# SLOVENSKI STANDARD
# SIST EN 50463-3:2013

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**Nadomešča:**
**SIST EN 50463:2008**

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**Železniške naprave - Merjenje energije na vlaku - 3. del: Ravnanje s podatki**

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

Bahnanwendungen - Energiemessung auf Bahnfahrzeugen - Teil 3: Daten-Behandlung



Applications ferroviaires - Mesure d'énergie à bord des trains - Partie 3 : Traitement des données



**Ta slovenski standard je istoveten z: EN 50463-3:2012**



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**ICS:**

45.060.10 Vlečna vozila Tractive stock

**SIST EN 50463-3:2013** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 50463-3

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ICS 45.060.10

Supersedes EN 50463:2007 (partially)

English version

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

Applications ferroviaires - Mesure d'énergie à bord des trains - Partie 3 : Traitement des données

Bahnanwendungen - Energiemessung auf Bahnfahrzeugen - Teil 3: Daten-Behandlung



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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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# Foreword

This document (EN 50463-3:2012) 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- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2015-10-15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 50463-3:2012), together with parts 1, 2, 4 and 5, supersedes EN 50463:2007.

EN 50463-3:2012 includes the following significant technical changes with respect to EN 50463:2007:

— this 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 3 of EN 50463 which consists of the following parts, under the common title *Railway applications — Energy measurement onboard 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 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. This part 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 this part of EN 50463.

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 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.

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

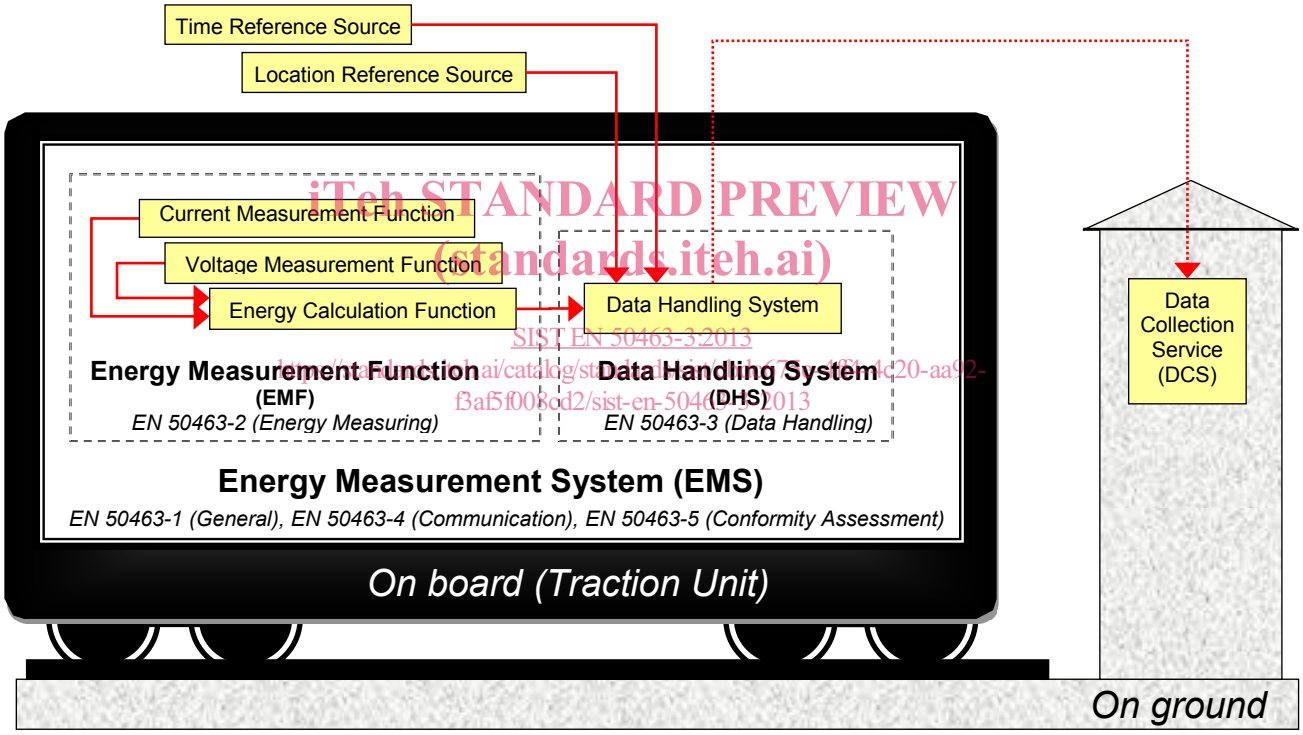




**Figure 1 - EMS functional structure and dataflow diagram**

## 1 Scope

This European Standard 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 Billing Data.

The Conformity Assessment arrangements for the DHS are specified in this document.

## 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.

CEN/TS 45545-2:2009, *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire behaviour of materials and components*

CLC/TS 45545-5:2009, *Railway applications — Fire protection on railway vehicles — Part 5: Fire safety requirements for electrical equipment including that of trolley buses, track guided buses and magnetic levitation vehicles*

EN 50121-3-2:2006, *Railway applications — Electromagnetic compatibility — Part 3-2: Rolling stock — Apparatus*



EN 50155:2007, *Railway applications — Electronic equipment used on rolling stock*

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 50463-4:2012, *Railway applications — Energy measurement on board trains — Part 4: Communication*

EN 50463-5:2012, *Railway applications — Energy measurement on board trains — Part 5: Conformity assessment*

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

EN 61373:2010, *Railway Applications — Rolling stock equipment — Shock and vibration tests*

World Geodetic System, revision WGS 84

## 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 60050-311, IEC 60050-312, IEC 60050-313, IEC 60050-314, IEC 60050-321 and IEC 60050-811. 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**
**Coordinated Universal Time**
**UTC**
time scale which forms the basis of a coordinated radio dissemination of standard frequencies and time signals, and 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]

**3.1.2**
**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.



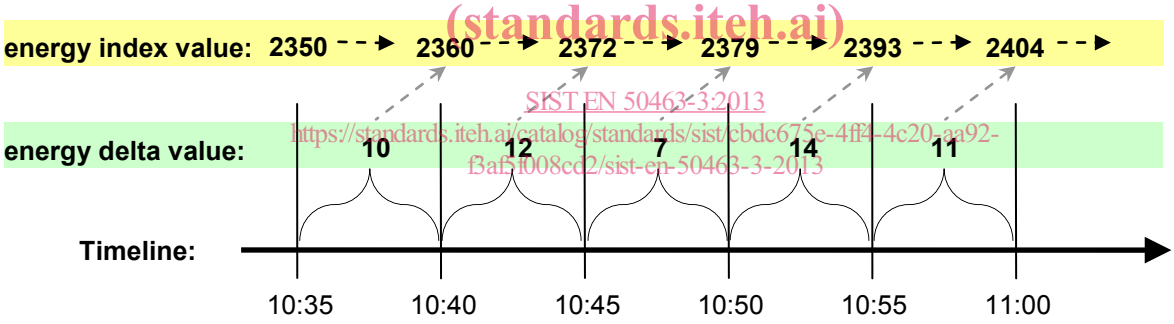




**Figure 2 – Example of energy index value**

**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 CEBD is produced



### 3.2 Abbreviations

For the purposes of this document, the following terms and definitions apply.

| | |
|---|---|
| CEBD | Compiled Energy Billing 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, Maintenance and Safety |
| TRP | Time Reference Period |
| UTC | Coordinated Universal Time |

# 4 Requirements

## 4.1 General

The requirements in EN 50463-1:2012, Clause 4 apply to any device containing one or more functions of the DHS where applicable. EN 50463-3 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 $20 \times 10^{-6}$ or better.

### 4.2.6 Synchronisation

The internal time source shall not deviate from the reference time source by more than 2 s. This shall be ensured by checking the synchronisation between the internal time source and one or more external time source(s) on a regular basis.

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 assured that the DHS allocates the energy data to the correct register and CEBD.

#### 4.3.2 Type

The DHS shall receive energy data from the ECF necessary for the creation of CEBD.

NOTE Each energy data will consist of two mandatory values (active energy consumed/regenerated) and two conditional values (reactive energy consumed/generated).

#### 4.3.3 Format

The values in the energy data received from an ECF will be in units of Watt-hour (active energy) and var-hour (reactive energy) or their decimal-multiples.

The energy data received from an ECF is either energy delta values or energy index values or both.

If the only energy data received from an ECF are delta values and the DHS also produces optional index vales, the DHS shall use these delta values to produce the index values.

If the only energy data received from an ECF are index values, the DHS shall use these index values to produce the delta values.



If the energy data received from an ECF are index values and delta values, the DHS shall use these inputs to produce energy data of the same type (e.g. delta inputs are used by the DHS to produce delta values only).



NOTE The algorithms for producing energy delta values in CEBD are specified in 4.7.3.



#### 4.3.4 Index value overrun

The DHS shall be able to detect any index value overrun in an ECF from the energy data received from the ECF. When this occurs, the DHS shall still be able to calculate required energy delta values.

#### 4.3.5 Merging with time data

Energy data in the DHS shall be accompanied by time data according to 4.2, where required for the production of CEBD. If the energy data provided by the ECF does not include time data, the DHS shall add time data without introducing any time displacement error to the energy data.

#### 4.3.6 Energy data flags

The DHS shall accept any quality flags attached to the energy data received from the ECF.

The DHS shall ensure that all energy data in the DHS carries one the following types of quality flags:

a) Measured (code: 127): based on measurements and calculations in the ECF;

b) Uncertain (code: 61): indicating that the energy data transmitted from ECF may be wrong (e.g. partially missing energy data, indications of EMF errors, flag “Uncertain” on energy data or time data);

c) Non-existent (code: 46): no energy data available to DHS.

NOTE The codes are based on the ebIX-code system, UN/CEFACT Data Element 4405 Release D.05A.

#### 4.3.7 k-factor

Any DHS intended to be able to receive energy data as secondary values from one or more ECF, shall be able to: