
**Rubber and plastics hoses and hose assemblies, wire or textile reinforced types with working pressure equal or above 70 MPa (700 bar) —
Specification**

Tuyaux et flexibles en caoutchouc et en plastique, types à armature métallique ou textile pour pression de service supérieure ou égale à 70 MPa (700 bar). — 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.

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This first edition of ISO 23384 cancels and replaces ISO 19385:2017, which has been technically revised. It also incorporates the Amendment ISO 19385:2017/Amd.1:2019.

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.

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Rubber and plastics hoses and hose assemblies, wire or textile reinforced types with working pressure equal or above 70 MPa (700 bar) — Specification

1 Scope

This document specifies requirements for two types of reinforced hoses and hose assemblies of nominal size from 3,2 to 25, dependent on relation of minimum burst pressure to maximum working pressure. Each type is divided into classes dependent on maximum working pressure.

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 °C to $+100\text{ °C}$;
- water-based fluids HFC, HFAE, HFAS and HFB as defined in ISO 6743-4 at temperatures ranging from 0 °C to $+70\text{ °C}$;
- water at temperatures ranging from 0 °C to $+70\text{ °C}$.

Such hoses and hose assemblies are intended to be used for:

- water jetting and water blasting applications;
- hydraulic applications.

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

NOTE 1 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.

NOTE 2 For hydraulic jacks with manually driven pumps, hoses and hose assemblies per ISO 16301 can 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 6803, *Rubber or plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing*

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

ISO 8031, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity*

ISO 8033, *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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 List of significant hazards

4.1 General

This clause contains some of the significant hazards, hazardous situations and events, as far as they are dealt with in this document, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk.

4.2 Hazards due to bursting or leaking of hoses

Hazards can occur when a hose bursts or leaks. The escaping stream of liquid can cause physical damage and a sudden repositioning of the hose line in a dangerous manner (whip).

4.3 Hazards due to failure of connectors

Hazards can occur when a connector fails. The escaping stream of liquid can cause physical damage and a sudden repositioning of the hose line in a dangerous manner (whip).

4.4 Hazards due to errors by the operator

Hazards can occur if the operator uses incompatible substances or incompatible components. Hazards can also occur if the operator exceeds the limits of use specified by the manufacturer (e.g. too high pressure, too high tensile stress), also pinhole caused by kink may result in a significant injury.

4.5 Hazards due to change in length of hose assembly

Hazardous situations occur when there is a sudden change of pressure in the hose line causing a change in length resulting in the operators losing their firm hold.

5 Classification

5.1 Hose types

Two types of hose are specified, distinguished by the relation of minimum burst pressure to maximum working pressure:

- a) Type A: hoses with the relation of minimum burst pressure to maximum working pressure of 4:1

- b) Type B: hoses with the relation of minimum burst pressure to maximum working pressure of 2,5:1 or at least 2:1 for hoses with maximum working pressure of 300 MPa (3 000 bar) and higher.

5.2 Hose classes

Seven classes of hose are specified, distinguished by the maximum working pressure. They are listed in [Table 1](#) and [Table 2](#)

Table 1 — Classes and nominal sizes of hoses Type A

Class	MPa	70
	bar	700
Nominal size		
3,2		x
5		x
6,3		x
8		x
10		x
12,5		x
19		N/A
25		N/A

Other nominal sizes and classes are acceptable.

For other nominal sizes and classes:

- relation of maximum working pressure to proof pressure and to minimum burst pressure shall not be changed (see also [8.1.2](#));
- all performance requirements in [8.2](#) and [8.4](#) to [8.13](#) shall be met;
- dimensions and minimum bend radius shall be agreed between manufacturer and purchaser.

Table 2 — Classes and nominal sizes of hoses Type B

Class	MPa	70	100	140	200	250	300	400
	bar	700	1 000	1 400	2 000	2 500	3 000	4 000
Nominal size								
3,2		x	x	x	x	N/A	N/A	N/A
5		x	x	x	x	x	x	x
6,3		x	x	x	x	x	x	N/A
8		x	x	x	x	x	x	N/A
10		x	x	x	x	x	x	N/A
12,5		x	x	x	x	x	x	N/A
19		x	x	x	N/A	N/A	N/A	N/A
25		x	x	x	N/A	N/A	N/A	N/A

Other nominal sizes and classes are acceptable. No classes below 70 MPa (700 bar) are acceptable.

For other nominal sizes and classes:

- relation of maximum working pressure to proof pressure and to minimum burst pressure shall not be changed (see also [8.1.2](#));
- all performance requirements in [8.2](#) and [8.4](#) to [8.13](#) shall be met;

- dimensions shall be agreed between manufacturer and purchaser; for Type B hoses with the maximum working pressure between 70 MPa (700 bar) and 100 MPa (1 000 bar) the maximum outside diameter shall not exceed the values for class 70 hose of the same nominal size;
- minimum bend radius shall be agreed between manufacturer and purchaser.

5.3 Non-conductive hoses

Hoses may be manufactured as “non-conductive”. In this case, ISO 8031 shall be applied accordingly.

6 Materials and construction

6.1 Hoses

Hoses shall consist of a rubber or plastic lining, multiple layers of textile or steel wires and oil, abrasion and weather resistant rubber or plastic cover.

For “non-conductive” hoses, the cover shall not be perforated. The cover shall be orange (colour code RAL 2004).

6.2 Hose assemblies

Hose assemblies shall only be manufactured with those hose fittings whose functionality conforms to the requirements of [8.1](#), [8.2](#), [8.4](#), [8.5](#), [8.6](#), [8.9](#), [8.10](#) and [8.13](#).

Hose assemblies with the hoses according to this document are often used in applications where a hose assembly is located close to an operator and no protection measures like rigid screens or covers are possible. In addition, they are often subjected to external mechanical impacts. Protecting measures including, but not limited to bend stiffeners, protection hoses, additional hose covers shall always be used and may be omitted only in justified cases (e.g. tube cleaning or robotic water-jetting).

7 Dimensions and tolerances

7.1 Diameters

When measured in accordance with ISO 4671, the diameters of the hoses shall conform to the values given in [Table 3](#).

Table 3 — Diameters of hoses

		Inside diameter		Maximum outside diameter							
		min.	max.	A				B			
Type		A and B									
Class	MPa	All classes		70	70	100	140	200	250	300	400
	bar			700	700	1 000	1 400	2 000	2 500	3 000	4 000
Nominal size											
3,2		3,0	3,6	10,0	7,2	7,5	8,0	8,0	N/A	N/A	N/A
5		4,6	5,4	17,0	10,0	15,0	18,0	20,0	20,0	22,0	25,0
6,3		6,1	7,0	20,0	12,0	20,0	21,0	22,0	24,0	26,0	N/A
8		7,5	8,5	22,0	14,0	23,0	23,0	24,0	26,0	26,0	N/A
10		9,3	10,1	24,0	18,0	26,0	26,0	28,0	28,0	28,0	N/A
12,5		12,3	13,5	28,0	25,0	29,0	31,0	33,0	33,0	33,0	N/A

Table 3 (continued)

	Inside diameter		Maximum outside diameter							
	min.	max.	A				B			
Type	A and B		A	B						
19	18,6	19,8	N/A	35,0	35,0	38,0	N/A	N/A	N/A	N/A
25	25,0	26,4	N/A	44,0	44,0	47,0	N/A	N/A	N/A	N/A

7.2 Concentricity

When measured in accordance with ISO 4671, the concentricity of hoses shall conform to [Table 4](#).

Table 4 — Concentricity of hoses

Nominal size	Maximum variation in wall thickness between inside diameter and outside diameter mm
Up to and including 6,3	0,8
Over 6,3 and including 19	1,0
Over 19	1,3

8 Performance requirements

8.1 Hydrostatic requirements

8.1.1 When tested in accordance with ISO 1402 at the relevant proof pressure and the relevant minimum burst pressure given in [Table 5](#), the hose assemblies shall not leak.

Table 5 — Maximum working pressure, proof pressure and minimum burst pressure for all nominal sizes

Maximum working pressure		Proof pressure				Minimum burst pressure			
Type A and B		Type A		Type B		Type A		Type B	
MPa	bar	MPa	bar	MPa	bar	MPa	bar	MPa	bar
70	700	140	1 400	105	1 050	280	2 800	175	1 750
100	1 000	N/A	N/A	150	1 500	N/A	N/A	250	2 500
140	1 400	N/A	N/A	210	2 100	N/A	N/A	350	3 500
200	2 000	N/A	N/A	300	3 000	N/A	N/A	500	5 000
250	2 500	N/A	N/A	375	3 750	N/A	N/A	625	6 250
300	3 000	N/A	N/A	360 ^a	3 600 ^a	N/A	N/A	600 ^a	6 000 ^a
400	4 000	N/A	N/A	480 ^a	4 800 ^a	N/A	N/A	800 ^a	8 000 ^a

^a Minimum values, see also [8.1.2](#).

8.1.2 For other classes:

— For Type A hoses, proof pressure shall be 2,0 times the maximum working pressure and minimum burst pressure shall be 4,0 times the maximum working pressure.

- For Type B hoses with maximum working pressure of less than 300 MPa (3 000 bar), proof pressure shall be 1,5 times the maximum working pressure and minimum burst pressure shall be 2,5 times the maximum working pressure.
- For Type B hoses with maximum working pressure of 300 MPa (3 000 bar) and above, proof pressure shall be 0,6 times the minimum burst pressure. Minimum burst pressure shall be agreed between manufacturer and purchaser but shall be not less than 2,0 times of maximum working pressure.

8.2 Change in length

When tested in accordance with ISO 1402, the change in length of hose at the maximum working pressure (see Table 5) shall not exceed ± 2 %.

8.3 Minimum bend radius

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

Table 6 — Minimum bend radius

		Type							
		A	B						
Class	MPa	70	70	100	140	200	250	300	400
	bar	700	700	1 000	1 400	2 000	2 500	3 000	4 000
Nominal size									
3,2		55	70	70	150	180	N/A	N/A	N/A
5		70	100	100	180	200	250	300	350
6,3		70	150	180	200	220	300	350	N/A
8		100	180	200	250	300	320	350	N/A
10		120	180	200	300	320	350	400	N/A
12,5		150	200	220	300	350	400	450	N/A
19		N/A	220	280	350	N/A	N/A	N/A	N/A
25		N/A	350	400	450	N/A	N/A	N/A	N/A

8.4 Resistance to impulse

8.4.1 The impulse test shall be in accordance with ISO 6803. The test fluid temperature shall be 100 °C for Type A hoses and 70 °C for Type B hoses.

8.4.2 For Type A hoses, when tested at an impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 200 000 impulse cycles.

For Type B hoses, when tested at an impulse pressure equal to 100 % of the maximum working pressure, the hose shall withstand a minimum of 20 000 impulse cycles.

8.4.3 There shall be no leakage or other malfunction before reaching the specified number of cycles.

8.4.4 This test shall be considered a destructive test and the test pieces shall be destroyed.

8.5 Leakage of hose assemblies

When tested in accordance with ISO 1402, there shall be no leakage or evidence of failure. This test shall be considered a destructive test and the test pieces shall be destroyed.

8.6 Cold flexibility

When tested in accordance with method B of ISO 10619-2:2017 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 after regaining ambient temperature.

8.7 Ozone resistance

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

8.8 Adhesion between components (only for rubber hoses)

When tested in accordance with ISO 8033, the adhesion between lining and reinforcement, and between cover and reinforcement shall not be less than $2,0\text{ kN/m}$ for rubber hoses.

8.9 Resistance to tensile force

The hose assemblies shall withstand a tensile force equivalent to that induced by minimum burst pressure. Hose assembly shall be clamped at fittings in a tensile test machine and subjected to a tensile load equal to the hose internal cross-sectional area times minimum burst pressure. Tensile test machine traverse travel rate shall be 25 mm/min . There shall be no visible failures. Hose OD reduction is permitted.

8.10 Fluid resistance

8.10.1 Test pieces

The fluid resistance tests specified in [8.10.2](#) to [8.10.4](#) shall be carried out on moulded sheets of lining and cover material having a minimum thickness of 2 mm .

8.10.2 Oil resistance

When determined in accordance with ISO 1817 by immersion in oil No.3 oil for 72_{-2}^0 h at a temperature of $100\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, the percentage change in volume of the lining and cover shall be between -15% and $+35\%$.

8.10.3 Water-based fluid resistance

When determined in accordance with ISO 1817 by immersion in a test fluid made up of equal volumes of 1,2-ethanediol and distilled water for 168_{-2}^0 h at a temperature of $70\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$, the percentage change in volume of the lining and cover shall be between -15% and $+35\%$.

8.10.4 Water resistance

When determined in accordance with ISO 1817 by immersion in distilled water for 168_{-2}^0 h at a temperature of $70\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$, the percentage change in volume of the lining and cover shall be between -15% and $+35\%$.

8.11 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.

8.12 Abrasion resistance

Abrasion test is to be specified in ISO 20444¹⁾.

8.13 Proof pressure hold test

Each hose assembly manufactured shall be subject to a proof pressure hold test in accordance with ISO 1402 for not less than 1 min. The proof pressure shall be according to [Table 5](#).

9 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 or hose assembly design, manufactured by a particular method from particular materials, 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 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.

10 Designation

Hoses shall be designated as in the following example for a Type B hose, class 100 with a nominal size of 10.

EXAMPLE ISO 23384-B-100/10.

11 Marking

11.1 Hoses

Hoses shall be marked with at least the following information, and the marking shall be repeated at least once every 500 mm:

- a) the manufacturer's name or identification, e.g. XXX;
- b) the number of this document, i.e. ISO 23384;
- c) the type and class in MPa, e.g. A-70;
- d) the nominal size, e.g. 12,5;
- e) for "non-conductive" hoses, the words "NON-CONDUCTIVE";
- f) the maximum working pressure, in megapascals and in bars, or in either, with the unit indicated, e.g. 70 MPa (700 bar);
- g) the quarter and last two digits of the year of manufacture, e.g. 4Q21 (other date-coding methods indicating, for instance, the day or month and year of manufacture are allowed as long as they are clear to the user).

1) Under preparation.

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

EXAMPLE 1 XXX/ISO 23384/A-70/12,5/NON-CONDUCTIVE/70 MPa (700 bar)/4Q21.

EXAMPLE 2 XXX/ISO 23384/B-125/16/125 MPa/4Q21.

11.2 Hose assemblies

Every hose assembly shall be permanently marked with at least the following information:

- a) the hose assembly manufacturer's name or identification, e.g. XXX;
- b) the number of this document and hose type, i.e. ISO 23384-A;
- c) the maximum working pressure of the hose assembly, including the unit of pressure, e.g. 70 MPa;
- g) the last two digits of year and month of assembly, separated by an oblique, e.g. 21/12.

EXAMPLE XXX/ISO 23384-A/70 MPa/21/12

It is strongly recommended that an individual tracking number is marked on every hose assembly.

12 Recommendations for packing and storage

These are given in ISO 8331.

13 Recommendations for length of supplied hoses and tolerances on lengths of hose assemblies

These are given in [Annex C](#).

14 Test certificate

When requested by the purchaser, the manufacturer or supplier shall provide a test certificate for each length of hose or each hose assembly supplied to the purchaser.

Annex A (normative)

Type and routine testing of hoses

Property	Type test Frequency (for each hose size and type): at initial product qualification, in the event of product changes after initial qualification and after 5 years	Routine test Performed on each length of finished hose prior to warehousing or sale
Hoses/hose assemblies (as appropriate)		
Visual examination (inside and outside)	X	X
Measurement of inside diameter	X	X
Measurement of outside diameter	X	X
Measurement of concentricity	X	X
Proof test	X	X
Burst test	X	N/A
Change-in-length test	X	N/A
Minimum bend radius	X	N/A
Impulse test	X	N/A
Leakage test	X	N/A
Cold bending test	X	N/A
Ozone resistance test	X	N/A
Adhesion between components	X	N/A
Abrasion test	X	N/A
Tensile test	X	N/A
Electrical conductivity (non-conductive only)	X	N/A
Resistance to fluids		
Oil resistance test for cover	X	N/A
Oil resistance test for lining	X	N/A
Water-based fluid resistance test for cover	X	N/A
Water-based fluid resistance test for lining	X	N/A
Water resistance test for cover	X	N/A
Water resistance test for lining	X	N/A
X = test to be carried out; N/A = not applicable		