SLOVENSKI STANDARD
SIST EN 16186-3:2022

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SIST EN 16186-3:2016+A1:2019

Železniške naprave - Voznikova kabina - 3. del: Načrtovanje slikovnih zaslonov za težka železniška vozila

Railway applications - Driver’s cab - Part 3: Design of displays for heavy rail vehicles

Bahnanwendungen - Führerraum - Teil 3: Displaygestaltung für Vollbahnfarhzeuge

Applications ferroviaires - Cabine de conduite - Partie 3 : Conception des affichages pour véhicules ferroviaires lourds

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ICS:

45.060.10	Vlečna vozila	Tractive stock

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EUROPEAN STANDARD

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English Version

Railway applications - Driver's cab - Part 3: Design of displays for heavy rail vehicles

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Bahnanwendungen - Führerraum - Teil 3: Displaygestaltung für Vollbahnfahrzeuge

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 16186-3:2022) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16186-3:2016+A1:2018.

EN 16186, *Railway applications — Driver’s cab* is written as an EN series on all the aspects to be considered when designing a driver’s cab, from anthropometric data and visibility, over the integration of displays, controls and indicators as well as the design of displays to cab layout and access facilities. The background information on the anthropometric data used is provided in CEN/TR 16823 [1].

EN 16186, *Railway applications — Driver’s cab* currently consists of the following parts:

— *Part 1: Anthropometric data and visibility*;

— *Part 2: Integration of displays, controls and indicators*;

— *Part 3: Design of displays for heavy rail vehicles*;

— *Part 4: Layout and access*;

— *Part 5: External visibility for tram vehicles*;

— *Part 6: Integration of displays, controls and indicators for tram vehicles* [1)];

— *Part 7: Design of displays for tram vehicles* [2)];

— *Part 8: Tram vehicle layout and access*.

EN 16186-3:2022 includes the following significant technical changes with respect to EN 16186-3:2016+A1:2018:

— consistency of display application;

— luminance;

— appearance of a flashing yellow frame;

— typography;

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1) Under preparation. Stage at the time of publication: prEN 16186-6:2022.

2) Under development.

— audible feedback;

— characterization of the pictograms according to the reversibility of the function by the driver (Table A.1);

— creation or modification of pictograms 18, 19b, 29, 39b, 46b, 95, 109.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The requirements of this document, which interface with vehicle functions, have been elaborated with the commitment to respect the standards specifying these functions and in addition to respect the state of the art of other rolling stock functions.

For the tracing of requirements, a link to CLC/TS 50459 series [2] or the ERA DMI document [3] serving as a source for the related requirements is added.

The reasons for defining the information are as follows:

— achieving harmonized and coherent presentation of information;

— defining Driver-Machine Interface ergonomics that is compatible with agreed interoperable specifications;

— reducing the risk of incorrect operation by a driver working with different trains fitted with displays;

— facilitating train operation with unified ergonomics, hence reducing the cost of driver training.

Information designed according to this document is deemed to fulfil the following basic principles:

— be clear, correct and necessary;

— indicate its priority, whether by positioning, size, colour, sounds, sound levels, etc.;

— minimize confusion of the driver;

— prevent unnecessary distraction of the drivers' attention while performing their normal duties.

If a requirement contains an option, the choice of this option is purely up to the applicant.

NOTE The term "option" is to be understood as a possibility that is usually expressed by the word "can".

1 Scope

This document specifies all necessary design rules and associated assessment criteria as well as guidance concerning the design of information and the corresponding user interfaces of driver's cabs.

It considers the tasks the driver has to carry out and human factors. This document specifies how information is arranged and displayed. It is explicitly applicable to display applications like TRD, ETD, CCD and TDD and may be completed by the CLC/TS 50459 series.

This document is not applicable to legacy ATP systems. If requirements in this document are in conflict with the ERA DMI document (ERA_ERTMS_015560) the requirements of the ERA DMI document should prevail for the CCD ETCS application.

NOTE 1 For resolving any discrepancies (e.g. 5.4.2.3) ERA is expected to harmonize the usage philosophy of the ERA DMI with this document.

All assessments based on the normative requirements of this document are applicable mainly to

— symbols provided by Annex A;

— arrangement of screen areas conforms to Figure 1 (generic organization of information);

— colours, fonts;

— audible information.

This document is applicable to the following aspects:

— legibility and intelligibility of displayed information: general rules concerning the layout of information on the displays, including character size and spacing;

— definition of harmonized colours, symbols, etc.;

— definition of harmonized principles for the command interface (by physical or touchscreen buttons): size, symbols, reaction time, way to give feedback to the driver, etc.;

— general arrangements (dialogue structures, sequences, layout philosophy, colour philosophy), symbols, audible information, data entry arrangements.

NOTE 2 If this document deals with how information can be given for operation and in degraded situations, it does not define operating rules and degraded situations.

This document does not request any safety requirement related with displayed information.

This document specifies minimum requirements and does not prevent more complex solutions.

Requirements describing the functions using the display are out of scope of this document.

This document applies to driver's cabs of locomotives and driving vehicles of the heavy rail system.

EXAMPLES Locomotives, railcars, power heads, driving trailers.

This standard is not applicable for vehicles of urban rail systems.

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.

CLC/TS 50459-2:2021, *Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — Part 2: Ergonomic arrangements of GSM-R information*

CLC/TS 50459-3:2021, *Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — Part 3: Ergonomic arrangements of non ETCS information*

EN 894-2:1997+A1:2008, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays*

EN 14198:2016+A2:2021, *Railway applications — Braking — Requirements for the brake system of trains hauled by locomotives*

EN 16186-1:2014+A1:2018, *Railway applications — Driver's cab — Part 1: Anthropometric data and visibility*

EN 16186-2:2017, *Railway applications — Driver's cab — Part 2: Integration of displays, controls and indicators*

EN 16334:2014, *Railway applications — Passenger Alarm System — System requirements*

EN 16683:2015, *Railway applications — Call for aid and communication device — Requirements*

EN ISO 9241-307:2008, *Ergonomics of human-system interaction — Part 307: Analysis and compliance test methods for electronic visual displays (ISO 9241-307:2008)*

EN ISO 9241-303:2011, *Ergonomics of human-system interaction — Part 303: Requirements for electronic visual displays (ISO 9241-303:2011)*

ISO 2575:2021, *Road vehicles — Symbols for controls, indicators and tell-tales*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16186-1:2014+A1:2018, EN 16186-2:2017 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
activated
put into a functional state following a validated input

3.2
authentication
process checking the identity of the user, device or any other element of the system or integrity of the stored, transmitted or retrieved/exposed data

Note 1 to entry: This can be a pre-requisite to access the system.

3.3
authorisation
process granting the access rights to a user, program or process, or an event or status of the system putting the system itself in hold condition which can be exited only by the action of authorized staff

3.4
brightness
attribute of a visual sensation according to which an area appears to emit more or less light

Note 1 to entry: The use of this term is not restricted to primary light sources.

[SOURCE: EN ISO 9241-302:2008, definition 3.3.9, modified (Note added)]

3.5
button
operating element for interaction with the display (hard key, soft key, sensitive area)

3.5.1
enabled
put into a state where the function related to the button can be activated by pressing the button

3.5.2
pressed
put into a state where the action on the button is ongoing

3.6
cell
basic unit to define the shape of DMI objects and the proportions of areas

Note 1 to entry: Depending on the resolution of the screen, a cell consists of one or more pixels.

3.7
Closed Circuit Television
CCTV
television allowing the transmission of images over a relatively short distance intended for a particular group of users

[SOURCE: IEC 60050-723:1997, 723-01-19, modified “generally by cable” removed]

3.8
display
hardware device or system that shows text and/or graphic information to the user

Note 1 to entry: The display optionally contains hard keys.

3.9
command
action executed by the personnel on the human-machine interface

3.10
consistency
maintenance of interface design choices (codes, naming, formats, procedures, etc.) in similar contexts

Note 1 to entry: See [4].

3.11
control and command display
CCD
device that shows information from automatic train control or protection systems (ETCS and national systems) as well as information from the TCMS

3.12
electronic timetable display
ETD
operator option that shows information and allows interaction regarding the electronic timetable sheet

3.13
error
deviation from the intended design which could result in unintended system behaviour or failure

[SOURCE: EN 50129:2003, 3.1.15]

3.14
event
occurrence of a state at a defined precondition and time requesting attention, e.g. alarm, authentication, authorisation, fault, warning

[SOURCE: EN 15380-4:2013, 3.12, modified ("requesting attention, e.g. alarm, authentication, authorisation, fault, warning" added)]

3.15
failure
<of an item> loss of ability to perform as required

[SOURCE: IEC 60050-192:2015, 192-03-01, modified (the Notes 1, 2 and 3 to entry have been omitted)]

3.16
fault
<in a system> state of an item characterized by inability to perform a required function, excluding the inability during preventive maintenance or other planned actions

Note 1 to entry: A fault is often the result of a failure of the item itself, but can exist without prior failure (e.g. in case of a design fault).

Note 2 to entry: The fault is a state characterized by inability to perform a required function.

[SOURCE: IEC 60050-821:2017, 821-11-20, modified – The definition "abnormal condition that could lead to an error in a system" has been changed. The note 1 to entry has been changed and the note 2 to entry has been added.]

3.17
grid array
area consisting of cells which results in a visual appearance of information in certain proportions

Note 1 to entry: Form and shape of the information on the screen in this standard is based on a graphical screen with a total grid array of 640 x 480 rectangular cells. This ratio forms the basis for all object proportions independent of resolution and size of the screen.

3.18
hard key
physical key with permanent marking and not part of the screen area

Note 1 to entry: This permanent marking can be alpha and/or numeric and/or a symbol.

3.19
input field
highlighted screen area for entering data

3.20
label
symbol or text indication on or close to an indicator or a button

EXAMPLE Soft key label

3.21
luminance
physical measurement of the stimulus which produces the sensation of brightness, in terms of the luminous intensity in a given direction (usually towards the observer), per unit area, of an emitting, transmitting or reflecting surface, expressed in candelas per square metre (cd/m^2)

Note 1 to entry: It is the luminous intensity of the light emitted or reflected in a given direction from an element of the surface divided by the area of the element projected in the same direction.

[SOURCE: EN ISO 11064-6:2005, 3.9, modified: (cd/m^2) added, notes 2 and 3 removed.]

3.22
pilot pressure
pressure existing at the pneumatic relay of the driver's brake valve

3.23
redundancy concept
display concept that ensures the display of information of a display out of order on one or more of the other operational display(s)

3.24
remedy
help and/or explanatory information related to a technical fault

3.25
RGB
colour scheme defined in EN 61966-2-1

3.26
screen
visual result of software, implemented on a display that is devoted to interact with the user

Note 1 to entry: A screen is a set of information made of a background, windows and symbols. This information can be for example speed, distance, pressure, temperature, electric current, real time video images, which may allow or request drivers to input data through a user interface

3.27
screen area
part of display providing the screens

3.28
sensitive area
enabled area on a touchscreen on which a physical action is possible in order to give input to the display

3.29
soft key
context-dependent key consisting of a combination of a hard key and an associated screen label (text or symbol)

Note 1 to entry: This key is for multifunctional use.

3.30
standstill
condition under which the vehicle speed has decreased to 3 km/h or less

3.31
status
existent or potential state of the system or actual state at a given time *t*

Note 1 to entry: A status can be: a) ON/active/up, b) OFF/inactive/down, c) excluded, d) faulty

3.32
symbol
pictorial representation (with optional digits and letters) used for displaying information

3.33
technical and diagnostic display
TDD
device that provides information and recommendations with regard to train and/or vehicle status, diagnostics, failure management and dedicated functions of the vehicle or the entire train

3.34
technical specification
document describing specific parameters and/or product requirements, which have to be agreed by contracting parties

3.35
text
alphanumeric information

3.36
title
text explaining the purpose of the window or screen

3.37
train control and monitoring system
TCMS
means of controlling and monitoring functions of the train internally, whether by software or hardware, and of providing information to the driver of the status of equipment on-board the train

3.38
train mission
train running number and start and end of train run, provided the train composition is not changed

3.39
train radio display unit
TRD
device that provides information and interaction regarding the train radio

3.40
troubleshooting
process of structured and intentional activities in order to cope with a technical problem with support of the diagnostic system

3.41
window
separate visual area of the screen which displays information output and may allow input

Note 1 to entry: Usually it has a rectangular shape.

4 Symbols and abbreviations

ACK	Acknowledgment
CCD	Control and Command Display
CCTV	Closed Circuit Television
DAC	Driver Activity Control
DMU	Diesel Multiple Unit
EMU	Electrical Multiple Unit
ep	electro-pneumatic
ETCS	European Train Control System
ETD	Electronic Timetable Display
MCB	Main Circuit Breaker
PAD	Passenger Alarm Device
PAS	Passenger Alarm System
TCMS	Train Control and Monitoring System
TDD	Technical and Diagnostic Display