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Agricultural irrigation equipment — Thermoplastic collapsible hoses for irrigation — Specifications and test methods

Matériel agricole d'irrigation — Tuyaux écrasables en matières thermoplastiques pour l'irrigation — Spécifications et méthodes d'essai

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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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 18, *Irrigation and drainage equipment and systems*.

This second edition cancels and replaces the first edition (ISO 16438:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

— PVC layflat hoses are excluded from this document;

— some definitions have been updated;

— some changes in pressure tests parameters and procedure have been applied;

— marking the word "irrigation" became optional.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Thermoplastic collapsible hoses have been introduced to agricultural irrigation projects in recent years, as headers supplying drip tape systems or as replacement for gated pipes.

Thermoplastic collapsible hoses for irrigation are a special type of hoses. They have a unique combination of attributes and requirements which must be well specified and controlled, but are not covered by any other International Standard:

— equal and accurate spacing of multiple water outlet connections along their length;

— low elongation and amount of twist while under pressure;

— resistance to most fertilizers and other chemicals employed in irrigation;

— protection against degradation by UV radiation;

— impermeability of wall to incident light;

— information of pressure loss data.

This document is intended to cover all those aspects, by specifying the requirements and the applicable test methods.

Agricultural irrigation equipment — Thermoplastic collapsible hoses for irrigation — Specifications and test methods

1 Scope

This document specifies requirements and test methods for reinforced and non-reinforced thermoplastic collapsible hoses, intended to be used as main and sub-main supply lines for the conveyance and distribution of water for irrigation, at water temperatures up to 50 °C. PVC layflat hoses are excluded from this document.

It is applicable to irrigation hoses with nominal diameters between 40 mm and 500 mm and working pressures between 0,3 bar (30 kPa) and 6 bar (600 kPa).

This document is applicable to two types of hose configurations, with or without outlet connections (see Clause 4).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1402:2021, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

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

ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 7686, *Plastics pipes and fittings — Determination of opacity*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
hose
flexible tube used for conveying water under pressure

3.2
collapsible hose
hose (3.1) which, when not under internal pressure, collapses to such an extent that the inner faces of the bore almost touch or make contact and the hose cross-section appears flat

[SOURCE: ISO 8330:2014, 2.1.62, modified — The definition has been modified.]

3.3
reinforced hose
hose (3.1) which has a reinforcing layer or other reinforcing component incorporated in its wall

3.4
non-reinforced hose
hose (3.1) which has no reinforcing layer or component incorporated

3.5
irrigation lateral
branch supply line within an irrigation system on which water distribution devices are mounted directly or by means of fittings, risers, or tubes

Note 1 to entry: Examples of water distribution devices are sprinklers, emitters, and drippers.

[SOURCE: ISO 8779:2020, 3.2]

3.6
water outlet connection
connection points for *irrigation laterals* (3.5) in hose wall, equally or non-equally spaced along its length

3.7
maximum operating pressure
MOP
highest water pressure in a hose recommended by the manufacturer to ensure proper operation

3.8
nominal diameter
numerical designation used to refer to the size of the hose, approximately equal to the actual internal or external diameter of the hose

3.9
twisting
angular deflection of a hose, created when pressurized, by rotation of one of its ends relative to its other end

3.10
warping
deviation of a hose centreline from straight when pressurized

[SOURCE: ISO 8330:2014, 2.1.146, modified — The second half of the definition has been omitted.]

4 Classification

Hoses are classified as one of the following two types:

a) Plain hose – hose without any outlets;

b) Distributor hose – hose having multiple water outlet connections along its length.

5 Material

The hoses shall be made of thermoplastic materials.

The hoses shall be opaque and protected against degradation by solar (UV) radiation and other environmental effects. They shall be resistant to most fertilizers and other chemicals commonly employed in agricultural irrigation.

6 Marking

Each hose shall bear clear and durable marking, repeated at intervals of not more than 10 m, including the following details:

a) the manufacturer's name or trademark;

b) (optional) the word IRRIGATION;

e) nominal diameter;

f) maximum operating pressure;

g) production year and month, or a substitute code;

h) the number of this document: ISO 16438;

i) (optional) outlet connection spacing – if applicable.

7 Dimensions

7.1 Inside diameter

When measured in accordance with ISO 4671, the inside diameter of a hose shall not deviate by more than ±2 % from the inside diameter declared by the manufacturer.

7.2 Length

The total length of hose supplied, when measured at ambient temperature in straight, uncoiled condition, shall not be less than the length declared by the manufacturer.

7.3 Spacing of outlet connections

This test applies to distributor hoses with equally-spaced outlet connections.

Measure the spacing (distance between centres) of five consecutive outlet connections to the nearest 1 mm.

The actual spacing shall not deviate by more than ±5 % from the spacing declared by the manufacturer and the absolute value of the sum of all signed (+ or –) deviations, shall not exceed 5 %.

8 Fittings

For each size of hose, the manufacturer shall assure that suitable fittings are available to make secure connections between hoses and between hose and common water sources.

The fittings shall be watertight and withstand the maximum operating pressure of the hoses to which they are connected.

9 Hydrostatic and hydraulic characteristics

9.1 Proof pressure test

Perform the test in accordance with ISO 1402:2021, 8.1, for 1 h and at a water temperature of 50 °C. Sample length, excluding end fittings, shall be at least 600 mm. Allow the sample to stabilize at the test temperature for 60 minutes before testing. Test pressure shall be as indicated in Table 1.

Table 1 — Proof test pressure

Maximum operating pressure of hose MOP bar	Test pressure bar
from 0,3 up to 6,0	1,5 x MOP

While testing distributor hose ensure that the test piece includes at least one outlet, which is sealed according to the hose manufacturer's instructions.

The test piece shall not show any evidence of leakage, cracking, delamination, abrupt distortion, or other signs of failure at the hose wall or, for distributor type hose, at any of the outlets.

9.2 Deformation under pressure and after relaxation

Use a new sample. Sample length, excluding end fittings, shall be at least 600 mm. Prepare the test piece in accordance with ISO 1402:2021, 8.2.1.1, pressurizing it to 15 % of the hose MOP.

Perform the test in accordance with the rest of the instructions in ISO 1402:2021, 8.2 for 1 h and at a water temperature of 50 °C. Allow the sample to stabilize at the test temperature for 60 min before testing. Use a test pressure equal to the MOP of the hose.

At the end of one hour, while still under pressure, the following requirements shall apply:

— the measured change in length shall not exceed +1 %;

— for distributor type hose, the measured amount of twisting shall not exceed 0,1 °/m.

One hour after the complete removal of pressure, the following requirements shall apply:

— the remaining change in length from start of the test shall not exceed +0,8 %;

— the remaining change in diameter from start of the test shall not exceed +2,5 %.

9.3 Warping

Perform the test in accordance with ISO 1402:2021, 8.2.5, using water at 23 °C. Sample length shall be not less than 20 m. Use a test pressure equal to the MOP of the hose. Wait 5 min from application of pressure before making the measurement.

The measured amount of warping shall not exceed 5 mm per 1 m length.

9.4 Head loss

The head loss of the hoses shall be determined by the manufacturer, optionally using the calculation method given in ISO/TR 10501, and be reported in the manufacturer's documentation.

10 Physical characteristics

10.1 Opacity

When tested in accordance with ISO 7686, the percentage of incident light energy transmitted through the hose wall shall not exceed 0,2 %.

10.2 UV resistance

Perform the test in accordance with ISO 4892-3 for 1 500 h, using a cycle of 8 h UVB radiation at 60 °C followed by 4 h condensation at 50 °C. The hose shall not show signs of cracks or other defects rendering it unserviceable.