
**Rubber hoses and hose assemblies —
Textile-reinforced hydraulic types
for oil-based or water-based fluids —
Specification**

*Tuyaux et flexibles en caoutchouc — Types hydrauliques avec
armature de textile pour fluides à base d'huile ou à base d'eau —
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.

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 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This sixth edition cancels and replaces the fifth edition (ISO 4079:2017), which has been technically revised.

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

- the temperature of water and water-based fluids has been increased from +60 °C to +70 °C in [Clause 1](#);
- definitions of [Table 1](#), [Table 2](#) and [Table 3](#) have been updated;
- [Table 1](#) has been split into [Table 1](#) and [Table 2](#); all following tables and references have been renumbered;
- [Table 1](#) and [Table 2](#) have been updated with dimensions from EN 853;
- the proof pressure, the minimum burst pressure and the maximum working pressure have been updated in [Tables 3, 4](#) and [5](#);
- the temperature of water and water-based fluids has been changed from +60 °C to +70 °C in [7.4.2](#) and [7.10.3](#);
- “oil No. 3” has been changed to “IRM 903 oil” in [7.10.2](#);
- some of the marking requirements have been revised in [Clause 9](#).

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.

Rubber hoses and hose assemblies — Textile-reinforced hydraulic types for oil-based or water-based fluids — Specification

1 Scope

This document specifies requirements for five types of textile-reinforced hydraulic hoses and hose assemblies of nominal size from 5 to 100.

They are suitable for use with:

- oil-based hydraulic fluids HH, HL, HM, HR and HV as defined in ISO 6743-4 at temperatures ranging from $-40\text{ }^{\circ}\text{C}$ to $+100\text{ }^{\circ}\text{C}$;
- water-based fluids HFC, HFAC, HFAS and HFB as defined in ISO 6743-4 at temperatures ranging from $-40\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$;
- water at temperatures ranging from $0\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$.

This document does not include requirements for end fittings. It is limited to requirements for hoses and hose assemblies.

NOTE It is the responsibility of the user, in consultation with the hose manufacturer, to establish the compatibility of the hose with the fluid to be used.

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

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

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

ISO 6605, *Hydraulic fluid power — Test methods for hoses and hose assemblies*

ISO 6743-4, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*

ISO 6803, *Rubber or plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing*

ISO 7233, *Rubber and plastics hoses and hose assemblies — Determination of resistance to vacuum*

ISO 7326:2016, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

ISO 8033:2016, *Rubber and plastics hoses — Determination of adhesion between components*

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

ISO 10619-1:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

ISO 10619-2:2017, *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 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 <http://www.electropedia.org/>

4 Classification

Five types of hose are specified, distinguished by their construction, working pressure and minimum bend radius.

- Type 1TE: hoses with a single braid of textile reinforcement.
- Type 2TE: hoses with one or more braid(s) of textile reinforcement.
- Type 3TE: hoses with one or more braid(s) of textile reinforcement (higher working pressure).
- Type R3: hoses with two braids of textile reinforcement.
- Type R6: hoses with a single braid of textile reinforcement.

NOTE Type 1TE is not subjected to the impulse or vacuum resistance test. Type R3 is not subjected to the vacuum resistance test. Type R6 is not subjected to the impulse or vacuum resistance test.

5 Materials and construction

5.1 Hoses

Hoses shall consist of a rubber lining that is resistant to oil- or water-based hydraulic fluids or water, one or more layers of suitable textile yarn and a weather- and oil-resistant rubber cover.

Hoses shall be designed to enable end fittings to be assembled without removal of the cover.

5.2 Hose assemblies

Hose assemblies shall be manufactured using hoses conforming to the requirements of this document.

Hose assemblies shall be manufactured only with those hose fittings whose correct functioning has been verified in accordance with 7.2, 7.4, 7.5 and 7.6. The manufacturer's instructions shall be followed for the preparation and fabrication of hose assemblies.

6 Dimensions

6.1 Hose diameters and hose concentricity

When measured in accordance with ISO 4671, the inside and outside diameters of hoses shall conform to the values given in Table 1.

When measured in accordance with ISO 4671, the concentricity of hoses shall conform to the values given in Table 2.

Table 1 — Dimensions of hoses

Nominal size ^a	Inside diameter mm						Outside diameter mm									
	Types 1TE, 2TE, 3TE ^b		Type R6		Type R3		Type 1TE		Type 2TE		Type 3TE		Type R6		Type R3	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
5	4,9	5,2	4,2	5,4	4,5	5,4	10,0	11,6	11,0	12,6	12,0	13,6	10,3	11,9	11,9	13,5
6,3	6,4	6,9	5,6	7,2	6,1	7,0	11,6	13,2	12,6	14,2	13,6	15,2	11,9	13,5	13,5	15,1
8	7,9	8,4	7,2	8,8	7,6	8,5	13,1	14,7	14,1	15,7	16,1	17,7	13,5	15,1	16,7	18,3
10	9,5	10,0	8,7	10,3	9,2	10,1	14,7	16,3	15,7	17,3	17,7	19,3	15,1	16,7	18,3	19,8
12,5	12,7	13,3	11,9	13,5	12,4	13,5	17,7	19,7	18,7	20,7	20,7	22,7	19,0	20,6	23,0	24,6
16	15,8	16,5	15,1	16,7	15,6	16,7	21,9	23,9	22,9	24,9	24,9	26,9	22,2	23,8	26,2	27,8
19	18,8	19,8	18,3	19,9	18,7	19,8	—	—	26,0	28,0	28,0	30,0	25,4	27,8	31,0	32,5
25	25,4	26,2	—	—	25,1	26,2	—	—	32,9	35,9	34,4	37,4	—	—	36,9	39,3
31,5	31,8	32,8	—	—	31,4	32,9	—	—	—	—	40,8	43,8	—	—	42,9	46,0
38	38,1	39,1	—	—	—	—	—	—	—	—	47,6	51,6	—	—	—	—
51	50,6	51,8	—	—	—	—	—	—	—	—	60,3	64,3	—	—	—	—
60	59,6	61,2	—	—	—	—	—	—	—	—	70,0	74,0	—	—	—	—
80	79,6	81,2	—	—	—	—	—	—	—	—	91,5	96,5	—	—	—	—
100	99,4	101,4	—	—	—	—	—	—	—	—	113,5	118,5	—	—	—	—

^a The nominal sizes correspond to those given in ISO 1307.

^b Inside diameters apply to type 3TE only for hose sizes larger than 25.

Table 2 — Concentricity of hoses

Nominal size	Maximum variation in wall thickness between internal diameter and outside diameter mm
Up to and including 6,3	0,8
Greater than 6,3 and up to and including 25	1,0
Greater than 25	1,3

6.2 Length

The length of supplied hoses and hose assemblies shall be the subject of agreement between the manufacturer and the purchaser.

NOTE Recommendations for supplied lengths of hoses and hose assemblies are given in [Annex C](#).

7 Performance requirements

7.1 General

The requirements for type and routine testing are given in [Annex A](#). The recommendations for periodic testing are given in [Annex B](#).

7.2 Hydrostatic requirements

When tested in accordance with ISO 1402 or ISO 6605 at the relevant proof pressure given in [Table 3](#) and the relevant minimum burst pressure given in [Table 4](#), the hoses and hose assemblies shall not fail.

When tested in accordance with ISO 1402 or ISO 6605, the change in length of hoses at the maximum working pressure (see Table 5) shall not exceed +2 % or –4 % for hoses up to and including nominal size 31,5 and +5 % or 0 % for hoses above nominal size 31,5.

Table 3 — Proof pressure

Nominal size	Type 1TE MPa (bar)	Type 2TE MPa (bar)	Type 3TE MPa (bar)	Type R6 MPa (bar)	Type R3 MPa (bar)
5	5,0 (50)	16,0 (160)	32,0 (320)	7,0 (70)	21,0 (210)
6,3	5,0 (50)	15,0 (150)	29,0 (290)	5,6 (56)	17,5 (175)
8	4,0 (40)	13,6 (136)	26,0 (260)	5,6 (56)	16,8 (168)
10	4,0 (40)	12,6 (126)	22,0 (220)	5,6 (56)	15,6 (156)
12,5	3,2 (32)	11,6 (116)	18,6 (186)	5,6 (56)	14,0 (140)
16	3,2 (32)	10,0 (100)	16,0 (160)	4,8 (48)	12,2 (122)
19	—	9,0 (90)	14,0 (140)	4,2 (42)	10,5 (105)
25	—	8,0 (80)	11,0 (110)	—	7,8 (78)
31,5	—	—	9,0 (90)	—	5,2 (52)
38	—	—	8,0 (80)	—	—
51	—	—	6,6 (66)	—	—
60	—	—	5,0 (50)	—	—
80	—	—	3,6 (36)	—	—
100	—	—	2,0 (20)	—	—

Table 4 — Minimum burst pressure

Nominal size	Type 1TE MPa (bar)	Type 2TE MPa (bar)	Type 3TE MPa (bar)	Type R6 MPa (bar)	Type R3 MPa (bar)
5	10,0 (100)	32,0 (320)	64,0 (640)	14,0 (140)	42,0 (420)
6,3	10,0 (100)	30,0 (300)	58,0 (580)	11,2 (112)	35,0 (350)
8	8,0 (80)	27,2 (272)	52,0 (520)	11,2 (112)	33,6 (336)
10	8,0 (80)	25,2 (252)	44,0 (440)	11,2 (112)	31,2 (312)
12,5	6,4 (64)	23,2 (232)	37,2 (372)	11,2 (112)	28,0 (280)
16	6,4 (64)	20,0 (200)	32,0 (320)	9,6 (96)	24,4 (244)
19	—	18,0 (180)	28,0 (280)	8,4 (84)	21,0 (210)
25	—	16,0 (160)	22,0 (220)	—	15,6 (156)
31,5	—	—	18,0 (180)	—	10,5 (105)
38	—	—	16,0 (160)	—	—
51	—	—	13,2 (132)	—	—
60	—	—	10,0 (100)	—	—
80	—	—	7,2 (72)	—	—
100	—	—	4,0 (40)	—	—

Table 5 — Maximum working pressure

Nominal size	Type 1TE MPa (bar)	Type 2TE MPa (bar)	Type 3TE MPa (bar)	Type R6 MPa (bar)	Type R3 MPa (bar)
5	2,5 (25)	—	16,0 (160)	3,5 (35)	10,5 (105)
6,3	2,5 (25)	—	14,5 (145)	2,8 (28)	8,7 (87)
8	2,0 (20)	—	13,0 (130)	2,8 (28)	8,4 (84)

Table 5 (continued)

Nominal size	Type 1TE MPa (bar)	Type 2TE MPa (bar)	Type 3TE MPa (bar)	Type R6 MPa (bar)	Type R3 MPa (bar)
10	2,0 (20)	8,0 (80)	11,0 (110)	2,8 (28)	7,8 (78)
12,5	1,6 (16)	7,5 (75)	9,3 (93)	2,8 (28)	7,0 (70)
16	1,6 (16)	6,8 (68)	8,0 (80)	2,4 (24)	6,1 (61)
19	—	6,3 (63)	7,0 (70)	2,1 (21)	5,2 (52)
25	—	5,8 (58)	5,5 (55)	—	3,9 (39)
31,5	—	5,0 (50)	4,5 (45)	—	2,6 (26)
38	—	4,5 (45)	4,0 (40)	—	—
51	—	4,0 (40)	3,3 (33)	—	—
60	—	—	2,5 (25)	—	—
80	—	—	1,8 (18)	—	—
100	—	—	1,0 (10)	—	—

7.3 Minimum bend radius

For hose types 1TE and R6, use test pieces having a length at least four times the minimum bend radius. Measure the hose outside diameter with callipers in the straight-lay position before bending the hose. Bend the hose through 180° to the minimum bend radius (see Table 6) and measure the flatness with the callipers.

When the hose is bent to the minimum bend radius given in Table 6, measured in accordance with method A1 of ISO 10619-1:2017, Clause 4, the value of T/D, as defined in ISO 10619-1, shall be not less than 0,9.

For all other hose types, when bent to the minimum bend radius given in Table 6, measured in accordance with method A1 of ISO 10619-1:2017, Clause 4 the hose shall conform, in the bent state, to the impulse and low temperature flexibility requirements of 7.4 and 7.6.

Table 6 — Minimum bend radius

Nominal size	Minimum bend radius mm				
	Type 1TE	Type 2TE	Type 3TE	Type R6	Type R3
5	35	35	40	50	75
6,3	45	40	45	65	75
8	65	50	55	75	100
10	75	60	70	75	100
12,5	90	70	85	100	125
16	115	90	105	125	140
19	—	110	130	150	150
25	—	150	150	—	205
31,5	—	—	190	—	250
38	—	—	240	—	—
51	—	—	300	—	—
60	—	—	400	—	—
80	—	—	500	—	—
100	—	—	600	—	—

7.4 Resistance to impulse

There shall be no leakage or other evidence of failure before reaching the specified number of cycles.

This test shall be considered a destructive test, and the test piece shall be discarded after the test.

7.4.1 Oil-based fluid impulse test

The impulse test shall be performed on hose types 2TE, 3TE and R3 in accordance with ISO 6803 or ISO 6605, using oil-based hydraulic fluid as required by ISO 6803 or ISO 6605, at a fluid temperature of 100 °C.

The impulse test is not required for types 1TE and R6.

For type 2TE hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure, the hose shall withstand a minimum of 100 000 impulse cycles.

For type 3TE and R3 hoses, when tested at an impulse pressure equal to 133 % of the maximum working pressure for hoses of nominal size up to and including 25, or at 100 % of the maximum working pressure for hoses of nominal size greater than 25, the hose shall withstand a minimum of 200 000 impulse cycles.

There shall be no leakage or other evidence of failure before reaching the specified number of cycles.

This test shall be considered a destructive test, and the test piece shall be discarded after the test.

7.4.2 Water-based fluid impulse test

The impulse test shall be performed on hose types 2TE, 3TE and R3 in accordance with ISO 6803 or ISO 6605. The test fluid temperature shall be 70 °C. The test fluid shall be selected from HFC, HFGE, HFAS, and HFB as defined in ISO 6743-4.

The impulse test is not required for types 1TE and R6.

For type 2TE hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure, the hose shall withstand a minimum of 100 000 impulse cycles.

For type 3TE and R3 hoses, when tested at an impulse pressure equal to 133 % of the maximum working pressure for hoses of nominal size up to and including 25, or at 100 % of the maximum working pressure for hoses of nominal size greater than 25, the hose shall withstand a minimum of 200 000 impulse cycles.

The following test can be used as an option to maximize test efficiency by reducing the amount of testing needed:

- a) oven-age assemblies filled with one of the water-based fluids specified in 7.4.2 for 120 h at 70 °C;
- b) impulse-test the aged assemblies using an oil-based hydraulic fluid as specified in ISO 6803 or ISO 6605 at a temperature of 100 °C.

For type 2TE hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure, the hose shall withstand a minimum of 100 000 impulse cycles.

For type 3TE and R3 hoses, when tested at an impulse pressure equal to 133 % of the maximum working pressure for hoses of nominal size up to and including 25, or at 100 % of the maximum working pressure for hoses of nominal size greater than 25, the hose shall withstand a minimum of 200 000 impulse cycles.

There shall be no leakage or other evidence of failure before reaching the specified number of cycles.

This test shall be considered a destructive test, and the test piece shall be discarded after the test.

7.5 Leakage of hose assemblies

When tested in accordance with ISO 1402 or ISO 6605, there shall be no leakage or other evidence of failure. This test shall be considered a destructive test, and the test piece shall be discarded after the test.

7.6 Low temperature flexibility

When tested in accordance with method B of ISO 10619-2:2017, Clause 5 at a temperature of $-40\text{ }^{\circ}\text{C}$, there shall be no cracking of the lining or cover. The test piece shall not leak or crack when subjected to a proof pressure test in accordance with ISO 1402 or ISO 6605 after regaining ambient temperature.

7.7 Adhesion between components

When determined in accordance with ISO 8033, the adhesion for hose types 1TE, 2TE and 3TE shall be in accordance with Table 7. For hose types R3 and R6, the adhesion between lining and reinforcement and between cover and reinforcement shall not be less than 1,4 kN/m.

Test pieces shall be type 5 for lining and reinforcement and type 2 or type 6 or type 8 for cover and reinforcement as described in ISO 8033:2016, 6.1 and 6.3.

Table 7 — Minimum adhesion between components

Nominal size	Between lining and reinforcement kN/m	Between cover and reinforcement kN/m
Up to and including 8	1,5	2,0
Greater than 8	2,5	2,5

7.8 Vacuum resistance

When tested in accordance with ISO 7233, hoses and hose assemblies shall conform to the values given in Table 8.

Table 8 — Degree of vacuum

Type 2TE		Type 3TE	
Nominal size	Negative gauge pressure (max.) MPa (bar)	Nominal size	Negative gauge pressure (max.) MPa (bar)
5	0,060 (0,60)	5	0,080 (0,80)
6,3	0,060 (0,60)	6,3	0,080 (0,80)
8	0,060 (0,60)	8	0,080 (0,80)
10	0,060 (0,60)	10	0,080 (0,80)
12,5	0,060 (0,60)	12,5	0,080 (0,80)
		16	0,080 (0,80)
		19	0,060 (0,60)
		25	0,060 (0,60)

NOTE 1 There is no vacuum resistance requirement for sizes of types 2TE and 3TE not listed.

NOTE 2 There is no vacuum resistance requirement for hoses of types 1TE, R6 and R3.

7.9 Abrasion resistance

Abrasion resistance test requirements to be added when new abrasion resistance test methods are available.

7.10 Fluid resistance

7.10.1 General

The fluid resistance tests shall be carried out on moulded sheets of lining and cover compound having a minimum thickness of 2 mm and of cure state equivalent to that of the hose.

7.10.2 Oil resistance

When determined in accordance with ISO 1817 by immersion in IRM 903 oil for 168 h at a temperature of 100 °C, the percentage change in volume of the lining shall be between 0 % and +25 % for type 1TE, 2TE and 3TE hoses and between 0 % and +100 % for type R6 and R3 hoses (i.e. shrinkage shall not be permissible).

When determined in accordance with ISO 1817 by immersion in IRM 903 oil for 168 h at a temperature of 70 °C, the percentage change in volume of the cover shall be between 0 % and +100 % (i.e. shrinkage shall not be permissible).

7.10.3 Water resistance

For all types of hose, when tested in accordance with ISO 1817 by immersion in distilled water for 168 h at a temperature of 70 °C, the percentage change in volume of the lining shall be between 0 % and +25 % and the percentage change in volume of the cover shall be between 0 % and +100 % (i.e. shrinkage shall not be permissible).

7.11 Ozone resistance

When tested in accordance with method 1 or 2 of ISO 7326:2016, depending on the nominal size of the hose, no cracking or other deterioration of the cover shall be visible under $\times 2$ magnification.

7.12 Visual examination

Hoses shall be examined for visible defects in the outer cover and to verify that the hose identification is correct and has been properly marked. Hose assemblies shall, in addition, be inspected to verify that the correct fittings are fitted.

8 Frequency of testing

Type testing and routine testing shall be as specified in [Annex A](#).

Type tests are those tests required to confirm that a particular hose design, manufactured by a particular method, meets all the requirements of this document. The tests shall be repeated at a maximum of five-year intervals, or whenever a change in the method of manufacture or materials used occurs. They shall be performed on all sizes, and on all classes and types except those of the same size and construction.

Routine tests are those tests required to be carried out on each length of finished hose prior to dispatch.

Production acceptance tests are those tests, specified in [Annex B](#), which should preferably be carried out to control the quality of manufacture. The frequencies specified in [Annex B](#) are given as a guide only.

9 Marking

9.1 Hoses

Hoses meeting the requirements of this document shall be marked at least once every 760 mm with at least the following information:

- a) the manufacturer's name or identification, e.g. XXX;
- b) a reference to this document, i.e. ISO 4079;
- c) the type, e.g. 1TE;
- d) the nominal size, e.g. 16;
- e) the maximum working pressure, in megapascals and in bars, or in either, with the unit indicated, e.g. 1,6 MPa (16 bar);
- f) the quarter and last two digits of the year of manufacture, e.g. 2Q20 (other date-coding methods indicating, for instance, the month or day of manufacture are allowed as long as they are clear to the user).

EXAMPLE XXX/ISO 4079/1TE/16/1,6 MPa (16 bar)/2Q20.

For 9.1, b), hose manufacturer shall use the latest publication of this document; otherwise, the year of publication shall be included in the marking.

9.2 Hose assemblies

Hose assemblies meeting the requirements of this document shall be permanently marked with at least the following information:

- a) the manufacturer's name or identification, e.g. XXX;
- b) the maximum working pressure of the assembly, in megapascals and in bars, or in either, with the units indicated, e.g. 1,6 MPa (16 bar);

NOTE 1 The maximum working pressure of a hose assembly is equal to the maximum working pressure of the component having the lowest maximum working pressure.

- c) two digits indicating the last two digits of the year of assembly followed by the two digits indicating the month of assembly, e.g. 2006 (monthly, daily and other code dating methods are allowed as long as they are clear to the user).

EXAMPLE XXX/1,6 MPa (16 bar)/2006.

NOTE 2 Typical markings include but are not limited to stamping the fitting socket, embossing on a metal or plastic ring.

NOTE 3 The sequence of the elements is optional and they do not need to be in one row.

Annex A (normative)

Test frequency for type tests and routine tests

Property / Test	Type tests Frequency (for each hose type and size): at the initial product qualification, in the event of product changes after initial qualification and after 5 years	Routine tests Performed on each length of finished hose or hose assembly prior to warehousing or sale
Hose tests		Per length^a
Visual examination	X	X
Measurement of inside diameter	X	X
Measurement of outside diameter	X	X
Measurement of outer cover thickness (if applicable — see Table 2)	X	N/A
Measurement of concentricity	X	N/A
Adhesion test (cover)	X	N/A
Adhesion test (lining)	X	N/A
Proof pressure test	X	X
Change in length test ^b	X	X
Burst pressure test ^b	X	N/A
Low temperature flexibility test ^b	X	N/A
Vacuum resistance test ^b	X	N/A
Minimum bend radius test ^b	X	N/A
Fluid resistance test for cover	X	N/A
Fluid resistance test for lining	X	N/A
Ozone resistance test	X	N/A
Abrasion resistance test	TBD	TBD
Hose assembly tests (to be performed by the hose assembler)		Per assembly
Visual examination	X	X
Proof pressure test	X	X
Change in length test	X	X
Leakage test	X	N/A
Burst pressure test	X	N/A
Impulse test	X	N/A
X = Test required.		
N/A = Test not applicable.		
^a A length is defined as a continuously produced length up to a maximum of 3 000 m.		
^b These tests may be carried out with hose assemblies.		