BRITISH STANDARD

BS 6207-3:
2001

Mineral insulated cables with a rated voltage not exceeding 750 V —

Part 3: Guide to use

(Implementation of HD 586.3:2001)

ICS 29.060.20

National foreword

This British Standard implements Harmonization Document HD 586.3:2001, which was published by the European Committee for Electrotechnical Standardization (CENELEC).

The UK participation in its preparation was entrusted by Technical Committee GEL/20, Electric cables, to Subcommittee GEL/20/1, Wiring cables, 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.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 4 October 2001

The following BSI references relate to the work on this standard:
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HARMONIZATION DOCUMENT **HD 586.3 S1**

DOCUMENT D'HARMONISATION

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ICS 29.060.20

English version

Mineral insulated cables with a rated voltage not exceeding 750 V Part 3: Guide to use

Câbles à isolant minéral de tension assignée ne dépassant pas 750 V Partie 3: Guide d'emploi

Mineralisolierte Leitungen mit einer Nennspannung bis 750 V Teil 3: Anwendungsrichtlinien

This Harmonization Document was approved by CENELEC on 2000-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document on a national level.

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

This Harmonization Document exists in three official versions (English, French, German).

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CENELEC

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

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Ref. No. HD 586.3 S1:2001 E

Foreword

This Harmonization Document was prepared by the Technical Committee CENELEC TC 20, Electric cables. It was submitted to the Unique Acceptance Procedure and was approved by CENELEC as HD 586.3 S1 on 2000-12-01.

The following dates were fixed:

— latest date by which the existence of the HD has to be announced at national level	(doa)	2001-07-01
— latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement	(dop)	2002-01-01
— latest date by which the national standards conflicting with the HD have to be withdrawn	(dow)	2003-01-01

Annexes designated "informative" are given for information only.
In this standard, annex A is informative.

Contents

Introduction

The aim in publishing this standard is to inform users of the properties and limiting conditions for mineral insulated electric cables and therefore to avoid misuse of the cables.

1 Scope

This standard provides a guide to the proposed safe use of electric cables and their terminations as presently covered in the following standards.

HD 586 Mineral insulated cables with a rated voltage not exceeding 750 V
Part 1: Cables
Part 2: Terminations

2 References

This standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed in annex A but reference should be made to the latest editions.

3 Definitions

The meaning and sense of the terms used in this standard are as defined in the current edition of HD 384.2 unless otherwise stated.

4 Safety

4.1 Fundamental considerations

4.1.1 Safety of a cable means that the product does not present an unacceptable risk of danger to life or property whilst being used in its intended manner.

4.1.2 Unless otherwise stated, cables should not be used for any other purpose than the transmission and distribution of electricity.

4.1.3 The test methods, test parameters and requirements described in the standards referred to in clause 1 are only for the purpose of checking design with respect to safety and quality assurance. They should not be regarded as providing guidance that the cables are suitable for service under conditions equivalent to the test conditions.

4.2 General

4.2.1 All conductors and cables should be selected so as to be suitable for the voltages and currents likely to occur under all conditions which are or should have been anticipated in the equipment or installation in which they are used.

4.2.2 Cables should be so constructed, installed, protected, used and maintained as to prevent danger so far as it is reasonably practical.

4.2.3 The limiting temperature conditions under which mineral insulated cables and terminations can reasonably be expected to operate safely under normal circumstances are given in Table 1.

These conditions are those considered capable of ensuring a length of life in service which has been accepted as reasonable by experience of the cable and terminations and in particular conditions of use.

4.2.4 Cables should be selected so that they are suitable for the operating conditions and equipment classification.

Examples of operating conditions are:

a) voltage;
b) overcurrent;
c) protective measures;
d) grouping of cables;
e) method of installation;
f) accessibility.

4.2.5 Cables should be selected so that they are suitable for any external influences that may exist.

Examples of external influences are:

a) ambient temperature;
b) presence of rain, steam or accumulation of water;
c) presence of corrosive, flammable, chemical or polluting substances;
d) mechanical stresses (such as through holes or sharp edges in metal work);
e) fauna (such as rodents);
f) flora (such as mould);
g) radiation (such as sunlight).

NOTE In respect of item g) it should be noted that colour is important, a black covering giving a higher degree of protection.

4.3 Support and fixing

Cables should be supported adequately. Recommended maximum spacings for surface installations are given in Table 2. For inaccessible positions the weight of the cable between supports should be taken into account and the advice of the cable manufacturer obtained.

5 Limiting conditions

5.1 General

The influences of all factors as outlined in 5.2 to 5.9 should be considered in combination not separately.

5.2 Voltage

The rated voltage of a cable is the reference voltage for which the cable is designed and which serves to define the electrical tests.

5.3 Current carrying capacity

5.3.1 The cross-sectional area of every conductor size should be such that its current carrying capacity is not less than the maximum sustained current which will normally flow through it.

For the purposes of this standard, the limiting temperature to which the current carrying capacity is related should not exceed that appropriate to the maximum cable termination operating temperature, the cable covering material, if any, or any material in contact with the cable.

5.3.2 The current carrying capacities of cables for fixed wiring, to meet the requirements of HD 384.5.523, are given in CENELEC Report R064-001.

The values given have been determined such that the limiting temperatures given in Table 1 of this standard are not exceeded under particular defined conditions where the cables are continuously loaded.

For current ratings for other installed conditions the cable manufacturer should be consulted.

5.3.3 In the case of soft soldered conductor joints or connections the limiting temperature for the conductor under short circuit conditions is 160 °C. Account of this limitation should be taken in selecting and operating cables.

5.3.4 Defined conditions include the method of installation of the cables used. Account should be taken of these conditions in determining the current carrying capacity of a cable.

Correction factors for quoted current carrying capacities are available for particular conditions such as:

a) ambient temperature;

b) cable grouping;

c) type of overcurrent protection;

d) presence of thermal insulation.

5.3.5 If cables are operated for prolonged periods at temperatures above those given in Table 1 then the cable terminations, covering or surrounding material may be damaged.

5.3.6 The selection of the cross-sectional area of any conductor should not be based on current carrying capacity alone; account should be taken of the influence of the requirements for protection against:

a) electric shock;

b) thermal effects;

c) overload and short circuit currents;

d) voltage drop;

e) mechanical strength.

5.4 Thermal effects

5.4.1 The limiting temperatures of cables are given in Table 1. The values given should not be exceeded by any combination of the heating effect of the current in the conductors and the ambient conditions. Particular account should be taken of the following:

a) Cables in free air should not be so installed that the natural air convection is impeded. When cables are covered or embedded in thermal insulation or when the heat dissipation is impeded by other means, it is essential that the corresponding reduction of the current carrying capacity be observed.

b) The temperature of cable sheaths can be significantly higher than the ambient temperatures, where the cables are subjected to radiation, e.g. solar or infrared. Where these situations cannot be avoided their effect should be taken into account in assessing the current carrying capacity or the temperature of the cable relative to the limiting conditions.

c) Account should be taken of the temperatures occurring within equipment, appliances, luminaires and at their terminals, in selecting the types of termination to be used.

5.4.2 Cables should be selected, located and installed so that their intended heat dissipation is not inhibited and they do not present a fire hazard to adjacent materials.

5.4.3 In the event of a fire, cables can provide a source of fuel and a means of propagating a fire along their length. This hazard may be eliminated by using bare copper sheathed mineral insulated cable. Where covered mineral cables are used the amount of combustible material is small and the hazard may be reduced by selecting a covering material with reduced flame propagation characteristics.

Where a particular hazard exists or is likely to exist in the presence of explosive or flammable atmospheres, specific regulations apply. It is essential that the requirements of these regulations be taken into account in selecting the current carrying capacity and the type of cable termination to be used.

5.4.4 When the cable is installed not exposed to touch and the current is such that the cable sheath exceeds 70 °C, the cable shall be bare copper and shall be so located or guarded as to prevent contact of persons or animals therewith and it shall not be in contact with combustible material. When installed in such conditions cable need not be derated when used in groups.

5.4.5 Cable terminations should be selected such that they are operated within the temperature limits specified by the manufacture.

5.5 Mechanical stress

5.5.1 General

In assessing risks of mechanical damage to cables account should be taken of mechanical strains likely to be imposed during the normal process of installation.

5.5.2 Tension

The tension applied to a cable should not exceed 50 N/mm^2 per conductor, subject to a maximum of 1 000 N unless otherwise agreed by the cable manufacturer.

5.5.3 Bending

The internal radius of every bend in a cable should not cause damage to the cable.

a) The internal radius of every bend should not be less than six times the cable diameter; this will allow bends to be straightened and repositioned. Bends with a smaller radius may be permitted provided that the bend is a once only bend that is not reworked; such bends should not be less than 3 times the cable diameter.

b) Cables which are installed vertically, without intermediate support, which are inaccessible and unlikely to be disturbed, should be supported at the top of the run such that the internal radius of the resultant bend is not less than 6 times the cable diameter.

5.5.4 Compression

Whilst mineral insulated cables possess significant resistance to compression and deformation, the installation and use of the cable should not be designed to make use of these characteristics.

5.6 Compatibility

5.6.1 The possibility of interference between adjacent circuits either mechanical or electrical should be avoided. The solid copper sheath of mineral insulated cables provides an electrical screen. To maximise the screening effect, brass cable glands should be used to provide a complete 360° connection to apparatus.

5.6.2 Consideration should be given to the effects of heat given out by cables, or the chemical/physical effect of materials used in their construction, on materials adjacent to which they are installed, e.g. construction materials, decorative materials, cable enclosures, supports.

5.6.3 The interaction of adjacent materials with the materials used in the construction of cables should be taken into account.

5.6.4 The effects on cables of transient overvoltages, which may be generated during the switching of inductive loads, should be considered. When such transient voltages are likely to be in excess of the rated voltage, action should be taken to limit their magnitude.

5.6.5 HD 586.1 S1 and HD 586.2 S1 are intended to ensure that cables and terminations are compatible. However, it is recommended that installers confirm compatibility.

5.7 Dynamic stresses

The possibility of damage to cables and their supports due to disruptive effects of the electro-mechanical forces caused by any current that the cables may have to carry in service, including short circuit currents, should be taken into account.

5.8 Flexing

Cable should not be installed in situations where it is subjected to repetitive flexing, but may be flexed occasionally in use.

5.9 Corrosion protection and direct burial

Covered cables may be buried directly in the ground. Where cables are used in atmospheres corrosive to copper, a suitable outer covering shall be provided as recommended by the manufacturer.

6 Installation

Cable and terminations should be selected, installed and commissioned by a competent person. The installation should comply with the requirements given in HD 384.

7 Initial and periodic verification

Cables should be inspected periodically and every time it is suspected that a cable has been damaged. If a cable shows visible damage, it should be electrically tested. If found to be electrically faulty, the cable should be either repaired, through suitable devices and by skilled persons, or replaced.

Damage to the outer covering is not critical to the continued satisfactory operation of the cable, but can be repaired or made good for aesthetic reasons.

8 Packaging, storage and handling / transportation.

8.1 Packaging

Cables within the scope of this standard will normally be delivered to the user either on drums, reels, in coils or as cut lengths in non-tangle packaged units. They will normally be labelled to identify the manufacturer, the cable type, size and length.

Terminations within the scope of this standard will normally be delivered to the user in sealed bags or boxes. The boxes or bags will normally contain a complete kit of components sufficient to assemble one or more gland, seal or complete termination.

8.2 Storage

Cables should be stored in such a manner as to prevent damage. Terminations should be stored in a dry location.

8.3 Handling / transportation

If the temperature falls below the minimum recommended installation temperature given in Table 1 care should be taken to minimise any mechanical stress applied to any covering, in particular bending, impact or shock.

Table 1 — Limiting temperature conditions

Maximum continuous sheath operating temperature, exposed to touch or in contact with combustible material:	
bare copper sheath	70 °C
covered copper sheath	70 °C
Maximum continuous sheath operating temperature, not exposed to touch, and not in contact with combustible material:	
bare copper sheath & 105 °C seals	105 °C
bare copper sheath & 250 °C seals	250 °C
Maximum conductor temperature under fault conditions, exposed to touch or in contact with combustible material:	
bare or covered sheath	160 °C [1]
Maximum conductor temperature under fault conditions, not exposed to touch, and not in contact with combustible material:	
bare copper sheath	250 °C [1]
Minimum installation temperature:	
bare copper sheath	[2]
covered copper sheath	[3]
Minimum continuous operating temperature:	
bare copper sheath	[2]
covered copper sheath	[3]

1) Seals must be suitable for this short-term temperature rating.
2) For all practical circumstances, unlimited with respect to cable performance
3) Seek advice from the manufacturer for the particular covering material.

Table 2 — Recommended fixing distances

Overall diameter of cable (mm)	**Horizontal** (m)	**Vertical** (m)
Not exceeding 9	0,6	0,8
Exceeding 9 not exceeding 15	0,9	1,2
Exceeding 15 not exceeding 20	1,5	2,0
Exceeding 20	2,25	3,0

Annex A
(informative)

Bibliography

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R064-001, *CENELEC report on current carrying capacities in conductors and cables.*

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