BS EN 1765:2016

BSI Standards Publication

Rubber hose assemblies for oil suction and discharge services — Specification for the assemblies

bsi.

National foreword

This British Standard is the UK implementation of EN 1765:2016. It supersedes BS EN 1765:2004 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/66, Rubber and plastics tubing, hoses and hose assemblies.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Rubber hose assemblies for oil suction and discharge services - Specification for the assemblies

Flexibles en caoutchouc pour chargement et déchargement des produits pétroliers - Spécifications pour les flexibles

Gummischlauchleitungen für das Ansaugen und Fördern von Öl - Anforderungen an die Schlauchleitungen

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European foreword

This document (EN 1765:2016) has been prepared by Technical Committee CEN/TC 218 “Rubber and plastics hoses and hose assemblies”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1765:2004.

Compared to EN 1765:2004 the following changes have been made:

a) Clause 2: the normative references have been updated;

b) Subclause 4.2: hose assemblies type S and L were subdivided into two grades Grade M (electrically bonded) and Grad Ω (electrically conductive);

c) Subclause 5.2.3.2: one type of hose assembly assembled with hose nipples in accordance to EN 14420-2 and swaged or crimped ferrules has been added;

d) Table 4: for the electrical properties (continuity) the maximum electrical resistance 10^6 per assembly for grade Ω was added;

e) Clause 12: the requirements for marking have been amended.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document 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 document 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 essential that the purchaser provides 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).

1 Scope

This European 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 containing a maximum aromatics content of 50 % (*v/v*). It is not suitable for liquefied petroleum gas and natural gas.

Hose assemblies to this document can be used in the temperature range −20 °C to 82 °C.

The hoses specified are in the size range of nominal bore 50 to 500 and may be smooth bore, rough bore or armoured rough bore.

Hoses for use with petroleum products having an aromatic content greater than 50 % (v/v) are outside the scope of this document but the requirements may be used as a basis for such hoses on request to the manufacturer.

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.

EN 14420-2, *Hose fittings with clamp units - Part 2: Hose side parts of hose tail*

EN 14420-3 *Hose fittings with clamp units - Part 3: Clamp units, bolted or pinned*

EN 14420-4, *Hose fittings with clamp units - Part 4: Flange connections*

EN ISO 1402, *Rubber and plastics hoses and hose assemblies - Hydrostatic testing (ISO 1402)*

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

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods (ISO 1461)*

EN ISO 7233, *Rubber and plastics hoses and hose assemblies - Determination of resistance to vacuum (ISO 7233)*

EN ISO 8031:2009, *Rubber and plastics hoses and hose assemblies - Determination of electrical resistance and conductivity (ISO 8031:2009)*

EN ISO 8033, *Rubber and plastics hoses - Determination of adhesion between components (ISO 8033)*

EN ISO 8330:2014, *Rubber and plastics hoses and hose assemblies - Vocabulary (ISO 8330:2014)*

EN ISO 15614-1:2004, *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 (ISO 15614-1:2004)*

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

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

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*

ASME B.1.20.1, *Pipe Threads, General Purpose, Inch*

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

EN ISO 2063, *Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys (ISO 2063)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 8330:2014 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 connections

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 one or both couplings

4 Classification

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 End – use

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 may 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 may be electrically continuous or electrically discontinuous (see Warning in 4.1);

Hoses and hose assemblies for this application shall be divided into two grades:

— Grade M: electrically bonded;

— Grade Ω: electrically conductive; see EN ISO 8031:2009, Annex A for new recommended marking to indicate conductive lining, conductive cover or conductive lining and cover;

— **Type L**, hose assemblies for dock service where greater flexibility, lower weight and ease of handling are of primary consideration. Type L hose assemblies may be electrically continuous or electrically discontinuous. They are only suitable for discharge applications (see Warning in 4.1);

Hoses and hose assemblies for this application shall be divided into two grades:

— Grade M: electrically bonded;

— Grade Ω: electrically conductive; see EN ISO 8031:2009, Annex A for new recommended marking to indicate conductive lining, conductive cover or conductive lining and cover.

4.3 Pressure ratings and designations

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

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

Table 1 — Pressure ratings and designation

Maximum working pressure and test pressure Bar [a]	**Proof pressure (maximum 5 min.)** bar	**Type and designation**	**Description**
7	10,5	R7	Rough bore
7	10,5	A7	Armoured rough bore
7	10,5	S7	Smooth bore
7	10,5	L7	Light weight
10	15	R10	Rough bore
10	15	A10	Armoured bore
10	15	S10	Smooth bore
10	15	L10	Lightweight
15	22,5	R15	Rough bore
15	22,5	A15	Armoured bore
15	22,5	S15	Smooth bore
15	22,5	L15	Lightweight
[a] 1 bar = 0,1 MPa.			

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.

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 comprise of:

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 comprise 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 may 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.

5.2.3 Type S: Electrically continuous or electrically discontinuous

5.2.3.1 Hoses

Hoses shall comprise of:

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

Three types of assembling are possible:

— with built-in hoses nipples,

— assembled with hose nipples and clamps in accordance to EN 14420-2, EN 14420-3, and EN 14420-4,

— assembled with hose nipples in accordance to EN 14420-2 and swaged or crimped ferrules.

When built-in nipples are used 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 flexible bonding wire to the end of the helical wire and the nipple.

5.2.4 Type L: Electrically continuous or electrically discontinuous

5.2.4.1 Hoses

Hoses shall comprise of:

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.

   Reinforcing plies of either textile or fine wire thoroughly impregnated with electrical conductive rubber are also allowed;

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

5.2.4.2 Hose assemblies

Three types of assembling are possible:

— with built-in end-fitting or

— assembled with hose nipples and clamps in accordance to EN 14420-2, EN 14420-3 and EN 14420-4,

— assembled with hose nipples in accordance to EN 14420-2 and swaged or crimped ferrules.

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.

When built-in nipples are used 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.

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 EN 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 ASME B.1.20.1, 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.

Flanges shall be attached to the nipple by screwing or welding or formed integral with the nipple. They shall be aligned with the nipple so that the deviation in any direction shall not exceed 1°.

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 0,8 mm ± 0,01 mm per revolution.

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

Flange protection coatings may 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 may be applied either by galvanizing or aluminium or zinc spraying in accordance with the requirements given in EN 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 EN ISO 1460 and EN ISO 1461.

6.2 Method of attachment of end connections to the hose

For Types R, S and L, end fittings shall be either built-in during manufacture of the hose or assembled with clamps in line with EN 14420-2, EN 14420-3 and EN 14420-4 or shall be swaged.

For Type A, end fittings shall be built-in during manufacture, or assembled with clamps in line with EN 14420-2, EN 14420-3 and EN 14420-4 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.

6.3 Electrical discontinuous assemblies

For electrical discontinuous assemblies it is essential that all metallic body components in the hose construction be electrically isolated for both nipples. The electrical resistance shall be in accordance to EN ISO 8031:2009 (see Table 4).

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

6.4 Electrical continuous assemblies with built-in nipples

For electrically continuous hose assemblies with built-in nipples 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.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 Diameters

The nominal bore of hoses and associated fittings making a hose assembly shall be as given in Table 2.

Table 2 — Nominal bore, inside diameters and tolerances

Nominal bore	Inside diameters (mm)	Tolerances (mm)
50	50	±0,6
75	75	±0,6
100	100	±1,6
150	150	±2,0
200	200	±2,0
250	250	±2,4
300	300	±5,0
400 [a]	400	±5,0
500 [a]	500	±6,0

[a] Types S10 and S15 only.

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.

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 vulcanized sheets, except for the abrasion test, which shall be carried out on moulded test pieces vulcanized to the same state as the hose.

Table 3 — Physical properties of rubber compounds

Property	Unit	Requirement	Method of test
Lining: Resistance to liquids (volume swell)	%	Not greater than 60	ISO 1817, method 1. 48 h at 40 °C, liquid C
Cover: Abrasion resistance	mm^3	200 maximum	ISO 4649, method A
Cover: Resistance to liquids (volume swell)	%	Not greater than 100	ISO 1817, method 1. 48 h at 40 °C, liquid B
Cover: Resistance to ozone	-	No cracks when viewed under x 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	Method of test
Adhesion between components (dry)	N/mm	3,75 minimum	EN ISO 8033 Samples built to Annex D, 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.	Annex E
Twist at maximum working pressure (type A only)	°/m	9 maximum	Annex E
Resistance to proof pressure	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 Annex E, E.4.	EN ISO 1402
Resistance to vacuum (type S only)	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.	EN ISO 7233, method B
Bending test resistance (types R, A and S only)	-	Empty hose assemblies shall be bent to the appropriate inside bend radius given in Table F.1, Annex F, without resultant damage.	Annex F
Bending test resistance (Type L only)	-	Hose assemblies shall be bent to the appropriate inside bend radius given in Table F.1, Annex F, with an internal pressure of 3,5 bar without resultant damage.	Annex F
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. Grade M. Maximum electrical resistance 10^6 per assembly. Grade Ω.	EN ISO 8031:2009
Electrical properties (discontinuity) (types S and L only)	Ω	Minimum $2,5 \times 10^4$ between the couplings	EN ISO 8031:2009

Property	Unit	Requirement	Method of test
Resistance to minimum burst pressure	bar	No failure at 4 times the max. working pressure given in Table 1	Annex G

9 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 Annex E, Clause E.6).

10 Type testing

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

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

10.3 Hose assemblies of lesser diameter of an approved type, incorporating the same basic construction an 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 test.

11 Frequency of testing

Type and routine tests are specified in Annex H.

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

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

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 document, EN 1765:2016;

c) type and designation, e.g. A15;

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

e) the maximum working pressure, e.g. 15 bar;

f) symbol to identify electrical conductivity, e.g. M, respectively Ω (Type S and L only);

g) the quarter and year of manufacture, e.g. 2Q-2015;

h) the serial number of the hose assembly

EXAMPLE 1 XXX…/EN 1765:2016/A15/75/15 bar/Ω /2Q2015/005.

Electrically discontinuous assemblies shall have in addition, the words 'ELECTRICALLY DISCONTINUOUS' The marking shall be permanent and durable.

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;

b) the month and year of assembly e.g. 06-2015;

c) the test pressure/maximum working pressure, e.g. 15 bar.

EXAMPLE 2 XXX/999/01–2015/15.

This stamping should be only 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 bore, see 7.1;

b) nominal length, see 7.2;

c) fluid(s) to be conveyed;

NOTE This information may 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 8.2 Table 4 and Annex E, 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 shall be included:

   1) hydrostatic pressure test, see 8.2 Table 4 and Annex E, and requirement for proof pressure test, if any;

   2) vacuum test (type S only), see 8.2, Table 4;

   3) bending test see 8.2, Table 4 and Annex F;

   4) bursting test, see 8.2, Table 4 and Annex G;

   5) permanent and temporary elongation, see 8.2, 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 may 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 may 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 may 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 may 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 typical 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 — Masses of hoses

Nominal	**Masses in kg/m**											
bore	**R7**	**R10**	**R15**	**A7**	**A10**	**A15**	**S7**	**S10**	**S15**	**L7**	**L10**	**L15**
50	5,5	6,0	6,5	3,5	4,0	4,5	4,0	4,5	5,0	2,0	2,25	2,5
75	8,0	8,5	9,0	5,5	6,0	6,5	5,5	6,0	6,5	3,75	4,0	4,5
100	11,0	12,0	13,0	7,0	7,5	8,5	7,0	7,5	8,5	4,75	5,0	5,5
150	19,0	20,0	21,0	12,0	13,0	16,0	13,0	14,0	15,0	6,0	6,5	7,5
200	28,0	29,0	30,0	17,0	18,0	26,0	19,0	20,0	21,0	9,0	10,0	12,0
250	38,0	40,0	42,0	20,0	23,0	30,0	27,0	28,5	30,0	13,0	14,0	16,0
300	47,0	50,0	53,0	N.Av.	N.Av.	N.Av.	35,0	37,0	40,0	N.Av.	N.Av.	N.Av.
400	N.Av.	132,0	142,5	N.Av.	N.Av.	N.Av.	N.Av.	85,0	90,0	N.Av.	N.Av.	N.Av.
500	N.Av.	N.Av.	187,5	N.Av.	N.Av.	N.Av.	N.Av.	120,0	125,0	N.Av.	N.Av.	N.Av.
N.Av. = not available												

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 ASTM No. 2 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 may 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 x 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 EN 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 ASTM No. 2 oil. It is left in a safe position for 30 d 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 Report

D.7.1 The adhesion level is recorded as N/mm width. 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, just like the details of the test fluid shall be reported too.

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 may 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 0,7 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 over a period of 5 min the pressure to half the appropriate maximum working pressure given in Table 1 and hold for 10 min.

Reduce the pressure to 0 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.

E.5 Calculation

Calculate the temporary elongation as:

$$\% = \frac{L_1 - L_o}{L_o} \times 100 \quad \text{(E.1)}$$

and the permanent elongation as:

$$\% = \frac{L_2 - L_o}{L_o} \times 100 \quad \text{(E.2)}$$

The values of the temporary and permanent elongation shall not exceed the values given in Table E.1 relevant to the designation of the hose.

Table E.1 — Temporary and permanent elongation at maximum w.p

Designation	**Temporary elongation** % max.	**Permanent elongation** % max.
A7, A10, A15	10	2,5
R7	10	2,5
R10, R15	7,5	1,5
S7 (textile)	10	2,5
S7 (wire)	2	1
S10, S15 (textile)	7,5	1,5
S10, S15 (wire)	2	1
L7, L10, L15	5	2

For Type A assemblies only, the twist shall also be determined and recorded and not exceed 9 °/m.

E.6 Test report

The test report shall at least include the following information:

a) full description of the assembly tested including serial number;

b) date and batch of the assembly tested;

c) test medium and pressure (including proof pressure when applicable);

d) temporary elongation %;

e) permanent elongation %;

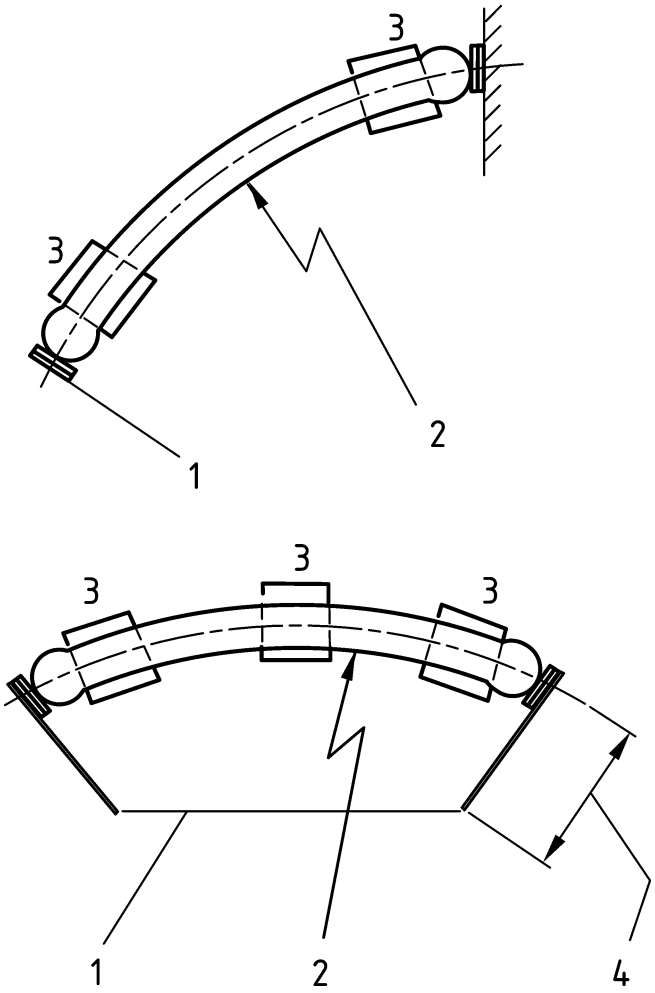
f) degrees of twist if applicable;

g) date of test.

Annex F
(normative)

Minimum bend radius test

When hose assemblies cannot be bent to the required minimum bend radius (see Table F.1) by hand, the minimum bend radius tests shall be performed as indicated in Figure F.1, hose empty for types R, A and S and pressurized for type L. The test shall be repeated five times. After completion of the minimum bend radius test, there shall be no permanent deformation, such as kinking or ovalling, when returned to the straight position.



Key

1 come – along or chain block (Pull normal to longitudinal axis of hose end)
2 minimum inside bend radius
3 casters
4 approximately three times of nominal bore

Figure F.1 — Alternative methods for minimum bend radius testing for large bore hoses (approximately NB 150 and more)

Table F.1 — Bending radii

Nominal bore	Inside bend radius (Metres)											
	Type R				Type A			Type S				Type L
	Woven textile reinforcement (see 5.2.1.1 d))			Wire or textile cord reinforced (see 5.2.1.1 d))				Woven textile (see 5.2.3.1c)			Wire or textile cord reinforcement (see 5.2.3.1 c))	
	R7	R10	R15	R7, R10, R15	A7	A10	A15	S7	S10	S15	S7, S10, S15	L7, L10, L15
50	0,63	0,68	0,75	0,50	0,33	0,35	0,43	0,50	0,50	0,50	0,35	0,30
75	0,85	1,00	1,10	0,60	0,48	0,52	0,64	0,70	0,80	0,85	0,45	0,45
100	1,10	1,25	1,45	0,75	0,60	0,65	0,80	0,95	1,10	1,20	0,60	0,60
150	1,60	1,85	2,15	1,00	0,90	0,975	1,20	1,40	1,60	2,00	0,85	0,90
200	2,15	2,50	2,85	1,25	1,20	1,30	1,60	1,85	2,15	2,80	1,10	1,20
250	2,60	3,10	3,55	1,50	1,50	1,63	2,00	2,35	2,70[a]	3,50[a]	1,35[a]	1,50[b]
300	3,10	3,68	4,25	1,75	1,80	1,95	2,40	2,80	3,30[a]	4,30[a]	1,60[a]	N/A
400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,40	5,00[a]	2,10[a]	N/A
500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5,50	5,90[a]	2,70[a]	N/A

N/A = Test not applicable

[a] Minimum length of assembly shall be 4,5 m for test under pressure.

[b] Minimum length of assembly shall be 5 m.

Annex G
(normative)

Burst test

G.1 Scope:

The following test shall be carried out on each prototype hose assembly using the largest nominal bore in the projected range for each type on a sample of minimum 6 m between end connections.

NOTE Hoses with smaller nominal bore on the same range which incorporate the same basic construction and fabrication methods but have fewer reinforcement plies should not require prototype tests. Only a major change in design or method of manufacture or test should require further prototype testing.

Major changes are:

— change in material of lining;

— change in material of reinforcement (type or grade);

— change in size of yarns or wire cord of reinforcement material;

— change in angle of lay of reinforcement;

— change of method of application of reinforcement;

— change of method or design of coupling or fitting attachment;

— change in location of manufacture.

G.2 Carry out the hydrostatic test appropriate to the size and type of hose assembly according to Annex E, Procedure E.4.

G.3 For Types R, A and S, bend the hose assembly to the appropriate inside bend radius given in Table F.1, and while in this position repeat the hydrostatic test in Annex E.

For Type L assemblies, bend the assembly until a definite kink develops and hold this position for 5 min. After straightening, subject the hose assembly to a pressure of 0,7 bar and the hose shall show no signs of permanent kink nor other damage.

G.4 With the hose in a straight position apply a hydrostatic pressure equal to four times the appropriate test pressure given in Table 1. The pressure shall be attained over a period of 15 min and held for a further 15 min without failure of the assembly.

G.5 After the holding period in Annex E, continue to raise the pressure until the hose assembly fails. Record the pressure at which failure occurs and the nature and location of failure.

Annex H
(normative)

Test frequency for type testing and routine test

Table H.1 gives the frequency of testing for type testing and routine tests.

Table H.1 — Type testing and routine tests

Property test	Type testing	Routine test	Clause reference
Compound tests Lining: resistance to liquids	x	N/A	Table 3 (8.1)
Cover: resistance to liquids	x	N/A	Table 3 (8.1)
abrasion resistance	x	N/A	Table 3 (8.1)
ozone resistance	x	N/A	Table 3 (8.1)
Hose assemblies			
Adhesion (dry)	x	N/A	Table 4 (8.2)
Adhesion (wet)	x	N/A	Table 4 (8.2)
Change in length at max. w.p.	x	x	Table 4 (8.2)
Proof pressure	x	N/A [a]	Table 4 (8.2)
Vacuum test (type “S” only)	x	x	Table 4 (8.2)
Twist test (type “A” only)	x	x	Table 4 (8.2)
Bending test (types R, A + S)	x	N/A	Table 4 (8.2)
Bending test (types L)	x	N/A	Table 4 (8.2)
Electrical tests	x	x	Table 4 (8.2)
Burst test	x	N/A	Table 4 (8.2)

x = test to be carried out

N/A = test not applicable

[a] Proof pressure test to be carried out when purchaser requires this (see Annex A, k) 1).

Annex I
(informative)

Test frequency for production acceptance tests

Production acceptance tests are those carried out per batch as indicated in Table I.1. A batch is defined as either 500 m of hose assembly or 2 000 kg of lining and/or cover compound.

Table I.1 — Recommended frequency for production acceptance tests

Property Test	**production acceptance**	**Clause reference**
Compound tests Lining: resistance to liquids	x	Table 3 (8.1)
Cover: resistance to liquids	x	Table 3 (8.1)
abrasion resistance	x	Table 3 (8.1)
ozone resistance	N/A	Table 3 (8.1)
Hose assemblies		
Adhesion (dry)	x	Table 4 (8.2)
Adhesion (wet)	x	Table 4 (8.2)
Change in length at max. w.p.	x	Table 4 (8.2)
Proof pressure	x	Table 4 (8.2)
Vacuum test (type “S” only)	x	Table 4 (8.2)
Twist test (type “A” only)	x	Table 4 (8.2)
Bending test (types R, A + S)	x	Table 4 (8.2)
Bending test (types L)	x	Table 4 (8.2)
Electrical tests	x	Table 4 (8.2)
Burst test	N/A	Table 4 (8.2)
x = test to be carried out N/A = test not applicable		

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