SLOVENSKI STANDARD
SIST EN 50668:2021

01-junij-2021

Železniške naprave - Signalni in kontrolni sistemi za urbane železniške sisteme, ki niso v sistemu UGTMS

Railway applications - Signalling and control systems for non UGTMS Urban Rail systems

Bahnanwendungen - Nicht UGTMS Signal- und Zugbeeinflussungssysteme für den städtischen schienengebundenen Personennahverkehr

Applications ferroviaires - Systèmes de signalisation et de contrôle pour systèmes ferroviaires urbains non-UGTMS

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Railway applications - Signalling and control systems for non UGTMS Urban Rail systems

Applications ferroviaires - Systèmes de signalisation et de contrôle pour systèmes ferroviaires urbains non-UGTMS

Bahnanwendungen - Signal- und Zugsteuerungssysteme für städtische Schienenbahnsysteme ohne UGTMS

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European foreword

This document [EN 50668:2019] has been prepared by CLC/SC 9XA “Communication, signalling and processing systems” of CLC/TC 9X “Electrical and electronic applications for railways”.

The following dates are fixed:

- latest date by which the existence of this document has to be announced at national level (doa) 2020-01-08
- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-07-08
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2022-07-08

This document has been prepared under a mandate (M/486) given to CENELEC by the European Commission and the European Free Trade Association.

The 2013 CEN/CLC Guide 26, *Railway applications – Preparation of standards for urban rail systems design, construction, manufacture, operations and maintenance*, has been used as guidance for the preparation of this document.

Introduction

This document covers systems restricted to on-sight train operation (TOS/GOA0) and non-automated train operations (NTO/GOA1 with intermittent supervision), and covers signalling on tramways and other urban rail systems which do not fall directly within either existing railway or highway standards. This would typically be for parts of systems which are along off-street alignment, and which operate to line of sight, or automatic interlock signalling with intermittent train control (i.e. as defined in the EN 62290 series, GOA0 and GOA1 with intermittent supervision systems). This document does not conflict with the scope and requirements of the EN 62290 series.

This document proposes the minimum required functions of signalling systems for guided urban system operating line of sight and non-automated operations.

This document does not set any operational rules, any system architecture or any rules for application conditions of technical systems for the different categories of urban rail systems.

In this document GOA1a describes a GOA1 with intermittent supervision systems.

This document covers all GOA0 and GOA1a urban guided transport systems.

Such systems require more functionality and a better safety level than that provided by traffic signal controllers (as set out in EN 12675) but avoid the requirements inherent in railway signalling systems which from a tramway perspective may be restrictive operationally and financially.

Numerous states in Europe use these systems to control points, manage train movements along single lines and prevent conflicts at junctions as well as on at grade crossings with road and pedestrian traffic. Whilst adopting much of the functional requirements and safeguards used in standard traffic signal controllers, there is additional functionality required and currently in use to fulfil the needs of urban rail.

Mainline railway signalling systems include a lot of such additional functionality, but in terms of this and the required safety integrity, they are not ideally suited to the needs of urban rail.

The two fundamentally different approaches for the design of signalling systems are:

- technology as used for traffic signal controllers, or
- technology as used for signalling systems to be developed in accordance with Safety Integrity Levels sufficient for tramways and urban rail,

both of which are currently in use to some extent on most systems. This may leave system owners and operators vulnerable to challenge, particularly after an incident, because there is no relevant accepted standard to justify appropriate use of such equipment.

1 Scope

This document specifies minimum functional requirements for urban rail signalling and control systems:

- which operate on line of sight or using automatic interlock signalling with intermittent train control,
- not covered by the existing UGTMS standard EN 62290 series,
- not forming a part of an urban traffic control system but possibly interfaced with such systems.

The document is restricted to minimum functional requirements which allow users to define more specific requirements based on the given framework of the system requirements at top level. This document is not applicable to command and control systems for urban rail using continuous data transmission and continuous supervision of train movements by train protection profile (already covered by the EN 62290 series).

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviations

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

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

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

3.1 Terms and definitions

3.1.1
external device
device providing external demand inputs to elements of signalling control

Note 1 to entry: The methods of making these demand inputs can vary from simple manual inputs to automatic data derived inputs from train-borne equipment.

Note 2 to entry: Example of external device:

- Remote inputs from control rooms;
- Input from road traffic controller;
- A request transmitted from a train.

3.1.2
level crossing
level grade crossing
crossing of a urban rail system and a road at the same level

Note 1 to entry: In some member states when a tramway on its own alignment crosses a road used by other traffic it does not normally do so as a level crossing within the meanings of national road and rail traffic legislation, but is usually termed a road junction or crossing at grade. References to level crossing in this document equate to a crossing at grade when the urban rail system under consideration is a tramway.

[SOURCE: IEC 60050-821:2017, 821-07-01, modified – Note 1 to entry has been added.]

3.1.3
level crossing area
portion of the level crossing between the road stop lines on either side of the urban rail system

3.1.4
road traffic
road vehicles, pedestrians, equestrians, bicycles and any other road users

3.1.5
route <in railway signalling>
predefined path for a traffic movement

Note 1 to entry: This is as distinct from the meaning in railway signalling of a route. With respect to TOS/GOA0, the driver is the person in charge of the vehicle and is required to be able to stop the train within his sighting distance.

[SOURCE: IEC 60050-821:2017, 821-01-22, modified – Note 1 to entry has been added]

3.1.6
signal <in railway signalling>
apparatus by means of which a conventional indication is given

Note 1 to entry: This conventional indication, visual or acoustic, generally concerning the movements of urban rail vehicles, is transmitted to the staff entrusted to observe it.

Note 2 to entry: When a tramway track or part of a tramway route is in an area which is part of the highway or public road it may not be called a signal under some national legislation unless it complies with prescribed diagrams and usage to control traffic. Equipment used only to confirm such things as the lie and interlocking of points may therefore described in some countries as a point indicator. In this document where the terms point signal or point interlocking signal appear, it shall be taken that these refer to a point indicator or point interlocking indicator as appropriate.

[SOURCE: IEC 60050-821:2017, 821-02-01, modified – Note 2 to entry has been added]

3.1.7
train
combination of rolling stock coupled together

Note 1 to entry: Rolling stock includes banking locomotives.

Note 2 to entry: The term is used in this document for all categories of urban rail, such as trams, or GOA0 or GOA1a systems for example light rail, etc.

[SOURCE: IEC 60050-821:2017, 811-01-08, modified – Note 2 to entry has been added]

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

GOA	Grade of Automation
GOA0	Grade of Automation 0
GOA1a	Grade of Automation 1 with Intermittent Supervision
HMI	Human Machine Interface
NTO	Non-automated Train Operation
(O)	Optional
TOS	Train Operations on Sight
UGTMS	Urban Guided Transport Management System

4 General provisions and boundary conditions

4.1 General

The signalling systems covered by this document and their components should be suitable for use on street alignment or off-street alignment.

Figures 1 to 3 below provide an overview of the areas of non UGTMS Urban Rail systems for which operational scenarios need to be considered. In each area a train passes through, specific functionality is required.

This document covers the following areas:

a) **Independent points (stand-alone)** used for TOS/GOA0 operations, to direct trains to different tracks of the network.

b) **Single track sections** used for TOS/GOA0 operations where the guideway layout is restricted to a single track for train movements in either direction of travel.

c) **Level crossings (crossings at grade)** used for both TOS/GOA0 and NTO/GOA1a operation, where a guideway crosses public streets and/or footpaths.

d) **Route control area** used for:

- TOS/GOA0 where the guideway layout has a higher complexity than for independent points areas and it is reasonable to set a route consisting of various route elements for passage of the train, to ease operation,
- NTO/GOA1a where train movements on safe routes are compulsory.

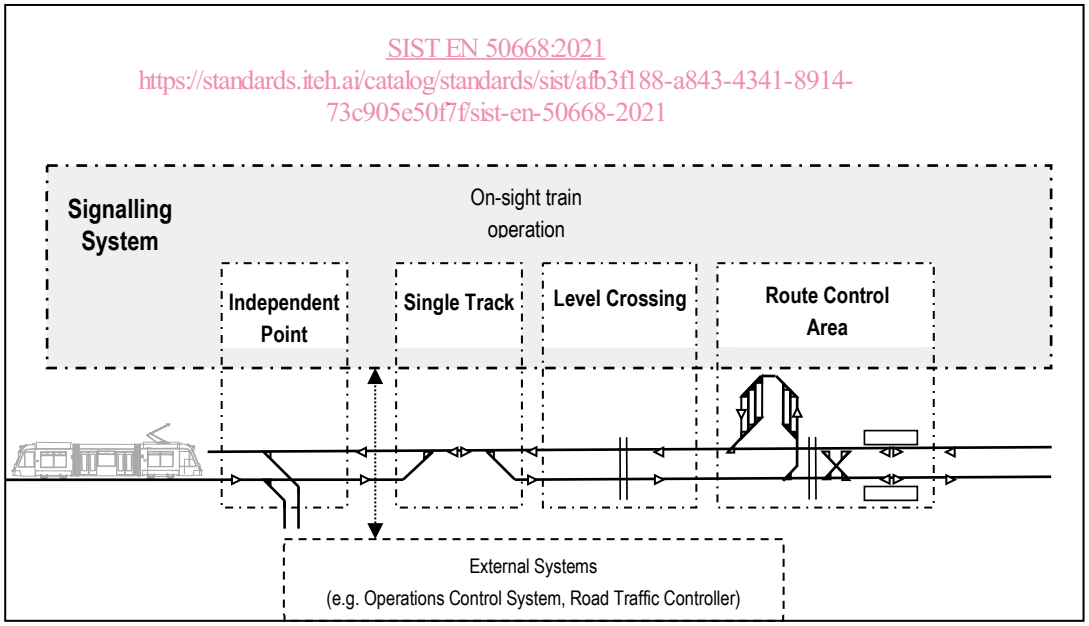

Figure 1 — On-sight train operation (TOS/GOA0)

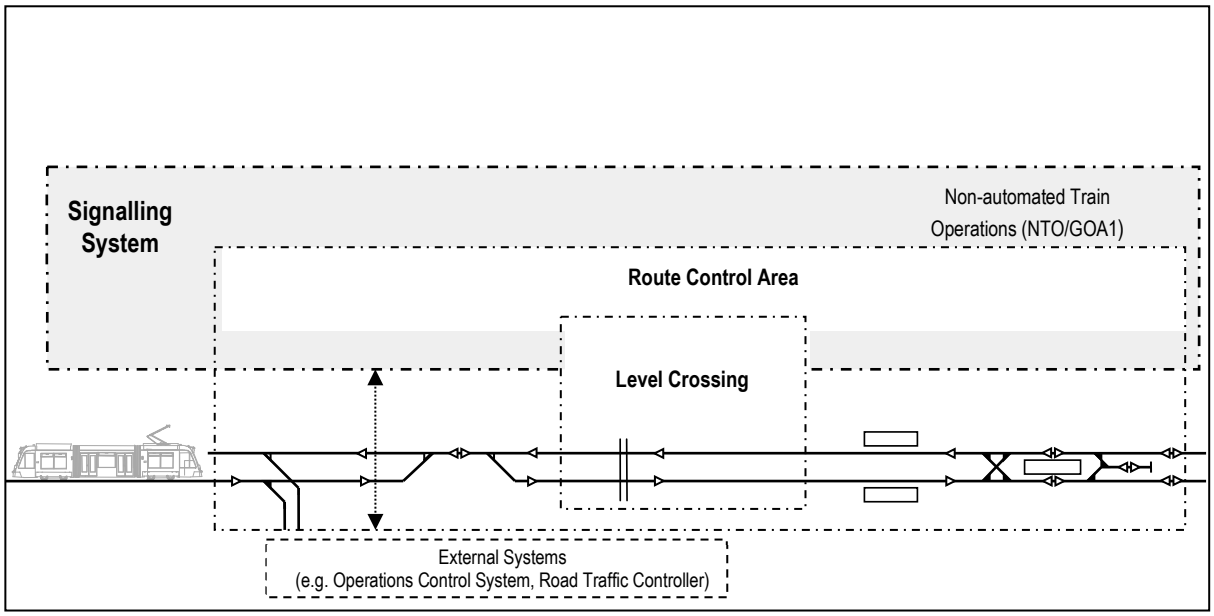

Figure 2 — Non-automated train operations (NTO/GOA1a)

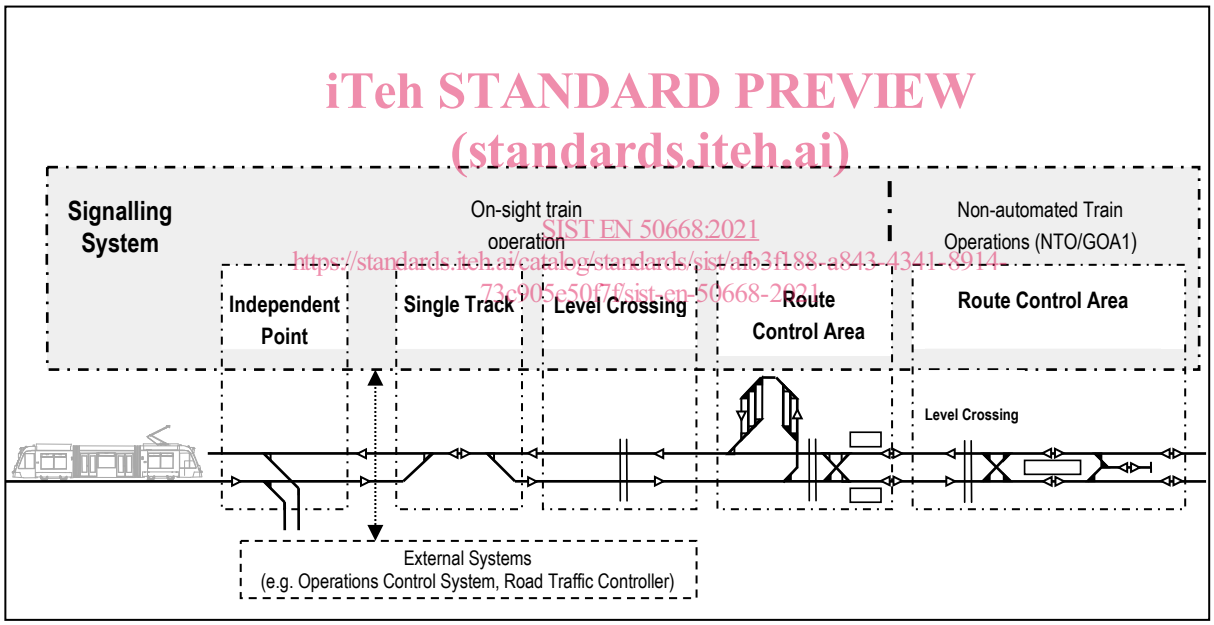

Figure 3 — Combined on-sight train operation (TOS/GOA0) and non-automated train operations (NTO/GOA1a)

4.2 Independent point control

Independent point control is used to set points in different positions and to avoid points moving under trains by:

- setting and securing points,
- checking and displaying the position of points.

Independent point control is used for on-sight train operation (TOS/GOA0) and covers independent points which may be linked together, but it is not part of a route control area.

4.3 Single track section control

Single track section control is to prevent concurrent use of a single track section by trains travelling in opposite directions by:

- ensuring the routes associated to single track sections are set and secured,
- signalling of single track sections.

Single track section control is used for TOS/GOA0 operation. Control of points is treated separately.

4.4 Level crossing control

Level crossing control is to prevent concurrent use of the guideway by rail and crossing road/pedestrian traffic by:

- signalling and/or signage of level crossings for rail and road traffic, and
- when signalled, closing to road /pedestrian traffic and holding level crossing for use by rail traffic.

Level crossing control is used for both TOS/GOA0 and NTO/GOA1a operations.

Some functionalities of level crossing control are covered by route control for NTO/GOA1a operation.

4.5 Route control

Route control is used to set routes via various route elements for:

a) **TOS/GOA0**

the prevention of conflicting movements and points moving under trains, by:

- setting and securing all routes via level crossings, switchable (e.g. points) and non-switchable (e.g. track sections) route elements,
- signalling of routes.

b) **NTO/GOA1a**

the prevention of conflicting movements and points moving under trains, by:

- setting and securing all routes via level crossings, switchable (e.g. points) and non-switchable (e.g. crossing, track sections) route elements,
- ensuring safe separation of trains,
- signalling of routes and control of train movements at specific locations.

5 Hazards to be covered

5.1 General

Boundary conditions depending on grades of automation:

a) In TOS/GOA0 operation, it is assumed that:

- whilst operating on street alignment, conflicts with other road and pedestrian traffic are covered by highway legislation and means of prevention (e.g. traffic signs, road traffic signals and controllers) are therefore not part of this hazard identification,

- the train driver is responsible for carrying out such functions, within the boundary conditions defined by national or operational rules; The train driver is responsible for carrying out conflict with road and pedestrian traffic,
- the separation of trains is the responsibility of the driver,
- the determination of appropriate speed to avoid collisions is the responsibility of the train driver,
- the observance of appropriate speed to avoid derailment is the responsibility of the train driver.

b) In NTO/GOA1a operation:

- trains operate on a segregated guideway,
- the separation of trains is managed through the signalling system,
- speed supervision is part of the signalling system (O).

The hazard analysis described in 5.2, 5.3, 5.4, and 5.5 is general, to support any specific hazard analysis performed in a project.

5.2 Independent point area

Boundary conditions

- for locally set points, the driver is responsible for checking that the switching of the point is permissible, for observing that the point is correctly positioned and to observe the permitted speed relative to the position of the points,
- there are no conflicting train movements, only the hazards due to the point are considered.