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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Railway applications – Energy measurement on board trains – Part 5: Conformance test

Applications ferroviaires – Mesure d'énergie à bord des trains – Partie 5: Essai de conformité

IEC 62888-5:2018-08(en-fr)

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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RAILWAY APPLICATIONS – ENERGY MEASUREMENT ON BOARD TRAINS –

Part 5: Conformance test

FOREWORD

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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
9/2412/FDIS	9/2426/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.

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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.

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INTRODUCTION

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

This part is Part 5 of the IEC 62888 series which consists of the following parts, under the common 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.

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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 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.

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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.

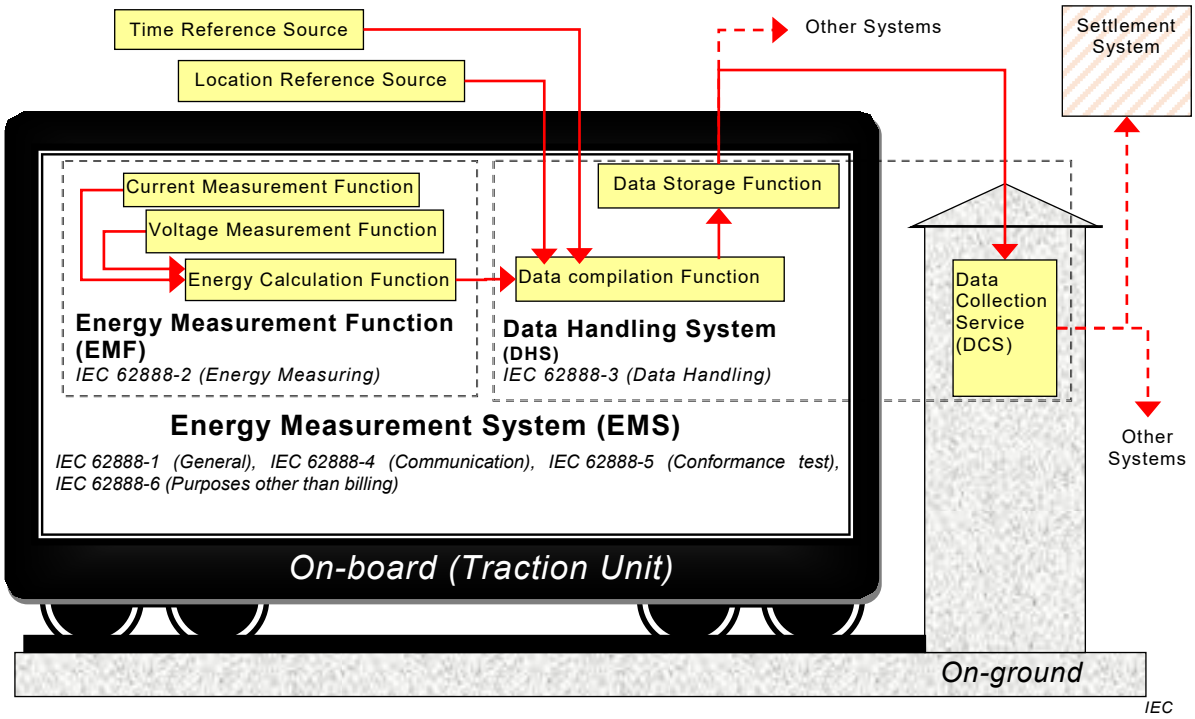

Figure 1 – EMS functional structure and dataflow diagram

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RAILWAY APPLICATIONS – ENERGY MEASUREMENT ON BOARD TRAINS –

Part 5: Conformance test

1 Scope

This part of IEC 62888 specifies the conformance test arrangements for newly manufactured EMS installed on a traction unit. This includes the integration conformance test and installation conformance test. In addition, this document also specifies the conformance test procedures for device and ancillary component replacement (e.g. due to damage in service), and periodic check to verify the EMS conformance test remains valid.

The assessment methods d) to j) in 4.3 apply at EMS system level. The methods are covered by IEC 62888-5 for Level 1 and by IEC 62888-6 for Level 2 and Level 3.

This document does not include elements related to conformance test aspects other than design review and testing provisions for the products, processes or services specified. Consequently, this document does not delete, change or interpret the general requirements for conformance test procedures and vocabulary detailed in ISO/IEC 17000.

This document does not cover the conformity assessment schemes that are the responsibility of ISO policy committee “Committee on conformity assessment” (ISO/CASCO).

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

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 62888-4:2018, *Railway applications – Energy measurement on board trains – Part 4: Communication*

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

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3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of 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
conformance test
demonstration that specified requirements are fulfilled

3.1.2
conformance test folder
CTF
folder holding all documentation produced during conformance test

3.1.3
EMS installation
installation of an EMS equipment type into a traction unit of a specified type

3.1.4
EMS integration
integration of devices, interconnections and ancillary components, forming a specific EMS equipment type

3.1.5
Implementation Under Assessment
IUA
specific EMS equipment type used throughout the conformance test

3.1.6
installer
entity responsible for the installation of an EMS equipment type into a traction unit type

3.1.7
EMS integrator
entity responsible for integrating devices, interconnections and ancillary components, forming an EMS equipment type

3.1.8
periodic re-verification
activities carried out periodically to check that the conformance test of an in-service EMS remains valid

Note 1 to entry: These re-verification activities are solely for the purpose stated, consequently other in-service activities such as maintenance and fault finding, etc., are not covered by this term.

3.1.9
protective interface
interface which permits intended data to be exchanged, and prevents unintended data being exchanged

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3.1.10
traction unit type
specific design of traction unit, produced by one manufacturer and having similar properties, the same uniform construction of parts determining these properties and the same functional components

Note 1 to entry: The type is represented by the traction unit sample provided for the EMS installation type tests.

3.2 Abbreviated terms

CTF	Conformance Test Folder
CEMD	Compiled Energy Measured Data
CPID	Consumption Point Identification
DCS	Data Collection Service
DHS	Data Handling System
EMF	Energy Measurement Function
EMS	Energy Measurement System
IDRR	Integration Design Review Report
IRTR	Installation Routine Test Report
ITTR	Integration Type Test Report
IUA	Implementation Under Assessment
RVR	Re-verification Report
SDRR	Installation Design Review Report
STTR	Installation Type Test Report

4 Conformance test approach

4.1 General

This clause specifies the structure and methodology for the conformance test. The procedures, design review requirements, testing requirements, and conformance test documentation requirements are specified in Clause 5. Completion of devices level conformance test is a pre-requisite to carry out EMS conformance test. The conformance test is undertaken in the following key stages:

a) device level;

b) EMS level;

c) EMS re-verification and device / ancillary component replacement.

Stage 1 is mandatory for newly manufactured devices and is covered by IEC 62888-2, IEC 62888-3 and IEC 62888-4. Stages 2, 3 are mandatory for every EMS in accordance with the scope as specified in Clause 1. The conformance test, undertaken during stages 2 and 3, deals primarily with system level requirements, and it does not replicate the detail in stage 1.

4.2 Situation of applicability

The EMS conformance test described in this part applies in case of:

- EMS integration,
- EMS installation,
- EMS periodic re-verification,
- EMS device / ancillary component replacement.

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4.3 General methodology

The conformance test is undertaken using the following methods, they are listed in logical order and may be undertaken in the same testing environment:

a) device design review;

b) device type test;

c) device routine test;

d) EMS integration design review;

e) EMS integration type test;

f) EMS installation design review;

g) EMS installation type test;

h) EMS installation routine test.

Furthermore, the following methods cover the re-verification and replacement:

i) EMS periodic re-verification;

j) EMS device / ancillary component replacement.

Methods a) to c) are used at device level. Conformance test arrangements are covered by IEC 62888-2, IEC 62888-3, IEC 62888-4 for Level 1 and by IEC 62888-6 for Level 2 and Level 3.

Methods d) to j) apply at EMS system level. The methods are covered by IEC 62888-5 for Level 1 and by IEC 62888-6 for Level 2 and Level 3.

Each method described generates evidence of conformance.

Completing the integration methods d) and e) allows the possibility of using this integration conformance test in conjunction with multiple installation conformance tests. This approach can be employed when the same EMS equipment type is to be used on several different traction unit types, using multiple installation conformance tests to deal with the installation issues only.

Figure 2 illustrates the methods of conformance test arrangements.

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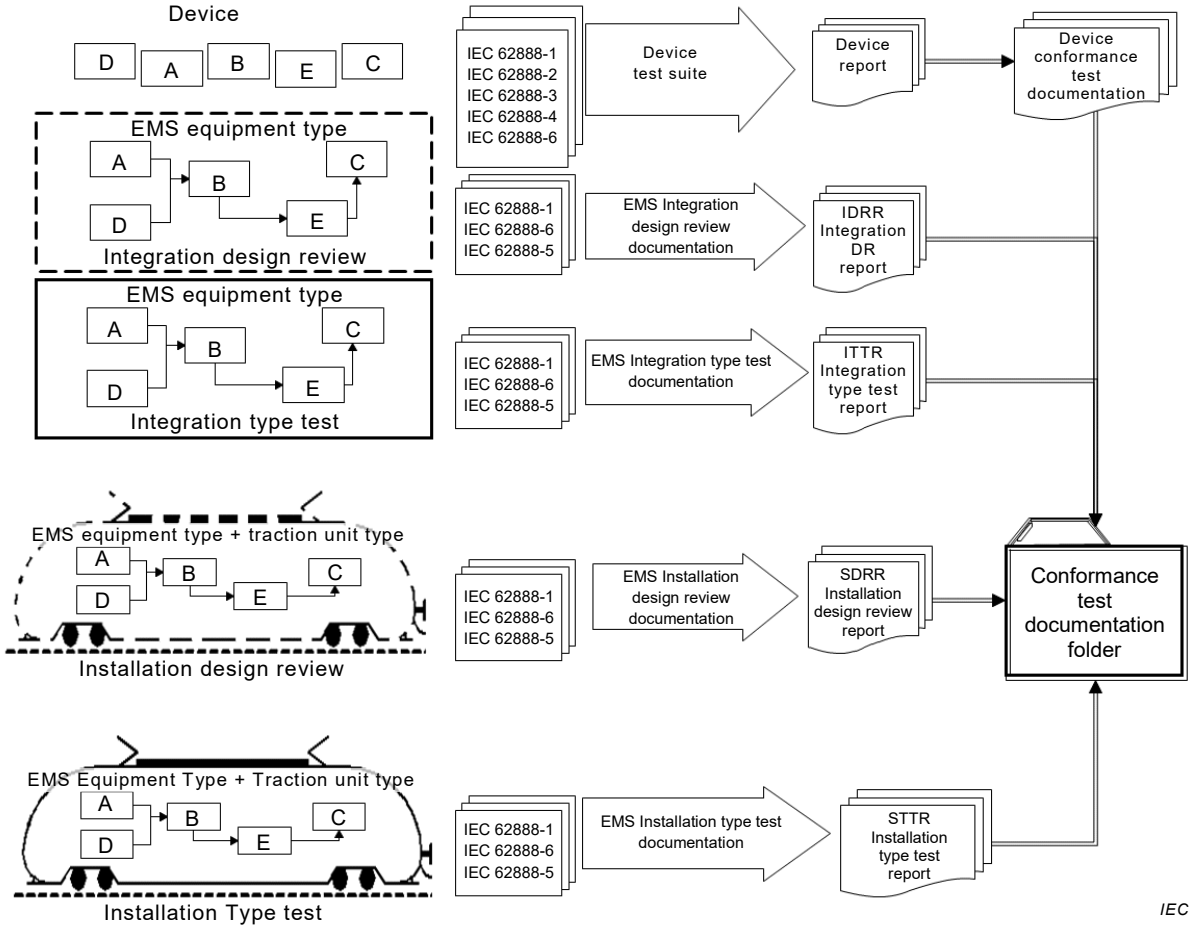

Figure 2 – Methods of conformance test

4.4 EMS system level specific methodology

4.4.1 General

At EMS system level, the methods d) to h) in 4.3 apply for type and routine tests, the methods i) and j) in 4.3 apply for EMS re-verification and EMS device component replacement.

4.4.2 EMS integration design review

The integration design review demonstrates that all the devices of a specific equipment type used to form EMS are able to be brought together correctly in accordance with an EMS design, and when integrated together provide the intended functionality in accordance with this series of standards.

4.4.3 EMS integration type test

The integration type test demonstrates that all the devices of a specific equipment type used to form EMS when integrated together are functioning as intended in accordance with this series of standards.

4.4.4 EMS installation design review

The installation design review assesses the compatibility between an EMS of a specific equipment type and a traction unit type, so that its functionality is maintained when installed on board.

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