



SLOVENSKI STANDARD SIST EN 50327:2003

01-december-2003

Železniške aplikacije - fiksne naprave - Harmonizacija vrednot za pretvorniške skupine in preskušanja na pretvorniških skupinah

Railway applications - Fixed installations - Harmonisation of the rated values for converter groups and tests on converter groups

Bahnanwendungen - Ortsfeste Anlagen - Harmonisierung der Bemessungswerte von Stromrichtergruppen und Prüfungen von Stromrichtergruppen

Applications ferroviaires - Installations fixes - Harmonisation des valeurs assignées et des essais sur les groupes convertisseurs

<https://standards.iteh.ai/catalog/standards/sist/f81cfe22-4d99-4aa2-9cc4-608476b68352/sist-en-50327-2003>

Ta slovenski standard je istoveten z: EN 50327:2003

ICS:

29.200	W{ ^!} ä äÜ!^ç[!] ä ä Ùæäã äæ [Á^\ dã] } ä äæ ð	Rectifiers. Convertors. Stabilized power supply
29.280	Ò^\ dã } ää ^ } ää] !^ { æ	Electric traction equipment

SIST EN 50327:2003 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50327:2003

<https://standards.iteh.ai/catalog/standards/sist/f81cf22-4d99-4aa2-9cc4-608476b68352/sist-en-50327-2003>

EUROPEAN STANDARD

EN 50327

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2003

ICS 29.200; 29.280

English version

**Railway applications –
Fixed installations –
Harmonisation of the rated values for converter groups
and tests on converter groups**

Applications ferroviaires –
Installations fixes –
Harmonisation des valeurs assignées et
des essais sur les groupes convertisseurs

Bahnanwendungen –
Ortsfeste Anlagen –
Harmonisierung der Bemessungswerte
von Stromrichtergruppen und Prüfungen
von Stromrichtergruppen

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50327:2003

<https://standards.iteh.ai/catalog/standards/sist/f81cf22-4d99-4aa2-9cc4-3441008130/sist-en-50327-2003>
This European Standard was approved by CENELEC on 2002-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (fixed installations) of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50327 on 2002-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-05-01

Annexes designated “informative” are given for information only. In this standard, annexes A, B and C are informative.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 50327:2003](https://standards.iteh.ai/catalog/standards/sist/f81cfe22-4d99-4aa2-9cc4-608476b68352/sist-en-50327-2003)

<https://standards.iteh.ai/catalog/standards/sist/f81cfe22-4d99-4aa2-9cc4-608476b68352/sist-en-50327-2003>

Contents

Introduction	4
1 Scope	5
2 Normative references	5
3 Definitions, symbols and abbreviations	6
3.1 Basic connections of converter groups	6
3.2 Symbols	8
3.3 Definitions	9
4 Service conditions	13
5 General requirements for converter groups	13
5.1 Voltage requirements	13
5.2 Current demand	14
5.3 Short circuit requirements	14
5.4 Insulation levels	14
6 Relationships among parameters of the items of a converter group	15
6.1 General	15
6.2 Theoretical relationships	15
7 Tests suitable to verify the correct performance of the converter group	17
7.1 General	17
7.2 Performance of tests	17
7.3 Test schedule	17
7.4 Loss determination for the converter group	17
7.5 Power factor measurement	17
7.6 Measurement of the inherent voltage drop	18
7.7 Short circuit test	18
Annex A (informative) Short circuit currents	19
Annex B (informative) Examples of power factors of converter groups with d.c. output	24
Annex C (informative) Interbridge reactor	26
Bibliography	28
Figure 1 – Diagrams of converter groups and related quantities	7
Figure 2 – Typical arrangement of an a.c./d.c. group with auxiliary services transformer	8
Figure A.1 – Example of transient current under short circuit for a 12-pulse converter	21
Figure A.2 – Example of transient current on the most charged arm	21
Figure A.3 – External characteristic for connection 7 (single-phase bridge)	22
Figure A.4 – External characteristic for connection 8 (three-phase bridge)	22
Figure A.5 – External characteristic for connections 9 and 12 (double three-phase bridge)	23
Figure C.1 – Interbridge reactor	26
Table 1 – Components of a converter group	5
Table 2 – Theoretical relationships for line commutated converters	16
Table 3 – Relationship valid in most cases between basic and rated current	16
Table 4 – Summary of tests	17
Table A.1 – Formulae for k_{dc}	19
Table A.2 – Typical values for k_{dc}	20

Introduction

Converters, traction transformers and switchgear are ordered in most cases as individual items and are tested in manufacturer's premises as such.

It is evident that tuning is necessary to choose compatible ratings and that certain performances cannot be verified (through additional or investigation type tests) unless at least the traction transformer and the converter are coupled together.

That is the reason for this document.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 50327:2003](https://standards.iteh.ai/catalog/standards/sist/f81cfe22-4d99-4aa2-9cc4-608476b68352/sist-en-50327-2003)

<https://standards.iteh.ai/catalog/standards/sist/f81cfe22-4d99-4aa2-9cc4-608476b68352/sist-en-50327-2003>

1 Scope

This European Standard provides requirements for some type tests which are significant only when made on the entire group.

It provides also a basic relationship between compatible ratings of traction transformer and converter(s), in order to provide minimum requirements for the choice of their ratings.

Moreover it gives the minimum values to be considered in order to choose switching devices with characteristics suitable for the converter group(s) involved.

Annexes provide useful information as a guide for the group designer.

Table 1 indicates the components of a converter group and the relevant applicable standards.

Table 1 - Components of a converter group

Component	Standard
Converter	EN 50328
Traction transformer	EN 50329
Interbridge reactor	EN 60289 and informative annex D
Reactors	EN 60289
Transducers	EN 50123-7-1 EN 50123-7-2
Instrument transformers (as applicable)	EN 50152-3-2 / EN 50152-3-3 EN 60044 series
Control devices	as applicable
Busbars and connections	as applicable

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50123-7-1	2003	Railway applications – Fixed installations – D.C. switchgear Part 7-1: Measurement, control and protection devices for specific use in d.c. traction systems - Application guide
EN 50123-7-2	2003	Railway applications – Fixed installations – D.C. switchgear Part 7-2: Measurement, control and protection devices for specific use in d.c. traction systems - Isolating current transducers and other current measuring devices
EN 50125-2	2002	Railway applications – Environmental conditions for equipment – Part 2: Fixed electrical installations

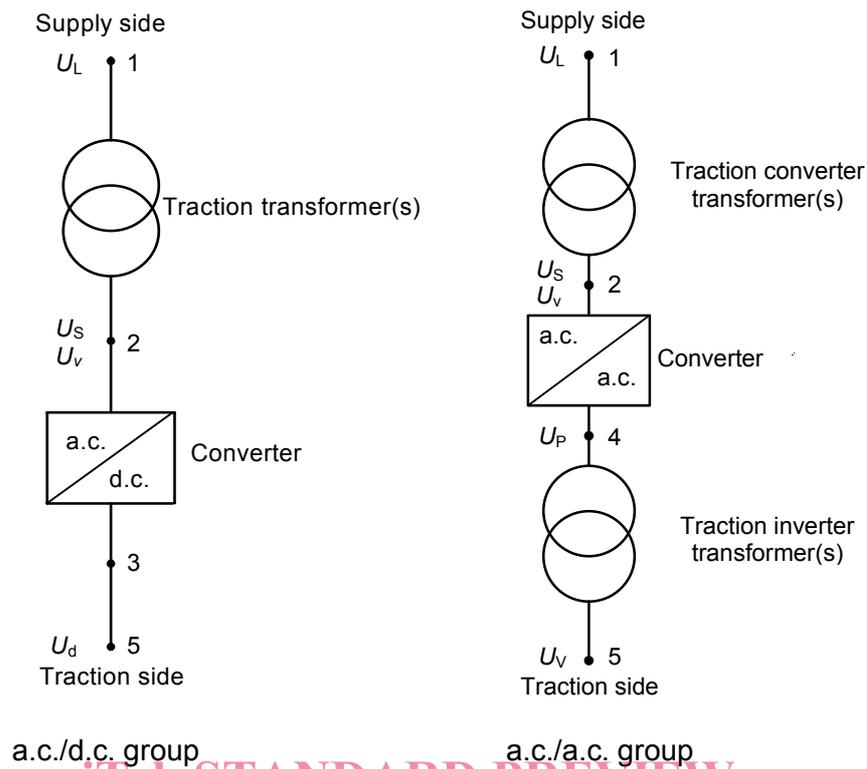
EN 50152-3-2	2001	Railway applications – Fixed installations - Particular requirements for a.c. switchgear – Part 3-2: Measurement, control and protection devices for specific use in a.c. traction systems - Single-phase current transformers
EN 50152-3-3	2001	Railway applications – Fixed installations - Particular requirements for a.c. switchgear – Part 3-3: Measurement, control and protection devices for specific use in a.c. traction systems - Single-phase inductive voltage transformers
EN 50163	1995	Railway applications – Supply voltages of traction systems
EN 50328	2003	Railway applications – Fixed installations – Electronic power converters for substations
EN 50329	2003	Railway applications – Fixed installations – Traction transformers
EN 60044	Series	Instrument transformers (IEC 60044 series, mod.)
EN 60076	Series	Power transformers (IEC 60076 series, mod.)
EN 60289	1994	Reactors (IEC 60289:1988, mod.)
EN 61000-2-12	¹⁾	Electromagnetic compatibility (EMC) Part 2-12: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public medium-voltage power supply systems
IEC 60050-811	1991	International Electrotechnical Vocabulary (IEV) Chapter 811: Electric traction
IEC/TR 60146-1-2	1991	Semiconductor convertors – General requirements and line commutated convertors Part 1-2: Application guide

3 Definitions, symbols and abbreviations

3.1 Basic connections of converter groups

For the purpose of this standard it is given a schematic overview of the various types of converter groups as far as the main components are concerned. The various types of converter groups are schemed in Figure 1 and Figure 2.

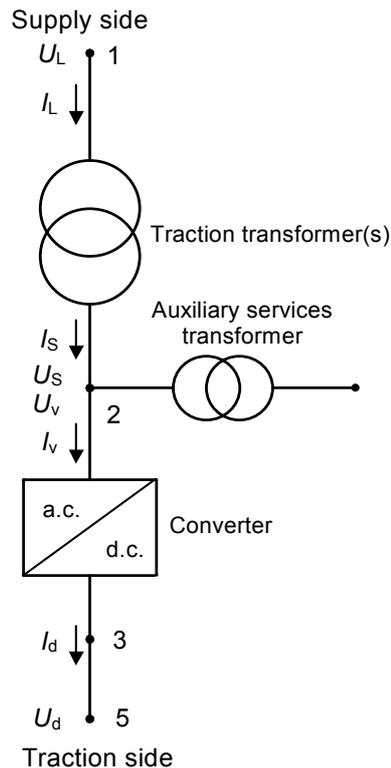
¹⁾ To be polished.



Point	Rated voltage(s)	Rated current	Basic current	Rated service current	Basic service current
1: Supply-side	U_{NL}	I_{NL}	I_{BL}	I_{NGL}	I_{BGL}
2: Transformer output	U_{NS}	I_{NS}	I_{BS}	I_{NGS}	I_{BGS}
2: Converter input	U_{Nv}	I_{Nv}	I_{Bv}	I_{NGv}	I_{BGv}
3: a.c./d.c. converter output	$U_{Nd} (U_{di} U_{di\alpha})$	I_{Nd}	I_{Bd}	n.a.	n.a.
4: a.c./a.c. or d.c./a.c. converter output	U_{NP}	I_{NP}	I_{BP}	n.a.	n.a.
5: a.c. traction-side	U_{NV}	I_{NV}	I_{BV}	n.a.	n.a.
5: d.c. traction-side	$U_{Nd} (U_{di} U_{di\alpha})$	I_{Nd}	I_{Bd}	n.a.	n.a.

NOTE 1 "input" - "output" are referred to the normal flow of the current.
n.a. = not applicable (not significant).

Figure 1 - Diagrams of converter groups and related quantities



iTeh STANDARD PREVIEW (standards.i-teh.ai)

NOTE Connection point 2 is separately indicated as transformer output and as converter input. In effect, it is possible that a connection is present for auxiliary supplies or that other circuit components are interposed.

SIST EN 50327:2003

Figure 2. Typical arrangement of an a.c./d.c. group with auxiliary services transformer

3.2 Symbols

f_N rated frequency

I_{Bd} basic d.c. current on the output or intermediate side of a converter group

I_{BGL} basic service current on the supply-side of the converter group

I_{BGS} basic service current on the converter side of a traction converter transformer

I_{BGv} basic service current on the supply side of a traction converter

I_{BL} basic current on the supply-side of a converter group

I_{BP} basic current on the inverter-side of a traction inverter transformer

I_{BS} basic current on the converter side of a traction converter transformer

I_{BV} basic current on the transformer side of a traction converter

I_{Bv} basic a.c. current on the traction side of a traction converter group

I_{Nd} rated d.c. current on the traction side of a converter group

I_{NGL} rated service current on the supply-side of a converter group

I_{NGS} rated service current on the converter side of a traction converter transformer

I_{NGv} rated service current on the supply side of a traction converter

I_{NL} rated current on the supply-side of a converter group

I_{NP} rated current on the inverter-side of a traction inverter transformer

I_{NV}	rated a.c. current on the traction side of a converter group
I_{NV}	rated current on the transformer side of a traction converter
I_{NS}	rated current on the converter side of a traction converter transformer
K	coupling factor
k_{dx}	conventional load ratio
S_{NL}	rated power of the supply side winding of a traction transformer
S_{NP}	rated power of the inverter side winding of an inverter transformer
S_{NSn}	rated power of a winding in a traction transformer
S_{NV}	rated power of the traction side winding(s) of an inverter transformer
U_{di}	ideal no-load direct voltage
$U_{di\alpha}$	controlled ideal no-load direct voltage
U_{d0}	conventional no-load direct voltage
U_{d00}	real no-load direct voltage
U_{max1}	highest permanent voltage
U_{Nd}	rated direct voltage
U_{nd}	nominal voltage
U_{NL}	rated voltage on the supply side of a converter group
U_{NP}	rated voltage on the inverter side of a traction inverter transformer
U_{NS}	rated voltage on the converter side(s) of a traction converter transformer
U_{NV}	rated a.c. voltage on the traction side(s) of an inverter transformer
U_{NV}	rated a.c. voltage on the supply side of a converter
Ψ	power factor ratio

3.3 Definitions

For the purpose of this European Standard the following definitions apply:

3.3.1

converter group

the chain consisting of the traction transformer and the associated converter

3.3.2

traction transformer

transformer connected to an a.c. or d.c. contact line, directly or through a converter, used in fixed installations of railway applications

3.3.2.1

traction converter transformer

traction transformer on the supply side of a converter group and supplying contact line(s) through static converter(s)

3.3.2.2

traction inverter transformer

traction transformer on the traction (contact line) side of a converter group and supplied by a static converter(s) (inverter)

3.3.3

electronic power converter

operative unit for power conversion comprising one or more assemblies of semiconductor devices

3.3.4

rated value

numerical value for the electrical, thermal, mechanical and environmental rating assigned to the quantities which define the operation of a converter group in the conditions specified in accordance with this European Standard and on which the supplier's guarantees and tests are based

3.3.5

rated frequency (f_N)

frequency on either side of the converter group for the conversion of which the converter group is designed to operate

3.3.6

rated voltage on the supply-side of a converter group (U_{NL})

r.m.s. value of the sinusoidal no-load voltage assigned to be applied to the supply-side terminals of a converter group (standards.iteh.ai)

3.3.7

rated voltage on the converter side(s) of a traction converter transformer (U_{Ns})

r.m.s. value of the no-load voltage at the line-to-line terminals of the converter side(s) of a traction converter transformer, at the rated voltage on the supply side of the traction transformer

3.3.8

rated a.c. voltage on the supply side of a converter (U_{Nv})

r.m.s. value of the no-load voltage between vectorially consecutive commutating phase terminals of a commutating group, at the rated voltage on the supply side of the traction converter transformer

3.3.9

rated voltage on the inverter side of a traction inverter transformer (U_{Np})

r.m.s. value of the sinusoidal no-load voltage resulting at the inverter side terminals of a traction transformer

3.3.10

rated voltage on the traction side(s) of an inverter transformer (U_{Nv})

r.m.s. value of the no-load voltage at the line-to-line terminals of the traction side(s) of an inverter transformer at the rated voltage on its inverter side

3.3.11

ideal no-load direct voltage (U_{di})

theoretical no-load mean direct voltage of a converter, assuming no reduction by phase control, no voltage drop in the assemblies and no voltage rise at small loads (see 1.5.26.1 of EN 50328)