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**Railway Applications – Electric equipment for rolling stock –
Part 3: Electrotechnical components – Rules for DC circuit-breakers**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RAILWAY APPLICATIONS – ELECTRIC EQUIPMENT FOR ROLLING STOCK –

Part 3: Electrotechnical components – Rules for DC circuit-breakers

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
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- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60077-3 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This second edition cancels and replaces the first edition, issued in 2001. It constitutes a technical revision.

This edition includes the following main technical changes with regard to the previous edition:

- a) procedure of verification of temperature rise is changed;
- b) air-tightness test as type test, insulation resistance measurement are added.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
9/2537/FDIS	9/2553/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This document should be read in conjunction with IEC 60077-1 and IEC 60077-2.

A list of all parts in the IEC 60077 series, published under the general title *Railway applications – Electric equipment for rolling stock*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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RAILWAY APPLICATIONS – ELECTRIC EQUIPMENT FOR ROLLING STOCK –

Part 3: Electrotechnical components – Rules for DC circuit-breakers

1 ~~Scope and object~~

In addition to the general requirements of IEC 60077-2, this part of IEC 60077 gives the rules for circuit-breakers, the main contacts of which are ~~to be~~ connected to DC power and/or auxiliary circuits. The nominal voltage of these circuits does not exceed 3 000 V DC according to IEC 60850.

This part of IEC 60077, together with IEC 60077-2, states specifically:

- a) the characteristics of the circuit-breakers;
- b) the service conditions with which circuit-breakers ~~have to comply~~ complies with reference to:
 - operation and behaviour in normal service;
 - operation and behaviour in the case of short circuit;
 - dielectric properties;
- c) the tests for confirming the compliance of the components with the characteristics under the service conditions and the methods to be adopted for these tests;
- d) the information to be marked on, or given with, the circuit breaker.

NOTE 1 Circuit-breakers which are dealt with in this document ~~may~~ can be provided with devices for automatic opening under predetermined conditions other than those of overcurrent, for example, under-voltage and reversal of power ~~current~~ flow direction. This document does not deal with the verification of operation under such predetermined conditions.

NOTE 2 The incorporation of electronic components or electronic sub-assemblies into electrotechnical components is now common practice.

Although this document is not applicable to electronic equipment, the presence of electronic components does not provide a reason to exclude such electrotechnical components from the scope.

Electronic sub-assemblies included in circuit-breakers ~~should~~ comply with the relevant document for electronics (IEC 60571).

NOTE 3 Certain of these rules ~~may~~, after agreement between the user and the manufacturer, ~~be~~ are used for electrotechnical components installed on vehicles other than rail rolling stock such as mine locomotives, trolleybuses, etc. In this case, particular additional requirements ~~may~~ can be necessary.

This document does not cover:

- a) multi-connection of electro-technical components to achieve a particular duty;
- b) industrial circuit-breakers which ~~have to comply~~ complies with IEC 60947-2;
- c) DC circuit-breakers for fixed installations which ~~have to comply~~ complies with IEC 61992-2.

For b) and c), in order to ensure satisfactory operation, this document ~~should be~~ is used to specify only the particular requirements for rolling stock. In such cases, a specific document ~~should state~~ states the additional requirements with which the industrial or fixed installations circuits breakers ~~are to~~ comply, for example:

- either to be adapted (for example, for control voltage, environmental conditions, etc.);

- or to be installed and used in such a way that they do not have to endure specific rolling stock conditions;
- or to be additionally tested to prove that these components can withstand satisfactorily the rolling stock conditions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

~~IEC 60050(441):1984, International Electrotechnical Vocabulary — Switchgear, controlgear and fuses~~

IEC 60077-1:1999/2017, *Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules*

IEC 60077-2:1999/2017; *Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

~~IEC 60571:1998, Electronic equipment used on rail vehicles~~

~~IEC 60850:2000, Railway applications — Supply voltage of traction systems~~

~~IEC/TR3 60943:1998, Guidance concerning the permissible temperature rise for parts of electrical equipment, in particular for terminals~~

~~IEC 60947-2:1989, Low-voltage switchgear and controlgear — Part 2: Circuit-breakers~~

IEC 61373:1999, *Railway applications – Rolling stock equipment – Shock and vibration tests*

~~IEC 61992-2:2001, Railway applications — Fixed installations — DC switchgear — Part 2: Circuit-breakers~~

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Railway Applications – Electric equipment for rolling stock –
Part 3: Electrotechnical components – Rules for DC circuit-breakers**

**Applications ferroviaires – Équipements électriques du matériel roulant –
Partie 3: Composants électrotechniques – Règles pour disjoncteurs
à courant continu**

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IEC 60077-2:2017; *Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61373, *Railway applications – Rolling stock equipment – Shock and vibration tests*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

APPLICATIONS FERROVIAIRES – ÉQUIPEMENTS ÉLECTRIQUES DU MATÉRIEL ROULANT –

Partie 3: Composants électrotechniques – Règles pour disjoncteurs à courant continu

AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés «Publication(s) de l'IEC»). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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La Norme internationale IEC 60077-3 a été établie par le comité d'études 9 de l'IEC: Matériels et systèmes électriques ferroviaires.

Cette deuxième édition annule et remplace la première édition, parue en 2001. Elle constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) modification de la procédure de vérification de l'échauffement;

- b) ajout de l'essai d'étanchéité comme essai de type et de la mesure de la résistance d'isolement.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
9/2537/FDIS	9/2553/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Il convient qu'il soit lu conjointement avec l'IEC 60077-1 et l'IEC 60077-2.

Une liste de toutes les parties de la série IEC 60077, publiées sous le titre général *Applications ferroviaires – Équipements électriques du matériel roulant*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous «<http://webstore.iec.ch>» dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

APPLICATIONS FERROVIAIRES – ÉQUIPEMENTS ÉLECTRIQUES DU MATÉRIEL ROULANT –

Partie 3: Composants électrotechniques – Règles pour disjoncteurs à courant continu

1 Domaine d'application

La présente partie de l'IEC 60077 donne, en complément des règles générales de l'IEC 60077-2, les règles relatives aux disjoncteurs dont les contacts sont connectés aux circuits à courant continu de traction et/ou aux circuits des auxiliaires. La tension continue nominale de ces circuits n'excède pas 3 000 V CC, conformément à l'IEC 60850.

En complément de l'IEC 60077-2, la présente partie de l'IEC 60077 précise particulièrement:

- a) les caractéristiques des disjoncteurs;
- b) les conditions de service que les disjoncteurs supportent du point de vue:
 - du fonctionnement et du comportement en service normal;
 - du fonctionnement et du comportement en cas de court-circuit;
 - des propriétés diélectriques;
- c) les essais de conformité des composants avec les caractéristiques dans les conditions de service ainsi que les méthodes d'essai correspondantes à utiliser;
- d) les informations à donner ou à marquer sur le disjoncteur.

NOTE 1 Les disjoncteurs qui font l'objet du présent document peuvent être équipés de dispositifs d'ouverture automatique dans des conditions prédéterminées autres que celles de la surcharge, comme une tension insuffisante ou l'inversion de la direction du flux de puissance, par exemple. Le présent document ne traite pas de la vérification de tels fonctionnements dans de telles conditions prédéterminées.

NOTE 2 L'incorporation de composants électroniques ou de sous-ensembles électroniques dans les composants électrotechniques est maintenant une pratique courante.

Bien que le présent document ne soit pas applicable aux matériels électroniques, la présence de composants électroniques n'est pas une raison suffisante pour exclure ces composants électrotechniques du domaine d'application du document.

Les sous-ensembles électroniques inclus dans les disjoncteurs sont conformes au document correspondant applicable à l'électronique (IEC 60571).

NOTE 3 Après accord entre l'utilisateur et le constructeur, certaines de ces règles sont utilisées pour les composants électrotechniques installés dans des véhicules autres que ceux du matériel roulant ferroviaire tels que les locomotives de mine, les trolleybus, etc. Dans ce cas particulier, des exigences complémentaires peuvent être nécessaires.

Le présent document ne couvre pas:

- e) l'assemblage de composants électrotechniques destinés à des fonctions particulières;
- f) les disjoncteurs industriels conformes à l'IEC 60947-2;
- g) les disjoncteurs à courant continu des installations fixes conformes à l'IEC 61992-2.

Pour f) et g), dans le but d'obtenir un fonctionnement satisfaisant, le présent document est employé uniquement pour spécifier les exigences particulières relatives à l'application ferroviaire. Dans de tels cas, un document spécifique indique les exigences complémentaires auxquelles les disjoncteurs industriels ou les disjoncteurs pour installations fixes se conforment, par exemple:

- pour être adaptés (tension de commande, conditions d'environnement, etc.);

- pour être installés et utilisés de sorte qu'ils n'aient pas à subir les conditions particulières du matériel roulant;
- ou pour subir des essais complémentaires afin de montrer que ces composants peuvent supporter de façon satisfaisante les conditions du matériel roulant.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60077-1:2017, *Applications ferroviaires – Equipements électriques du matériel roulant – Partie 1: Conditions générales de service et règles générales*

IEC 60077-2:2017; *Applications ferroviaires – Equipements électriques du matériel roulant – Partie 2: Composants électrotechniques – Règles générales*

IEC 60529, *Degrés de protection procurés par les enveloppes (code IP)*

IEC 61373, *Applications ferroviaires – Matériel roulant – Essais de chocs et vibrations*