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Železniške naprave - Voznikova kabina - 3. del: Načrtovanje slikovnih zaslonov

Railway applications - Driver's cab - Part 3: Design of displays

Bahnanwendungen - Führerraum - Teil 3: Gestaltung von Führerraumanzeigen

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

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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 STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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Foreword

This document (prEN 16186-3:2014) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the second CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

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

— Part 1: Anthropometric data and visibility

— Part 2: Integration of displays, controls and indicators

— Part 3: Design of displays

— Part 4: Access and layout

Introduction

The requirements of this standard 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 tracing of requirements a link to TS 50459-1 [1] or the ERA DMI document [2] serving as a source for the related requirements is added.

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

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;

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

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

Information designed according to this standard 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 driver's attention whilst performing their normal duties.

There are three kinds of requirements labelled:

a) Objectives

Objectives are labelled by the term “objective” and are expressed by “should”. Objectives themselves are not subject to assessments, objectives provided by this standard are deemed to be fulfilled by the application of this standard.

b) Recommendations

Recommendations are expressed by “should”. A recommendation is only subject to assessment if it is chosen by the applicant

c) Normative requirements

Normative requirements are expressed by “shall” and represent the comprehensive set of interoperable requirements. They are subject to assessment.

1 Scope

This standard provides all necessary design rules and associated assessment criteria as well as guidance concerning the design of information and the corresponding user interfaces of interoperable rolling stock. It considers the tasks the driver has to carry out and human factors. This standard describes how information is arranged and displayed. The standard does not apply to legacy ATP systems. If requirements in this standard are in conflict with the ERA DMI document (ERA_ERTMS_015560) the requirements of the ERA DMI document shall prevail for the CCD ETCS application.

All assessments based on the normative requirements of this standard focus mainly on

— symbols provided by Annex A,

— arrangement of cab display areas conform with Figure 2 (generic organisation of information),

— colours, fonts,

— audible information.

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

NOTE 1 The term “option” is to be understood as a possibility that is usually expressed by the word “can”.

This standard covers 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 structure, sequences, layout philosophy, colour philosophy), symbols, audible information, data entry arrangements.

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

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

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.

CLC/TS 50459-6:2005, *Railway applications — Communication, signalling and processing systems — European Rail Traffic Management System — Driver-Machine Interface — Part 6: Audible information*

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

prEN 16186-1, *Railway applications - Driver's cab - Part 1: Visibility, layout, access*

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

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

ISO 2575:2010, *Road vehicles — Symbols for controls, indicators and tell-tales*

3 Terms and definitions

For the purposes of this document, the terms, definitions and abbreviations given in prEN 16186-1 and prEN 16186-2 and the following apply.

3.1
activated
put into a functional state following a validated input

3.2
alarm
information provided to the driver in case of degradation relevant to the driver

3.3
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 may be a pre-requisite to access the system.

3.4
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

3.5
button
operating element for interaction with the cab 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
cab display
hardware device or system that shows text and/or graphic information to the user

Note 1 to entry: Examples for screen projection technologies are liquid crystal display LCD, light-emitting diode LED, or gas plasma or a projector showing information on a surface.

Note 2 to entry: The cab display includes the projection surface(s) and the device that produces the information on the projection surface(s). It can contain hard keys.

3.7
Class B CCS (legacy ATP systems)
control-command and signalling on-board equipment according to TSI CR CCS, Class B (see [3])

Note 1 to entry: Legacy ATP (Automatic Train Protection) is historical ATP.

3.8
command
action executed by the personnel on the human-machine interface

3.9
consistency
maintenance of interface design choices (codes, naming, formats, procedures, etc.) in similar contexts (see [4])

3.10
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

3.11
electronic timetable display
ETD
operator option that shows information and allows interaction regarding the electronic timetable sheet

3.12
error
deviation from the intended design which could result in unintended system behaviour or failure

[SOURCE: EN 50129:2003]

3.13
event
condition requesting attention, e.g. alarm, authentication, authorisation (2), fault, warning

3.14
failure
deviation from the specified performance of the system

[SOURCE: EN 50129:2003; modified]

3.15
fault
abnormal condition which could lead to an error

[SOURCE: EN 50129:2003; modified]

3.16
hard key
physical key with permanent marking and not part of the screen area

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

3.17
indicator
element designed to draw attention to a cab system status which requires a response

[SOURCE: prEN 16186-2]

3.18
input field
highlighted screen area for entering data

3.19
label
symbol or text indication on or close to an indicator or a button

EXAMPLE Soft key label

3.20
pilot pressure
pressure existing at the pneumatic relay of the driver's brake valve

3.21
polarity
relationship in a display between the brightness of a symbol and background

Note 1 to entry: Positive polarity is when there are dark characters on a light background; negative polarity is when there are light characters on a dark background.

[SOURCE: ISO 15008:2003 (withdrawn) with modified note]

3.22
redundancy concept
display concept that ensures the display of information of a cab display out of order on one or more of the other operational cab display(s)

3.23
remedy
help and/or explanatory information related to a technical fault

3.24
RGB
colour scheme defined in EN 61966-2-1

3.25
screen
visual result of software, implemented on a cab 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 may 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

3.26
screen area
part of cab display providing the screens

3.27
sensitive area
enabled area on a touchscreen on which a physical action is possible in order to give input to the cab display

3.28
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.

3.29
standstill (V = 0)
condition under which the vehicle speed has decreased to 3 km/h or less

3.30
status
existent or potential state of the system or actual state at a given time “t”

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

3.31
symbol
presentation of information in graphical form instead of using text

3.32
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

3.33
technical specification
document describing specific parameters and/or product requirements, which have to be agreed by contracting parties

3.34
text
alphanumeric information

3.35
title
text explaining the purpose of the window or screen

3.36
Train Control and Monitoring System
TCMS
means of controlling 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

3.37
train mission
train running number and start and end of train run, provided the train composition is not changed

3.38
train radio display unit
TRD
device that provides information and interaction regarding the train radio

3.39
trouble-shooting
process of structured and intentional activities in order to cope with a technical problem with support of the diagnostic system

3.40
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

DMU	Diesel Multiple Unit
EMU	Electrical Multiple Unit
ETCS	European Train Control System
MCB	Main Circuit Breaker

5 Requirements for cab displays

5.1 General

5.1.1 General objectives

All requirements provided in 5.1.1 are regarded to be objectives.

5.1.1.1 Robustness

Objective: Any protection against mechanical damage should not adversely affect the visibility of the displayed information.

5.1.1.2 Consistency of cab display application

Objective: An application using a cab display should be consistent with the other cab display applications.

5.1.1.3 Design principles

Objective: All cab displays and displayed applications should be designed according to consistent principles and therefore have a common approach for the user interface.

The following principles should govern graphical user interface design:

— symbols should be used so as to be consistent with their meaning (same information = same symbol);

— all displayed information provided should be located in the preferred field of vision (see Annex I);

— high priority visual information requiring immediate action should be more prominently displayed and should be accompanied by an alerting tone;

— each window should have an explicit title;

— numerical values should be displayed using standard units (e.g.: line voltage in V);

— when two symbols (e.g. a needle and a figure) represent the same piece of information on a screen, the same colour should be used for both;

NOTE The symbols in Annex A follow these general rules. Further information related with the symbols is provided in Annex A.

5.1.1.4 Information objective

Objective: Information provided should be optimized according to the phase of driving and the state of the train.

5.1.1.5 Suppression of information

Objective: Information that does not affect the driving task should be suppressed unless specifically selected.

5.1.2 Provide operation relevant information

5.1.2.1 Energy consumption information

If energy measuring function or other information on the energy consumption is available, information may be provided on the TDD or ETD.

5.1.2.2 Lubrication parameterisation

If lubrication of wheel flange is provided, an interface on the TDD may be provided to select or modify parameters.

5.1.2.3 Exterior lighting diagnostic

If a system is available for monitoring continuously the head, marker and tail lights, an interface shall be provided to indicate light failure to the driver.

5.1.3 Display performance requirements

5.1.3.1 Principle of presenting information

All information should be organized into functional groups that contain related items of information. Such relationships should be based on logical or functional considerations:

a) Critical information

Critical information, such as alarms, should be brought to the driver's attention, e.g. by use of dedicated locations, special highlighting. In general, the legibility of a particular item of information should depend on the importance of that information.

b) Audible information

Audible information may be used for prompting the user that input is required but, in general, audible information should be reserved for feedback or critical information.

c) Menus

If a menu structure is provided to locate different functions, the menu should:

— facilitate a selection of quick and easy options relevant for the operational task;

— provide a selection facility which allows selecting a desired option accurately and unambiguously.

d) Feedback and response times

Visual, audio or tactile feedback should be provided at all times.