



SLOVENSKI STANDARD
oSIST prEN 16186-7:2024
01-september-2024

Železniške naprave - Voznikova kabina - 7. del: Načrtovanje slikovnih zaslonov za tramvajjska vozila

Railway applications - Driver's cab - Part 7: Design of displays for tram vehicles

Bahnanwendungen - Führerraum - Teil 7: Displaygestaltung für Straßenbahnfahrzeuge

Applications ferroviaires - Cabine de conduite - Partie 7 : Conception des affichages pour tramways

Ta slovenski standard je istoveten z: prEN 16186-7

[oSIST prEN 16186-7:2024](https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024)

<https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024>

ICS:

45.060.10	Vlečna vozila	Tractive stock
45.140	Oprema za podzemne vlake, tramvaje in lahka tirna vozila	Metro, tram and light rail equipment

oSIST prEN 16186-7:2024

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 16186-7

June 2024

ICS 45.060.10; 45.140

English Version

Railway applications - Driver's cab - Part 7: Design of displays for tram vehicles

Applications ferroviaires - Cabine de conduite - Partie
7 : Conception des affichages pour tramways

Bahnanwendungen - Führerraum - Teil 7:
Displaygestaltung für Straßenbahnfahrzeuge

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

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

CEN members are the national standards bodies of 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, Türkiye and United Kingdom.

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.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	4
Introduction.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions.....	7
4 Symbols and abbreviations.....	11
5 Characteristics of displays and visible or audible information	12
5.1 General	12
5.1.1 General guidelines	12
5.1.2 Display performance requirements and principles of presenting information	14
5.1.3 Principles for warnings.....	15
5.1.4 Languages	16
5.1.5 Tram-trains	17
5.2 Design of information	17
5.2.1 General.....	17
5.2.2 Screen organization and dimensions.....	17
5.2.3 Luminance	19
5.2.4 Colours	20
5.2.5 Symbols.....	24
5.2.6 Text.....	24
5.2.7 Loudspeaker	26
5.3 User/display interaction.....	26
5.3.1 Buttons.....	26
5.3.2 Keyboards.....	31
5.4 Input of data	32
5.4.1 General.....	32
5.4.2 Entering (alpha)numeric characters	32
5.4.3 Input fields.....	33
5.4.4 Acknowledgements	34
5.5 Troubleshooting	34
5.5.1 Fault indication requesting driver warning and acknowledgement (troubleshooting process)34	34
5.5.2 Fault indication not requesting driver warning and acknowledgement.....	35
Annex A (informative) Symbols, text messages and audible signals	36
A.1 General	36
A.2 Pictograms and text messages	36
A.2.1 Guidelines for pictograms.....	36
A.2.2 Pictograms and text messages.....	37

A.3 Audible signals	49
Annex B (informative) Hard keys arrangement	51
Annex C (informative) TDD basic screen	52
C.1 General	52
C.2 TDD basic screen at standstill	52
C.3 TDD basic screen while running	52
Annex D (informative) Data entry and keyboard examples	55
D.1 Numerical data entry examples	55
D.2 Alphanumerical data entry examples	57
Annex E (informative) Registration form for new graphical symbols	59
Bibliography	60

iTech Standards
 (<https://standards.iteh.ai>)
 Document Preview

[oSIST prEN 16186-7:2024](https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024)

<https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024>

prEN 16186-7:2024 (E)**European foreword**

This document (prEN 16186-7:2024) 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 CEN Enquiry.

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: Layout and access;*
- *Part 5: External visibility for tram vehicles;*
- *Part 6: Integration of displays, controls and indicators for tram vehicles¹;*
- *Part 7: Design of displays for tram vehicles²;*
- *Part 8: Tram vehicle layout and access.*

NOTE Part 1 to 4 above-mentioned standards are only applicable for heavy rail vehicles.

ITEH Standards
(<https://standards.iteh.ai>)
Document Preview

[oSIST prEN 16186-7:2024](https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024)

<https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024>

¹ Under development.

² This document, under development.

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.

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 tram vehicles fitted with displays;
- facilitating tram vehicle 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 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 1 The term “option” is to be understood as a possibility that is usually expressed by the word “can”.

NOTE 2 In the context of this document, “tram vehicles” also means “tram-trains”.

[oSIST prEN 16186-7:2024](https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024)

<https://standards.iteh.ai/catalog/standards/sist/b5407a3c-5414-4655-badc-93909bb48a26/osist-pren-16186-7-2024>

prEN 16186-7:2024 (E)

1 Scope

This document is applicable to vehicles operating on tram networks.

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 of tram vehicles.

It considers the tasks the driver has to carry out and human factors. This document specifies how information is arranged and displayed.

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

- symbols provided by Annex A;
- arrangement of screen areas conform with 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 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.

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.

FprEN 16186-6:2023, *Railway applications - Driver's cab - Part 6: Integration of displays, controls and indicators for tram vehicles*

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

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)*

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 16186-5 and FprEN 16186-6 and the following apply.

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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 may 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: ISO 9241-302:2008 [1], 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.

prEN 16186-7:2024 (E)**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 60050-723-01-19 [2], 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 BASTIEN J.M.C., SCAPIN D.L. *A validation of ergonomic criteria for the evaluation of human-computer interfaces*. Int. J. Hum. Comput. Interact. 1992, 4 pp. 183–196 [3].

3.11**Operational Aided System Display****OASD**

display that allows the driver to enter operational related information and to get real time information (tram vehicle number, route information, driver ID, track status, electronic timetable, messages, ...)

3.12**error**

discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition

Note 1 to entry: An error can be caused by a faulty item, e.g. a computing error made by faulty computer equipment.

Note 2 to entry: A human error can be seen as a human action or inaction that can produce an unintended result.

[SOURCE: EN 50129:2018 [4], 3.1.13]

3.13**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 [5], 3.12, modified (“requesting attention, e.g. alarm, authentication, authorisation, fault, warning” added)]

3.14**failure**

(Of an item) loss of ability to perform as required

[SOURCE: EN 50129:2018 [4], 192-03-01, modified (the Notes 1, 2 and 3 to entry have been omitted)]

3.15**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 [6], 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.]

3.16**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 1024×768 rectangular cells. This ratio forms the basis for all object proportions independent of resolution and size of the screen.

3.17**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.

3.18**input field**

highlighted screen area for entering data

3.19**label**

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

EXAMPLE Soft key label

3.20**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: ISO 11064-6:2005 [7], 3.9, modified: (cd/m^2) added, notes 2 and 3 removed.]

3.21**remedy**

help and/or explanatory information related to a technical fault

3.22**RGB**

colour scheme defined in EN 61966-2-1 [8]

prEN 16186-7:2024 (E)**3.23****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 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

3.24**screen area**

part of display providing the screens

3.25**sensitive area**

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

3.26**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.

3.27**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.

3.28**symbol**

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

Note 1 to entry: a pictogram is a specific type of symbol

3.29**technical and diagnostic display****TDD**

device that provides information and recommendations with regard to tram vehicle and/or vehicle status, diagnostics, failure management and dedicated functions of the vehicle or the entire train

3.30**basic screen**

screen at the root of the screen hierarchy easily accessible

Note 1 to entry: Depending on the situation, the basic screen can be different (at standstill, while running, etc.).

3.31**technical specification**

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

3.32**text**

alphanumeric information

3.33**title**

text explaining the purpose of the window or screen

3.34**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

3.35**mission**

train running number and start and end of train run, assuming the train composition is not changed

3.36**troubleshooting**

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

3.37**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**Table 1 — Abbreviations**

ACK	Acknowledgment
CCTV	Closed Circuit Television
DAC	Driver Activity Control
HSCB	High Speed Circuit Breaker
PAD	Passenger Alarm Device
PAS	Passenger Alarm System
TCMS	Train Control and Monitoring System
TDD	Technical and Diagnostic Display
WSP	Wheel Slide Protection

prEN 16186-7:2024 (E)**5 Characteristics of displays and visible or audible information****5.1 General****5.1.1 General guidelines****5.1.1.1 Robustness**

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

5.1.1.2 Consistency of display application

An application Information that requires an action from the driver, shall be presented only once. Existing data shall be consistently available for all displays where relevant. Each piece of information (e.g. time) should be only shown on one display. In case a piece of information is shown on more than one display (or other devices), the delay between the visualization of the information on the displays shall not exceed 1 s.

5.1.1.3 Design principles

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

The following principles govern graphical user interface design:

- symbols should be used consistently with their meaning (same information = same symbol);
- all driving related displayed information should be located in the preferred field of vision (see FprEN 16186-6:2023, Figure A.2);
- visual information requiring immediate action shall be prominently displayed;
- high priority visual information shall be accompanied by an alerting tone. The number of sounds should be minimized (see 5.1.3.5);

NOTE 1 High priority information is information that requires immediate action by the driver.

- each window should have an explicit title;
- numerical values should be displayed using standard units and SI standard prefixes (e.g.: voltage in V, mV, kV etc.);
- when two symbols (e.g. a needle and a figure) represent the same piece of information on a screen, the same colour shall be used for both unless they physically overlap;

NOTE 2 The symbols in Annex A follow these general rules. Further information related with the symbols is provided in Annex A.

5.1.1.4 Principles for the provision of information

The information provided should be adapted to the phase of driving and the state of the train. The principle of “just enough” at the right time should drive the design of the screens.

TDD displaying safety information shall be developed with the appropriate safety level, if the information is not already displayed outside the TDD.

Mandatory information for operations should be displayed on the TDD basic screen, such as:

- door status and selected side (left, right, both);