# IEC 61992-4

Edition 1.1 2015-09
CONSOLIDATED VERSION

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

colour inside

## Railway applications – Fixed installations – DC switchgear – Part 4: Outdoor d.c. disconnectors, switch-disconnectors and earthing switches

## Applications ferroviaires – Installations fixes – Appareillage à courant continu – Partie 4: Interrupteurs-sectionneurs, sectionneurs et sectionneurs de terre à courant continu, pour usage extérieur



IEC 61992-4:2006-02+AMD1:2015-09 CSV(en-fr)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 45.060

ISBN 978-2-8322-2946-0

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Edition 1.1 2015-09
CONSOLIDATED VERSION

# REDLINE VERSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

# RAILWAY APPLICATIONS – FIXED INSTALLATIONS – DC SWITCHGEAR –

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**IEC 61992-4 edition 1.1 contains the first edition (2006-02) [documents 9/889/FDIS and 9/911/RVD] and its amendment 1 (2015-09) [documents 9/2018/CDV and 9/2067/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 61992-4 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

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 4: Outdoor 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 outdoor fixed installations of traction systems.

NOTE 1 EN 50121-5 specifies requirements for electromagnetic compatibility (EMC).

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

## 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.



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

IEC 60694:1996, *Common specifications for high-voltage switchgear and controlgear standards*
Amendment 1 (2000)
Amendment 2 (2001)



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

IEC 60913, *Electric traction overhead lines*

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*

IEC 62271-102, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

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

EN 50125-2:2002, *Railway applications – Environmental conditions for equipment – Part 2: Fixed electrical installations*

## 3 Terms and definitions

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

# 4 Service requirements

The equipment covered in this standard is mainly intended for outdoor installations.

The requirements given for outdoor equipment in EN 50125-2 or in 2.1.2 of IEC 60694 may be used and IEC 60913 may be taken into account. In this standard, the pollution degree PD 4A (see EN 50124-1) is considered as a normal condition.

Where service requirements and environmental class differ from those defined in the above standards, require to be specified or a particular environmental class is required, the purchaser shall state this fact in the tender specification. The supplier shall confirm that the unit is suitable for the service requirements specified.

# 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 as follows:

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



## 5.2 Type of unit

A unit shall be defined by the following details (where 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, if any (see IEC 60529).



## 5.3 Rated values

### 5.3.1 General

The rated characteristic values shall be specified by the purchaser. Rated insulation voltage values shall be selected from the values indicated in Table 1 of 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.

The nominal voltages and the system voltages and limits shall be taken from IEC 60850. The insulation values shall be taken from Table 1 of IEC 61992-1:

– nominal voltage $U_n$ (see 3.2.1.1 of IEC 61992-1);
– system voltages and limits (see 3.2.1.2 of IEC 61992-1);
– rated voltage $U_{Ne}$ (see 3.2.1.4 of IEC 61992-1);
– rated insulation voltage $U_{Nm}$ (this value shall be equal to or higher than $U_{max}$) (see 3.2.1.3 of IEC 61992-1);
– rated impulse withstand voltage $U_{Ni}$ (see 3.2.1.7 of IEC 61992-1);
– power-frequency voltage withstand level (dry and wet) $U_a$ (see 3.2.1.8 of IEC 61992-1);
– 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.

The current values shall be selected taking into account 5.1 of IEC 61992-1:

– 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 capacity (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);
– 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 given in Table 1 for the appropriate category.

**Table 1 – Categories of units**

| Category | Capacities (with $t_c$ ≥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 $I_{Ncw}$ and $I_{Ncwe}$ for earthing switches.

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 onto a fault current.

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



### 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 the 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 remain within 85 % and 110 % of the voltage in accordance with 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(s). In the 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 or NC or commutation). 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 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 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 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 switchgear.

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 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 be not lower than those indicated in IEC 61992-1, Table 1 and Annex D respectively.

NOTE Clearances 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.

The clearance between open contacts shall be not less than indicated in Clause A.2 by reference to Table 1, of IEC 61992-1, clearance *B*. In case of units with double break, the sum of the two isolating distances in series shall exceed the minimum value required by 25 %.

### 6.5 Primary connections

The units shall be equipped with fixed or removable (bolted) connections.

### 6.6 Location of the primary connections

Their position shall be agreed between purchaser and supplier, unless covered by an IEC standard.

### 6.7 Earthing terminal

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

NOTE This condition may be fulfilled by normal constructional elements ensuring adequate electrical continuity.

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.

### 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 enclosure

Unit enclosure, when specified by the purchaser or provided by the manufacturer, shall conform with the requirements of IEC 61992-6 (indoor assemblies). In addition, the enclosure shall have a degree of protection appropriate to outdoor conditions in accordance with IEC 60529.



### 6.10 Temperature-rises

#### 6.10.1 Limits

For switch-disconnectors and disconnectors the temperature-rise shall be 30 K less than the values given in Clause 6 of IEC 61992-1.

NOTE The reduction is due to the combined effect of the solar radiation and of the increase of oxidation in open air.



An allowance of 10 K is applicable to those contacts which have successfully completed the test given in 8.3.5.

#### 6.10.2 Main circuit

The main circuit of a unit, including all electrically connected parts, shall be able to carry its rated currents $I_{Ne}$, $I_{th}$ or $I_{the}$. It shall also comply with the load cycle which may be specified by the purchaser (see 3.2.5 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-rises, 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-rises.

### 6.11 Dielectric strength

Dielectric strength shall conform to the values given in Table 1 of IEC 61992-1, taking into account that power frequency withstand values are also for wet conditions.