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SIST EN 16843:2024

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Železniške naprave - Infrastruktura - Mehanske zahteve za spoje v voznih tirnicah

Railway applications - Infrastructure - Mechanical requirements for joints in running rails

Bahnanwendungen - Infrastruktur - Mechanische Anforderungen an Fahrschienenstöße

Applications ferroviaires - Infrastructure - Exigences mécaniques des joints dans les rails de roulement

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93.100

Gradnja železnic

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mécaniques des joints dans les rails de roulement

Bahnanwendungen - Infrastruktur - Mechanische
Anforderungen an Fahrschienenstöße

This European Standard was approved by CEN on 16 July 2023.

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EN 16843:2024 (E)**European foreword**

This document (EN 16843:2024) 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of an identical text or by endorsement, at the latest by July 2024, and conflicting national standards shall be withdrawn at the latest by July 2024.

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1 Scope

This document deals with mechanical rail joints for permanent installation with flat bottom rails 46 kg/m and above.

The scope of this document is:

- to establish requirements for insulated and non-insulated fish-plated rail joints, for stressed rail (continuous welded rail, CWR) and unstressed rail (jointed track);
- to define mechanical and electrical requirements for type approval and for acceptance of insulated rail joints which are manufactured in a factory (prefab construction) as well as assembled on-site (site construction).

This document specifies the minimum requirements. Special applications as for instance tram systems can require different demands in certain paragraphs and are agreed between customer and supplier.

This document applies to rail joints formed of a pair of rails, with perpendicular or angled rails ends.

The scope of this document excludes all types of mechanical joints for temporary installation in track, used for example during track construction or for securing broken rails and welds before final repair. The scope also excludes expansion devices (covered in EN 13232-8), and special joints in switch constructions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10025-2:2019, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10204, *Metallic products - Types of inspection documents*

EN 13674 (series), *Railway applications - Track - Rail*

EN ISO 7500-1, *Metallic materials - Calibration and verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1)*

EN ISO 21920-2, *Geometrical product specifications (GPS) - Surface texture: Profile - Part 2: Terms, definitions and surface texture parameters (ISO 21920-2)*

3 Terms and definitions

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 <https://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1

customer

operator or user of the equipment, or the purchaser of the equipment on the user's behalf

3.2

supplier

body responsible for the use of the EN in response to the customer's requirements

3.3

mechanical rail joint

mechanical assembly, for example with fishplates to join two rail ends

3.4

standard mechanical rail joint

mechanical rail joint that connects two rails of the same profile

3.5

transition mechanical rail joint

mechanical rail joint that connects two rail profiles which are different or which compensate for railhead wear

3.6

non-insulated rail joint

mechanical rail joint which does not separate the rail ends electrically

3.7

insulated rail joint

mechanical rail joint with the additional function to separate the rail ends electrically

3.8

insulated rail joint for jointed track with expansion

insulated rail joint with expansion capacity which can accommodate longitudinal displacement of the jointed rail length

3.9

insulated rail joint for jointed track without expansion

insulated rail joint without expansion capacity which can only resist the longitudinal forces of a jointed track

3.10

insulated rail joint for CWR

insulated rail joint without expansion capacity which can resist the forces in CWR

3.11**prefab construction**

mechanical rail joints manufactured in a factory

3.12**site construction**

mechanical rail joints manufactured in track (on-site) by an assembler

3.13**continuous welded rail****CWR****joint-free rail**

rails welded together to form a single rail length longer than a defined length

3.14**rail with joints**

rail in jointed track installed at lengths less than a defined length, with expansion gaps provided at mechanical joints

3.15**fishplate**

component applied in mechanical rail joints on each side of the rail on the fishing surfaces

3.16**fishplate bolts**

bolts used in mechanical rail joints with special design to fit the fishplates

3.17**end post**

insulating component between the two rail ends with the same profile as the rail ends

3.18**joint clearance**

functionally required distance between the two rail ends of a jointed track

3.19**suspended joint**

unsupported joint situated between two supports with regular spacing

3.20**supported joint**

joint situated on top of one support, one sleeper or a double sleeper

3.21**rail bond**

electrical connection for traction and/or signalling currents in jointed track

3.22**rail bolt for earthing**

bolt connected to the rail for earth bond

3.23**insulating bush**

insulating component between bolt and rail or fishplate

4 Symbols and abbreviations

Symbols and abbreviations used in this document are set out in Table 1.

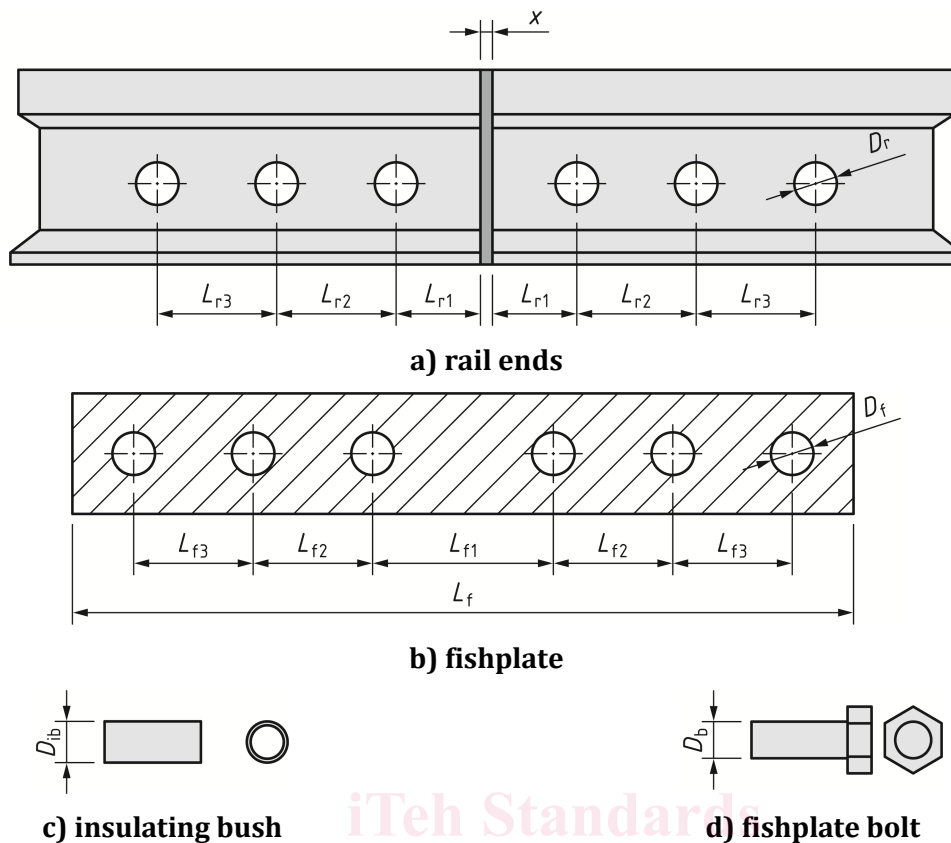
Table 1 — Overview of symbols

Symbol	Description	Unit
A_{rail}	Cross-section area of the nominal rail profile	m ²
D_b	Diameter of fishplate bolt	m
D_f	Diameter of holes in fishplate	m
D_{ib}	External diameter of insulating bush	m
D_r	Diameter of holes in rail end	m
E	Young's modulus of rail steel	N/m ²
F	Force in repeated bending test	N
F_{min}	Minimum force in repeated bending test	N
F_{max}	Maximum force in repeated bending test	N
$F_{t,min}$	Minimum tension strength in tension strength test	N
$F_{t,s}$	Tension strength in tension strength test	N
H	Height of rail section	m
I_{rail}	Geometrical moment of inertia of rail section	m ⁴
J_c	Joint clearance capacity	m
J_{min}	Minimum joint clearance	m
J_{max}	Maximum joint clearance	m
J_n	Nominal joint clearance with rails, fishplates and fishplate bolts at nominal position	m
J_t	Instantaneous joint clearance	m
k	Track index	N/m
L	Length of test specimen	m
L_{char}	Characteristic length	m
$L_{jt,max}$	Maximum rail length for jointed track	m
L_f	Total length of fishplate	m
L_{f1}	Longitudinal distance between axes of centre holes of the fishplate	m
L_{f2}	Longitudinal distance between axes of fishplate holes 1 and 2	m
L_{f3}	Longitudinal distance between axes of fishplate holes 2 and 3 (optional)	m
L_h	Longitudinal distance between clamps	m
L_{r1}	Longitudinal distance between rail end and axis of the nearest rail hole 1	m
L_{r2}	Longitudinal distance between axes of rail holes 1 and 2	m

Symbol	Description	Unit
L_{r3}	Longitudinal distance between axes of rail holes 2 and 3 (optional)	m
L_s	Longitudinal distance between vertical supports	m
L_w	Longitudinal distance between load insertion points	m
M_{\max}	Maximum bending moment	Nm
M_r	Required bending moment in repeated bending test	Nm
M_s	Bending moment in static bending test	Nm
N_{\max}	Maximum tension force in the rail due to temperature difference	N
Q	Nominal static wheel load	N
d	Average deflection of mechanical rail joint in static bending test	m
d_1, d_2, d_3, d_4	Deflections of mechanical rail joint in static bending test	m
d_{\max}	Maximum average deflection of mechanical rail joint in static bending test	m
e	Thickness of end post ($e = 0$ if no end post is used)	m
s, s_1, s_2	Tolerances of fishplate in vertical deflection	m
t, t_1, t_2	Tolerances of fishplate in transverse deflection	m
w_s	Residual gap in residual gap test	m
$w_{s,\max}$	Maximum residual gap in residual gap test	m
w_{\max}	Maximum rail deflection in adjoining track structure	m
ΔT	Rail temperature variation in jointed track (difference between minimum and maximum rail temperature)	°C
ΔT_1	Temperature difference between neutral (stress-free) and minimum rail temperature	°C
α	Linear thermal expansion coefficient of rail steel	K ⁻¹
γ_c	Safety and correction factor	-
γ_s	Safety factor for variable loads	-

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Figure 1 illustrates the parts of a mechanical rail joint.



Key

x gap

NOTE 1 For insulated joint without expansion: gap $x = e$.

NOTE 2 For mechanical rail joints and insulated rail joints with expansion: gap $x = J_n$

NOTE 3 Figure 1 illustrates a typical configuration not a specific design.

Figure 1 — Definition of parts and design parameters of mechanical rail joints