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

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

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

Bahnanwendungen - Energiemessung auf Bahnfahrzeugen - Teil 4: Kommunikation

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European foreword

This document (EN 50463-4:2017) has been prepared by CLC/TC 9X “Electrical and electronic applications for railways”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-04-06
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2020-10-06

This document supersedes EN 50463-4:2012.

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

— general replacement of the text of 4.3 with new complete protocols for data transfer between EMS and DCS to make it interoperable (Clause 4);

— introduction of link to the EN 61375 Communication standard series (Clause 4);

— introduction of the normative Annexes D to F containing the XML schemas to detail the requirements of Clause 4.

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 the relationship with EU Directive(s) 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 common 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 EN ISO/IEC 17000:2004, Annex A “Principles of conformity assessment”, 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 and on-ground Data Collecting 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.

a) 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:

1) 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.

2) 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 AC traction 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 (CEBD).

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.

3) EN 50463-3 — Data handling:

The scope of EN 50463-3 is the Data Handling System (DHS) and the associated requirements of Data Collecting System (DCS).

The on board DHS receives, produces and stores data, ready for transmission to any authorized receiver of data on board or on ground. The main goal of the DHS is to produce Compiled Energy Billing Data and transfer it on an interoperable basis to an on-ground Data Collecting System (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.

The DCS on-ground receives Compiled Energy Billing Data and transfer it to settlement system.

EN 50463-3 also defines the conformity assessment of the DHS and for the transfer of CEBD to an on-ground Data Collecting System (DCS).

4) EN 50463-4 — Communication:

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

This part of 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 including the transfer of CEBD on an interoperable basis.

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

5) 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.

b) 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 widely omitted for clarity, except for the train to ground communication. Not all interfaces are shown.

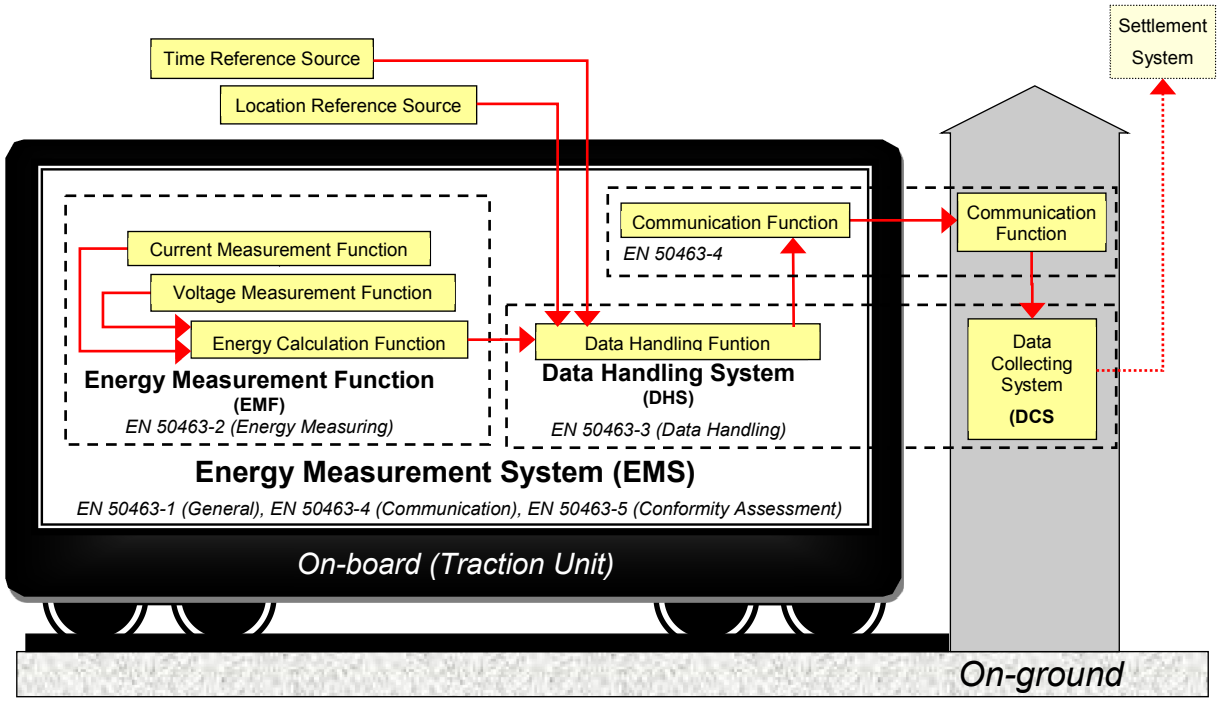

Figure 1 — EMS functional structure and dataflow diagram

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

The on board to ground communication services cover 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 50463-1:2017, *Railway applications — Energy measurement on board trains — Part 1: General*

EN 50463-2:2017, *Railway applications — Energy measurement on board trains — Part 2: Energy measuring*

EN 50463-3:2017, *Railway applications — Energy measurement on board trains — Part 3: Data handling*

EN 50463-5:2017, *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 61158-2:2014, *Industrial communication networks — Fieldbus specifications — Part 2: Physical layer specification and service definition (IEC 61158-2:2014)*

EN 61375-1:2012, *Electronic railway equipment — Train communication network (TCN) — Part 1: General architecture (IEC 61375-1:2012)*

prEN 61375-2-6:2016, *Electronic railway equipment — Train communication network — Part 2-6: On-board to ground communication (IEC 61375-2-6:201X)*

EN 61375-3-1:2012, *Electronic railway equipment — Train communication network (TCN) — Part 3-1: Multifunction Vehicle Bus (MVB) (IEC 61375-3-1:2012)*

EN 61375-3-3:2012, *Electronic railway equipment — Train communication network (TCN) —- Part 3-3: CANopen Consist Network (CCN) (IEC 61375-3-3:2012)*

EN 61375-3-4:2014, *Electronic railway equipment — Train communication network (TCN) — Part 3-4: Ethernet Consist Network (ECN) (IEC 61375-3-4:2014)*

EN ISO 3166-1:2014, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:2013)*

EN ISO/IEC 9646-1:1996[1)], *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts (ISO/IEC 9646-1:1994)*

ISO 8601:2004, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO 11898-1:2015, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11898-2:2016, *Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit*

ISO/IEC 8482:1993, *Information technology — Telecommunications and information exchange between systems — Twisted pair multipoint interconnections*

ISO/IEC/IEEE 8802-3:2017, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 3: Standard for Ethernet*

ITU-T/Recommendation V.24:2000, List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)

RFC 1321:1992, The MD5 Message-Digest Algorithm

RFC 1952:1996, GZIP file format specification

RFC 2616:1999, Hypertext Transfer Protocol – HTTP/1.1

RFC 3275:2002, XML-Signature Syntax and Processing

RFC 3986:2005, Uniform Resource Identifier (URI): Generic Syntax

RFC 4001:2005, Textual Conventions for Internet Network Addresses

RFC 4051:2005, Additional XML Security Uniform Resource Identifiers (URIs)

RFC 4648:2006, The Base16, Base32, and Base64 Data Encodings

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

koniec náhľadu – text ďalej pokračuje v platenej verzii STN

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*.