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(istoveten CLC/TS 50459-1:2005)

Railway applications - Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 1: Ergonomic principles for the presentation of ERTMS/ETCS/GSM-R information

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TECHNICAL SPECIFICATION

SPECIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CLC/TS 50459-1

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English version

Railway applications – Communication, signalling and processing systems – European Rail Traffic Management System – Driver-Machine Interface Part 1: Ergonomic principles for the presentation of ERTMS/ETCS/GSM-R information

Applications ferroviaires –
Systèmes de signalisation, de
télécommunications et de traitement –
Système européen de gestion du trafic
ferroviaire –
Interface de conduite
Partie 1: Principes ergonomiques
pour la présentation des informations
ERTMS/ETCS/GSM-R

Bahnanwendungen –
Telekommunikationstechnik, Signal-
technik und Datenverarbeitungssysteme –
Europäisches Leitsystem für den
Schienenverkehr –
Mensch-Maschine Schnittstelle
Teil 1: Ergonomische Prinzipien
für die Darstellung von
ERTMS/ETCS/GSM-R Informationen

This Technical Specification was approved by CENELEC on 2005-05-07.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. CLC/TS 50459-1:2005 E

Foreword

This Technical Specification was prepared by SC 9XA, Communication, signalling and processing systems, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the vote and was approved by CENELEC as CLC/TS 50459-1 on 2005-05-07.

The following date was fixed:

– latest date by which the existence of the CLC/TS
   has to be announced at national level   (doa)   2005-11-07

This Technical Specification has been prepared under mandates M/024 and M/334 given to CENELEC by the European Commission and the European Free Trade Association.

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Contents

Introduction

This Technical Specification forms Part 1 of a series, the other parts being:

CLC/TS 50459-2   for ergonomic arrangements of ERTMS/ETCS information

CLC/TS 50459-3   for ergonomic arrangements of ERTMS/GSM-R information

CLC/TS 50459-4   for data entry procedure for ERTMS/ETCS/GSM-R

CLC/TS 50459-5   for symbols for ERTMS/ETCS/GSM-R

CLC/TS 50459-6   for audible information for ERTMS/ETCS/GSM-R

These Technical Specifications contain the ergonomic arrangements of information on the ERTMS DMI Display. Most items are illustrated with an example.

1 Scope

This Technical Specification describes from an ergonomic point of view how ERTMS information shall be arranged and displayed. This Technical Specification describes more ergonomic details than currently provided by the ERTMS/ETCS/GSM-R specifications.

This Technical Specification defines the ergonomics for the Driver-Machine Interface (DMI) for the ERTMS/ETCS Train Control System, and for the integrated ERTMS/GSM-R Train Control and Train Radio Systems, and for the stand alone ERTMS/GSM-R Train Radio Systems and for other technical systems currently provided on the rolling stock.

The ergonomics covers the

— general arrangements (dialogue structure, sequences, layout philosophy, colour philosophy),

— symbols,

— audible information,

— data entry arrangements.

The aims of the ERTMS/ETCS/GSM-R Train Control and Train Radio Systems are standardised systems facilitating interoperable movement of trains and permitting economies of scale in procurement and operations. The objective of this Technical Specification is to define the minimum requirements on the DMI that are necessary to enable these objectives to be achieved. Hence the Technical Specification is limited to ergonomic considerations and does not define the technology to be used for the implementation.

The reasons for defining the ergonomics of the DMI are as follows:

— achieving harmonised and coherent presentation for ERTMS/ETCS and STM information. Given the large number of STM's requiring the use the ERTMS/ETCS DMI, only a harmonised approach is feasible;

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

— to reduce the risk of incorrect operation by a driver working with different trains fitted with ERTMS/ETCS and ERTMS/GSM-R;

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

This Technical Specification is applicable on all trains fitted with the ERTMS/ETCS and also for trains fitted with train radio (GSM-R) DMI.

The scope of Part 1 of the Technical Specification CLC/TS 50459 series is to define ergonomic principles for the interface between the driver and ERTMS/ETCS/GSM-R.

This specification gives guidelines how to implement different technology (soft keys, touch screen device, LCD, cathode tube, etc.)

2 Normative references

The following referenced documents are indispensable for the application 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.

Council Directive 96/48/EC of 23 July 1996 on the interoperability of the trans-European high-speed rail system, Official Journal L 235 , 17/09/1996 P. 0006 – 0024

CLC/TS 50459-2, *Railways applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 2: Ergonomic arrangements of ERTMS/ETCS information*

CLC/TS 50459-3, *Railways applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface – Part 3: Ergonomic arrangement of ERTMS/GSM-R information*

CLC/TS 50459-4, *Railways applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 4: Data entry for the ERTMS/ETCS/GSM-R systems*

CLC/TS 50459-5, *Railways applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 5: Symbols*

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

UIC 651, *Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers*

3   Terms, definitions and abbreviated terms

3.1 Definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
activated
state following a driver action

3.1.2
beyond
track location according to Figure 1
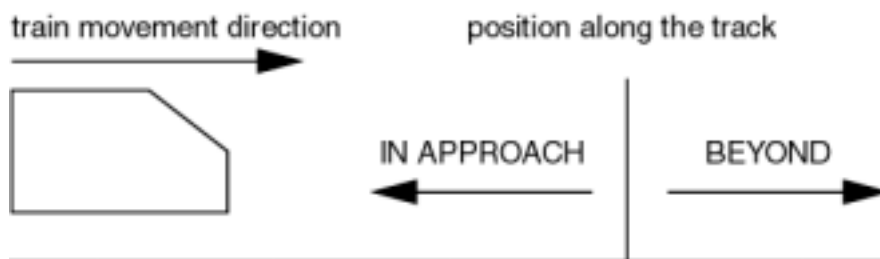
Figure 1 — In approach and beyond

3.1.3
button
object shown to the driver through which a driver action is possible. It is composed of a label and an associated sensitive area

NOTE   The sensitive area of a button can be accessed via a touch screen area or via a hard key, depending on the chosen technology.

3.1.4
cell
basic unit to define the shape of DMI objects and the proportions of areas

NOTE   The size of the cell is defined in 4.3.1

3.1.5
dimmed
areas which appearance has been made less conspicuous than other areas

EXAMPLE When the Indication Status is activated the Planning area is dimmed

NOTE   A dimmed area is used to emphasise particular information on other areas shown on the DMI during critical situations

3.1.6
ERTMS/ETCS system
system in which ERTMS/ETCS functional, technical and the related operational specifications are determined

3.1.7
ERTMS/GSM-R system
system in which ERTMS/EIRENE functional and system specifications are determined

3.1.8
grid array
area consisting of cells which results in a visual appearance of information in certain proportions

3.1.9
hard key
physical key not part of the display area. This key can also have a text label or symbol

3.1.10
in approach
track location according to Figure 1

3.1.11
indicator
object with a label shown to the driver for which no driver action is possible. If an indicator is surrounded by a flashing frame, the indicator may become a button

3.1.12
input field
object shown to the driver which allows the driver to enter data and composed of a label with an associated area to show the data

3.1.13
label
symbol or text indication on an indicator or a button

3.1.14
On-Board system
ERTMS/ETCS system and/or the ERTMS/GSM-R system or sub-system located in rolling stock

3.1.15
sensitive area
surface on which a driver can make a physical action to give input to the On-Board system

3.1.16
soft key
context-dependent key which consists of a hard key with an associated label on the display area

3.1.17
symbol
presentation of information in graphical form instead of using text

3.1.18
title
object with a text explaining the purpose of the window

3.1.19
window
separate area which shows information

3.2 Symbols and abbreviated terms

ACK   Acknowledgement

DMI   Driver-Machine Interface

EIRENE European Integrated Railways radio Enhanced Network

ERRI   European Rail Research Institute

ERTMS European Rail Traffic Management System

ETCS   European Train Control System

GSM-R   Global System for Mobile communication – Railways

ISO   International Standardisation Organisation

STM   Specific Transmission Module

UIC   Union Internationale des Chemins de Fer

w x h   width by height

4   General ergonomic principles

4.1   Principles for presentation

This clause provides requirements for the graphical presentation and arrangement of the information shown on the cab display.

4.1.1   Presentation techniques

A clear presentation of information of the DMI leads to better understanding of the tasks to be performed. This will increase speed and accuracy of driver actions thus reducing the probability of human errors.

4.1.1.1   Emphasising particular information

To emphasise particular information shown on the DMI during critical situations, it shall be possible to change the appearance of other areas to make these other areas less conspicuous.

This change of appearance shall be achieved by one or more of the following techniques:

— changing colours and grey into dark grey;

— texture large surfaces;

— changing non-dotted lines into dotted ones.

4.1.1.2   Use of symbols

Symbols are used for frequent, common and known indications. Symbols can also be used for context sensitive labels as part of a graphical language. In CLC/TS 50459-5 the presentation of symbols is described.

If symbols are described in CLC/TS 50459-5 they shall be used.

If the indication is not described in CLC/TS 50459-5 a text label or message should be used. The use of a new symbol for a new indication is not precluded.

Symbols shall not be used in a text message.

4.1.1.3   Use of colours

The main operational colours of the DMI are white, grey, yellow, orange and red. They are the basis of DMI colour philosophy. The colours express the priority of the information presented. Priority is linked to the expected driver reaction time.

— No immediate attention/action required (base priority): white (1) / grey (3) shall be used; the information concerns a normal situation.

— Attention/action required (medium priority): yellow (8) shall be used; the information still concerns a normal situation and there is no danger; after a while more attention/action may be required.

— Immediate attention/action necessary (high priority): orange (9) shall be used; the situation is undesirable and may be unexpected; immediate action is necessary to avoid further undesirable effects.

— Urgent attention/action necessary (highest priority): red (10) shall be used; the information concerns an unusual, unexpected, dangerous and/or harmful situation (example: train trip, emergency call).

The use of these colours, and their number references, is summarised in Table 1.

Table 1 — Colour philosophy DMI

Colour [a]	Urgency	Expected situation if not reacted in time	
		Speed dial	Symbols
white (1) / grey (3)	no danger at all	normal, no immediate reaction required	normal, no action or no immediate reaction required
yellow (8)	no danger yet	no reaction might lead to orange, be prepared to take action	no reaction might lead to red, action is required
orange (9)	overspeeding	no reaction might lead to red, action required	not applicable
red (10)	danger or unwanted situation	can lead to orange, yellow or white/grey after appropriate action, too late to react to the displayed information, but not too late for subsequent action / system has intervened	can lead to white/grey after appropriate action, too late to react to the displayed information, but not too late for subsequent action / system intervention is possible
[a] For the colour definition see Table 2. The numbers in brackets refer to the number column in Table 2.			

For symbols only grey (3), yellow (8) and red (10) colour shall be used. Text background can be grey or dark blue (6).

The difference between the use of white and grey depends on the need for a more conspicuous presentation.

The colour scheme based on a dark blue background shall be used, because it ensures an optimum contrast ratio.

An additional background may be used, provided it does not interfere with the basic colour philosophy. The contrast-ratio should be modified in order to maintain optimal readability.

As an informative example (Table 2) the following 24-bit RGB colour values are used in this standard for the figures.

Table 2 — Example of a 24-bit RGB colour scheme

Nr	Colour name	Red	Green	Blue
1	white	255	255	255
2	black	0	0	0
3	grey	195	195	195
4	medium grey	150	150	150
5	dark grey	85	85	85
6	dark blue (background)	3	17	34
7	very dark blue	4	12	25
8	yellow	223	223	0
9	orange	234	145	0
10	red	191	0	2
11	grey blue	81	91	109
12	blue grey	37	69	93
13	dark yellow [a]	117	105	0
14	light green [a]	45	144	51
15	dark green [a]	12	58	12
[a] These colours were defined for the tests, but are not used anymore in this specification.				

A monochrome display may be used for a standalone GSM-R DMI. If such display is used, a similar ergonomic approach to ETCS shall be followed, but without the use of colour.

4.1.1.4   Use of flashing

Flashing shall be used to draw the attention of the driver to a certain part of the display or to draw attention to a delay-type button (see 4.4.2.5).

Flashing shall only appear on frames.

When flashing is used, the related information shall change from visible to not visible (e.g. background colour) with a nominal frequency of 2 Hz with a symmetrical mark space ratio.