



INTERNATIONAL STANDARD

**Railway applications – Fixed installations – Particular requirements for AC
switchgear –
Part 3-3: Measurement, control and protection devices for specific use in AC
traction systems – Voltage transformers**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 45.060.01

ISBN 978-2-8322-7668-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	3
INTRODUCTION	5
1 Scope	6
2 Normative references	6
3 Terms, definitions and abbreviated terms	7
3.1 Terms and definitions	7
3.2 Abbreviated terms	8
4 Service conditions	8
5 Rating	8
5.1 General	8
5.2 Nominal voltage (U_n)	8
5.3 Rated voltage (U_{Ne})	8
5.4 Insulation coordination	9
5.4.1 General	9
5.4.2 Rated insulation level	9
5.5 Rated frequency	10
5.6 Rated output	10
5.7 Rated accuracy class	10
5.8 Standard values of rated voltages	10
5.9 Standard values of rated voltage factor	10
5.10 Ferroresonance	11
6 Design and construction	11
6.1 General	11
6.2 Transformer construction	11
6.3 Requirements for the external insulation	11
6.4 Nameplates	12
7 Tests	12
7.1 General	12
7.2 Ferroresonance withstand test	12
7.3 Partial discharge test	12
8 Rules for transport, storage, erection, operation and maintenance	13
9 Safety	13
10 Influence of the product on the environment	13
11 Information to be given with enquiries, tenders and orders	13
Bibliography	14
Table 1 – Nominal voltages (U_n), rated voltages (U_{Ne}), rated impulse voltages (U_{Ni}) and power-frequency withstand voltage (U_d) for circuits connected to the contact line	9
Table 2 – Partial discharge test voltages and permissible levels	13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3-3: Measurement, control and protection devices for specific use in AC traction systems – Voltage transformers

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62505-3-3 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

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

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

- This standard was revised to reflect the latest versions of standards referenced and to remove text already included in the IEC 61869 series.
- The structure of the document was adapted to that of IEC 62505-1 and IEC 62505-2.
- Ratings have been added to provide designations in line with other railway standards, for example IEC 62497.

- Tests requirements have been detailed to meet operating conditions of railway applications.
- Partial discharge voltages have been specified in Table 2.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
9/2556/FDIS	9/2562/RVD

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

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

This document has to be read in conjunction with IEC 61869-1:2007 and IEC 61869-3:2011 (see Introduction).

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

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

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

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Where a particular clause/subclause of IEC 61869-3 is not mentioned in this standard, that clause/subclause 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 61869-3 is to be adapted accordingly.

The numbering of clauses in the IEC 61869 series is similar to that in the IEC 62505 series.

Where terms defined in IEC 61869-1 and IEC 61869-3 conflict with definitions of the same terms as given in IEC 60050-811:2017 or of the other railway applications documents listed in the normative references, the definitions in IEC 61869-1 and IEC 61869-3 are to be used.

NOTE The suffix N which appears in this standard for rated values is not present in IEC 61869-1 and IEC 61869-3.

References in subclauses of IEC 61869-1 and IEC 61869-3 have to be replaced by references to applicable subclauses in this standard as far as reasonably possible.

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

Part 3-3: Measurement, control and protection devices for specific use in AC traction systems – Voltage transformers

1 Scope

This part of IEC 62505 is applicable to new voltage transformers which are:

- intended for use in indoor or outdoor fixed installations in tractions systems, and
- operated with an AC line voltage and frequency as specified in IEC 60850.

NOTE 1 IEC 60850 specifies the AC 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 AC traction systems are typically connected to earth and included in the return current path, all phase to earth voltages are subject to the limits as given in IEC 60850. Nevertheless, conductor to conductor voltages are sometimes higher, e.g. in autotransformer systems.

This document does not provide specific requirements for AC traction systems supplied with a frequency of 25 Hz or with a nominal voltage of 12,5 kV or 50 kV. Nevertheless, requirements set out in this document can be used as a guidance also for these systems.

Voltage transformers are mainly used with:

- measuring instruments,
- protective devices.

This document also applies to voltage transformers other than inductive types as far as reasonably possible. Requirements of this document have priority.

NOTE 3 Combined current and voltage transformers, also capacitive voltage transformers are typically not used in fixed installations in traction systems.

2 Normative references

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.

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

IEC 61869-1:2007, *Instrument transformers – Part 1: General requirements*

IEC 61869-3:2011, *Instrument transformers – Part 3: Additional requirements for inductive voltage transformers*

IEC 62497-1:2010, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*
IEC 62497-1:2010/AMD1:2013