



SLOVENSKI STANDARD
SIST EN 50463:2008
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Železniške naprave - Merjenje energije na vlaku

Railway applications - Energy measurement on board trains

Bahnanwendungen - Energiemessung auf Bahnfahrzeugen

Applications ferroviaires - Mesure d'énergie a bord des trains

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Railway applications - Energy measurement on board trains

Applications ferroviaires -
Mesure d'énergie à bord des trains

Bahnanwendungen -
Energiesmessung auf Bahnfahrzeugen

This European Standard was approved by CENELEC on 2007-07-01. 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.

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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 the 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 50463 on 2007-07-01.

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) 2008-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2010-07-01

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Introduction

This European Standard has been prepared using EN 62053 as reference standard. As many new requirements and tests had to be added, this new standard has been split into five clauses, namely

- 1 Scope
- 2 Normative references
- 3 Definitions
- 4 Requirements
- 5 Tests and test conditions.

For all tests which are not specified in this standard, the existing IEC publications apply.

This standard covers the "standard meter", which may be used for energy metering on board trains. It does not deal with special features (such as solution with the section that perform the measure in separate housing respect to display). These might be covered in separate International Standards.

This standard considers accuracy class 1.

The test levels are regarded as minimum values to ensure the proper functioning of the meter under normal working conditions. For special application, alternative test levels might be necessary and should be agreed by the user and the manufacturer.

A static meter faces the same general environmental conditions as the other electronic devices on board trains. Therefore, the specification will implement all the requirements set by EN 50155 for class TX.

Regarding the influence of harmonics, special test procedures had to be incorporated. These tests check the functionality of the meter when the meter is exposed to large distortions in the current circuit and the accuracy of the meter with 5th harmonic in the current and voltage circuit (see Annex B).

To test accurate operation of the meter under practical conditions have been specified (see 5.7.2.2):

- half-wave rectification (d.c. and even harmonics);
- phase-fired control (odd harmonics);
- burst control (sub-harmonics).

To check if a meter accurately measures total energy in the presence of harmonics, a test with 5th harmonic in both the current and voltage circuits has been specified. It is assumed that correct measurement of 5th harmonic energy indicates that measurement for other harmonics will be good.

The reliability aspects of equipment for electrical energy measurement and load control will be handled separately.

For tests and test conditions, existing tests and test levels have been taken from EN 62053 and IEC or EN standards as appropriate.

The IEC and EN publications referred to in this standard are listed in Clause 2.

1 Scope

This European Standard applies only to newly manufactured static energy meters of accuracy class 1, for the measurement on board, of alternating current electrical energy or direct current electrical energy used for traction applications operating at the following supply voltages:

- 25 kV (single phase) at 50 Hz,
- 15 kV (single phase) at 16,7 Hz,
- 3 kV, 1,5 kV and 0,75 kV d.c.

It applies only to static meters consisting of a measuring element and register(s) enclosed together in a meter enclosure.

It does not apply to:

- a) portable meters;
- b) data interfaces with on board systems;
- c) data management system;
- d) data interfaces with telecommunication system;
- e) on-board global measurement systems; additionally, if voltage and current transducers are considered of accuracy class 0,5. If these transducers are multi-service, specific and separate outputs will be considered.

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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.

CLC/TS 45545-5	2004	Railway applications - Fire protection on railway vehicles – Part 5: Fire safety requirements for electrical equipment including that of trolley buses, track guided buses and magnetic levitation vehicles
EN 50121-3-2	2006	Railway applications - Electromagnetic compatibility (EMC) – Part 3-2: Rolling stock - Apparatus
EN 50155	2001	Railway applications – Electronic equipment used on rolling stock
EN 50163	2004	Railway applications - Supply voltages of traction systems
EN 55022	2006	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (CISPR 22:2005, mod.)
EN 60085	2004	Electrical insulation - Thermal classification (IEC 60085:2004)

EN 60359	2002	Electrical and electronic measurement equipment - Expression of performance (IEC 60359:2001)
EN 60387	1992	Symbols for alternating current electricity meters (IEC 60387:1992)
EN 60514	1995	Acceptance inspection of Class 2 alternating-current watt-hour meters (IEC 60514:1975, mod.)
EN 60529 + corr. May	1991 1993	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)
EN 60870-5-2	-	Telecontrol equipment and systems – Part 5-2: Transmission protocols - Link transmission procedures (IEC 60870-5-2)
EN 60999-1	2000	Connecting devices - Safety requirements for screw-type and screwless-type clamping units for electrical copper conductors – Part 1: General requirements and particular requirements for conductors from 0,5 mm ² up to 35 mm ² (included) (IEC 60999-1:1999)
EN 61010-1	-	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements (IEC 61010-1)
EN 61373	1999	Railway applications – Rolling stock equipment – Shock and vibration tests (IEC 61373:1999)
EN 62053	Series	Electricity metering equipment (a.c.) – Particular requirements (IEC 62053 series)
EN 62056	Series	Electricity metering – Data exchange for meter reading, tariff and load control (IEC 62056 series)
IEC 60050-300	2001	International Electrotechnical Vocabulary - Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument
IEC/TR 60736	1982	Testing equipment for electrical energy meters

3 Definitions

For the purposes of this European Standard, the following definitions apply.

The majority of the following definitions have been taken from the relevant parts of the International Electrotechnical Vocabulary (IEV), IEC 60050-311, IEC 60050-312, IEC 60050-313 and IEC 60050-314. In such cases, the appropriate IEV reference is given. Certain new definitions or modifications of IEV definitions have been added in this standard in order to facilitate understanding. Expression of the performance of electrical and electronic measuring equipment has been taken from EN 60359.

3.1 General definitions

3.1.1

energy meter

instrument intended to measure electrical energy by integrating power with respect to time

[IEV 313-01-35]

Where the display and/or the memory/ies is/are external or where other elements are enclosed in the meter enclosure (such as maximum demand indicators, telemetering, time switches or remote control, etc.) this standard applies only to the metering section

3.1.2

static energy meter

meter in which current and voltage act on solid-state (electronic) elements to produce an output proportional to energy consumption

3.1.3

meter type

particular design of meter, manufactured by one manufacturer, having:

- a) similar metrological properties;
- b) the same uniform construction of parts determining these properties;
- c) the same ratio of the maximum current to the rated current

NOTE 1 The type may have several values of reference current and reference voltage.

NOTE 2 Meters are designated by the manufacturer by one or more groups of letters or numbers, or a combination of letters and numbers. Each type has one designation only.

NOTE 3 The type is represented by the sample meter(s) intended for the type tests and whose characteristics (rated current and reference voltage) are chosen from the values given in the tables proposed by the manufacturer.

[IEV 314-07-07, modified]

3.1.4

transducer

apparatus (or device) in a.c. or d.c. needed for feeding the meter inputs with suitable electrical quantities

3.2 Definitions related to the functional elements

3.2.1

measuring element

part of the meter which produces an output proportional to the energy

3.2.2

data storage

meter capability to record data

3.2.3

internal messaging

meter capability of generating messages for autodiagnosis functions, alarms and other working information

3.2.4

train location data

input data to give the position of the train

3.2.5

local downloading port

optical and/or electrical serial port that is used for local data downloading

3.2.6

on board train system port

port that is used for connecting the meter to the on-board train communication system

3.2.7

test output port

port that is used for testing the meter

3.2.8

operation indicator

device which gives a visible signal of the operation of the meter

[IEV 314-07-13]

3.2.9

current circuit

internal connections of the meter and part of the measuring element through which the current in to which the meter is connected flows

3.2.10

voltage circuit

internal connections of the meter, part of the measuring element and, in certain meters, also the power supply for the meter, supplied with the voltage of the circuit to which the meter is connected

3.2.11

constant

value expressing the relation between the active energy registered by a meter and the corresponding value of the test output

NOTE If this value is a number of pulses, the constant should be either pulses per kilowatt-hour (imp/kWh) or watt-hours per pulse (Wh/imp).

[IEV 314-07-08]

3.3 Definitions of mechanical elements

3.3.1

base (of an energy meter)

part on which the meter is generally fixed and to which are attached the measuring element, the terminals or the terminal block, and the cover

NOTE For a flush-mounted meter, the meter base may include the sides of the enclosure.

[IEV 314-07-14, modified]

3.3.2 socket

basic element with jaws to accommodate terminals of a detachable watt-hour meter and which has terminals for connection to the supply line. It may be a single-position socket for one meter or a multiple-position socket for two or more meters

[IEV 314-07-15, modified]

3.3.3 cover

enclosure for the meter, made either wholly of transparent material or opaque material provided with window(s) through which the operation indicator and the display (if fitted) can be read

[IEV 314-07-16, modified]

3.3.4 enclosure

comprises the base and the cover

3.3.5 accessible conductive part

refer to EN 61010-1

3.3.6 protective earth terminal

refer to EN 61010-1

3.3.7 terminal block

support made of insulating material on which all or some of the terminals of the meter are grouped together

[IEV 314-07-18]

3.3.8 terminal cover

cover which covers the meter terminals and, generally, the ends of the external wires or cables connected to the terminals of the meter. It shall provide a sealing system

[IEV 314-07-19, modified]

3.3.9 clearance and creepage distance

definitions are referred to EN 61010-1

3.4 Definitions of insulations

Refer to EN 61010-1.

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insulating material on which all or some of the terminals

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3.5 Definitions of meter quantities

3.5.1

rated current (I_n)

value of current in accordance with which the relevant performance of a transformer (or transducer) operated meter is set

NOTE The term current indicates r.m.s. value unless otherwise specified.

[IEV 314-07-02, modified]

3.5.2

maximum current (I_{max})

highest value of current at which the meter will meet the accuracy requirements of this standard

NOTE The term current indicate r.m.s. value unless otherwise specified.

[IEV 314-07-03, modified]

3.5.3

minimum current (I_{min})

lowest value of current at which the meter purports to meet the accuracy requirements of this standard

NOTE The term current indicate r.m.s. value unless otherwise specified.

3.5.4

rated voltage (U_n)

value of the voltage in accordance with which the relevant performance of the meter is set

NOTE The term voltage indicate r.m.s. value unless otherwise specified.

3.5.5

maximum voltage (U_{max})

highest value of voltage at which the meter purports to meet the accuracy requirements of this standard

NOTE The term voltage indicates r.m.s. value unless otherwise specified.

3.5.6

minimum voltage (U_{min})

lowest value of voltage at which the meter purports to meet the accuracy requirements of this standard

NOTE The term voltage indicates r.m.s. value unless otherwise specified.

3.5.7

rated frequency

value of the frequency (for a.c. meters) in accordance with which the relevant performance of the meter is set

3.5.8

class index

number which gives the limits of the permissible percentage uncertainty for all values of external factors for specified ranges

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