IEC TS 61375-2-4

Edition 1.0 2017-02

TECHNICAL SPECIFICATION

colour inside

Electronic railway equipment – Train communication network (TCN) – Part 2-4: TCN application profile

IEC TS 61375-2-4:2017-02(en)

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC TS 61375-2-4

Edition 1.0 2017-02

TECHNICAL SPECIFICATION

colour inside

Electronic railway equipment – Train communication network (TCN) – Part 2-4: TCN application profile

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 45.060.01

ISBN 978-2-8322-3818-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 2-4: TCN application profile

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61375-2-4, which is a technical specification, has been prepared by IEC technical committee 9: Electrical equipment and systems for railways, in collaboration with UIC.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
9/2093/DTS	9/2150A/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61375 series, published under the general title *Electronic railway equipment – Train communication network (TCN)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

IEC TS 61375-2-4 defines the application profiles of the Train Communication Network in order to achieve communication between software applications throughout consist networks defined in IEC 61375-1 and the train backbone defined in IEC 61375-2-5.

This part of IEC 61375 defines the requirements for the applications communicating via the data transmission equipment of the consists throughout the consist networks and the train backbones.

The purpose of this part of IEC 61375 is to:

- fully document the communication requirements for all train applications, align them and set them out in standard form,
- provide guidelines for the technical solution of communication between software applications residing on the same or on different consists, which are part of a train, and which are connected to the consist networks and the train backbones in scope,
- define train applications for certain functionalities, which are in scope of this part of IEC 61375.

ELECTRONIC RAILWAY EQUIPMENT – TRAIN COMMUNICATION NETWORK (TCN) –

Part 2-4: TCN application profile

1 Scope

This part of IEC 61375 applies to the applications in trains, i.e. it covers the application profile for functions belonging to the Train Control and Monitoring System (TCMS). The application profile is based on the TCN communication system for the data communication between consists of the said trains. This document provides for a data interface with parameters and addressing of TCMS functions based on the communication profile laid out in IEC 61375-2-3.

This document is applicable in rolling stock requiring interoperable coupling and uncoupling. This part of IEC 61375 may be additionally applicable to closed trains and multiple unit trains when so agreed between purchaser and supplier.

The applicability of this part of IEC 61375 to the train communication network technologies as defined allows for interoperability of individual consists within trains.

The data communication systems inside consists are not covered by this document and are given only as example solutions to cope with the said TCN. In any case, proof of compatibility between a proposed train backbone and a proposed consist network will have to be brought by the supplier.

Special backup functions, which are used in cases when the train backbone is in a degraded condition are not in the scope of this document.

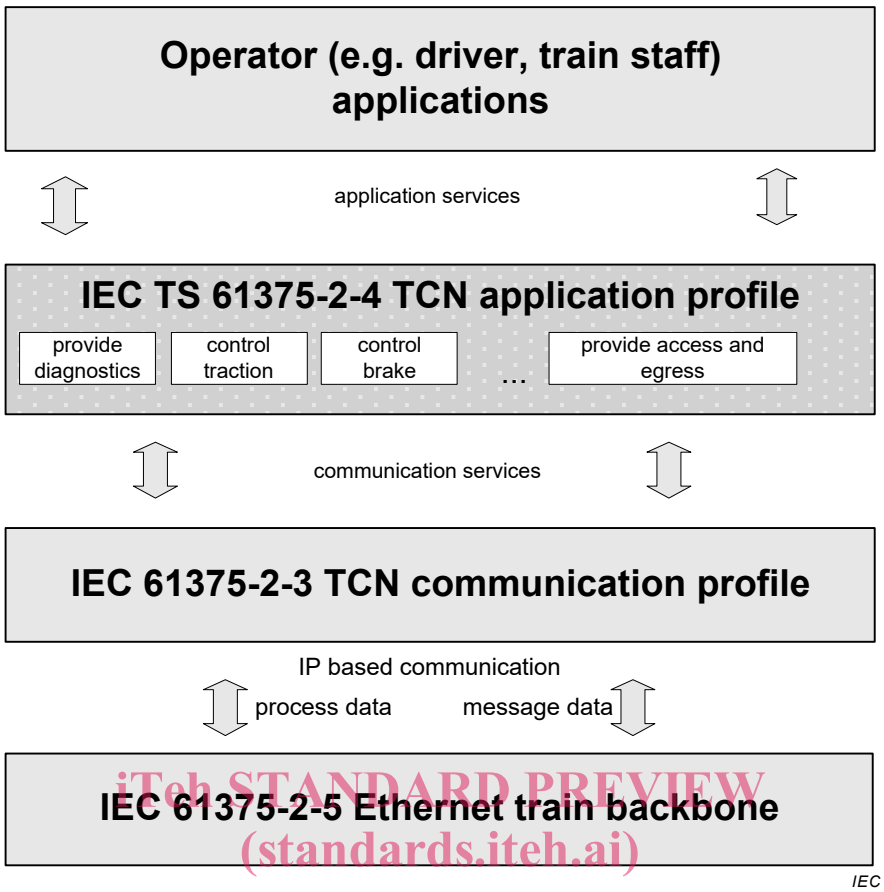

Figure 1 – IEC TS 61375-2-4 as a link between the functions and the applications

As illustrated in Figure 1 the purpose of this part of IEC 61375 is to create a general model that describes in a functional way the remote control of TCMS functions like “provide access and egress”. This document makes direct reference to IEC 61375-2-3, which covers data transmission on the Ethernet train backbone (ETB) and specifies the functions between the consists concerned (e.g. locomotives, multiple units and driving trailers) including the rules to set up the necessary data telegrams for transmission and process.

This document specifies the application profiles covering the train functions to:

a) provide access and egress;

b) control traction;

c) control brake;

d) provide diagnostics.

NOTE Functions b) to d) will be covered in a future revision of this document.

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 61375-1, *Electronic railway equipment – Train communication network (TCN) – Part 1: General architecture*

IEC 61375-2-1, *Electronic railway equipment – Train communication network (TCN) – Part 2-1: Wire Train Bus (WTB)*

IEC 61375-2-3, *Electronic railway equipment – Train communication network (TCN) – Part 2-3: TCN communication profile*

3 Terms, definitions, abbreviated terms, acronyms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61375-1 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
all doors of consist CLOSED
each single door of the consist is closed

Note 1 to entry: This state is side selective.

3.1.2
all doors of consist LOCKED
each single door of the consist is locked

Note 1 to entry: This state is side selective.

3.1.3
all doors of train CLOSED
all doors of each consist are closed

Note 1 to entry: This state is side selective.

3.1.4
all doors of train LOCKED
all doors of each consist are locked

Note 1 to entry: This state is side selective.

3.1.5
application profile
defined standardized set of services or functions offered to the application processes for information exchange with specified data formats and data processing

3.1.6
CLOSE
action to juxtapose the door to its frame, to obstruct an entrance or opening

3.1.7
consist FAILURE
the consist is defined in failure state when the consist DCU control function or communication is in failure

Note 1 to entry: Failure detection may be realized by self-diagnostic of the consist DCU or by function supervision of consist DCU by the train DCU (e.g. process data sink time supervision).

3.1.8
door ATTENDED
single door which remains active and open after the crew manipulator associated with it (e.g. square key) has remotely commanded all the other doors of the train to close

3.1.9
door CLOSED
the door is defined closed when the door is adjacent to its frame and the mechanical locking device is not in effect, making possible the mechanical opening of the door itself

Note 1 to entry: In this condition it is possible to move the door electrically or pneumatically.

3.1.10
door OUT OF ORDER
when at least one of the following conditions applies:

a) the link to the remote control is failing;

b) the door cannot be controlled locally

3.1.11
door ISOLATED
when it is closed and mechanically locked by means of the appropriate mechanical closure device

Note 1 to entry: In this condition the door is permanently closed and locked and it cannot be moved in any way.

Note 2 to entry: In this condition the internal emergency handle and the outside one have no effect on the opening of the door.

3.1.12
ISOLATE door
to close and mechanically lock the door and leave the door unable to execute any operation command

Note 1 to entry: ISOLATE door uses mechanical methods in case of door malfunction. For example the door isolation device is located on the door leaf, it is accessible from inside and /or outside via a square (or triangular) key lock.

3.1.13
door LOCKED
the door is defined locked when the physical door is adjacent to its frame and the mechanical locking device is in effect, making it impossible to open the door mechanically

Note 1 to entry: In this condition it is impossible to move the door physically.

3.1.14
door OPENED
the door is defined as opened when it is not adjacent to its frame and the entrance is not blocked

Note 1 to entry: In this condition it is ready to accept a closing command.

3.1.15
driving trailer
vehicle with a driving cab at least at one end of the vehicle from which the traction and braking functions of a train can be controlled

3.1.16
functional address
unique identification for a function

3.1.17
leading vehicle
vehicle, which is elected by a communication service of IEC 61375-2-3 and which controls the movements of the train

3.1.18
locomotive
motor vehicle, not forming part of a train-unit and not carrying a payload, intended to move other vehicles

[SOURCE: IEC 60050-811:2017, 811-02-06]

3.1.19
OPEN
action to move the physical door and create an entrance

3.1.20
passenger coach
passenger carrying vehicle without its own propulsion system

3.1.21
shoegear
train equipment to transfer electric current from the third rail

Note 1 to entry: It is usually mounted on bogies.

3.1.22
traction unit
vehicle with its own power equipment

3.1.23
vehicle
single item of rolling stock

Note 1 to entry: Examples of a single item of rolling stock include a locomotive, a coach and a wagon.

[SOURCE: IEC 60050-811:2017, 811-02-02]

3.2 Abbreviated terms and acronyms

ASC Automatic Speed Control
ASN.1 Abstract Syntax Notation 1
DAC Driver Activity Control
DB Deutsche Bahn (German Railways)
DCU Door Control Unit
DDU Driver Display Unit
DMU Diesel Multiple Unit
ED End Device
EMU Electric Multiple Unit
ENUM Enumeration
ETB Ethernet Train Backbone
ETCS European Train Control System
FI Function Interface
HMI Human Machine Interface