SLOVENSKI STANDARD
SIST EN 12434:2001

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Kriogene posode - Kriogene gibke cevi

Cryogenic vessels - Cryogenic flexible hoses

Kryo-Behälter - Kryo-Schlauchleitungen

Récipients cryogéniques - Tuyaux flexibles cryogéniques

Ta slovenski standard je istoveten z: **EN 12434:2000**

ICS:

23.020.40	Proti mrazu odporne posode (kriogenske posode)	Cryogenic vessels
23.040.70	Gumene cevi in armature	Hoses and hose assemblies

SIST EN 12434:2001 **en**

EUROPEAN STANDARD
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EN 12434

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English version

Cryogenic vessels - Cryogenic flexible hoses

Récipients cryogéniques - Tuyaux flexibles cryogéniques

Kryo-Behälter - Kryoschlauchleitungen

This European Standard was approved by CEN on 7 July 2000.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 134 "Resilient and textile floor coverings", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by February 2001, and conflicting national standards shall be withdrawn at the latest by February 2001.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

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

1 Scope

This standard gives design, construction, type and production testing, and marking requirements for non insulated cryogenic flexible hose used for the transfer of cryogenic fluids within the following range of operating conditions :

— working temperature: from - 270 °C to + 65 °C ;

— maximum nominal pressure: 80 bar ;

— nominal size (DN): from 10 to 100.

End fittings for mounting of any couplings are within the scope of this standard, but the couplings are subject to other standards.

It is intended that the hose be designed and tested to satisfy the generally accepted nominal pressure e.g. PN 40. Hoses may then be selected with a PN equal to or greater than the maximum allowable pressure (PS) of the equipment to which it is to be used.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1252-1, Cryogenic vessels - Materials - Part 1 : Toughness requirements for temperatures below - 80 °C

EN 1333, Pipework components - Definition and selection of PN

EN 1797-1, Cryogenic vessels - Gas/materials compatibility - Oxygen compatibility

EN 12300, Cryogenic vessels - Cleanliness for cryogenic service

EN ISO 6708, Pipework components - Definition and selection of DN (nominal size) (ISO 6708:1995)

ISO 7369:1995, Pipework - Flexible metallic hoses - Vocabulary of general terms

3 Terms and definitions

For the purposes of this Standard, in addition to those given in ISO 7369:1995, the following terms and definitions apply :

3.1
hose
A flexible leak tight inner tube either corrugated metal, elastomer or plastic.

3.2
braid
A layer, or layers, of cylindrically woven wires covering the hose and attached to the flexible hose assembly end fittings, serving the function of restraining the flexible hose against elongation.

3.3
protection coil or cover
An outer coil or cover fitted to protect the main hose and braid against damage and abrasion.

3.4
end fitting
A fitting (of material compatible with material and product transferred) attached to each end of the hose and braid (when fitted).

3.5
hose assembly
A hose with end fittings attached, complete with braid and/or other covering, ready for service.

3.6
nominal size (DN)
As defined in EN ISO 6708.

3.7
nominal pressure (PN)
As defined in EN 1333.

NOTE 1 PN ≥ PS (as defined in PED)

NOTE 2 See also the last sentence of the scope.

3.8
working temperature range
The highest and lowest temperature to which the hose assembly is to be subjected.

3.9
cyclic life
Minimum number of complete cycles which, at the test conditions, the hose assembly is designed to withstand without failure.

4 General requirements

4.1 Design and construction

The nominal pressure used during tests (see clause 5) shall be greater than or equal to the nominal pressure (PN) specified. In addition, the nominal pressure (PN) shall not be less than the maximum allowable pressure (PS) of the equipment to which it is to be used. A hose is typically made from corrugated metal, from strip steel. The corrugation may be parallel or helicoil. The nominal pressure stamped on the hose assembly shall be greater than or equal to the maximum pressure in service.

If elastomers or composites are used, additional requirements shall be applied in accordance with 5.3.2.2.

A braid is commonly fitted over the inner tube. This, generally, consists of woven wire in one or two layers, in stainless steel or a high strength copper alloy. It may have a cover, which shall be compatible with the surroundings and, normally, with the conveyed fluid.

The design shall ensure that pressurisation, or corrosion, between the inner tube and the outer braid or sheath is prevented.

End fittings shall be designed as a rigid seal to the ends of a hose to ensure :

— a tight fixing to the hose ;

— a strong joint between the braid and hose to stabilise the hose against elongation at nominal pressure.

An area for marking shall be provided on one of the end fittings.

A typical cryogenic hose assembly is shown in annex A.

4.2 Materials

All materials shall be compatible with the fluid conveyed.

End connections and couplings shall be made of materials compatible with the materials of the flexible hose assembly.

A material is said to be compatible when it does not lead to any violent reaction (ignition,etc.) or any slow reaction (ageing) with the conveyed gases, and has a little permeability.

The materials used in a cryogenic hose assembly service shall :

— maintain sufficient ductility at the lowest working temperature (as specified in EN 1252-1) ;

— be oxygen compatible, if specified for oxygen or nitrous oxide service (as specified EN 1797-1) ;

— contain less than 70 % copper, in the alloy as well as the soldering materials, if it is specified for mixtures containing acetylene.

4.3 Cleanliness

Hose assemblies specified for all cryogenic fluids shall be cleaned in accordance with EN 12300.

NOTE Measures should be taken during manufacture to remove or avoid hydrocarbons, moistures, particles or other contaminations inside the hose assembly.

4.4 Mechanical properties

4.4.1 Burst pressure

The burst pressure shall be at least three times the nominal pressure within the temperature range of – 270 °C to + 65 °C.

Failure shall occur only in the body of the hose and braid and not in their connections.

4.4.2 Pressure cycles

Hose assemblies shall have a minimum cyclic life 10 000 cycles when pressurised from < 1 bar to nominal pressure repeatedly in accordance with 5.3.1.

4.4.3 Bending

Hose assemblies shall have a minimum cyclic life of 50 000 cycles when repeatedly rolled at nominal pressure in accordance with 5.3.2.

4.4.4 Resistance to abuse

Hose assemblies should have a sufficient resistance to detoriation of the braid when they are dragged on the ground. For additional protection of the braid, e.g. a coil can be used.

Hose assemblies shall withstand to a crushing test, simulating a person stepping on the hose assembly, in accordance with 5.2.6.

4.4.5 Low temperature resistance

All components of the hose assemblies which become cold during operation shall retain their toughness at the lowest design temperature.

4.4.6 Leak tightness

Hose assemblies shall be leak tight in accordance with 6.2.

4.4.7 Electrical properties

Hose assemblies specified for flammable products shall be electrically conducting from one end to the other (electric resistance less than 0,5 Ω).

5 Hose sample tests

5.1 General

The hose sample test procedures shall include :

a) Inspection and non-destructive tests :

1) inspection: dimensions, cleanliness, material identification and marking ;

2) tests: pressure test, leak and crushing tests.

b) Destructive tests :

— pressure cycling, bursting test, rolling bend cycling and examination of sectional cut.

The tests shall be recorded in a written report which shall be retained.

Four hoses (A, B, C and D) are necessary to perform hose sample tests for each hose sample of hose assembly.

The tests and order of tests (1, 2, 3) are summarised in Table 1.

Table 1 — Testing scope and sequence

Tests	Hose assembly			
	A	B	C	D
1 – Non destructive tests				
a) Identification of materials b) Dimensional check c) Cleanliness check d) Pressure test e) Leak test	1	1	1	1
f) Crushing test	2	2	-	2
2 – Destructive tests				
a) Hydraulic pressure cycling	3	-	-	-
b) Rolling bend cycling	-	3	2	-
c) Hydraulic bursting	4	5	-	3
d) Examination of a sectional cut	-	-	4	-

When a hose assembly with a given DN_O and a given nominal pressure P_O has been successfully sample tested, any hose assembly of the same type, having :

— a nominal pressure ≤ P_O

— a nominal diameter ≤ 1,5 DN

can be considered as approved.

A hose assembly is said to be of the same type when the design and its characteristics are similar to the tested hose: similarly is defined as having the same materials, welding method, type of corrugation (shape, method of manufacturing), method of joining (hose and end fitting), braid (type of braiding, i.e. calculated - according to diameters - to obtain the same maximum tensile stress in each wire, same materials, same welding method, ...).

Hose sample tests shall be carried out on hose assembly of a given length (see annexes B and C).

When a hose sample of hose assembly has been tested, all of its characteristics are to be included in a specification to which reference can be made.

5.2 Non-destructive tests and inspection

The following tests shall be carried out on a minimum of four hose assemblies in the following order:

5.2.1 Identification of materials

The materials, assembly methods, weld procedures and welder qualification for the manufacture of the hose assemblies shall be identified and recorded.

5.2.2 Dimensional check

The outside diameter and total length of hose assemblies shall be measured, as delivered, to check conformity with the drawings.

5.2.3 Cleanliness check

The level of contamination of the hose assembly shall be determined as defined in EN 12300.

5.2.4 Pressure test

All flexible hose assemblies shall be subjected to a hydraulic pressure test, at room temperature (20 ± 10) °C, equal to 1,5 times the nominal pressure. The pressure shall be held for a minimum of 3 minutes. There shall be no leaks. The overall length shall not increase by more than 3 %.

As an alternative to the hydraulic test it is also permissible to perform a pneumatic test, at the same pressure, provided that the necessary safety precautions are met.

5.2.5 Leak tests

The hose assembly shall be leak tested by immersion in water which is pressurised with gaseous nitrogen or air to nominal pressure.

The pressure shall be maintained for a minimum of 5 minutes. There shall be no leaks detected (e.g. no release of bubbles of gas in water). This corresponds approximately to a leak rate of less than 10^{-3} mbarl/s.

Other methods of equivalent or greater accuracy may be used for standard hose assemblies. Hose assemblies specified for more stringent applications may have more strength leak requirements (e.g. helium leak testing under pressure).

5.2.6 Crushing test

This test is only carried out for hose assemblies made without corrugated stainless steel.

This test shall be performed on hose assemblies to simulate risks of damage when walking on a hose. The hose assembly shall be held between two (200 x 200) mm rigid plates and a force of 1000 N shall be applied ten times at the same location in the middle of each flexible hose.

The hose assembly shall then be examined to check if there is any pronounced damage caused by this test (a reduction in diameter greater than 20 % and appreciable damage to the braid is unacceptable).

After that, the destructive tests shall be carried out on these same hose assemblies.

5.3 Destructive tests

5.3.1 Hydraulic pressure cycling

This test shall be carried out on one hose assembly of the tested lot with pressure cycling from 1 bar to nominal pressure, at room temperature and at a frequency of < 10 cycles per minute.

The test shall be stopped at 10 000 cycles and the hose assembly be subjected to a hydraulic burst test.

5.3.2 Rolling bend cycling test

5.3.2.1 Metallic hose assemblies and hose assemblies of materials with a record of use in cryogenic service

A rolling bend cycling test shall be carried out with the flexible hose assembly maintained at its nominal pressure.

The tests are described in annex B.

The test hose assembly shall undergo 50 000 cycles without failure and then be subjected to a leak test (leak rate higher than the one required in 5.2.5).

5.3.2.2 Hose assemblies constructed from materials or composites not commonly used in cryogenic service

A rolling bend cycling test shall be carried out (with the addition of some induced torque and intermittent thermal shock) with the hose assembly maintained at its nominal pressure.

The tests are described in annex C.

The test hose assembly shall undergo 50 000 cycles with no sign of leakage.

5.3.3 Hydraulic bursting test

The tested samples shall be steadily pressurised up to the rupture.

This test shall be carried out :

— on one hose assembly after non-destructive tests (flexible hose D) ;

— on one hose assembly subjected to a hydraulic pressure cycling test (flexible hose A) ;

— on a flexible hose assembly subjected to rolling bend cycling test (flexible hose B).

Bursting pressure values shall be greater than three times the nominal pressure, at room temperature (20 ± 10) °C. Furthermore, bursting is to occur only in the body of the hose assembly and may in no case affect the end fittings and their connections.