
Železniške naprave - Stabilne naprave električne vleke - Posebne zahteve za stikalne naprave za izmenični tok - 4. del: Stikalne naprave za izmenični tok v kovinskih ohišjih vlečnih sistemov

Railway applications - Fixed installations - Particular requirements for AC switchgear - Part 4: AC metal-enclosed traction switchgear

Bahnanwendungen - Ortsfeste Anlagen - Besondere Anforderungen an Wechselstrom-Schaltanlagen - Teil 4: Metallgekapselte Wechselstrom-Bahnschaltanlagen

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Applications ferroviaires - Installations fixes - Exigences particulières pour appareillage à courant alternatif ? Partie 4: Appareillage ferroviaires sous enveloppe métallique pour courant alternatif

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European foreword

This document (CLC/TS 50152-4:2021) has been prepared by CLC/SC 9XC “Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations)”.

CLC/TS 50152-4:2021 has been elaborated to set out requirements for AC metal-enclosed switchgear and controlgear which are operated at traction system voltages 15 kV 16,7 Hz or 25 kV 50 Hz named traction switchgear in this document.

The EN 50152 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 — Devices;*
- *Part 3-2: Measurement, control and protection devices for specific use in a.c. traction systems — Current transformers;*
- *Part 3-3: Measurement, control and protection devices for specific use in a.c. traction systems — Voltage transformers.*
- *Part 4: AC metal-enclosed traction switchgear.*

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

CLC/TS 50152-4:2021 (E)**Introduction**

This document needs to be read in conjunction with EN 62271-1:2017 and EN IEC 62271-200:2021.

Where a particular clause of EN IEC 62271-200:2021 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 EN IEC 62271-200:2021 needs to be adapted accordingly.

The numbering of clauses in the EN 62271 series is not used in this document. For easier understanding the numbering of clauses in EN IEC 62271-200:2021 is given in square brackets.

Where terms defined in EN 62271-1:2017 and EN IEC 62271-200:2021 conflict with definitions of the same terms as given in IEC 60050-811:1991 or of the other railway application documents listed in the normative references, the definitions in EN 62271-1:2017 and EN IEC 62271-200:2021 need to be used.

The term ‘traction switchgear’ is used whenever EN 62271 series uses ‘switchgear and controlgear’, except for headlines which are kept.

NOTE The suffix N which appears in this standard for rated values is not present in EN 62271-1:2017 and EN IEC 62271-200:2021.

References in subclauses of EN 62271-1:2017 and EN IEC 62271-200:2021 need to be replaced by references to applicable subclauses in this document as far as reasonably possible.

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1 Scope

This document specifies requirements for prefabricated metal-enclosed traction switchgear for alternating current with traction voltages and frequencies as specified in EN 50163:2004 and used in indoor and outdoor installations. Enclosures may include fixed and removable components and may be filled with fluid (liquid or gas) to provide insulation.

NOTE 1 EN 50163 specifies the AC traction systems 15 kV 16,7 Hz and 25 kV 50 Hz.

NOTE 2 This document applies to single-phase or two-phase systems.

For metal-enclosed traction switchgear containing gas-filled compartments, the design pressure is limited to a maximum of 300 kPa (relative pressure).

NOTE 3 EN 62271-203 can be used as a guide for design and testing in case the design pressure of gas-filled compartments exceeds 300 kPa (relative pressure).

Components contained in metal-enclosed traction switchgear are to be designed and tested in accordance with their various relevant standards. This document supplements the standards for the individual components regarding their installation in traction switchgear assemblies.

This document does not preclude that other equipment may be included in the same enclosure. In such a case, any possible influence of that equipment on the traction switchgear is to be taken into account.

NOTE 4 Traction switchgear having an insulation enclosure is covered by EN 62271-201. For definition see there or IEC 441-12-06.

2 Normative references

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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.

EN 50121-5:2017, *Railway applications - Electromagnetic compatibility - Part 5: Emission and immunity of fixed power supply installations and apparatus*

EN 50124-1:2017, *Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*

EN 50152-1:2012, *Railway applications - Fixed installations - Particular requirements for alternating current switchgear - Part 1: Circuit-breakers with nominal voltage above 1 kV*

EN 50152-2:2012, *Railway applications - Fixed installations - Particular requirements for alternating current switchgear - Part 2: Disconnectors, earthing switches and switches with nominal voltage above 1 kV*

EN 50163:2004, *Railway applications - Supply voltages of traction systems*

EN 62271-1:2017, *High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear*

EN IEC 62271-200:2021, *High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV (IEC 62271-200:2021)*

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3 Terms and definitions**[3]**

For the purposes of this document, the terms and definitions given in EN 50152-1:2012, EN 50152-2:2012, EN 62271-1:2017, EN IEC 62271-200:2021 and the following apply.

3.1**traction switchgear****<AC>**

metal-enclosed high-voltage switchgear operated at an AC-supply voltage of traction systems according to EN 50163:2004

3.2**basic current****<of traction switchgear>** I_B

current value of the main circuit which is assumed to last for longer periods and represents the load carried continuously by the traction switchgear assembly and on which the overloads are imposed

[SOURCE: EN 50329:2003, 1.3.13, modified – application <for traction switchgear> has been added, “(I_{BL} , I_{BP} , I_{BS} , I_{BV} , I_{BGL} , I_{BGS})” has been replaced by “ I_B ”, “in a winding” has been replaced by “of a main circuit”, “according to a given duty class (see 1.3.18)” has been deleted, “transformer” has been replaced by “switchgear assembly” and “By consequence are defined” has been removed]

3.3**duty class**

conventional classification of the current capability of traction switchgear expressed in per unit of the basic current (I_B)

Note 1 to entry: The duty classes, associated with other rated values, define the characteristics of the traction switchgear.

[SOURCE: EN 50329:2003, 1.3.19, modified – “transformer” has been replaced by “switchgear”, Second sentence moved to a new Note to entry and “transformer” has been replaced by “switchgear”, “Annex A indicates preferred duty classes and the corresponding basic and rated values” has been removed and NOTE has been removed]

4 Normal and special service conditions**[4]**

EN 62271-1:2017, Clause 4 is applicable with the following addition:

Unless otherwise specified in this standard, the traction switchgear is designed to be used under normal service conditions.

For special service conditions, agreement shall be made between purchaser and supplier. EN 50125-2:2002 should be taken as guidance for the selection of appropriate classifications.

NOTE 1 The altitude reference condition is 1 000 m as per EN 62271-1. The altitude reference of EN 50124-1 (up to 2 000 m) applies to insulation coordination only and is not considered as a reference condition in this document.

NOTE 2 EN 50125-2:2002 uses classifications of EN 60721-3-3:1995 and EN 60721-3-4:1993 which have been revised in 2019. Some classifications of EN 50125-2 are only available in the older versions.

5 Ratings [5]

5.1 General [5.1]

EN IEC 62271-200:2021, Clause 5 is applicable with the following modifications given hereafter and in 5.2 to 5.10.

NOTE 1 References in this document typically name EN IEC 62271-200:2021. Nevertheless clauses of EN IEC 62271-200:2021 normally contain references to EN 62271-1 and specify the deviations to it.

EN IEC 62271-200:2021, 5.1 is replaced by the following:

The ratings of traction switchgear are the following:

- a) nominal voltage (U_n) and number of poles;
 - b) rated voltage (U_{Ne});
 - c) rated insulation level (U_{Ni} and U_d);
 - d) rated frequency (f_r);
 - e) rated continuous current (I_r);
 - f) rated short-time withstand current (I_k);
 - g) rated peak withstand current (I_p);
 - h) rated duration of short circuit (t_k , t_e) (for main and earthing circuits);
 - i) rated supply voltage of auxiliary and control circuits (U_a);
 - j) rated supply frequency of auxiliary and control circuits;
 - k) rated values of the components forming part of the traction switchgear including their operating devices and auxiliary equipment;
 - l) rated pressure of compressed gas supply for controlled pressure systems;
 - m) rated filling level (of fluid-filled compartments);
- Optional ratings:
- n) rated voltage for AC cable test voltage (U_{ct} (AC));
 - o) rated voltage for DC cable test voltage (U_{ct} (DC));
 - p) rated duration for DC cable test voltage, (t_{ct} (DC));
 - q) basic current (I_B) and duty class;
 - r) ratings of the internal arc classifications (IAC).

5.2 Nominal voltage (U_n)

The standard values of nominal voltage U_n are 15 kV and 25 kV as listed in EN 50163:2004, Table 1.

CLC/TS 50152-4:2021 (E)**5.3 Rated voltage (U_{Ne})****[5.2]**

EN IEC 62271-200:2021, 5.2 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 traction switchgear (e.g. highest permanent voltage U_{max1} as defined in EN 50163:2004).

The value of U_{Ne} shall be used whenever EN 62271-1:2017 or EN IEC 62271-200:2021 reference U_r unless another value is named explicitly.

NOTE 1 The rated voltage for fixed installations in railway applications is a phase-to-earth value. This also applies to AT systems having a system voltage of $2x U_n$.

NOTE 2 Making and breaking also under out-of-phase situations applies to conventional and AT systems. They are specified in EN 50152-1.

NOTE 3 Components forming part of traction switchgear may have individual values of rated voltage in accordance with their relevant standards.

5.4 Insulation coordination**5.4.1 General**

Insulation coordination shall be conducted according to EN 50124-1:2017 e.g. selection of values for Over Voltage category (OV) and Pollution Degree (PD).

The rated voltage U_{Ne} shall be used when EN 50124-1:2017 refers to the rated insulation voltage U_{Nm} .

NOTE The insulation characteristics determined by applying U_{max1} are expected to be suitable to allow the highest non-permanent voltage U_{max2} taken from EN 50163.

The definition of the four overvoltage categories shall be as in EN 50124-1:2017, 4.2.3.2.

The definition of the seven pollution degrees shall be as in EN 50124-1:2017, 4.4 and Table A.4. The typical pollution degrees of the locations to install traction switchgear are:

- for indoor switchgear: PD3
- for outdoor switchgear: PD4A

The location of the switchgear may provide different environmental conditions and pollution degrees need to be adapted accordingly, please refer to EN 50124-1:2017, Table E.1

The inside of the switchgear may provide different environmental conditions e.g. by the degree of ingress protection (IP class) and pollution degrees may be adapted accordingly.

5.4.2 Rated insulation level**[5.3]**

EN 62271 1:2017, 5.3 is replaced by the following:

The value 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 EN 50124-1:2017.

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	U_{Ni} (kV)	U_d (kV)
15	17,25	4	125	50
	17,25 ^a	4	170	70
25	27,5	3	170	70
		4	200	95
	27,5 ^a	3	200	95
		4	250	95

NOTE The rated short-duration power-frequency withstand voltage is represented by U_d as used in EN 62271-1:2017 not by U_a as used in EN 50124-1:2017. U_a is used in EN 62271-1:2017 for the rated auxiliary voltage.

^a For more demanding 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.

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

5.5 Rated frequency (f_r)

[5.4]

EN IEC 62271-200:2021, 5.4 is replaced by the following:

The standard values of the rated frequency are 16,7 Hz and 50 Hz as listed in EN 50163:2004, Table 1.

5.6 Currents in normal operation

5.6.1 Rated continuous current (I_r)

[5.5]

EN IEC 62271-200:2021, 5.5 is applicable.

5.6.2 Basic current (I_B) and duty class

Manufacturers should also assign one or more sets of basic current (I_B) and duty class to the traction switchgear.

NOTE 1 Traction switchgear is subject to loads with significant and rapid variations in amplitude and duration. Assigning of basic current (I_B) and duty class can support adequate selection of traction switchgear in relation to the traction load.

Any value may be selected as basic current (I_B).

NOTE 2 Values for current ratings are typically selected from the R 10 series, specified in IEC 60059. For traction switchgear this unnecessarily reduces the possibilities of selecting a basic current (I_B) in conjunction with a rated continuous current (I_r) and is therefore not deemed adequate.

Table 2 gives the preferred duty classes for the design of traction switchgear.