BS EN 12115:2011

BSI Standards Publication

# Rubber and thermoplastics hoses and hose assemblies for liquid or gaseous chemicals — Specification

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**National foreword**

This British Standard is the UK implementation of EN 12115:2011. It supersedes BS EN 12115:2000 which is withdrawn.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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**Compliance with a British Standard cannot confer immunity from legal obligations.**

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EUROPEAN STANDARD

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# EN 12115

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Supersedes EN 12115:1999

English Version

# Rubber and thermoplastics hoses and hose assemblies for liquid or gaseous chemicals - Specification

Tuyaux et assemblages flexibles en caoutchouc et en matériaux thermoplastiques pour substances chimiques liquides ou gazeuses - Spécifications

Gummi- und Kunststoffschläuche und -schlauchleitungen für flüssige oder gasförmige Chemikalien - Anforderungen

This European Standard was approved by CEN on 30 November 2010.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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# Contents

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# Foreword

This document (EN 12115:2011) 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 July 2011, and conflicting national standards shall be withdrawn at the latest by July 2011.

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

This document supersedes EN 12115:1999.

In comparison with EN 12115:1999 the following changes have been made:

a) the test procedure to determine the electrical resistance through the hose wall is given in Annex A (normative);

b) a list of hose lining material resistant to specific chemical substances, identified by CAS number, has been added as Annex F (informative);

c) the normative references have been updated.

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

# Introduction

This European Standard has been prepared to provide minimum acceptable requirements for the satisfactory performance of flexible rubber and thermoplastics hoses and hose assemblies with unspecified reinforcement and linings of different types of synthetic rubbers and thermoplastics, for each chemical substance conveyed.

A list of hose lining material resistant to specific chemical substances, identified by CAS number, has been added as Annex F (informative). This list is for information only.

# 1 Scope

This European Standard specifies requirements for two types of hose assemblies (Types D and SD) and four grades based on electrical properties with hoses made of rubber or thermoplastics and hose fittings made of metal designed to convey liquid or gaseous chemical substances, hereinafter termed the "chemicals conveyed".

The hose assemblies are intended for use with chemicals conveyed in the temperature range of -20 °C to +65 °C at a working pressure ≤ 10 bar[1)].

NOTE 1 This European Standard sets out requirements for these hose assemblies to ensure that users are not exposed to danger from fire or explosion and that the environment is protected against contamination or damage.

NOTE 2 Other temperatures and working pressures than those given above can be agreed with the manufacturer, provided that the marking on the hose (see 14.1) states this and the requirements of Table 5 and all the other requirements are met.

NOTE 3 Other diameters than those given in this European Standard can be agreed with the manufacturer.

NOTE 4 This European Standard also provides guidance on the storage of hose assemblies (Clause 15).

NOTE 5 The attention of users is drawn to Annex F concerning the selection of lining material related to the chemical(s) to be conveyed by the hoses and/or hose assemblies.

This standard does not apply to hose assemblies for:

— aircraft refuelling (EN 1361);

— fuel dispensing (EN 1360);

— oil burners (EN ISO 6806);

— refrigerant circuits;

— fuel truck delivery (EN 1761);

— liquid petroleum gases (LPG) (EN 1762);

— fire fighting (EN ISO 14557);

— oil suction and discharge (EN 1765);

— rotary drilling (EN ISO 6807);

— fuel dispensing with vapour recovery system (EN 13483).

This European Standard does not apply to multilayer hose assemblies (EN 13765 and EN 13766).

1) 1 bar = 0,1 MPa.

## 2 Normative references

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

EN 10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings*

EN 10270-1, *Steel wire for mechanical springs — Part 1: Patented cold drawn unalloyed spring steel wire*

EN 10270-2, *Steel wire for mechanical springs — Part 2: Oil hardened and tempered spring steel wire*

EN ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing (ISO 1402:2009)*

EN ISO 1746, *Rubber or plastics hoses and tubing — Bending tests (ISO 1746:1998, including technical corrigendum 1:1999)*

EN ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies (ISO 4671:2007)*

EN ISO 4672:1999, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests (ISO 4672:1997)*

EN ISO 7233, *Rubber and plastics hoses and hose assemblies — Determination of resistance to vacuum (ISO 7233:2006)*

EN ISO 7326, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions (ISO 7326:2006)*

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 8033:2006)*

EN ISO 8330:2008, *Rubber and plastics hoses and hose assemblies — Vocabulary (ISO 8330:2007)*

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 1629, *Rubber and latices — Nomenclature*

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

ISO 4649:2002, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 8331, *Rubber and plastics hoses and hose assemblies — Guidelines for selection, storage, use and maintenance*

BS 3592-1:1986, *Steel wire for hose reinforcement — 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 EN ISO 8330:2008 apply.

NOTE In this European Standard the word "fitting" has been used; this is, in some cases, interchangeable with the word "coupling".

## 4 Classification

Hoses and hose assemblies for this application shall be divided into two types, according to their duty requirements:

— Type D: hoses and hose assemblies for delivery duty only;

— Type SD: hoses and hose assemblies for suction and delivery duty.

Hoses and hose assemblies for this application shall be divided into four 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;

— Grade M/T: electrically bonded and with an electrical resistance through the hose wall not exceeding $10^9$ Ω;

— Grade Ω/T: electrically conductive and with an electrical resistance through the hose wall not exceeding $10^9$ Ω.

## 5 Couplings and end fittings

Hoses shall be fitted with end fittings and couplings to form hose assemblies. Examples are given in Annex C.

## 6 Materials and construction

### 6.1 General

Hoses Type D shall consist of a lining, reinforcement and a cover.

Hoses Type SD shall consist of a lining, reinforcement and a cover, and in addition incorporate one or more helixes.

### 6.2 Lining

The lining shall be resistant to the chemical substances conveyed. The lining shall be uniform in quality and thickness and shall be free from porosity, air holes, foreign inclusions and other defects which could impair the expected use.

### 6.3 Cover

The cover shall be resistant to mechanical damage, wear and environmental effects due to weather and short-term chemical exposure.

### 6.4 Reinforcement

The reinforcement shall consist of a textile material which is resistant to the medium conveyed.

### 6.5 Helical wires

The helix or helixes shall be fully embedded into the hose wall so that contact with the medium conveyed is avoided.

## 7 Dimensions and tolerances, typical masses

### 7.1 Diameters, thickness, vacuum stability, bend radii and resistance to vacuum

The inside and outside diameters of the hoses, the minimum thickness of lining and cover and the minimum bend radius shall conform to the values given in Table 1 or Table 2 (depending on the type).

The Type D hoses shall be able to withstand an internal vacuum as specified in Table 1 (vacuum stability) without collapse or changes in diameter and length in excess of the values specified in Table 5.

**Table 1 — Dimension requirements, Type D hoses**

| **Nominal bore** | **Inside diameter** mm | **Tolerance** mm | **Outside diameter** mm | **Tolerance** mm | **Minimum thickness mm** | | **Bend radius** mm min [b] | **Vacuum stability** bar |
|---|---|---|---|---|---|---|---|---|
| | | | | | **lining** [a] | **cover** | | |
| 13 | 13,0 | ±0,5 | 23,0 | ±1,0 | 2,0 | 1,6 | 90 | -0,5 |
| 19 | 19,0 | | 31,0 | | | | 125 | |
| 25 | 25,0 | | 37,0 | | | | 150 | -0,4 |
| 32 | 32,0 | | 44,0 | | | | 175 | |
| 38 | 38,0 | | 51,0 | | | | 225 | |
| 50 | 50,0 | ±0,7 | 66,0 | ±1,2 | 2,0 | 2,0 | 275 | -0,3 |
| 51 | 51,0 | | 67,0 | | | | 275 | |
| 63 | 63,0 | ±0,8 | 79,0 | | | | 300 | — |
| 75 | 75,0 | | 91,0 | | | | 350[c] | |
| 76 | 76,0 | | 92,0 | | | | 350[c] | |
| 100 | 100,0 | | 116,0 | ±1,6 | | | 450[c] | |
| 101,5 | 101,5 | | 118,0 | | | | 450[c] | |

[a] The dimensions for the minimum lining thickness do not apply to hoses made from materials PE-X/UPE and fluoro-plastics. The thickness for these materials shall be 0,4 mm.

[b] The bend radii specified do not apply to hoses made from PE-X/UPE and fluoro-plastics where the value shall be 1,5 x the values shown above.

[c] Only applies to operation at not less than 1 bar, otherwise the hose will kink.

The Type SD hoses shall be able to withstand an internal vacuum as specified in Table 2 (resistance to vacuum) and shall conform to the requirements specified in Table 5.

**Table 2 — Dimension requirements, Type SD hoses**

| Nominal bore | Inside diameter | Tolerance | Outside diameter | Tolerance | Minimum thickness mm | | Bend radius mm | Resistance to vacuum |
|---|---|---|---|---|---|---|---|---|
| | mm | mm | mm | mm | lining [a] | cover | min [b] | bar |
| 19 | 19,0 | ±0,5 | 31,0 | ±1,0 | 1,6 | 1,6 | 125 | -0,8 |
| 25 | 25,0 | | 37,0 | | | | 150 | |
| 32 | 32,0 | | 44,0 | | | | 175 | |
| 38 | 38,0 | | 51,0 | | | | 225 | |
| 50 | 50,0 | ±0,7 | 66,0 | ±1,2 | 1,7 | 1,7 | 275 | |
| 51 | 51,0 | | 67,0 | | | | 275 | |
| 63 | 63,0 | ±0,8 | 79,0 | ±1,2 | 1,8 | 1,7 | 300 | |
| 75 | 75,0 | | 91,0 | | | | 350 | |
| 76 | 76,0 | | 92,0 | | | | 350 | |
| 100 | 100,0 | | 116,0 | ±1,6 | | 2,0 | 450 | |
| 101,5 | 101,5 | | 118,0 | | | | 450 | |

[a] The dimensions for the minimum lining thickness do not apply to hoses made from materials PE-X/UPE and fluoro-plastics. The thickness for these materials shall be 0,4 mm.

[b] The bend radii stated do not apply to hoses made from PE-X/UPE and fluoro-plastics where the value shall be 1,5 x the values shown above.

### 7.2 Concentricity

When determined in accordance with EN ISO 4671, the concentricity, based on a total indicator reading between the internal diameter and the outside surface of the cover, shall be ≤ 1,0 mm for hoses ≤ 51 nominal bore and ≤ 1,5 mm for hoses > 51 nominal bore.

### 7.3 Length of hose assemblies

The length of the hose assembly shall be the intended installed length measured from sealing surfaces of the end fittings.

For hose assembly lengths ≤ 1 000 mm the tolerance shall be (+15/−10) mm.

For hose assembly lengths > 1 000 mm the tolerance shall be (+1,5/−1,0) %.

## 8 Physical properties of materials used for hoses

### 8.1 General

The physical properties of the materials used for the lining and cover shall conform to the values given in Table 3, when tested in accordance with the methods listed in Table 3. Tests shall be carried out either on samples taken from the hose or from separately vulcanized sheets (to the same degree as the hose).

NOTE The cover is not intended to be in contact with the chemical conveyed. Whenever such contact occurs the cover of the hose should be examined for harmful effects.

**Table 3 — Physical properties of materials**

| Property | | Unit | Requirement | | Test method |
|---|---|---|---|---|---|
| | | | Lining | Cover | |
| Tensile strength | min. | MPa | 8,0 | 8,0 | ISO 37 (dumbbell test pieces) |
| Elongation at break | | % | | | |
| Fluoro-rubber (FKM) | min. | | 150 | 150 | ISO 37 (dumbbell test pieces) |
| Other materials, see Table 4 | min. | | 250 | 250 | |
| Ageing | | % | | | |
| Tensile strength change | max. | from the un-aged value | — | 15 | ISO 188 (air-oven method) 7 days at (70 ± 1) °C |
| Elongation at break change | max. | | — | 20 | |
| Abrasion resistance | | | | | |
| black filled compound | max. | $mm^3$ | — | 200 | ISO 4649:2002 Method A |
| non-black filled compound, coloured | | | — | 350 | |

## 8.2 Materials used for the lining

The lining shall be made from the range of materials given in Table 4.

NOTE The characteristics within a material group can vary, e.g. dependent upon type of polymer, ratio of mixture and vulcanization method.

**Table 4 — Materials groups for hose lining**

| Polymer [a] reference | Material for hose lining and typical applications | | Recommended colour coding on hose cover |
|---|---|---|---|
| NBR 1 | Acrylonitrile butadiene rubbers | Hoses for mineral oil products of all types less than 50 % aromatic | Yellow |
| NBR 2 | | Hoses for aromatic and chlorinated hydrocarbons and solvents | Blue |
| NBR 3 | | Hoses for oily foodstuffs | White |
| NR | Isoprene rubber (natural rubber), e.g. for potable alcohol | | No recommended colour |
| IIR | Isobutene/Isoprene rubber (butyl rubber) | | Lilac |
| EPDM | Terpolymers made from ethylene, propylene and a diene with an unsaturated part portion of the diene in the side chain | | |
| CSM | Chlorosulfonated polyethylene | | Green |
| FKM | Rubbers with fluoro, fluoroalkyl or fluoroalkoxy groups on the polymer chain (fluoro-rubber) | | Green and white |
| PE-X/UPE | Cross-linked polyethylene/ultra-high molecular polyethylene | | Blue and white |
| [b] | Fluoro-plastics (e.g. PTFE, PFA, FEP…) | | Blue and white and a third colour |

a For alphabetic abbreviations see ISO 1629.

b No reference is given. Details of materials and their resistance against the chemical conveyed shall be agreed from manufacturer's information, see Annex F.

Other materials may be agreed between the manufacturers and user, but all requirements of this European Standard shall be met.

### 8.3 Material of the helix

The helix or helixes shall consist of galvanized hard or mild steel wire, in accordance with EN 10270-1 or EN 10270-2 (galvanized to EN 10244-2), or to BS 3592-1:1986. Alternatively, the helix or helixes may, when required, consist of stainless steel wire, in accordance with EN 10088-3:2005, steel numbers 1.4306, 1.4401, 1.4404 or 1.4436.

### 8.4 Materials of the end fittings and couplings

The material of end fittings and couplings, either metal or plastics, shall be chemically resistant to the substance conveyed. Information concerning suitability of various metals is given in Annex F.

## 9 Performance requirements of hoses and hose assemblies

The physical properties of the finished hose and hose assemblies shall conform to the values given in Table 5, when tested in accordance with the appropriate methods given in Table 5.

**Table 5 — Performance requirements of hoses and hose assemblies**

| Property | Unit | Requirement | Test method |
|---|---|---|---|
| Proof test pressure | — | No leakage or other signs of weakness 1,5 × the working pressure | EN ISO 1402 |
| Change in length<br>at proof test pressure<br><br>at -0,8 respectively -0,9 bar vacuum | % | maximum allowed<br>Type D 0 to +8<br>Type SD 0 to +10<br>Type SD -2 % | EN ISO 1402 |
| Twist at proof test pressure . | °/m | maximum 8 | EN ISO 1402 |
| Resistance to vacuum,<br>Vacuum according to Table 2<br>for 10 min | — | No failure, no collapse, no blisters or delamination of lining (Type SD) | EN ISO 7233 |
| Vacuum stability<br>Vacuum according to Table 1 for 10 minutes | % | No changes in diameter and/or length > -2 % (Type D) | EN ISO 7233 |
| Burst pressure | bar | minimum four times the working pressure | EN ISO 1402 |
| Adhesion between components,<br>dry | N/mm | minimum 2,4 | EN ISO 8033 |
| Crush recovery, .<br>Type SD only (peak compressive strength test) | % | maximum 3 | Annex D |
| Ozone resistance | — | No cracking observed under × 2 magnification | EN ISO 7326<br>relative humidity (55 ± 10) %,<br>ozone concentration (50 ± 5) pphm,<br>elongation 20 %<br>Test duration:<br>$(72^{0}_{-2})$ h.<br>Test temperature:<br>(40 ± 2) °C |
| Flammability test | — | a) Burning with a naked flame to cease within 20 s of removal of the burner;<br>b) No further glowing visible 2 min after removal of the burner;<br>c) Hose shall show no sign of leakage. | Annex E |
| Electrical properties | Ω | $10^2$/ assembly-M-grade<br>$10^6$ / assembly-Ω-grade<br><br>$10^9$/ hose wall-T-grade | EN ISO 8031:2009, Clause 4<br><br>EN ISO 8031:2009, 4.9 |

**Table 5** *(continued)*

| Property | Unit | Requirement | Test method |
|---|---|---|---|
| Bending test<br>at min. bending radius with, for Type D only, an internal pressure of 0,7 bar, deformation of the external hose diameter | % | 10 | EN ISO 1746 |
| Flexibility<br>At -20 °C | — | No permanent deformation or visible structural damage | EN ISO 4672:1999<br>Method B |

## 10 Electrical properties

Electrical resistance of hoses and hose assemblies can be obtained by two methods.

a) Incorporating two low resistance bonding wires into the hose construction. These shall be spirally applied and shall be positioned in such a way to cross uniformly.

When attaching fittings to these hoses, the bonding wires shall be folded into the hose bore, securely positioned between the lining and the fitting tail, and extended minimum one third of the length of the fitting tail into the bore.

When tested in accordance with EN ISO 8031, the resistance along the bonding wires, in the case of hoses, or the resistance between fittings, in the case of hose assemblies, shall not exceed $10^2$ Ω per length. When obtaining electrical continuity by this method the hose shall be marked with the symbol “M”.

b) Incorporating electrically conducting materials in the hose construction. When attaching fittings to these hoses, an adequate connection between the end-fittings and the conductive layer shall be made. Conductive layers can be either lining, or cover or both lining and cover.

When tested in accordance with EN ISO 8031, the resistance along the conductive layer, in the case of hoses, or the resistance between the fittings, in the case of hose assemblies, shall not exceed $10^6$ Ω per length. When obtaining electrical resistance by this method the hose shall be marked with the symbol “Ω“.

c) When there is a need for hose assemblies of a) or b) with an electrical resistance through the hose wall of not more than $10^9$ Ω these hoses shall be marked with an additional symbol "/T", e.g. "M/T" or "Ω/T". Such hose assemblies are required in situations where dissipation of electrostatic charges are a safety requirement (i.e. in explosive environments).

The test procedure to determine the electrical resistance through the hose wall is given in EN ISO 8031:2009, 4.9. This test will only give representative results when it is conducted on a hose assembly of identical construction and materials, with the same type of fittings and materials as the production hose which is intended for this service.

During and after subjection to the hydrostatic tests as given in EN ISO 1402, electrical continuity of each hose shall be maintained from end to end and electrical continuity of each hose assembly shall be maintained from one fitting to the other.

Electrical conductivity in Type SD shall not be obtained by only connecting the fittings to the helixes. The property required in c) shall be verified for each design during type testing only.

## 11 Frequency of testing

The minimum frequency of testing shall conform to the schedule given in Annex A.

Type tests are tests to verify that the hose or hose assembly conforms to all requirements of this European Standard.

Routine tests are tests on each length of finished hose or hose assembly.

Production acceptance tests are those tests carried out per batch or 10 batches, see schedule given in Annex B; this is for guidance only.

## 12 Type tests

Type tests shall be carried out in order to confirm that all the material, construction and test requirements of this European Standard have been met by the method of manufacture and hose design.

Type tests shall be repeated at a minimum of every five years or whenever there is a change in design, method of manufacture or materials.

Type tests shall be performed on at least a reference diameter of a hose e.g. 50 mm I.D. of each design in the manufacturer's range for each type.

## 13 Test report

When requested by the purchaser, the manufacturer or supplier shall provide a test report with each length or batch of hoses or hose assemblies supplied to the purchaser.

In this report all hoses or hose assemblies shall be positively identified by batch or serial number, and all test results shall be recorded.

## 14 Marking

### 14.1 Hoses

All hoses shall be continuously marked by relief embossing or branding which is clearly legible and durable, in medium spaced lettering, with a letter height of at least 5 mm.

Unless otherwise agreed, the length of the identification according to the identification example shall not exceed 500 mm.

The hoses shall be colour-coded in accordance with Table 4.

At least the following information shall be marked:

a) manufacturer’s name or identification, e.g. - Ltd.;

b) number and date of this European Standard, i.e. EN 12115:2011;

c) material of hose lining, e.g. IIR, EPDM…;

d) hose type, D or SD;

e) nominal bore, e.g. 38;

f) maximum working pressure, in bar, e.g. 10 bar;

g) operating temperature range (if different from standard -20 °C to 65 °C);

h) symbol to identify electrical conductivity, e.g. Ω, respectively Ω/T;

i) quarter and year of manufacture, e.g. 3Q - 10.

EXAMPLE Ltd. - EN 12115:2010 - EPDM - D - 38 - 10 bar - Ω - 3Q - 10.

## 14.2 Hose fittings

The fittings shall be permanently marked at least with the following information:

— manufacturer's name or trademark;

— type and nominal size;

— material;

— maximum working pressure of the fitting.

It is the responsibility of the user to verify that the maximum permissible working pressure of the assembly is suitable for safe duty at the operating pressure in user's system. This maximum working pressure of the assembly may be lower than the maximum working pressure marked on the hose.

For further information see ISO/TR 17784.

## 14.3 Identification of hose assemblies

Before they are used for the first time, hose assemblies in accordance with this European Standard shall have two stainless steel identification bands (see below) in addition to the marking specified in 14.1 and 14.2. These bands shall be fixed by the assembler onto the hose assembly near the fitting so that it is captive. Identification details shall be marked clearly, legibly and durably, for example by engraving.

Band 1 shall remain permanently in position on the hose assembly.

Each time hose assemblies are routinely tested, Band 2 shall be removed and replaced with a new band by the operator bearing the new identification details given for Band 2 below.

**Band 1**

a) operator registration number (to identify the hose assembly, assembler no., e.g. building counter number);

b) admissible operating pressure, e.g. −0,8 bar to 10 bar;

c) admissible operating temperature range (only when this deviates from the temperature range -20 °C to 65 °C);

d) symbol to identify electrical conductivity, e.g. Ω; respectively Ω/T; Ω - L, Ω - C, Ω - CL or M, M/T;

e) date of assembly, e.g. month and year.

EXAMPLE No. XXX 0123 - padm (−0,8 bar to 10 bar) - tadm - (−30 °C to 80 °C) - Ω - 10/10.

**Band 2**

a) test laboratory (only if this cannot be ascertained with a documentation registration number);

b) date end fittings fitted or test date, e.g. 10/10;

c) date the next test is due, month and year, e.g. 06/11[2)].

EXAMPLE NNNN - fitted (tested) on 10/10 - next test due 06/11.

## 15 Storage and admissible storage time

The recommendations for storing hoses and hose assemblies are given in ISO 8331.

Once hoses and hose assemblies have been stored for three years with effect from the date of manufacture or from the last test, they should be subjected to a further routine test in accordance with Table A.1 before use.

2) Test period shall be given by the user.

# Annex A
(normative)

## Test frequency for type tests and routine tests

The minimum frequency of test for type tests and routine tests shall be as specified in Table A.1.

**Table A.1 — Test frequency for type tests and routine tests**

| Property | Type tests | Routine tests |
|---|---|---|
| **Material tests** | | |
| Tensile strength and elongation | X | N. A. |
| Tensile strength and elongation after ageing | X | N. A. |
| Abrasion resistance | X | N. A. |
| Resistance to chemicals | X | N. A. |
| **Hose tests** | | |
| Adhesion between components, dry | X | N. A. |
| Ozone resistance | X | N. A. |
| Bending test | X | N. A. |
| Measurement of inside and outside diameters | X | X |
| Measurement of thickness (lining and cover) | X | X |
| Measurement of concentricity | X | X |
| Proof pressure | X | X |
| Burst pressure | X | N. A. |
| Resistance to vacuum | X | N. A. |
| Electrical properties for M- and Ω-grades | X | X |
| Electrical properties for T-grade (M/T or Ω/T) | X | N. A. |
| Flexibility at -20 °C | X | N. A. |
| Crush recovery test | X | N. A. |
| Flammability test | X | N. A. |
| **Hose assembly tests** | | |
| Proof pressure | X | X |
| Change in length & twist at proof of pressure | X | N. A. |
| Resistance to vacuum (Type SD only) | X | N. A. |
| Vacuum stability (Type D only) | X | N. A. |
| Burst pressure | X | N. A. |
| Electrical properties between fittings (for all grades) | X | X |
| X = test to be carried out<br>N. A. = not applicable | | |

# Annex B
(informative)

# Production acceptance tests

The frequency of test for production acceptance tests should be as specified in Table B.1.

**Table B.1 — Production acceptance tests**

| Property | Production acceptance tests | |
|---|---|---|
| | per batch [a] | per 10 batches [a] |
| **Material tests** | | |
| Tensile strength and elongation | X | N. A. |
| Tensile strength and elongation after ageing | N. A. | X |
| Abrasion resistance | N. A. | N. A. |
| Resistance to chemicals | N. A. | N. A. |
| **Hose tests** | | |
| Adhesion between components, dry | X | N. A. |
| Ozone resistance | N. A. | X |
| Bending test | N. A. | X |
| Measurement of inside and outside diameters | N. A. | N. A. |
| Measurement of thickness (lining and cover) | N. A. | N. A. |
| Measurement of concentricity | N. A. | N. A. |
| Proof pressure | N. A. | N. A. |
| Burst pressure | N. A. | X |
| Resistance to vacuum | N. A. | X |
| Electrical properties | N. A. | N. A. |
| Flexibility at -20 °C | N. A. | X |
| Crush recovery test | N. A. | X |
| Flammability test | N. A. | N. A. |
| **Hose assembly tests** | N. A. | N. A. |
| X = test to be carried out<br>N. A. = not applicable | | |
| [a] A batch is defined as either 1 000 m hose or 2 000 kg of lining and/or cover compound. | | |

# Annex C
(informative)

# Couplings and fittings

Hoses can be fitted with the following coupling types to form hose assemblies.

Built-in (special cases only):

— clamped;

— swaged or crimped;

— banded.

The end fitting can be of the following connection type:

— quick release/quick acting;

— screw thread;

— flanged;

— union;

— special types (camlock, Storz, claw type, etc.).

Preference should be given to fittings and couplings as described in EN 14420-1 to -8.

Guidance on coupling types is given in ISO/TR 17784.

# Annex D
(normative)

# Crush recovery test (for SD hoses only)

Place a test piece of length L ≥ 350 mm on a rigid, flat base plate so that it is not taut.

Place a 100 mm square 10 mm thick test plate with the edge rounded off to r = 0,5 mm centrally on the test piece. Measure the distance between two plates, the original outside diameter, ($d_1$), (see Figure D.1).

Apply test force, $F$, (see Table D.1) to the test plate for a period of 3 min.

The hose outside diameter can be reduced ≤ 15 % at this stage.

Remove the test force, and after 5 min remeasure the distance between the two plates ($d_2$).

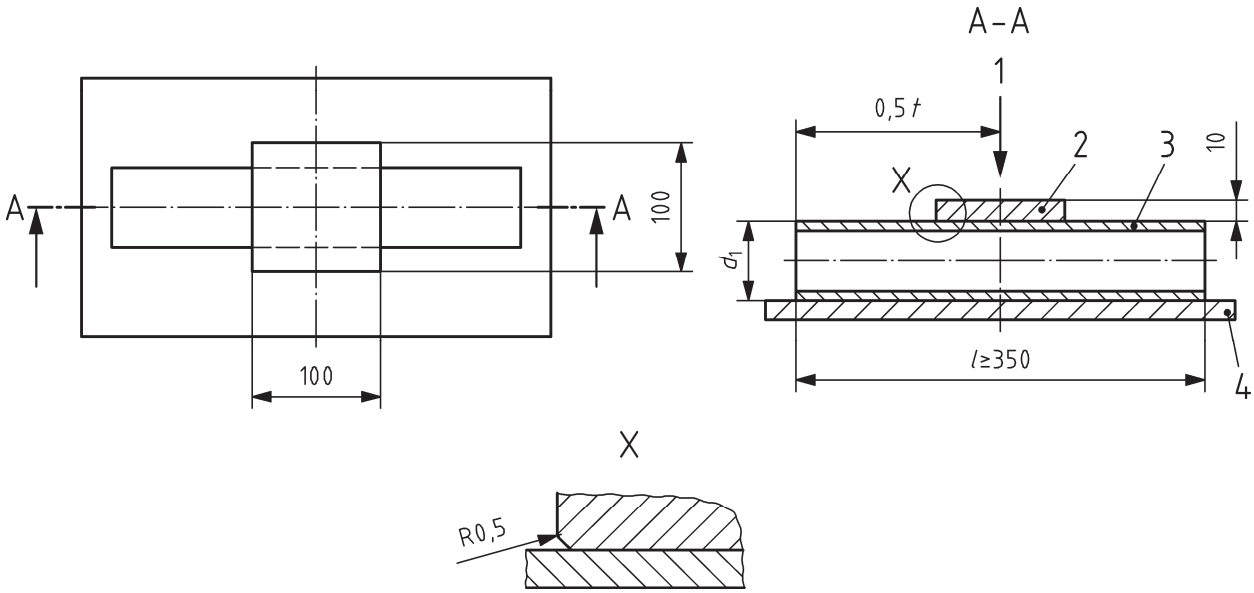
Calculate the reduction as a percentage.

$$\Delta_d = \frac{d_1 - d_2}{d_1} \times 100\ \%$$

**Table D.1 — Test force**

| Nominal bore | Test force, $F$<br>N |
|---|---|
| ≤ 50 | 1 500 ± 10 |
| > 50 | 2 000 ± 10 |

Dimensions in millimetres




**Key**

1 test force, $F$
2 test plate
3 test piece
4 base plate

**Figure D.1 — Arrangement for crush recovery test**

# Annex E
(normative)

# Flammability test

## E.1 Test pieces

Hose assembly with both ends capped.

## E.2 Apparatus

Bunsen burner;

Stopwatch;

Suitable clamps to hold test assembly.

## E.3 Test method

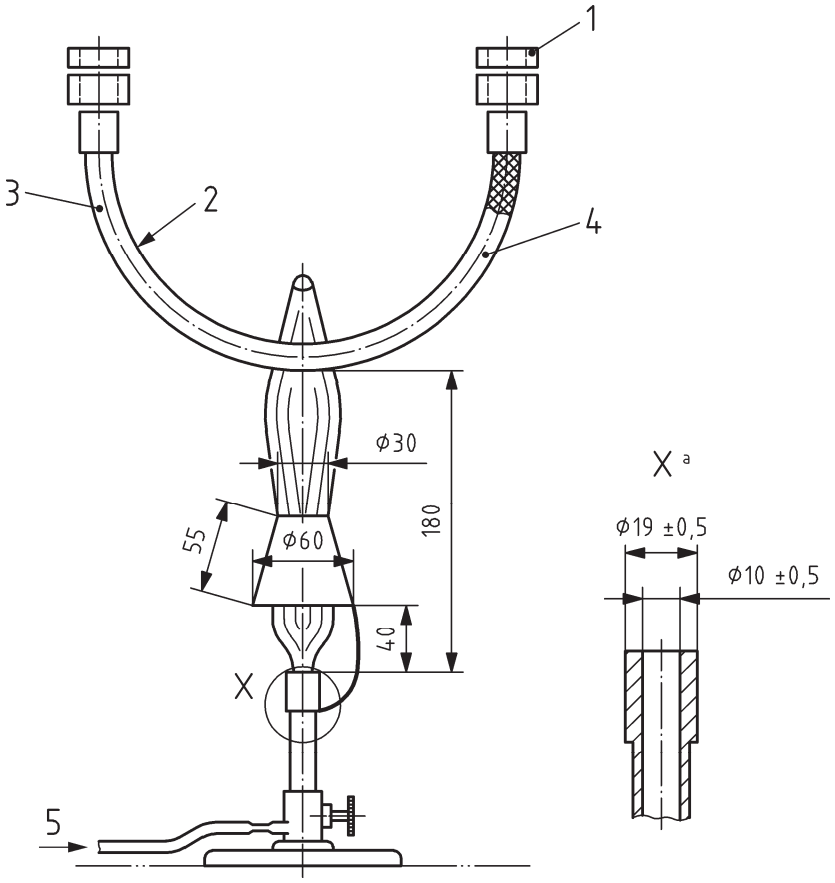
The hose test piece shall be bent into a U-shape of radius according to Figure E.1. The test piece shall be filled with liquid F according to ISO 1817. The test piece shall be exposed to a naked flame from a Bunsen burner of 10 mm pipe diameter for a period of 3 min, with the airflow to the burner shut off. The distance between the burner and test piece shall be according to Figure E.1. The hose sample shall be deemed to be non-flammable if:

— it ceases to burn with a naked flame within 20 s on removal the burner, and

— there is no further glowing visible 2 min after removing the burner flame.

On completion of the test, the hose test piece shall show no sign of leakage with the test fluids.

Dimensions in millimetres




**Key**

1 cap
2 bending radius = 10 to 15 times the outside diameter
3 hose assembly
4 liquid F in accordance with ISO 1817
5 propane (LPG) ≈ 50 mbar

**Figure E.1 — Arrangement for flammability test**

# Annex F
(informative)

# Resistance to chemicals conveyed

## F.1 General

It is the responsibility of the user, in consultation with the manufacturer, to ensure that the lining of the hoses or hose assemblies is suitable to be resistant to the chemicals to be conveyed.

Table F.2 gives guidance values for the chemical resistance of hose linings of various materials and compounds, as well as end fitting materials, to the chemicals listed by their CAS numbers.

| CAS number = Chemical Abstracts Service Registry Number |
|---|

The names of the chemical substances listed by their CAS numbers can be found on the website of the U.S. organization Chemical Abstracts Service (CAS), http://www.cas.org .

In Table F.2 guide values for the resistance of hose and hose assemblies to the chemicals conveyed, identified by their CAS-No, are given. They are primarily based on laboratory tests conducted by the hose manufacturer, generally carried out on tests plates at ambient temperature, obtained from literature, and experience. If the test temperature deviated from the ambient temperature the relevant value is given in the appropriate column of Table F.2.

Four suitability groups (A, B, C and H) according to Table F.1 are distinguished.

## F.2 Suitability of hose

The suitability of a hose is indicated by the resistance of its lining to the chemical conveyed.

Adequate resistance also means that there is no limit to resistance and retention of the original properties of the hose, when used correctly. The effect and diffusion capacity of many of the chemicals conveyed can cause swelling and shrinkage of the hose material, as well as chemical reactions impairing the properties of the hose and the chemicals conveyed (routine tests at the operators work may therefore be required to determine operational safety).

These processes occur more quickly and severely with increased operating temperature and pressure, and affect the end of the service life.

The hose properties as well as the service life of the hose can also be affected by flow rate, wear, duration and frequency of the effect and by impurities in the chemicals conveyed.

## F.3 Resistance of end fitting materials

The details given are guide values. They are based on experience and are taken from relevant literature. In individual cases, even slight differences in concentration and admixtures to the chemicals conveyed, an increase in temperature, can substantially reduce the resistance to pressure of the metal end fitting.

If no relevant experience is available, end-fitting materials shall be individually tested. It should be noted that pairing of couplings of different material groups (e.g. aluminium and brass) should be avoided, as contact corrosion can occur where electrolyte is present (chemical series).

## F.4 Conveyance of chemicals other than those listed in Table F.2

If chemical products or product mixtures other than those listed in Table F.2 are conveyed, or if the nature and composition, e.g. concentration and temperature of the chemical conveyed, deviate from Table F.2, the matter should be discussed with the manufacturer before using the hose assembly and the lining material should be tested for chemical resistance to the product to be conveyed. Assessment of the suitability of hoses and hose assemblies for a specific application can only be made in individual cases.

**Table F.1 — Suitability groups**

| Suitability group | Significance |
|---|---|
| A | suitable for continuous and intermittent use |
| B | limited suitability (only for intermittent use) |
| C | unsuitable, lining material attacked and destroyed after a short time |
| H | information to be provided by the manufacturer on the suitability of the lining |
| – | no information available as to suitability |
| NOTE Important hose suitability criteria are changes in volume, hardness, strength and elongation. Queries in this respect may be addressed to the manufacturer. | |

**Table F.2 — Resistance**

| Chemical product | | Suitability of hose assembly according to Table F.1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hose lining material according to Table 4 | | | | | | | | Material group of the end fitting parts in contact with the chemical conveyed | | |
| CAS-No [a] | Test temperature | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 10 025-87-3 | 50 °C | C | C | C | B | B | B | A | A | - | B | - |
| 10 028-15-6 | - | C | C | C | C | A | A | A | A | A | A | A |
| 10 028-22-5 | - | A | H | A | A | A | A | A | A | C | A | C |
| 10 035-10-6 | - | C | C | C | C | A | A | A | C | C | C | C |
| 10 043-01-3 | - | A | H | A | A | A | A | A | A | C | A | C |
| 10 043-35-3 | - | A | H | A | A | A | A | A | A | A | A | A |
| 10 043-52-4 | - | A | H | A | A | A | A | A | A | C | B | B |
| 10 279-63-7 | - | A | H | A | A | A | A | A | A | C | A | C |
| 10 361-37-2 | - | A | H | A | A | A | A | A | A | B | B | B |
| 10 361-65-6 | - | A | H | A | A | A | A | A | A | - | A | - |
| 100-41-4 | 18 °C | C | H | C | C | C | C | A | A | - | A | - |
| 100-42-5 | 20 °C | C | C | C | C | C | C | A | A | - | A | - |
| 100-44-7 | - | C | C | C | C | H | C | A | A | - | B | - |
| 100-51-6 | - | C | C | C | A | A | A | A | A | A | A | - |

a CAS-No: Chemical Abstracts Service (CAS) Registry number. See website of CAS, http://www.cas.org
b Cu-Zn: Copper-zinc alloys
c St-St: Stainless steel (austenitic and ferritic)
d C-St: Carbon steel

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 100-52-7 | - | C | C | C | C | H | C | C | A | A | A | A |
| 100-63-0 | - | C | C | C | B | B | C | A | A | - | A | - |
| 10124-37-5 | - | A | H | A | A | A | A | A | A | - | A | - |
| 101-84-8 | 60 °C | C | C | C | C | C | C | A | C | - | A | - |
| 102-71-6 | 20 °C | A | A | A | A | A | A | C | A | - | A | - |
| 103-50-4 | - | C | C | C | C | B | C | C | A | - | A | - |
| 103-73-1 | - | C | C | C | C | C | C | C | A | A | A | A |
| 104-76-7 | - | A | A | A | A | A | A | A | A | A | A | A |
| 105-37-3 | - | C | C | C | A | A | B | C | A | - | A | - |
| 105-39-5 | - | C | C | C | C | A | C | C | A | - | A | - |
| 105-45-3 | - | C | C | C | C | B | C | C | A | - | A | - |
| 105-53-3 | - | C | C | C | A | A | A | C | A | - | A | - |
| 105-53-3 | - | C | C | C | A | A | A | C | A | C | A | B |
| 105-54-4 | - | C | C | C | C | A | C | C | A | - | A | - |
| 106-89-8 | - | C | C | C | C | A | C | C | A | - | A | - |
| 107-02-8 | - | C | H | C | C | A | C | C | A | A | A | A |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 107-06-2 | - | C | C | C | C | C | C | A | A | - | A | B |
| 107-10-8 | - | C | C | C | C | B | C | C | A | - | A | - |
| 107-13-1 | - | C | H | C | C | H | C | C | A | A | A | A |
| 107-15-3 | - | H | H | H | H | A | A | C | A | - | A | - |
| 107-18-6 | - | A | A | A | A | A | A | A | A | - | A | - |
| 107-21-1 | 50 °C | A | A | A | A | A | A | A | A | A | A | A |
| 107-88-0 | - | A | H | A | A | A | A | A | A | - | A | - |
| 107-92-6 | - | C | C | C | C | A | A | A | A | B | A | C |
| 108-03-2 | 20 °C | C | C | C | B | A | A | B | A | - | A | - |
| 108-05-4 | - | C | C | C | C | A | C | C | A | - | A | - |
| 108-10-1 | - | C | C | C | C | A | C | C | A | - | A | - |
| 108-20-3 | 20 °C | H | H | H | C | C | C | C | A | A | A | A |
| 108-24-7 | - | C | H | C | B | A | A | C | A | - | A | A |
| 108-31-6 | - | A | A | A | A | A | A | A | A | - | A | - |
| 108-59-8 | - | C | C | C | A | A | A | C | A | - | A | - |
| 108-86-1 | - | C | H | C | C | C | C | A | C | - | A | B |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 108-88-3 | 20 °C | C | H | C | C | C | C | A | A | A | A | A |
| 108-90-7 | 20 °C | C | H | C | C | C | C | A | A | - | A | A |
| 108-91-8 | - | C | C | C | C | H | C | C | A | - | A | A |
| 108-93-0 | - | A | A | A | A | A | A | H | A | - | A | - |
| 108-94-1 | - | C | H | C | C | H | C | C | A | A | A | A |
| 108-95-2 | 60 °C | C | C | C | C | A | C | A | A | A | A | B |
| 109-43-3 | - | C | C | C | C | A | C | A | A | - | A | - |
| 109-60-4 | - | C | C | C | B | A | C | C | A | A | A | A |
| 109-66-0 | - | A | A | A | C | C | B | A | A | - | A | - |
| 109-67-1 | - | A | A | A | C | C | B | A | A | A | A | A |
| 109-69-3 | - | B | H | B | C | C | C | A | A | - | A | - |
| 109-73-9 | - | C | C | C | C | B | C | A | A | - | A | - |
| 109-86-4 | 50 °C | A | A | A | A | A | A | C | A | - | A | - |
| 109-89-7 | - | C | H | C | C | H | C | C | A | - | A | - |
| 109-99-9 | - | C | C | C | C | C | C | C | A | - | A | - |
| 11 138-47-9 | - | A | H | A | A | A | A | A | A | - | A | A |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 110-02-1 | - | C | H | C | C | C | C | A | A | - | A | - |
| 110-16-7 | - | A | H | A | A | A | A | A | A | - | A | - |
| 110-19-0 | 20 °C | C | C | C | C | A | C | C | A | - | A | - |
| 110-49-6 | - | C | C | C | B | A | B | C | A | - | A | A |
| 110-54-3 | - | A | A | A | C | C | B | A | A | - | A | - |
| 110-63-4 | - | A | A | A | A | A | A | A | A | - | A | - |
| 110-65-6 | - | A | A | A | A | A | A | A | A | - | A | - |
| 110-80-5 | 50 °C | A | A | A | A | A | A | A | A | - | A | - |
| 110-82-7 | - | A | A | A | C | C | C | A | A | - | A | - |
| 110-83-8 | - | B | B | B | C | C | C | A | A | - | A | - |
| 110-86-1 | - | C | C | C | C | B | C | C | A | - | A | - |
| 111-15-9 | - | C | H | C | A | A | A | A | A | - | A | - |
| 111-26-2 | - | C | C | C | C | C | C | C | A | - | A | - |
| 111-27-3 | - | A | A | A | A | A | A | A | A | - | A | - |
| 111-42-2 | - | A | H | A | A | A | A | C | H | - | A | A |
| 111-46-6 | - | A | A | A | A | A | A | A | A | A | A | A |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 111-65-9 | - | A | A | A | C | C | B | A | A | A | A | A |
| 111-76-2 | - | A | A | A | A | A | A | A | C | A | A | A |
| 111-77-3 | - | A | A | A | A | A | A | A | A | - | A | - |
| 111-87-5 | - | A | A | A | A | A | A | A | A | A | A | A |
| 111-96-6 | - | C | C | C | C | C | C | C | A | A | A | A |
| 112-07-2 | - | C | C | C | C | A | C | C | A | - | A | - |
| 112-27-6 | - | A | A | A | A | A | A | A | A | A | A | A |
| 112-80-1 | - | A | A | A | B | A | A | A | A | C | A | B |
| 115-10-6 | - | H | H | H | C | C | C | C | A | - | A | - |
| 116-54-1 | - | C | C | C | C | A | C | C | A | - | A | - |
| 117-84-0 | - | C | C | C | C | A | C | A | A | A | A | A |
| 119-64-2 | - | C | C | C | C | C | C | A | A | - | A | A |
| 12 124-97-9 | - | A | H | A | A | A | A | A | A | - | A | - |
| 12 125-02-9 | - | A | H | A | A | A | A | A | A | C | B | C |
| 12 135-76-1 | - | A | H | A | A | A | A | A | A | - | - | - |
| 121-44-8 | - | A | A | A | C | C | B | C | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 123-31-9 | - | C | C | C | B | A | A | C | A | - | A | - |
| 123-42-2 | - | C | C | C | A | A | A | C | A | - | - | - |
| 123-54-6 | - | C | C | C | C | A | C | C | A | - | A | A |
| 123-72-8 | - | C | C | C | C | A | H | C | A | A | A | A |
| 123-73-9 | - | C | C | C | C | A | C | A | A | A | A | A |
| 123-86-4 | - | C | C | C | C | A | C | C | A | A | A | A |
| 124-04-9 | - | A | A | A | A | A | A | A | A | A | A | A |
| 124-17-4 | - | C | C | C | C | A | C | C | A | - | A | - |
| 124-38-9 | - | A | A | A | A | A | A | A | A | A | A | A |
| 124-40-3 | - | C | H | C | C | H | C | C | A | - | A | - |
| 126-73-8 | - | C | C | C | C | A | C | C | A | - | A | - |
| 127-08-2 | - | A | H | A | A | A | A | A | A | A | A | A |
| 127-09-3 | - | A | H | A | A | A | A | A | A | - | A | A |
| 127-18-4 | 20 °C | C | C | C | C | C | C | A | A | B | A | A |
| 127-18-4 | - | C | C | C | C | C | C | A | A | A | A | A |
| 13 473-90-0 | - | A | H | A | A | A | A | A | A | B | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 13 765-35-0 | - | A | H | A | A | A | A | A | A | - | A | - |
| 1302-42-7 | - | A | H | A | A | A | A | A | A | - | A | - |
| 1302-81-4 | - | A | H | A | A | A | A | A | A | - | A | - |
| 1303-96-4 | - | A | H | A | A | A | A | A | A | A | A | A |
| 1305-62-0 | - | A | H | A | A | A | A | A | A | - | A | - |
| 1310-58-3 | - | B | H | B | A | A | A | A | A | - | B | - |
| 1310-73-2 | - | B | H | B | B | A | A | A | A | B | A | B |
| 1313-82-2 | - | A | H | A | A | A | A | A | A | A | A | A |
| 1319-77-3 | 60 °C | C | C | C | C | H | C | A | C | C | A | A |
| 1330-20-7 | - | C | H | C | C | C | C | A | A | A | A | A |
| 1330-78-5 | - | C | H | C | B | A | C | A | A | - | A | - |
| 133-37-9 | - | A | H | A | A | A | A | A | A | B | A | B |
| 1336-21-6 | - | A | H | A | A | A | A | A | A | C | A | B |
| 1344-09-8 | - | A | H | A | A | A | A | A | A | A | A | A |
| 1344-28-1 | - | A | H | A | A | A | A | A | A | A | A | A |
| 136-60-7 | - | C | C | C | C | A | C | C | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 139-12-8 | - | A | H | A | A | A | A | A | A | - | - | - |
| 14 013-86-6 | - | A | H | A | A | A | A | A | A | C | A | C |
| 1401-55-4 | 60 °C | C | C | C | C | A | A | A | A | A | A | A |
| 140-88-5 | - | C | H | C | C | H | C | C | A | B | A | B |
| 141-28-6 | - | C | H | C | C | A | C | C | A | - | A | - |
| 141-32-2 | - | C | C | C | C | H | C | C | A | - | A | - |
| 141-43-5 | - | H | H | H | A | A | A | C | A | A | A | A |
| 141-78-6 | - | C | H | C | C | A | B | C | A | - | A | - |
| 141-97-9 | - | C | C | C | C | B | C | C | A | - | A | - |
| 142-04-1 | - | C | C | C | C | A | C | A | A | - | A | - |
| 142-62-1 | - | A | A | A | C | A | C | - | C | - | A | - |
| 142-71-2 | - | A | H | A | C | A | A | A | A | C | A | C |
| 142-77-8 | - | C | C | C | C | A | C | A | A | - | A | - |
| 142-82-5 | - | A | A | A | C | C | B | A | A | - | A | - |
| 142-82-5 | - | A | A | A | C | C | B | A | A | - | A | - |
| 142-96-1 | - | C | C | C | C | C | C | C | A | A | A | A |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 143-08-8 | - | A | A | A | H | H | A | A | A | - | A | - |
| 144-62-7 | 50 °C | B | H | B | A | A | A | A | A | C | A | C |
| 15 477-33-5 | - | A | H | A | A | A | A | A | A | - | A | - |
| 151-50-8 | - | A | H | A | A | A | A | A | A | C | A | B |
| 1589-49-7 | - | A | A | A | A | A | A | B | A | A | A | A |
| 16 721-80-5 | - | A | H | A | A | A | A | A | A | - | A | - |
| 16 961-83-4 | - | C | C | C | C | A | A | C | A | C | A | C |
| 1806-54-8 | - | C | H | C | B | A | C | A | A | - | A | - |
| 23 276-62-2 | - | A | H | A | A | A | A | A | A | - | A | C |
| 2432-87-3 | - | C | C | C | C | A | C | A | A | A | A | A |
| 25 154-52-3 | - | C | C | C | C | C | C | A | A | A | A | A |
| 25 167-70-8 | - | H | H | H | C | C | H | A | A | A | A | A |
| 25 323-30-2 | - | C | C | C | C | C | C | A | C | - | A | - |
| 25 339-17-7 | - | A | A | A | H | H | A | A | A | A | A | A |
| 2551-62-4 | - | A | A | A | A | A | A | A | A | - | A | - |
| 26 311-34-9 | - | A | A | A | H | H | A | A | A | A | A | A |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 27 458-92-0 | - | A | A | A | H | H | A | A | A | A | A | A |
| 27 458-93-1 | - | A | A | A | H | H | A | A | A | A | A | A |
| 27 458-94-2 | - | A | A | A | H | H | A | A | A | A | A | A |
| 2915-53-9 | - | C | C | C | C | A | C | A | A | A | A | A |
| 301-04-2 | - | A | H | A | A | A | A | A | A | - | A | - |
| 302-01-2 | - | C | C | C | C | A | B | C | A | - | A | A |
| 306-52-5 | - | C | B | C | A | A | A | A | A | - | A | B |
| 32 057-09-3 | 20 °C | C | C | C | C | A | A | A | A | C | A | C |
| 3687-31-8 | - | A | H | A | A | A | A | A | A | - | A | - |
| 3811-04-9 | - | A | H | A | A | A | A | A | A | - | A | B |
| 46-17-5 | - | A | A | A | A | A | A | A | A | A | A | A |
| 497-19-8 | - | A | H | A | A | A | A | A | A | B | A | A |
| 50 813-16-6 | - | A | H | A | A | A | A | A | A | - | A | - |
| 50-00-0 | - | B | B | B | B | A | A | A | A | B | A | - |
| 502-56-7 | - | C | C | C | C | A | C | C | A | - | A | - |
| 540-84-1 | - | A | A | A | C | C | H | A | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 543-90-8 | - | A | H | A | A | A | A | A | A | - | A | - |
| 544-92-3 | - | A | H | A | C | A | A | A | A | C | A | C |
| 56-23-5 | - | C | C | C | C | C | C | A | A | A | A | A |
| 56-81-5 | - | A | A | A | A | A | A | A | A | A | A | A |
| 57-10-3 | - | A | A | A | B | A | A | A | A | C | A | B |
| 57-11-4 | - | A | A | A | A | A | A | A | A | B | A | B |
| 57-11-4 | - | A | A | A | C | A | A | A | A | C | A | B |
| 57-13-6 | - | A | A | A | A | A | A | A | A | A | A | A |
| 57-50-1 | - | A | H | A | A | A | A | A | A | - | A | - |
| 57-55-6 | - | A | A | A | A | A | A | A | A | - | A | - |
| 584-08-7 | - | A | H | A | A | A | A | A | A | C | A | B |
| 594-36-5 | - | C | H | C | C | C | C | A | A | - | A | B |
| 5970-45-6 | - | A | H | A | A | A | A | A | A | - | A | - |
| 60-29-7 | | C | C | C | C | C | C | C | A | A | A | A |
| 60-35-5 | - | C | C | C | C | A | A | A | A | - | A | - |
| 62-53-3 | 60 °C | C | C | C | C | A | C | B | A | C | A | B |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 625-86-5 | - | C | C | C | C | A | C | C | A | - | A | - |
| 628-63-7 | - | C | H | C | B | A | B | C | A | A | A | A |
| 631-61-8 | - | A | H | A | A | A | A | A | A | - | A | - |
| 64-18-6 | 60 °C | C | C | C | C | A | A | A | A | C | B | C |
| 64-18-6 | 60 °C | C | C | C | C | A | A | C | A | C | B | C |
| 64-19-7 | - | H | H | H | A | A | A | A | A | C | A | B |
| 64-19-7 | - | H | H | H | A | A | A | A | A | C | A | B |
| 64-19-7 | - | C | C | C | B | A | A | C | A | C | A | B |
| 6484-52-2 | - | A | H | A | A | A | A | A | A | - | A | B |
| 65-85-0 | - | A | H | A | A | A | A | A | A | A | A | B |
| 67-56-1 | - | A | A | A | A | A | A | B | A | A | A | A |
| 67-63-0 | - | A | A | A | A | A | A | A | A | A | A | A |
| 67-64-1 | - | C | C | C | A | A | B | C | A | A | A | A |
| 67-66-3 | - | C | H | C | C | C | C | A | A | A | A | A |
| 67-68-5 | - | C | C | C | C | A | C | H | H | - | A | - |
| 68-12-2 | - | C | C | C | A | A | B | C | A | - | A | - |

**Table F.2** *(continued)*

| Chemical product | | Suitability of hose assembly according to Table F.1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hose lining material according to Table 4 | | | | | | | | Material group of the end fitting parts in contact with the chemical conveyed | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 68-12-2 | 60 °C | C | C | C | C | H | C | C | C | - | A | - |
| 6915-15-7 | - | A | H | A | A | A | A | A | A | - | A | - |
| 69-72-7 | - | A | H | A | A | A | A | A | A | C | A | B |
| 71-23-8 | - | A | A | A | A | A | A | C | A | - | A | - |
| 71-36-3 | - | A | A | A | A | A | A | A | A | A | A | A |
| 71-41-0 | - | A | A | A | A | A | A | A | A | A | A | B |
| 71-43-2 | 50 °C | C | H | C | C | C | C | A | A | A | A | A |
| 71-43-2 | - | C | C | C | C | C | C | A | A | A | A | A |
| 71-55-6 | - | C | H | C | C | C | C | A | A | A | A | A |
| 7397-62-8 | - | C | C | C | C | A | C | A | A | - | A | - |
| 7439-97-6 | - | A | A | A | A | A | A | A | A | - | A | A |
| 7446-09-5 | - | C | C | C | C | A | A | A | A | B | A | A |
| 7446-09-5 | 60 °C | C | C | C | C | A | A | A | A | B | A | A |
| 7446-11-9 | - | C | C | C | C | B | A | A | A | - | A | - |
| 7446-19-7 | - | A | H | A | A | A | A | A | A | B | A | B |
| 7447-39-4 | - | A | H | A | C | A | A | A | A | C | B | B |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 7447-40-7 | - | A | H | A | A | A | A | A | A | B | B | B |
| 74-87-3 | - | C | C | C | C | C | C | A | A | A | A | A |
| 7487-88-9 | - | A | H | A | A | A | A | A | A | C | A | A |
| 74-89-5 | 20 °C | C | C | C | A | B | B | B | A | - | A | - |
| 74-90-8 | - | B | B | B | A | A | A | A | A | C | A | C |
| 75-00-3 | 18 °C | C | C | C | C | C | C | A | A | - | A | A |
| 75-01-4 | - | C | C | C | C | H | C | A | C | A | A | A |
| 75-05-8 | - | H | H | H | H | B | B | C | A | - | A | - |
| 75-07-0 | 18 °C | C | C | C | B | A | C | C | A | A | A | B |
| 75-08-1 | - | C | C | C | C | H | B | B | A | - | A | - |
| 75-09-2 | 20 °C | C | H | C | C | C | C | A | A | B | A | - |
| 75-15-0 | - | C | H | C | C | C | C | A | B | A | A | A |
| 75-21-8 | 20 °C | C | C | C | C | A | C | C | A | - | A | - |
| 75-36-5 | - | C | C | C | C | H | C | A | A | - | A | B |
| 75-45-6 | - | H | H | H | H | H | H | H | H | A | A | A |
| 75-50-3 | - | A | A | A | C | C | B | C | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 7550-45-0 | - | C | C | C | C | C | C | A | - | - | B | - |
| 75-56-9 | - | C | C | C | C | A | C | C | A | - | A | - |
| 75-71-8 | - | H | H | H | H | H | H | H | H | A | A | A |
| 75-85-4 | - | A | A | A | A | A | A | B | A | A | A | A |
| 76-03-9 | - | C | C | C | C | A | B | B | A | - | B | - |
| 7631-99-4 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7646-85-7 | - | A | H | A | A | A | A | A | A | C | B | B |
| 7646-93-7 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7647-01-0 | - | C | C | C | C | A | A | A | A | C | A | A |
| 7647-01-0 | - | B | H | B | B | A | A | A | A | C | C | C |
| 7647-01-0 | - | C | C | C | B | A | A | A | A | C | C | C |
| 7647-14-5 | - | A | H | A | A | A | A | A | A | B | B | B |
| 7664-38-2 | 60 °C | B | H | B | B | A | A | A | A | C | B | C |
| 7664-39-3 | - | C | C | C | A | A | A | A | A | C | B | C |
| 7664-39-3 | - | C | C | C | B | A | A | A | A | C | C | B |
| 7664-41-7 | - | H | H | H | H | H | H | H | A | C | A | B |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | | | St-St [c] | C-St [d] |
| 7664-41-7 | - | H | H | H | H | H | H H | | A | C A B | | | 7664-93-9 | 50 °C |
| | | B | H | B | A | A | A A | | A | C C C | | | 7664-93-9 | 50 °C |
| | | C | C | C | B | A | A A | | A | C C C | | | 7664-93-9 | 50 °C |
| | | C | C | C | C | B | H A | | A | C | | | B | C |
| 7664-93-9 | 20 °C | C | C | C | C | C | H | H | A | C | | | A | A |
| 7681-11-0 | - | A | H | A | A | A | A | A | A | C | | | B | B |
| 7681-52-9 | - | C | C | C | C | A | A | A | A | B | | | B | B |
| 7681-57-4 | - | A | H | A | A | A | A | A | A | C | | | A | A |
| 7697-37-2 | 60 °C | C | C | C | C | B | H | A | A | C | | | A | C |
| 7697-37-2 | 40 °C | C | C | C | C | B | H | A | H | C | | | A | C |
| 7697-37-2 | - | C | C | C | C | C | C | C | C | C | | | B | C |
| 7705-08-0 | - | A | H | A | A | A | A | A | A | C | | | C | C |
| 7719-09-7 | - | C | C | C | C | C | C | B | C | - | | | B | - |
| 7719-12-2 | - | C | C | C | C | C | A | A | A | - | | | B | - |
| 7720-78-7 | - | A | H | A | A | A | A | A | A | C | | | A | C |
| 7722-64-7 | - | C | C | C | C | A | A | A | A | C | | | A | A |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 7722-84-1 | - | A | H | A | A | A | A | A | A | B | A | A |
| 7722-84-1 | - | C | C | C | B | B | A | B | A | B | A | A |
| 7726-95-6 | - | C | C | C | C | C | C | A | C | A | A | B |
| 7727-15-3 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7727-21-1 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7727-37-9 | - | A | A | A | A | A | A | A | A | A | A | A |
| 7727-54-0 | - | A | H | A | A | A | A | A | A | C | A | B |
| 7732-18-5 | - | A | H | A | A | A | A | A | A | A | A | A |
| 7732-18-5 | - | A | H | A | A | A | A | A | A | A | A | A |
| 7738-94-5 | - | C | C | C | C | B | A | A | A | C | A | B |
| 7757-79-1 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7757-82-6 | - | A | H | A | A | A | A | A | A | B | A | A |
| 7758-01-2 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7758-02-03 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7758-19-2 | - | C | C | C | C | A | A | A | A | - | A | - |
| 7758-87-4 | - | A | H | A | A | A | A | A | A | C | A | B |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 7758-94-3 | - | A | H | A | A | A | A | A | A | C | B | C |
| 7758-98-7 | - | A | H | A | C | A | A | A | A | C | A | C |
| 7772-98-7 | - | A | H | A | A | A | A | A | A | B | A | A |
| 7772-99-8 | - | A | H | A | A | A | A | A | A | - | B | - |
| 7775-09-9 | - | B | H | B | A | A | A | A | A | - | A | - |
| 7778-18-9 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7778-50-9 | - | A | H | A | A | A | A | A | A | B | A | B |
| 7778-54-3 | - | C | C | C | A | A | A | A | A | C | B | B |
| 7778-74-7 | - | A | H | A | A | A | A | A | A | - | B | - |
| 7778-80-5 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7782-41-4 | - | H | H | H | C | H | B | A | C | - | A | - |
| 7782-50-5 | - | C | C | C | C | H | H | A | C | C | B | C |
| 7782-50-5 | - | H | H | H | C | H | B | A | C | A | A | A |
| 7782-50-5 | - | C | C | C | C | A | A | A | A | C | B | C |
| 7782-61-8 | - | A | H | A | A | A | A | A | A | C | A | C |
| 7782-99-2 | - | C | C | C | C | A | A | A | A | C | A | B |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 7783-06-4 | - | C | C | C | C | A | B | B | A | B | A | B |
| 7783-20-2 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7784-13-6 | - | A | H | A | A | A | A | A | A | C | B | C |
| 7784-30-7 | - | A | H | A | A | A | A | A | A | - | A | - |
| 7786-30-3 | - | A | H | A | A | A | A | A | A | C | B | B |
| 7786-81-4 | - | A | H | A | A | A | A | A | A | C | A | B |
| 7790-94-5 | - | C | C | C | C | H | C | C | C | C | B | B |
| 7791-25-5 | - | C | C | C | C | B | A | A | A | A | B | B |
| 77-92-9 | - | A | H | A | A | A | A | A | A | B | A | A |
| 7803-51-2 | - | C | C | C | A | A | A | A | A | - | A | - |
| 7803-57-8 | - | H | H | H | C | A | B | C | A | - | A | - |
| 7803-57-8 | - | H | H | H | C | A | B | A | A | - | A | - |
| 78-59-1 | 20 °C | C | C | C | C | A | H | C | A | - | A | - |
| 78-83-1 | 70 °C | A | A | A | A | A | A | A | A | A | A | A |
| 78-93-3 | - | C | C | C | B | A | C | C | A | A | A | A |
| 78-96-6 | - | B | B | B | C | A | C | C | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 79-01-6 | - | C | C | C | C | C | C | A | A | A | A | A |
| 79-10-7 | 50 °C | C | C | C | C | A | A | C | H | - | A | - |
| 79-11-8 | - | C | C | C | C | H | H | A | A | C | B | C |
| 79-14-1 | - | C | C | C | A | A | A | A | A | - | A | B |
| 79-20-9 | - | C | C | C | C | A | C | C | A | A | A | A |
| 79-34-5 | - | C | C | C | C | C | C | A | A | A | A | A |
| 79-43-6 | - | C | C | C | C | A | A | C | A | - | A | - |
| 8002-05-9 | - | A | A | A | C | C | C | A | A | A | A | A |
| 8002-05-9 | - | A | A | A | C | C | C | A | A | A | A | A |
| 8006-64-7 | - | A | A | A | C | C | C | A | A | A | A | A |
| 8012-95-1 | - | A | A | A | C | B | B | A | A | A | A | A |
| 8014-95-7 | - | C | C | C | C | C | C | H | C | - | B | - |
| 8023-83-4 | - | A | A | A | A | A | A | A | A | A | A | A |
| 8032-32-4 | - | A | A | A | C | C | C | A | A | - | A | - |
| 80-62-6 | - | C | C | C | C | A | H | C | A | - | A | - |
| 84-66-2 | - | C | C | C | A | A | B | C | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 84-74-2 | - | C | C | C | C | A | C | A | A | - | A | - |
| 84-75-3 | - | C | C | C | C | A | C | A | A | - | A | - |
| 84-76-4 | - | C | C | C | A | A | A | A | A | A | A | A |
| 85-44-9 | - | A | H | A | A | A | A | A | A | - | A | - |
| 88-72-2 | 20 °C | C | C | C | C | C | C | B | A | - | A | - |
| 88-89-1 | - | B | H | B | B | A | A | A | A | C | A | C |
| 88-99-3 | - | A | H | A | A | A | A | A | A | - | A | - |
| 9000-70-8 | - | A | H | A | A | A | A | A | A | A | A | A |
| 91-17-8 | - | A | A | A | C | C | C | A | A | - | A | - |
| 91-20-3 | 90 °C | C | C | C | C | C | C | A | C | - | A | - |
| 92-52-4 | 20 °C | C | C | C | C | B | C | A | C | - | A | - |
| 93-58-3 | - | C | C | C | C | A | C | C | A | - | A | - |
| 93-89-0 | - | C | C | C | C | A | C | C | A | A | A | A |
| 95-50-1 | - | C | C | C | C | C | C | A | A | A | A | A |
| 95-92-1 | - | C | C | C | A | A | B | C | A | - | A | - |
| 96-22-0 | - | C | C | C | C | A | C | C | A | - | A | - |

**Table F.2** *(continued)*

| **Chemical product** | | **Suitability of hose assembly according to Table F.1** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hose lining material according to Table 4** | | | | | | | | **Material group of the end fitting parts in contact with the chemical conveyed** | | |
| CAS-No [a] | Test tempera-ture | NBR 1 | NBR 2 | NBR 3 | NR | IIR or EPDM | CSM | FKM | PE-X/ UPE | Cu-Zn [b] | St-St [c] | C-St [d] |
| 96-33-3 | - | C | H | C | C | H | C | C | A | - | A | - |
| 96-34-4 | - | C | C | C | C | A | C | C | A | - | A | - |
| 97-95-0 | - | A | A | A | A | A | A | A | A | A | A | A |
| 98-00-0 | 50 °C | H | H | H | A | H | H | C | B | B | A | A |
| 98-01-1 | - | C | C | C | A | A | A | C | A | A | A | A |
| 98-83-9 | - | C | C | C | C | C | C | H | A | - | A | - |
| 98-86-2 | - | C | C | C | C | A | H | C | A | - | A | - |
| 98-87-3 | - | C | C | C | C | C | C | H | A | A | B | A |
| 98-95-3 | 40 °C | C | C | C | C | C | C | B | A | - | A | - |

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