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**Rubber hoses, textile-reinforced, for  
compressed air — Specification**

*Tuyaux en caoutchouc renforcés textile pour l'air comprimé —  
Spécifications*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 2398 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

This fifth edition cancels and replaces the fourth edition (ISO 2398:1995), which has been technically revised.

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# Rubber hoses, textile-reinforced, for compressed air — Specification

**WARNING** — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to ensure compliance with any national regulatory conditions.

## 1 Scope

This International Standard specifies the requirements for three types, three classes and two categories of textile-reinforced rubber hose for compressed air, up to a maximum working pressure of 25 bar<sup>1)</sup> with an operating-temperature range of – 40 °C to + 70 °C, depending on the type and category.

## 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.

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 1307, *Rubber and plastics hoses — Hose sizes, minimum and maximum inside diameters and tolerances on cut lengths*

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

ISO 1746:1998, *Rubber or plastics hoses and tubing — Bending tests*

ISO 1817, *Rubber, vulcanized — Determination of the effects of liquids*

ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of dimensions*

ISO 4672:1997, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests*

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

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

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

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1) 1 bar = 0,1 MPa

### 3 Terms and definitions

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

### 4 Classification

Hoses are designated as one of the following types, depending on their pressure rating:

- Type 1:** Low pressure — Designed for a maximum working pressure of 10 bar
- Type 2:** Medium pressure — Designed for a maximum working pressure of 16 bar
- Type 3:** High pressure — Designed for a maximum working pressure of 25 bar

These types can be sub-divided into three classes depending on their oil resistance:

- Class A** Non-oil-resistant
- Class B** Nominal oil resistance
- Class C** Good oil resistance

The types and classes above can also be further sub-divided into two categories, depending on their operating-temperature range:

- Category N-T** (Normal Temperature)  $-25\text{ °C to }+70\text{ °C}$
- Category L-T** (Low Temperature)  $-40\text{ °C to }+70\text{ °C}$

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### 5 Materials and construction

The hose shall consist of:

- a rubber lining;
- a reinforcement of natural or synthetic textile, applied by any suitable technique;
- a rubber cover.

The lining and cover shall be of uniform thickness, concentric to comply with the minimum thickness specified, and free from holes, porosity and other defects. The cover finish may be smooth or fabric-marked.

### 6 Dimensions

#### 6.1 Internal diameters and tolerances

When measured in accordance with ISO 4671 the internal diameters and their tolerances shall conform to the values specified in Table 1.

Table 1 — Minimum and maximum internal diameters

Hose size	Minimum internal diameter	Maximum internal diameter
	mm	mm
4	3,25	4,75
5	4,25	5,75
6,3	5,55	7,05
8	7,25	8,75
10	9,25	10,75
12,5	11,75	13,25
16	15,25	16,75
19	18,25	19,75
20	19,25	20,75
25	23,75	26,25
31,5	30,25	32,75
38	36,50	39,50
40	38,50	41,50
51	49,50	52,50
63	61,50	64,50
76	74,50	77,50
80	78,00	82,00
100	98,00	102,00
102	100,00	104,00

## 6.2 Concentricity

When determined in accordance with ISO 4671, the concentricity, based on a total indicator reading between the internal diameter and the outside surface of the cover, shall be no greater than 1,0 mm for hoses of internal diameter up to and including 76 mm, and no greater than 1,5 mm for hoses of inside diameter greater than 76 mm.

## 6.3 Tolerance on length

The tolerance on cut lengths shall be as specified in ISO 1307, the length being measured in accordance with ISO 4671.

## 6.4 Minimum thickness of lining and cover

When measured in accordance with ISO 4671, the minimum thickness of the lining and cover shall be as follows:

- Type 1** lining 1,0 mm  
cover 1,5 mm
- Type 2** lining 1,5 mm  
cover 2,0 mm
- Type 3** lining 2,0 mm  
cover 2,5 mm

## 7 Physical properties

### 7.1 Rubber compounds

When determined by the methods listed in Table 2, the physical properties of the compounds used for the lining and cover shall conform to the values specified in Table 2.

Tests shall be carried out either on samples taken from the hose or from separately vulcanized sheets, 2 mm in thickness and vulcanized to the same cure state as the production hoses.

**Table 2 — Physical properties of rubber compounds**

Property	Requirement		Test method
	Lining	Cover	
Minimum tensile strength	7,0 MPa	7,0 MPa	ISO 37 (dumb-bell test piece)
Minimum elongation at break	250 %	250 %	ISO 37 (dumb-bell test piece)
<b>Resistance to ageing</b>			
Change in tensile strength from original value (max.)	± 25 %	± 25 %	ISO 188 (3 days at 100 °C ± 1 °C), air-oven method
Change in elongation at break from original value (max.)	± 50 %	± 50 %	ISO 37 (dumb-bell test piece)
<b>Resistance to liquids</b>			
Increase in volume (class A)	N/A	N/A	—
Increase in volume (max.) (class B only)	115 % No shrinkage allowed	N/A	ISO 1817 (72 h at 70 °C ± 2 °C in oil No. 3), gravimetric method
Increase in volume (max.) (class C only)	30 % No shrinkage allowed	75 % No shrinkage allowed	ISO 1817 (72 h at 70 °C ± 2 °C in oil No. 3), gravimetric method



## 7.2 Finished hose

When determined by the methods listed in Table 3, the physical properties of the finished hose shall conform to the values specified in Table 3.

**Table 3 — Physical properties of finished hose**

Property	Requirement	Test method
Proof pressure	20 bar (type 1) 32 bar (type 2) 50 bar (type 3)	ISO 1402
Change in length at maximum working pressure	± 5 %	ISO 1402
Change in diameter at maximum working pressure	± 5 %	ISO 1402
Minimum burst pressure	40 bar (type 1) 64 bar (type 2) 100 bar (type 3)	ISO 1402
Adhesion between components	2,0 kN/m (min.)	ISO 8033
Ozone resistance	No cracking observed under × 2 magnification	ISO 7326:1991 method 1 (up to 25 mm id) method 2 or 3 for other sizes
Flexibility at 23 °C	<i>T/D</i> not less than 0,8	ISO 1746:1998, method A
Low-temperature flexibility	No cracks and shall pass the proof test specified above	ISO 4672:1997, method B Category N-T at – 25 °C ± 2 °C Category L-T at – 40 °C ± 2 °C

## 8 Marking

The hose shall be continuously and durably marked with the following minimum information:

- manufacturer's name or identification;
- number and year of publication of this International Standard (ISO 2398:2006);
- hose type and class;
- category, if low-temperature (L-T);
- internal diameter, in mm;
- maximum working pressure, in bars;
- date of manufacture, by giving the quarter and year of manufacture or using another suitable date code.

EXAMPLE      MAN/ISO 2398:2006/2B/L-T/25 mm/16 bar/2Q06.