

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Railway applications – Fixed installations – Particular requirements for AC  
switchgear –  
Part 2: Disconnectors, earthing switches and switches with nominal voltage  
above 1 kV**

IEC 62505-2:2016

<https://standards.iteh.ai/catalog/standards/sist/a81d1306-e02b-4953-b97e->

**Applications ferroviaires – Installations fixes – Exigences particulières pour  
appareillage à courant alternatif –  
Partie 2: Sectionneurs, sectionneurs de terre et commutateurs avec tension  
nominale supérieure à 1 kV**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS – FIXED INSTALLATIONS –  
PARTICULAR REQUIREMENTS FOR AC SWITCHGEAR –****Part 2: Disconnectors, earthing switches and  
switches with nominal voltage above 1 kV**

## FOREWORD

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International Standard IEC 62505-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This standard is based on EN 50152-2.

This second edition cancels and replaces the first edition issued in 2009. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

This standard was revised to reflect the latest versions of standards referenced and to remove text already included in the IEC 62271 series. The scope was extended to include single-phase and two-phase devices. Definitions were added to provide the necessary precision and to meet the needs of railway applications. Table 1 was reworked according to the changes of

IEC 62497-1:2010, Table A.2 and Table B.1. Table 2 'Coordination table of rated values for devices' of the previous version was removed. Ratings previously given under the clause 'type tests' were moved to the new Table 2 'Mechanical endurance classes and recommended use'. Requirements for combined equipment were added to provide guidance if components of different manufacturers are used in one switching device.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/2098/FDIS	9/2134/RVD

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

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

A list of all parts of IEC 62505 series, under the general title *Railway applications – Fixed installations – Particular requirements for a.c. switchgear*, can be found on the IEC website.

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

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

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## INTRODUCTION

The IEC 62505 series under the generic title *Railway applications – Fixed installations – Particular requirements for a.c. switchgear*, is divided as follows:

- Part 1: Circuit-breakers with nominal voltage above 1 kV.
- Part 2: Disconnectors, earthing switches and switches with nominal voltage above 1 kV.
- Part 3-1: Measurement, control and protection devices for specific use in a.c. traction systems – Application guide.
- Part 3-2: Measurement, control and protection devices for specific use in a.c. traction systems – Single-phase current transformers.
- Part 3-3: Measurement, control and protection devices for specific use in a.c. traction systems – Single-phase inductive voltage transformers.

IEC 62505-2 has to be used in conjunction with IEC 62271-1:2007, IEC 62271-102:2001 and its Amendment 1:2011 and/or IEC 62271-103:2011, depending on the equipment involved.

References in subclauses of IEC 62271-1, IEC 62271-102 and IEC 62271-103 need to be replaced by references to applicable subclauses in this standard as far as reasonably possible. References in subclauses in IEC 62271-102 need to be to IEC 62271-1 instead of IEC 60694.

Where a particular clause of IEC 62271-1, IEC 62271-102 or IEC 62271-103 is not mentioned in this standard, that clause applies as far as reasonable. Where requirements relate exclusively to three-phase systems or to voltages outside those in use in traction systems, they are not applicable. Where this standard states "addition" or "replacement", the relevant text of IEC 62271-1, IEC 62271-102 and IEC 62271-103 needs to be adapted accordingly. When a clause is named applicable to both IEC 62271-102 or IEC 62271-103, then reference needs to be made only to the standard appropriate for the respective switching device.

The numbering of clauses in IEC 62271 series is not used in this Standard. The numbering in square brackets refers to the numbering of clauses in IEC 62271 series. References specific to numbering of clauses in IEC 62271-102 have the prefix '102.' and specific to IEC 62271-103 have the prefix '103.'

Where terms defined in IEC 62271 series conflict with definitions of the same terms as given in IEC 60050-811:1991, or the other railway applications documents listed in the normative references, the definitions in IEC 62271-1, IEC 62271-102 and IEC 62271-103 need to be used.

NOTE 1 The clause numbering in IEC 62271-102 and IEC 62271-103 is the same as in IEC 62271-1. Additional requirements specific to the type of switching device start with subclause numbers from 100.

NOTE 2 The suffix N which appears in this Standard for rated values is not used in IEC 62271 series.

# RAILWAY APPLICATIONS – FIXED INSTALLATIONS – PARTICULAR REQUIREMENTS FOR AC SWITCHGEAR –

## Part 2: Disconnectors, earthing switches and switches with nominal voltage above 1 kV

### 1 Scope

This part of IEC 62505 is applicable to single-pole, two-pole and three-pole alternating current (a.c.) disconnectors, earthing switches and switches which are:

- designed for indoor or outdoor fixed installations in traction systems, and
- operated with an a.c. line voltage and frequency as specified in IEC 60850.

NOTE 1 IEC 60850 specifies the a.c. traction systems:

15 kV 16,7 Hz,

12 kV 25 Hz,

12,5 kV, 20 kV also 25 kV with 50 Hz, and

12,5 kV, 20 kV, 25 kV also 50 kV with 60 Hz.

NOTE 2 As rails of a.c. traction systems are typically connected to earth and included in the return current path, all phase-to-earth voltages will be within the tolerances as specified in IEC 60850. Nevertheless, phase-to-phase voltages are sometimes higher, e.g. in autotransformer systems.

### 2 Normative references

IEC 62505-2:2016

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60850:2014, *Railway applications – Supply voltages of traction systems*

IEC 62236-5:2008, *Railway applications – Electromagnetic compatibility – Part 5: Emission and immunity of fixed power supply installations and apparatus*

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications*

NOTE IEC 62271-1 A1:2011 is not referenced. It refers to voltage levels beyond those used in railway systems.

IEC 62271-102:2001, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*  
Amendment 1:2011

NOTE IEC 62271-102 A2:2013 is not referenced. It refers to voltage levels beyond those used in railway systems.

IEC 62271-103:2011, *High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV*

IEC 62497-1:2010, *Railway applications – Insulation co-ordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*  
Amendment 1:2013



IEC 62498-2:2010, *Railway applications – Environmental conditions for equipment – Part 2: Fixed electrical installations*

IEC 62505-1:2016, *Railway applications – Fixed installations – Particular requirements for a.c. switchgear – Part 1: Circuit breakers with nominal voltage above 1 kV*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given IEC 62271-1:2007, IEC 62271-102:2001 and IEC 62271-103:2011 as well as the following apply.

NOTE The index of definitions is the same as in 3.8 of IEC 62271-103:2011, but amended according to the definitions below and those of IEC 62271-102:2001, Clause 3.

#### 3.1

##### **switching device**

general term covering disconnectors, earthing switches and switches

Note 1 to entry: This definition of 'switching device' is limited to this standard. It is possible that there are different or more comprising uses in other parts of the IEC 62505 and IEC 62271 series (e.g. in IEC 62271-1, 3.1.1).

#### 3.2

##### **single-pole switching device**

switching device with one electrically separated conducting path for the main circuit suitable for use in a single phase circuit

#### 3.3

##### **two-pole switching device**

switching device with two independent electrically separated conducting paths for the main circuit

Note 1 to entry: In some cases, the two paths are connected in series for use in a single-phase circuit where the establishment of the two paths is simultaneous.

Note 2 to entry: This device allows to interrupt or establish simultaneously a single-phase circuit in two different points.

#### 3.4

##### **three-pole switching device**

switching device with three independent electrically separated conducting paths for the main circuit

Note 1 to entry: Three-pole switching devices allow to simultaneously disconnect phase and earth connections in AT systems.

#### 3.5

##### **combined switching device**

switching device where the main circuit of the switching device, the operating link and operating drive may be used in combination with those from different manufacturers

Note 1 to entry: This is common practice in some countries especially for mast switches.

#### 3.6

##### **nominal voltage**

$U_n$

suitable approximate voltage value used to designate or identify a given supply system

Note 1 to entry: This value is also assigned to the switching device to show its usability in the supply system.

Note 2 to entry: An AT-System which is supplied with 2 phases, having a phase shift of 180° between them, is commonly named  $2 \times U_n$  according to the  $U_n$  supplied to the catenary system.

[SOURCE: IEC 62497-1:2010, 3.4.1]

### 3.7 rated voltage

$U_{ne}$   
value of voltage assigned by the manufacturer to the equipment or part of it and to which operating and performance characteristics are referred

Note 1 to entry: This value is also used to determine its dielectric characteristics and will be used instead of the rated insulation voltage ( $U_{Nm}$ ) as defined and used in IEC 62497-1.

Note 2 to entry: The abbreviation  $U_r$  is not used for railway switching devices.

[SOURCE: IEC 62497-1:2010, 3.4.3, modified: "to a component, device or equipment" replaced by "equipment or part of it"]

### 3.8 Over Voltage category OV

classification of the circuit protection against internal and external overvoltages

### 3.9 Pollution Degree PD

classification of the pollution to be considered due to the micro climate

### 3.10 line

general term covering the catenary and bare feeder conductors in fixed installations

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Note 1 to entry: This definition is added, as line is understood in most cases as HV transmission line.

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## 4 Normal and special service conditions [2]

Clause 2 of IEC 62271-1:2007 is applicable except as follows:

The preferred values of minimum ambient air temperature under normal service conditions for indoor switching devices are  $-5\text{ °C}$ ,  $-15\text{ °C}$  and  $-25\text{ °C}$ .

NOTE 1 These values are the same as in IEC 62271-1.

The typical value for indoor switching devices is  $-5\text{ °C}$ . Nevertheless it needs to be considered that more severe conditions could occur in rare cases and equipment design is most likely similar to outdoor equipment.

For special service conditions, agreement shall be made between purchaser and supplier. IEC 62498-2:2010 should be taken as guidance to select appropriate classifications.

NOTE 2 The altitude reference of IEC 62497-1 (up to 2 000 m) applies to insulation coordination only and is not considered in this standard.

## 5 Rating [4]

### 5.1 General

Clause 4 of IEC 62271-102:2001 and IEC 62271-103:2011 is applicable except as follows:

## 5.2 Nominal voltage ( $U_n$ )

The standard voltages of nominal voltages  $U_n$  shall be one of the voltages listed in Table 1 or Table B.1 of IEC 60850:2014.

## 5.3 Rated voltage ( $U_{Ne}$ ) [4.1]

Subclause 4.1 of IEC 62271-1:2007 is replaced by the following:

The rated voltage  $U_{Ne}$  shall be chosen taking into consideration the maximum voltage level suitable to be permanently applied to the switching device (i.e. highest permanent voltage  $U_{max1}$  as defined in IEC 60850:2014).

The value of  $U_{Ne}$  shall be used whenever IEC 62271-1:2007, IEC 62271-102:2001 or IEC 62271-103:2011 reference to  $U_r$  unless another value is named explicitly.

NOTE 1 The insulation characteristics determined by applying  $U_{max1}$  are expected to be suitable to allow the highest non-permanent voltage  $U_{max2}$  taken from IEC 60850.

NOTE 2 The rated voltage for fixed installations in railway applications is a phase-to-earth value.

## 5.4 Insulation coordination

### 5.4.1 General

Insulation coordination shall be conducted according to IEC 62497-1:2010, e.g. selection of values for overvoltage category (OV) and pollution degree (PD).

The rated voltage  $U_{Ne}$  shall be used when IEC 62497-1:2010 refers to the rated insulation voltage  $U_{Nm}$ .

[IEC 62505-2:2016](https://standards.iteh.ai/catalog/standards/sist/a81d1306-e02b-4953-b97e-165a1810/iec-62505-2-2016)

The definition of the four overvoltage categories shall be as in IEC 62497-1:2010, 4.2.3.2.

The definition of the seven pollution degrees shall be as in IEC 62497-1:2010, 4.4 and Table A.4.

### 5.4.2 Rated insulation level [4.2]

Subclause 4.2 of IEC 62271-102:2001 and IEC 62271-103:2011 is applicable except as follows:

The values of the rated impulse withstand voltage  $U_{Ni}$  and of the power-frequency withstand voltage  $U_d$  shall be as given in Table 1, taken from the values listed in IEC 62497-1:2010.

**Table 1 – Nominal voltages ( $U_n$ ), rated impulse voltages ( $U_{Ni}$ ) and short-duration power-frequency withstand voltage ( $U_d$ ) for circuits connected to the contact line**

$U_n$ kV	$U_{Ne}$ kV	OV	Common value		Across the isolating distance	
			$U_{Ni}$ kV	$U_d$ kV	$U_{Ni}$ kV	$U_d$ kV
<b>IEC 60850: 2014</b>	<b>IEC 62497-1:2010 Table B.1</b>				<b>IEC 62271-1:2007 Table 1a</b>	
15	17,25	3 <sup>a</sup>	95	38 <sup>b</sup>	110	50 <sup>c</sup>
		4	125	50	145	60
	17,25 <sup>d</sup>	3 <sup>a</sup>	145	70	165	80
		4	170	70 <sup>b</sup>	195	95 <sup>c</sup>
20 <sup>e</sup>	24 <sup>e</sup>	3	125	50	145	60
		4	150 <sup>c</sup>	50 <sup>c</sup>	175 <sup>c</sup>	60 <sup>c</sup>
25	27,5	3	170	70 <sup>b</sup>	200 <sup>f</sup>	95 <sup>f</sup>
		4	200	95	220 <sup>g</sup>	110 <sup>c</sup>
	27,5 <sup>d</sup>	3	200	95	220 <sup>g</sup>	110 <sup>c</sup>
		4	250	95	290	110
	30 <sup>e</sup>	3	170	70 <sup>b</sup>	195	80
		4	200	70 <sup>c</sup>	230 <sup>c</sup>	80 <sup>c</sup>
	30 <sup>e, h</sup>	4	325	140	375	160

NOTE The rated short-duration power-frequency withstand voltage is represented by  $U_d$  as used in IEC 62271-1 not by  $U_a$  as used in IEC 62497-1.  $U_a$  is used in IEC 62271-1 for the rated auxiliary voltage.

<sup>a</sup> Not commonly used.

<sup>b</sup> Values taken from Table 1a of IEC 62271-1:2007 as being well-established practice.

<sup>c</sup> Values taken from experience and being well-established practice.

<sup>d</sup> For higher requirements on insulation system. This is common practice in some countries with larger number of installations at altitude up to 2 000 m without additionally applying an altitude correction factor.

<sup>e</sup> Values taken from Table B.1 of IEC 60850:2014.

<sup>f</sup> Values taken from Table B.1 of IEC 62497-1:2010.

<sup>g</sup> Values taken from Table 1b of IEC 62271-1:2007 as being well-established practice.

<sup>h</sup> For higher requirements on insulation in systems with a phase shift of 180°. Increased test voltages could be favourable for these terminals (e. g. between phases of an AT-system with  $U_n = 25$  kV).

All test voltages for dielectric tests on the main circuit shall be taken from Table 1.

### 5.5 Rated frequency [4.3]

Subclause 4.3 of IEC 62271-1:2007 is applicable.

### 5.6 Rated supply voltage of closing and opening devices and of auxiliary and control circuits ( $U_a$ ) [4.8]

Subclause 4.8 of IEC 62271-1:2007 is applicable with the following addition.

The relative tolerance as specified in 4.8.3 of IEC 62271-1:2007 does not apply to a.c. power supplies fed from a transformer connected to the traction line voltage. This tolerance shall be agreed upon between purchaser and supplier.