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Rubber hose and hose assemblies for oil suction and discharge service — Specification

Flexibles en caoutchouc pour chargement et déchargement des produits pétroliers — Spécification

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Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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 second edition of ISO 1823 cancels and replaces ISO 1823-1:1997 and ISO 1823-2:1997. Considering the actual market situations, two classes (the lowest and highest aromatics content) and one grade for maximum working pressure have been added in 4.3 and 4.4, respectively.

Introduction

This International Standard specifies minimum requirements for the satisfactory performance of wire- or textile-reinforced rubber hose assemblies of both smooth and rough bore types for oil suction and discharge services. The hoses are commonly used for transferring crude oil and liquid petroleum products, other than liquefied petroleum gas and natural gas, to and from tanker and bunkering vessels or for similar duties ashore.

Specific details of the construction of hoses are not rigidly defined in this International Standard since it is felt that this could restrict the introduction of improved methods of construction. The hose assemblies have been classified and designated in terms of service pressure, which includes an allowance for surge pressure and which equates to the factory test pressure. To keep this specification in line with other documents, this factory test pressure is also defined as the maximum working pressure (see Table 1). It is the responsibility of the user to determine the appropriate working pressure, which will depend on the severity of the user's operating conditions and on the service life that is expected of the hose assembly.

It is necessary for the purchaser to provide certain information about the hose assembly and its intended use at the time of enquiry and/or order; this information is listed in Annex A (informative). Recommendations concerning packaging and transportation are given in Annex B (informative) and expected masses of hoses, in kilograms per metre of free length, are given in Annex C (informative).

Rubber hose and hose assemblies for oil suction and discharge service — Specification

1 Scope

This International Standard specifies the characteristics of four types of oil suction and discharge hose assemblies used for the conveyance of petroleum, including crude oils and other liquid petroleum products. Each type being divided into three classes depend on the aromatic contents. It is not suitable for liquefied petroleum gas and natural gas.

Hose assemblies to this International Standard can be used in the temperature range –20 °C to 80 °C.

The hoses specified are in the range of nominal size 50 to 500 and can be types of smooth bore, rough bore, armoured rough bore, and light weight.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 228, *Pipe threads where pressure-tight joints are not made on the threads*

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

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1460, *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area*

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

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

ISO 2063, *Metallic and other inorganic coatings — Thermal spraying — Zinc, aluminium and their alloys*

ISO 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 7005-1, *Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems*

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

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

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

BS 3592-1, *Steel wire for hose reinforcement — Part 1: Specification for coated round and flat steel wire for rubber hose reinforcement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8330 and the following apply.

3.1
electrically bonded hose assembly
hose assembly that uses a metallic wire connection to create a low-resistance electrical connection between the end connection

3.2
electrically discontinuous hose assembly
hose assembly that incorporates an electrical insulation between the end of the helical wire or/and wire cord reinforcement and on or both couplings

4 Classificaiton

4.1 General

WARNING — Careful consideration needs to be given before the use of electrically discontinuous hoses for transferring liquids known to generate static charges. In no circumstances should more than one length of electrically discontinuous hose be used in an individual transfer pipeline and effective electrical continuity to earth from both ends of the electrically discontinuous hose should be maintained.

4.2 Types

Hose assemblies for this application are classified according to end-use as follows:

— **Type R**, rough bore hose assemblies for dock operation and intended for situations where a relatively stiff, heavy, and robust assembly can be used. The lining of the rubberized fabric is supported and reinforced by an internal (hot-dipped) zinc coated steel wire helix. Type R assemblies are electrically continuous;

— **Type A**, armoured rough bore hose assemblies for dock operation. In addition to an internal zinc coated steel wire helix, there shall be external helical armour of a similar material. Type A hoses are electrically continuous and can be lighter and more flexible than type R;

— **Type S**, smooth bore hose assemblies for dock operation where flexibility and lightness are important. Type S hose assemblies can be electrically continuous or electrically discontinuous (see Warning);

— **Type L**, hose assemblies for dock and general discharge service where greater flexibility, lower weight, and ease of handling are of primary consideration. Type L hose assemblies can be electrically continuous or electrically discontinuous. They are only suitable for discharge applications (see Warning).

4.3 Classes

Each type of hose assemblies shall be designated according to three classes, depending on the conveyance of petroleum products containing the maximum aromatics content:

— **Class 25**: For oil and gasoline service (suitable for below 25 % aromatics content);

— **Class 50**: For oil and gasoline service (up to and including 50 % max. aromatics content);

— **Class 100**: For oil and gasoline service (suitable for up to 100 % aromatics content).

NOTE For the determination of aromatics content, see ISO 3837.

4.4 Grades

Each class is further divided into five grades depending on the maximum working pressure:

— **Grade 5**: For maximum working pressure 0,5 MPa (5 bar);

— **Grade 7**: For maximum working pressure 0,7 MPa (7 bar);

— **Grade 10**: For maximum working pressure 1,0 MPa (10 bar);

— **Grade 15**: For maximum working pressure 1,5 MPa (15 bar);

— **Grade 20**: For maximum woking pressure 2,0 MPa (20 bar).

4.5 Pressure and designations

Each type of hose assembly shall be designated according to the type letters R, A, S, or L, followed by the class figures, and followed by the grade figures which indicate maximum working pressure given in Table 1.

Table 1 — Grade description, pressure and designation

Grade description	Maximum working pressure		Proof pressure test (maximum 5 min)		Designation[a]		
	MPa	bar	MPa	bar			
5	0,5	5	0,75	7,5	R25–5 S25–5	A50–5 L50–5	
7	0,7	7	1,05	10,5		R50–7 A50–7 S50–7 L50–7	R100–7 A100–7 S100–7 L100–7
10	1,0	10	1,50	15	R25–10 S25–10	R50–10 A50–10 S50–10 L50–10	R100–10 A100–10 S100–10 L100–10
15	1,5	15	2,25	22,5	R25–15 S25–15	R50–15 A50–15 S50–15 L50–15	R100–15 A100–15 S100–15 L100–15
20	2,0	20	3,00	30,0		R50–20 S50–20	R100–20 S100–20

[a] Other combinations are available if required. See the second paragraph of Introduction.

For the purposes of this International Standard, the maximum working pressure includes an allowance for surge pressures above the normal operating pressure.

5 Materials and construction

5.1 Materials

5.1.1 Lining

The rubber lining shall be resistant to the materials the assembly is to convey.

The hose lining shall be suitable for continuous operation with the liquids to be conveyed.

NOTE The purchaser should state the products that the assembly is to carry (see Annex A).

5.1.2 Reinforcing plies

The reinforcing plies shall consist of textile or wire cord impregnated with rubber.

Reinforcing wire cord shall be brass, copper, or zinc coated carbon steel wire.

5.1.3 Wire helices

Wire helices shall be cold drawn carbon steel having sulfur and phosphorus contents each not greater than 0,040 %, and coated with copper or phosphate and comply with the requirements given in BS 3592-1.

If joined, helical reinforcement wire shall be welded and shall conform to the following requirements:

a) welding shall be carried out using electric butt welding;

b) no weld shall be within 1,5 m of a nipple end or of another weld in the same wire neither along the hose length nor, in the case of two or more wire plies, nearer than 600 mm in adjacent wires.

5.1.4 Internal and armouring wire helices

Internal and armouring, round and flat steel wire shall be cold drawn coated steel having sulfur and phosphorus contents each not greater than 0,040 % and comply with the requirements given in BS 3592-1.

5.1.5 Cover

The cover of synthetic rubber shall be resistant to abrasion, outdoor exposure, and petroleum products, including fuel.

5.2 Construction

5.2.1 Type R: Electrically continuous

5.2.1.1 Hoses

Hoses shall consist of the following:

a) an internal wire helix sunk into the inner wall of the hose;

NOTE An additional wire helix can be embedded into other layers.

b) at least one oil resistant rubber impregnated textile ply between the internal wire helix and the lining;

c) a lining of oil resistant rubber, conforming to the requirements given in 5.1.1;

d) plies of woven textile reinforcement or textile or wire cord;

e) an open weave breaker fabric;

f) an outer rubber cover conforming to the requirements given in 5.1.5.

5.2.1.2 Hose assemblies

The internal wire helix shall be connected to the nipple of the end connections by welding or brazing.

If an embedded wire helix is incorporated it shall be spiralled over the nipples to a point at least between the first and second bands and shall be finished off with at least two closed turns anchored together by welding or by clipping and soldering.

5.2.2 Type A: Electrically continuous

5.2.2.1 Hoses

Hoses shall consist of:

a) an internal round wire helix;

b) a textile ply impregnated with rubber conforming to the requirements given in 5.1.2;

c) a rubber lining filler resistant to the product to be carried by the hose (see Annex A) and conforming to the requirements given in 5.1.1;

d) plies of textile reinforcement thoroughly impregnated with rubber;

e) an outer rubber cover conforming to the requirements given in 5.1.5;

f) an external round wire armouring helix lying in the corrugations of the outer cover with no free movement in any direction when the hose is laid out straight and under no pressure. When pressed against the cover, the wires shall stand proud of the cover by a minimum of one-third of the diameter of the wire.

5.2.2.2 Hose assemblies

Where built-in nipples are used, the internal wire helix shall be spiralled over the nipples for at least 30 mm and shall be finished off with at least two close turns anchored together and attached to the nipple by welding or brazing.

The external wire helix shall be close pitched when wiring on top of the nipple except on the top of the nipple bands, where the wire can cross at open pitch and return to close pitch between bands.

Both ends of the wire helix shall be secured around the carcass of the hose by a number of close turns having a minimum axial length equal to three-quarters of the nominal size of the hose. These turns shall be fixed together by soldering, clipping, welding, or a combination of these. The ends of the wire helix shall be bonded electrically to the nipple.

There shall be stepped stiffening layers of rubber-impregnated fabric overlapping the nipples.

NOTE Bolted clamps are used for metric dimensions up to 150 mm.

5.2.3 Type S: Electrically continuous or electrically discontinuous

5.2.3.1 Hoses

Hoses shall consist of the following:

a) a lining of rubber conforming to the requirements given in 5.1.1, which shall be smooth and reasonably free from scores or indentations and shall be flush with the nipples when built-in nipples are used;

b) an open weave textile breaker fabric thoroughly impregnated with rubber laid between the hose lining and the reinforcing plies and between the plies and the cover;

c) reinforcing plies of either woven textile or textile or wire cord thoroughly impregnated with rubber;

d) at least one helical wire embedded in a layer of rubber;

e) a smooth outer rubber cover conforming to the requirements given in 5.1.5.

5.2.3.2 Hose assemblies

The embedded wire helix (helices) shall be spiralled over the nipples to a point at least between the first and second bands and shall be finished off with at least two turns anchored together by soldering, clipping, welding, or a combination of these.

Where built-in nipples are used for electrically continuous hose assemblies, the end of the wire helix shall be electrically bonded to the nipples by brazing, welding, or by soldering a short of flexible bonding wire to the end of the helical wire and the nipple. For discontinuous hose assemblies, see 6.3.

5.2.4 Type L: Electrically continuous or electrically discontinuous

5.2.4.1 Hoses

Hoses shall consist of the following:

a) a lining conforming to the requirements given in 5.1.1, which shall be smooth and reasonably free from scores or indentations and shall be substantially flush with the nipples when built-in nipples are used for assemblies;

b) a breaker fabric incorporated between the lining and reinforcement when fine wire reinforcement is used;

c) reinforcing plies of either textile or fine wire thoroughly impregnated with rubber; the ends of the hose adjacent to the nipples shall have extra reinforcement to reduce the flexibility of the hose/nipple junction; textile reinforcing plies shall incorporate at least two electrical bonding wires consisting of at least nine strands of wire having a high resistance to fatigue and continuous throughout the reinforcement;

d) a smooth outer rubber cover conforming to the requirements given in 5.1.5.

5.2.4.2 Hose assemblies

As this hose type is for discharge application only, the construction does not incorporate a wire helix and therefore requires no special instructions for attachment of the hose to the nipple of the fitting.

For electrically continuous assemblies, the ends of the electrical bonding wire shall be in contact with the fitting nipples by means of a low resistance, corrosion protected connection. For discontinuous hose assemblies, see 6.3.

6 End connections

6.1 Nipples and flanges

Nipples and flanges shall be of steel or aluminium alloy (see Annex A).

Nipple tube, bands, and other welded-on components shall conform to the requirements of ISO 15614-1:2004, Table 3 Group 1, with a minimum yield stress of 205 N/mm^2, a minimum tensile strength of 331 N/mm^2, and a maximum carbon content of 0,23 %.

Nipples shall be screwed with a thread conforming to ISO 228 or flanged.

Flanges shall be normalized carbon steel forgings with a maximum carbon content of 0,25 % and, where fitted, shall be drilled in accordance with a standard drilling table relating to the purchaser's requirements and the pressure designation of the hose.

The flange gasket contact surface shall be machine finished and conform to the requirements given in ISO 7005-1. They shall have a continuous spiral grove generated by a 1,6 mm radius round nose tool at a feed rate of 0,80 mm ± 0,01 mm per revolution.

The use of built-in swivel flanges is permitted when high flexibility and easy handling has been specified (see Annex A).

Flange protection coatings can be specified by the purchaser (see Annex A) but shall not be applied to the flange sealing surface nor the internal surfaces of the flange or nipple. Coatings can be applied either by galvanizing or aluminium or zinc spraying in accordance with the requirements given in ISO 2063 to a nominal thickness of 100 µm, with no localized area being less than 75 µm.

Hot-dip coatings when applied shall conform to the requirements given in ISO 1460 and ISO 1461.

6.2 Method of attaching end connections to the hose

For Types R, S, and L, end fittings shall be either built-in during manufacture of the hose or shall be swaged. For Type A, end fittings shall be built-in during manufacture, or swaged, or wired in, or strapped.

The exterior of the hose over built-in nipples shall taper smoothly into the body of the hose and no outside bands or clips shall be fitted. The design of the hose body shall be such that threaded bolts appropriate to the flange can be inserted into the flange.

NOTE 1 For types S and L, see 6.3 and 6.4.

NOTE 2 Bolted clamps are used for metric dimension up to 150 mm.

6.3 Electrically discontinuous assemblies

For electrically discontinuous assemblies, it is essential that all metallic body components in the hose construction be electrically bonded to the same nipple at one end only. The non-bonded nipple end shall be identified with a vulcanized brand carrying the words "NON-BONDED END" in letters 20 mm min. in height, and placed close to the electrically discontinuous brand.

NOTE See Annex A regarding information to be supplied on ordering.

6.4 Electrically continuous assemblies

For electrically continuous hose assemblies, a low resistance connection shall be provided by bonding the nipples at each end to the built-in wires. For embedded helical wire reinforcement other than fine wire reinforcement [see 5.2.4.1 item c)], a wire or bonded tape connector shall be used. One end of this connector shall be carried more than one turn around the nipple and secured thereto by soldering, brazing, or welding; the other end shall be attached to at least three turns of the helical wire reinforcement of the hose by soldering, brazing, or welding. The bonding wire or bonded tape shall be so embedded in the hose that normal flexing or stretching of the hose will not subject it to any stress that might cause breakage.

For electrically continuous assemblies of hoses incorporating fine wire reinforcement, the wire or bonded tape, if incorporated, shall be anchored to the nipples in a manner that will ensure electrical continuity conforming to the test in Table 4 "Electrical properties (continuity)".

7 Dimensions and tolerances

7.1 Dimensions

The nominal size of hoses and inside diameter shall be as given in Table 2.

Table 2 — Nominal size, inside diameters and tolerances

Nominal size	Inside diameter mm	Tolerance mm
50	50	±0,8
	51[b]	
75	75	±1,6
	76[b]	
80	80	±1,6
100	100	±1,6
	101[b]	
125	125	±1,6
	127[b]	
150	150	±2,0
	152[b]	
200	200	±2,0
	203[b]	
250	250	±2,4
	254[b]	
300	300	±5,0
	305[b]	
310	310	±5,0
400[a]	400	±5,0
	406[b]	
500[a]	500	±6,0
	508[b]	

[a] Types S10 and S15 only.

[b] These values that are converted from the specifications in inches can be used when agreed between the the manufacturer and the purchaser.

7.2 Length

The length of hose assemblies shall be measured between flange faces or, where hose assemblies are supplied without flanges, between the ends of the nipples.

The length of a finished hose assembly shall not differ from the nominal length by more than +2 % to –1 %. For this purpose, the hose assembly shall be measured after being subjected to the test described in E.4.

NOTE The nominal length of the hose assembly should be stated at the time of order by the purchasers (see Annex A).

8 Physical properties

8.1 Rubber compounds

The physical properties of the rubber compounds used for the lining and the cover shall comply with the values given in Table 3 when tested by the methods listed in Table 3. Tests shall be carried out on samples taken from the hose or from separately vulcanised sheets, except for the abrasion test, which shall be carried out on moulded test pieces vulcanised to the same state as the hose.

Table 3 — Physical properties of rubber compounds

Property	Unit	Requirement	Test method
Lining: Resistance to liquids (volume swell) (Class 25 only)	%	Not greater than 60	Method 1, ISO 1817. 48 h at 40 °C, liquid B
Lining: Resistance to liquids (volume swell) (Class 50 only)			Method 1, ISO 1817. 48 h at 40 °C, liquid C
Lining: Resistance to liquids (volume swell) (Class 100 only)			Method 1, ISO 1817. 48 h at 40 °C, liquid E
Cover: Abrasion resistance	Mm^3	200 maximum	Method A of ISO 4649
Cover: Resistance to liquids (volume swell)	%	Not greater than 100	Method 1, ISO 1817. 48 h at 40 °C, liquid B
Cover: Resistance to ozone	—	No cracks when viewed under ×2 magnification	ISO 1431-1 72 h, 50 pphm ± 5 pphm O_3 10 % extension at 40 °C and 65 % relative humidity.

8.2 Finished hose assemblies

The physical properties of the finished hose assemblies shall comply with the values given in Table 4 when tested by the methods listed in Table 4.

Table 4 — Physical properties of finished hose assemblies

Property	Unit	Requirement	Test method
Adhesion between components (dry)	N/mm	3,75 minimum	ISO 8033, Samples built to D.3
Adhesion between components (wet)	N/mm	2,5 minimum	Annex D
Charge in length at max. working pressure	%	The temporary and permanent elongation are given in Table E.1.	Annex E
Twist at maximum working pressure (Type A only)	°/m	9 maximum	Annex E
Resistance to proof pressure	MPa (bar)	No leakage at 1,5 times the maximum working pressure given in Table 1, after 5 min hold. This test shall be carried out after completion of the temporary and permanent elongation measurements specified in E.4.	ISO 1402
Resistance to vacuum (Type S only)	MPa (bar)	No signs of collapse or puncture. The lining shall show no sagging, delamination or resultant imperfection (e.g. blisters) when tested at −0,85 bar gauge.	ISO 7233, Method B

Table 4 *(continued)*

Property	Unit	Requirement	Test method
Bending test resistance (Types R, A and S only)	—	Empty hose assemblies shall be bent to the appropriate minimum bend radius given in Table 5, without resultant damage.	ISO 10619-1
Bending test resistance (Type L only)	—	Hose assemblies shall be bent to the appropriate minimum bend radius given in Table 5, with an internal pressure of 0,35 MPa (3,5 bar) without resultant damage.	ISO 10619-1
Electrical properties (continuity)	Ω	After carrying out the change in length and vacuum tests the continuity measured between the couplings shall be maintained. Maximum electrical resistance 100 per assembly.	ISO 8031
Electrical properties (discontinuity) (Types S and L only)	Ω	Minimum $2,5 \times 10^4$ between the couplings	ISO 8031
Resistance to minimum burst pressure	MPa (bar)	No failure at four times the max. Working pressure given in Table 1	ISO 1402

Table 5 — Minimum bend radii

Nominal size	Type R m						Type A m				
	Woven textile					Wire or textile cord					
	R5	R7	R10	R15	R20	R5,R7,R10, R15,R20	A5	A7	A10	A15	A20
50	0,60	0,63	0,68	0,75	0,85	0,50	0,30	0,33	0,35	0,43	0,50
75	0,75	0,85	1,00	1,10	1,20	0,60	0,45	0,48	0,52	0,64	0,64
80	0,80	0,90	1,07	1,17	1,30	0,64	0,47	0,50	0,55	0,70	0,70
100	1,00	1,10	1,25	1,45	1,65	0,75	0,58	0,60	0,65	0,80	0,80
125	1,25	1,40	1,60	1,80	2,00	0,85	0,70	0,75	0,80	1,00	1,00
150	1,50	1,60	1,85	2,15	2,50	1,00	0,85	0,90	0,975	1,20	1,20
200	2,00	2,15	2,50	2,85	3,20	1,25	1,15	1,20	1,30	1,60	1,60
250	2,50	2,60	3,10	3,55	3,90	1,50	1,40	1,50	1,63	2,00	2,00
300	3,00	3,10	3,68	4,25	4,70	1,75	1,70	1,80	1,95	2,40	2,40
310	3,10	3,20	3,80	4,40	5,00	1,80	1,75	1,85	2,00	2,50	2,50
400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5 — *(continued)*

Nominal size	Type S m						Type L m
	Woven textile					Wire or textile cord	
	S5	S7	S10	S15	S20	S5,S7,S10, S15,S20	L5,L7,L10,L15,L20
50	0,50	0,50	0,50	0,50	0,60	0,35	0,30
75	0,70	0,70	0,80	0,85	0,90	0,45	0,45
80	0,75	0,80	0,90	0,95	1,00	0,48	0,48
100	0,90	0,95	1,10	1,20	1,30	0,60	0,60
125	1,10	1,15	1,25	1,50	1,80	0,73	0,75
150	1,30	1,40	1,60	2,00	2,40	0,85	0,90
200	1,60	1,85	2,15	2,80	3,20	1,10	1,20
250	2,00	2,35	2,70	3,50	4,00	1,35	1,50
300	2,40	2,80	3,30	4,30	4,80	1,60	N/A
310	2,50	2,90	3,50	4,40	5,00	1,65	N/A
400	N/A	N/A	4,40	5,00	N/A	2,10	N/A
500	N/A	N/A	5,50	5,90	N/A	2,70	N/A
N/A = not available							

9 Type tests

9.1 Type approval can be obtained by the manufacturer supplying evidence that all the material, construction, and the requirements of this International Standard have been met by the method of manufacture and hose design. Type approval tests shall be carried out a minimum of every five years or whenever a change of manufacture or material occurs.

9.2 This test shall be carried out on the largest diameter shown on manufacturers' drawings for each hose type and design.

9.3 Hose assemblies of lesser diameter of an approved type, incorporating the same basic construction and fabrication methods, but having fewer reinforcement plies due to the smaller diameter, but at least equal calculated burst strength, do not require a design type approval test.

10 Frequency of testing

Type and routine tests are specified in Annex F.

Type tests are those tests required to obtain proof that the design meets all requirements of this International Standard.

Routine tests are those tests that shall be carried out on all hose assemblies prior to dispatch.

Production acceptance tests are those tests, specified in Annex G, which should be carried out by the manufacturer to control the quality of his manufacture. The frequency specified in Annex G is a guide, being an informative annex only.

11 Test report

If a test report is requested to be supplied for each finished assembly at the placement of an order (see Annex A), it shall contain the hose serial number and the results of all tests carried out on the assembly (including the details of hydrostatic test results specified in E.6).

12 Marking

Each length of hose assembly shall be permanently and legibly marked at both ends in diametrically opposed positions in characters at least 10 mm in height with the following information.

The marking shall be either by use of a rubber label in a contrasting colour, permanently fixed by vulcanizing to the body of the hose near each end fitting, or by use of a brass label brazed or soldered to the extreme end of the outer surface of the nipple or rim of the flange.

a) the manufacturer's name or trade mark, e.g. XXX….;

b) the number and year of this International Standard, e.g. ISO 1823:2015;

c) type, classes, and grade designated, e.g. A50-15;

d) the nominal size, e.g. 75;

e) the maximum working pressure, e.g. 1,5 MPa (15 bar);

f) the quarter and year of manufacture, e.g. 2Q-2014;

g) the serial number issued by the manufacturer of the hose assembly, e.g. 005.

EXAMPLE 1 XXX…/ISO 1823:2015/A50-15/75/1,5MPa and/or 15 bar/2Q-2014/005.

Electrically discontinuous assemblies shall have, in addition, the words 'ELECTRICALLY DISCONTINUOUS' in legible characters at least 20 mm permanently vulcanized onto the body of the hose at each end in diametrically opposite positions. This information should be supplemented at the end adjacent to the non-bonded nipple by the words 'NON-BONDED END'.

After testing, the temporary elongation value shall be painted legibly at each end of the hose in diametrically opposite positions.

For assemblies with flanged couplings non built-in during manufacture, the following information shall be clearly stamped on the edge of all flanges in diametrically opposite positions:

a) the manufacturer's name or trade mark and serial number issured by the manufacturer; e.g. XXX/999;

b) the month and year of assembly e.g. 06-2014;

c) the test pressure/maximum working pressure, e.g. 1,5 MPa (15 bar).

EXAMPLE 2 XXX/999/06–2014/1,5 MPa (15 bar).

This stamping should only be placed when there is sufficient space available on the flange edge and not interfere with the markings placed by the flange manufacturer. In case there is insufficient space for stamping the required information on the flange edges, it should be stamped on a metal tag permanently attached to the flanged coupling.

Annex A
(informative)

Information to be supplied by the purchaser

The purchaser should provide the following information related to the assembly and its intended use at the time of enquiry or order:

a) nominal size, see 7.1;

b) nominal length, see 7.2;

c) fluid(s) to be conveyed;

NOTE This information might necessitate a lining material with specialized resistance to fluids.

d) requirement or not, for electrical continuity, see 6.3 and 6.4;

e) nipple and flange metal, see 6.1;

f) profile of the flange joining faces (flat or raised), see 6.1;

g) status of the flange (fixed or swivel), see 6.1;

h) need for, and type of, a protective coating, see 6.1;

i) fluid, if kerosene is used, for the hydrostatic test, see Table 4 and E.3;

j) flange drilling tables to be applied;

k) need for a test report, see Clause 9, and, if requested, whether each of the following results of tests are to be included:

1) hydrostatic pressure test, Table 4 and Annex E, and requirement for proof pressure test, if any;

2) vacuum test (type S only), see Table 4;

3) bending test, see Table 4 and ISO 10619-1;

4) bursting test, see Table 4 and ISO 1402;

5) permanent and temporary elongation, see Table 4 and Annex E.

Annex B
(informative)

Recommendations for packaging and transportation of oil suction and discharge hose assemblies

B.1 National

Hose assemblies should be suitably wrapped in hessian or other material over their entire length. They can be crated if desired.

Flanged ends should be protected by circular discs of slightly greater diameter than the diameter of the flange, bolted in two places diametrically opposite.

Threaded ends should be protected by thread protector, taping, or other suitable means. Hose assemblies should be laid straight and supported evenly on a transporter or carrier. Lifting points should be clearly marked on the package to show permitted point for handling.

NOTE Clients, services, and government departments might have separate packing specifications.

B.2 International

Hose assemblies should be wrapped in waterproof paper, hessian, or other suitable material over their entire length.

Flanged ends should be protected by circular discs of slightly greater diameter than the diameter of the flange, bolted in two places diametrically opposite. These discs should have holes for ventilation purposes.

Threaded ends should be protected by thread protectors, taping, or other suitable means. Wooden slatting consisting of two thicknesses of board, nailed together and of sufficient length should be strapped about the package. The slats should be held in position around the package by tensioned steel strapping, lashing or other suitable means. The slats should be sufficiently long to extend over the flanges so that they can be nailed to the side of the flange protection block.

Lifting points should be clearly marked on the package to show permitted points for handling. It is suggested that permanent rope slings should be attached as part of the package at the lifting points.

The entire package should be sufficiently robust to withstand all handling during transportation.

Small diameter hose assemblies can be coiled and crated. Such crates should be of sufficient dimension to ensure that the hose assembly is not bent past the minimum bend radius for the size. All hose assembly ends, whether screwed or flanged, should be well protected by some suitable means to prevent damage to other parts of the coiled hose assembly. In such cases, it might be possible to crate more than one hose assembly in any package and suitable inter-leaving protection between coils should be provided.

All slatted hose assemblies should be transported straight and supported evenly along their entire length.

Stacking of packages is permissible but wooden battens should be used to separate layers and give even support.

On no account should heavy objects be placed on top of hose assembly packages where damage to packing is possible.

Annex C
(informative)

Masses

Table C.1 gives average masses in kilograms per metre of free hose length for Types R, A, S, and L hoses. These masses are given as a guide only and more accurate figures should be obtained from the manufacturer.

Table C.1 — Average masses of hoses

Nominal size	Mass (kg/m)									
	R5	R7	R10	R15	R20	A5	A7	A10	A15	A20
50	5,0	5,5	6,0	6,5	7,0	3,25	3,5	4,0	4,5	5,0
75	7,5	8,0	8,5	9,0	9,5	5,0	5,5	6,0	6,5	7,0
80	8,0	8,5	9,0	9,5	10,0	6,0	7,0	7,5	8,0	8,5
100	10,0	11,0	12,0	13,0	14,0	6,5	7,0	7,5	8,5	9,0
125	13,5	15,0	16,0	17,5	19,0	8,5	9,5	10,0	11,5	13,0
150	18,0	19,0	20,0	21,0	23,0	11,0	12,0	13,0	16,0	18,0
200	27,0	28,0	29,0	30,0	32,0	16,0	17,0	18,0	26,0	28,0
250	36,0	38,0	40,0	42,0	45,0	18,0	20,0	23,0	30,0	32,0
300	45,0	47,0	50,0	53,0	56,0	N/A	N/A	N/A	N/A	N/A
310	46,5	48,5	52,0	55,0	58,0	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nominal size	**Mass (kg/m)**									
	S5	S7	S10	S15	S20	L5	L7	L10	L15	L20
50	3,75	4,0	4,5	5,0	5,5	2,0	2,0	2,25	2,5	3,0
75	5,0	5,5	6,0	6,5	7,0	3,5	3,75	4,0	4,5	5,0
80	5,5	6,0	6,5	7,0	7,5	3,75	4,0	4,25	4,75	5,5
100	6,5	7,0	7,5	8,5	9,0	4,5	4,75	5,0	5,5	6,0
125	9,0	10,0	10,5	12,0	14,0	5,0	5,25	5,5	6,25	7,0
150	12,0	13,0	14,0	15,0	17,0	5,5	6,0	6,5	7,5	9,0
200	18,0	19,0	20,0	21,0	23,0	8,5	9,0	10,0	12,0	14,0
250	26,0	27,0	28,5	30,0	32,0	12,0	13,0	14,0	16,0	18,0
300	33,0	35,0	37,0	40,0	43,0	N/A	N/A	N/A	N/A	N/A
310	34,0	36,0	38,0	42,0	46,0	N/A	N/A	N/A	N/A	N/A
400[a]	N/A	N/A	85,0	90,0	N/A	N/A	N/A	N/A	N/A	N/A
500[a]	N/A	N/A	120,0	125,0	N/A	N/A	N/A	N/A	N/A	N/A

N/A = not available

[a] Types S10 and S15 only.

Annex D
(normative)

Wet adhesion test

D.1 Scope

The following method describes a procedure for establishing the adhesion level before and after contact with a reference fluid over a specified length time and at a specified temperature. The reference fluid is chemically similar to the material which the hose will be carrying and for oil hoses it is normally IRM 902 oil. This is carried out as a check on a prototype/production hose design. Various times, temperatures, and test fluids can be used.

D.2 Terms and definitions

D.2.1
adhesion
force required to peel apart two layers at their interface

D.3 Principle

Samples will be built on a mandrel as a production/prototype hose and with sufficient reinforcing material (a minimum of six fabric plies or four wire cord plies unless the hoses which the sample represents have less than this number). The sample will be vulcanized under the same conditions as a production/prototype hose. The sample will be free of helical wire(s) and for ease of manufacture and testing the reinforcing plies can be laid at the same angles as the actual hose or at 90° to the horizontal axis of the hose.

D.4 Apparatus

D.4.1 Tensiometer and chart recorder.

D.4.2 300 mm ruler.

D.4.3 Scalpel.

D.4.4 Metal sheet, larger than the outside diameter of the sample.

D.4.5 Suitable adhesive and tools for mixing.

D.4.6 Two part epoxy adhesive.

D.4.7 Reference test fluid.

D.5 Test specimens

These are cut lengths from the adhesion sample both before and after soak.

D.6 Procedure

D.6.1 An adhesion strip (300 mm × 25 mm approximately) is cut from close to the edge of the sample using a power saw.

D.6.2 The adhesion level on each interface shall be determined in accordance with ISO 8033.

D.6.3 The remaining part of the sample is glued to the steel plate. The plate and the first 25 mm of sample bore shall be solvent wiped to enable the adhesive to form a bond.

D.6.4 A suitable amount of adhesive is mixed and applied to the plate and sample in order to form a leak free seal.

D.6.5 When the adhesive has fully hardened the sample is filled with the test fluid IRM 902 oil. It is left in a safe position for 30 days at ambient temperature.

D.6.6 After this time period, the sample is removed from the metal plate and another adhesion test strip is cut and tested.

D.6.7 Both sets of results are tabulated on the same report.

D.7 Test report

D.7.1 The adhesion level is recorded as N/mm. The rubber and/or other material at both sides of this interface are also reported. The nature of the bond separation is also noted.

D.7.2 The time and temperature of soak shall be reported, as most details of the test fluid.

Annex E
(normative)

Hydrostatic test for suction and discharge hose assemblies

E.1 Principle

The hose assembly is subjected to an internal hydrostatic pressure; the elongation of the hose at that pressure is measured and recorded as the temporary elongation. After release of the internal pressure, the increase in length of the hose is re-measured and reported as the permanent elongation. The test shall be carried out at ambient temperature (minimum 5 °C).

E.2 Apparatus

E.2.1 Pressure source, capable of applying an internal pressure at the rate given in E.4.

E.2.2 Pressure gauges, of a range so that the test pressure reading is between 15 % and 85 % of the full-scale reading.

E.2.3 Measuring tape, accurate to 1 mm.

E.3 Test medium

The test can be carried out using water or kerosene (see Annex A). Water shall be the reference medium.

E.4 Procedure

Lay the hose assembly as straight as possible and without restriction of movement. Fill the assembly with the test medium eliminating air and gases and apply a pressure of 0,07 MPa (0,7 bar). Measure the overall length of the assembly or the length between the measuring points (L_o).

Ensure that the measuring points for the length of the assembly, (L_o), are identified and used for the re-measurement, (L_1 and L_2). For type A hoses, mark the ends of the assembly with reference points for measurement of twist.

Increase the pressure over a period of 5 min to half the appropriate maximum working pressure given in Table 1 and hold for 10 min.

Reduce the pressure to 0 MPa (bar) over a period of 5 min.

Increase over a period of 5 min the pressure to the appropriate maximum working pressure given in Table 1 and hold for 10 min. Re-measure the length of the hose over the same surface as before, (L_1), and for Type A hoses only, record any twisting of the hose in angular degrees.

Reduce the pressure to 0 bar over a period of 5 min.

Leave the assembly relaxed for 15 min and then raise the pressure to 0,7 bar. Re-measure the length of the hose over the same surface as before (L_2).

Carry out the proof pressure test at 1,5 times the maximum working pressure according to Table 1, when this is required.