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National foreword

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Electrical installation guide - Selection and erection of electrical equipment - Wiring systems - Limitation of temperature rise of connecting interfaces

Guide pour les installations électriques - Choix et mise en oeuvre des matériels électriques - Canalisations - Limitation des échauffements dus aux interfaces de connexion

Leitfaden für elektrische Anlagen - Auswahl und Errichtung elektrischer Betriebsmittel - Kabel- und Leitungsanlagen - Begrenzung des Temperaturanstiegs bei Schnittstellenanschlüssen

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Foreword

This Technical Report was prepared by SC 64B, Protection against thermal effects, of Technical Committee CENELEC TC 64, Electrical installations and protection against electric shock.

The text of the draft was submitted to a vote and was approved by CENELEC as CLC/TR 50479 on 2006-10-09.

This Technical Report supersedes R064-002:1994.

INTRODUCTION

When designing an installation or during initial verification, it is sometimes observed that the temperatures reached by interfaces between terminals and conductors are higher than those which could be withstood by insulation in normal service.

In this case, precautions shall be taken so that the temperature attained by terminals in normal service shall not impair effectiveness of the insulation of conductors connected to them or supporting them.

See HD 384.5.52 'Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 52: Wiring systems'.

52.1 General

52.1.1 Scope

This Technical Report is for use as a guide for electrical installations. It is applicable to the limitation of temperature rises of connecting interfaces.

52.1.2 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 60439-1:1999, Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1:1999)

EN 60439-3:1991, Low-voltage switchgear and controlgear assemblies - Part 3: Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards (IEC 60439-3:1990, modified)

HD 384.5.523 S2:2001, Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Section 523: Current-carrying capacities in wiring systems
(IEC 60364-5-523:1999, modified)

CLC/TR 60890:2002, A method of temperature-rise assessment by extrapolation for partially type-tested assemblies (PTTA) of low-voltage switchgear and controlgear (IEC 60890:1987 + corr. 1988 + A1:1995)

IEC/TR 60943:1998, Guidance concerning the permissible temperature rise for parts of electrical equipment, in particular for terminals

52.2 Maximum temperatures of terminals in normal service conditions

52.2.1 The temperature of a terminal is the sum of the ambient temperature and its temperature rise in normal service.

Product standards give conventional limit values for temperature rise under defined test conditions, but do not indicate, in general, limits for permissible temperature rises in service conditions.

Relevant standards in this respect are EN 60439-1, EN 60439-3 and CLC/TR 60890.

52.2.2 The temperatures of terminals are affected by the heat dissipated in normal service by the equipment. This heat may be caused by internal losses dissipated in the equipment and by neighbouring internal and external heat sources, if any**.**

The temperatures of terminals are also related to the way in which they are used, which could affect their electrical resistance and dissipation of heat.

52.2.3 Compatibility between temperatures of terminals of equipment and temperatures permitted for the insulation of the conductors and cables shall be obtained by appropriate arrangement during installation.

Clauses, subclauses	Recommendations
52.3 Means for limiting temperatures of terminals in service or their effects	Recommendations for the choice of methods for limiting temperatures of terminals in service on their effects Recommendations are given below on the selection of methods according to local conditions of installation, practicability of installation, nature of equipment.
52.3.1 Temperatures of terminals can be limited by one or more of the following measures:	
52.3.1.1 Limitation of contents of enclosures (cubicles, cabinets, trunkings, conduits)	The limitation of contents of trunkings and conduits is recommended when a great number of circuits issue from the same panel ; in this case it is preferable to use several runs of trunking or conduit.
52.3.1.2 Spacing between equipment in order to improve natural ventilation	Spacing between adjacent equipment permits better dissipation of heat. It is necessary to refer to manufacturer's instructions. This solution is especially recommended when a great number of items of equipment are installed in the same enclosure (cubicle or cabinet).
52.3.1.3 Appropriate arrangement of equipment dissipating heat inside enclosures	It is recommended that equipment-dissipating heat is installed in an appropriate way so that the correct operation of other equipment will not be impaired. Other means, such as the interposition of screens or deflectors, may be used for this purpose.
52.3.1.4 Natural or forced ventilation or air-conditioning of cubicles, cabinets or locations.	Forced ventilation of the equipment may be necessary in specific applications, for examples to protect against ingress of dust.
52.3.1.5 Derating of equipment by use of equipment having higher rated current, consequently dissipating less heat.	Derating of equipment can be used to reduce the temperature of terminals, provided that such derating is permitted for the equipment.
52.3.1.6 Selection of material for enclosures of cubicles or cabinets in which terminals are installed, in order to improve the thermal dissipation.	
52.3.1.7 Maintenance of correct clamping of conductors in the terminals.	Arrangements shall be made to ensure the maintenance of clamping pressure of conductors in their terminals. Such arrangements may be built-in (for example, use of resilient connections) or result from instructions for the inspection of the installation.

Clauses, subclauses	Recommendations
52.3.2 The effects of temperature rise of terminals in normal service can be limited by one or more of the following means:	
52.3.2.1 Selection of the insulation of conductors in relation to the presumed temperatures rises. Permissible temperatures in steady-state service for some types of Insulation of conductors are determined by TC 20: Ordinary EPR 60°C PVC normal 70°C PVC temperature resistent 90°C XLPE 90°C Silicone rubler 180°C EVA rubler 110°C Polyolefin halogen free 90°C Current-carrying capacities of conductors, the values of which are given in tables of HD 384.5.523, are calculated so that the temperature on the cores does not exceed the permissible temperature determined by the selection of the insulation. A steady-state service implies that overcurrents are infrequent and of limited duration in order not to affect seriously the life of the insulation.	If elastomeric insulation rather than thermoplastic is used in order to utilize their higher thermal ratings, it may be necessary to derate the equipment to which they are connected
52.3.2.2 Connection of a short length of conductor whose cross-sectional area may be chosen to be larger than that required by the current.	Increasing the cross-sectional area of conductors for other reasons (voltage drop, withstand of short-circuit currents, reduction of the fault loop impedance) improves the thermal withstand of the conductors. Interposing of an intermediate terminal outside the equipment enables a conductor of larger cross-section or a higher temperature type of cable to be connected.
52.3.2.3 Replacement of the insulation of the conductors by a sleeve which permits a higher temperature or replacement of the conductors by conductors insulated appropriately, for a sufficient length.	Insulated conductors which permit temperatures at least to 110°C are recommended for the supply to equipment operating at a high temperature, such as some luminaires or heating appliances.
52.3.2.4 Separation of conductors of multicore cables between the end of the sheath and the terminal leads to a decrease in the temperature to a value compatible with the permissible temperature of the insulation of the conductors.	Choice of a sufficient length for the separation may be based on experiment or on a calculation according to IEC/TR 60943.

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