

Low-voltage switchgear and controlgear assemblies —

Part 2: Particular requirements for busbar trunking systems (busways)

The European Standard EN 60439-2:2000, including amendment A1:2005, has the status of a British Standard

ICS 29.130.20

National foreword

This British Standard is the official English language version of EN 60439-2:2000, including amendment A1:2005. It is identical with IEC 60439-2:2000, including amendment 1:2005. It supersedes BS EN 60439-2:1993 which is withdrawn.

The start and finish of text introduced or altered by IEC amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee PEL/17, Switchgear controlgear and HV-LV co-ordination, to Subcommittee PEL/17/3, Low-voltage switchgear and controlgear assemblies, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep 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

Attention is drawn to the fact that CEN and CENELEC Standards normally include an annex which lists normative references to international publications with their corresponding European publications. The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Standards Catalogue* or of British Standards Online.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 37 and a back cover.

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English version

Low-voltage switchgear and controlgear assemblies
Part 2: Particular requirements for busbar trunking systems (busways)
(IEC 60439-2:2000/A1:2005 + A1:2005)
(includes amendment A1:2005)

Ensembles d'appareillage à basse tension
Partie 2: Règles particulières pour
les canalisations préfabriquées
(CEI 60439-2:2000/A1:2005 + A1:2005)
(inclut l'amendement A1:2005)

Niederspannung-
Schaltgerätekombinationen
Teil 2: Besondere Anforderungen
an Schienenverteiler
(IEC 60439-2:2000/A1:2005 + A1:2005)
(enthält Änderung A1:2005)

This European Standard was approved CENELEC on 2000-04-01. Amendment A1 was approved by CENELEC on 2005-10-01. 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 electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

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

Foreword

The text of document 17D/225/FDIS, future amendment to IEC 60439-2:1987, prepared by SC 17D, Low-voltage switchgear and controlgear assemblies, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60439-2:1993 on 2000-04-01.

The text of this document, together with that of IEC 60439-2:1987 and its amendment 1:1991, was published by IEC as the third edition of IEC 60439-2 in March 2000. According to a decision of principle taken by the Technical Board of CENELEC, the approval of EN 60439-2:1993/A2 has been converted into the approval of a new EN 60439-2.

This European Standard supersedes EN 60439-2:1993.

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) 2001-01-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2003-04-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annexes J, K, L, M and N are informative.

Annex ZA has been added by CENELEC.

Busbar trunking systems (busways) shall comply with all requirements of EN 60439-1, if not otherwise indicated hereinafter and shall also comply with the particular requirements contained in this standard.

The clauses of this standard supplement, modify or replace the corresponding clauses in EN 60439-1.

Where there is no corresponding clause or subclause in this standard, the clause or subclause of the main document applies without modification as far as is reasonable.

In view of the fact that this standard should be read in conjunction with EN 60439-1, the numbering of its clauses and subclauses corresponds to the latter.

Endorsement notice

The text of the International Standard IEC 60439-2:2000 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 17D/324/FDIS, future amendment 1 to IEC 60439-2:2000, prepared by SC 17D, Low-voltage switchgear and controlgear assemblies, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60439-2:2000 on 2005-10-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2006-07-01
- latest date by which the national standards conflicting
with the amendment have to be withdrawn (dow) 2008-10-01

The text of this amendment has been aligned with the content of Amendment A1:2004 to EN 60439-1:1999 where applicable.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2005 to the International Standard IEC 60439-2:2000 was approved by CENELEC as an amendment to the European Standard without any modification.

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES
Part 2: Particular requirements for busbar trunking systems (busways)

1 General

1.1 Scope and object

Add the following paragraphs:

This International Standard applies to busbar trunking systems (BTS) and their accessories for feeding and distributing electrical power in residential, retail, public, agricultural and industrial premises. It also applies to busbar trunking systems which are designed to incorporate communication and/or control systems or intended to supply luminaires through tap-off units but does not apply to supply track systems in accordance with IEC 60570.

The busbar trunking systems considered in this standard are type-tested ASSEMBLIES (TTA) when tested in accordance with clause 8 of this standard; variations in length and angles of bends are considered to be covered.

Tap-off units may be partially type-tested ASSEMBLIES (PTTA).

1.2 Normative references

Insert in the existing list the titles of the following standards:

IEC 60269 (all parts), *Low-voltage fuses*

IEC 60332-3:1992, *Tests on electric cables under fire conditions - Part 3: Tests on bunched wires or cables*

IEC 60439-1:1999, *Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies*

IEC 60570:1995, *Electrical supply track systems for luminaires**

 *Text deleted* 

IEC 60909:1988, *Short-circuit current calculation in three-phase a.c. systems*

IEC 60947-2:1995, *Low-voltage switchgear and controlgear- Part 2: Circuit-breakers***

ISO 834-1:1999, *Fire-resistance tests - Elements of building construction - Part 1: General requirements*

* There is a consolidated edition 1.1 (1998) that includes IEC 60570 (1995) and amendment 1 (1998).
** There is a consolidated edition 2.1 (1998) that includes IEC 60947-2 (1995) and amendment 1 (1997).

2 Definitions

2.1.1.2

partially type-tested low-voltage switchgear and controlgear ASSEMBLY (PTTA)

Replace the existing text by:

applicable only for tap-off units

2.3.4

busbar trunking system (busway)

Add before the note the following new item:

- additional conductors for communication and/or control

Add the following definitions:

2.3.5

busbar trunking unit

unit of a busbar trunking system complete with busbars, their supports and insulation, external enclosure and any fixing and connecting means to other units, with or without tap-off facilities

NOTE Trunking units may have different geometrical shapes such as straight length, elbow, tee or cross.

2.3.6

busbar trunking unit with tap-off facilities

busbar trunking unit designed to enable tap-off units to be installed at one or more points as predetermined by the manufacturer

The connection of tap-off units to the busbar trunking unit may or may not require the busbar system to be disconnected from the supply

2.3.7

busbar trunking unit with trolley-type tap-off facilities

busbar trunking unit designed to permit the use of roller- or brush-type tap-off units

2.3.8

busbar trunking adapter unit

busbar trunking unit intended to connect two units of the same system but of different type or of different rated current

2.3.9

busbar trunking thermal expansion unit

busbar trunking unit intended to permit a certain movement in the axial direction of the busbar trunking due to thermal expansion of the system

NOTE The expansion element may apply to the conductor within the enclosure or both enclosure and conductors according to the design.

2.3.10

busbar phase transposition unit

busbar trunking unit intended to change the relative positions of the phase conductors in order to balance the inductive reactances or to transpose the phases (such as L1-L2-L3-N to N-L3-L2-L1)

2.3.11

flexible busbar trunking unit

busbar trunking unit having conductors and enclosures designed to be bent during installation

2.3.12

busbar trunking feeder unit

busbar trunking unit serving as any incoming unit. The connection of the feeder unit to the supply may or may not require the supply to be disconnected

2.3.13

tap-off unit

outgoing unit for tapping-off power from the busbar trunking unit with tap-off facilities (see 2.3.6), such as rollers, brushes or plug-in devices

A tap-off unit may also be permanently connected and can be intended for one or any combinations of power, communication or control circuits.

A tap-off unit may contain accessories, such as protective devices (for example fuse, fuse-switch, switch-fuse, circuit-breaker, residual current circuit-breaker), electronic apparatus for communication or remote control, contactors, socket-outlets, connecting facilities such as prewired, screw-type or screw-less type terminals, etc.

Tap-off units may be partially type-tested assemblies (PTTA).

2.3.14

busbar trunking unit for building movements

busbar trunking unit intended to allow for building movements due to thermal expansion and contraction of the building

2.3.15

busbar trunking fire barrier unit

busbar trunking unit or a part of a busbar trunking unit, with or without additional parts, intended to prevent the propagation of fire for a specified time under fire conditions

2.3.16

busbar trunking fire resistant unit

busbar trunking unit, with or without additional parts, intended to maintain electrical circuit integrity for a specified time under fire conditions

3 Classification of ASSEMBLIES

Add to the existing dashed items the following new items:

- the mechanical loads they can withstand in use (see 7.1.1.1 to 7.1.1.3);
- resistance to fire and to flame propagation, if applicable (see 7.1.1.4 to 7.1.1.7).

Add a new paragraph as follows:

Busbar trunking systems and their accessories may be installed, according to the design, in indoor and outdoor locations, in various attitudes, in different mounting conditions; the manufacturer of the BTS shall state the applicable conditions.

4 Electrical characteristics of ASSEMBLIES

4.5 Rated conditional short-circuit current (I_{cc})

Add new note 3 to the existing notes:

NOTE 3 The rated conditional short-circuit current (I_{cc}) should be stated (for example, for tap-off units) for the corresponding protective device, if any (see 8.2.3.2.4).

Add the following new subclause:

4.9 Electrical characteristics of busbar trunking system

4.9.1 Resistance, reactance and impedance values of the system

The manufacturer shall state in the manner described in clause 5 the following characteristics of the phase conductors of the system:

- the mean ohmic resistance of the phase conductors, per metre length:
 - R_{20} at a temperature of +20 °C;
 - R_1 at rated current I_n , at the steady-state operating temperature θ_1 ;
- the mean reactance of the phase conductors, per metre length:
 - X_1 at rated current I_n , at rated frequency F ;
- the mean impedance of the phase conductors, per metre length:
 - Z_1 at the steady state operating temperature θ_1 .

NOTE These values are determined according to 8.2.9, by direct measurement or by calculations from measurements (see clause N.1).

The voltage drop of the system may be determined by calculations from these resistance and reactance values (see annex J).

The steady-state operating temperature θ_1 is equal to the temperature rise $\Delta\theta_1$ at the rated current I_n plus 35 °C, the conventional ambient temperature for the busbar trunking system.

$Z_1 = (R_1^2 + X_1^2)^{1/2}$ and is also the phase-sequence impedance (positive or negative) of the system, at the steady state operating temperature θ_1 .

4.9.2 Resistance, reactance and impedance values of the system under fault conditions

The following applies to BTS rated above 100 A.

The manufacturer shall state in the manner described in clause 5 the following fault-loop impedance values, in order to permit calculations of short-circuit and fault currents in every point of an electrical installation which includes a busbar trunking system.

Either of the following methods may be used to calculate such fault currents:

a) *Method of symmetrical components* (see IEC 60909):

- the zero-sequence impedance of the conductors being considered at a temperature of +20 °C, per metre length:
 - Z_{0phN} phase-to-neutral
 - Z_{0phPEN} phase-to-PEN
 - Z_{0phPE} phase-to-PE

b) *Method of impedances*:

- the mean ohmic resistance of the conductors being considered at a temperature of +20 °C, per metre length:
 - $R_{b0 phph}$ phase-to-phase
 - $R_{b0 phN}$ phase-to-neutral
 - $R_{b0 phPEN}$ phase-to-PEN
 - $R_{b0 phPE}$ phase-to-PE
- the mean ohmic resistance of the conductors being considered at rated current I_n , at the steady-state operating temperature θ_1 of the system, per metre length:
 - $R_{b1 phph}$ phase-to-phase
 - $R_{b1 phN}$ phase-to-neutral
 - $R_{b1 phPEN}$ phase-to-PEN
 - $R_{b1 phPE}$ phase-to-PE
- the mean ohmic reactance of the conductors being considered, at rated current I_n , at rated frequency F , per metre length:
 - X_{bphph} phase-to-phase
 - X_{bphN} phase-to-neutral
 - X_{bphPEN} phase-to-PEN
 - X_{bphPE} phase-to-PE

NOTE These values may be determined by direct measurement or by calculations from measurements (see clause N.2).

4.9.3 Short-circuit characteristics of the system

The manufacturer shall state one or more of the following rated short-circuit characteristics of the conductors of the busbar trunking system:

- I_{cc} rated conditional short-circuit current (A)
- I_{cw} rated short-time withstand current and I_{pk} peak short-circuit current according to 7.5.2 and 8.2.3 (A)

5 Information to be given regarding the ASSEMBLIES

5.1 Nameplate

After the first paragraph add the following paragraph:

One nameplate shall be located near one end of each busbar trunking unit and one on each tap-off unit. If the busbar trunking enclosure is used as a PE conductor and if a terminal is provided for external connection to the enclosure, this terminal should be marked according to 7.6.5.2.

Add the following items u) and v):

- u) resistance, reactance and impedance values of the system (see 4.9.1);
- v) resistance, reactance and impedance values of the system under fault conditions (see 4.9.2).

6 Service conditions

6.1.1 Ambient air temperature

Add the following new subclause:

6.1.1.3 Reference ambient air temperature for busbar trunking system

Unless otherwise specified, the rated current of the busbar trunking system, according to table 3 and 8.2.1.3, shall be stated by the manufacturer for the reference ambient air temperature of 35 °C.

Rating factors, if applicable, should be stated by the manufacturer ($k_1 = 1$ for 35 °C) to determine the allowable current ($I = k_1 \times I_n$) of the system according to the range of temperatures in mounting conditions.

6.2 Special service conditions

Add the following new subclauses:

6.2.11 Mounting conditions for busbar trunking system

If a busbar trunking system can be used in different mounting conditions (for example, changes of the orientation of conductors), according to clause 3, the manufacturer shall state the corresponding mounting factor (k_2), if any, to determine the resulting allowable current of the system taken equal to $I = k_1 \times k_2 \times I_n$.

6.2.12 Power frequency magnetic field

It may be necessary in certain installations (for example, those involving high-speed data networks, radiology apparatus, workstation monitors, etc.) to know the strength of the power frequency magnetic field in the vicinity of the busbar trunking.

A method for measurement and calculation of the modulus of the magnetic field around the busbar trunking is given in annex K.

A1 6.2.13

Applications with high repetitive overcurrent, for example resistance welding. **A1**