

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2025 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 45.060.01

ISBN 978-2-8327-0302-1

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
INTRODUCTION	8
1 Scope.....	11
2 Normative references.....	11
3 Terms, definitions and abbreviated terms.....	11
4 Operational concept.....	12
4.1 Organisation of operation for urban guided transport.....	12
4.2 Basic operational principles	13
4.3 Principles to ensure safe route.....	14
4.4 Principles to ensure safe separation of trains	14
4.5 Principles to ensure safe speed	14
4.6 Degraded modes of train operation.....	15
5 Functions for train operation	16
5.1 Ensure safe movement of trains	16
5.1.1 Ensure safe route	16
5.1.2 Ensure safe separation of trains	20
5.1.3 Determine permitted speed	23
5.1.4 Authorize train movement	25
5.1.5 Supervise train movement.....	28
5.1.6 Provide interface with external interlocking	31
5.2 Drive train.....	32
5.2.1 Determine operating speed profile	32
5.2.2 Control train movement in accordance with train operating speed profile	33
5.2.3 Stop train in station.....	34
5.3 Supervise guideway.....	36
5.3.1 Prevent collision with obstacles	36
5.3.2 Prevent collisions with persons on tracks	37
5.3.3 Protect staff on track by work zone	42
5.4 Supervise passenger transfer	43
5.4.1 Control train and platform doors	43
5.4.2 Prevent injuries to persons between cars or between platform and train	46
5.4.3 Ensure train departure.....	47
5.5 Operate a train	49
5.5.1 Put in or take out of operation	49
5.5.2 Manage driving modes	50
5.5.3 Manage movement of trains after unexpected stops	51
5.5.4 Manage stabling	52
5.5.5 Deleted.....	52
5.5.6 Restrict train entry to station	52
5.5.7 Change the travel direction	53
5.5.8 Couple and uncouple a train.....	53
5.5.9 Supervise the status of UGTMS.....	54
5.5.10 Manage traction power supply on train	57
5.5.11 Manage train washing	58
5.5.12 Manage non-stopping areas	59
5.6 Ensure detection and management of emergency situations.....	59

5.6.1	React to detected onboard fire/smoke	59
5.6.2	React to detected derailment.....	60
5.6.3	React to detected or suspected broken rail.....	60
5.6.4	Manage passenger requests	61
5.6.5	React to loss of train integrity.....	63
5.6.6	React to the loss of train doors closed and locked status	63
6	Functions for operation management and supervision	64
6.1	Manage the daily timetable	64
6.1.1	Import timetables	65
6.1.2	Select the timetable	65
6.1.3	Modify the operational timetable.....	65
6.2	Manage the train service	66
6.2.1	Manage train missions.....	66
6.2.2	Set routes automatically	68
6.2.3	Regulate trains	69
6.2.4	Deleted.....	69
6.2.5	Manage operational disturbances	69
6.2.6	Dispatch trains for energy saving.....	70
6.3	Supervise train operations	70
6.3.1	Supervise train tracking	70
6.3.2	Supervise trains and wayside equipment.....	71
6.3.3	Supervise passengers	72
6.3.4	Perform progressive shutdown	73
6.4	Control traction power.....	73
6.4.1	Monitor traction power supply.....	73
6.4.2	Command traction power supply.....	74
6.4.3	Control regenerative braking.....	74
6.5	Manage the interface with the HMI	74
6.5.1	Manage the interface with the operations control HMI.....	75
6.5.2	Manage the interface with the train HMI	75
6.6	Provide interface with the communication system for passengers and staff.....	75
6.7	Provide interface with the passenger information system	76
6.8	Provide interface with passenger surveillance system.....	76
6.9	Support maintenance	76
6.10	Manage train and staff resources	77
6.10.1	Assign train to operation needs	77
6.10.2	Assign or reassign train staff.....	77
Annex A	(informative) Advice to the reader about options in the document, for functions and requirements	79
A.1	General statement	79
A.2	Indications provided for information in this document.....	79
Annex B	(informative) Typical system performance criteria	89
Annex C	(informative) Summary of applicability of functions and subfunctions depending on GOAs	91
Bibliography	98
Figure 1	– Three-step process followed by the UGTMS series.....	9
Figure 2	– Organisation of operation.....	12

Figure 3 – Train protection profile and speed supervision	15
Figure 4 – Specification of a safe route.....	17
Table B.1 – Examples of performance criteria seen as essential for a UGTMS application.....	89
Table C.1 – Mandatory and optional functions/subfunctions according to GOA.....	92

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publications”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as far as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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

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

This edition includes the following significant technical changes with respect to the previous edition:

- a) the functions 5.1.4.5 Stopping a train en route, 5.1.5.4 Monitor speed limit at discrete location, 5.5.5 Manage UGTMS transfer tracks, 5.6.4.1 Monitor passenger emergency calls and 6.2.4 Ensure connecting services have been deleted;
- b) the functions 5.5.11 Manage train washing, 5.5.12 Manage non-stopping areas and 6.3.4 Perform progressive shutdown have been added;

- c) many of the requirements have been reworded: changes in their wording could be only minor and editorial, or it could have technical consequences;
- d) some requirements of the second edition have been moved from one function/subfunction to another;
- e) some requirements have been deleted;
- f) some new requirements have been added in the existing functions;
- g) an informative annex giving the reader some user's recommendations about this document has been added;
- h) another informative annex giving some typical performance-related criteria has been also added.
- i) an informative annex providing a summary of applicability of functions and subfunctions (mandatory or optional) depending on GOA has been added.

In order to avoid any disturbance in the use of the document, when functions or requirements of IEC 62290-2:2014 have been deleted, their numberings have been kept on purpose in this document. 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 to this third edition is limited as much as possible.

For readability of the text, just below the headline of functions and subfunctions describing requirements, the description of applicability of this function depending on GOAs is given in bold characters.

For the same reason of readability, some elements of Annex A are in italic and bold characters, when some extracts of the main part of the document are considered for providing additional information to the reader, oriented for the proper use of the document.

The text of this International Standard is based on the following documents:

Draft	Report on voting
9/3167/1 DIS	9/3198/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62290 series, published 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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

Currently in preview, click buy full version

INTRODUCTION

The IEC 62290 series specifies the functional, system and interface requirements for the command, control, and management systems intended to be used on urban, guided passenger transport lines and networks.

These systems are designated herein as urban guided transport management and command/control systems (UGTMS). UGTMS cover a wide range of operations needs from non-automated (GOA1) to unattended (GOA4) operation. A line may be equipped with UGTMS on its full length or only partly equipped.

The IEC 62290 series does not specifically address security issues. However, aspects of safety requirements may apply to ensuring security within the urban guided transit system.

The main objectives of this series are as follows:

- to provide a baseline system description and functional requirements specification for a transport authority to use in a request for proposal,
- to provide recommendations for those transport authorities wishing to acquire an interoperable or interchangeable system.

It is the responsibility of the transport authority concerned to decide on how to apply the IEC 62290 series and to take into account their particular needs.

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

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

The IEC 62290 series defines a catalogue of UGTMS requirements split into mandatory and optional functions. The functions listed are based on the given grade of automation. Most of the functions characterized as mandatory are considered with no condition. Some specific functions have a condition to be mandatory (this condition being generally related to the use of an external equipment by UGTMS). By fulfilling the requirements, a supplier can create one or more generic applications including all mandatory functions and all or a subset of optional functions. A generic application will achieve interoperability within the defined specific application conditions. Customising a generic application will create a specific application taking into account of local conditions such as track layout and headway requirements. It is the choice of supplier and transport authority to add additional functions to a generic or specific application. These additional functions are not described in the IEC 62290 series.

According to IEC 62278, it is the responsibility of the transport authority to decide, taking into account their risk acceptance principles, to conduct specific hazard and risk analysis for each specific application. The safety levels for the functions of each specific application are determined by a specific risk analysis.

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

The IEC 62290 series is intended to consist of four parts:

- IEC 62290-1, "System principles and fundamental concepts", provides an introduction to the IEC 62290 series and deals with the main concepts, the system definition, the principles and the main basic functions of UGTMS.

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

- IEC 62290-2, "Functional requirements specification", specifies the functional requirements associated to the basic functions provided by IEC 62290-1, within the system boundaries and interfaces as defined in IEC 62290-1:2024, Figure 3.

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

- IEC 62290-3, "System requirements specifications", deals with the architecture of the system and the allocation of the requirements and functions identified in IEC 62290-2 to UGTMS equipment.

The SRS (system requirement specification) specifies the architecture of a UGTMS system, with mandatory and optional UGTMS equipment.

- IEC 62290-4¹, "Interface specifications", deals with the definition of the interfaces, as well as the data exchanged by them (FIS and FFFIS), for the interoperable and interchangeable UGTMS equipment identified in IEC 62290-3.

For interfaces between UGTMS equipment, the logical interface or FIS (functional interface specification) or the physical and logical interface or FFFIS (form fit functional interface specification) will be considered.

NOTE The specific structure of IEC 62290-4 will be established to accommodate optional and mandatory UGTMS equipment, and to reflect local conditions. In principle, only one FIS or FFFIS will be defined for the same interface. However, when justified in some cases, several FISs or several FFFISs will be defined for the same interface.

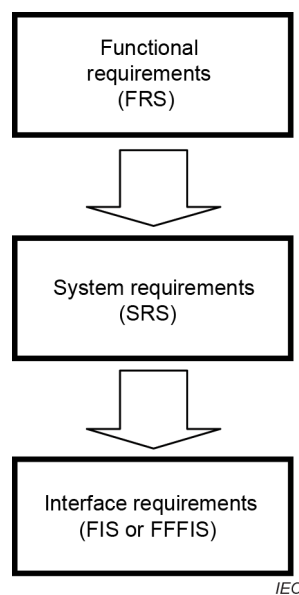


Figure 1 – Three-step process followed by the UGTMS series

¹ Under consideration.

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

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

Requirements which are established by the IEC 62290 series are indicated clearly with a requirement identification number related to the function to be covered.

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

Part 2: Functional requirements specification

1 Scope

This part of IEC 62290 specifies the functional requirements of UGTMS (urban guided transport management and command/control systems) for use in urban guided passenger transport lines and networks. This document is applicable for new lines or for upgrading existing signalling and command control systems.

This document is applicable to applications using

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

In this document, the functional requirements set the framework to which detailed functions are added to define any generic or specific application.

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

NOTE The functional breakdown in this document is consistent with basic functions in IEC 62290-1:2024, Table 1. These basic functions have been refined in this document into a more complete and detailed tree, and the "mandatory/optional" attributes of their subfunctions can be different with those given in IEC 62290-1:2024, Table 1. The functional breakdown which follows Clause 1 is the reference one for the IEC 62290 series.

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.

IEC 62290-1:2024, *Railway applications – Urban guided transport management and command/control systems – Part 1: System principles and fundamental concepts*

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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