BRITISH STANDARD

BS EN
50464-2-2:2007

Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV —

Part 2-2: Distribution transformers with cable boxes on the high-voltage and/or low-voltage side — Cable boxes type 1 for use on distribution transformers meeting the requirements of EN 50464-2-1

The European Standard EN 50464-2-2:2007 has the status of a British Standard

ICS 29.180

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 50464-2-2:2007. It supersedes BS 7821-2.2:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/14, Power transformers.

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.

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

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Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV - Part 2-2: Distribution transformers with cable boxes on the high-voltage and/or low-voltage side - Cable boxes type 1 for use on distribution transformers meeting the requirements of EN 50464-2-1

Transformateurs triphasés de distribution immergés dans l'huile, 50 Hz, de 50 kVA à 2 500 kVA, de tension la plus élevée pour le matériel ne dépassant pas 36 kV - Partie 2-2: Transformateurs de distribution raccordés par boîtes à câble côté haute tension et/ou côté basse tension - Boîtes à câbles de type 1 pour utilisation sur transformateurs de distribution conformes aux exigences de la EN 50464-2-1

Ölgefüllte Drehstrom-Verteilungstransformatoren 50 Hz, 50 kVA bis 2 500 kVA, mit einer höchsten Spannung für Betriebsmittel bis 36 kV - Teil 2-2: Verteilungstransformatoren mit Kabelanschlusskästen auf der Ober- und/oder Unterspannungsseite - Kabelanschlusskästen Typ 1 für Verteilungstransformatoren nach EN 50464-2-1

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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.

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CENELEC

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

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Foreword

The text of the Harmonization Document HD 428.2.2 S1:1997, prepared by the Technical Committee CENELEC TC 14, Power transformers, was submitted to the formal vote for conversion into a European Standard and was approved by CENELEC as EN 50464-2-2 on 2006-12-01.

The following date was 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) 2007-12-01

The EN 50464 series consists of the following parts, under the general title “Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV”:

Part 1	General requirements
Part 2-1	Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – General requirements
Part 2-2	Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – Cable boxes type 1 for use on distribution transformers meeting the requirements of EN 50464-2-1
Part 2-3	Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – Cable boxes type 2 for use on distribution transformers meeting the requirements of EN 50464-2-1
Part 3	Determination of the power rating of a transformer loaded with non-sinusoidal currents
Part 4	Requirements and tests concerning pressurised corrugated tanks

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1 Scope

This European Standard specifies the requirements for cable boxes, Type 1, in which the cable cores are terminated. The cable boxes are suitable for use on transformers defined in EN 50464-2-1, "Distribution Transformers with Cable Boxes", for side mounted or cover mounted use. The cable boxes are suitable for operation indoors and outdoors under environmental conditions specified in EN 50464-1. Important design and construction requirements of the cable boxes are given.

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.

EN 50180		Bushings above 1 kV up to 36 kV and from 250 A to 3,15 kA for liquid filled transformers
EN 50181	1997	Plug-in type bushings above 1 kV up to 36 kV and from 250 A to 1,25 kA for equipment other than liquid filled transformers
EN 50336	2002	Bushings for transformers and reactor cable boxes not exceeding 36 kV
EN 50386	2002	Bushings up to 1 kV and from 250 A to 5 kA, for liquid filled transformers
EN 50387	2002	Busbar bushings up to 1 kV and from 1,25 kA to 5 kA, for liquid filled transformers
EN 60076	series	Power transformers (IEC 60076 series, partially modified)
EN 60529	1993	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)

3 Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
fully insulated cable box
metallic cable box where those parts of the termination and bushing within the enclosure including live metal parts and cable cores are insulated by oil or compound and allowance made for thermal expansion

The box is suitably sealed to contain the oil or compound and allows for their expansion due to temperature changes

3.2
air filled cable box
metallic cable box designed to protect the ends of the cables and bushings, providing a weatherproof enclosure with a minimum rating of IP54

3.2.1
air insulated termination
air filled cable box within which the cable cores are electrically terminated by stress control appropriate to the cable design and voltage; air being the sole insulation for the terminal connections

3.2.2
shrouded insulation termination
air filled cable box within the cable cores are terminated as in 3.2.1 with additional local insulation enhancement, e.g. phase barrier, bushing protection or taping. Enhancement can be achieved using insulated phase barriers; however, in this case, air bushings with full creepage distance shall be used

4 Electrical requirements and clearances

4.1 General

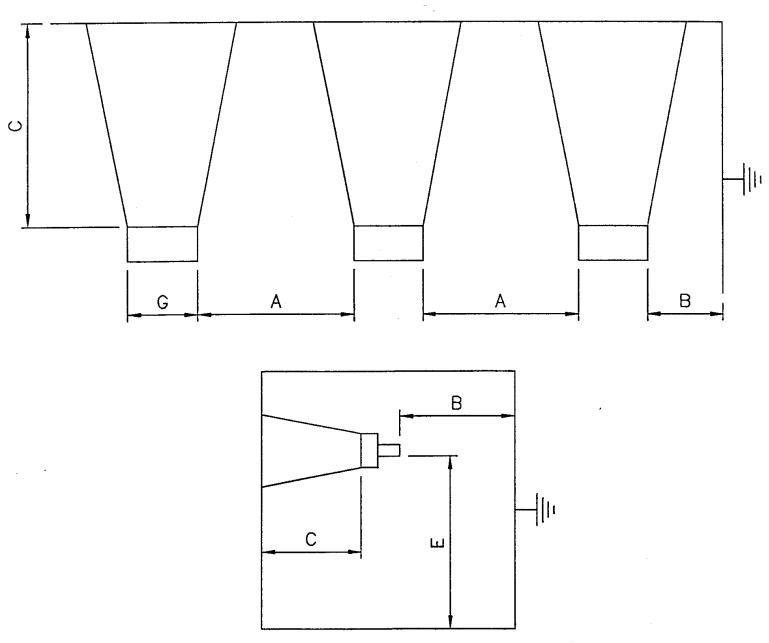
The enclosures when in position on the equipment with which they are to be used shall be capable of withstanding the high voltage tests specified in EN 50464-1 as well as commissioning tests to be carried out on the connected cable.

4.2 High voltage enclosures

The rated voltage of a box is the highest voltage designated for the equipment and preferred values in use are given in Table 1.

Table 1 defines the minimum clearances required between live metal parts, and between live metal parts to earth, and insulator creepage requirements. The fixing flange types are as given in EN 50464-1, Figure 1. However, shorter clearances may be agreed subject to confirmation by test.

Bushings suitable for use in high voltage enclosures are specified in the documents listed in Clause 2, and in particular in EN 50180. Other bushings can be used if agreed between purchaser and manufacturer provided the minimum limiting dimensions of Table 1 are complied with.



NOTE For dimension G see EN 50180.

Figure 1 – Clearance distances

Table 1 – Three phase cable box, Type 1

Air insulation													
	List 1						List 2						
	BIL	A	B	C	E		BIL	A	B	C		E	
					Single core	3 core				min.	max.	Single core	3 core
kV	kVp	mm	mm	mm	mm	mm	kVp	mm	mm	mm	mm	mm	mm
12	60	90	90	125	495	585	75	120	120	125	200	495	585
24	95	160	160	224	585	685	125	200	200	205	305	575	685
36	145	270	270	309	625	880	170	320	320	325	380	625	880

Fully insulated oil/compound filled						
		List 2				
	BIL	A	B	C	E	
					Single core	3 core
kV	kVp	mm	mm	mm	mm	mm
12	75	45	32	50	495	585
24	125	100	75	90	575	685
36	170	125	100	135	625	880

Shrouded						
		List 2				
	BIL	A	B	C	E	
					Single core	3 core
kV	kVp	mm	mm	mm	mm	mm
12	75	55	50	80	495	585
24	125	110	100	140	575	685
36	170	165	150	225	625	880

NOTE The above clearance dimensions are minima. The design of enclosure should take account of the actual manufacturer's dimensions for the terminals to ensure that all clearances are complied with. The distances given in the table are consistent with the minimum clearances necessary; the currently available bushings, however, as described in EN 50180 have distances, especially C, in excess of those given in the table. This fact should be taken into account when sizing the cable box.

– List 1 distances are for use with shedded bushings.

– The clearances given assume that the cable termination connected to the bushing cap does not reduce the clearance dimension.

– Air Insulation List 2 - C values. Minimum values are based on BS practice and experience. Maximum values are in line with EN 50180.

– For voltage levels below 12 kV the dimensions A, B, C and E are subject to agreement between purchaser and manufacturer.

– For application of List 1 and List 2, see EN 60076-3.

– Cables above 185 mm² should not be crossed in boxes with E dimensions equal to those given. The E dimension can be extended to a dimension agreed between manufacturer and purchaser when crossed cables are required.

4.3 Low voltage boxes

All low voltage boxes shall be capable of accepting either bushings or monobloc or single bloc busbar type terminations of the correct rating for the maximum current required from the transformer. The box flange is as given in EN 50464-2-1, Figure 1.

Due consideration shall be given to the effects of electromagnetic induced losses caused by high currents.

On agreement between purchaser and manufacturer, the flange types can be different to those given.

Terminations suitable for use in LV cable boxes are specified in EN 50180 and EN 50387.

5 Design considerations

5.1 General

The boxes shall be self-contained. The bushing mounting plate is an integral part of the enclosure for HV boxes. Cast iron shall not be used.

Fully insulated cable boxes shall be suitably sealed to contain the oil or the compoundand allowance made for thermal expansion.

Ventilation measures are to be provided in the case of air filled boxes of IP54 protection. Means of draining air filled boxes are to be provided. Filling measures are to be provided in the case of oil/compound filled boxes and due consideration made to the filling medium expansion due to temperature changes.

5.2 Terminal nuts and stems

The dimensions of terminal nuts and stems are related to the bushings in use for the appropriate currents and are given in relevant standards.

5.3 Provision for glanding cables

NOTE Under consideration in TC 20.

5.4 Termination of cables within enclosure

To allow for termination of cables, the minimum vertical distance from the surface of the bushing cap to the gland plate shall be as given in Figure 1. The dimension E allows only for uncrossed cables at above 185 mm².

6 Testing

6.1 Type tests

A new design of an enclosure shall be subject to the following type tests if clearances lower than those given in Table 1 are used. Tests are required on the cable box not necessarily connected to the transformer.

6.1.1 Electrical

- Rated Lightning Impulse Withstand on the high voltage box, terminated with cables as in service.

- Rated Short Duration Power Frequency Withstand on the enclosure, terminated with cables as in service.

The voltage levels for these tests will be appropriate impulse and power frequency levels for the highest system voltage as defined in EN 60076-3.

6.1.2 Mechanical

A mechanical test shall be made on oil/compound filled boxes by subjecting the box to a pressure of 1 bar for 15 min at room temperature. There shall be no permanent distortion when the pressure is released.

6.2 Routine tests

Dimensional checks shall be made to ensure that the enclosure is the same as the prototype tested.

All oil/compound filled boxes shall be tested with oil at room temperature at a pressure of 0,76 bar for 12 h. No leakage shall occur into oil free spaces or any permanent deflection when the pressure is released.

7 Earthing of cable boxes

Means shall be provided to earth the cable box and the cable metallic armour/sheet/screen to the box.

The rating of the earth connection shall be appropriate for the system earth fault current.

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