									Nut		Corrosion-resistant
10	as required									Washer		Corrosion-resistant
11	1									Spring-washer		Corrosion-resistant
Variant A: By means of clamping pieces												
12	as required									Clamping piece ^{*)}		Corrosion-resistant
Variant B: By means of clamping ring												
13	1									Clamping ring ^{*)}		Corrosion-resistant
14	as required									Clamping paw ^{*)}		Corrosion-resistant
*) Constructional details are not covered by this standard.												

Table 5 — List of components, 250 A inclined types

Item	Quantity									Designation		Remarks
	I-12-250/P1	I-12-250/P2	I-12-250/P4	I-24-250/P2	I-24-250/P3	I-24-250/P4	I-36-250/P1	I-36-250/P3	I-36-250/P4			
1	1	1								Insulator	Type 11	Porcelain
			1	1							Type 12	
					1		1				Type 13	
						1		1			Type 14	
									1		Type 15	
2	1									Terminal stud ^{*)}		Brass
3	1									Cap ^{*)}		Brass
4	1									Gasket ^{*)}		Oil-resistant rubber
5	1									Spacer ^{*)}		
6	1									Packing ^{*)}		Oil-resistant rubber
7	3									Nut		Brass
8	2									Washer		Brass
9	as required									Nut		Corrosion-resistant
10	as required									Washer		Corrosion-resistant
11	1									Spring-washer		Corrosion-resistant
12	as required									Clamping piece ^{*)}		Corrosion-resistant
*) Constructional details are not covered by this standard.												

Table 7 — List of components, 630 A upright types

Item	Quantity						Designation		Remarks
	12-630/P3	12-630/P4	24-630/P2	24-630/P4	36-630/P2	36-630/P4			
1	1						Insulator	Type 6	Porcelain
		1	1					Type 7	
				1	1			Type 8	
						1		Type 9	
2	1						Terminal stud ^{*)}		Brass
3	1						Cap ^{*)}		Brass
4	1						Gasket ^{*)}		Oil-resistant rubber
5	1						Spacer ^{*)}		
6	1						Packing ^{*)}		Oil-resistant rubber
7	3						Nut		Brass
8	2						Washer		Brass
9	as required						Nut		Corrosion-resistant
10	as required						Washer		Corrosion-resistant
11	1						Spring-washer		Corrosion-resistant
Variant A: By means of clamping pieces									
12	as required						Clamping piece ^{*)}		Corrosion-resistant
Variant B: By means of clamping ring									
13	1						Clamping ring ^{*)}		Corrosion-resistant
14	as required						Clamping paw ^{*)}		Corrosion-resistant
*) Constructional details are not covered by this standard.									