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Železniške naprave - Merjenje energije na vlaku - 4. del: Komunikacija

Railway applications - Energy measurement on board trains - Part 4: Communication

Bahnanwendungen - Energiemessung auf Bahnfahrzeugen - Teil 4: Kommunikation

Applications ferroviaires - Mesure d'énergie à bord des trains - Partie 4: Communications
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EUROPEAN STANDARD
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English version

**Railway applications -
Energy measurement on board trains -
Part 4: Communication**

Applications ferroviaires -
Mesure d'énergie à bord des trains -
Partie 4: Communications

Bahnanwendungen -
Energiesmessung auf Bahnfahrzeugen -
Teil 4: Kommunikation

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

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CENELEC

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This document (EN 50463-4:2012) has been prepared by CLC/TC9X "Electrical and electronic applications for railways".

The following dates are proposed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-10-15
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2015-10-15

This document (EN 50463-4:2012), together with parts 1, 2, 3 and 5, supersedes EN 50463:2007.

EN 50463-4:2012 includes the following significant technical changes with respect to EN 50463:2007:

- the series is based on and supersedes EN 50463:2007;
- the scope is extended, new requirements are introduced and conformity assessment arrangements are added.

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive 2008/57/EC amended by Commission Directive 2011/18/EU, see informative Annex ZZ, which is an integral part of this document.

This document is Part 4 of the EN 50463 series which consists of the following parts, under the title *Railway applications - Energy measurement on board trains*:

Part 1, General;

Part 2, Energy measuring;

Part 3, Data handling;

Part 4, Communication;

Part 5, Conformity assessment.

This series of European Standards follows the functional guidelines description in Annex A "Principles of conformity assessment" of EN ISO/IEC 17000 tailored to the Energy Measurement System (EMS).

The requirements for Energy Measurement Systems in the relevant Technical Specifications for Interoperability are supported by this series of European Standards.

Introduction

The Energy Measurement System provides measurement and data suitable for billing and may also be used for energy management, e.g. energy saving.

This series of European Standards uses the functional approach to describe the Energy Measurement System. These functions are implemented in one or more physical devices. The user of this series of standards is free to choose the physical implementation arrangements.

Structure and main contents of the EN 50463 series

This series of European Standards is divided into five parts. The titles and brief descriptions of each part are given below:

EN 50463-1 – General

The scope of EN 50463-1 is the Energy Measurement System (EMS).

EN 50463-1 provides system level requirements for the complete EMS and common requirements for all devices implementing one or more functions of the EMS.

EN 50463-2 – Energy measuring

The scope of EN 50463-2 is the Energy Measurement Function (EMF).

The EMF provides measurement of the consumed and regenerated active energy of a railway traction unit. If the traction unit is designed for use on a.c. traction supply systems the EMF also provides measurement of reactive energy. The EMF provides the measured quantities via an interface to the Data Handling System.

The EMF consists of the three functions: Voltage Measurement Function, Current Measurement Function and Energy Calculation Function. For each of these functions, accuracy classes are specified and associated reference conditions are defined. EN 50463-2 also defines all specific requirements for all functions of the EMF.

The Voltage Measurement Function measures the voltage of the Contact Line system and the Current Measurement Function measures the current taken from and returned to the Contact Line system. These functions provide signal inputs to the Energy Calculation Function.

The Energy Calculation Function inputs the signals from the Current and Voltage Measurement Functions and calculates a set of values representing the consumed and regenerated energies. These values are transferred to the Data Handling System and are used in the creation of Compiled Energy Billing Data.

The standard has been developed taking into account that in some applications the EMF may be subjected to legal metrological control. All relevant metrological aspects are covered in EN 50463-2.

EN 50463-2 also defines the conformity assessment of the EMF.

EN 50463-3 – Data handling

The scope of EN 50463-3 is the Data Handling System (DHS).

The on board DHS receives, produces and stores data, ready for transmission to any authorised receiver of data on board or on ground. The main goal of the DHS is to produce Compiled Energy Billing Data and transfer it to an on ground Data Collection Service (DCS). The DHS can support other functionality on board or on ground with data, as long as this does not conflict with the main goal.

EN 50463-3 also defines the conformity assessment of the DHS.

EN 50463-4 – Communication

The scope of EN 50463-4 is the communication services.

This part of the EN 50463 gives requirements and guidance regarding the data communication between the functions implemented within EMS as well as between such functions and other on board units where data are exchanged using a communications protocol stack over a dedicated physical interface or a shared network.

It includes the on board to ground communication service and covers the requirements necessary to support data transfer between DHS and DCS.

EN 50463-4 also defines the conformity assessment of the communications services.

EN 50463-5 – Conformity assessment

The scope of EN 50463-5 is the conformity assessment procedures for the EMS.

EN 50463-5 also covers re-verification procedures and conformity assessment in the event of the replacement of a device of the EMS.

EMS functional structure and dataflow

Figure 1 illustrates the functional structure of the EMS, the main sub-functions and the structure of the dataflow and is informative only. Only the main interfaces required by this standard are displayed by arrows.

Since the communication function is distributed throughout the EMS, it has been omitted for clarity. Not all interfaces are shown.

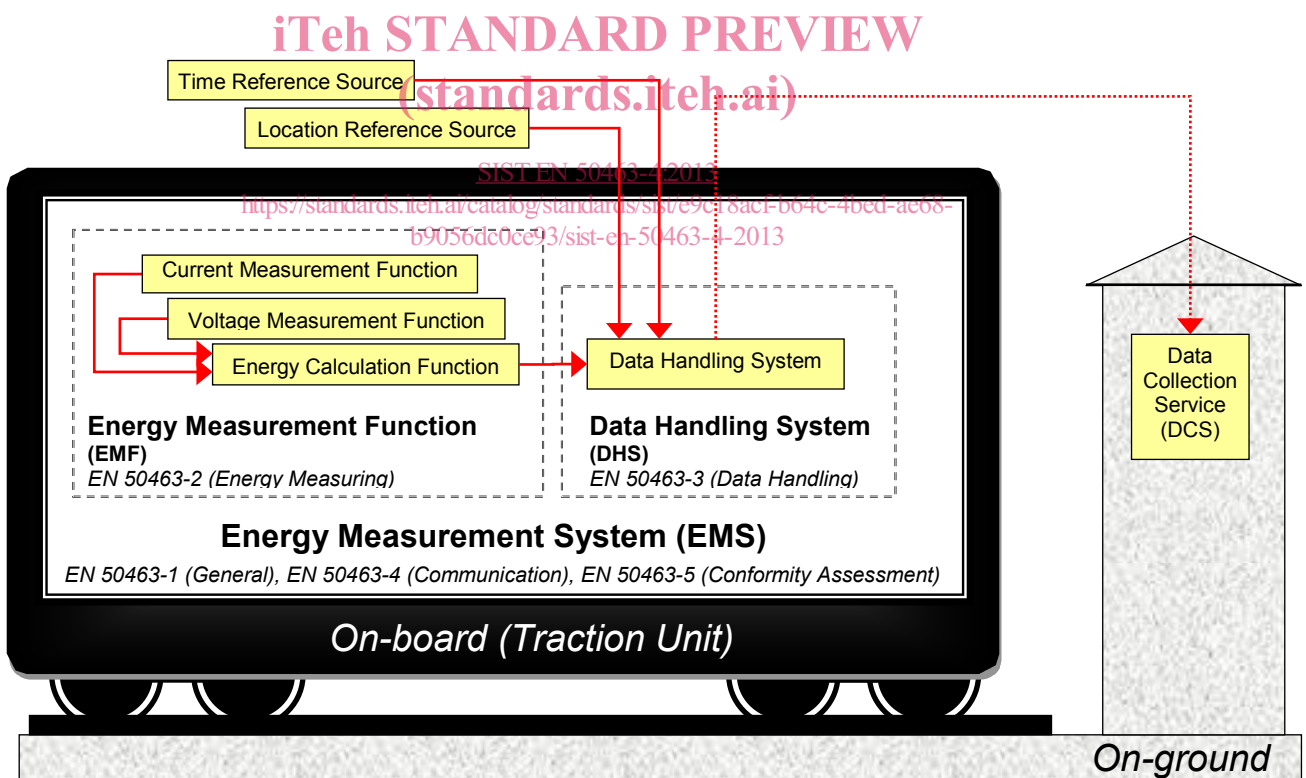


Figure 1 – EMS functional structure and dataflow diagram

1 Scope

This European Standard applies to the on board and on board to ground communication services, i.e. it covers the data communication using digital interfaces:

- a) between functions implemented within the EMS;
- b) between EMS function and other on board subsystems;
- c) between EMS and ground communication services.

The on board data communication services of the EMS are covering the data exchange between functions of the EMS and the data exchange between EMS and other on board units, where data is exchanged using a communications protocol stack over a dedicated physical interface or a shared communication network.

The on board to ground communication services are covering the wireless data communication between the DHS and the on ground server.

Furthermore, this document includes conformity assessment requirements.

2 Normative references

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.

EN 50463-1:2012, *Railway applications — Energy measurement on board trains — Part 1: General*

EN 50463-2:2012, *Railway applications — Energy measurement on board trains — Part 2: Energy measuring*

EN 50463-3:2012, *Railway applications — Energy measurement on board trains — Part 3: Data handling*

EN 50463-5, *Railway applications — Energy measurement on board trains — Part 5: Conformity assessment*

EN 60870-5 (all parts), *Telecontrol equipment and systems — Part 5: Transmission protocols (IEC 60870-5 series)*

EN 61158-2, *Industrial communication networks — Fieldbus specifications — Part 2: Physical layer specification and service definition (IEC 61158-2)*

IEC 61375 (all parts), *Electronic railway equipment — Train communication network (TCN)*

ISO 11898-1:2003, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11898-2:2003, *Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit*

ISO/IEC 8482, *Information technology — Telecommunications and information exchange between systems — Twisted pair multipoint interconnections*

ISO/IEC 8825 (all parts), *Information technology — ASN.1 encoding rules*

ISO/IEC 8802-3:2000, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 9646-1:1994, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts* ¹⁾

ITU-T Recommendation V.24, *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)*

RFC 1035, *Domain names: implementation and specification*

RFC 1123, *Requirements for Internet Hosts – Application and Support*

RFC 1535, *A Security Problem and Proposed Correction With Widely Deployed DNS Software*

RFC 2181, *Clarifications to the DNS specification*

TIA/EIA-422-B, May 1994, *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50463-1:2012 and the following apply.

NOTE When possible, the following definitions have been taken from the relevant chapters of the International Electrotechnical Vocabulary (IEV), IEC 60050. 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.

3.1.1

Board to Ground Interface

BGI

interface used for the communication between the train and the ground

3.1.2

consist

single vehicle or group of vehicles that are not separated during normal operation; train set and rake of coaches are synonyms

Note 1 to entry: A consist may contain one or more traction units.

3.1.3

consist network

CN

communication network interconnecting communication devices in one consist

Note 1 to entry: It is possible that more than one CN is installed in the same consist.

3.1.4

Consist Network Interface

CNI

interface to an on board consist network used by the EMS and by other on board devices interfacing with the EMS

¹⁾ Also available as ITU-T Recommendation X.290 (04/95), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – General concepts*

3.1.5**Coordinated Universal Time****UTC**

time scale which forms the basis of a coordinated radio dissemination of standard frequencies and time signals; it corresponds exactly in rate with international atomic time, but differs from it by an integral number of seconds

Note 1 to entry: Coordinated universal time is established by the International Bureau of Weights and Measures (BIPM) and the International Earth Rotation Services (IERS).

Note 2 to entry: The UTC scales is adjusted by the insertion or deletion of seconds, so called positive or negative leap seconds, to ensure approximate agreement with UT1.

[SOURCE: ITU-R Recommendation TF.686, modified]

3.1.6**DHS to Service Interface****DSI**

interface between the DHS and a maintenance/administration tool

3.1.7**DHS to MCF Interface****DMI**

interface between the DHS and the MCF; it may be dedicated or shared on CNI

3.1.8**EMF to DHS Interface****EMDI**

interface between the EMF and the DHS

3.1.9**EMF to Service Interface****ESI**

interface between the EMF and a maintenance/administration tool

3.1.10**energy delta value**

energy consumed and/or regenerated during a time period

Note 1 to entry: See Figure 2 for example.

3.1.11**energy index value**

total accumulated energy consumption and/or energy regeneration at the end of a time period

Note 1 to entry: See Figure 2 for example.

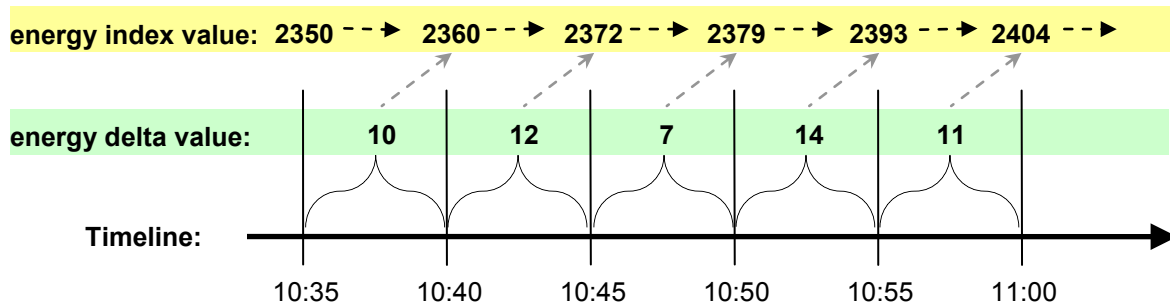


Figure 2 – Example of energy index value

3.1.12**flag**

code indicating information relevant to the functioning of the EMS

Note 1 to entry: Examples include data quality, operational status, etc.

3.1.13**Fully Qualified Domain Name****FQDN**

domain name which specifies its exact location in the tree hierarchy of the Domain Name System (DNS); it specifies all domain levels, starting from the host name up to the top-level domain

3.1.14**Ground Station****GS**

any station on ground which is able to communicate with the EMS

Note 1 to entry: A GS may host different services such as DCS or any EMS management service.

3.1.15**integrity**

security measures addressing the detection of a corrupted payload

3.1.16**Internet Engineering Task Force****IETF**

organised activity of the Internet Society in charge of producing technical documents relevant to the design, use and management of the Internet

3.1.17**Implementation Under Assessment****IUA**

implementation of one or more protocols specified in this part of EN 50463 in an adjacent user/provider relationship being a part of the EMS that is submitted to the conformity assessment

3.1.18**location data**

data describing the geographical position of the traction unit

3.1.19**Location Function to DHS Interface****LFDI**

interface linking the location function to the DHS

Note 1 to entry: The location function can be interfaced with the DHS via a CNI.

3.1.20**Mobile Communication Function****MCF**

function performing the EMS to on ground communication

Note 1 to entry: It includes the sub-function(s) for the wireless link between the train and ground and the sub-functions that execute the communication protocols up to the application interface.

3.1.21**Mobile Communication Gateway****MCG**

device that implements the MCF

Note 1 to entry: It may be embedded into the DHS, shared on CNI or connected as a dedicated device by means of the DMI.

3.1.22**non-voluntary change**

accidental or unintentional change

Note 1 to entry: Accidental change is caused by unpredictable physical influences, and unintentional change is the effect caused by user functions and residual defects of the software even though the best efforts in development techniques have been applied.

3.1.23**payload**

part of the message containing the useful data produced by the source application and used by the destination application

3.1.24**Protocol Analyser****PA**

instrument which is used to record and analyse the frames produced by the IUA during the protocol testing

3.1.25**Protocol Frame Generator****PFG**

instrument which is used to inject the testing frames into the interface of the IUA

3.1.26**Protocol Implementation Conformity Statement****PICS**

document containing the information of the claim of conformity of the IUA in respect of the specification

3.1.27**protective interface**

interface which permits intended data to be exchanged, and prevents unintended data being exchanged

3.1.28**Protocol Implementation Extra Information for Testing****PIXIT**

document used when testing the user defined aspects of the protocol for the IUA

3.1.29**sensor**

device performing the VMF and/or CMF

Note 1 to entry: Sensor is used as a general term and encompasses a wide variety of technology / devices for measurement purposes e.g. inductive transformers, hall-effect devices, capacitive and resistive dividers, and resistive shunts etc.

Note 2 to entry: One sensor can perform multiple functions.

3.1.30**software**

executable code, databases, registers and any parameter that affect the software execution

3.1.31**test authority**

organisation responsible for conformity testing

3.1.32**test bench**

arrangement of test equipment for testing an IUA