BS EN 15807:2011

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Railway applications — Pneumatic half couplings

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee RAE/4, Railway Applications - Braking.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISBN 978 0 580 57770 3

ICS 45.040; 45.060.01

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2011.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15807

January 2011

ICS 45.060.01; 45.040

English Version

Railway applications - Pneumatic half couplings

Applications ferroviaires - Demi-accouplements

Bahnanwendungen - Bremskupplungen

This European Standard was approved by CEN on 3 December 2010.

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Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 15807:2011: E

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Foreword

This document (EN 15807:2011) 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of an identical text or by endorsement, at the latest by July 2011 and conflicting national standards shall be withdrawn at the latest by July 2011.

This document has been prepared under a mandate given to CEN/CENELEC/ETSI 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.

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1 Scope

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

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 14478:2005, *Railway applications — Braking — Generic vocabulary*

EN 50125-1:1999, *Railway applications — Environmental conditions for equipment — Part 1: Equipment on board rolling stock*

EN ISO 8033:2006, *Rubber and plastics hoses — Determination of adhesion between components (ISO 8033:2006)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227:2006)*

ISO 37:2005, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48:2007, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

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

ISO 815, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures*

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

ISO 1431-3, *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, *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 23529:2004, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478:2005 and the following apply.

3.1.1
pneumatic half coupling
assembly of components to connect the BP or MRP of a rail vehicle to the BP or MRP, respectively, of another rail vehicle

3.1.2
components

3.1.2.1
brake coupling head
components that when mechanically coupled together allow a flow of pressurised air between them

3.1.2.2
nipple
component at one end of the pneumatic half coupling that connects it to the end cock, or pipe, located on the vehicle

3.1.2.3
hose clip
component that mechanically fixes the hose to the coupling head or the nipple in order to assembly the pneumatic half coupling

3.1.2.4
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

3.1.2.5
flexible hose and constituents

3.1.2.5.1
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 a elastomeric tube, textile reinforcement and a elastomeric covering bonded together

3.1.2.5.2
tube
interior layer of the flexible hose

3.1.2.5.3
reinforcement
intermediate layer that provides the strength to maintain the general shape of the hose whilst giving the flexibility

3.1.2.5.4
covering
external layer of the flexible hose which protects the interior constituents from mechanical and environmental damage

3.1.3
bar
1 bar = 10^5 N/m^2 = 10^5 Pa = 10^{-1} MPa

3.2 Abbreviations

BP	Brake Pipe
MRP	Main Reservoir Pipe

" inch

LO a length of 20 mm marked on the calibrated part of the test piece

IRHD International Rubber Hardness Degree

4 Design and manufacture

4.1 Requirements

4.1.1 Brake pipe

The pneumatic half couplings for the automatic air brake pipe shall conform to Figures 1 and 2 and either 3 or 4. 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 as shown in Figure 1 and have a truncated internal ISO 228 - G 1 1/4” pipe thread.

4.1.2 Main reservoir pipe

The pneumatic half couplings for the main reservoir pipe shall conform to Figures 5, 6 and either Figures 3 or 4 for interoperable traffic and either Figures 5 and 6 or Figures 7 and 8 plus either Figures 3 or 4 for internal traffic within a Member State. The length of the assembled pneumatic half coupling, dimension X-X in Figure 5 or 7, is specified to suit the application, but the recommended length is 730 mm. The nipple to connect to the end cock shall be as shown in Figure 1 (and is the same as for the air brake pipe) and have a truncated internal ISO 228 - G 1 1/4” pipe thread.

4.1.3 Flexible hose

4.1.3.1 General

The internal diameter of the coupling hoses for both pipes shall be between 25 mm and 30 mm. The recommended diameter is 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 Figures 1, 5 and 7. 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 reinforcing inlay sealed (vulcanised) at each end shall generally be used for these couplings, Figure 9, but hoses of other materials, e.g. metallic, may be used if they are flexible enough. The flexible hose shall conform to the dimensions defined in Figure 9. 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 qualification 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 4.1.3.2 to 4.1.3.14 concern the elastomeric composite hoses.

NOTE In the case of use of another material, the tests to be conducted shall be defined in agreement between the customer and the supplier.

4.1.3.2 Bending

It shall be possible to bend the hose to form approximately a torus of internal diameter equivalent to about 4 times the external nominal diameter of the hose, without using a 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 5.3.3.

4.1.3.3 Pressure test

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, no permanent deformation of the hose shall be apparent, after a waiting period of 3 min.

This requirement shall be tested in accordance with 5.3.4.

4.1.3.4 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 5.3.5.

4.1.3.5 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:

— 70 N for hoses tested in accordance with EN ISO 8033:2006, type 1 in delivery condition, and

— 87 N for hoses tested in accordance with EN ISO 8033:2006, type 2 in delivery condition;

— 55 N for hoses tested in accordance with EN ISO 8033:2006, type 1 after ageing for 7 days at 70 °C, and

— 75 N for hoses tested in accordance with EN ISO 8033:2006, type 2 after ageing for 7 days at 70 °C.

This requirement shall be tested in accordance with 5.3.6.

NOTE if the methods from EN ISO 8033:2006, types 1 or 2 are not appropriate to a specific design of half coupling another method from EN ISO 8033 can be used. The criteria of acceptance shall be defined before the test on a case-by-case basis.

4.1.3.6 Resistance of the internal and external layers of the hose to repeated tensile loads

The internal and external layers of the hose, when subjected to successive repeated tensile loads, shall withstand, in accordance with the conditions defined in 5.3.7:

— 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 5.3.7.

4.1.3.7 Residual deformation through static tensile loading of the internal layer of the hose

After tensile loading, the test piece taken from the internal layer 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 5.3.8.

4.1.3.8 Impact test

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 5.3.9.

4.1.3.9 Resistance to ozone cracking of the external layer of the hose under static conditions

The external layer 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 7 X.

This requirement shall be tested in accordance with 5.3.10.

4.1.3.10 Deflection 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 20 mm.

This requirement shall be tested in accordance with 5.3.11.

4.1.3.11 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 5.3.11, 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 5.3.12.

4.1.3.12 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 4.1.3.11 and the hose clamp 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 5.3.13.

4.1.3.13 Flare test

After the test provided for in 5.3.14, 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.

Moreover, the residual widening shall not exceed 2 % after a period of rest.

This requirement shall be tested in accordance with 5.3.14.

4.1.3.14 Hardness

Requirements for hardness are the following:

— hardness as ready for submission (at 23 °C ± 2 °C): Manufacturers stated nominal IRDH with a tolerance of -2 +8 % IRHD.

— hardness after ageing for 7 days at 70 °C: Hardness recorded after ageing shall not deviate by more than -2 +8 % IRHD from the value recorded before ageing.

This requirement shall be tested in accordance with 5.3.15.

4.1.4 Ring-shaped elastomer joints

4.1.4.1 Dimensions

The dimensional specifications of the joints shall be in conformity with the requirements of Figures 3 or 4.

4.1.4.2 Hardness

Requirements for hardness are the following:

— hardness as ready for submission (at 23 °C ± 2 °C): 65 IRDH 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 5.4.3.

4.1.4.3 Tensile characteristics

a) As ready for submission:

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 5.4.4.

4.1.4.4 Deformation tests

Deformation tests shall be carried out at high and low temperature. The test set out in Table 2 under point “deformation under tensile test” or those specified under point “deformation under compression test” 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 on a joint as ready for submission: ≤ 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 5.4.5.

4.1.4.5 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 5.4.6.

4.1.5 Coupling heads

The coupling heads for the BP shall conform to Figure 2. The coupling head for the MRP shall conform to Figure 6 for interoperable traffic and either Figure 6 or Figure 8 for internal traffic within a Member State. Both 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 coupling heads can be made as a single piece or two pieces, the second piece is shown by the ++ in Figures 2 and 6. If the coupling head is made in a single piece the sealing washer shown in Figure 3 shall be used, otherwise the sealing washer shown in Figure 4 shall be used.

Annex B shows a special form of coupling head for the MRP when used for rescue purposes for internal traffic within a Member State.

Dimensions in millimetres

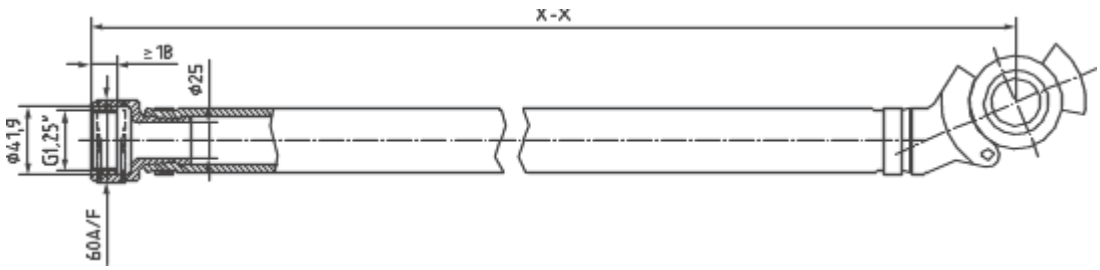
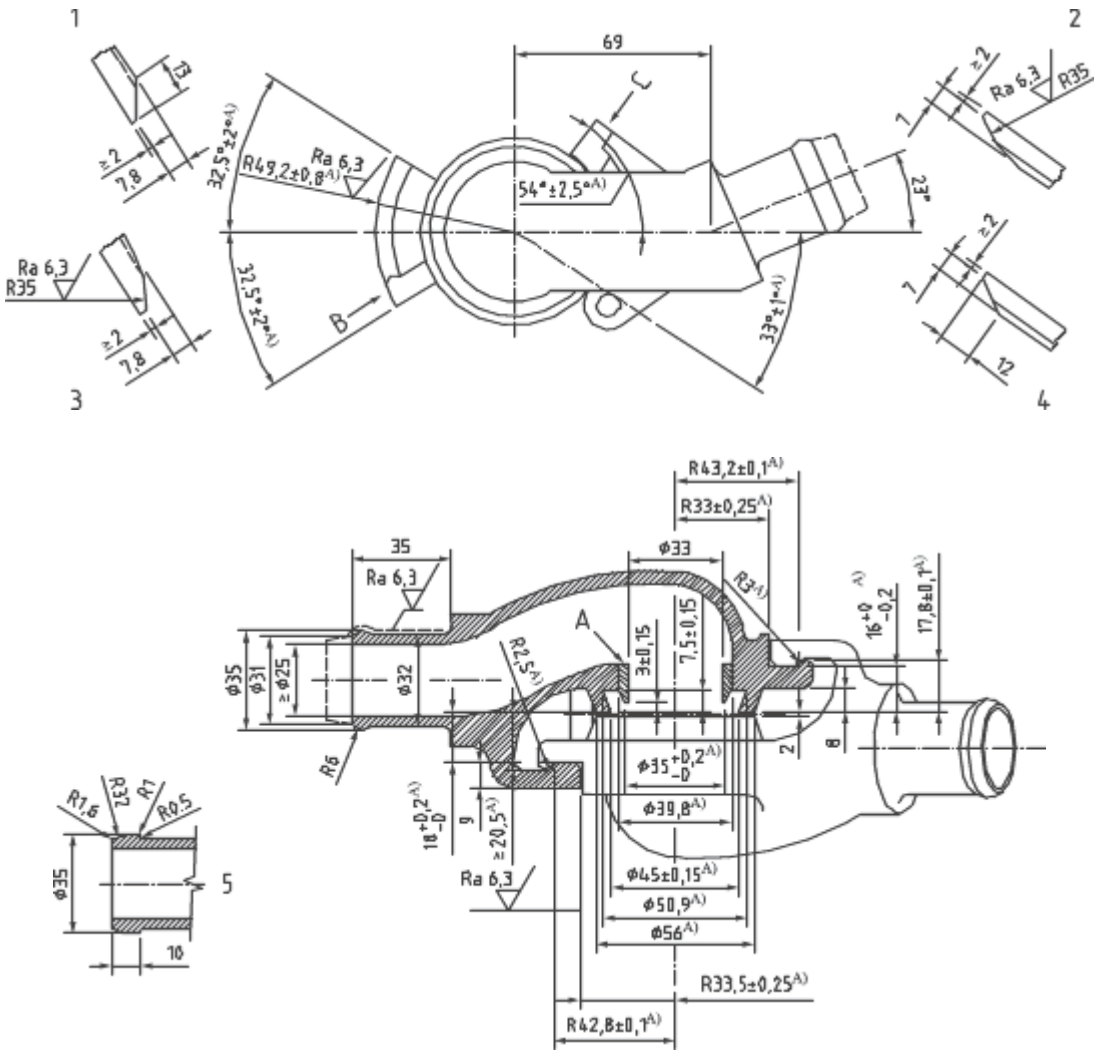


Figure 1 — Brake pipe pneumatic half coupling

Dimensions in millimetres



Key

1 alternative view in direction of arrow B

2 part view in direction of arrow C

3 part view in direction of arrow B

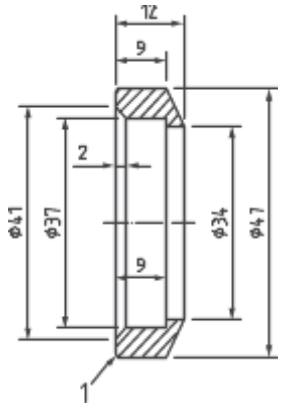
4 alternative view in direction of arrow C

5 alternative form for end nipple of coupling head

A) mandatory dimension

Figure 2 — Brake pipe coupling head

Dimensions in millimetres



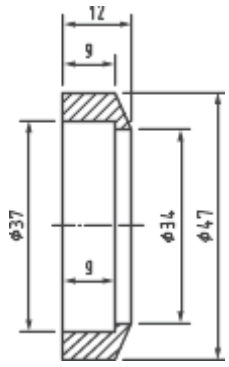
Key

1 bevelled edge

NOTE All dimensions are mandatory.

Figure 3 — Sealing washer

Dimensions in millimetres



NOTE All dimensions are mandatory.

Figure 4 — Sealing washer

Dimensions in millimetres

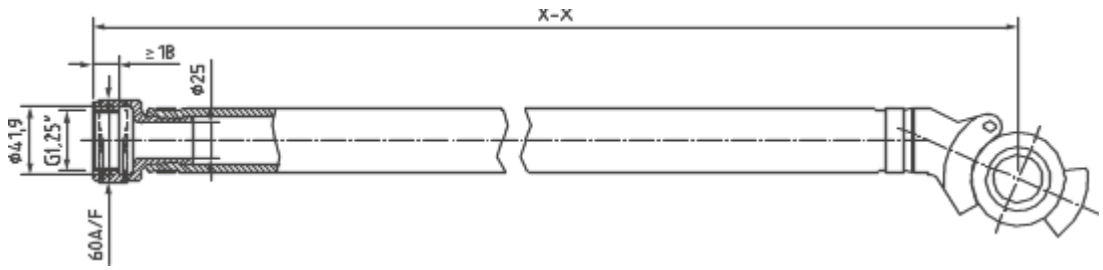
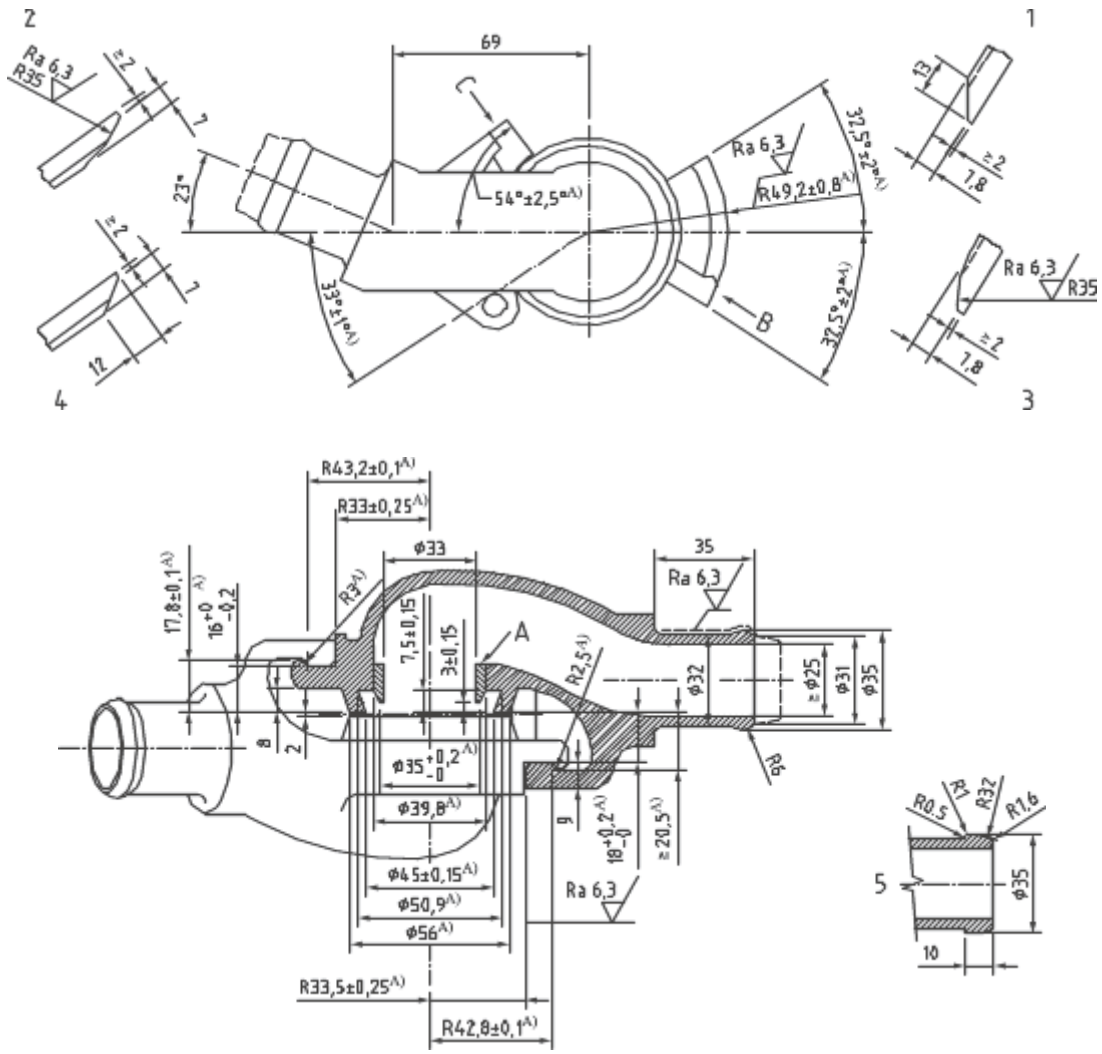


Figure 5 — Main reservoir pipe pneumatic half coupling

Dimensions in millimetres



Key

1 alternative view in direction of arrow B

2 part view in direction of arrow C

3 part view in direction of arrow B

4 alternative view in direction of arrow C

5 alternative form for end nipple of coupling head

A) mandatory dimension

Figure 6 — Main reservoir pipe coupling head

Dimensions in millimetres

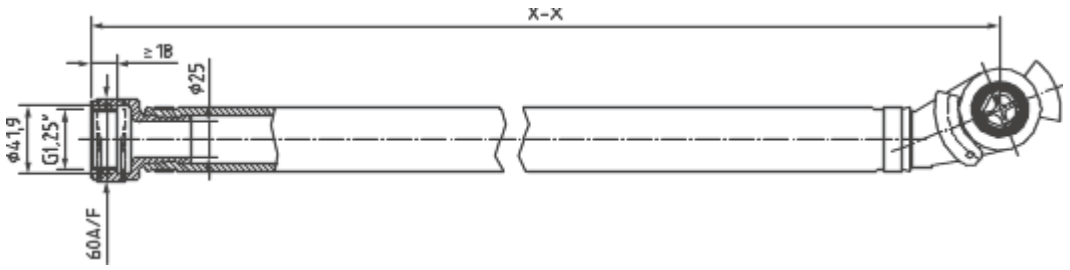


Figure 7 — Main reservoir pipe pneumatic half coupling with valve

Dimensions in millimetres

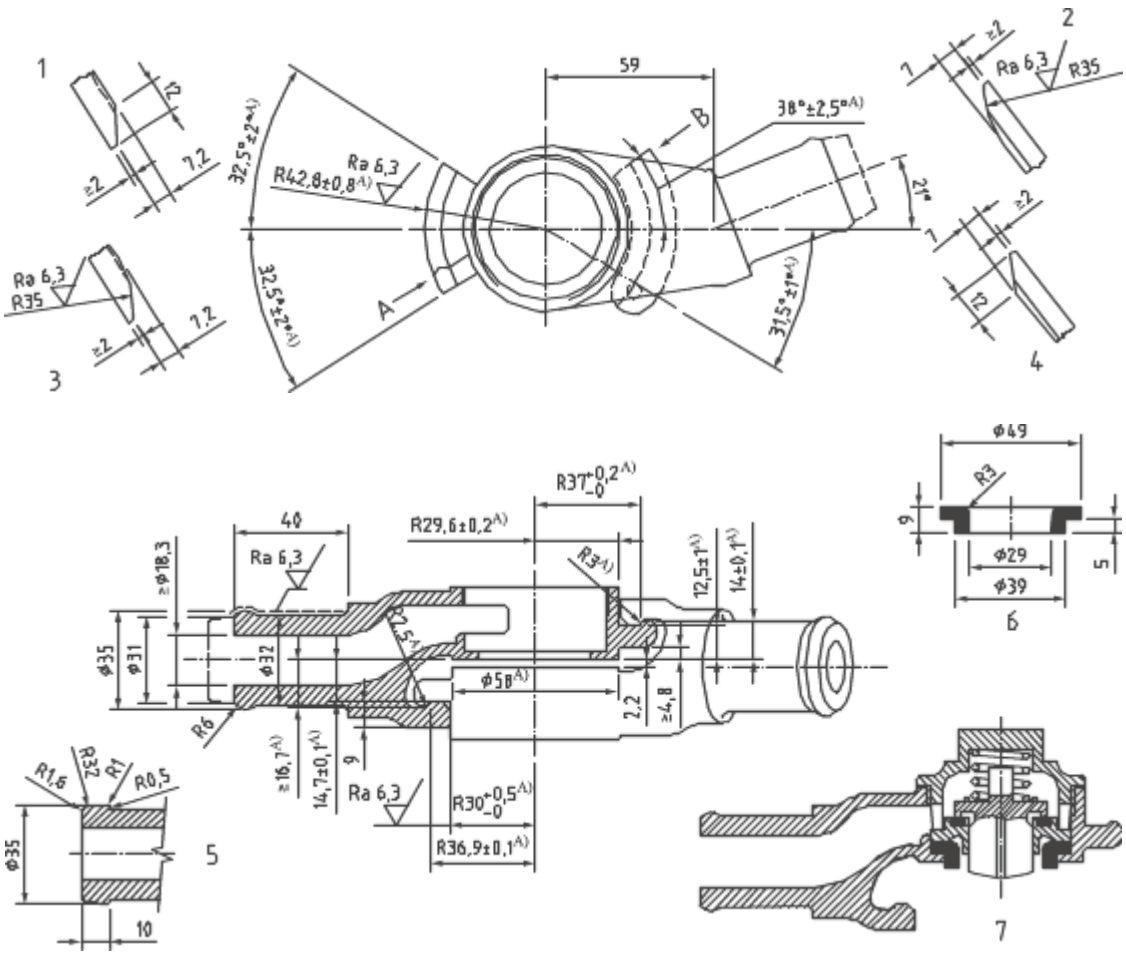


Figure 8 *(to be continued)*

Key

1 alternative view in direction of arrow A

2 part view in direction of arrow B

3 part view in direction of arrow A

4 alternative view in direction of arrow B

5 alternative form for end nipple of coupling head

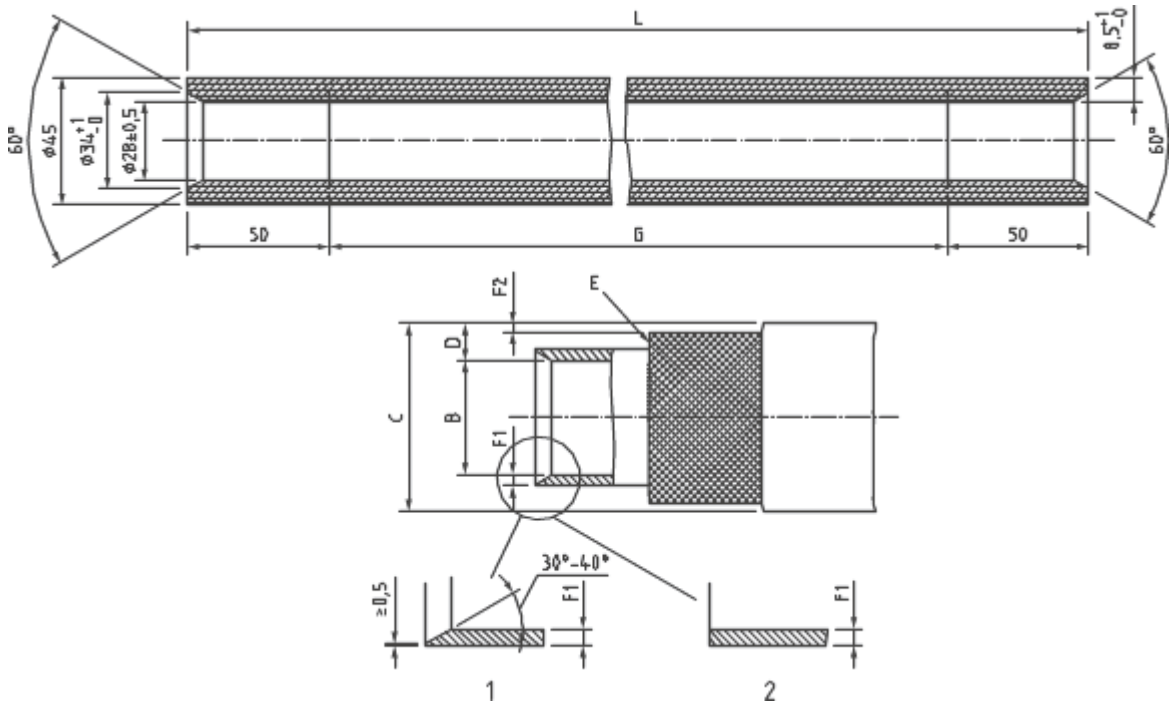
6 seal detail

7 typical valve assembly

A) mandatory dimension

Figure 8 — Main reservoir pipe coupling head with valve *(continued)*

Dimensions in millimetres



Key

1 preferred arrangement

2 alternative arrangement

B bore of hose

C outer diameter of hose

D wall thickness of hose

E textile reinforcement

F1 inner rubber lining

F2 outer rubber covering

G area of hose where the identification marking is to be located

L length of hose

Figure 9 — Flexible hose

4.2 Compressed air quality

It shall be possible to operate the pneumatic half coupling without restrictions with at least the compressed air quality according to the following classes defined by ISO 8573-1:2010:

— class 4 – for the maximum particle size and the maximum concentration of solid contaminants;

— class 4– for the water dewpoint;

— class 4 – for the maximum total (droplets, aerosols and vapours) oil concentration.

4.3 Ambient temperature

The pneumatic half coupling shall be able to operate within the temperature classes T1 and TX as specified by EN 50125-1:1999, where the upper limit for TX is +70 °C external air temperature.

NOTE The customer can specify a higher or lower temperature value if operational constraints demand it.

4.4 Environmental corrosion conditions

The pneumatic half coupling shall withstand the external corrosion due to normal atmospheric pollutants such that its function is unaffected. It shall operate without restrictions under conditions as specified in EN 50125-1:1999. The pneumatic half coupling may be tested in accordance with 5.5.5.

NOTE This test is not normally carried out and is only conducted when required by the customer.

4.5 Leakage

The sealing arrangement with the pneumatic half coupling assembly shall prevent any significant loss of air dependent on the temperature. Between – 25 °C and + 70 °C the pneumatic half coupling shall not leak at a greater rate than 0,030 Nl/min when tested at a pressure of 10 bar. This requirement shall be tested in accordance with 5.5.4.3.

Between – 40 °C and – 25 °C a pair of pneumatic half couplings shall have a leakage rate of not greater than 0,2 l/min when tested at a pressure of 10 bar in accordance with 5.5.4.3.

4.6 Mechanical strength of assembly

The pneumatic half coupling shall withstand an overpressure of 15 bar for 15 min, and 40 bar for 15 s without detachment of the hose from the coupling head or the nipple, or leakage. This requirement shall be tested in accordance with 5.5.3.

The pneumatic half coupling shall withstand a pull test when the coupling head is screwed on to a fixture and the nipple is pulled with a force of 5 kN for 30 s. The hose shall not move on the nipple or coupling head, the hose shall not suffer damage and there shall be no leakage greater than 0,030 Nl/min. This requirement shall be tested in accordance with 5.5.6.

4.7 Vacuum withstand

This is not a standard European requirement and is referenced for information in Annex A.

4.8 External appearance

The external surfaces of the pneumatic half coupling shall be free of sharp edges that could be a danger to those persons handling the pneumatic half coupling or to other equipment in the proximity of the pneumatic half coupling. This requirement shall be checked while testing the other constructional features in accordance with 5.5.2.

4.9 Fire behaviour

The materials used in the manufacture of the pneumatic half coupling shall prevent the emission of fumes or gases, or minimise where the materials to give compliance with this standard do not allow prevention, which are harmful and dangerous to the environment, particularly in the event of fire.

The pneumatic half coupling shall limit fire ignition, propagation and the production of smoke in the event of fire on primary ignition from a source of 7 kW for 3 min.

NOTE Due to specific infrastructure requirements, fire requirements for the pneumatic half coupling for particular railway authorities or train operators may be different. The relevant fire requirements should be tested.

5 Type test methods

5.1 Sampling for type test

A sample of ten pneumatic half couplings shall be taken from the production.

5.2 Test requirements

All the type tests shall be performed at (20 ± 5) °C and the air quality of the compressed air class 4-4-4 specified in ISO 8573-1:2010. The tests marked with a « * » in Table 3 in 5.5.1 shall be performed additionally at TX specified in EN 50125-1, with the upper temperature limit of 70 °C and at a wider temperature range if otherwise agreed between customer and supplier (pass/fail criteria for this case shall be agreed between customer and supplier). The tests on non-elastomeric composite hoses shall be carried out on three hoses from the sample before their assembly into the pneumatic half coupling. The tests marked with a « ++ » in Table1 in 5.3.1 and Table 3 in 5.5.1 are not mandatory and are only performed if required.

The pneumatic half coupling satisfies this European Standard provided it passes all the type tests 5.3.3 to 5.3.13, 5.4.3 to 5.4.6, 5.5.2, 5.5.3, 5.5.4.1 and 5.5.6.

5.3 Test procedure flexible hose

5.3.1 Nature and proportion of the tests and inspections

The hoses shall be subjected to the tests and inspections indicated in Table 1 as shown below. The batch size that the samples are taken from is unlimited, provided measures shall be taken to provide identical material for the whole batch.

Table 1 — Sample testing

Nature of the tests and inspections	**Corresponding standard subclause**	**Number of test pieces per batch**	**Shape and dimensions of the test pieces**
Dimensional check	-	10	The hose itself
Bend test	5.3.3	3	The 3 hoses used for the assembly test
Pressure test	5.3.4	2	2 of the 3 hoses used for the assembly test
Bursting test in submission condition	5.3.5	2	The 2 hoses used for the pressure test
Reinforcement adhesion test: - in submission condition - after ageing	5.3.6	 3 3	 Test pieces: hose section 35 mm to 40 mm in length
Test for dynamic fatigue through repeated tensile loadings: - in submission condition - after ageing	5.3.7	 3 per external layer 3 per internal layer 3 per external layer 3 per internal layer	 Dumb-bell shaped test pieces removed from hoses used for the bursting test, in accordance with 5.3.2.
Test for residual deformation through static tensile loading after ageing	5.3.8	3	Dumb-bell shaped test pieces removed, in accordance with 5.3.2, from hoses used for the bursting test
Impact test	5.3.9	3	The hose itself
Test for resistance to ozone cracking of the external layer under static conditions	5.3.10	3	Dumb-bell shaped test pieces removed from hoses used for the bursting test, in accordance with 5.3.2
Deformation test at low temperature	5.3.11	3	The hose itself
Connection assembly test	5.3.12 5.3.13	3	The hose itself
Flare test (++)	5.3.14	3	The hose itself

5.3.2 Preparation of the test pieces

The test pieces required for the tests provided in 5.3.7, 5.3.8 and 5.3.10 are of type 2 in ISO 37:2005 (see Figure 10); they are taken from the hose in the circumferential direction.

If the test piece thickness exceeds 2,5 mm, it shall be reduced to this dimension by grinding or by any suitable means, care being taken to avoid any temperature rise.

After cutting up, the test pieces for testing after accelerated ageing shall be placed in an oven at 70 °C for seven days. These operations shall be carried out in accordance with ISO 188. The other test pieces shall be tested in submission condition.

Dimensions in millimetres

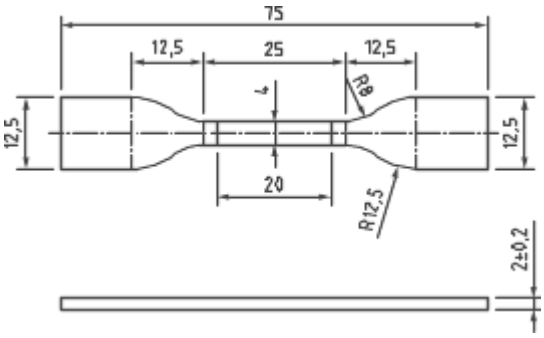
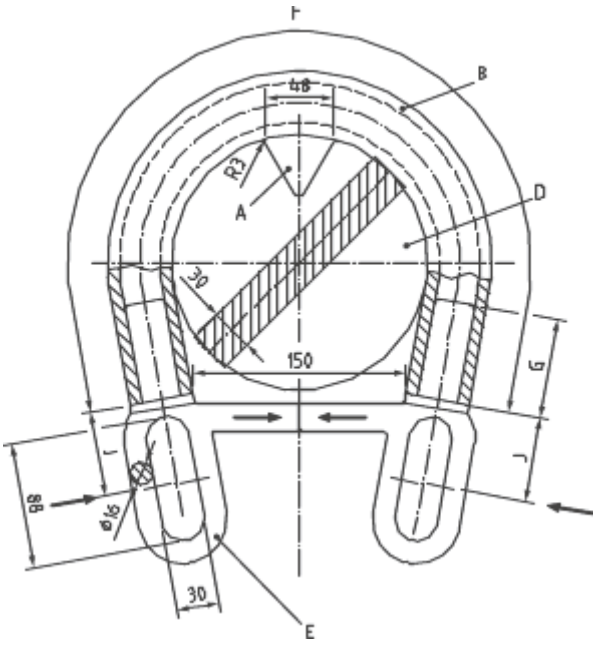


Figure 10 — H2 ISO/37 test piece

5.3.3 Bend test

The bend test shall be carried out by means of two handles and a disc as shown in Figure 11. The disc shall contain a small A-shaped opening for insertion of the recording instrument in order to determine the flattening of the hose during bending. The bending force is measured at the ends of the hose. The length of the hose is 620 mm.

Dimensions in millimetres



Key

A shaped opening for measuring diameter = 30 ± 2 mm

B hose for testing

C diameter 180 mm, approximately 4 times the external nominal diameter of the hose

D disc thickness 30 mm

E handles

F length of the hose (calculated from the external nominal diameter of the hose)

G length of fixing piece = 70 mm

J application of bending force

Figure 11 — Example of assembly for the bend test

The result shall be consistent with those stipulated in 4.1.3.2.

5.3.4 Pressure test

The hose shall be fitted at one of its ends with a cap and at the other with a connection suitably clamped in order to permit the application of an internal hydraulic or air pressure of 13 bar for a period of $5^{+0,5}_{0}$ min. The end fitted with a cap shall be left free to follow the deformation of the hose.

The result shall be consistent with those stipulated in 4.1.3.3.

5.3.5 Bursting test

The hose which has undergone the pressure test is then subjected to an internal hydraulic pressure increased gradually by (10 ± 1) bar per min, until bursting occurs.

The result shall be consistent with those stipulated in 4.1.3.4.

5.3.6 Adhesion of the reinforcement

This test shall be carried out in accordance with the provision of EN ISO 8033.

a) Ring-shaped test pieces.

Cut a ring 25 mm ± 0,5 mm wide from the hose at right angles to its longitudinal axis. The test piece is slit transversely and opened to form a strip. This is shown in Figure 12.

Dimensions in millimetres

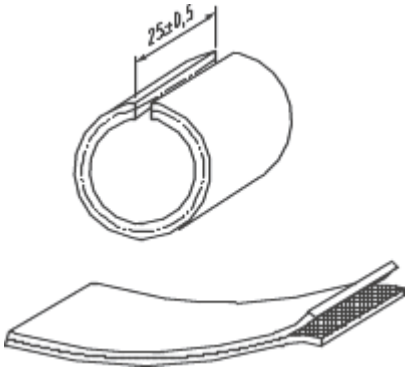


Figure 12 — Ring shaped test piece

The wrappers and reinforcement are separated by means of a dynamometer, in accordance with the provisions in EN ISO 8033, and the tearing force necessary is recorded.

b) Test pieces in strips.

A length of 160 mm of the hose section is slit in half longitudinally. In the centre part of the test piece parallel to the axis, two cuts 25 mm ± 0,5 mm wide are made in the test piece surface without damaging the reinforcement. Detachment of the centre strip is begun, leaving the two marginal areas intact on either side of this strip. This is shown in Figure 13.

Dimensions in millimetres

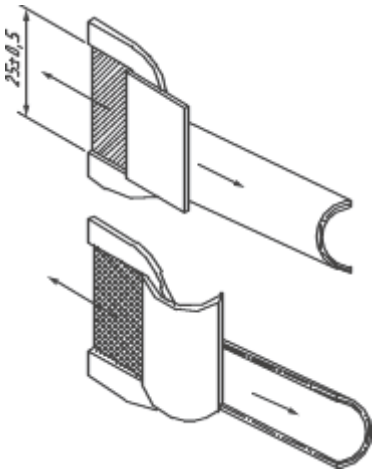


Figure 13 — Strip test piece

The wrappers and reinforcement are separated by means of a dynamometer, in accordance with the provisions in EN ISO 8033, and the required tearing force is recorded.

The results shall be consistent with those stipulated in 4.1.3.5.

NOTE If the methods from EN ISO 8033:2006, types 1 or 2 are not appropriate to a specific design of half coupling another method from EN ISO 8033 can be used. The criteria of acceptance shall be defined before the test on a case-by-case basis.

5.3.7 Test of dynamic fatigue through repeated tensile loadings of the internal and external layers

The test piece shall be subjected to successive tensile loadings on a suitable machine under the following conditions:

— the length L0 (20 mm ± 0,2 mm) marked on the calibrated part of the test piece is increased to 3 L0 by an initial load;

— the machine is then adjusted so that the length 3 L0 is increased to 4 L0, and then reduced to 3 L0. This operation is repeated at the rate of 30 loading cycles per min.

The result shall be consistent with those stipulated in 4.1.3.6.

5.3.8 Test for residual deformation through static tensile loading after ageing

The test shall be carried out in accordance with the provisions of ISO 2285.

The test piece used shall be of type H2 and 2 mm ± 0,2 mm in thickness.

The length L0 (20 mm ± 0,2 mm) of the calibrated part of the test piece shall be marked by means of reference line on the concave side. It shall be measured between the inner of the reference lines.

The test pieces used shall have previously been aged under conditions defined in 5.3.2.

The test shall be carried out:

— at ambient temperature;

— at constant elongation so that the initial gauge length L0 of the test piece (tested after ageing) is increased to 4 L0 and maintained at this value for $24^{\ 0}_{-2}$ h.

The residual elongation shall be measured $30^{+3}_{\ 0}$ min after completely releasing the test piece from any load.

The distance of the gauge length L shall be measured between the inner sides of the lines to the nearest 0,1 mm, by means of a magnifying micrometer with a minimum magnifying power of 7 X.

The residual deformation through static tensile loading of the internal layer shall be calculated using the following formula: 100 X (L - L0) / L0.

The result shall be consistent with those stipulated in 4.1.3.7.

5.3.9 Impact test

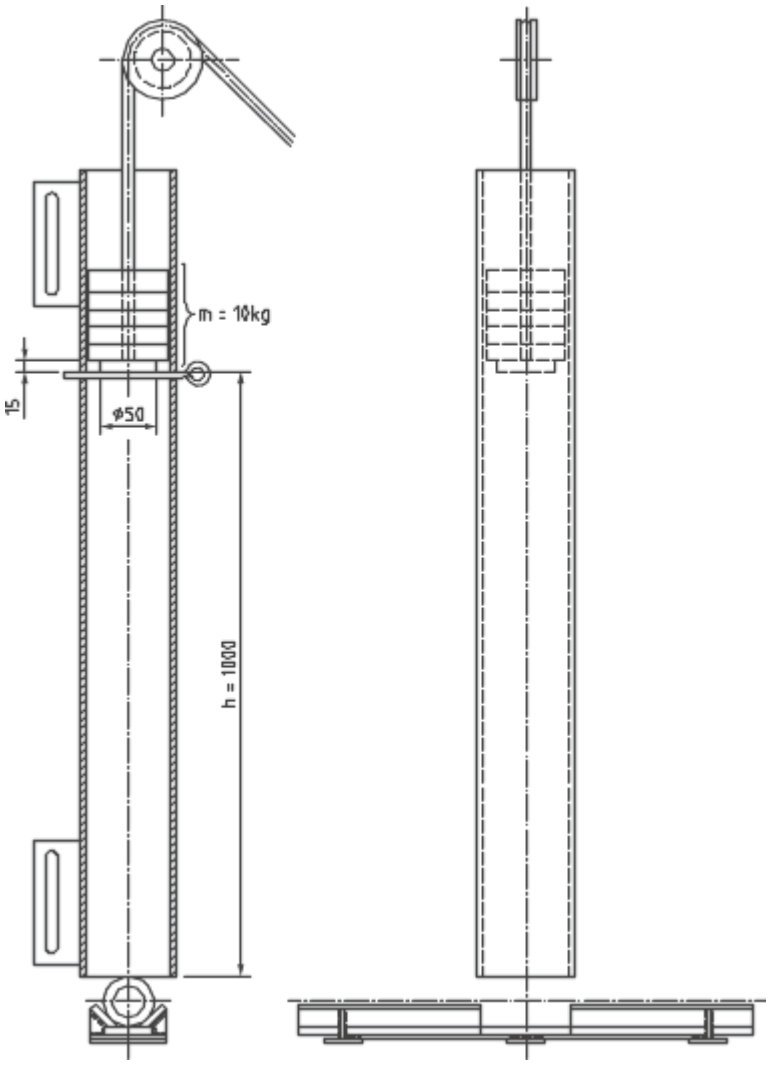
The test shall be carried out with the device shown in Figure 14. A mass of 10 kg ± 0,1 kg, retained in the inoperative position by a pin is released and falls freely from a height of 1 m ± 0,001 m in a guiding tube.

The tube, in which the end piece shown in Figure 15 has been inserted beforehand, is placed on a V-shaped block, so that the weight falls on the distended portion caused by the thickened ring on the end piece.

The hose shall then be subjected to the bursting test specified in 5.3.5.

The result shall be consistent with those stipulated in 4.1.3.8.

Dimensions in millimetres



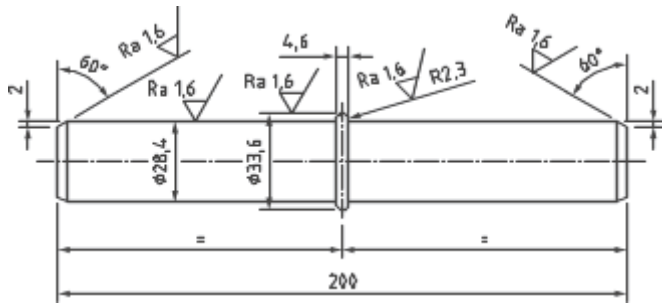
Key

h height of free fall of mass

m falling mass

Figure 14 — Example of test rig for the impact test

Dimensions in millimetres



General tolerance ± 0,1

Material: case – hardened steel to 68 Rockwell “A”

Figure 15 — Example of end-piece for the impact test

5.3.10 Test for Resistance to ozone cracking of the external layer under static conditions

The test shall be carried out in accordance with the provisions of ISO 1431-1 and ISO 1431-3.

The test piece taken from the external layer of the hose used for the bursting test, in accordance with Figure 10 and subjected to an elongation of 20 %, shall be placed for $24^{\ 0}_{-2}$ h, in a chamber where the ozone concentration is (200 ± 20) parts per 100 millions by volume, the temperature being maintained at 30 °C ± 2 °C throughout the test.

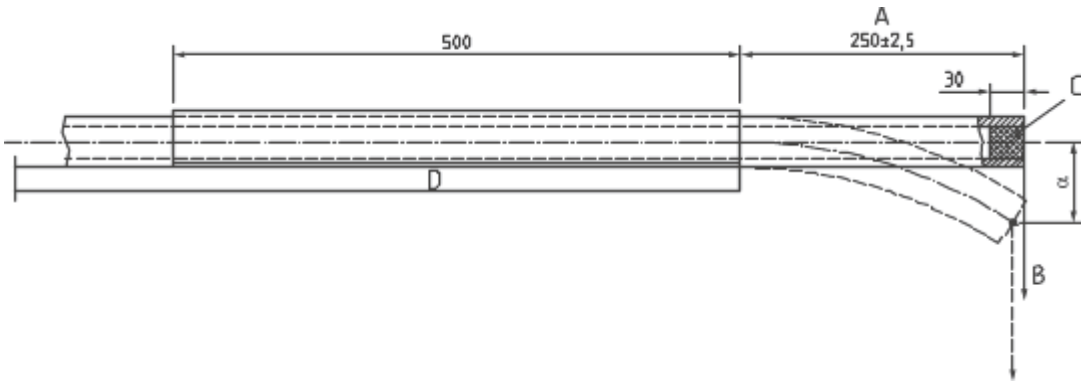
The test piece shall be examined, in the stretched condition, through a magnifying glass with a minimum magnifying power of 7 X.

The result shall be consistent with those stipulated in 4.1.3.9.

5.3.11 Deflection at low temperature

The test shall be carried out by gripping the hose in a clamp so that one of its ends, into which a stopper with a means of connecting a weight, projects 250 mm ± 1 mm beyond the end of the clamp as shown in Figure 16.

Dimensions in millimetres



Key

A free end

B mass of 2 kg ± 0,01 kg

C stopper with location for mass

D flat rigid bracket

Figure 16 — Example of test rig for deflection at low temperature

The whole test assembly is placed in a chamber maintained at a temperature of – 30 °C ± 2 °C. After (6 ± 0,25) h of exposure to this temperature, the complete assembly being left in the same chamber, a 2 kg mass is suspended from the stopper in line with the end of the hose as shown in Figure 16; the resulting deflection (a) of the free end of the hose, after $3\,^{+1}_{0}$ s application of the load, is measured and recorded.

The result shall be consistent with those stipulated in 4.1.3.10.

5.3.12 Test for fitting of connections on hoses

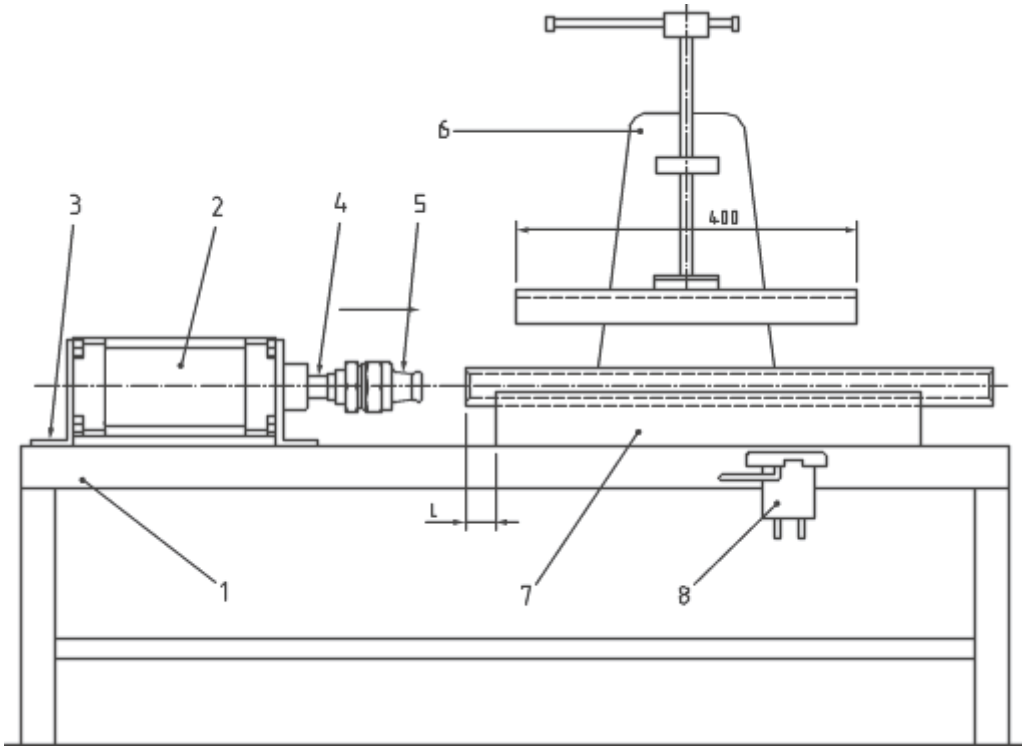
a) Principe of test

The test involves fitting a connection on a hose under specific conditions and checking the quality of the resulting assembly.

b) Apparatus used.

The test shall be carried out using the apparatus outlined in the general diagram in Figure 17.

Dimensions in millimetres



Key

1 frame of apparatus

2 double acting pneumatic jack with adjustable pneumatic damping

3 plate with sliding base

4 jack rod with connection fitted as the end

5 connection

6 movable screw device for clamping hose

7 hose support

8 3 position lever controlled rotary air distributor

Figure 17 — Example of apparatus for testing the assembly of brake hoses

The end of the rod of the pneumatic jack shall be designed to be fitted with a new connection with the shapes and dimensions defined in Figure 18.

Dimensions in millimetres

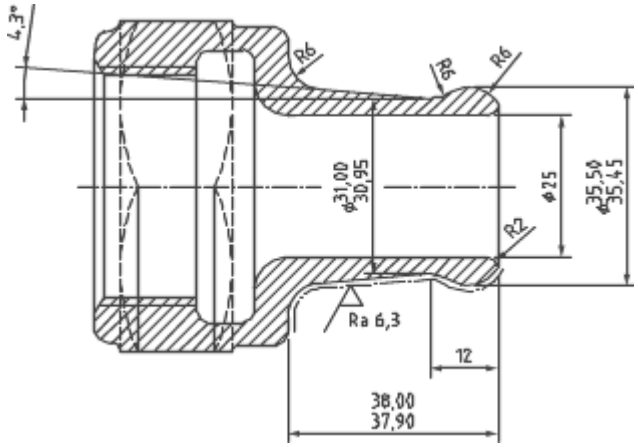


Figure 18 — Connection for coupling test

The position of the pneumatic jack on the frame of the apparatus is adjustable and shall be set in such a way that the distance between the end of the fixed support and the shoulder of the connection fitted on the extremity of the jack rod, when the latter is extended to the full, is 21 mm ± 1 mm.

The bore of the jack cylinder has a diameter of 100 mm, and the jack rod shall have a total stroke of 100 mm.

The compressed air supplied to the air circuit of the jack shall be under a stabilised pressure of (5 ± 0,1) bars. The full stroke of the jack rod is completed in one second using an air flow reducer.

c) Test procedure

Before they are positioned on the apparatus, both the extremity of the connection and that of the hose shall first be immersed in a 3 % solution of a surface active agent in water.

The connection is placed at the end of the jack rod.

The hose is positioned on the support in such a way that the previously moistened free end overlaps that of the fixed support by 35 mm ± 0,5 mm (distance L). The hose thus positioned slightly by means of the movable clamping device.

Compressed air is then supplied in the pneumatic system of the jack. Once the jack rod has completed its stroke, the hose tightening device is loosened and the jack rod restored to its initial position.

In case where the connection has effectively been fitted on the hose, the hose fitted with its connection is removed from the end of the jack rod.

d) Results to be obtained

The purpose of the test is to check that the connection can easily be fitted onto the hose.

When the connection is effectively fitted on the hose, the quality of the fitting shall be checked, with particular attention to the relative position of the end of the hose and the connection shoulder, and it is necessary to make sure that the two parts are not out of alignment.

The results shall be consistent with those stipulated in 4.1.3.11.

5.3.13 Uncoupling test

A hose fitted with the connection shown in Figure 19, inserted under the conditions defined in 4.1.3.11 and with the hose clamp tightened using the minimum force prescribed in the assembly instructions for the pneumatic half coupling, shall be subjected to an uncoupling test.

The hose with its connection is left untouched for $48\,^{0}_{-2}$ h at ambient temperature.

The connection is then sealed and, by means of the apparatus used for the pressure test and under the same conditions (see 4.1.3.3), the hose is subjected to a hydraulic pressure progressively increased by (10 ± 1) bar/min.

The results shall be consistent with those stipulated in 4.1.3.12.

Dimensions in millimetres

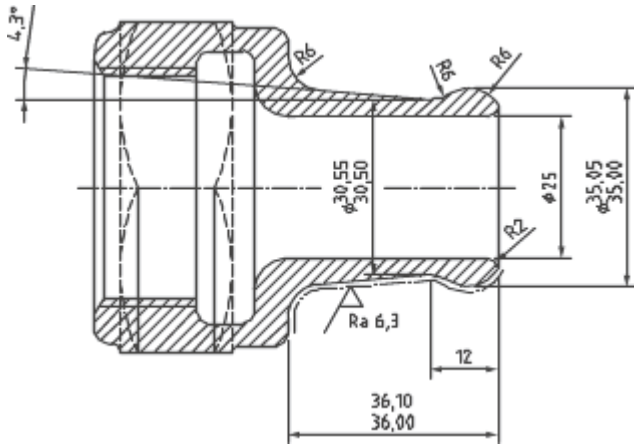
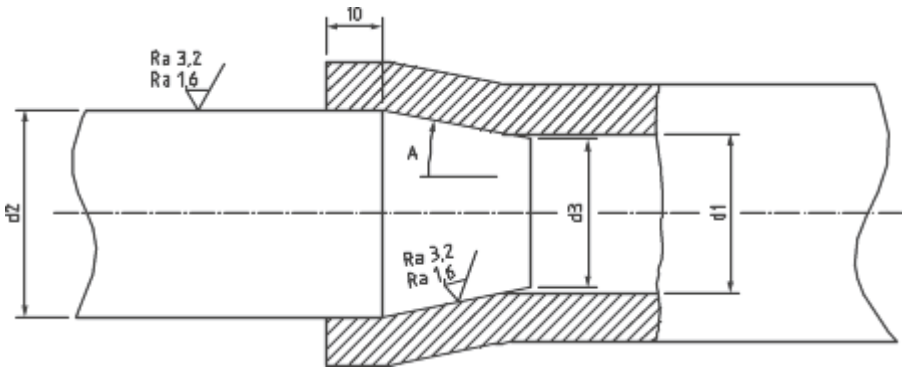


Figure 19 — Connection for uncoupling test

5.3.14 Flare test

This test involves inserting a tapered instrument in one end of the hose test piece for 2 min ± 5 s (see Figure 20).

Dimensions in millimetres



Key

A taper 1 in 5

d1 d1 = inner theoretical nominal diameter of hose

d2 d2 = (d1 x 1,3) ± 0,05

d3 d3 = d1 – 2 mm

Figure 20 — Tapered instrument for flare test

The use of a lubricant is allowed.

The results shall be consistent with those stipulated in 4.1.3.13.

5.3.15 Hardness test

This test shall be carried out in accordance with ISO 48:2007, type M before and after ageing in accordance with ISO 188.

The results shall be consistent with those stipulated in 4.1.3.14.

5.4 Test procedure ring-shaped elastomer joints

5.4.1 Nature and proportion of the tests and inspections

The ring-shaped elastomer joints shall be subjected to the tests and inspections indicated in Table 2 as shown below.

Table 2 — Nature and proportion of tests and inspections

Nature of the tests and inspections	**Corresponding standard subclause**	**Number of test pieces per batch**	**Shape and dimensions of the test pieces**
Dimensional check	-	10	The entire joint
Hardness test - as ready for submission - after ageing	5.4.3	 3 3	 Test pieces in the form of plates in accordance with ISO 48
Tensile test - as ready for submission - after ageing	5.4.4	 3 3	 Dumb-bell shaped test pieces in accordance with ISO 37:2005, type 2 (“b” dimension reduced to 8,5 mm ± 0,5 mm)
Deformation under tensile test Tension set at 70 °C Flexibility test at -25 °C	5.4.5	 3 3	 Test pieces identical to those used for tensile test The complete joint
Deformation under compression test Compression set at 70 °C Compression set at – 30 °C	5.4.5	 3 3	 Test piece in the form plates measuring 10 x 20 mm x thickness (stack to obtain 6,3 ± 0,3 mm thickness)
Water-tightness test	5.4.6	4	2 x 2 joints

5.4.2 Preparation of the test pieces

Test pieces removed from joints as ready for submission shall be conditioned for 24 h in accordance with ISO 23529:2004 (at 23 °C ± 2 °C and (50 ± 5) % relative humidity).

Pieces to be tested after accelerated ageing shall be cut and then subjected to a temperature of 70 °C under oven conditions for seven days. Following this, they shall be conditioned for 24 h in accordance with ISO 23529:2004 (at 23 °C ± 2 °C and (50 ± 5) % relative humidity).

The above procedures shall be conducted in accordance with ISO 188.

5.4.3 Hardness test

This test shall be carried out in accordance with ISO 48:2007, method M.

The results shall be consistent with those stipulated in 4.1.4.2.

5.4.4 Tensile strength test

This test shall be carried out in accordance with ISO 37.

The results shall be consistent with those stipulated in 4.1.4.3.

5.4.5 Deformation tests

a) Tension set:

This test shall be carried out in accordance with ISO 2285. The following conditions shall apply:

1) 50 % elongation;

2) length of test: 24^{0}_{-2} h;

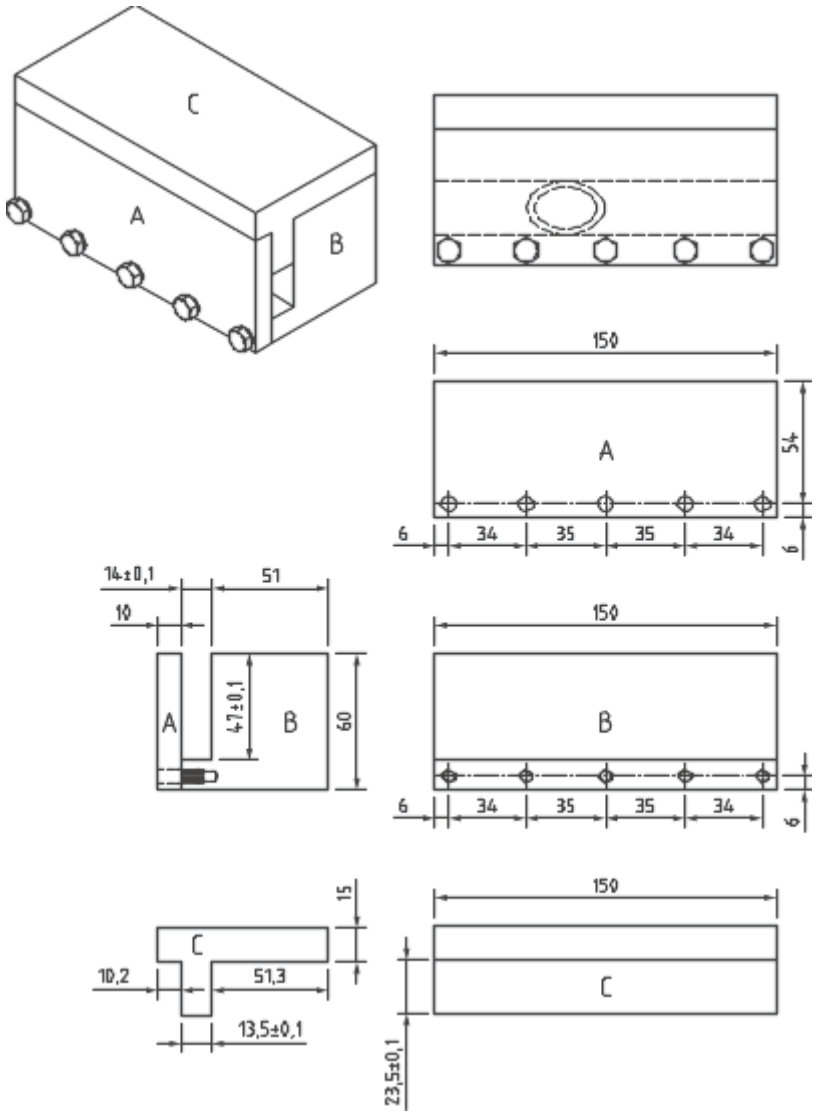
3) test temperature: 70 °C ± 1 °C.

b) Flexibility test:

Measure the outside diameter of the joint as ready for submission following three hours conditioning at 23 °C ± 2 °C and (50 ± 5) % relative humidity.

Place the joint and test assembly (see Figure 21) in a test chamber for three hours at a temperature of -25 °C.

Dimensions in millimetres



Key

A test piece A: polymethylmethacrylate

B test piece B: aluminium

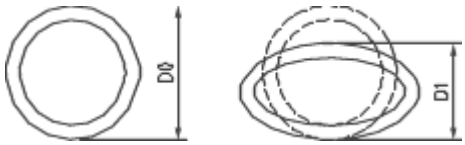
C test piece C: aluminium

Figure 21 — Example of test rig for flexibility test

Compress the joint radially 50 % in the chamber at a temperature of -25 °C until the part under test and the test bench have reached the prescribed temperature.

Maintain the joint and test assembly in the test chamber, remove the compression force and measure the diameter of the joint after a period of 10 min.

Express the permanent deformation as follows: DRC = 100 X (D0 – D1) / D0 (see Figure 22).



Key

D0 initial diameter

D1 residual diameter

Figure 22 — Permanent deformation

c) Compression set:

1) Test at + 70 °C.

This test shall be carried out in accordance with ISO 815 amended as follows:

i) stack test pieces to obtain 6,3 mm ± 0,3 mm thickness;

ii) length of test: 22 h.

2) Test at – 30 °C.

This test shall be carried out in accordance with ISO 815 amended as follows:

i) stack test pieces (see test at + 70 °C);

ii) length of test: 22 h;

iii) measure h_1 after $5^{+0,5}_{0}$ min at – 30 °C, where h_1 is the thickness of the test piece after recovery.

The results shall be consistent with those stipulated in 4.1.4.4.

5.4.6 Water tightness test

Two coupling heads, fitted with sealing washers, are joined together to simulate service conditions and immersed in water. Air pressure at 0,5 bar is applied to the coupling heads. After 1 min ± 5 s the air pressure is removed.

Pass/fail criteria: The result is satisfactory if the coupling heads are watertight round the sealing washers and allow no visible leakage (no bubbles) under the effect of 0,5 bar air pressure.

5.5 Test procedure pneumatic half coupling

5.5.1 Principle

The tests shall be carried out in the order shown in Table 3.

Table 3 — Operations to carry out for qualification

Tests	Corresponding standard subclause	Tested pneumatic half coupling number									
		1	2	3	4	5	6	7	8	9	10
Physical and geometrical characteristics	5.5.2	X	X	X	X	X	X	X	X	X	X
Hydraulic test	5.5.3	X	X						X	X	
Leakage	5.5.4.1	X	X	X	X	X	X	X	X	X	X
Leakage *	5.5.4.2			X*		X*		X*			X*
Corrosion test ++	5.5.5						X			X*	
Pull test	5.5.6				X		X				

5.5.2 Check of physical and geometrical characteristics

The requirement of 4.1 shall be checked using appropriate measuring instruments, in accordance with the specification and the manufacturer's drawings. The threaded nipple shall be checked by GO/NO-GO gauges.

Pass/fail criteria: The result is satisfactory if all the specified characteristics are met.

5.5.3 Hydraulic test of the assembly at given pressure

The hose fitted with its connection, inserted under the conditions defined in 4.1.4.11, shall be subjected to an uncoupling test.

The hose with its connection is left untouched for 48 h at ambient temperature.

One of the pairs of coupled pneumatic half couplings shall be subject to a hydraulic test using water by increasing the pressure by (10 ± 1) bar/min up to value of $15\,^{0}_{-0,1}$ bar and held at this pressure for $15\,^{+0,5}_{0}$ min.

The second pair of coupled pneumatic half couplings shall be subject to a hydraulic test using water by increasing the pressure by (10 ± 1) bar/min up to value of $40\,^{0}_{-0,4}$ bar and held at this pressure for 15 s minimum.

After the hydraulic test, the pair of pneumatic half couplings are tested for leakage in accordance with 5.5.4.2.

Pass/fail criteria: The result is satisfactory if, after returning to atmospheric pressure, no permanent deformation occurs, the hose does not detach from or move on the coupling head or the nipple by more than 2 mm, there is no leakage whilst under water pressure and there is no subsequent leakage in accordance with 5.5.4.2 after the hydraulic test.

5.5.4 Leakage

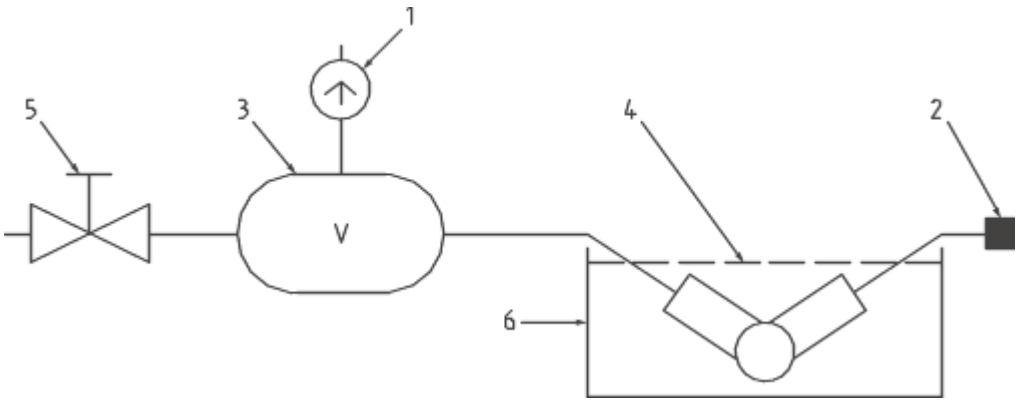
5.5.4.1 General

All the pneumatic half couplings shall be tested at ambient temperature in pairs. The four selected shall be tested at extreme temperature as two pairs. Main reservoir pneumatic half couplings fitted with self sealing valve (Figure 7) shall also be tested as individual assemblies.

The pneumatic half couplings may be tested as single items if the size of the climatic chamber and water bath are limited by using a mating coupling head whose hose connection port has been sealed, thus allowing the pneumatic half coupling interface to be fully checked.

5.5.4.2 Ambient temperature

The pneumatic half couplings are set up in a test rig shown in Figure 23 with a reservoir volume (V) of 14 l and the pneumatic half couplings underwater. The system is charged to 10 bar and the isolating cock (5) is closed. After waiting one minute for settlement, the test commences.



Key

1 pressure sensor

2 plug

3 reservoir

4 pair of pneumatic half couplings to be tested

5 isolating cock

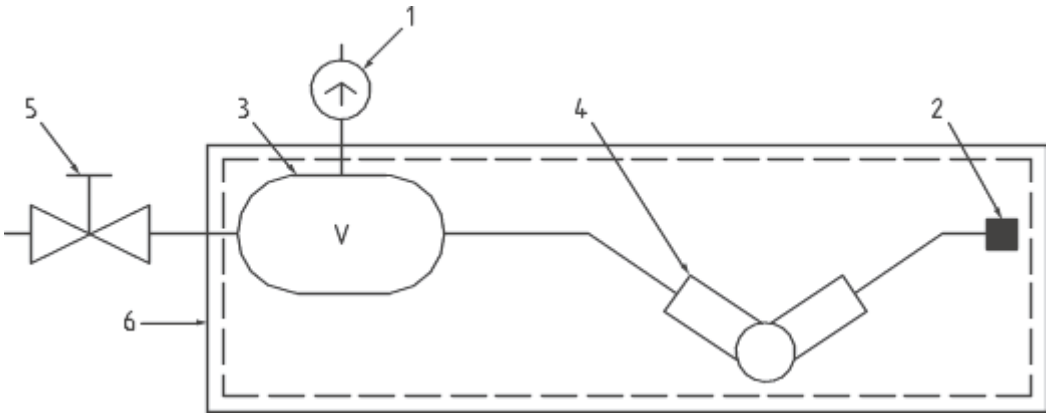
6 water bath

Figure 23 — Ambient leakage test rig

Pass/fail criteria: The result is satisfactory if there is no leakage shown on the pressure sensor after 1 min and there are no bubbles escaping from the pneumatic half couplings in the water bath.

5.5.4.3 Extreme temperatures

The test is carried out on a pair of pneumatic half couplings at temperatures of –40 °C, –25 °C and +70 °C. The pneumatic half couplings are set up in a test rig shown in Figure 24 with a reservoir volume (V) of 14 l. The system is charged to (10 ± 0,1) bar, and the pneumatic half couplings soaked at the extreme temperature. When the system has stabilised, the isolating cock (5) is closed. After waiting one minute for settlement, the test commences.



Key

1 pressure sensor

2 plug

3 reservoir

4 pair of pneumatic half couplings to be tested

5 isolating cock

6 thermostatic enclosure

NOTE Items 1, pressure sensor, and 5 may be positioned just outside the thermostatic enclosure.

Figure 24 — Extreme temperature leakage test rig

Pass/fail criteria: The result is satisfactory if there is no leakage shown on the pressure sensor after 1 min at temperatures of –25 °C and +70 °C. The result is satisfactory if the leakage shown on the pressure sensor after 1 min is not greater than 0,05 bar at a temperature of –40 °C.

5.5.5 Corrosion test

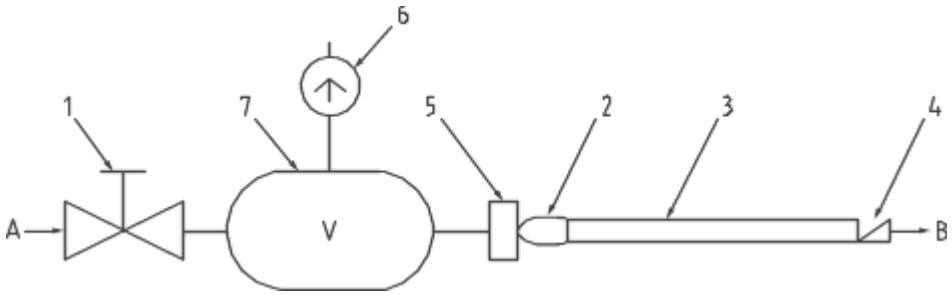
Test conditions: The pneumatic half coupling shall be tested in accordance with EN ISO 9227 (see note).

Pass/fail criteria: When the conditions are applied during 56 h the area where rust appears shall be less than 25 % of the whole area of the ferrous components.

NOTE The customer may specify other test conditions applicable to their application.

5.5.6 Pull test

A pneumatic half coupling is set up in a test rig as shown in Figure 25 with a reservoir volume (V) of 14 litres and the system is charged to (10 ± 0,1) bar. When the system has stabilised, the isolating cock is closed. After waiting 1 min for settlement the longitudinal test force (F_{test}) is built up from 0 kN to 5 kN ± 0,1 kN in 45 s ± 15 s and is held at that value for 30 s.



Key

1 isolating cock

2 coupling head

3 hose

4 nipple

5 locating point for the half coupling

6 pressure sensor

7 reservoir

Figure 25 — Pull test rig

Pass/fail criteria: The hose shall not move on the nipple or coupling head, there shall be no hose damage and there shall be no leakage greater than 0,030 Nl/min.

5.6 Documentation

The qualification test report shall contain at least the following data:

— identification in reference to accurate design drawings;

— manufacturing date;

— reference to this standard;

— accurate figures found through the tests;

— general appearance after corrosion test;

— manufacturing quality and material specifications.

6 Individual inspection

Every pneumatic half coupling shall be subject to the test specified in 5.5.4.2 only at temperature of (+20 ± 5) °C.

NOTE The customer and the supplier may agree on an alternative inspection process.

7 In-Service assessment

For a pneumatic half coupling to be used on interoperable vehicles, an in-service trial may be required dependant on the verification requirements. Annex C contains typical requirements of an in-service trial that may be used to assess a pneumatic half coupling.

For a pneumatic half coupling to be used on interoperable vehicles, testing of the pneumatic half coupling as part of the complete brake system when static, when fitted to a vehicle, should be conducted in accordance with the requirements of the vehicle brake system type tests as defined in the relevant system test clause of the applicable EN standard.

8 Designation

A pneumatic half coupling shall be designated BP or MRP.

9 Identification and marking

The rubber hose shall have as a minimum embossed or recessed markings identifying the manufacturer of the rubber hose and the month and year of manufacture (see Note).

A hose to be used on interoperable vehicles shall have the “U” within a circle as shown in Figure 24.

Dimensions in millimetres

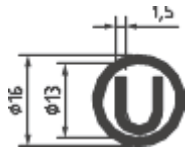


Figure 26 — Interoperable mark

The embossed or recessed text on the hose shall have a text height of ≥ 10 mm.

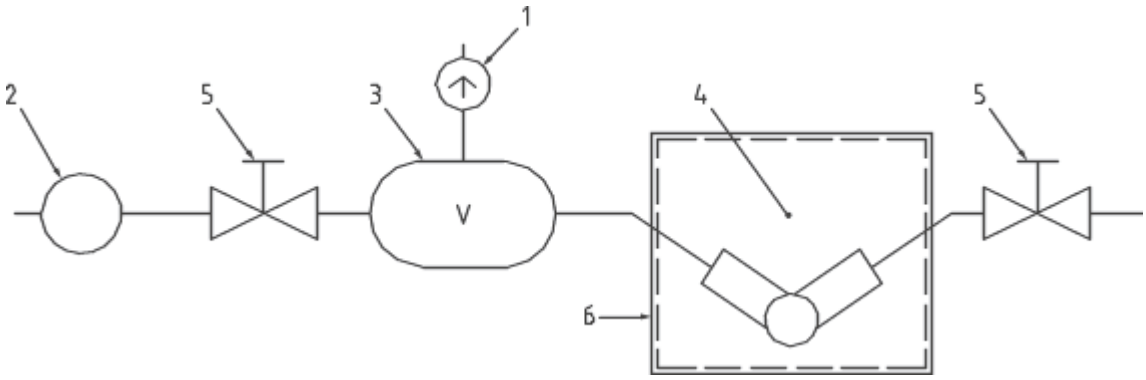
NOTE Any additional marking will be agreed between the supplier and the customer.

Annex A
(informative)

Vacuum withstand

This is not a standard European requirement and should only be carried out when required as a specific additional requirement for the assembly. The pneumatic half coupling shall be able to function with a pressure of 0,75 bar below atmospheric pressure. The leakage shall be tested in accordance with A.1.2.Vacuum test.

The test consists in checking the air tightness on a pair of coupled pneumatic half couplings under vacuum of 0,75 bar below atmospheric pressure. The Figure A.1 shows an example of an installation to undertake the test with a reservoir volume (V) of 14 litres. The test shall be carried out with temperatures of +20 °C, +70 °C, –40 °C or other maximum/minimum temperatures as required.



Key

1 pressure sensor

2 vacuum pump

3 reservoir

4 pair of pneumatic half couplings to be tested

5 isolating cock

6 thermostatic enclosure

Figure A.1 — Vacuum test installation scheme

Pass/fail criteria: The result is satisfactory if the pressure increase is less or equal to that shown in Table A.1:

Table A.1 — Results to be achieved

Temperature	+20 °C	+70 °C	–40 °C
pressure increase permitted in bar as a function of volume and time	$\frac{0{,}020 \times t}{V}$	$\frac{0{,}020 \times t}{V}$	$\frac{0{,}100 \times t}{V}$
t test time expressed in minutes	V test circuit volume expressed in litres		

Annex B
(informative)

MRP pneumatic half coupling for emergency coupling hoses

B.1 General

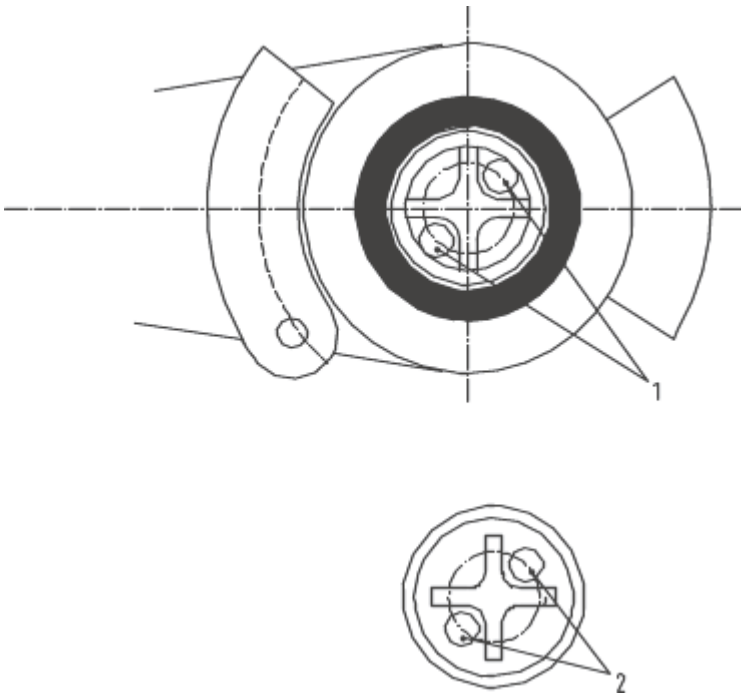
The MRP is required to be vented in the event that there is an involuntary separation between two multiple units during multiple unit rescues. This venting is required to enable the automatic application of the spring-applied parking brakes on the multiple unit being rescued. MRP coupling heads utilised in emergency pneumatic half couplings for UK multiple units vary from those shown in Figure 8 to allow this venting to take place.

B.2 Coupling head

The MRP coupling head is as shown in Figure 8 to enable it to be coupled to other pneumatic half couplings of this type, but is altered to incorporate vent holes (or slots) in the base of the star valve. These vent holes (or slots) prevent the star valve from sealing when the MRP emergency pneumatic half coupling is uncoupled. This is the only change to the coupling head from that shown in Figure 8.

B.3 Identification

To enable this MRP emergency pneumatic half coupling to be identified, the square head of the valve cover is painted black to differentiate it from a standard MRP pneumatic half coupling.



Key

1 vent holes

2 total vent hole unrestricted area = > to that of a Φ8.5 hole

Figure B.1 — Vent holes in star valve

Annex C
(informative)

In-service trial

C.1 General

An in-service trial may be conducted on pneumatic half couplings which are defined as a new product or a modified version of an existing product which has changed the design sufficiently such that it requires a new type designation.

C.2 Test set-up and sampling

The in-service trials should be conducted using a number of pneumatic half couplings of the same type, with a minimum number of ten, fitted to vehicles running in agreed train formations running in defined service duties.

The pneumatic half couplings should be taken from a representative production process and subject to the type testing requirements of this standard prior to the in-service trial.

C.3 Procedure

The in-service trial should be conducted for a minimum period of 12 months. During this time the functional performance of the pneumatic half coupling should be monitored at agreed times on not less than three occasions. This monitoring should be carried out by performing static functional testing on all the vehicles fitted with trial pneumatic half couplings, and by physical examination of the pneumatic half couplings.

C.4 Pass/fail criteria

All functional requirements should be met and no physical deterioration should occur at the end of the twelve-month trial.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the Directive 2008/57/EC[1)].

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for HS Rolling Stock, Table ZA.2 for CR Freight Wagons and Table ZA.3 for CR Locomotives and Passenger Rolling Stock, confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

1) This Directive 2008/57/EC adopted on 17th June 2008 is a recast of the previous Directives 96/48/EC 'Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and revisions thereof by 2004/50/EC 'Corrigendum to Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system'.

Table ZA.1 — Correspondence between this European Standard, the HS TSI RST published in the OJEU dated 26 March 2008 and Directive 2008/57/EC

Clauses/subclauses of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
The whole standard is applicable	4.Characteristics of the subsystem 4.2 Functional and technical specification of the subsystem § 4.2.2.2.1 Structure and mechanical parts End couplers and coupling arrangements to rescue trains. Subsystem requirements §4.2.6.1 Environmental conditions, Environmental conditions §4.2.7.2.2 Measures to prevent fire Annex K Coupler K.2 Towing coupler used for recovery and rescue	Annex III, Essential Requirements 1.General requirements 1.1 Safety Clauses 1.1.1, 1.1.3, 1.1.4, 1.1.5 1.2 Reliability and availability 1.3 Health Clause 1.3.2 1.4 Environmental protection Clause 1.4.2 1.5 Technical compatibility 2 Requirements specific to each Subsystem 2.4 Rolling Stock 2.4.2 Reliability and availability 2.4.3 Technical compatibility §3	The dimensions given in Figure 7 of the EN for Main reservoir pipe pneumatic half coupling with valve and in Figure 8 of the EN for Main reservoir pipe coupling head with valve do not apply for interoperable traffic.

Table ZA.2 — Correspondence between this European Standard, the CR TSI RST Freight Wagons dated July 2006, published in the OJEU on 8 December 2006 and its intermediate revision published in the OJEU on 14 February 2009 and Directive 2008/57/EC

Clauses/subclauses of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
Clauses 1 to 9 inclusive Annex C of the standard are applicable.	4.Characterisation of the subsystem 4.2. Functional and technical specifications of the subsystem 4.2.4 Braking § 4.2.4.1.2.3 Braking performance, Functional and Technical Specification, Mechanical Components §4.2.6 Environmental conditions 5 Interoperability constituents §5.3.3.6 List of constituents, Braking, Pneumatic half coupling §5.4.3.7 Constituents performances and specifications, Braking, Pneumatic half coupling 6 Assessment of conformity and/or suitability for use of the constituents and verification of the subsystem §6.2.3.3 Subsystem conventional rail rolling stock freight wagons, Specifications for assessment of the subsystem, Braking Annex I Braking, interfaces of interoperability constituents, section I.6 Annex P Braking performance, assessment of interoperability constituents sections P.1.6, P.2.6 Annex Q Assessment procedures, Interoperability Constituents Table Q.1	Annex III, Essential Requirements 1.General requirements 1.1 Safety Clauses 1.1.1, 1.1.3, 1.1.4 1.1.5 1.2 Reliability and availability 1.3 Health Clause 1.3.2 1.4 Environmental protection Clause 1.4.2 1.5 Technical compatibility 2 Requirements specific to each Subsystem 2.4 Rolling Stock 2.4.2 Reliability and availability 2.4.3 Technical compatibility §3	The dimensions given in Figure 7 of the EN for Main reservoir pipe pneumatic half coupling with valve and in Figure 8 of the EN for Main reservoir pipe coupling head with valve do not apply for interoperable traffic.

Table ZA.3 — Correspondence between this European Standard, the CR TSI Locomotives and Passenger RST (final draft ST05EN04 dated 26 May 2010) accepted by RISC in June 2010 and Directive 2008/57/EC

Clauses/subclauses of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
The whole standard is applicable.	4.Characterisation of the rolling stock subsystem 4.2 Functional and technical specification of the subsystem 4.2.2 Structure and mechanical parts § 4.2.2.2.3 End coupling § 4.2.2.2.4 Rescue coupling 4.2.4 Braking §4.2.4.3 Type of brake system §4.2.4.10 Brake requirements for rescue purposes §4.2.6.1 Environmental conditions, Environmental conditions §4.2.10.2 Fire safety and evacuation, Material requirements	Annex III, Essential Requirements 1.General requirements 1.1 Safety Clauses 1.1.1, 1.1.3, 1.1.4, 1.1.5 1.2 Reliability and availability 1.3 Health Clause 1.3.2 1.4 Environmental protection Clause 1.4.2 1.5 Technical compatibility 2 Requirements specific to each Subsystem 2.4 Rolling Stock 2.4.2 Reliability and availability 2.4.3 Technical compatibility §3	The full compliance with the TSI requirements depends on the way the product is integrated into the rolling stock. The dimensions given in Figure 7 of the EN for Main reservoir pipe pneumatic half coupling with valve and in Figure 8 of the EN for Main reservoir pipe coupling head with valve do not apply for interoperable traffic.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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