
Železniške naprave - Zgornji ustroj proge - Zagotavljanje varnosti med delom na progi - 2-1. del: Skupne rešitve in tehnologija - Tehnične zahteve za opozorilne sisteme TWS

Railway applications - Track - Safety protection on the track during work - Part 2-1: Common solutions and technology - Technical requirements for Track Warning Systems (TWS)

Bahnanwendungen - Oberbau - Sicherungsmaßnahmen während Gleisbauarbeiten - Teil 2-1: Allgemeine Lösungen und Technologie - Technische Anforderungen an Warnsysteme an Gleisen

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Applications ferroviaires - Voie - Protection et sécurité durant des travaux sur la voie - Partie 2-1: Solutions communes et technologie - Exigences relatives aux dispositifs d'annonce des circulations (TWS)

Ta slovenski standard je istoveten z: EN 16704-2-1:2016

ICS:

13.100	Varnost pri delu. Industrijska higiena	Occupational safety. Industrial hygiene
93.100	Gradnja železnic	Construction of railways

SIST EN 16704-2-1:2017

en,fr,de

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EUROPEAN STANDARD

EN 16704-2-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2016

ICS 93.100

English Version

Railway applications - Track - Safety protection on the track during work - Part 2-1: Common solutions and technologies - Technical requirements for Track Warning Systems (TWS)

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EN 16704-2-1:2016 (E)**European foreword**

This document (EN 16704-2-1:2016) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by May 2017.

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This European Standard is one of the series EN 16704 “*Railway applications – Track – Safety protection on the track during work*” as listed below:

- *Part 1: Railway risks and common principles for protection of fixed and mobile work sites*
- *Part 2-1: Common solutions and technology – Technical requirements for Track Warning Systems (TWS)*
- *Part 2-2: Common solutions and technology – Technical requirements for barriers*
- *Part 3: Competences of personnel related to work on or near the railway track*

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Introduction

The purpose of this standard is to define the requirements for Track Warning Systems (TWS) used to warn people about approaching trains and rail vehicles when on or near the track during their work.

TWS can be subdivided into the following types:

- LOWS – Lookout Operated Warning Systems;
- ATWS – Automatic Track Warning Systems;
- SCWS – Signal Controlled Warning Systems.

Each class can be used as a warning system by itself or with an additional function that can influence approaching trains and rail vehicles. For instance LOWS-I, ATWS-I or SCWS-I (-I: influence function).

This standard defines minimum system requirements for TWS.

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EN 16704-2-1:2016 (E)**1 Scope**

This European Standard defines minimum functional and non-functional requirements for Track Warning Systems (TWS) used to warn persons about approaching trains and rail vehicles during their work on or near the track. These systems may also have an additional function that can influence the approaching trains and rail vehicles. The influence could be a stopping, passing or other function.

This European Standard is applicable to:

- systems, sub-systems and components within TWS, including those containing software;
- new TWS;
- new integrations of systems, sub-systems and components into existing TWS; and
- modifications of TWS developed according to this standard.

It is also recommended to use this standard for single warning units (e.g. simple electrical horns).

This European Standard does not apply to the following items:

- hazards during the installation/removal of the TWS caused by trains and rail vehicles on the lines;
- hazards caused by the improper use of TWS;
- hazards caused by the improper behaviour of persons working on or near the track;
- hazards caused by the (unauthorized) presence of persons on or near the track;
- CO₂-horns (tyfons), human operated pressure signal horns, flags, detonators or machine warning systems according to UIC 644,
- national safety regulations to plan and operate TWS in track.

2 Normative references

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.

EN 894-3:2000+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators*

EN 16704-1:2016, *Railway applications – Track – Safety protection on the track during work – Part 1: Railway risks and common principles for protection of fixed and mobile work sites*

EN 50121-4, *Railway applications – Electromagnetic compatibility – Part 4: Emission and immunity of the signalling and telecommunications apparatus*

EN 50125-3:2003, *Railway applications - Environmental conditions for equipment - Part 3: Equipment for signalling and telecommunications*

EN 50126-1:1999, *Railway applications - The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Basic requirements and generic process*

EN 50128, *Railway applications – Communications, signalling and processing systems – Software for railway control and protection systems*

EN 50129, *Railway applications - Communication, signalling and processing systems - Safety related electronic systems for signalling*

EN 50159, *Railway applications - Communication, signalling and processing systems - Safety-related communication in transmission systems*

EN 60204-1, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

EN 60529, *Degrees of protection provided by enclosures (IP Code)*

EN 61310-1, *Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, acoustic and tactile signals*

EN ISO 12100, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16704-1:2016 and the following apply.

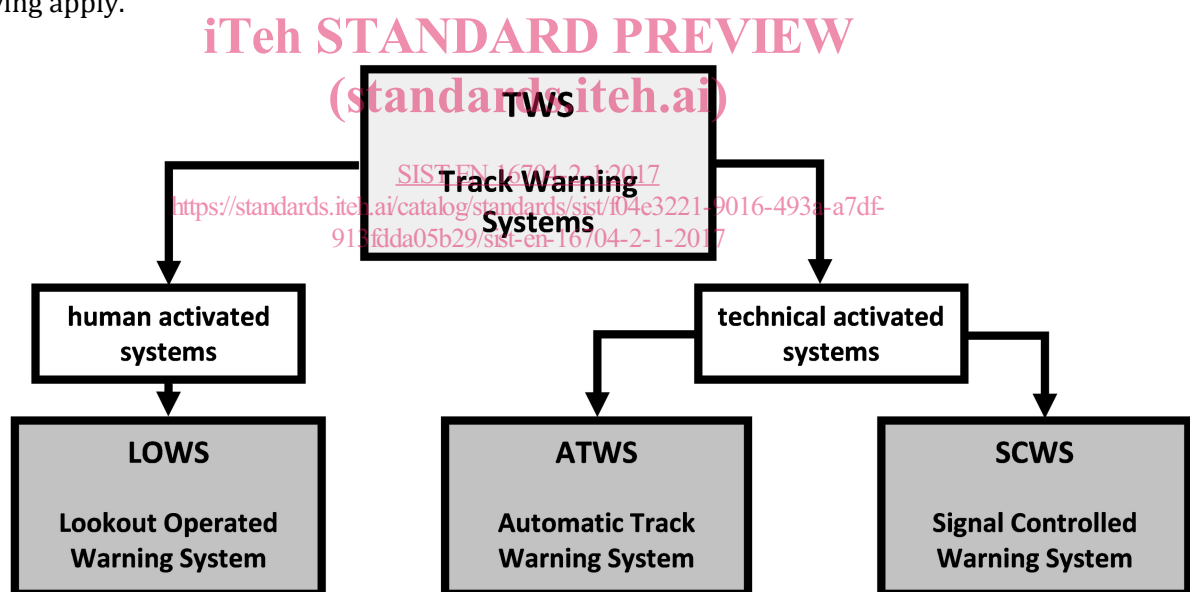


Figure 1 — Overview TWS family

3.1

Track Warning System

TWS

system which warns people of approaching trains and rail vehicles when they are on or near the track. These systems may also be able to influence the approaching trains and rail vehicles. The influence could be a stopping, passing or other function

EN 16704-2-1:2016 (E)**3.2****human activated system**

TWS where the process for detecting approaching trains and rail vehicles is dependent on human interaction

3.3**technical activated system**

TWS where the process for detecting approaching trains and rail vehicles is independent of human interaction

3.4**Lookout Operated Warning System****LOWS**

TWS which detects approaching trains and rail vehicles by human operated detection units including a vigilance control for human operated detection units

3.5**Automatic Track Warning System****ATWS**

TWS which detects approaching trains and rail vehicles by technical means (e.g. treadles, axle counters)

3.6**Signal Controlled Warning System****SCWS**

TWS which detects approaching trains and rail vehicles by data from the signalling system

3.7**TWS-input**

step or steps in the process of a TWS which detect approaching and/or leaving trains and rail vehicles

3.8**TWS-communications**

step or steps in the process of a TWS which provide communications between TWS functional units (these can be wired and/or wireless) according to EN 50159

3.9**TWS-logic**

step or steps in the process of a TWS to process the input and to generate warning information for the output

3.10**TWS-output**

step or steps in the process of a TWS

- a) to warn people by TWS-Signals and/or
- b) to influence approaching trains and rail vehicles

3.11**TWS-Signals**

acoustic and/or optical signals to warn people on or near the track about approaching trains and rail vehicles

3.12**human detection**

detection activated by a person (e.g. lookout) as input for TWS

3.13**human activation**

activation of a TWS-signal by a person (e.g. lookout, TWS-Operator)

3.14**human cancellation**

cancellation of a TWS-Signal by a person (e.g. lookout, TWS-Operator) as input for TWS

3.15**technical detection**

detection activated by an approaching train or rail vehicle not operated by a person (e.g. treadles, axle counters) as input for TWS

3.16**technical cancellation**

cancellation of a TWS-Signal not by a person (e.g. treadles, axle counters) as input for TWS

3.17**safety critical failure**

failure according to EN 50129, which could affect the safety integrity of the system

3.18**failure**

deviation from the specified performance of a system. A failure is the consequence of a fault or error in the system

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[SOURCE: EN 50129:2003, definition 3.1.17]

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3.19**failsafe**

concept which is incorporated into the design of a product such that, in event of a failure, it enters or remains in safe state

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[SOURCE: EN 50129:2003, definition 3.1.16]

3.20**Safety Integrity Level****SIL**

number which indicates the required degree of confidence that a system will meet its specified safety functions with respect to systematic failures

[SOURCE: EN 50129:2003, definition 3.1.51]

3.21**RAMS (Reliability, Availability, Maintainability, and Safety)**

acronym meaning a combination of reliability, availability, maintainability and safety

[SOURCE: EN 50126-1:1999, definition 3.29]

3.21.1**reliability**

probability that an item can perform a required function under given conditions for a given time interval

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[SOURCE: EN 50126-1:1999, definition 3.30]

3.21.2**availability**

ability of a product to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval assuming that the required external resources are provided

[SOURCE: EN 50126-1:1999, definition 3.4]

3.21.3**maintainability**

probability that a given active maintenance action, for an item under given conditions of use, can be carried out within a stated time interval when the maintenance is performed under stated conditions and using stated procedures and resources

[SOURCE: EN 50126-1:1999, definition 3.20]

3.21.4**safety**

freedom from unacceptable level of risk

[SOURCE: EN 50126-1:1999, definition 3.35]

3.22**safety relevant information of TWS**

safety relevant operational information recorded and stored in a data recorder

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3.23**data recorder/black box**

location/locations in the TWS where safety relevant information is stored and can be accessed

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3.24**safe state**

condition which continues to preserve safety

[SOURCE: EN 50129:2003, definition 3.1.44]

3.25**TWS-Operator**

person who operates TWS

3.26**influence function**

function of a TWS to influence approaching trains and rail vehicles

3.27**vigilance control**

technical function to control the vigilance of a person (e.g. dead-man's button)

3.28**announcement time**

period between the moment the warning starts and the moment the approaching train or rail vehicle reaches the beginning of the work site