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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

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

IEC 62888-4:2018-01(en-fr)

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COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RAILWAY APPLICATIONS – ENERGY MEASUREMENT ON BOARD TRAINS –

Part 4: Communication

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.
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This standard is based on EN 50463.

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

FDIS	Report on voting
9/2323/FDIS	9/2334/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.

A list of all parts in the IEC 62888 series, published under the general title *Railway applications – Energy measurement on board trains*, 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.

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INTRODUCTION

Three levels are introduced for categorizing EMS as described in this document in 4.1.

This part is Part 4 of the IEC 62888 series, which consists of the following parts, under the general title *Railway applications – Energy measurement on board trains*:

Part 1: General

Part 2: Energy measurement

Part 3: Data handling

Part 4: Communication

Part 5: Conformance test

Part 6: Requirements for purposes other than billing

This series of International Standards follows the functional guidelines description in Annex A, "Principles of conformity assessment", of ISO/IEC 17000:2004 tailored to the Energy Measurement System (EMS).

The Energy Measurement System (EMS) provides measurement and data suitable for applications such as energy management, energy saving, billing and others.

This series of International Standards uses the functional approach to describe the EMS. 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 IEC 62888 series

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

IEC 62888-1 – General

The scope of IEC 62888-1 is the Energy Measurement System (EMS).

IEC 62888-1 provides system level requirements for the complete EMS and common requirements for all devices implementing one or more functions of the EMS.

IEC 62888-2 – Energy measurement

The scope of IEC 62888-2 is the Energy Measurement Function (EMF).

The EMF provides measurement of the consumed and regenerated active energy of a traction unit. If the traction unit is designed for use on AC 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. This part also defines all specific requirements for all functions of the EMF.

The Voltage Measurement Function measures the voltage of the contact line (CL) system and the Current Measurement Function measures the current taken from and returned to the CL 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 Measured Data.

All relevant metrological aspects are covered in this part of IEC 62888.

IEC 62888-2 also defines the conformance test of the EMF.

IEC 62888-3 – Data handling

The scope of IEC 62888-3 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 Measured 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.

IEC 62888-3 also defines the conformance test of the DHS.

IEC 62888-4 – Communication

The scope of IEC 62888-4 is the communication services.

This part of IEC 62888 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.

IEC 62888-4 also defines the conformance test of the communications services.

IEC 62888-5 – Conformance test

The scope of IEC 62888-5 is the conformance test procedures for the EMS.

IEC 62888-5 also covers re-verification procedures and conformance test in the event of the replacement of a device of the EMS.

IEC 62888-6 – Requirements for purposes other than billing

The scope of IEC 62888-6 is to specify the requirements for EMS to be used for benchmarking, daily energy consumption monitoring, technical research and development.

This part provides the requirements for monitoring consumed energy on-board in daily services in an easy way and the measured data are applicable for general purposes in industry such as energy management, energy saving, etc. However, this part is not applicable for billing purposes.

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.

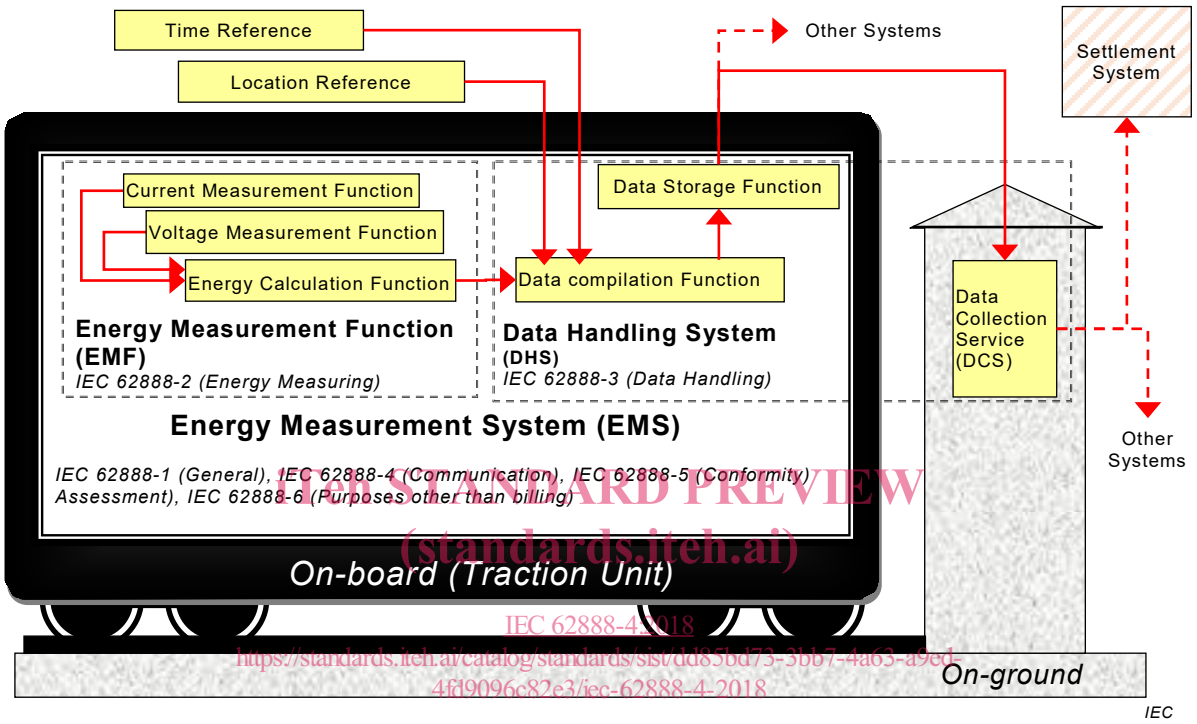

Figure 1 – EMS functional structure and dataflow diagram

RAILWAY APPLICATIONS – ENERGY MEASUREMENT ON BOARD TRAINS –

Part 4: Communication

1 Scope

This part of IEC 62888 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 is 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 conformance test requirements.

Specific requirements for EMS Level 2 and Level 3 are specified in IEC 62888-6.

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 60870-5 (all parts), *Telecontrol equipment and systems – Part 5: Transmission protocols*

IEC 61158-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

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

IEC 62888-1:2018, *Railway applications – Energy measurement on board trains – Part 1: General*

IEC 62888-2:2018, *Railway applications – Energy measurement on board trains – Part 2: Energy measurement*

IEC 62888-3:2018, *Railway applications – Energy measurement on board trains – Part 3: Data handling*

IEC 62888-5:2018, *Railway applications – Energy measurement on board trains – Part 5: Conformance test*

IEC 62888-6:2018, *Railway applications – Energy measurement on board trains – Part 6: Requirements for purposes other than billing*

ISO/IEC 8482, *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*

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

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*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62888-1:2018 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

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 a group of vehicles which are not separated during normal operation

Note 1 to entry: A consist can contain no, one or several consist networks.

Note 2 to entry: A consist may contain one or more traction units.

[SOURCE: IEC 60050-811:2017, 811-37-20, modified: Note 2 to entry has been added]

3.1.3
consist network
CN
bus connecting equipment within a consist, e.g. the MVB, and which conforms or adapts to the TCN real-time protocols

[SOURCE: IEC 60050-811:2017, 811-37-21]

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

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 are adjusted by the insertion or deletion of seconds, so called positive or negative leap seconds, to ensure approximate agreement with UT1.

[SOURCE: IEC 60050-713:1998, 713-05-20]

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.

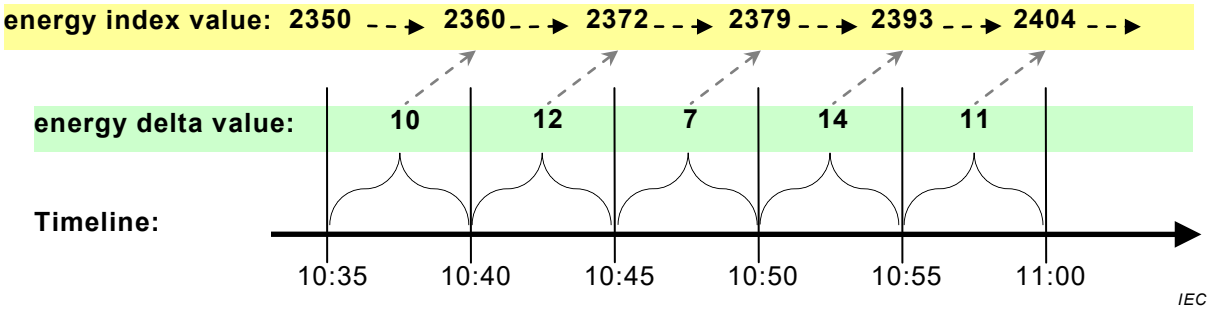

Figure 2 – Example of energy index value

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)

Note 1 to entry: 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
state in which information is complete and not altered

[SOURCE: IEC 60050-821:2017, 821-11-26]

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 between user and provider being part of the EMS that is submitted to the conformance test

Note 1 to entry: The protocols are specified in this part of IEC 62888.

3.1.18
location data
data describing the geographical position of the traction unit