SLOVENSKI STANDARD
SIST EN 15807:2021

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Nadomešča:
SIST EN 15807:2011

Železniške naprave - Pnevmatske polspojke

Railway applications - Pneumatic half couplings

Bahnanwendungen - Bremskupplungen

Applications ferroviaires - Demi-accouplements pneumatiques

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45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

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This European Standard was approved by CEN on 25 January 2021.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 15807:2021) 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of an identical text or by endorsement, at the latest by September 2021, and conflicting national standards shall be withdrawn at the latest by September 2021.

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 supersedes EN 15807:2011.

EN 15807:2021 includes the following technical changes with respect to EN 15807:2011:

— the document has been revised generally;

— tolerances, tables and figures have been updated;

— 5.8 “Fire behaviour” has been adapted due to EN 45545-1:2013 and EN 45545-2:2020;

— 5.1.3.5 “Adhesion of the reinforcement”: Nominal values have been adapted due to material parameters of the requested fire resistant material;

— 5.1.3.15 and 6.3.16 “Kink resistance test” has been added;

— 5.1.3.16 and 6.3.17 “Influence of oil” has been added;

— 5.1.4.6 “Oil resistance of the sealing washer” has been added;

— 5.1.6 “Nipple” and 5.1.7 “Hose clip” have been added;

— 6.4.7 “Influence of oil” has been added;

— Annex A “Vacuum withstand” has been removed;

— Annex ZA has been updated.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Directive 2016/797/EU.

For relationship with EU Directive 2016/797/EU, see informative Annex ZA, which is an integral part of this document.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document applies to pneumatic half couplings designed to couple either the brake pipes or main reservoir pipes of railway vehicles, without taking the type of vehicles and track-gauge into consideration.

This document gives the requirements for the design, dimensions, testing and quality assurance of pneumatic half couplings.

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 1562:2019, *Founding - Malleable cast irons*

EN 1563:2018, *Founding - Spheroidal graphite cast irons*

EN 14478:2017, *Railway applications - Braking - Generic vocabulary*

EN 45545-1:2013, *Railway applications - Fire protection on railway vehicles - Part 1: General*

EN 45545-2:2020, *Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components*

EN 50125-1:2014, *Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment*

EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

EN ISO 8033:2017, *Rubber and plastics hoses - Determination of adhesion between components (ISO 8033:2016)*

EN ISO 9227:2017, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2017)*

ISO 37:2017, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48-2:2018, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 188:2011, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 815-1:2019, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 815-2:2019, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures*

ISO 1431-1:2012, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1431-3:2017, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 3: Reference and alternative methods for determining the ozone concentration in laboratory test chambers*

ISO 2285:2019, *Rubber, vulcanized or thermoplastic — Determination of tension set under constant elongation, and of tension set, elongation and creep under constant tensile load*

ISO 8573-1:2010, *Compressed air — Part 1: Contaminants and purity classes*

ISO 10619-2:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 23529:2016, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478:2017 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
brake coupling head
components that, when mechanically coupled together, allow a flow of pressurised air between them

3.2
nipple
component at one end of the pneumatic half coupling that connects it to the end cock, or pipe, located on the vehicle

3.3
hose clip
component that mechanically fixes the hose to the coupling head or the nipple in order to assembly the pneumatic half coupling

3.4
sealing washer
component that is installed in the coupling head to prevent unacceptable loss of air when two coupling heads are connected to one another

3.5
flexible hose
component that is connected between the brake coupling head and the nipple to convey the pressurised air and give the required flexibility between vehicles, and that is generally made up of an elastic tube, textile reinforcement inlay and elastomeric cover bonded together

3.6
tube
inner layer of the flexible hose which is supplied by the compressed air

3.7
reinforcement
intermediate layer that provides the strength to maintain the general shape of the hose whilst giving the flexibility

3.8
cover
outer layer of the flexible hose which protects the interior constituents from mechanical and environmental damage

4 Symbols and abbreviated terms

BP	Brake Pipe
IRHD	International Rubber Hardness Degree
*L*0	a length of 20 mm marked on the calibrated part of the test piece
MRP	Main Reservoir Pipe

5 Design and manufacture

5.1 Requirements

5.1.1 Brake pipe

The pneumatic half couplings for the automatic air brake pipe shall conform to Figure 1, Figure 3, Figure 5 and Figure 9. The length of the assembled pneumatic half coupling, dimension *X-X* in Figure 1, is specified to suit the application, but the recommended length is 730 mm. The nipple to connect to the end cock shall be in accordance with 5.1.6.

5.1.2 Main reservoir pipe

The pneumatic half couplings for the main reservoir pipe shall conform to Figure 2, Figure 4, Figure 5 and Figure 9 for interoperable traffic. The length of the assembled pneumatic half coupling, dimension *X-X* in Figure 2, is specified to suit the application, but the recommended length is 730 mm. The nipple to connect to the end cock shall be in accordance with 5.1.6.

NOTE An alternative design of the MRP half coupling, as described in Annex A, is permitted for use in the United Kingdom.

5.1.3 Flexible hose

5.1.3.1 General

The nominal internal diameter of the coupling hoses for both pipes shall be 28 mm. The length of the flexible hose is varied to suit the application, but should be the standard 620 mm to give the recommended length of 730 mm for dimension *X-X* as shown in Figure 1 and Figure 2. The recommended length of these hoses when used with a swing head autocoupler should be increased to give an assembled length of the pneumatic half coupling of 1 080 mm for the automatic air brake pipe and 930 mm for the main reservoir pipe. Elastomeric composite hoses having a textile reinforcement inlay shall be used for these couplings (see Figure 10). It shall be avoided that textile reinforcement inlay is destroyed by humidity (e.g. by using of hydrophobic textile materials). The flexible hose shall conform to the dimensions defined in Figure 10. The choice of elastomers for elastomeric composite hoses is the choice of a manufacturer to meet the requirements of this specification. The elastomer used during a serial

production shall conform with regard to the formulation of materials and characteristics to those products tested in the assessment procedure.

The tolerances for the overall length of the pneumatic half couplings shall be:

— < 1 000 mm ±5 mm,

— 1 000 mm to 2 499 mm ±10 mm,

— 2 500 mm to 6 000 mm ±30 mm,

— > 6 000 mm ±0,8 %.

The requirements 5.1.3.2 to 5.1.3.16 concern the elastomeric composite hoses.

5.1.3.2 Bending

It shall be possible to bend the hose to form approximately a torus, without using a total force greater than 130 N for this operation, without folds appearing on the peripheral surface and without the maximum flattening recorded amounting to more than 16 % of the nominal external diameter of the hose.

This requirement shall be tested in accordance with 6.3.3.

5.1.3.3 Behaviour under pressure

After being subjected to an internal pressure of 13 bar for a period of 5 min, there shall be no apparent leak, swelling, or tear on the hose. The dimensional variations admitted under pressure conditions shall be as follows:

— variation in external diameter ±10 %;

— variation in length ≤ 3,5 %;

— twist ≤ 20 °/m.

In addition, after discontinuation of the test pressure after a waiting period of 3 min, the max. permanent deformation to the initial state of the hose shall be as follows:

— variation in external diameter ±2 %;

— variation in length ±2 %.

This requirement shall be tested in accordance with 6.3.4.

5.1.3.4 Bursting pressure

The bursting pressure, measured on the hose in delivery condition, shall not be less than 70 bar.

This requirement shall be tested in accordance with 6.3.5.

5.1.3.5 Adhesion of the reinforcement

The mean value of the force needed to separate the reinforcement and each of the layers:

— shall not be less than 2,5 N/mm for hoses tested in accordance with EN ISO 8033:2017, type 1 and type 2 in delivery condition, and

— shall not be less than 2,5 N/mm for hoses tested in accordance with EN ISO 8033:2017, type 1 and type 2 after ageing for 7 days at 70 °C, and

— should not be less than 2,5 N/mm for hoses tested in accordance with EN ISO 8033:2017, type 1 and type 2 after interaction with oil in accordance with 6.3.17.

This requirement shall be tested in accordance with 6.3.6.

If the methods from EN ISO 8033:2017, type 1 or type 2 are not appropriate to a specific design of half coupling, another method from EN ISO 8033:2017 may be used. The criteria of acceptance is then defined before the test on a case-by-case basis.

5.1.3.6 Resistance of the tube and cover of the hose to repeated tensile loads

The tube and cover of the hose, when subjected to successive repeated tensile loads, shall withstand, in accordance with the conditions defined in 6.3.7

— 400 tensile loadings for hoses tested in delivery condition,

— 350 tensile loadings for hoses tested after ageing for 7 days at 70 °C.

This requirement shall be tested in accordance with 6.3.7.

5.1.3.7 Residual deformation through static tensile loading of the tube of the hose

After tensile loading, the test piece taken from the tube of the hose and tested after ageing for 7 days at 70 °C, shall not be more than $L0$ + 12 % in length.

This requirement shall be tested in accordance with 6.3.8.

5.1.3.8 Impact resistance

After being subjected to the impact of a weight of 10 kg dropped from a height of 1 m, the bursting pressure of the hose shall not be less than 70 bar.

This requirement shall be tested in accordance with 6.3.9.

5.1.3.9 Resistance to ozone cracking of the tube and cover of the hose under static conditions

The tube and cover of the hose, after exposure to an ozone-enriched atmosphere, shall not show signs of cracking visible with a magnifying glass with a magnifying power of 7X.

This requirement shall be tested in accordance with 6.3.10.

5.1.3.10 Behaviour at low temperature

The deflection of the hose as measured at the end of a length of 250 mm, 3 s after application of a load of 20 N at −30 °C, shall not be less than 10 mm.

If the brake coupling is used for temperatures down to −40 °C, an additional temperature test shall be performed.

This requirement shall be tested in accordance with 6.3.11.

After bending and regaining ambient temperature, the hose shall pass a burst pressure test in accordance with 5.1.3.4.

5.1.3.11 Ease of assembly of connections on the hoses

It shall be possible for the connections to be easily mounted on the hoses under the conditions stipulated in 6.3.12 so that the end of the hose makes clean contact with the shoulder of the connection. The centre lines of the hose and connection shall be in alignment after assembly.

This requirement shall be tested in accordance with 6.3.12.

5.1.3.12 Resistance to uncoupling of connections on the hoses

Uncoupling of the connection of the hose to the end fittings shall not occur when the pressure is less than 20 bar when the hose has been inserted as prescribed in 5.1.3.11 and the hose clip has been tightened using the minimum force prescribed in the assembly instructions for the pneumatic half coupling.

This requirement shall be tested in accordance with 6.3.13.

5.1.3.13 Elongation resistance

After an elongation, the linings and layers shall neither tear nor become detached. The inspection shall cover the visible outer surfaces, and it shall be performed with the naked eye.

The measured residual widening in any part of the hose shall not exceed 2 % after a waiting period of (120 + 20) s.

This requirement shall be tested in accordance with 6.3.14.

5.1.3.14 Hardness

Requirements for hardness are the following:

— Hardness in delivery condition at (23 ± 2) °C: Manufacturers stated nominal IRHD with a tolerance of ± 5 IRHD.

— Hardness after ageing for 7 days at 70 °C: Hardness recorded after ageing shall not deviate by more than ± 5 IRHD from the value recorded before ageing.

This requirement shall be tested in accordance with 6.3.15.

5.1.3.15 Kink resistance

There shall be no observable permanent deformation or structural damage and no hose delamination after the kink resistance test.

NOTE When the hose is bent at too sharp an angle, it can kink and shorten the effective hose life, and any such kinking is not an acceptable or safe practice, but it happens. The requirement for a kink resistance test is included to prevent potential problems with hose kinking in actual field use.

The requirement shall be tested in accordance with 6.3.16.

5.1.3.16 Oil resistance of the flexible hose

If required, by the technical specification, oil resistance test should be performed in accordance with 6.3.17.

5.1.4 Sealing washers

5.1.4.1 Dimensions

The dimensional specifications of the sealing washers shall be in accordance with Figure 9.

5.1.4.2 Hardness

Requirements for hardness are the following:

— Hardness in delivery condition at (23 ± 2) °C: 65 IRHD with a tolerance of ± 5 IRHD.

— Hardness after ageing for 7 days at 70 °C: Hardness recorded after ageing shall not deviate by more than 5 IRHD from the value recorded before ageing.

This requirement shall be tested in accordance with 6.4.3.

5.1.4.3 Tensile characteristics

a) In delivery condition:

1) ultimate tensile strength ≥ 10 MPa;
2) elongation at break ≥ 300 %;

b) After ageing for 7 days at 70 °C:

Characteristics recorded after ageing shall not deviate from those recorded prior to ageing by more than:

1) 20 % for ultimate tensile strength,
2) 30 % for elongation at break.

This requirement shall be tested in accordance with 6.4.4.

5.1.4.4 Deformation resistance

Deformation tests shall be carried out at high and low temperature. The test set out in 5.1.4.4, a) or those specified in 5.1.4.4, b) shall be performed:

a) Deformation under tensile test:

1) tension set under 50 % elongation for 24 h at 70 °C: ≤ 10 %;
2) flexibility test at −25 °C and under 50 % compression, carried out in delivery condition: ≤ 8 %.

b) Deformation under compression test:

1) compression set following compression for 22 h at 70 °C: ≤ 25 %;
2) compression set following compression for 22 h at −30 °C: ≤ 60 %.

This requirement shall be tested in accordance with 6.4.5.

5.1.4.5 Water tightness

Two coupling heads, fitted with sealing washers and joined together to simulate service conditions and immersed in water, shall be watertight round the sealing washers and allow no visible leakage (no air bubbles) under the effect of 0,5 bar air pressure.

This requirement shall be tested in accordance with 6.4.6.

5.1.4.6 Oil resistance of the sealing washer

Under the influence of the oil indicated in technical specification, the variation in hardness and volume of test pieces shall be in conformity with technical specification.

This requirement shall be tested in accordance with 6.4.7.

5.1.5 Coupling heads

The coupling head for the BP shall conform to Figure 3, Figure 5 and Figure 6 or Figure 7. The coupling head for the MRP shall conform to Figure 4, Figure 5 and Figure 6 or Figure 7. All the figures show the mandatory dimensions to ensure coupling, but the shape and the other dimensions are able to be varied, provided the heads are designed to offer the least possible resistance to airflow. The sealing washer shown in Figure 9 shall be used.

The material of the coupling heads shall be one of the following:

— EN-GJS-400-15 or EN-GJS-500-7 in accordance with EN 1563:2018;

— EN-GJMB-350-10 or EN-GJMW-400-05 in accordance with EN 1562:2019;

— other material if equivalent characteristics are demonstrated.

NOTE An alternative design of the MRP coupling head, as described in Annex A, is permitted for use in the United Kingdom.

5.1.6 Nipple

The nipple to connect to the end cock shall be as shown in Figure 6 or Figure 7 and Figure 8, and shall have a truncated internal pipe thread of size G 1 1/4 in accordance with EN ISO 228-1:2003.

The figures show the mandatory dimensions, but the shape and the other dimensions are able to be varied, provided the nipples are designed to offer the least possible resistance to airflow.

The material of the nipple shall be one of the following:

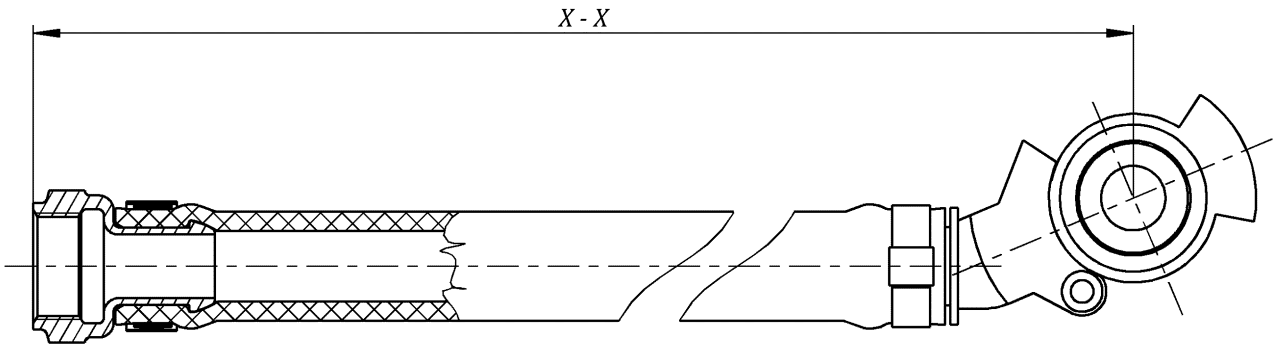
— EN-GJS-400-15 or EN-GJS-500-7 in accordance with EN 1563:2018;

— EN-GJMB-350-10 or EN-GJMW-400-05 in accordance with EN 1562:2019;

— other material if equivalent characteristics are demonstrated.

5.1.7 Hose clip

The design of the hose clip shall ensure that the pneumatic half coupling withstands the mechanical strength requirements as defined in 5.6.



Key

X - X length of the assembled pneumatic half coupling

Figure 1 — Brake pipe pneumatic half coupling

Key

X - X length of the assembled pneumatic half coupling

Figure 2 — Main reservoir pneumatic half coupling