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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

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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

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2016-02-19.

It has been drawn up by CLC/TC 9X.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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52 European foreword

53 This document (prEN 50463-3:2015) has been prepared by CLC/TC 9X "Electrical and electronic
54 applications for railways".

55 This document is currently submitted to the Enquiry.

56 The following dates are proposed:

- latest date by which the existence of (doa) dor + 6 months
this document has to be announced at national
level
- latest date by which this document has to be (dop) dor + 12 months
implemented at national level by publication of an
identical national standard or by endorsement
- latest date by which the national standards (dow) dor + 36 months
conflicting with this document have to be
withdrawn (to be confirmed or
modified when voting)

57

58 This document will supersede EN 50463-3:2012.

59 prEN 50463-3:2015 includes the following significant technical changes with respect to EN 50463-3:2012:

60 — updated requirements for DCS, CEED, quality codes and logs (Clause 4).

61 This document has been prepared under a mandate given to CENELEC by the European Commission
62 and the European Free Trade Association, and supports essential requirements of EU Directive(s).

63 For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this
64 document.

65 This document is Part 3 of the EN 50463 series which consists of the following parts, under the common
66 title *Railway applications — Energy measurement on board trains*:

67 — *Part 1: General*;

68 — *Part 2: Energy measuring*;

69 — *Part 3: Data handling*;

70 — *Part 4: Communication*;

71 — *Part 5: Conformity assessment*.

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

75 The requirements for Energy Measurement Systems in the relevant Technical Specifications for
76 Interoperability are supported by this series of European Standards.

prEN 50463-3:2015**77 Introduction**

78 The Energy Measurement System provides measurement and data suitable for billing and may also be
79 used for energy management, e.g. energy saving.

80 This series of European Standards uses the functional approach to describe the Energy Measurement
81 System. These functions are implemented in one or more physical devices. The user of this series of
82 standards is free to choose the physical implementation arrangements.

83 — Structure and main contents of the EN 50463 series:

84 This series of European Standards is divided into five parts. The titles and brief descriptions of each part
85 are given below:

86 — EN 50463-1 — General:

87 The scope of EN 50463-1 is the Energy Measurement System (EMS).

88 EN 50463-1 provides system level requirements for the complete EMS and common requirements for all
89 devices implementing one or more functions of the EMS.

90 — EN 50463-2 — Energy measuring:

91 The scope of EN 50463-2 is the Energy Measurement Function (EMF).

92 The EMF provides measurement of the consumed and regenerated active energy of a railway traction
93 unit. If the traction unit is designed for use on a.c. traction systems the EMF also provides measurement
94 of reactive energy. The EMF provides the measured quantities via an interface to the Data Handling
95 System.

96 The EMF consists of the three functions: Voltage Measurement Function, Current Measurement Function
97 and Energy Calculation Function. For each of these functions, accuracy classes are specified and
98 associated reference conditions are defined. EN 50463-2 also defines all specific requirements for all
99 functions of the EMF.

100 The Voltage Measurement Function measures the voltage of the Contact Line system and the Current
101 Measurement Function measures the current taken from and returned to the Contact Line system. These
102 functions provide signal inputs to the Energy Calculation Function.

103 The Energy Calculation Function inputs the signals from the Current and Voltage Measurement Functions
104 and calculates a set of values representing the consumed and regenerated energies. These values are
105 transferred to the Data Handling System and are used in the creation of Compiled Energy Billing Data.

106 The standard has been developed taking into account that in some applications the EMF may be
107 subjected to legal metrological control. All relevant metrological aspects are covered in EN 50463-2.

108 EN 50463-2 also defines the conformity assessment of the EMF.

109 — prEN 50463-3 — Data handling:

110 The scope of prEN 50463-3 is the Data Handling System (DHS).

111 The on board DHS receives, produces and stores data, ready for transmission to any authorized receiver
112 of data on board or on ground. The main goal of the DHS is to produce Compiled Energy Billing Data and

113 transfer it to an on ground Data Collection Service (DCS). The DHS can support other functionality on
114 board or on ground with data, as long as this does not conflict with the main goal.

115 prEN 50463-3 also defines the conformity assessment of the DHS.

116 — **EN 50463-4 — Communication:**

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

118 This part of EN 50463 gives requirements and guidance regarding the data communication between the
119 functions implemented within EMS as well as between such functions and other on board units where
120 data are exchanged using a communications protocol stack over a dedicated physical interface or a
121 shared network.

122 It includes the on board to ground communication service and covers the requirements necessary to
123 support data transfer between DHS and DCS.

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

125 — **EN 50463-5 — Conformity assessment:**

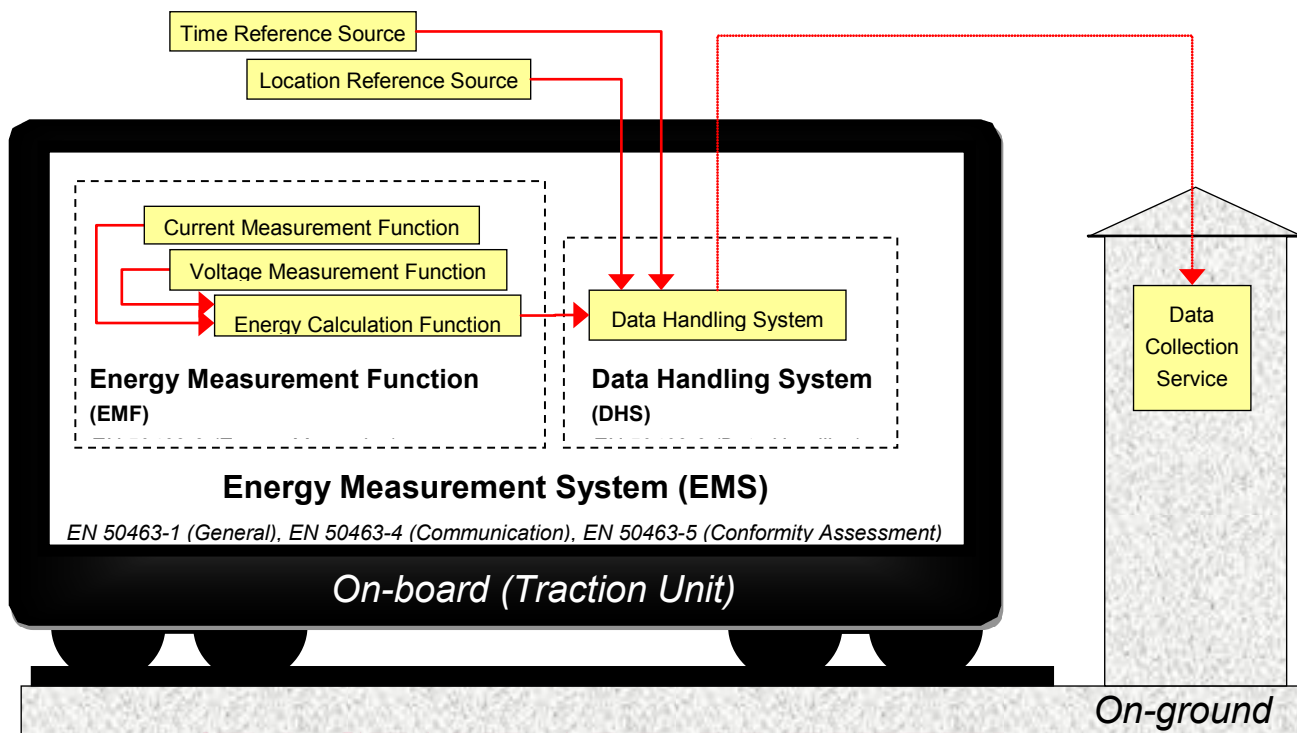
126 The scope of EN 50463-5 is the conformity assessment procedures for the EMS.

127 EN 50463-5 also covers re-verification procedures and conformity assessment in the event of the
128 replacement of a device of the EMS.

129 — **EMS functional structure and dataflow:**

130 Figure 1 illustrates the functional structure of the EMS, the main sub-functions and the structure of the
131 dataflow and is informative only. Only the main interfaces required by this standard are displayed by
132 arrows.

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



135

136

Figure 1 — EMS functional structure and dataflow diagram

SIST EN 50463-3:2018

<https://standards.iteh.ai/catalog/standards/sist/1bda98d7-cbed-4ae1-80b8-e44d62c0a748/sist-en-50463-3-2018>

137 **1 Scope**

138 This draft European Standard covers the requirements applicable to the Data Handling System (DHS) of
139 an Energy Measurement System.

140 This document also includes the basic requirements for the Data Collection Service on-ground, relating to
141 the acquisition and storage and export of Compiled Energy Billing Data.

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

143 The settlement system is outside the scope of this standard, and the specification of the interface
144 between DCS and settlement system is outside the scope of this standard.

145 **2 Normative references**

146 The following documents, in whole or in part, are normatively referenced in this document and are
147 indispensable for its application. For dated references, only the edition cited applies. For undated
148 references, the latest edition of the referenced document (including any amendments) applies.

149 EN 45545-2, *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire*
150 *behavior of materials and components*

151 EN 45545-5, *Railway applications — Fire protection on railway vehicles — Part 5: Fire safety*
152 *requirements for electrical equipment including that of trolley buses, track guided buses and magnetic*
153 *levitation vehicles*

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

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

157 prEN 50463-1:2015, *Railway applications — Energy measurement on-board trains — Part 1: General*

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

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

160 EN 50463-5, *Railway applications — Energy measurement on-board trains — Part 5: Conformity*
161 *Assessment*

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

163 EN 61373:2010, *Railway applications — Rolling stock equipment — Shock and vibration tests*
164 *(IEC 61373)*

165 World Geodetic System, revision WGS 84

166 **3 Terms, definitions and abbreviations**

167 **3.1 Terms and definitions**

168 For the purposes of this document, the terms and definitions given in prEN 50463-1 and the following
169 apply.

prEN 50463-3:2015

170 NOTE When possible, the following definitions have been taken from the relevant chapters of the International
 171 Electrotechnical Vocabulary (IEV), IEC 60050–311, IEC 60050–312, IEC 60050–313, IEC 60050–314, IEC 60050–
 172 321 and IEC 60050–811. In such cases, the appropriate IEV reference is given. Certain new definitions or
 173 modifications of IEV definitions have been added in this standard in order to facilitate understanding. Expression of
 174 the performance of electrical and electronic measuring equipment has been taken from EN 60359.

175 **3.1.1**176 **Coordinated Universal Time**177 **UTC**

178 time scale which forms the basis of a coordinated radio dissemination of standard frequencies and time
 179 signals, and corresponds exactly in rate with international atomic time, but differs from it by an integral
 180 number of seconds

181 Note 1 to entry: Coordinated universal time is established by the International Bureau of Weights and Measures
 182 (BIPM) and the International Earth Rotation Services (IERS).

183 Note 2 to entry: The UTC scales is adjusted by the insertion or deletion of seconds, so called positive or negative
 184 leap seconds, to ensure approximate agreement with UT1.

185 [SOURCE: ITU-R Recommendation TF.686, modified]

186 **3.1.2**187 **energy delta value**

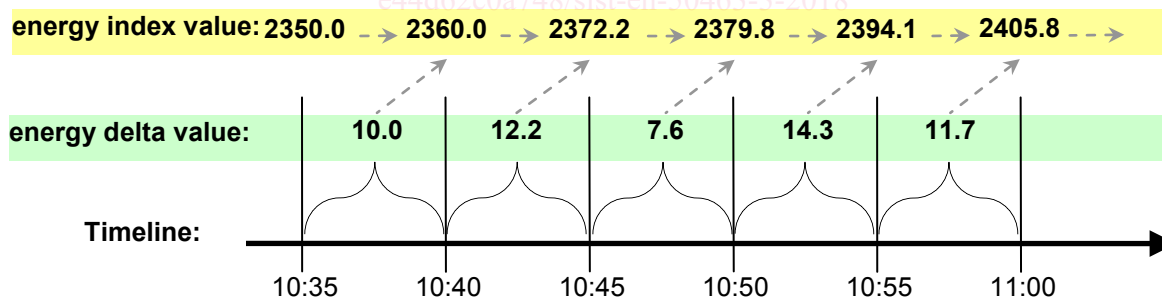
188 energy consumed and/or regenerated during a time period

189 Note 1 to entry: See Figure 2 for example.

190 **3.1.3**191 **energy index value**

192 total accumulated energy consumption and/or energy regeneration at the end of a time period

193 Note 1 to entry: See Figure 2 for example.



194

195

Figure 2 — Example of energy index value

196 **3.1.4**197 **flag**

198 code indicating information relevant to the functioning of the EMS

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

200 **3.1.5**201 **index value overrun**

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

203 **3.1.6**
 204 **k-factor**
 205 multiplicand necessary to convert a secondary value into a primary value

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

209 **3.1.7**
 210 **location data**
 211 data describing the geographical position of the traction unit

212 **3.1.8**
 213 **log**
 214 list or set of lists of recorded events

215 **3.1.9**
 216 **primary value**
 217 value referred to the measuring inputs of an EMF

218 **3.1.10**
 219 **secondary value**
 220 value of current, voltage, power or energy which needs to be multiplied by a k-factor to become a primary
 221 value

222 **3.1.11**
 223 **time data**
 224 data describing a time and date of a defined time source

225 **3.2 Abbreviations**

226 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

227 **4 Requirements**

228 **4.1 General**

229 The requirements in prEN 50463-1:2015, Clause 4 apply to any device containing one or more functions
 230 of the DHS where applicable. prEN 50463-3 defines additional requirements specific to the DHS and
 231 basic requirements for the DCS.

prEN 50463-3:2015

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

233 The DCS shall comply with the requirements in 4.12 only.

234 4.2 Time data**235 4.2.1 Source**

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

237 4.2.2 Reference time source

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

239 4.2.3 Content

240 Each time data shall include year, month, day, hour, minute and second.

241 4.2.4 Resolution

242 The time data shall have resolution of 1 s.

243 4.2.5 Stability

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

245 4.2.6 Synchronization

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

249 All synchronization events shall be logged, except successful automatic synchronization events where deviation was less than 2 s.

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

253 4.2.7 Quality code for time data

254 Each time data in the DHS shall be accompanied by a time data quality code.

255 One of the following quality codes shall be used with time data: