

RAUDTEEALASED RAKENDUSED. RÖÖBASTEE.
OHUTUSE TAGAMINE RÖÖBASTEEL TÖÖTAMISEL. OSA
2-1: ÜLDLAHENDUSED JA TEHNOLOOGIA. TEHNILISED
NÕUDED TEE HOIATUSSÜSTEEMIDELE (THS)

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

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16704-2-1:2016 sisaldab Euroopa standardi EN 16704-2-1:2016 ingliskeelset teksti.	This Estonian standard EVS-EN 16704-2-1:2016 consists of the English text of the European standard EN 16704-2-1:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 23.11.2016.	Date of Availability of the European standard is 23.11.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 93.100

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

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)

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)

Bahnanwendungen - Oberbau - Sicherungsmaßnahmen
während Gleisbauarbeiten - Teil 2-1: Allgemeine
Lösungen und Technologien - Technische
Anforderungen an Warnsysteme an Gleisen (TWS)

This European Standard was approved by CEN on 6 August 2016.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword.....	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	7
4 Functional requirements.....	11
4.1 Types of TWS.....	11
4.2 General functional requirements.....	11
4.2.1 System definition	11
4.3 LOWS.....	13
4.3.1 Lookout Operated Warning System (LOWS)	13
4.3.2 Lookout Operated Warning System with Influence Function (LOWS-I)	14
4.4 ATWS.....	15
4.4.1 Automatic Track Warning System ATWS	15
4.4.2 Automatic Track Warning System with Influence Function (ATWS-I)	16
4.5 SCWS	16
4.5.1 Signal Controlled Warning System (SCWS).....	16
4.5.2 Signal Controlled Warning System with Influence Function (SCWS-I)	17
5 Non-functional requirements.....	17
5.1 Communication.....	17
5.2 Reliability.....	17
5.3 Availability	17
5.4 Maintainability.....	17
5.5 Functional Safety	17
5.6 Service Life.....	17
5.7 Safety for the user	18
5.8 Environment.....	18
5.8.1 General.....	18
5.8.2 Protection against dust and water (IP-Codes).....	18
5.8.3 Pollution	18
5.8.4 Compatibility with Electromagnetic Current (EMC compatibility).....	18
5.8.5 Power Supply	18
5.8.6 External connectors and cables	18
5.8.7 Altitude	18
5.8.8 Pulse Pressure.....	19
5.8.9 Temperature.....	19
5.8.10 Humidity.....	19
5.8.11 Wind.....	19
5.8.12 Snow and hail.....	19
5.8.13 Ice.....	19
5.8.14 Solar radiation	19
5.8.15 Lightning protection	19
5.8.16 Fire protection	19
5.9 Vibration and Shock.....	20
5.9.1 General.....	20

5.9.2	Vibration	20
5.9.3	Shock	20
5.10	Dimension, mass, handling	20
5.11	Control elements of the TWS	20
5.12	Indication on the TWS.....	21
5.13	Technical processing time.....	21
5.14	TWS power supply and power consumption.....	22
5.15	Warning in case of a safety critical failure	22
5.16	Technical detection.....	22
5.17	Speed Range for detection components	22
5.18	TWS-Signal	22
5.18.1	Acoustic TWS-Signal	22
5.18.2	Optical TWS-Signals.....	23
5.19	Information by Human-Machine-Interface (HMI)	23
5.19.1	During operation	23
5.19.2	Priority of information on the HMI	23
5.19.3	Developing HMI.....	23
5.20	Data logging	23
5.21	User manual.....	24
5.22	Marking	24
5.23	Colour.....	25
Annex A (normative) Specification of acoustic warning signals.....		26
A.1	General	26
A.2	Sound criteria for acoustic TWS-Signals	26
A.3	Time criteria for acoustic TWS-Signals.....	27
Annex B (normative) Specification of optical TWS signals.....		28
B.1	General	28
Bibliography		29

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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.

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.

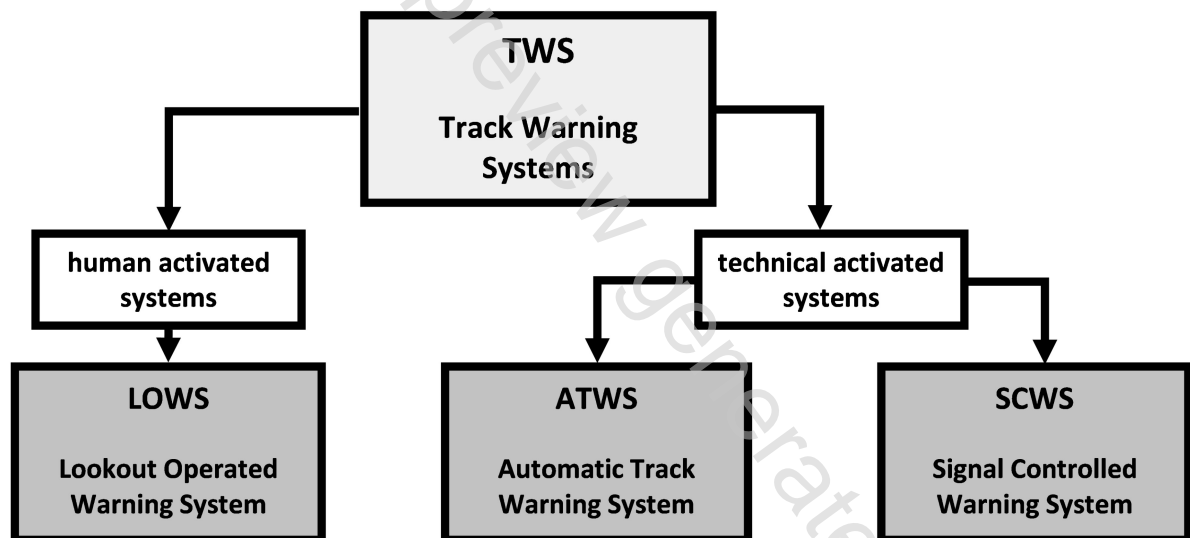


Figure 1 — Overview TWS family

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