



SLOVENSKI STANDARD
oSIST prEN IEC 62290-2:2023
01-junij-2023

Železniške naprave - Komandno-kontrolni sistemi za upravljanje urbanega prometa - 2. del: Specifikacija funkcionalnih zahtev

Railway applications - Urban guided transport management and command/control systems - Part 2: Functional requirements specification

Bahnanwendungen - Betriebsleit- und Zugsicherungssysteme für den städtischen schienengebundenen Personennahverkehr - Teil 2: Funktionale Anforderungsspezifikation

Applications ferroviaires - Systèmes de contrôle/commande et de gestion des transports guidés urbains - Partie 2: Spécification des exigences fonctionnelles

Ta slovenski standard je istoveten z: prEN IEC 62290-2:2023

ICS:

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45.060.01	Železniška vozila na splošno	Railway rolling stock in general

oSIST prEN IEC 62290-2:2023 **en**



9/2947/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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IEC TC 9 : ELECTRICAL EQUIPMENT AND SYSTEMS FOR RAILWAYS

SECRETARIAT:

France

SECRETARY:

Mr Denis MIGLIANICO

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:

Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

 EMC ENVIRONMENT QUALITY ASSURANCE SAFETY SUBMITTED FOR CENELEC PARALLEL VOTING NOT SUBMITTED FOR CENELEC PARALLEL VOTING**Attention IEC-CENELEC parallel voting**

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of

- any relevant patent rights of which they are aware and to provide supporting documentation,
- any relevant "in some countries" clauses to be included should this proposal proceed. Recipients are reminded that the enquiry stage is the final stage for submitting "in some countries" clauses. See AC/22/2007.

TITLE:

Railway applications – Urban guided transport management and command/control systems – Part 2: Functional requirements specification

PROPOSED STABILITY DATE: 2029

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
URBAN GUIDED TRANSPORT MANAGEMENT
AND COMMAND/CONTROL SYSTEMS –****Part 2: Functional requirements specification****FOREWORD**

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International Standard IEC 62290-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition issued in 2014. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- the functions 5.1.4.5 Stopping a train en route, 5.1.5.4 Monitor speed at discrete location, 5.5.5 Manage UGTMS transfer tracks, 5.6.4.1 Monitor passenger emergency calls and 6.2.4 Ensure commuting services of the second edition have been deleted,
- the functions 5.5.11 Manage train washing, 5.5.12 Manage non-stopping area and 6.3.4 Perform progressive shutdown have been added in this third edition

- many of the requirements of the second edition have been reworded: changes in their wording could be only minor and editorial, or it could have technical consequences,
- some requirements of the second edition have been moved from one subclause to another,
- some requirements of the second edition have been deleted,
- some new requirements have been added in the existing functions,
- an informative annex giving the reader some user's recommendations about Part 2 has been added,
- another informative annex giving some typical performance-related criteria has been also added

It has to be noted that in order to avoid any disturbance in the use of the document, when functions or requirements of the second edition have been deleted, their numberings have been kept on purpose in this third edition. The expression "Deleted" is indicated at the place of the former headlines of the deleted functions, or at the place of the wording of the deleted requirements. Therefore, the impacts on any existing references or traceability matrices defined previously this third edition is limited as much as possible.

The text of this standard is based on the following documents:

FDIS	Report on voting
9/XXXX/FDIS	9/XXXX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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A list of all parts of IEC 62290 series, under the general title *Railway applications – Urban guided transport management and command/control systems*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

1

INTRODUCTION

2 IEC 62290 standard series specifies the functional, system and interface requirements for the
3 command, control, and management systems intended to be used on urban, guided
4 passenger transport lines and networks. This series does not apply to lines that are operated
5 under specific railway regulations, unless otherwise specified by the authority having
6 jurisdiction.

7 These systems are designated here as Urban Guided Transport Management and
8 Command/Control Systems (UGTMS). UGTMS cover a wide range of operations needs from
9 non-automated (GOA1) to unattended (GOA4) operation. A line may be equipped with
10 UGTMS on its full length or only partly equipped.

11 This series does not specifically address security issues. However, aspects of safety
12 requirements may apply to ensuring security within the urban guided transit system.

13 The main objective of this series is to achieve interoperability, interchangeability and
14 compatibility.

15 This series is a recommendation for those transport authorities wishing to introduce
16 interoperable, interchangeable and compatible equipment.

17 It is the responsibility of the transport authority concerned in accordance with the authority
18 having jurisdiction to decide on how to apply this series and to take into account their
19 particular needs.

20 IEC 62290 series is also intended to support applications for upgrading existing signalling and
21 command control systems. In this case, interchangeability and compatibility could be ensured
22 only for the additional UGTMS equipment. Checking the possibility for upgrading existing
23 equipment and the level of interoperability is the responsibility of the transport authority
24 concerned.

25 Application of the series should take into account the differences between the various
26 networks operated in different nations. Those differences include operational and regulatory
27 requirements as well as different safety cultures.

28 This series defines a catalogue of UGTMS requirements split into mandatory and optional
29 functions. The functions used are based on the given grade of automation. Most of the
30 functions characterized as mandatory are to be considered with no condition. Some specific
31 functions have a condition to be mandatory (this condition being generally related to the use
32 of an external equipment by UGTMS). By fulfilling the requirements, a supplier can create one
33 or more generic applications including all mandatory functions and all or a subset of optional
34 functions. A generic application will achieve interoperability within the defined specific
35 application conditions. Customising a generic application will create a specific application
36 taking into account of local conditions such as track layout and headway requirements. It is
37 the choice of supplier and transport authority to add additional functions to a generic or
38 specific application. These additional functions are not described in this series.

39 According to IEC 62278, it is the responsibility of the transport authority, in agreement with
40 the authority having jurisdiction, to decide, taking into account their risk acceptance principles
41 to conduct specific hazard and risk analysis for each specific application. The safety levels for
42 the functions of each specific application have to be determined by a specific risk analysis.

43 Terms like "safety related command", "safety conditions", "safe station departure" are
44 mentioned without having performed any hazard analysis.

45 Standard series IEC 62290 is intended to consist of four parts:

- 46 • Part 1 “System principles and fundamental concepts” provides an introduction to the
 47 standard and deals with the main concepts, the system definition, the principles and
 48 the basic functions of UGTMS (Urban Guided Transport Management and
 49 Command/Control Systems).

50 The three other parts correspond to the three steps (see Figure 1) required in the process of
 51 specifying UGTMS and are to be used accordingly.

- 52 • Part 2 “Functional requirements specification” specifies the functional requirements
 53 associated to the basic functions provided by Part 1, within the system boundaries and
 54 interfaces as defined in Figure 3 of Part 1.

55 The FRS (Functional Requirements Specification) identifies and defines the functions
 56 that are necessary to operate an urban guided transport system. Two types of
 57 functions are distinguished for a given grade of automation: mandatory functions (e.g.
 58 train detection) and optional functions (e.g. manage stabling). Requirements of
 59 functions have the same allocation, unless they are marked otherwise.

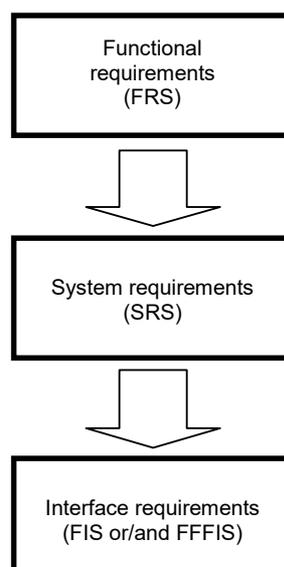
- 60 • Part 3 “System requirements specifications” deals with the architecture of the system
 61 and the allocation of the requirements and functions identified in Part 2 to UGTMS
 62 equipment.

63 The SRS (System Requirement Specification) specifies the architecture of a UGTMS
 64 system, with mandatory and optional UGTMS equipment.

- 65 • Part 4 (under consideration) “Interface specifications” deals with the definition of the
 66 interfaces, as well as the data exchanged by them (FIS and FFFIS), for the
 67 interoperable and interchangeable UGTMS equipment identified in Part 3.

68 For interfaces between UGTMS equipment, the logical interface or FIS (Functional
 69 Interface Specification) and/or the physical and logical interface or FFFIS (Form Fit
 70 Functional Interface Specification) will be considered.

71 NOTE The specific structure of Part 4 will be established to accommodate optional and mandatory UGTMS
 72 equipment, and to reflect local conditions. In principle, only one FIS or/and FFFIS will be defined for the same
 73 interface. However, when justified in some cases, several FISs or several FFFISs will be defined for the same
 74 interface.



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76 **Figure 1 – The three-step process followed by the UGTMS standard**

77 Requirements are those necessary to fulfil all operational needs for safe and orderly operation
 78 requested by transport authorities without regard to technical solutions.

79 The chosen level of detail in describing requirements enables customers as well as authorities
80 having jurisdiction to be assured that generic applications delivered by different suppliers will
81 cover at least the same functionality as specified in this document.

82 Requirements which are established by this series are indicated clearly with a requirement
83 identification number related to the function to be covered.

84

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RAILWAY APPLICATIONS – URBAN GUIDED TRANSPORT MANAGEMENT AND COMMAND/CONTROL SYSTEMS –

Part 2: Functional requirements specification

93

1 Scope

94 This document specifies the functional requirements of UGTMS (Urban Guided Transport
95 Management and Command/Control Systems) for use in urban guided passenger transport
96 lines and networks. This standard is applicable for new lines or for upgrading existing
97 signalling and command control systems.

98 This document is applicable to applications using:

- 99
- continuous data transmission
 - continuous supervision of train movements by train protection profile
 - localisation of trains by onboard UGTMS equipment (reporting trains), and optionally
102 by external wayside (and optionally onboard) device.

103 In this standard, the functional requirements set the framework to which detailed functions
104 should be added to define any generic or specific application.

105 Because of that, although this document is applicable as a basis to define SRS, FIS and
106 FFFIS, elements may be added for a generic or specific application.

107 Note: the functional breakdown in this document is consistent with Basic functions in Table 1
108 of Part 1. These Basic functions have been refined into a more complete and detailed tree,
109 and the “Mandatory/Optional” attributes of their subfunctions may be different with those given
110 in Table 1. The functional breakdown which follows this clause is the reference one for IEC
111 62290 series.

112

2 Normative references

113 The following documents, in whole or in part, are normatively referenced in this document and
114 are indispensable for its application. For dated references, only the edition cited applies. For
115 undated references, the latest edition of the referenced document (including any
116 amendments) applies.

117 IEC 62290-1, *Railway applications – Urban guided transport management and*
118 *command/control systems – Part 1: System principles and fundamental concepts*

119

3 Terms, definitions and abbreviations

120 For the purposes of this document, the terms, definitions and abbreviations given in
121 IEC 62290-1 apply.

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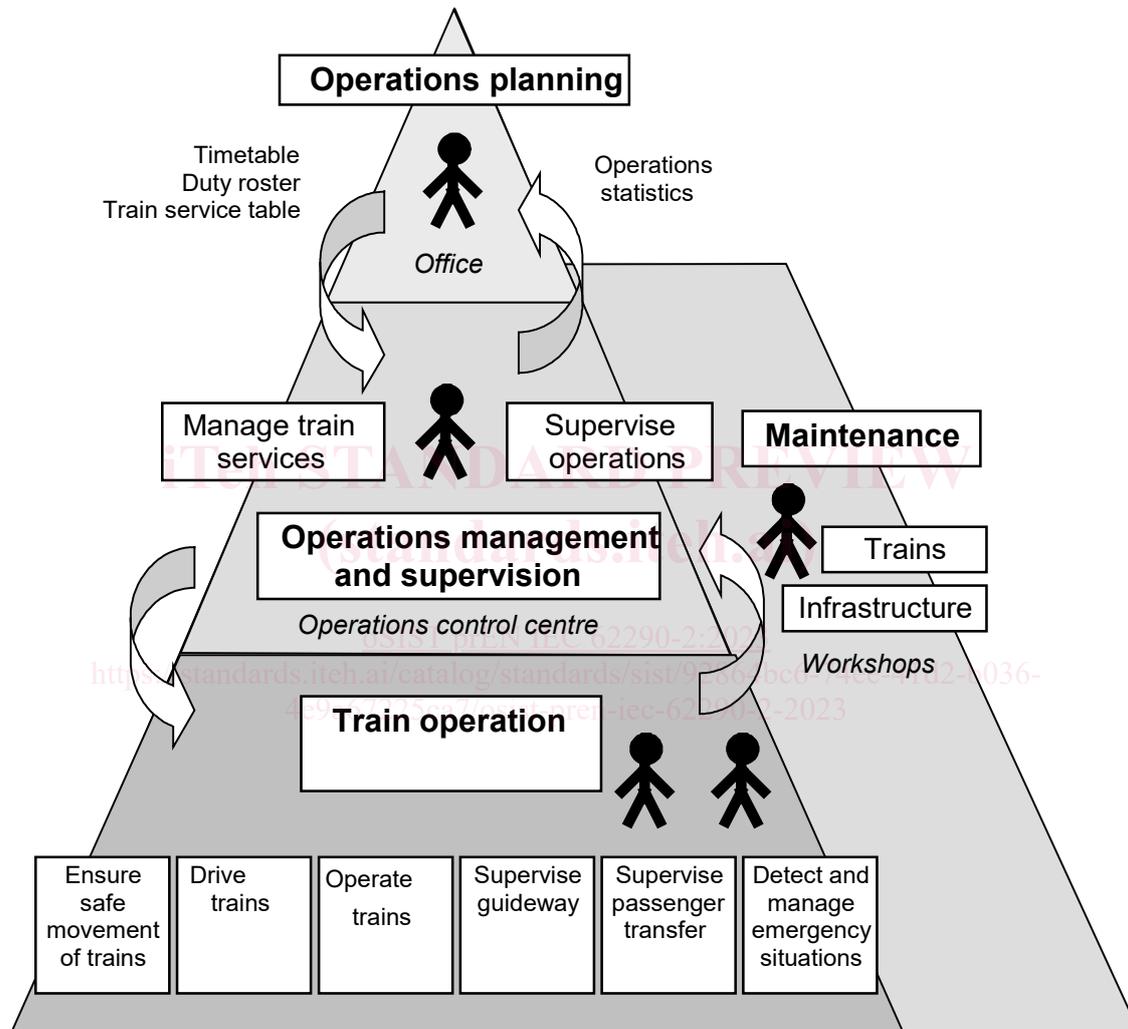
4 Operational concept

123

4.1 Organisation of operation for urban guided transport

124 Using infrastructure (guideway and its elements) and trains, the organisation of operation for
125 public transport is structured generally into the following tasks (see Figure 2):

- 126 • planning operation (Offices for planning operation including timetable, train and staff
127 resources), which is out of the scope of this standard,
- 128 • operations management and supervision (Operations Control Centre) as described in
129 Clause 6,
- 130 • executing train operations, as described in Clause 5,
- 131 • maintenance for all facilities and equipment of the transport system, especially
132 infrastructure, trains, UGTMS equipment. Maintenance is out of the scope of this
133 standard, but UGTMS supports maintenance as described in 6.9.



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Figure 2 – Organisation of operation

136 This operations organisation hierarchy provides an overview of UGTMS functions of this
137 functional requirements specification. Train operations are enabled by command-control
138 equipment situated both at the wayside and onboard, which interfaces to the Operations
139 Control Centre (OCC) equipment. Operation management and supervision is carried out from
140 the OCC which provides also the interface to the external operations control HMI to operate
141 and display all functions required by UGTMS.

142 The task of operations planning contains all necessary measures to prepare operation.

143 Operation planning provides the operation management and supervision level with all
144 necessary information to execute train operation and is provided with information from

145 management and supervision level to enable adjustment of the planning process for
146 operational needs.

147 Operations management and supervision include all measures, which are necessary to
148 ensure operations in normal, perturbed, and failure situations.

149 The functions, to be realised on this level are described in Clause 6.

150 **4.2 Basic operational principles**

151 UGTMS can be applied to a wide range of urban guided transport systems and the specific
152 UGTMS operational requirements for a given application depend on the required grade of
153 automation. Nevertheless, the following basic operational principles apply for all UGTMS
154 applications.

155 UGTMS has precise knowledge of the limits of UGTMS territory, which can include both
156 mainline and depot tracks.

157 UGTMS includes the capability to perform verification checks of the UGTMS onboard
158 equipment prior to entering UGTMS territory. The checks should be performed sufficiently in
159 advance of entry into UGTMS territory to verify the proper operation of the UGTMS onboard
160 equipment, including any UGTMS wayside equipment dependencies.

161 Under normal circumstances, it should not be necessary for a train to come to a stop when
162 entering or exiting UGTMS territory, unless required for other safety or operational reasons.

163 UGTMS trains can include passenger trains, non-passenger trains and maintenance trains
164 and different functional requirements may apply to the different types of train. For example,
165 non-passenger trains and maintenance trains are normally not required to stop at passenger
166 stations on the mainline.

167 UGTMS trains are capable of operating in various driving modes, depending on the grade of
168 automation and on the operational status of the UGTMS onboard and/or wayside equipment.

169 UGTMS ensures a safe route, safe train separation, and the safe speed of all UGTMS trains
170 operating in UGTMS territory. Trains can be operated manually by a train operator, or
171 automatically by UGTMS depending on the grade of automation. When operating
172 automatically, some functions (such as door operation) may continue to be the responsibility
173 of the train staff.

174 Non-operative UGTMS trains that are operating in UGTMS territory operate under the
175 protection of either a separate fall-back wayside signal system or operating procedures, or a
176 combination of both, as specified by the transport authority (see also 4.6 below).

177 Commands from staff shall be provided via the interface with the external operations control
178 HMI.

179 Systems are operated with or without a timetable, for example by using headway regulation
180 only.

181 **4.3 Principles to ensure safe route**

182 The operational purpose of setting routes is to allow trains to travel to different destinations in
183 the network.

184 UGTMS permits trains to be manually or automatically routed between any defined origin and
185 destination in accordance with the train service requirements for the line, predefined routing
186 rules, and any UGTMS user-directed service strategy. Where applicable to the specific track

187 configuration, automatic routing supports the proper merging and diverging of trains at
188 junctions, the turnback of trains, the movement of trains from/to depot areas, and the
189 rerouting of trains in response to service disruptions and/or planned outages.

190 UGTMS ensures a safe route for all UGTMS trains in all grades of automation.

191 To prevent train collisions and derailments, train movement is not authorized until the route is
192 set and locked. The route is locked prior to the train entering the route and route locking is
193 maintained while the train is within the route. Routes can be released by manual commands
194 or by movement of trains.

195 Ensuring a safe route is either a UGTMS function or an external function. In the latter case,
196 an appropriate interface shall be provided.

197 **4.4 Principles to ensure safe separation of trains**

198 The required design and operating headways for the line are as specified by the transport
199 authority. The design headway for a line involves many factors that are outside of UGTMS
200 (e.g. track alignment, gradients, track speed limits, train acceleration and braking rates,
201 station dwell times, terminal track configurations, train operator reaction times, etc.). These
202 factors shall be specified by the transport authority. UGTMS factors contributing to achievable
203 headways include accuracy of train location and train speed determination, resolution of
204 movement authority limits for a given train, frequency at which location reports and movement
205 authorities are updated, data communication delays, and UGTMS equipment reaction times
206 for both UGTMS wayside and UGTMS onboard equipment.

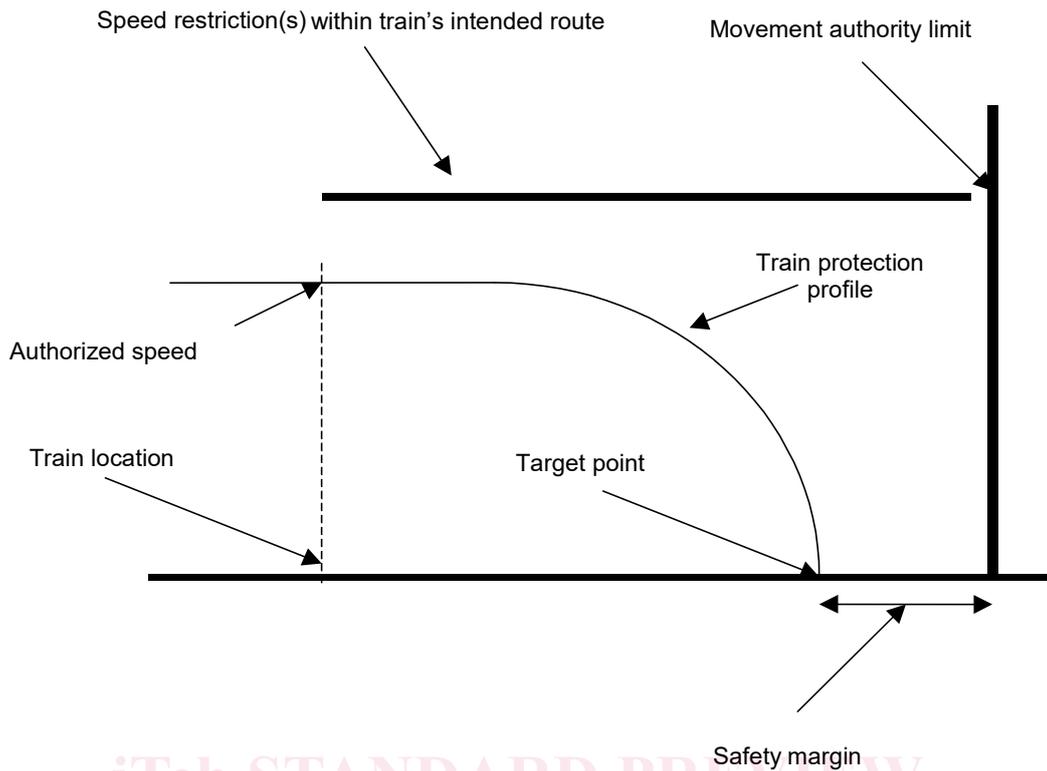
207 UGTMS provides safe train separation assurance in all grades of automation based on the
208 principle of an instantaneous stop of a preceding train. Safe train separation may be achieved
209 using either fixed block or moving block principles.

210 To ensure safe train separation, UGTMS establishes an absolute movement authority limit for
211 each train based on the determined location of the train ahead. This absolute movement
212 authority limit represents the limit of movement protection for a following train, with
213 appropriate consideration of the location margin of the preceding train, including location
214 uncertainty and rollback tolerance.

215 **4.5 Principles to ensure safe speed**

216 UGTMS provides overspeed protection in all grades of automation to ensure that the train's
217 actual speed does not exceed its safe speed. The safe speed is derived with consideration of
218 both permanent and temporary speed limits within the train's movement authority as well as
219 any permanent or temporary speed restrictions applicable to the train.

220 UGTMS ensures that a train does not travel beyond the train protection profile by supervising
221 train movement along the authorized route to a defined target point (see Figure 3). The
222 distance between the target point and movement authority limit is a variable safety distance,
223 as determined by the safe braking model, to ensure that this limit is not exceeded. The safe
224 braking model includes consideration of factors such as location margin inaccuracy of
225 following train, train length, allowable overspeed permitted by the UGTMS system, maximum
226 speed measurement error, UGTMS reaction times and latencies, maximum train acceleration
227 rate possible at the time an overspeed condition is detected by UGTMS, worst-case reaction
228 times to disable the propulsion system and apply the emergency brakes following detection of
229 an overspeed condition, and emergency brake rate, etc.



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231

Figure 3 – Train protection profile and speed supervision

232 According to the safe braking model, any violation of the train protection profile will not result
233 in the train being beyond the movement authority limit.

234 4.6 Degraded modes of train operation

235 It is a basic operational principle to continue to move trains with a level of safety potentially
236 degraded in the event of UGTMS equipment failures, possibly at reduced operating speeds
237 and/or increased operating headways when compared to normal train operations. As a
238 consequence, UGTMS supports degraded modes of operation in the event of failure, and
239 continues to provide train protection with reliance on adherence to operating procedures. This
240 is achieved through functional elements of UGTMS itself, through a separate non-UGTMS fall-
241 back wayside signal system (if specified by the transport authority), or through application of
242 the relevant operating procedures, or through a combination of any or all of the above.

243 Degraded modes of train operation should take advantage of the functional capabilities of
244 UGTMS in order to eliminate hazards to passengers and staff while continuing to provide
245 passenger train service. Specifically, degraded modes of train operations in UGTMS territory
246 should address those UGTMS equipment failures that affect all trains operating within a
247 particular area of control or a particular train operating within any area of control.

248 The management of external sensors related to their failures, resetting or overriding is not
249 handled by UGTMS.

250 For all functions of UGTMS a non-communicating UGTMS train or a train with inoperative
251 UGTMS onboard equipment shall be handled in the same way as a non-equipped train.