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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Railway applications – Energy measurement on board trains – Part 3: Data handling

Applications ferroviaires – Mesure d'énergie à bord des trains – Part 3: Traitement des données

IEC 62888-3:2018-01(en-fr)

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COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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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International Standard IEC 62888-3 has been prepared by technical committee 9: Electrical equipment and systems for railways.

This standard is based on EN 50463.

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

FDIS	Report on voting
9/2322/FDIS	9/2333/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 is Part 3 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.

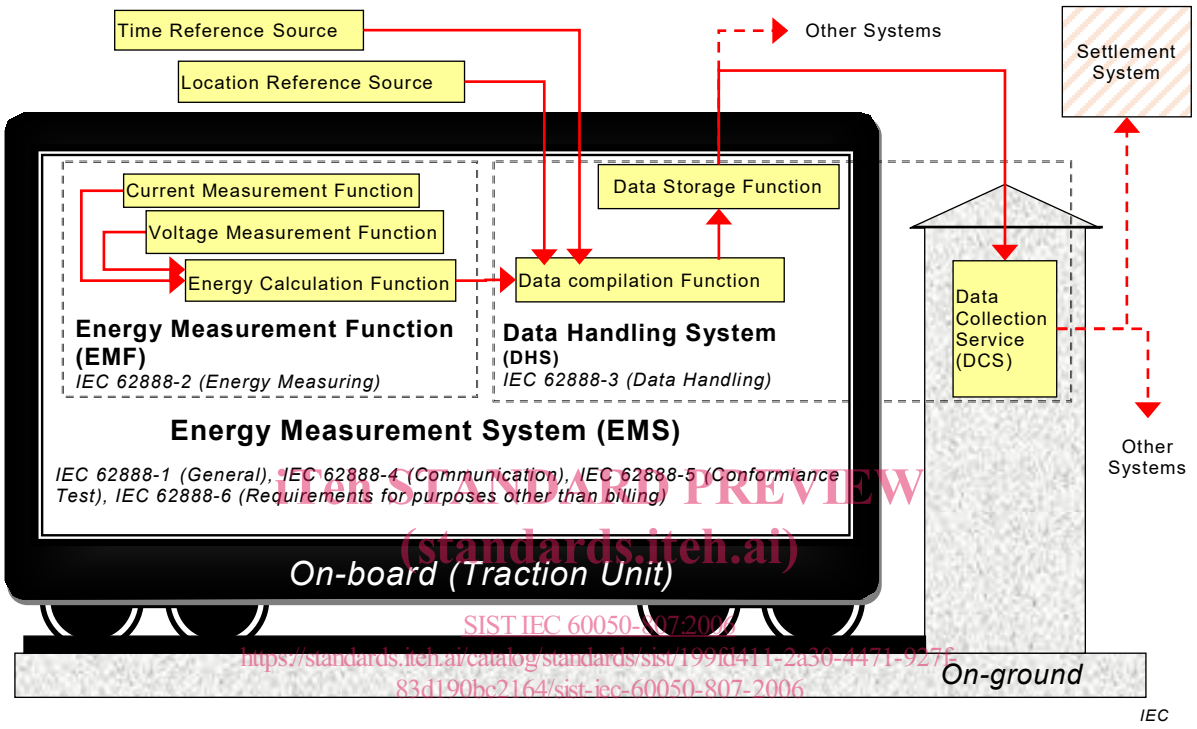

Figure 1 – EMS functional structure and dataflow diagram

RAILWAY APPLICATIONS – ENERGY MEASUREMENT ON BOARD TRAINS –

Part 3: Data handling

1 Scope

This part of IEC 62888 covers the requirements applicable to the Data Handling System (DHS) of an Energy Measurement System.

This document also includes the basic requirements for the Data Collection Service on ground, relating to the acquisition and storage of Compiled Energy Measurement Data.

The Conformance test arrangements for the DHS are specified in this document.

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 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60571:2012, *Railway applications – Electronic equipment used on rolling stock*

IEC 61373:2010, *Railway Applications – Rolling stock equipment – Shock and vibration tests*

IEC 62236-3-2:2008, *Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus*

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

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

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
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 scale is 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]

3.1.2
energy delta value
energy consumed and/or regenerated during a time period

Note 1 to entry: See Figure 2 for example.

3.1.3
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.

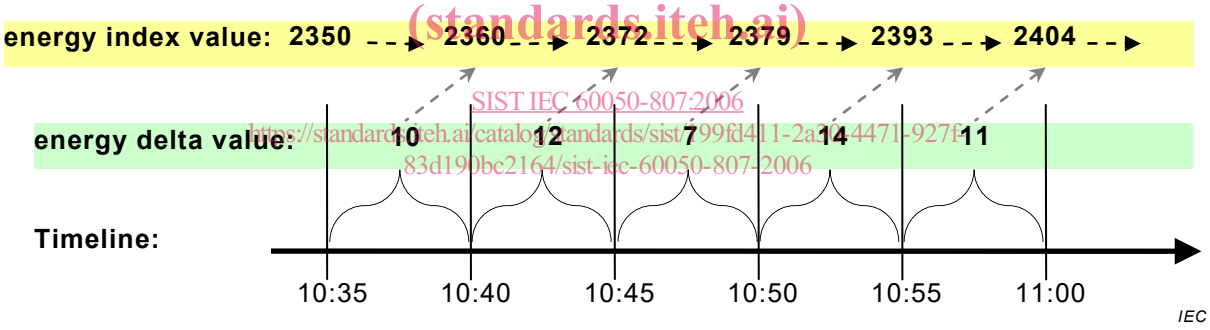

Figure 2 – Example of energy index value

3.1.4
flag
code indicating information relevant to the functioning of the EMS

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

3.1.5
index value overrun
return to zero of the index value after reaching the maximum value allowed by the register

3.1.6
k-factor
multiplicand necessary to convert a secondary value into a primary value

Note 1 to entry: Each Voltage Measurement Function and/or Current Measurement Function can have a specific k-factor. If the k-factor is applied to Energy Data, this factor is the product of the k-factors of the Voltage Measurement Function and/or Current Measurement Function used.

3.1.7
location data
data describing the geographical position of the traction unit

3.1.8
log
list of recorded events

3.1.9
primary value
value referred to the measuring inputs of an EMF

3.1.10
secondary value
value of current, voltage, power or energy which needs to be multiplied by a k-factor to become a primary value

3.1.11
time data
data describing a time and date of a defined time source

3.1.12
time period
period of time for which energy data is produced

3.1.13
Time Reference Period
TRP
time period for which CEMD is produced

3.2 Abbreviated terms

CEMD	Compiled Energy Measured Data
CL	Contact Line
DCS	Data Collection Service
DHS	Data Handling System
ECF	Energy Calculation Function
EMF	Energy Measurement Function
EMS	Energy Measurement System
RAMS	Reliability, Availability, Maintainability and Safety
TRP	Time Reference Period
UTC	Coordinated Universal Time

4 Requirements

4.1 General

The requirements in IEC 62888-1:2018, Clause 4 apply to any device containing one or more functions of the DHS where applicable. IEC 62888-3 defines additional requirements specific to the DHS and basic requirements for the DCS.

The DHS shall comply with the following requirements except for 4.12.

The DCS shall comply with the requirements in 4.12 only.

4.2 Time data

4.2.1 Source

The DHS shall produce time data using an internal time source (clock).

4.2.2 Reference time source

The internal time source shall use as its reference Standard UTC time/date (UTC +0).

4.2.3 Format

The time data shall have the following format: YYYYMMDDHHmmss:

a) YYYY: Year;
b) MM: Month;
c) DD: Day;
d) HH: Hour;
e) mm: Minute;
f) ss: Second.

4.2.4 Resolution level

The time data shall have resolution of 1 s.

4.2.5 Stability

The internal time source shall have a stability of 20×10^{-6} or better.

4.2.6 Synchronisation

The internal time source shall be synchronized with the reference time and shall not deviate from the reference time by more than 2 s.

All synchronisation events shall be logged.

Where applicable, the DHS shall be able to undertake correction to account for leap second off-set if not already undertaken at source.

4.2.7 Flags for time data

A quality flag shall be attached to the time data if a change (i.e. synchronisation, manual adjustment, error, etc.) has resulted in a change of the DHS internal time source by 2 s or more.

This is necessary to highlight a change in time data (e.g. resulting in an abnormal TRP length which may affect the subsequent processing and use of the associated data).

4.3 Energy data

4.3.1 Source

The DHS shall be able to receive energy data from one or more ECF.

If the DHS is capable of interfacing with multiple EMF in an EMS configuration, then the DHS shall be able to identify each EMF uniquely. It shall be ensured that the DHS allocates the energy data to the correct register and CEMD.