INTERNATIONAL STANDARD

ISO 6134

Third edition
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Rubber hoses and hose assemblies for saturated steam — Specification

Tuyaux et flexibles en caoutchouc pour vapeur saturée — Spécification

Reference number
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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 6134 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

This third edition cancels and replaces the second edition (ISO 6134:1992), which has been technically revised.

Contents

Foreword

This document (EN ISO 6134:2005) has been prepared by Technical Committee CEN/TC 218 "Rubber and plastics hoses and hose assemblies", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 45 "Rubber and rubber products".

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of an identical text or by endorsement, at the latest by September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

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

1 Scope

This document specifies requirements for two types of hoses and hose assemblies, low pressure with a maximum working pressure of 6 bar and high pressure with a maximum working pressure of 18 bar, made of rubber and hose fittings made of metal, designed to convey saturated steam and hot water condensate.

Each type is divided into two classes having either an oil resistant or non-oil resistant cover.

NOTE Information on the frequency of testing of hose assemblies in use and storage is given in Annex A and Annex B.

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 27326:1993, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions (ISO 7326:1991)*

EN 28033, *Rubber and plastics hose — Determination of adhesion between components (ISO 8033:1991)*

EN ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing (ISO 1402:1994)*

EN ISO 1746, *Rubber or plastics hoses and tubing — Bending tests (ISO 1746:1998, including technical corrigendum 1:1999)*

EN ISO 4023:2001, *Rubber hoses for steam — Test methods (ISO 4023:1991)*

EN ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of dimensions (ISO 4671:1999)*

EN ISO 8031:1997, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance (ISO 8031:1993)*

EN ISO 8330:2000, *Rubber and plastics hose and hose assemblies — Vocabulary (ISO 8330:1998)*

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

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

ISO 1817, *Rubber, vulcanised — Determination of the effect of liquids*

ISO 4649:2002, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 8330:2000 apply.

4 General requirements

Quick-release couplings shall not be used under any circumstances.

The end fittings used with the hose shall be of a type that provides for tightening-up during service, for example a clamp type to compensate for creep of the rubber compounds in the hose.

NOTE 1 Where superheated steam conditions occur, the service life of the product may be reduced.

NOTE 2 Vacuum caused by shutting off the hose assembly at both ends may precipitate "pop-corning" or separation of the lining.

5 Classification

This document specifies two types of hoses/hose assemblies to convey saturated steam and hot water condensate.

Type 1: low-pressure steam hose, maximum working pressure 6 bar [1)], corresponding to a temperature of 164 °C.

Type 2: high pressure steam hose, maximum working pressure 18 bar, corresponding to a temperature of 210 °C.

Each type of hose is divided into:

- Class A: a non oil-resistant cover; or
- Class B: an oil-resistant cover.

Both types and classes can be either:

a) electrically bonded, marked “M” (see Clause 11); or

b) electrically conductive, marked “Ω” (see Clause 11).

6 Materials and construction

Hoses shall consist of a lining which is resistant to steam and hot water condensate and shall be uniform in quality, free of porosity, air holes, foreign inclusions and other defects.

The reinforcement shall be textile for Type 1 and steel wire for Type 2, either braided, spiral or cord ply construction.

The cover shall give protection against mechanical damage and be resistant to heat, wear and environmental effects due to weather and short-term chemical exposure. It shall be pricked equally around the periphery and along the whole length of the hose in order to relieve any pressure built-up between the plies and the cover.

7 Dimensions and tolerances

7.1 Diameters, thickness of lining and cover, and bend radii

When determined in accordance with EN ISO 4671, the diameters, thickness of lining and cover, and the bend radii of the hoses shall conform to the values given in Table 1.

1) 1 bar = 0,1 MPa.

Table 1 — Diameters, thickness and bend radii

Dimensions in millimetres

Internal diameter		Outside diameter		Thickness min.		Bend radius min.
	Deviation limits		Deviation limits	Lining	Cover	
9,5	± 0,5	21,5	± 1,0	2,0	1,5	120
13	± 0,5	25	± 1,0	2,5	1,5	130
16	± 0,5	30	± 1,0	2,5	1,5	160
19	± 0,5	33	± 1,0	2,5	1,5	190
25	± 0,5	40	± 1,0	2,5	1,5	250
32	± 0,5	48	± 1,0	2,5	1,5	320
38	± 0,5	54	± 1,2	2,5	1,5	380
45	± 0,7	61	± 1,2	2.5	1.5	450
50	± 0,7	68	± 1,4	2,5	1,5	500
51	± 0,7	69	± 1,4	2,5	1,5	500
63	± 0,8	81	± 1,6	2,5	1,5	630
75	± 0,8	93	± 1,6	2,5	1,5	750
76	± 0,8	94	± 1,6	2,5	1,5	750
100	± 0,8	120	± 1,6	2,5	1,5	1 000
102	± 0,8	122	± 1,6	2,5	1,5	1 000

7.2 Length of hoses and hose assemblies and tolerances

The length of the hose assembly is the overall measured distance from the sealing surfaces of the couplings from end to end.

The deviation limits of the hoses and hose assemblies shall be as follows:

$l \leq 1\,000$ mm: ± 10 mm;

$l > 1\,000$ mm: ± 1 %.

7.3 Concentricity

When determined in accordance with EN ISO 4671, the concentricity of the hose wall shall not exceed 1,0 mm for internal diameter hoses up to and including 51 mm and 1,5 mm for sizes above.

8 Physical properties of compounds

Tests shall be carried out on test sheets of 2,0 mm minimum thickness of equivalent cure to that of the hoses.

The physical properties of compounds shall conform to the values given in Table 2.

The recommended frequency of testing is illustrated in Table D.1.

Table 2 — Physical properties of compounds

Property	Unit	Requirements		Method of test
		Lining	Cover	
Tensile strength, min.	MPa	8	8	ISO 37 (dumb-bell test piece)
Elongation at break, min.	%	200	200	ISO 37 (dumb-bell test piece)
Ageing – tensile strength change, max. – elongation at break change, max.	 % %	 50 50	 50 50	ISO 188 (7 days at 125 °C for Type 1 and 150 °C for Type 2, air oven method)
Abrasion resistance – black filled compound, max. – non-black filled compound, max. coloured	 mm^3 mm^3	 — —	 200 400	ISO 4649:2002, Method A
Change in volume, max. (class B only)	%	—	100	ISO 1817, oil No. 3, 72 h at 100 °C

9 Physical properties of finished hoses and hose assemblies

The physical properties of finished hoses and hose assemblies shall conform to the values given in Table 3.

The minimum frequency of testing shall be in accordance with Clause 14.

Table 3 — Physical properties of finished hoses and hose assemblies

Property	Unit	Requirements	Method of test
Hoses			
Burst pressure, min.		10 x the max. working pressure	EN ISO 1402
Proof test pressure	—	No leakage or distortion at 5 x the max. working pressure	EN ISO 1402
Adhesion between components, min.	kN/m	2,4	EN 28033
Bending test, (under no pressure), min.	T/D	0,8	EN ISO 1746
Change in length, at proof test pressure	%	-3 to +8	EN ISO 1402
Change in twist, max. at proof test pressure	°/m	10	EN ISO 1402
Ozone resistance of the cover	—	No cracking observed under x2 magnification	EN 27326:1993; Method 3, relative humidity (55 ± 10) %, ozone concentration (50 ± 5) × 10^{-9}, elongation 20 %, temperature 40 °C
Hose assemblies			
Proof test pressure	—	No leakage or distortion at 5 x the max. working pressure	EN ISO 1402
Electrical resistance	Ω Ω Ω	≤ 10^2/assembly for M-type ≤ 10^6/assembly and ≤ 10^9 resistance between lining and cover for Ω-type	EN ISO 8031:1997, Method 4 EN ISO 8031:1997, Method 3.4, 3.5 or 3.6
Short term steam test	—	Clause 10	Clause 10
Long term steam test	—	Clause 10	Clause 10

10 Resistance to steam

10.1 Principle

Expose a hose assembly to a flow of saturated steam in accordance with the method described in EN ISO 4023:2001, Method B.

The steam pressure for testing Type 1 hose/hoses assembly shall be 6 bar and shall be 18 bar for Type 2 hose/hoses assembly.

10.2 Short term exposure

The number of cycles of 20 h steam on and 4 h steam off shall be 7, i.e. a period of 168 h.
After this exposure, the change in any physical properties shall not exceed the values given in Table 4.

Table 4 — Permissible changes in properties after the short term test

Property	Type 1	Type 2
Maximum reduction in actual burst pressure, in %	25	10
Maximum reduction in lining elongation at break, in %	50	50
Minimum elongation at break of lining, in %	150	150
Maximum lining hardness increase, in IRHD	10	10

10.3 Long term test

The number of cycles of 20 h steam on and 4 h steam off shall be 30, i.e. a period of 720 h.

10.4 Observations

During either exposure, there shall be no leakage of steam through the hose wall. Following the test the lining shall not be cracked, blistered or pop-corned and the cover shall not be cracked or blistered.

10.5 Additional tests

On completion of either the short term test or the long term test at room temperature, bend the test piece through 180° for sizes up to and including 32 mm and 90° for sizes over 32 mm, four times over a mandrel of the appropriate radius given in Table 1.

Rotate the test piece through 90° between each bending operation.

After completion of the test there shall be no cracks in the bent position.

Measure the electrical resistance which shall not be greater than the values given in Table 3.

For safety requirements the electrical properties shall be measured after the bending procedure in both the 168 h and 720 h steam test.

11 Electrical resistance

The resistance between the hose couplings shall not exceed the value of 1×10^6 Ω.

This low electrical resistance of hose and hose assemblies can be obtained by two Methods:

a) Incorporating two low resistance bonding wires into the hose construction.

These shall be spirally applied and shall be positioned in such a way to cross uniformly.

When attaching fittings to this hose, the bonding wires shall be folded into the hose bore, positioned between the lining and the male part of the fitting and extending by approximately one third of the length of the male part of the fitting into the bore.

When tested in accordance with EN ISO 8031 the resistance along the bonding wires, in the case of hose or the resistance between fittings in the case of hose assemblies, shall not exceed 1 x 10^2 Ω per length.

When obtaining electrical continuity by this method the hose shall be marked with the symbol "M".

b) Incorporating electrically conducting elastomers.

When attaching fittings to this hose, an adequate connection between the end fittings and the conductive compound shall be obtained.

When tested in accordance with EN ISO 8031, the resistance along the conductive non-metallic material in the case of hoses or the resistance between the fittings in the case of hose assemblies, shall be equal to or less than 1×10^6 Ω per length and the resistance between lining and cover shall not exceed 1×10^9 Ω.

When obtaining electrical resistance by this method, the hose shall be marked with the symbol "Ω".

12 Marking

12.1 Hoses

All hoses shall be continuously marked by relief embossing or branding, which is clearly legible and durable, in medium spaced bold lettering, with a letter height of at least 5 mm.

Unless otherwise agreed, the length of the identification according to the identification example shall not exceed 500 mm.

At least the following information shall be marked:

a) manufacturer's name or identification;

b) number of this document, EN ISO 6134:2005;

c) type and class;

d) steam;

e) maximum working pressure in bar and max. temperature in °C (e.g. 18 bar - 210 °C)

f) internal diameter (e.g. 19);

g) symbol to identify electrical conductivity (Ω or M);

h) at least quarter and year of manufacture (e.g. 3Q-02).

EXAMPLE MAN - EN ISO 6134:2005 - 2A - steam - 18 bar - 210 °C - 19 - Ω - 3Q-05.

12.2 Hose couplings

The couplings shall be permanently marked with the following information:

a) name or identification of the manufacturer or assembler;

b) internal hose diameter;

c) wall thickness or external hose diameter;

d) maximum working pressure.

12.3 Identification of hose assemblies

Before using for the first time, hose assemblies complying with this document shall have two stainless steel identification bands in addition to the marking specified in 12.1 and 12.2. These bands shall be fixed onto the hose assembly close to the end fitting so that they remain captive.

Identification details shall be marked legibly and durably by, for example, engraving.

The identification bands are generally affixed by the operator.

Band 1 shall remain permanently in position on the hose assembly.

Once routine tests have been carried out on hose assemblies in use, Band 2 shall be removed and replaced by a new band bearing the identification details stated for Band 2.

Band 1

a) operator's registration number (to identify the hose assembly, operator's no., e.g. building no.);

b) admissible working pressure, e.g. 18 bar;

c) admissible working temperature, e.g. 210 °C;

d) symbol Ω or M (to identify electrical resistance of hose);

e) steam.

EXAMPLE No. XXXX - 18 bar - 210°C - Ω - steam.

Band 2

a) test laboratory (only if this cannot be ascertained with a document's registration number);

b) date of assembling or date of testing;

c) date of follow-up testing (month and year, e.g. 05-03).

EXAMPLE XXXX - tested on 30-11-99 - follow-up testing 05-03.

13 Type testing

Design verification testing shall be performed in order to supply evidence that all the material construction and the requirements of this document have been met by the method of manufacture and hose design. Design verification tests shall be carried out a minimum of every five years or whenever a change of manufacture, design or material occurs, on the largest size of each design in the manufacturer's range.

14 Frequency of testing

Type and routine tests are specified in Annex C.

Design verification tests are those tests required to confirm that the product meets all requirements of this document.

Routine tests are those tests that shall be carried out on all hose assemblies prior to dispatch.

Production acceptance tests are those tests, specified in Annex D, which should be carried out to control the quality of manufacture. The frequency specified in Annex D is as a guide being an informative annex only .

Annex A
(informative)

Test frequency for hose assemblies in use

If a statutory test frequency is not specified, the operator should establish a test frequency taking into account the operating conditions. This is generally 6 months.

If a hose assembly is in permanent use under severe working conditions, the test frequency should not exceed 1 month.

NOTE In case of extreme variations in pressure and/or temperature, hose assemblies should be tested at a regular frequency not exceeding 6 months.

The tests required are the following:

a) pressure test;

b) electrical resistance;

c) visual inspection;

d) removal/replacement of identification Band 2.

Annex B
(informative)

Storage and admissible storage time

The requirements for storing hoses and hose assemblies are given in ISO 8331.

Once hoses and hose assemblies have been stored for 3 years with effect from the date of manufacture or from the last test, they should be subjected to further routine tests in accordance with Clause 14 before use.