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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 A50–5 S25–5 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 %.

