



SLOVENSKI STANDARD
SIST EN 16186-2:2017

01-oktober-2017

Železniške naprave - Voznikova kabina - 2. del: Združevanje slikovnih zaslonov ter krmilnih in prikazovalnih elementov

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

Bahnanwendungen - Führerraum - Teil 2: Integration von Bildschirmen, Bedien- und Anzeigenelementen

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Applications ferroviaires - Cabines de conduite - Partie 2: Intégration des afficheurs, commandes et indicateurs

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Ta slovenski standard je istoveten z: EN 16186-2:2017

ICS:

45.060.10 Vlečna vozila Tractive stock

SIST EN 16186-2:2017

en,fr,de

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EUROPEAN STANDARD

EN 16186-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2017

ICS 45.060.10

English Version

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

Applications ferroviaires - Cabines de conduite - Partie
2 : Intégration des afficheurs, commandes et
indicateurs

Bahnanwendungen - Führerraum - Teil 2: Integration
von Displays, Bedien- und Anzeigeelementen

This European Standard was approved by CEN on 14 May 2017.

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European foreword

This document (EN 16186-2:2017) 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of an identical text or by endorsement, at the latest by February 2018, and conflicting national standards shall be withdrawn at the latest by February 2018.

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 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 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 [2].

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.*
- *Part 4: Layout and access*

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 16186-2:2017 (E)**Introduction**

This European Standard addresses operational requirements for train driving, shunting and related preparatory work as far as driver's cab interfaces are concerned. It provides current cab design principles and considers latest available research findings provided by the European Research project EUDD+ [3].

The informative Annex E is provided for Requirement Management purposes in accordance with EN 15380-4 [4].

Where no standard requirement has been specified in this standard, it addresses the need for specifications or choices of standard options to be done on project level.

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1 Scope

This European Standard is applicable to Electric Multiple Units (EMU), Diesel Multiple Units (DMU), Railcars, Locomotives, Driving Trailers (Driving Coaches).

NOTE 1 This European Standard applies to rolling stock in the scope of the Directive 2008/57/EC [1].

This European Standard is not intended to be applicable to metros, tramways and light rail vehicles.

This part of EN 16186 applies to driver's desks installed on the left, on the right, or in a central position in the driver's cab.

NOTE 2 For OTMs, see EN 14033-1 [5] and EN 15746-1 [6].

This European Standard gives design rules and guidance in order to ensure visibility and operability of screens, controls and indicators in the cab in all operating conditions (day, night, natural or artificial lighting).

It covers four aspects:

- the characteristics of the displays, controls and indicators in order to ensure proper visibility: i.e. range of luminance and contrast as well as the possibility of adjustment of perceived brightness;
- rules for positioning of the displays, keyboards, controls and indicators in the cab and on the driver's desk: i.e. position, angle of visibility, etc. with consideration of the normal driving position and the working environment (windscreen, natural or artificial lighting in the cab, unwanted glare and reflections, etc.);
- the characteristics and rules for positioning microphones and loudspeakers;
- design of symbols.

NOTE 3 All element numbers within the text refer to Table B.1.

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.

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

prEN 13272-1 *Railway applications – Electrical lighting for rolling stock in public transport systems - Part 1 - Mainline rail systems*

EN 15892, *Railway applications - Noise Emission - Measurement of noise inside driver's cabs*

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

EN 16186-3:2016, *Railway applications - Driver's cab - Part 3: Design of displays*

EN 16683, *Railway applications - Call for aid and communication device - Requirements*

ISO 3381, *Railway applications — Acoustics — Measurement of noise inside railbound vehicles*

EN 16186-2:2017 (E)**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 16186-1:2014, EN 16186-3:2016 and the following apply.

3.1 alarm
audible and/or visual warning requiring immediate action, with a defined priority

3.2 cab lighting
lighting that illuminates the whole driver's cab to provide safe operation at standstill e.g. during preparation work

3.3 class B cab signalling system
national legacy control-command and signalling systems

Note 1 to entry: Legacy ATP (Automatic Train Protection) is historical ATP in accordance with TSI CCS CR&HS (see [7]).

3.4 contrast
perception of a difference visually between one surface or element of a building/rail vehicle and another be reference to their light reflectance values (LRV) according to BS 8300:2009

[SOURCE: EN 16584-1:2017]

3.5 control
device used to interact with the vehicle

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3.6 indicator
element designed to indicate the system status

3.7 instrument lighting
lighting that illuminates specific gauges to make their scales visible at dark ambient conditions

3.8 position-dependent control
control which command is proportional to the position of the operating part of the device within a defined range

3.9 RAL xxxx
colour codification from Deutsches Institut für Gütesicherung und Kennzeichnung, former Reichs-Ausschuss für Lieferbedingungen

Note 1 to entry: RAL 3020 is the coding for traffic red.

3.10 reading zone lighting
lighting that illuminates the reading area of the desk to ensure readability of documents

3.11**time-dependent control**

control which command is proportional to the duration of the application of the operating part of the device in a specific position

3.12**warning**

visual and/or audible indication triggered by an event of which the recipient needs to be aware and which may not require immediate action

4 Symbols and abbreviations

ASC	Automatic Speed Control
ATC	Automatic Train Control
ATP	Automatic Train Protection
BP	Brake Pipe
CCD	Control Command Display
CCS	Control-command and signalling
CCTV	Closed Circuit Television
DAC	Driver Activity Control
DMU	Diesel Multiple Unit
EMU	Electric Multiple Unit
EOA	End Of Authority
ep	electro-pneumatic
ETCS	European Train Control System
ETD	Electronic Timetable Display
EUDD	European Driver's Desk
FBS	Functional Breakdown Structure
HVAC	Heating, Ventilation and Air Conditioning
KVB	Contrôle de vitesse par balise
MCB	Main Circuit Breaker
MRP	Main Reservoir Pipe
NSO	National Standards Organization
OTM	On-Track Machine
PAS	Passenger Alarm System
PIS	Passenger Information System
RAL	Reichs-Ausschuss für Lieferbedingungen (German Institute for Quality Assurance and Certification)
SRP	Seat reference Point
TCMS	Train Control and Monitoring System
TDD	Technical and Diagnostic Display
TRD	Train Radio Display

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EN 16186-2:2017 (E)**5 Driver's cab displays, controls and indicators for operational functions****5.1 General**

Elements required for operation are shown in Annex B. The symbols to be used for the operating elements shall be provided in accordance with Annex C. For project specific functions the symbols of Annex D should be used.

In the following text, three-digit numbers refer to Table B.1 that lists all the elements

5.2 Display or unit for train communication, monitoring and control

Vehicle monitoring, vehicle control and train communication shall be provided, as a minimum, by the following desk equipment:

- 004 - control command display (CCD);
- 002 - technical and diagnostic display (TDD);
- 001 - train radio display (TRD).

For train radio display, different solutions are possible, for example with a simplified driver's interface.

If other displays are added (additional TDD for EMU/DMU, passenger information system display...) the forward visibility (according to EN 16186-1) shall not be impeded.

For vehicles internally used within a country the CCD may be substituted by equipment with equivalent functionality.

5.3 Controls**5.3.1 Controls for Intercom**

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The driver's cab of units designed for Driver Only Operation, i.e. without staff on-board other than the driver, shall have in accordance with EN 16683:

- a device (e.g. microphone) to support the "call for aid" function;
- a device for acknowledging the call for aid;
- a control to cancel the communication link to the operated device.

These devices can be integrated or combined with other devices or functionalities

5.3.2 Controls for external passenger access

If external passenger access to the train (door control) is provided, the desk shall have the following devices:

- 021 - left doors release and cancel release;
- 023 - right doors release and cancel release;
- 022 - central closing all doors.

5.3.3 Controls for driver's cab temperature

There shall be a means of regulating the temperature. This should be compliant with EN 14813-1 and EN 14813-2.

5.3.4 Controls for coupling and uncoupling of vehicles

If rolling stock is equipped with an automatic coupler, the cab shall have a control to manage the coupling function. See EN 16186-3.

5.3.5 Controls for auxiliary desk

If auxiliary desks are provided, they shall include the following operating elements:

- 013 - ATP override;
- 015 - ATP acknowledgement;
- 213 – combined traction/brake controller with minimum functionality (T+, T, T-, SOS) or (T+, T, 0, SOS);
- 042 - activation of the auxiliary traction controller, if elements 033 - direction of travel “forwards”; and/or 035 - direction of travel “reverse” are not provided.

As an option:

- 021 - release and cancel release doors left side;
- 023 - release and cancel release doors right side;
- 213 – combined traction/brake controller with one or more additional functions (T-, 0, B-, B, B+);
- 033 - direction of travel “forwards”;
- 035 - direction of travel “reverse”;

NOTE T+ means increasing traction set point; T means constant traction set point, T- means decreasing traction set point. 0 means ramp down of any set point. B - means decreasing brake set point. B means constant brake set point, B+ means increasing brake set point and SOS means emergency brake.

- side microphone.

The following operating elements should be provided on or close to an auxiliary desk:

- 037 - direct brake;
- 038 - horn;
- 111 or 211 - DAC.

5.4 Warnings

5.4.1 Alarm due to a safety system

It is permissible to provide an audible and/or visual alarm to prevent imminent intervention by a safety system.

5.4.2 Alarm due to emergency opening of one or more external doors

This requirement only applies to EMUs, DMUs, driving coaches and locomotives that operate passenger trains.

Audible and visual alarms shall indicate to the driver an emergency opening of one or more passenger doors. It should be possible to acknowledge and cancel audible signals for emergency door opening.

EN 16186-2:2017 (E)**5.4.3 Driver interface with fire extinguishing system**

There shall be no means for the driver to interfere with the fire extinguishing system, if provided. Information that the fire extinguishing system has operated or is not available should be provided in the cab.

5.4.4 Alarm due to speed reduction

If a system other than automatic speed control (ASC) intervenes to reduce the train speed, an audible and/or visual alarm shall be given.

6 Characteristics of displays, controls and indicators**6.1 General****6.1.1 Design principles**

The design (e.g. the shape, the colour, the location) of the elements should assist the recognition of different functions under all ambient lighting conditions.

As design reference for controls and displays, EN 894 (all parts) and EN 1005 (all parts) may apply.

6.1.2 Reading zone

To allow the display on the driver's desk surface of paper documents required during driving, a reading zone of minimum size 300 mm x 210 mm in landscape orientation shall be available in front of the driver's seat. The reading zone may be used optionally as a writing zone if required. A means of holding shall be provided. If these means are not provided on the desk, the distance between the mid-point of the tall driver's eyes, in seated driving position (see EN 16186-1) and the document should not be more than 900 mm.

NOTE For the minimum character heights of paper documents to be read at a maximum distance of 900 mm, see EN 894-2.

6.1.3 Resistance to damage from cleaning activity

Labelling of operational elements shall not be rendered illegible by cleaning agents.

NOTE The list of acceptable cleaning agents is usually provided by the manufacturer.

6.1.4 Design to prevent the accumulation of dirt

Engravings deeper than 0,5mm shall be protected against the accumulation of dirt, e.g. by a cover or by sealing, in order to maintain their readability.

6.1.5 Labelling

Where plain-text labels are provided, the following applies:

- the function "On" is represented by the Roman "I";
- the function "Off" is represented by the Arabic zero "0";
- for plain-text markings see 9.2.1 and 9.3.

6.2 Characteristics of displays

6.2.1 Use of analogue and alphanumeric display

In general, an alphanumeric display should only be used where a precise discrete information is required and the values presented remain visible long enough to be read, i.e. they are not continually changing. Otherwise, an analogue or graphical display should be used, see also [9].

6.2.2 Requirements for arrays of display

If analogue or graphical displays require to be monitored on a regular basis to check whether conditions are 'normal', the displays should be arranged so that all the pointers are aligned alike when the instruments are indicating normal operation.

NOTE See [9] and [10] for ergonomic aspects.

6.2.3 Pointer and scale requirements

Generally a pointer moving against a fixed scale should be used, rather than vice versa.

6.3 Characteristics of controls

6.3.1 General Principles

6.3.1.1 Interface specific for the function

Interfaces should be specific for the functions to be executed by the driver, for example by different shapes, colours or positions. (standards.iteh.ai)

Controls may combine several associated functions.

The relevant driving tasks shall determine the choice to combine functions, e.g. a combined lever for traction and braking.

6.3.1.2 Control principle

Position-dependent controls should be the preferred option rather than time-dependent ones.

213 - combined traction/brake controller for auxiliary desks, controls for remote control desks and 037 - direct brake should be time dependent.

6.3.1.3 Direction of actuation

The direction of actuation of controls should be coherent with the behaviour of their related control systems.

6.3.1.4 Position indication of isolation devices

If an isolating device shows its position, e.g. by direction of a handle or a marking, the following rules apply:

- a) 1 = On or in operation; 0 = Off or not in operation.
- b) If this device is a stop cock mounted in a visible pipe, then the position of the stop cock shall refer to the direction of the pipe: Open = in line with the pipe, Closed = at right angle to the pipe.
- c) For checking for normal operation at brake panels the position for normal operation shall be vertical. Marking according to d) is required.
- d) In case of design constraints, the rules b and c may be superseded by permanent labelling.