IEC 61992-3

Edition 2.1 2015-09
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Railway applications – Fixed installations – DC switchgear –
Part 3: Indoor d.c. disconnectors, switch-disconnectors and earthing switches

Applications ferroviaires – Installations fixes – Appareillage à courant continu –
Partie 3: Interrupteurs-sectionneurs, sectionneurs et sectionneurs de terre à courant continu, pour l'intérieur

IEC 61992-3:2006-02+AMD1:2015-09 CSV(en-fr)

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FOREWORD

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IEC 61992-3 edition 2.1 contains the first edition (2006-02) [documents 9/888/FDIS and 9/910/RVD] and its amendment 1 (2015-09) [documents 9/2017/CDV and 9/2066/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61992-3 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This edition includes the following significant technical changes with respect to the previous edition:

– all requirements applying to more than one part of the IEC 61992 series are now specified in Part 1 and consequently the related clauses in this part of the series now make reference to Part 1;
– the list of applicable tests has been improved taking into account the new Part 4.

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

IEC 61992 consists of the following parts, under the general title *Railway applications – Fixed installations – DC switchgear:*

Part 1: General
Part 2: DC circuit breakers
Part 3: Indoor d.c. disconnectors, switch-disconnectors and earthing switches
Part 4: Outdoor d.c. disconnectors, switch-disconnectors and earthing switches
Part 5: Surge arresters and low-voltage limiters for specific use in d.c. systems
Part 6: DC switchgear assemblies
Part 7-1: Measurement, control and protection devices for specific use in d.c. traction systems – Application guide
Part 7-2: Measurement, control and protection devices for specific use in d.c. traction systems – Isolating current transducers and other current measuring devices
Part 7-3: Measurement, control and protection devices for specific use in d.c. traction systems – Isolating voltage transducers and other voltage measuring devices

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RAILWAY APPLICATIONS – FIXED INSTALLATIONS – DC SWITCHGEAR –

Part 3: Indoor d.c. disconnectors, switch-disconnectors and earthing switches

1 Scope

This part of IEC 61992 specifies requirements for d.c. disconnectors, switch-disconnectors and earthing switches for use in indoor fixed installations of traction systems.

NOTE 1 Switchgear assemblies, electromagnetic compatibility (EMC) and dependability are not covered in this standard, but rather by other parts of the IEC 61992 series or other documents as indicated in IEC 61992-1.

NOTE 2 In this standard, the word "unit" means "disconnector and/or switch-disconnector and/or earthing switch" as defined in 3.1.5, 3.1.6 and 3.1.7 of IEC 61992-1.

NOTE 3 Disconnectors, switch-disconnectors and earthing switches may have electrically latched mechanisms and, in such cases, may be indicated with the current term of "power contactors".

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.

IEC 60694:1996, *Common specifications for high-voltage switchgear and controlgear standards*

IEC 60850:2000, *Railway applications – Supply voltage of traction systems*

IEC 61992-1:2006, *Railway applications – Fixed installations – DC switchgear – Part 1: General*

IEC 61992-6:2006, *Railway applications – Fixed installations – DC switchgear – Part 6: DC switchgear assemblies*

EN 50124-1:2001, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for electrical and electronic equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61992-1 apply.

4 Service requirements

Environmental conditions applicable to the equipment discussed in this standard are covered in 4.1 of IEC 61992-1.

5 Characteristics of the unit

5.1 Enumeration of the characteristics

The characteristics of the unit and its assigned designations and values (where applicable) are covered as follows:

- type of unit (5.2);
- rated values (5.3);
- class of use (5.4);
- control circuits (5.5);
- auxiliary circuits (5.6).

5.2 Type of unit

A unit shall be defined by the following details as applicable:

- whether the unit is a switch-disconnector, disconnector, earthing switch or a combination of these types;
- number of poles;
- number of positions (if there are more than two);
- provision of an enclosure;
- degree of protection provided by the enclosure (see 3.3.29 of IEC 61992-1).

5.3 Rated values

5.3.1 General

The rated characteristic values shall be specified by the purchaser. Nominal voltage values shall be selected from the values indicated in Table 1 in IEC 61992-1; current values should have one of the preferred values in 5.1.2 of IEC 61992-1.

These values shall be confirmed by the manufacturer, who shall indicate the rated values for the type of unit proposed, and shall be complemented with other data.

All these values shall be stipulated in accordance with 5.3.2 to 5.3.4, but it is not necessary to specify all the listed rated values.

5.3.2 Voltages

A unit is defined by the following voltages:

- nominal voltage U_{n} (see IEC 60850);
- system voltages and limits (see 3.2.1.2 and 5.1.3 of IEC 61992-1);
- rated voltage U_{Ne} (see 3.2.1.4 of IEC 61992-1);
- rated insulation voltage U_{Nm} (see 3.2.1.3 of IEC 61992-1). It shall be equal to or higher than U_{max};
- rated impulse withstand voltage U_{Ni} (see 3.2.1.7 of IEC 61992-1);
- power-frequency voltage withstand level U_{a} (see 3.2.1.8 of IEC 61992-1);
- rated auxiliary and control supply voltages (see 3.2.1.5 of IEC 61992-1).

5.3.3 Currents

A unit is defined by the following currents:

– conventional thermal current I_{th}, I_{the} (see 3.2.3 and 3.2.4 of IEC 61992-1);

NOTE 1 Earthing switches are not required to be assigned this rating.

– rated service current I_{Ne} (see 3.2.5 of IEC 61992-1);

NOTE 2 Earthing switches are not required to be assigned this rating.

– rated breaking and making capacities (see 3.2.18 and 3.2.22 of IEC 61992-1);

- Switch-disconnectors and those disconnectors for which the manufacturer declares a making capacity, shall be able to make the stated prospective current at a voltage U equal to ~~1,2 ×~~ U_{Ne}.
- A rated breaking capacity requires the unit to be able to interrupt any current of a value lower than or equal to this rated breaking capacity.

– rated short-time withstand current I_{Ncw} (see 3.2.7 of IEC 61992-1);

NOTE 3 Rated short-time currents I_{Ncw} need not have the same value as the rated short-circuit current I_{Nss}.

– overload capability: the purchaser shall inform the supplier of the load cycle requirements (see 3.2.5, Note 2, of IEC 61992-1).

5.4 Class of use

Disconnectors shall close and open at no-load except if otherwise declared by the manufacturer.

Switch-disconnectors shall close and open on-load, including highly inductive loads.

Both devices shall have either electrically latched or mechanically latched mechanisms.

The minimum breaking, making and short-time withstand currents of the units shall be at least those in Table 1 for the appropriate category.

Table 1 – Categories of units

Category	Capacities (with $t_c \geq 0{,}01$ s)		Short-time withstand current	
	Making	Breaking	Current	Duration
I	0	0	I_{ncw} / I_{Ncwe}	0,25 s
II	0	I_{Ne}	I_{Ncw}	0,25 s
III	I_{Ne}	I_{Ne}	I_{Ncw}	0,25 s
IV	3 I_{Ne}	3 I_{Ne}	I_{Ncw}	0,25 s
V	I_{Nss}	0	I_{ncw} / I_{Ncwe}	0,25 s
VI	I_{Nss}	3 I_{Ne}	I_{Ncw}	0,25 s

NOTE 1 Unless otherwise specified I_{Nss} has the same rating as I_{Ncw} or, for earthing switches, I_{Ncwe}.

NOTE 2 A typical application of the above categories is the following:

Category I: Disconnector and earthing switch used in locations where the purchaser has taken all precautions to inhibit making on to a fault current.

Category II: Switch disconnector required for breaking load current only.

Category III: Switch-disconnector in series with the feeder, required for making and breaking the rated current only.

Category IV: Switch-disconnector as in III, but required for making and breaking the train starting current.

Category V: Disconnector and earthing switch used in locations where the possibility exists of an inadvertent make on to a fault current.

Category VI: Switch-disconnector as in IV, but required for making on to a fault current.

NOTE 3 For definition of t_c see 3.2.13 of IEC 61992-1.

NOTE 4 For earthing switches, refer to 8.3.4.3 of IEC 61992-6 to establish the value of I_{Ncwe} which should be 10 kA sustained as a minimum.

5.5 Control circuits

The control circuits are identified by the following:

– the voltage of the control circuits;
– the kind of current (d.c. or a.c.);
– the frequency, in case of a.c.

The voltage of the supply source and its frequency are the values on which the performance, the thermal behaviour and the insulation characteristics are based.

Unless otherwise required, the voltage shall be in accordance with 5.2 of IEC 61992-1 and the rated insulation voltage shall be in accordance with EN 50124-1.

The supply voltage shall be within a range between 85 % and 110 % of the specified voltage according to 5.2 of IEC 61992-1.

When the control voltage is the same as in the main circuit, the same variations as in the main circuit apply.

The manufacturer shall indicate the value(s) of the current drawn by the control circuits at the specified voltage. In case of control circuits which draw current intermittently, the duration of the current flow shall be given.

5.6 Auxiliary contacts and circuits

Auxiliary circuits are mainly defined by the number of contacts provided, their rating (thermal current and voltage) and by their characteristics (NO, NC or commutation). Unless otherwise required, the rated voltage shall be in accordance with 5.2 of IEC 61992-1, and the rated insulation voltage shall be in accordance with EN 50124-1.

The purchaser shall specify the minimum number of auxiliary contacts required.

The auxiliary wiring connected to a circuit at 1 000 V a.c. or 1 500 V d.c. or above shall be physically separated from those connected to a circuit at a voltage below these limits.

For other characteristics of the auxiliary circuits, the requirements of 5.5 apply.

6 Construction

6.1 General

All apparatus and connections required for the safe and satisfactory operation, control and protection of the equipment concerned, shall be provided, whether or not specifically mentioned. The equipment shall be earthed, insulated, screened or enclosed as may be appropriate to ensure the protection of the equipment and the safety of those concerned in its operation and maintenance.

Control and auxiliary circuits and contacts shall comply with the requirements of 5.2 of IEC 61992-1.

6.2 Materials

No materials containing asbestos shall be used in the construction of the units.

NOTE Special attention should be paid to the ability of the material used to resist moisture and fire: materials used should be of the self-extinguishing type, so that the risk of propagation of fire from one cubicle to another is minimised (see Annex B of IEC 61992-1).

6.3 Arcing contacts

Arcing contacts, if any, which are liable to be consumed during arc interruption shall be easy to replace.

6.4 Clearances and creepage distances

Clearances and creepage distances shall not be lower than those indicated in Table 1 of IEC 61992-1 and Annex D of IEC 61992-1 respectively.

NOTE Clearance and creepage distances may be increased to take into account the presence of foreign substances after the number of operations, in normal and short-circuit conditions, occurring during the normal life-span between cleaning procedures.

Where applicable, ribs shall be provided in order to break the continuity of conducting deposit which occurs during operation.

6.5 Primary connections

The units shall be equipped with fixed, removable (bolted or clamped) or plug-in coupling.

6.6 Location of the primary connections

For non-withdrawable units, the terminals for the primary connections shall be accessible with the unit as in its normal operating position.

For withdrawable units, the terminals for the primary connections shall be accessible in the conditions detailed in IEC 61992-6.

6.7 Earthing terminal

The frames, the structure and the fixed parts of the metallic enclosures shall be connected to each other and to a suitable earthing terminal, placed in an accessible position, in order to allow earthing.

NOTE 1 This condition may be fulfilled by normal construction elements ensuring an adequate electric continuity.

For withdrawable units, the earth connection shall be made before the shutters are opened, and the shutters shall be closed before the earth connection is disconnected.

NOTE 2 The purchaser may require a dedicated earth connection for this purpose. For non-dedicated earth connections, any bolt or similar fixing used for earth continuity, the maintenance instructions should state the requirements for cleaning the surfaces and ensuring tightness.

The earthing terminal shall be suitably protected against corrosion. The standard earth symbol shall be adequately and permanently marked.

The earthing terminal shall be capable of carrying the rated earth fault current I_{Ncwe} for 0,25 s (see 8.3.4.3 of IEC 61992-6).

6.8 Manual operation means

All units shall be provided with a manual closing handle for service, emergency and/or maintenance use as indicated in 6.13.1.

6.9 Unit enclosures

Unit enclosures shall conform with the requirements of IEC 61992-6.

6.10 Temperature-rises

6.10.1 Limits

The temperature shall not rise by more than the values given in Clause 6 of IEC 61992-1.

6.10.2 Main circuit

The main circuit of a unit, including all electrically connected parts, shall withstand its rated currents I_{Ne}, I_{th} or I_{the}. It shall also comply with the overcurrent load cycle which may be specified by the purchaser (see 3.2.5, Note 2, of IEC 61992-1).

6.10.3 Control circuit

The control circuit, as well as the control devices, used for the opening and closing operations of a unit shall not exceed the rated temperature-rise limits during their operation.

6.10.4 Auxiliary circuits

The auxiliary circuits, as well as the auxiliary devices, shall withstand their conventional thermal current (for switching devices) or their rated service current (for other equipment), without exceeding the rated temperature-rise limits.

6.11 Dielectric strength

Dielectric strength shall conform to the values stipulated in Table 1 in IEC 61992-1.