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# INTERNATIONAL STANDARD



# 4642

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Rubber products — Hoses, non-collapsible, for fire-fighting service

*Produits en caoutchouc — Tuyaux d'incendie non aplatissables*

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**Descriptors** : fire equipment, fire hoses, rubber products, hoses, specifications, dimensions, dimensional tolerances, tests, hydrostatic tests, destructive tests, mechanical tests, thermal tests, gas resistance tests, marking.

## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4642 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*, and was circulated to the member bodies in December 1976.

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It has been approved by the member bodies of the following countries :

Australia	Italy	Sri Lanka
Austria	Mexico	Sweden
Belgium	Netherlands	Thailand
Brazil	New Zealand	Turkey
Bulgaria	Philippines	U.S.A.
Canada	Poland	Yugoslavia
Germany, F.R.	Romania	
Hungary	South Africa, Rep. of	
India	Spain	

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The member body of the following country expressed disapproval of the document on technical grounds :

France

# Rubber products – Hoses, non-collapsible, for fire-fighting service

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### 1 SCOPE AND FIELD OF APPLICATION

This International Standard covers requirements for two types and five grades of rubber hoses, as listed below, suitable for use on portable and wheeled fire extinguishers on wall-mounted fire hose reels and as booster hoses on fire apparatus.

#### TYPES

Type 1 – Standard hoses, not for use on dry chemical type fire extinguishers where the chemical will reach temperatures below  $-30^{\circ}\text{C}$ .

Type 2 – Low temperature hoses, for dry chemical type fire extinguishers where the chemical may reach temperatures below  $-30^{\circ}\text{C}$ . The hoses may be electrically conductive as agreed between user and manufacturer. They may also require a special low temperature flexibility test at  $-55^{\circ}\text{C}$ .

#### GRADES

Grade A – working pressure, 9,0 MPa (90 bar)

Grade B – working pressure, 7,1 MPa (71 bar)

Grade C – working pressure, 5,6 MPa (56 bar)

Grade D – working pressure, 2,8 MPa (28 bar)

Grade E – working pressure, 1,4 MPa (14 bar)

### 2 REFERENCES

ISO/R 36, *Determination of the adhesion strength of vulcanized rubbers to textile fabrics.*

ISO 37, *Rubber, vulcanized – Determination of tensile stress-strain properties.*

ISO 188, *Rubber, vulcanized – Accelerated ageing or heat resistance tests.*

ISO 1402, *Rubber hose – Hydrostatic testing.*

ISO 1431, *Vulcanized rubbers – Determination of resistance to ozone cracking under static conditions.*

ISO 4672, *Rubber products – Hoses – Low temperature flexibility tests.*

### 3 CONSTRUCTION

#### 3.1 Lining

The lining shall consist of a natural or synthetic rubber complying with the requirements of 4.2, 5.2.7 and 5.2.8. For type 2 hoses it shall meet the requirement of 5.2.10.

#### 3.2 Reinforcement

The reinforcement shall consist of layers of suitable materials.

#### 3.3 Cover

The cover shall consist of natural or synthetic rubber complying with the requirements of 4.2, 5.2.7, 5.2.8 and 5.2.9. For type 2 hoses it shall meet the requirement of 5.2.10.

4 DIMENSIONS

4.1 Nominal bore and tolerances

The hoses shall comply with the appropriate dimensions and tolerance of table 1.

TABLE 1 – Dimensions

Values in millimetres

Nominal bore	Tolerance
10	± 0,75
12,5	± 0,75
16	± 0,75
20	± 0,75
25	± 1,25
31,5	± 1,25

4.2 Thickness of lining and cover

When measured in accordance with the method of annex A, the minimum thickness of the lining and the cover shall be 1,50 mm and 1,25 mm respectively.

5 PHYSICAL TESTS AND REQUIREMENTS

5.1 Non-destructive test on full length of hose (Hydrostatic proof test)

The hose shall show no leakage or other signs of weakness when tested in accordance with ISO 1402 at the proof pressure values shown in table 2.

TABLE 2 – Pressure requirements

Hose grade	Proof pressure	Minimum bursting pressure	Change in length at working pressure	Kink pressure
	MPa (bar)	MPa (bar)	%	
A	18,0 (180)	36,0 (360)	- 2 to + 4	—
B	14,2 (142)	28,4 (284)	- 2 to + 4	—
C	11,2 (112)	22,4 (224)	- 2 to + 4	—
D	5,6 (56)	11,2 (112)	—	3,4 (34)
E	2,8 (28)	5,6 (56)	—	1,7 (17)

5.2 Destructive tests

These tests shall be carried out on test pieces cut from a length of hose, but if this is not possible specially prepared test slabs shall be used.

5.2.1 Hydrostatic burst

When tested in accordance with ISO 1402, the hose shall not burst or leak at pressures below the minimum bursting pressure values shown in table 2.

5.2.2 Change in length (grades A, B and C only)

When tested in accordance with ISO 1402 but at working pressure not at proof pressure the hose shall meet the change in length requirements of table 2.

5.2.3 Twist

Hose with a nominal bore of 20 mm or larger shall not twist more than 0,5 radians\* per metre in a direction such as to loosen couplings when tested in accordance with ISO 1402.

5.2.4 Kink (grades D and E only)

When tested in accordance with the method of annex B the hose shall not burst or show signs of leakage at the appropriate pressure shown in table 2.

5.2.5 Low temperature resistance (type 2 only)

The hose shall develop no cracks or breaks when tested in accordance with the method of ISO 4672 at -40 °C, or -55 °C if so specified, using mandrels of diameter equal to ten times the outside diameter of the hose.

5.2.6 Adhesion

When tested in accordance with ISO/R 36, the adhesion between the hose components shall meet the appropriate levels given in table 3.

TABLE 3 – Minimum adhesion

Hose components	Adhesion kN/m
Lining to reinforcement	1,5
Reinforcement to reinforcement	2,0
Cover to reinforcement	1,5

\* 1 rad = 57,3°

**5.2.7 Tensile strength and elongation at break**

The tensile stress-strain properties of the rubber lining and cover, when tested in accordance with ISO 37, shall give a tensile strength and elongation at break of not less than the values given in table 4.

TABLE 4 – Tensile strength and elongation at break

Hose component	Tensile strength MPa	Elongation at break %
Lining	5	200
Cover	7	250

**5.2.8 Accelerated ageing**

After ageing as described in ISO 188 for 72  $\frac{0}{2}$  h at 100 °C, the properties of the lining and cover of the hose shall not be reduced by more than the values given in table 5.

TABLE 5 – Change in properties after ageing

Property	Lining	Cover
Change in tensile strength as % of initial value max.	– 25	– 25
Change in elongation at break as % of initial value max.	– 50	– 50

**5.2.9 Ozone resistance**

When tested in accordance with the method of annex C, the cover shall show no cracks at 2 × magnification.

**5.2.10 Electrical conductivity (type 2 only)**

The electrical conductivity of the hose shall be as agreed between the user and manufacturer.

**6 MARKING**

When required by the user, the marking shall consist of the following minimum data :

- a) the number of this International Standard;
- b) name or trade mark of manufacturer;
- c) fire reel hose (or fire extinguisher);
- d) type and working pressure;
- e) quarter and year of manufacture.

**7 ORDERING**

The grade and type of hose shall be clearly stated on all documents

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ANNEX A

DETERMINATION OF COVER AND LINING THICKNESSES

A.1 APPARATUS

**Micrometer**, graduated in divisions of 0,025 mm and having a presser foot  $6,3 \pm 0,25$  mm in diameter and exerting a total force of  $850 \pm 28$  mN.

A.2 PROCEDURE

A.2.1 Preparation of test piece

Remove a convenient size sample of lining or cover from the hose.

Divide the sample into two equal test pieces and buff one test piece just sufficiently to remove the impression caused by the reinforcement.

A.2.2 Test method

Measure the thickness of the two test pieces using the micrometer. Report the average of the measurements.

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ANNEX B  
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KINK TEST

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Fill the hose with water with a valve open and elevate the hose at the dead end. After all the air has been expelled, close the valve and kink the hose 450 mm from the coupling by tying the coupling back against the hose so that there is a sharp kink. Raise the pressure to the kink pressure specified in table 2 and examine the hose for signs of leakage.

ANNEX C

OZONE TEST

Prepare a sample of the cover and allow it to rest for 24 h in an ozone-free atmosphere prior to the test. The test shall consist of 24 h exposure at  $40 \text{ }^\circ\text{C}$  to an ozone concentration of  $(5 \pm 0,5) 10^{-7}$  (V/V) (50  $\pm$  5 ppm) at 20 % elongation in accordance with the method described in ISO 1431. After the 24 h exposure, examine the test piece at  $2 \times$  magnification for evidence of cracking.

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