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EUROPEAN STANDARD

EN 16839

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Railway applications - Rolling stock - Head stock layout

Applications ferroviaires - Matériel roulant ferroviaires
- Agencement de la traverse de tête

Bahnanwendungen - Schienenfahrzeuge - Anordnung
der Bauteile am Kopfstück

This European Standard was approved by CEN on 2 July 2017.

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

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

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European foreword

This document (EN 16839:2017) 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of an identical text or by endorsement, at the latest by April 2018, and conflicting national standards shall be withdrawn at the latest by April 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall 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, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. (standards.iteh.ai)

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EN 16839:2017 (E)**1 Scope**

This European Standard is valid for vehicles equipped with buffers and screw coupling systems.

In order to allow operation and coupling of trainsets or vehicles, this European Standard specifies the defined free space for the shunter called the “Berne rectangle” and the necessary free space for the installation of the rescue coupler.

This European Standard specifies the location, fixing and free spaces on the headstock of:

- buffers;
- screw coupling systems;
- end cocks;
- pneumatic half couplings;
- connections for electric cables.

It also specifies the calculation of the width of the buffer heads.

Unless otherwise displayed, all dimensions given in this European Standard are nominal values.

NOTE Some parts of this EN are copied from EN 16116-1, EN 16116-2, EN 15551 and EN 15566. These parts are meant to be deleted from these ENs during their next revision.

2 Normative references

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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 14601:2005+A1:2010, *Railway applications — Straight and angled end cocks for brake pipe and main reservoir pipe*

EN 15020:2006+A1:2010, *Railway applications — Rescue coupler — Performance requirements, specific interface geometry and test methods*

EN 15551:2017, *Railway applications — Railway rolling stock — Buffers*

EN 15566:2016, *Railway applications — Railway rolling stock — Draw gear and screw coupling*

EN 15807:2011, *Railway applications — Pneumatic half couplings*

EN 15877-1:2012, *Railway applications — Marking on railway vehicles - Part 1: Freight wagons*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

ISO 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14601, EN 15551, EN 15566, EN 15807 and the following apply.

3.1**Berne rectangle**

defined free space which is needed to ensure safe working conditions for the shunting staff during coupling and uncoupling of screw couplings

3.2**clearance**

areas needed for moveable parts

3.3**contact plane of buffers**

plane tangent to buffing surfaces of both buffer heads at the end of the vehicle perpendicular to running surface

Note 1 to entry: See EN 13848-1:2003+A1:2008, 3.1.4 and 4.1.

Note 2 to entry: Sometimes also named as "buffing plane".

Note 3 to entry: "Running surface" sometimes also named as "Top of Rail (TOR)".

3.4**free space**

area free of equipment used for protection for, e.g. shunters

3.5**headstock**

part of the underframe with a vertical reference plane at the ends of the vehicle where the buffers are fixed

Note 1 to entry: Headstock includes the part where draw gear is fixed.

3.6**guidance device for draw hook**

device to guide and support the draw hook

3.7**shunter**

member of staff who couples and uncouples railway vehicles

3.8**symmetrical buffer**

buffer, wherein the buffer head is, regardless of its contour geometry, mounted on its width dimension symmetrically to the centreline of the buffer housing or to the predetermined nominal position of the buffer centreline

4 Free spaces**4.1 General**

To ensure safe working conditions and also for easy operation for the shunters during coupling and uncoupling, it is necessary to define proper free spaces.

With the exception of the shunter's handrails there shall be no devices under the buffers that limit the shunter's access for coupling operations.

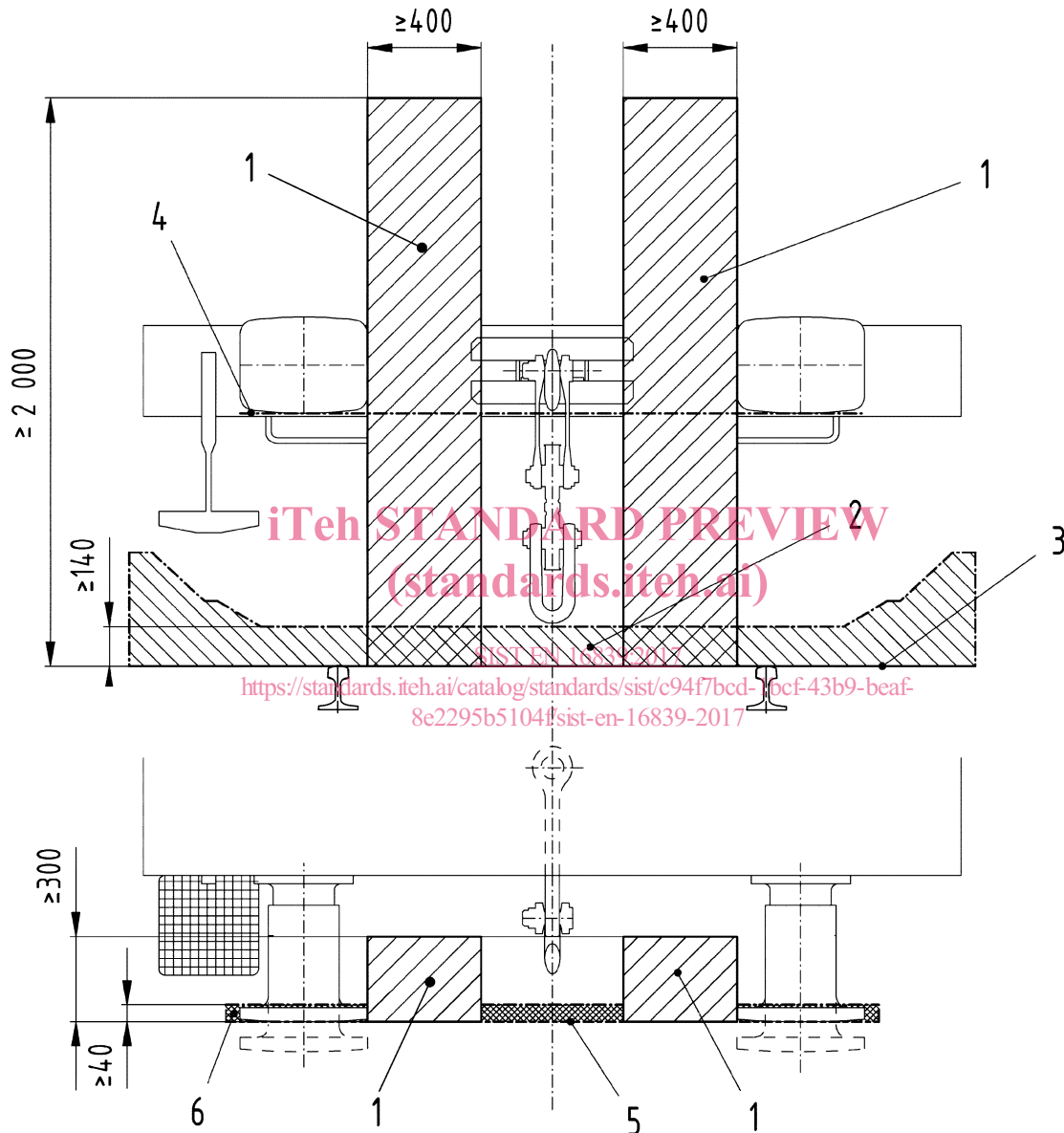
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Flexible connecting cables and flexible parts of hoses may penetrate these spaces.

The flexible parts of gangways according to EN 16286-1 may infringe the Berne rectangle.

For assessment of free spaces the coupling gear components shall be positioned on the centreline of the vehicle.

Dimension in millimetres



Key

- 1 free space for the shunter (Berne rectangle)
- 2 free space above running surface without moveable parts (e.g. couplers, pipes)
- 3 running surface
- 4 lower edge of buffer head
- 5 contact plane of fully elastic compressed buffers
- 6 free spaces, free of fixed devices behind the buffer head above its lower edge

Figure 1 — Free spaces

NOTE Steps and handrails are not part of this standard. The dimensions of the shunter steps and handrails and the clearance around these arrangements are given in EN 16116-1 and EN 16116-2.

4.2 Berne rectangle

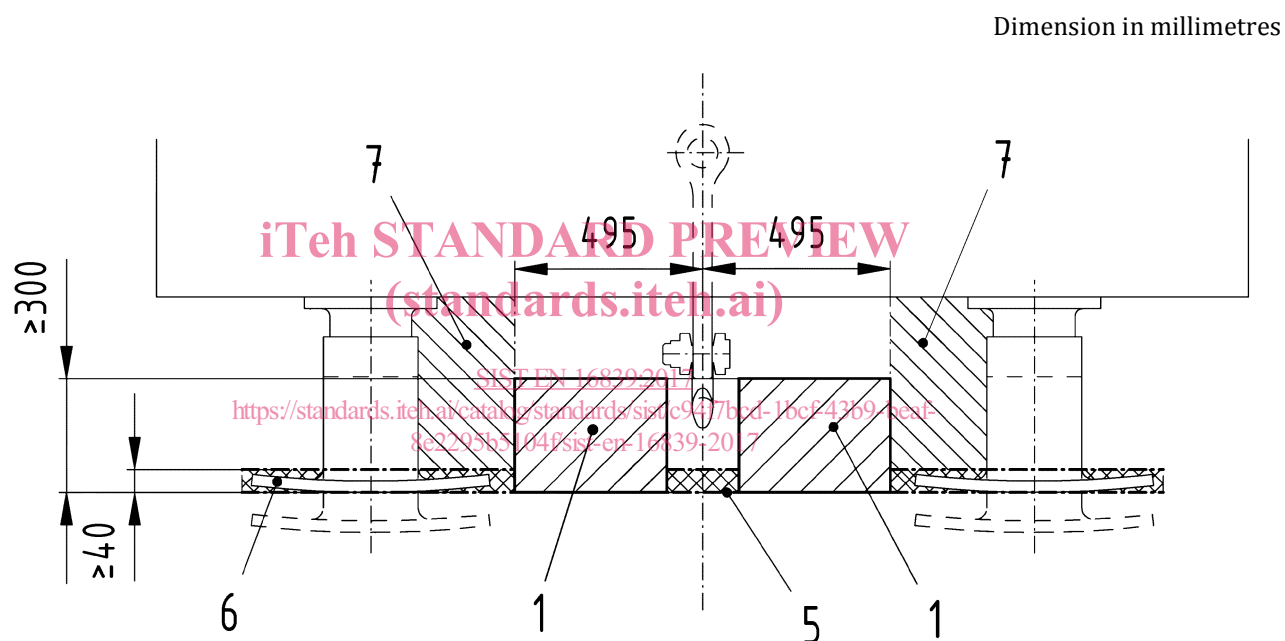
The free space for shunters during coupling is called “Berne rectangle”. Vehicles shall be designed in such a way that staff are not exposed to undue risk during coupling and uncoupling. The spaces shown in Figure 1 shall be free of fixed parts in all service conditions.

Any device fixed on a vehicle shall remain at least 40 mm behind the contact plane of fully compressed buffers above the lower edge of the buffer head.

4.3 Free spaces for coupling of passenger vehicles

See free spaces from 4.1 and Figure 2.

The limit of the securing devices for the gangway side plate (if fitted) shall be located at a minimum distance of 495 mm from the vehicle longitudinal centreline.



Key

- 1 for the shunter (Berne rectangle)
- 2 not shown in this elevation
- 3 not shown in this elevation
- 4 not shown in this elevation
- 5 contact plane of fully elastic compressed buffers
- 6 free spaces, free of fixed devices behind the buffer head above its lower edge
- 7 free space for gangway side plate

Figure 2 — Free spaces for coupling passenger vehicles

4.4 Climb protection

On vehicles, where buffer climb protection is used (compulsory for vehicles subjected to regulations for dangerous goods), the climb protection shall not restrict the free spaces.

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NOTE For buffer climb protection on vehicles subjected to regulations for dangerous goods see also TE25 on RID.

5 Buffers

5.1 General

The following requirements apply to vehicles equipped at least at one end with two buffers according to EN 15551, fixed symmetrically to the longitudinal centre line of the vehicle.

5.2 Position of buffers on the headstock

5.2.1 Distance between buffers

The standard distance between buffer centrelines shall be nominally according to Table 1.

Table 1 — Track gauge and distance between buffer centrelines

Track gauge mm	Distance between buffer centre lines mm
1 435	1 750 ± 10
Interchangeable 1 435/1 524	1 790 ± 10
Interchangeable 1 435/1 600	1 905 ± 3
Interchangeable 1 435/1 668	1 850 ± 10
1 524	1 830 ± 10
1 600	1 905 ± 3
1 668	1 850 ± 10

It is permitted for dual gauge units (interchangeable wheel sets) intended for running between standard gauge network 1 435 mm and broad gauge networks to have a different value of the distance between buffer centrelines (e.g. 1 850 mm), provided that full compatibility with buffers for standard 1 435 mm gauge is ensured.

Buffers shall be sized so that in horizontal curves and reverse curves, it is not possible for vehicles to lock buffers. The minimum horizontal overlap between buffer heads in contact shall be 25 mm.

5.2.2 Height of buffers above top of the rail

The height *b* of the centre line of the buffers to the top of the rail shall be in all loading and wear conditions in accordance with Table 2.

Table 2 — Height of buffers above top of the rail

Type	<i>b</i> mm
Locomotive	940 mm to 1 065 mm
Coaches	980 mm to 1 065 mm
Freight wagon and car carriers	940 mm to 1 065 mm

5.3 Buffer fixing

5.3.1 Vehicles without crashworthy buffer systems

The buffers shall be attached to the vehicle headstock.

The screws shall be M 24, grade 8.8, and self-locking nuts, grade 8, shall be used. The screws shall have a threaded projection of at least three threads.

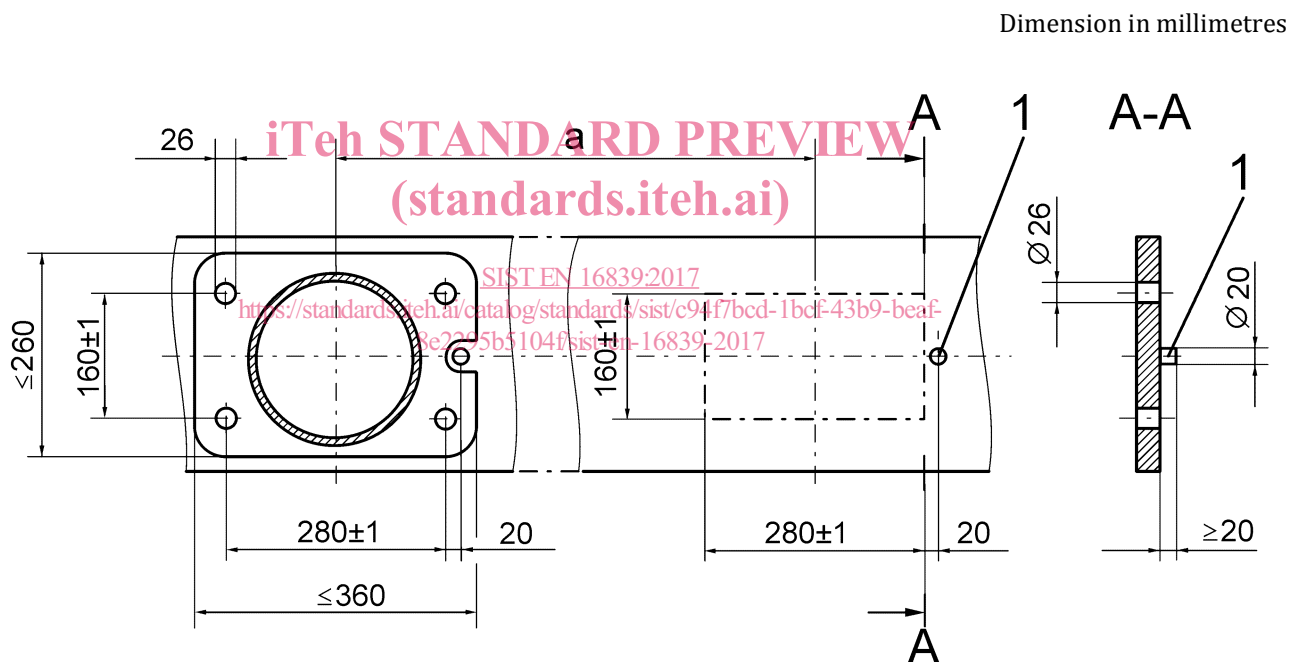
The recommended tightening torque should be 690 Nm.

For wagons, distance between holes shall be in accordance with Figure 3.

For wagons fitted with 150 mm stroke buffers, pins in the headstock, which indicate that this kind of buffer shall be used, shall be located at the right side of the each buffer (looking at the buffer head) as shown in Figure 3, item 1, Section A – A. The protrusion of the pin shall be at minimum 20 mm.

NOTE To avoid confusion of buffers with different strokes, buffers with 150 mm stroke therefore have an opening at their right side, buffers with 105 mm stroke do not have this opening.

The hole spacing (280×160) mm for freight wagons should also be used for passenger coaches, vans and locomotives.



Key

1 pin only for buffer with 150 mm stroke

a distance from buffer centre-line to buffer centreline (see Table1)

Figure 3 — Buffer and drilling template for wagon

5.3.2 Vehicles with crashworthy buffer systems

Vehicles that use crashworthy buffers or buffers which form part of a combined system consisting of a special buffer and a deformation element may have a different mounting configuration (e.g. position of flange, thread diameter, quantity of screws and their position).

NOTE These vehicles are locomotives, driving trailers or passenger coaches according to EN 15227 or tank wagons according to the Regulation for Dangerous Goods.

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The marking for wagons fitted with crashworthy buffer systems shall be according to EN 15877-1.

5.4 Interaction coupling/buffer**5.4.1 General**

To ensure that the train is able to negotiate horizontal curves of 150 m radius safely, the static characteristics of draw gear and buffers shall be coordinated.

A guideline value of 250 kN should not be exceeded for the compression force of a pair of buffers in contact on a horizontal curve of 150 m.

Unless otherwise specified in the technical specification, the stiffest static characteristics of the buffer and draw gear combined together with the static test methods according to EN 15566 and EN 15551 are to apply for evidence of buffer compression force.

The age of elastic elements in operational service could also be taken into account.

Conformity to these requirements may be assessed by calculation.

NOTE 1 The technical specification can define additional conditions for tested elastic devices, as for example temperature range, which for static characteristics are to be taken into account.

NOTE 2 For new elastic devices the available experience related assessed values can be applied.

To determine the compression force for vehicles, the calculation method shown under section 3 of RP 32 of ORE B 36 may be used (the method described in this report is also applicable for coaches and locomotives). This calculation method may also allow stress levels to be determined on smaller radius curves. If the coupling practice creates pretension forces, these shall be taken into account.

NOTE 3 The calculation method on curves according to RP 32 of ORE B 36 also gives confidence for an S-curve of 150 m with an intermediate straight of 6 m.

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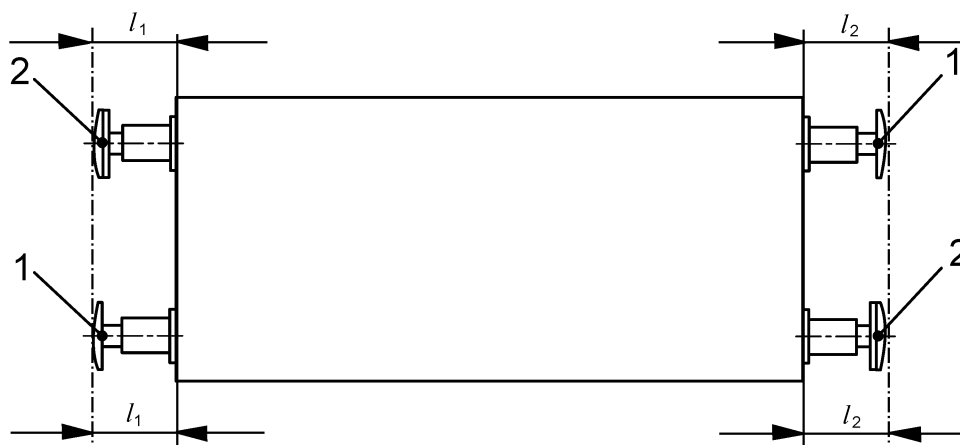
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5.4.2 Mounting of buffers

Two buffers with the same elastic system, category, head dimension, stroke and type of housing shall be fitted at each vehicle end. The nominal length of the buffers on each side shall be the same.

Housings which differ only in the buffer head material (steel or non-metallic insert) are considered to be identical.

When a non-metallic insert or head is provided on one of the two buffers per vehicle end, it shall be placed diagonally according to Figure 4.

**Key**

- 1 buffer with metallic head
- 2 buffer with non-metallic insert or head

Figure 4 — Mounting of buffers with non-metallic insert or head (top view)

5.5 Requirements to avoid buffer locking

5.5.1 Boundary dimensions

Buffer heads shall not exceed the limits shown in Figure 5

- LINE 5 towards the outside, the limit of the construction gauge defined for the vehicle concerned;
- LINE 1 towards the vehicle centre line, for wagons, a vertical line situated 600 mm from the vehicle centreline and for coaches and locomotives equipped with 110 mm stroke buffers, a vertical line situated 540 mm from the vehicle centre line. The compliance with this limited value is one of the preconditions, that this space will be kept free for the shunter;
- LINE 2 towards the ground, a horizontal line situated 250 mm below the centre line of the buffers.