

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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

**Applications ferroviaires – Systèmes de contrôle/commande et de gestion des  
transports guidés urbains –  
Partie 1: Principes système et concepts fondamentaux**



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

## Part 1: System principles and fundamental concepts

### FOREWORD

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International Standard IEC 62290-1 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This second edition cancels and replaces the first edition issued in 2006. It constitutes a technical revision.

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

- removing the concept of grade of line (GOL),
- putting IEC 62290-1 in line with IEC 62290-2.

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

FDIS	Report on voting
9/1913/FDIS	9/1941/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.

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. (See also introduction to this standard.)

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

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## INTRODUCTION

IEC 62290 standard 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. This series does not apply to lines that are operated under specific railway regulations, unless otherwise specified by the authority having jurisdiction.

These systems are designated here 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.

This 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 objective of this series is to achieve interoperability, interchangeability and compatibility.

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

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

IEC 62290 series is also intended to support applications for upgrading existing signalling and command control systems. In this case, interchangeability 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.

This series defines a catalogue of UGTMS requirements split into mandatory and optional functions. The functions used are based on the given grade of automation. 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 like 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 this series.

According to IEC 62278, it is the responsibility of the transport authority, in agreement with the authority having jurisdiction, 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 have to be determined by a specific risk analysis.

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

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

- Part 1 "System principles and fundamental concepts" provides an introduction to the standard and deals with the main concepts, the system definition, the principles and the



main basic functions of UGTMS (Urban Guided Transport Management and Command/Control Systems).

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

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

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. interfaces to passenger information and passenger surveillance systems). Requirements of functions have the same allocation, unless they are marked otherwise.

- Part 3 (under consideration) “System requirements specifications” deals with the architecture of the system and the allocation of the requirements and functions identified in part 2 to architecture constituents.

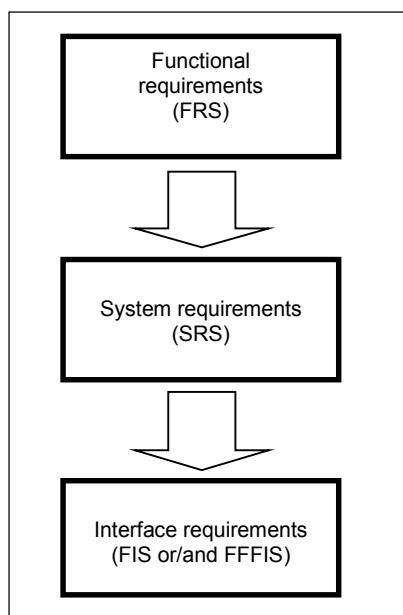
The SRS (System Requirements Specification) specifies the architecture of a UGTMS system, with mandatory and optional constituents.

- Part 4 (under consideration) “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 constituents identified in part 3.

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

NOTE The specific structures of part 3 and part 4 will be established following completion of part 2 to accommodate optional and mandatory constituents, and to reflect local conditions. In principle, only one FIS or/and FFFIS will be defined for the same interface. However, when justified in some cases, several FIS or several FFFIS will be defined for the same interface.

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IEC 1339/06

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

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 authorities having jurisdiction to be assured that generic applications delivered by different suppliers will cover at least the same functionality as specified in this part of IEC 62290.

Requirements which are established by this 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 1: System principles and fundamental concepts

### 1 Scope

This part of IEC 62290 provides an introduction to the standard and deals with the main concepts, the system definition, the principles and the basic functions of UGTMSs (Urban Guided Transport Management and Command/Control Systems) for use in urban guided passenger transport lines and networks. This part of IEC 62290 is applicable for new lines or for upgrading existing signalling and command control systems.

This part of IEC 62290 is applicable to applications using:

- continuous data transmission,
- continuous supervision of train movements by train protection profile,
- localisation of trains by external wayside equipment or reporting trains.

This standard is not applicable to existing command and control systems or projects in progress prior to the effective date of this standard.

### 2 Normative references

[IEC 62290-1:2014](https://standards.iteh.ai/catalog/standards/sist/0ea4d582-9218-426a-9cbe-2020-000000000000/iec-62290-1-2014)

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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.

IEC 62236 (all parts), *Railway applications – Electromagnetic compatibility*

IEC 62278, *Railway applications – Specification and demonstration of reliability, availability, maintainability and safety (RAMS)*

IEC 62279, *Railway applications – Communications, signalling and processing systems – Software for railway control and protection systems*

IEC 62280, *Railway applications - Communication, signalling and processing systems - Safety related communication in transmission systems*

IEC 62290-2, *Railway applications – Urban guided transport management and command/control systems – Part 2: Functional requirements specification*

IEC 62425, *Railway applications – Communication, signalling and processing systems – Safety related electronic systems for signalling*

### 3 Terms, definitions and abbreviations

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

### 3.1 Terms and definitions

#### 3.1.1

##### **additional function**

function to be adapted to the specific requirements of each transport authority (due to local rules or specific needs of the transport authority)

Note 1 to entry: The components affected by this function are not necessarily interchangeable nor interoperable.

#### 3.1.2

##### **automatic mode**

operation in semi-automated train operation (GOA2), driverless train operation (GOA3), unattended train operation (GOA4)

#### 3.1.3

##### **command**

order used to perform a function in a system

Note 1 to entry: This order can originate from

- a system operator,
- an external system,
- inside UGTMS;

this order can be sent:

- to an external system,
- inside UGTMS.

#### 3.1.4

##### **commercial speed**

nominal average speed of passenger service trains between two terminus stations of the line (dwell times at stations taken into account)

Note 1 to entry: Commercial speed is equal to the length between two terminus stations divided by the nominal journey time.

#### 3.1.5

##### **compatibility**

capability of the UGTMS system to co-exist with other systems in the same transport network without any interference

#### 3.1.6

##### **constituent**

any elementary component, group of components, subassembly or complete assembly of equipment incorporated or intended to be incorporated into UGTMS

#### 3.1.7

##### **control**

process to keep the output of the system within defined parameters using commands for non-safety related control or safety related control

Note 1 to entry: An example of non-safety related control is the process of commanding acceleration or braking to maintain speed at  $x \text{ km/h} \pm y \text{ km/h}$ . An example of safety related control is the process of commanding the emergency brakes if the speed exceeds the predefined speed limit.

#### 3.1.8

##### **driving on sight**

manual driving carried out at a speed that allows the driver to stop the train before reaching any obstacle on the track

**3.1.9****emergency brake**

brake or combination of brakes which ensures that the train will stop with the brake rate agreed between authority having jurisdiction, transport authority and train manufacturer

**3.1.10****generic application**

application which contains all mandatory and all or a subset of optional functions, with predefined configurability and customisable for different specific applications

**3.1.11****generic product**

product independent of applications, fulfilling predefined boundary conditions, interfaces and functionality (black box)

EXAMPLES: point machines, axle counters, real-time operating systems, fail-safe computer platforms without application software.

**3.1.12****grade of automation**

automation level of train operation, in which Urban Guided Transport (UGT) can be operated, resulting from sharing responsibility for given basic functions of train operation between operations staff and system

**3.1.13****interchangeability**

capability of system components identified in this standard to be procured from any number of suppliers and replaced without any substantial change in functionality or performance

Note 1 to entry: It also allows the system to adapt to technology evolutions without significant modification to its architecture.

**3.1.14****interlocking**

interdependent liaison between the control levers or the electrical control circuits of different apparatus such as points, signals, which makes it impossible to place them in positions which are unsafe

Note 1 to entry: In English, the term “interlocking” refers also to the place where interlocking is achieved.

Note 2 to entry: In French, the term “enclenchement” refers also to the individual locking of an apparatus such as a pair of points.

Note 3 to entry: For the purposes of this standard the term “interlocking” also refers to an apparatus ensuring the interlocking functionality.

[SOURCE: IEC 60050-821:1998, 821-05-02]

**3.1.15****interoperability**

ability of a transport network to operate trains and infrastructures to provide, accept and use services so exchanged without any substantial change in functionality or performance

Note 1 to entry: This ability rests on all the regulatory, technical and operational conditions which must be met in order to satisfy all the defined requirements applicable to the given grade of automation, irrespective of which supplier provides which components or systems.

**3.1.16****management**

in UGTMS, it is the process by which:

- to conduct scheduled, efficient and reliable train services

– to handle degraded modes and abnormal situations

### 3.1.17

#### **mandatory function**

function compulsory for any UGTMS application depending on the GOA and has to be developed in compliance with the UGTMS requirements in order to obtain interchangeable and interoperable components

Note 1 to entry: Requirements of mandatory functions are also mandatory unless they are marked as optional.

### 3.1.18

#### **mission**

##### **mission of a train**

non-safety related instruction for guiding a train for a journey from one defined location (e.g. terminal station, transfer track) to another defined location including intermediate stops for passenger transfer and possibly needed actions of a train (e.g. turn back) including time constraints

### 3.1.19

#### **movement authority**

permission for a train to run, within the constraints of the infrastructure, up to a specific location

### 3.1.20

#### **non-operative UGTMS trains**

non-UGTMS equipped trains and trains with inoperative UGTMS onboard equipment

### 3.1.21

#### **operations control centre**

##### **OCC**

centre from which operation of the line or the network is supervised and managed

### 3.1.22

#### **operations control HMI**

external central Human Machine Interface (HMI) (at Operations Control Centre OCC) and/or local Human Machine Interface (HMI) (if any)

### 3.1.23

#### **operations staff**

staff authorised to perform tasks concerning train operation or direct service to passengers

### 3.1.24

#### **optional function**

function not compulsory for a defined grade of automation

Note 1 to entry: For a specific UGTMS application the transport authority has to decide if it uses it or not; if yes, this function shall be compliant with the UGTMS requirements, in order to obtain interchangeable and interoperable components.

### 3.1.25

#### **reporting train**

UGTMS-equipped train able to report its location and other relevant information

### 3.1.26

#### **route**

predetermined path for a traffic movement

[SOURCE: IEC 60050-821:1998, 821-01-22]

**3.1.27****safe places**

areas within the network of an operator where evacuation of passengers can be performed, depending on current operational conditions, with a minimum of risks to the passengers (e.g. stations, refuges on the line)

**3.1.28****service brake**

braking applied by the driver or the train UGTMS onboard equipment to control train speed

Note 1 to entry: This takes into account passengers comfort, economic and environmental considerations.

**3.1.29****signal**

- conventional visual or acoustic indication, generally concerning the movements of railway vehicles and transmitted to the staff entrusted to observe it
- apparatus by means of which a conventional indication is given

[SOURCE: IEC 60050-821:1998, 821-02-01]

**3.1.30****specific application**

application designed for a particular realisation based on a customised generic application

**3.1.31****spot transmission**

track to train transmission that can only take place when the train passes the information point

**3.1.32****station**

place where trains stop to allow passengers to embark and disembark

**3.1.33****supervise**

to monitor the performance and the status of a system and initiate control when necessary

**3.1.34****train detection**

safe recognition of the presence or absence of any trains on a defined section of the track or at a given point

**3.1.35****train integrity**

state of the train being complete (no car unduly separated from the train)

**3.1.36****train stop**

device located adjacent to a running rail which is so positioned that if the signal with which it is associated is displaying danger it actuates the braking system of a train which passes this signal; alternatively, when a line speed restriction exists, it may be used independently of a signal

[SOURCE: IEC 60050-821:1998, 821-08-10]

**3.1.37****transfer track**

transition area between unequipped part of a network and UGTMS territory

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