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Rubber hoses for agricultural spraying

Tuyaux en caoutchouc pour pulvérisation agricole

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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 3.

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.

International Standard ISO 1401 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

This third edition cancels and replaces the second edition (ISO 1401:1987), which has been technically revised.

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Rubber hoses for agricultural spraying

1 Scope

This International Standard specifies requirements for three types of flexible rubber hose for pressure spraying of agropharmaceutical and/or fertilizer products within a temperature range of $-10\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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 471, *Rubber — Temperatures, humidities and times for conditioning and testing.*

ISO 1307, *Rubber and plastics hoses for general-purpose industrial applications — Bore diameters and tolerances, and tolerances on length.*

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

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

ISO 1817, *Rubber, vulcanized — Determination of the effect of liquids.*

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

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

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

3 Classification

Three types of hose are specified as follows:

- type A: Maximum working pressure of 1,0 MPa (10 bar);
- type B: Maximum working pressure of 4,0 MPa (40 bar);
- type C: Maximum working pressure of 6,0 MPa (60 bar)

4 Construction and materials

The hose shall consist of the following:

- a synthetic rubber lining;
- a reinforcement of one or more layers of textile fibres;
- a cover of natural or synthetic rubber.

5 Dimensions and tolerances

5.1 Nominal bore and internal diameter

The dimensions of the hose shall be in accordance with the internal diameter and tolerances given in Table 1, in accordance with ISO 1307.

Table 1 — Nominal bores, diameters and tolerances

Dimensions in millimetres

Nominal bore diameter	Internal diameter	Tolerance
6,3	6,3	$\pm 0,75$
8	8	$\pm 0,75$
10	10	$\pm 0,75$
12,5	12,5	$\pm 0,75$
16	16	$\pm 0,75$
20	20	$\pm 0,75$
25	25	$\pm 1,25$

5.2 Length

The tolerance on lengths shall be as specified in ISO 1307.

5.3 Minimum thickness of lining and cover

5.3.1 Types A and B

When tested in accordance with ISO 4671, the lining shall have a minimum thickness of 1,6 mm and the cover shall have a minimum thickness of 1,0 mm.

5.3.2 Type C

When tested in accordance with ISO 4671, the lining shall have a minimum thickness of 2,0 mm and the cover shall have a minimum thickness of 1,6 mm.

6 Physical requirements on samples taken from the hose or from moulded sheets of equivalent vulcanization

6.1 Tensile strength and elongation at break of rubber lining and cover

When determined in accordance with ISO 37, the tensile strength and elongation at break shall be no less than the values given in Table 2.

Table 2 — Tensile strength and elongation at break

Hose component	Tensile strength MPa	Elongation at break %
Lining	7,0	200
Cover	7,0	250

6.2 Requirements after immersion in fluid

When tested in accordance with ISO 1817, after immersion for $72 \text{ h} \pm 2 \text{ h}$ in a suitable reference liquid, dependent upon the agropharmaceutical/fertilizer product the hose is designed to convey and as agreed by the purchaser, at standard laboratory temperature (see ISO 471), the lining and cover shall conform to the values given in Table 3.

Table 3 — Requirements after immersion in reference fluid

Property	Requirement
Volume	Maximum increase 55 %
Tensile strength	Maximum reduction 50 %
Elongation at break	Maximum reduction 40 %

6.3 Accelerated ageing

After ageing the hose in air for three days at $100 \text{ °C} \pm 2 \text{ °C}$, as specified in ISO 188, the tensile strength and elongation at break as determined by ISO 37 shall decrease by no more than 25 % and 50 % respectively from their initial values.

7 Physical requirements on finished hoses

7.1 Change in dimensions

When the hose is tested at proof pressure in accordance with ISO 1402, the changes in outside diameter and length shall be no greater than $\pm 7 \text{ %}$ and there shall be no leaks or other signs of damage.

7.2 Hydrostatic requirements

7.2.1 Hydrostatic pressure

When tested in accordance with ISO 1402, the hose shall meet the requirements given in Table 4.

Table 4 — Hydrostatic pressure requirements

Hose type	Working pressure		Proof pressure		Minimum bursting pressure	
	MPa	bar	MPa	bar	MPa	bar
A	1	10	2	20	4	40
B	4	40	8	80	16	160
C	6	60	12	120	24	240

7.2.2 Hydrostatic testing after ageing in liquid

A 1 m length of hose shall be filled with the liquid to be used in the hose and aged for two weeks at standard laboratory temperature (see ISO 471). After ageing, the hose shall be drained and hydrostatically tested after 1 h in accordance with ISO 1402. The hose shall meet the requirements given in Table 4.

7.3 Bending-test requirements

When determined in accordance with ISO 1746 using a minimum radius of curvature of 10 times the nominal bore, the value of the ratio of hose outside dimension, during bending, to the original outside diameter, T/D , shall be a minimum of 0,80.

7.4 Adhesion

When determined in accordance with ISO 8033, the adhesion between the various components shall be no less than 1,5 kN/m.

7.5 Resistance to ozone

When tested in accordance with ISO 7326:1991, method 1, the test piece shall show no signs of cracking.

8 Marking

Each length of hose shall be clearly and durably marked, at least every 1 m, with at least the following information:

- the manufacturer's name or identification;
- the number of this International Standard;
- the hose type;
- the nominal bore;
- the maximum working pressure in MPa;
- the quarter and year of manufacture (e.g. 3Q99).