Electronic railway equipment — Train communication network (TCN)

Part 2-1: Wire Train Bus (WTB)
This British Standard is the UK implementation of EN 61375-2-1:2012. It is identical to IEC 61375-2-1:2012.

The UK participation in its preparation was entrusted by Technical Committee GEL/9, Railway Electrotechnical Applications, to Panel GEL/9/-/4, Railway applications - Train communication network and multimedia systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2012
Published by BSI Standards Limited 2012
ISBN 978 0 580 68227 8
ICS 45.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2012.

Amendments issued since publication

<table>
<thead>
<tr>
<th>Amd. No.</th>
<th>Date</th>
<th>Text affected</th>
</tr>
</thead>
</table>
Electronic railway equipment -
Train communication network (TCN) -
Part 2-1: Wire Train Bus (WTB)
(IEC 61375-2-1:2012)

Matériel électronique ferroviaire -
Réseau embarqué de train (TCN) -
Partie 2-1: Bus de Train Filaire (WTB)
(CEI 61375-2-1:2012)

Elektronische Betriebsmittel für Bahnen -
Zug-Kommunikations-Netzwerk -
Teil 2-1: WTB - Wire Train Bus
Konformitätsprüfung
(IEC 61375-2-1:2012)

This European Standard was approved by CENELEC on 2012-07-26. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

© 2012 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.
Foreword

The text of document 9/1642/FDIS, future edition 1 of IEC 61375-2-1, prepared by IEC/TC 9 "Electrical equipment and systems for railways" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61375-2-1:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-04-26
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-07-26

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

Endorsement notice

The text of the International Standard IEC 61375-2-1:2012 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60870-5-1 NOTE Harmonized as EN 60870-5-1.
### Normative references to international publications with their corresponding European publications

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.

**NOTE** When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<table>
<thead>
<tr>
<th>Publication</th>
<th>Year</th>
<th>Title</th>
<th>EN/HD</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60571</td>
<td>-</td>
<td>Electronic equipment used on rail vehicles</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IEC 60807</td>
<td>Series</td>
<td>Rectangular connectors for frequencies below 3 MHz</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IEC 61375-1</td>
<td>-</td>
<td>Electronic railway equipment - Train communication network - Part 1: TCN - Train Communication Network general architecture</td>
<td>EN 61375-1</td>
<td>-</td>
</tr>
<tr>
<td>IEC 61375-3-1</td>
<td>-</td>
<td>Electronic railway equipment - Train communication network (TCN) - Part 3-1: Multifunction Vehicle Bus (MVB)</td>
<td>EN 61375-3-1</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 8802-2</td>
<td>-</td>
<td>Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 2: Logical link control</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 8824</td>
<td>Series</td>
<td>Information technology - Abstract Syntax Notation One (ASN.1)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 8825</td>
<td>Series</td>
<td>Information technology - ASN.1 encoding rules</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 8859-1</td>
<td>-</td>
<td>Information technology - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 9646</td>
<td>Series</td>
<td>Information technology - Open Systems Interconnection - Conformance testing methodology and framework</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 10646</td>
<td>-</td>
<td>Information technology - Universal multiple-octet coded character set (UCS)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ISO/IEC 13239</td>
<td>-</td>
<td>Information technology - Telecommunications and information exchange between systems - High-level data link control (HDLC) procedures</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ITU-T Recommendation V.24</td>
<td>-</td>
<td>List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ITU-T Recommendation Z.100</td>
<td>-</td>
<td>Specification and Description Language (SDL)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Publication</td>
<td>Year</td>
<td>Title</td>
<td>Page</td>
<td>Year</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>-------------------------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>IEEE 754</td>
<td>-</td>
<td>Binary floating-point arithmetic</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>UIC CODE 556</td>
<td>-</td>
<td>Information transmission in the train (train-bus)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>UIC CODE 557</td>
<td>-</td>
<td>Diagnostics on passenger rolling stock</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Annex III of the EU Directive 2008/57/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.
## CONTENTS

**INTRODUCTION** ...................................................................................................................... 13

1 Scope ........................................................................................................................................ 15

2 Normative references. .............................................................................................................. 15

3 Terms and definitions, abbreviations, conventions ............................................................... 16

  3.1 Terms and definitions ........................................................................................................ 16

  3.2 Abbreviations .................................................................................................................. 32

  3.3 Conventions .................................................................................................................... 34

    3.3.1 Base of numeric values .............................................................................................. 34

    3.3.2 Naming conventions ................................................................................................. 34

    3.3.3 Time naming conventions ....................................................................................... 34

    3.3.4 Procedural interface conventions .......................................................................... 35

    3.3.5 Specification of transmitted data ............................................................................. 37

    3.3.6 State diagram conventions ..................................................................................... 39

  3.4 General considerations ..................................................................................................... 40

    3.4.1 Interface between equipment .................................................................................. 40

    3.4.2 Interface between consists ..................................................................................... 40

    3.4.3 Real-Time Protocols ............................................................................................... 40

    3.4.4 Network Management ............................................................................................ 41

    3.4.5 Configurations ........................................................................................................ 41

    3.4.6 Structure of a standard device ................................................................................. 42

  3.5 Conformance test .............................................................................................................. 45

4 Physical layer .......................................................................................................................... 46

  4.1 Topology ........................................................................................................................... 46

    4.1.1 Bus sections ........................................................................................................... 46

    4.1.2 Couplers ................................................................................................................ 46

    4.1.3 Nodes ..................................................................................................................... 46

    4.1.4 Consist orientation ................................................................................................. 46

    4.1.5 Consist specification (informal) ............................................................................ 47

  4.2 Medium specifications ...................................................................................................... 48

    4.2.1 Topology ................................................................................................................ 48

    4.2.2 Duplicated medium (option) ................................................................................ 48

    4.2.3 Bus Configuration rules ......................................................................................... 49

    4.2.4 Cable specification ................................................................................................ 50

    4.2.5 Shielding concept .................................................................................................. 51

    4.2.6 Terminator ............................................................................................................. 52

  4.3 Medium attachment ......................................................................................................... 53

    4.3.1 Node connection points identification ..................................................................... 53

    4.3.2 Direct node attachment ......................................................................................... 53

    4.3.3 Indirect node attachment ....................................................................................... 54

    4.3.4 Connector (optional) ............................................................................................... 54

  4.4 Node specifications .......................................................................................................... 55

    4.4.1 Node elements ....................................................................................................... 55

    4.4.2 Node and switch settings ...................................................................................... 57

    4.4.3 Duplicated Line Units (option) ............................................................................ 57

  4.5 Line Unit specifications .................................................................................................... 58