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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

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)

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

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)

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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prEN 16704-2-1:2014 (E)**Foreword**

This document (prEN 16704-2-1:2014) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

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 – Requirements for barriers*
- *Part 3: Competences of personnel related to work on or near the railway track*

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Introduction

Purpose/Intention of this standard is the definition of requirements for Track Warning Systems (TWS) used for the warning of persons on or nearby the track during their work about approaching trains or rail vehicles.

TWS can be subdivided in following classes:

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

Each class can be realized as a warning system only or a warning system influencing approaching trains or rail vehicles as well. For instance LOWS-S, ATWS-S or SCWS-S. (-S: stoppage function)

This standard does define minimum system requirements for TWS and shall gradually replace national system requirements for TWS.

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prEN 16704-2-1:2014 (E)**1 Scope**

This document defines minimum functional and non-functional requirements for developing a Track Warning Systems (TWS) to warn persons during their work on or nearby the track about the approaching of trains or rail vehicles using acoustical and visual TWS-Signals. These systems may also be able to influence the approaching of trains and rail vehicles by stoppage function.

This European Standard is applicable:

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

For single warning units (e.g. simple electrical horns) it is recommended to use this standard, too.

This document does not deal with:

- hazards during the installation of the TWS caused by trains or rail vehicles on the lines;
- hazards caused by the improper use of TWS;
- hazards caused by the improper behaviour of persons working on or nearby the track;
- CO₂-tyfone, 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 referenced documents are indispensable for the application 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.

EN 842, *Safety of machinery – Visual danger signals – General requirements, design and testing*

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

EN 14033-2, *Railway applications – Track – Railbound construction and maintenance machines – Part 2: Technical requirements for working*

prEN 16704-1:2014, *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 50121-1, *Railway applications – Electromagnetic compatibility – Part 1: General*

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

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

EN 50126, *Railway applications – The specification and demonstration of reliability, availability, maintainability and safety*

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

EN 50129, *Railway applications – Communication, signaling and processing systems – Safety related electronic systems for signaling*;

EN 50159, *Railway applications – Communication, signaling and processing systems – Safety related communication in open transmission systems*

EN 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999)*

EN 61000-2-4, *Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances (IEC 61000-2-4:2002)*

EN 61000-4-14, *Electromagnetic compatibility (EMC) – Part 4-14: Testing and measurement techniques – Voltage fluctuation immunity test (IEC 61000-4-14:1999 + A1:2001)*

EN 61310-1, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN ISO 11201, *Acoustics – Noise emitted by machinery and equipment – Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201)*

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 prEN 16704-1:2014 and the following apply.

3.1

Track Warning System (TWS)

system which warns persons on or nearby the track about approaching trains or rail vehicles. These systems may also be able to influence the approaching of trains and rail vehicles by stoppage function.

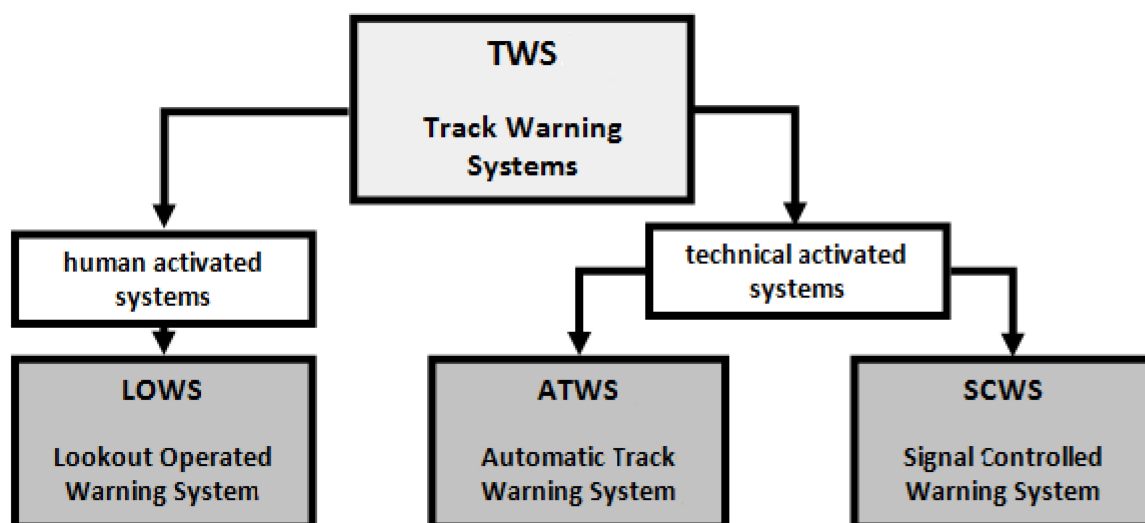


Figure 1 — Overview TWS family

prEN 16704-2-1:2014 (E)**3.2****human activated system**

system which is dependent on human interaction in the process to detect approaching trains or rail vehicles and to warn persons on or nearby the track

3.3**technical activated system**

system which is independent on human interaction in the process to detect approaching trains or rail vehicles and to warn persons on or nearby the track

3.4**Lookout Operated Warning System (LOWS)**

TWS which detect approaching trains or 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 detect approaching trains or rail vehicles by technical means (e.g. treadles

3.6**Signal Controlled Warning System (SCWS)**

TWS which detect approaching trains or rail vehicles by data from the signalling system

3.7**input TWS**

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

3.8**communication TWS**

step or steps in the process of TWS to communicate wired and/or wireless according to EN 50159

3.9**logic TWS**

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

3.10**output TWS**

step or steps in the process of TWS to warn persons by warning signals and/or to influence approaching trains or rail vehicles

3.11**TWS-signals**

signals according to Annex A and Annex B

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, operator)

3.14**human cancelation**

cancellation of a TWS-Signal by a person (e.g. lookout, 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 cancelation**

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

3.17**failure (not safety relevant)**

anomaly of the required functionality, without influence on the safety function of the system

3.18**error (safety relevant)**

anomaly to the required functionality, with influence on the safety function of the system

3.19**failsafe**

definition according to EN 50129

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 (EN 50129)

3.21**RAMSS (Reliability, Availability, Maintainability, Safety and Security)****3.21.1****Reliability**

probability that an item can perform a required function under given conditions for a given time interval (t_1 , t_2) (EN 50126)

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 (EN 50126)

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 (EN 50126)

3.21.4**Safety**

freedom from unacceptable level of risk (EN 50126)

3.22**safety relevant information TWS**

information processed by the TWS, recorded in a black box, that secured a save function

3.23**data recorder/black box**

location/locations in the TWS where safety relevant information are stored and can be read out

prEN 16704-2-1:2014 (E)**3.24****safe state**

definition according to EN 50129

3.25**redundancy**

definition according to EN 50129

3.26**TWS-Operator**

person which operates TWS

3.27**stoppage function**

function of the TWS to influence approaching trains or rail vehicles

3.28**vigilance control**

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

3.29**announcement time**

period between the moment the warning starts and the moment the train passes the beginning of the work site

3.30**processing time**

maximum time period for processing the steps from Input and giving acoustical and optical TW-Signals by the warning units in each configuration in compliance with the manual

3.31**warning area**

area on or nearby the track where persons are warned by TWS

3.32**Radio Block Center (RBC)**

subsystem of European Train Control System (ETCS). The RBC is a computer-based system that elaborates messages to be sent to the train on basis of information received from external trackside systems and on basis of information exchanged with the train. The main objective of these messages is to provide movement authorities to allow the safe movement of trains on the railway infrastructure area under the responsibility of the RBC

3.33**interlocking**

controls train movements by railway signals and block systems to ensure that trains operate safely and over the correct route

4 Functional requirements**4.1 Types of TWS**

TWS are LOWS, ATWS and SCWS with the same purpose (see 4.2.1). There is modularity in TWS assigned to the method/kind of input of the TWS.

Components of different types of TWS may be combined according to the specification of the manufacturers.