INTERNATIONAL STANDARD

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Rubber and plastics hoses, non-collapsible, for fire-fighting service —

Part 2: Semi-rigid hoses (and hose assemblies) for pumps and vehicles

Tuyaux en caoutchouc et en plastique, non aplatissables, pour la lutte contre l'incendie —
Partie 2: Tuyaux (et flexibles) semi-rigides pour pompes et véhicules

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This second edition cancels and replaces the first edition (ISO 4642-2:2009), of which it constitutes a minor revision.

ISO 4642 consists of the following parts, under the general title *Rubber and plastics hoses, non-collapsible, for fire-fighting service*:

— *Part 1: Semi-rigid hoses for fixed systems*

— *Part 2: Semi-rigid hoses (and hose assemblies) for pumps and vehicles*

Introduction

This part of ISO 4642 is mainly concerned with fire service semi-rigid delivery hoses and incorporates those hoses used manually to control and extinguish fires.

Rubber and plastics hoses, non-collapsible, for fire-fighting service —

Part 2: Semi-rigid hoses (and hose assemblies) for pumps and vehicles

1 Scope

This part of ISO 4642 specifies the requirements and test methods for semi-rigid reel hoses for use on fire-fighting vehicles and trailer pumps. The hoses are intended for use at a maximum working pressure of 1,5 MPa for normal pressure hoses (category I) and 4,0 MPa for high pressure hoses (category II). The hoses are further subdivided into types and classes (see Clause 4).

This part of ISO 4642 applies to delivery hoses for fire-fighting purposes intended for use at a minimum ambient temperature of −20 °C.

Hoses conforming to this part of ISO 4642 are intended to be used with fire hose couplings conforming to the relevant national standards couplings.

Requirements are also given for hose assemblies (see 6.12) where these are fitted by the hose manufacturer.

NOTE 1 Hoses for use at temperatures lower than −20 °C can be supplied by agreement between the manufacturer and purchaser.

NOTE 2 All pressures are expressed in megapascals where 1 MPa = 10 bar.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 176:2005, *Plastics — Determination of loss of plasticizers — Activated carbon method*

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

ISO 1307, *Rubber and plastics hoses — Hose sizes, minimum and maximum inside diameters, and tolerances on cut-to-length hoses*

ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

ISO 4671:2007, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies*

ISO 7326:2006, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

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

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 10619-2:2011, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

3 Terms and definitions

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

3.1
semi-rigid hose
hose that maintains its round cross-section even when unpressurized

4 Classification

4.1 General

All types and classes of hose shall be so flexible that they can be rolled and kept on a drum of minimum diameter 200 mm for 12 mm inside diameter, 19 mm inside diameter and 25 mm inside diameter hose and of minimum diameter 280 mm for 33 mm inside diameter hose.

Hoses shall be one of two categories distinguished by the maximum working pressure. Each hose shall be further divided into one of three types distinguished by its construction, and then into six classes distinguished by the materials used for lining and cover.

NOTE The hose can be coloured by agreement between the purchaser and the manufacturer.

4.2 Classification by types (hose construction)

4.2.1 Type A hoses shall consist of:

a) a seamless rubber or plastics lining;

b) a textile spiral or braided reinforcement;

c) a rubber or plastics cover.

4.2.2 Type B hoses shall consist of:

a) a seamless rubber or plastics lining;

b) a circular woven textile reinforcement with a rigid spiral helix;

c) an uncovered or rubber or plastics cover.

4.2.3 Type C hoses shall consist of:

a) a seamless rubber or plastics lining;

b) any suitable reinforcement;

c) a rubber or plastics cover.

NOTE While the construction of type A and type C hoses can be similar or even identical, the performance requirements differ for the following: burst and proof pressure, adhesion, hot surface resistance, crush resistance.

4.3 Classification by class (materials for lining and cover)

The hose types shall be further subdivided into six classes dependent on the materials used in their construction, in accordance with Table 1.

Table 1 — Classes and materials

Class	Lining material	Cover material
1	rubber	rubber
2	plastics	plastics
3	rubber	plastics
4	plastics	rubber
5	rubber	no cover
6	plastics	no cover

4.4 Classification by category

All hoses shall be divided into two categories dependent on the maximum working pressure, in accordance with Table 2.

Table 2 — Maximum working pressure, proof pressure and minimum burst pressure

Type of pressure MPa	Category I	Category II	
	Types A and B Classes 1 to 6	Types A and B Classes 1 to 6	Type C Classes 1 to 6
Maximum working pressure	1,5	4,0	4,0
Proof pressure	3,0	6,0	8,0
Minimum burst pressure	4,7	10,0	12,0

EXAMPLE A type C hose, constructed with a rubber lining and rubber cover and which has a maximum working pressure of 4,0 MPa, a proof pressure of 8,0 MPa and a minimum burst pressure of 12,0 MPa is classified as II/C/1.

5 Dimensions, tolerances and maximum mass

5.1 Inside diameter and maximum mass

The inside diameter of the hose and tolerances, when measured in accordance with ISO 4671, using any suitable method stated in ISO 4671:2007, Clause 4, shall conform to the requirements given in Table 3. The mass per metre length of the hose shall be in accordance with Table 3.

Table 3 — Inside diameter, tolerances on inside diameter and maximum mass per unit length

Inside diameter mm	Tolerances for inside diameter mm		Mass per unit length kg/m	
	Types A and C	Type B	Types A and C max.	Type B max.
12	0 to +0,6	—	0,30	—
19	0 to +0,9	0 to +1,5	0,75	0,25
25	0 to +1,2	0 to +1,5	0,90	0,35
33	0 to +1,6	0 to +2,0	1,00	0,50

5.2 Length and tolerances on length

The total length of hose supplied shall be in accordance with the purchaser's requirements and shall be stated in metres. Tolerance on length shall be in accordance with ISO 1307.

5.3 Concentricity

When tested in accordance with ISO 4671:2007, 8.3 (Method 2), the variation from concentricity measured between inside and outside diameters shall not exceed the following values:

Types A and C 1,5 mm

Type B 0,4 mm

6 Performance requirements of finished hose

6.1 Hydrostatic requirements

6.1.1 Deformation under maximum working pressure

The dimensional stability of the hose, when tested in accordance with ISO 1402, shall conform to the requirements given in Table 4. The length of the test piece shall be 1 m.

For category I hoses, the initial test pressure shall be 0,07 MPa and the final test pressure shall be 1,5 MPa. For category II hoses, the initial test pressure shall be 0,07 MPa and the final test pressure shall be 4,0 MPa.

The twist shall be no greater than 30° m^{-1} for types A and C. For type B, the twist may be greater than 30° m^{-1} but in this case it shall only be in a direction which closes the coupling and shall be stated in the test report.

Table 4 — Change in length and external diameter

	Tolerances for types A, B and C %
Change in length	0 to +7,5
Change in external diameter	0 to +7,5

NOTE Hose with a lower maximum change in length can be agreed between the purchaser and manufacturer.

6.1.2 Deformation under proof pressure

A proof pressure hold test shall be carried out on three hose lengths each of 1 m in accordance with ISO 1402. The proof pressure shall be as given in Table 2 and, on examination during the test, the test pieces shall not show any evidence of leakage, cracking, abrupt distortion or other signs of failure.

6.1.3 Minimum burst pressure

A burst pressure test shall be carried out in accordance with ISO 1402 on the three test pieces used for the deformation under proof pressure test, until the hose bursts.

None of the test pieces shall burst at a pressure less than that given in Table 2.

6.1.4 Kink pressure

When tested in accordance with Annex A, the test piece shall neither burst nor show any visible signs of defect before or after pressurizing at 1,5 MPa for category I hoses and at 4,0 MPa for category II hoses.

6.2 Adhesion

When tested in accordance with Annex H the adhesion between all components shall be not less than 1,5 kN/m for type A hoses, 1,0 kN/m for type B hoses and 2,0 kN/m for type C hoses.

6.3 Accelerated ageing

When tested in accordance with Annex B, the three test pieces subjected to the burst pressure test shall conform to the requirements of 6.1.3. The mean of the burst pressure test results shall not decrease by more than 25 % from the initial mean burst value determined from the results obtained in 6.1.3.

The resultant adhesion of the fourth test piece shall be in accordance with the requirements of 6.2.

NOTE There is no limitation on the increase in the values of these properties.

6.4 Abrasion resistance

6.4.1 General

Abrasion tests are specific to different hose constructions and/or materials. Two procedures with different values are therefore specified here to avoid unfair discrimination. In addition, it is important to note that the requirements, revolutions as given in Table 5 and double strokes as given in Table 6, cannot be correlated.

6.4.2 Abrasion resistance of class 5 and class 6 hoses

When tested in accordance with Annex C and using the number of revolutions given in Table 5, at least four of the five test pieces shall not burst on being subjected to the normal working pressure given in Table 2.

Table 5 — Abrasion resistance of uncovered hose (classes 5 and 6)

Inside diameter mm	Number of revolutions
12, 19, 25 and 33	300

6.4.3 Abrasion resistance of classes 1, 2, 3 and 4 hoses

When tested in accordance with Annex D, the average number of double strokes completed before burst shall be not less than that given in Table 6.

Table 6 — Abrasion resistance of covered hose (classes 1, 2, 3 and 4)

Inside diameter mm	Minimum number of double strokes before burst
12, 19, 25 and 33	300

6.5 Low temperature flexibility

The test shall be carried out in accordance with ISO 10619-2:2011, Clause 5 (Method B) using a mandrel of outside diameter equal to 12 × the inside diameter of the hose. After bending the hose round the mandrel through 180° for (10 ± 2) s at a temperature of (–20 ± 2) °C, or lower if requested, it shall not show any signs of breaking or cracking and shall meet the proof pressure requirement given in Table 2.

6.6 Hot surface resistance

When tested in accordance with Annex E at a test temperature of (300 ± 10) °C for types A and B and of (400 ± 10) °C for type C, in none of the four tests shall the test piece show signs of leakage within 60 s of the application of the filament rod or on removal of this filament rod after the specified period.

6.7 Ozone resistance

After carrying out an ozone resistance test in accordance with ISO 7326:2006, 8.1 (Method 1) for all inside diameter sizes and types, the hose lining and cover shall not show any signs of cracking. The lining shall be examined by slitting the hose wall.

6.8 Bending and crush resistance

When tested in accordance with Annex F at a temperature of (23 ± 2) °C, the ratio *T*:*D* shall not exceed 1,20.

6.9 UV resistance (xenon arc lamp)

NOTE A test for resistance to UV and requirements based on ISO 30013 will be added at next revision of this part of ISO 4642, when more experience has been acquired.

6.10 Loss in mass on heating

When tested in accordance with ISO 176:2005, 6.2 (Method B), the lining and cover materials shall not show a loss in mass greater than 4 %.

6.11 Deformation under crushing (type C only)

When tested in accordance with Annex G, the test piece shall allow the free passage of a ball of the diameter specified in Table 7.

Table 7 — Deformation under crushing

Inside diameter mm	Crush dimension, outside diameter mm	Minimum force N	Ball diameter mm
12	6	500	10
19	9,5	500	16
25	12,5	500	21
33	16	500	27

6.12 Hose assemblies

In some circumstances it is not the manufacturer who supplies the hose complete with couplings attached. In this case, the purchaser should be aware that this is outside the scope of this part of ISO 4642 and should ensure by other means that the security of the hose assembly has been tested.

Where the hose couplings are fitted by the hose manufacturer, the security of the hose assembly shall be tested in accordance with Annex I, by the manufacturer, before delivery to the purchaser. There shall be no sign of leakage or movement of the hose from the coupling.

The hose manufacturer should fit hose couplings that conform to any relevant national standards or legal requirements of the country of use.

7 Frequency of testing

Type testing and routine testing and the minimum frequency of such tests shall be as specified in Annex J.

Type tests are those tests carried out in order to obtain product approval.

Routine tests are those carried out on each length of hose or hose assembly.

