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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

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

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

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*

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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*

ISO 20444¹⁾, *Rubber and plastics hoses — Determination of abrasion resistance of the outer cover*

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:

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

1) Under preparation. Stage at the time of publication: ISO/DIS 20444:2020.

- 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)

Type	Inside diameter		Maximum outside diameter							
	min.	max.	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

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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.