

Workshop fabricated steel tanks —

Part 1: Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids

The European Standard EN 12285-1:2003 has the status of a
British Standard

ICS 13.300; 23.020.10

National foreword

This British Standard is the official English language version of EN 12285-1:2003. Together with BS EN 12285-2:2005, it supersedes BS 2594:1975 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PVE/21, Fabricated metallic tanks and equipment, to Subcommittee PVE/21/1, Fabricated metallic tanks, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 6 August 2003

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 159 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments
15962 Corrigendum No. 1	23 January 2006	Revision of supersession details

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ISBN 0 580 42404 9

English version

**Workshop fabricated steel tanks - Part 1: Horizontal cylindrical
single skin and double skin tanks for the underground storage of
flammable and non-flammable water polluting liquids**

Réservoirs en aciers fabriqués en atelier - Partie
1: Réservoirs horizontaux cylindriques à simple et double
paroi pour le stockage enterré de liquides inflammables et
non-inflammables polluant l'eau

Werksggefertigte Tanks aus Stahl - Teil 1: Liegende
zylindrische ein- und doppelwandige Tanks zur
unterirdischen Lagerung von brennbaren und
nichtbrennbaren wassergefährdenden Flüssigkeiten

This European Standard was approved by CEN on 4 November 2002.

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 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 Management Centre has the same status as the official versions.

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Foreword

This document (EN 12285-1:2003) has been prepared by Technical Committee CEN /TC 221 "Shop fabricated metallic tanks and equipment for storage tanks and for service stations", the secretariat of which is held by DIN.

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 September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

This standard is part of a series of standards in the field of shop fabricated metallic tanks. The titles of the standards which are already edited or are under preparation are:

- Workshop fabricated steel tanks; Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids
- Workshop fabricated steel tanks; Horizontal cylindrical single skin and double skin tanks for the aboveground storage of flammable and non-flammable water polluting liquids.

Further standards will be evaluated according to former decisions of CEN/TC 221 and according to the common rules for standard works for CEN-standards.

Annexes A, B and C are informative.

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

1 Scope

This standard specifies the requirements for shop fabricated cylindrical, horizontal steel tanks, single and double skin for the underground storage of water polluting liquids (both flammable and non-flammable) within the following limits:

- from 800 mm up to 3000 mm nominal diameter and,
- up to a maximum overall length of 6 times the nominal diameter and,
- for liquids with a maximum density of up to 1,9 kg/l and,
- with an operating pressure (p_0) of maximum 1,5 bar (abs.) and,
- for double skin tanks with a vacuum leak detection system where the kinematic viscosity does not exceed $5 \times 10^{-3} \text{ m}^2/\text{s}$.

This standard is applicable for normal operating temperature conditions (-20 °C to +50 °C). Where temperatures are outside this range, additional requirements should be taken into account.

For guidance on the liquid-material combinations see Annex B.

This standard is not applicable to the liquid classes listed in Table 1 because of special dangers involved. This standard does not deal with internal coating.

Table 1 — List of dangerous goods not to be considered by this standard

UN-classification	Dangerous Good
Class 1	Explosives
Class 4.2	Substances liable to spontaneous combustion
Class 4.3	Substances which in contact with water emit flammable gases
Class 5.2	Organic peroxides
Class 6.2	Infectious substances
Class 7	Radioactive substances, hydrocyanic or hydrocyanic solvent liquids, metalcarbonyls, hydrofluoracid, bromide liquids

The classifications referred to are those adopted by the United Nations Committee of Experts on the Transport of Dangerous Goods (not to be interpreted as tank classes described in 3.4).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 287–1, *Approval testing of welders — Fusion welding — Part 1: Steels.*

EN 288–1, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules for fusion welding.*

EN 288–2, *Specification and approval of welding procedures for metallic materials — Part 2: Welding procedure specification for arc welding.*

EN 288–3, *Specification and approval of welding procedures for metallic materials — Part 3: Welding procedure tests for the arc welding of steels.*

EN 10025, *Hot rolled products of non-alloy structural steels — Technical delivery conditions.*

EN 10051:1991, *Continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels — Tolerances on dimensions and shape.*

EN 10204:1991, *Metallic products — Types of inspection documents.*

prEN 13160–1, *Leak detection systems — Part 1: General principles.*

prEN 13160–2, *Leak detection systems — Part 2: Pressure and vacuum systems.*

prEN 13160–3, *Leak detection systems — Part 3: Liquid systems for tanks.*

prEN 13160–4, *Leak detection systems — Part 4: Liquid and/or vapour sensor systems for use in leakage containments or interstitial spaces.*

prEN 13160–5, *Leak detection systems — Part 5: Tank gauge leak detection systems.*

prEN 13160–6, *Leak detection systems — Part 6: Sensors in monitoring wells.*

prEN 13160–7, *Leak detection systems — Part 7: General requirements and test methods for interstitial spaces, leak protecting linings and leak protecting jackets.*

EN ISO 898–1, *Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs (ISO 898-1:1999).*

EN ISO 8501–1, *Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1:1988).*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1 tanks

workshop fabricated cylindrical containments for the storage of liquids. They are made of steel, equipped with dished ends and consist of one or more compartments

3.2

compartment

single storage fluid space within a tank

3.3

underground tanks

tanks which are totally or partially imbedded in the ground

3.4

tank classes

are defined in Table 2

Table 2 — Tank classes

Tank class	Description
Class A	For liquids with density up to 1,1 kg/l
Class B	For liquids with density up to 1,9 kg/l
Class C	For liquids with density up to 1,9 kg/l, and explosion pressure shockproof under atmospheric conditions (see also 3.5)

3.5

explosion pressure shockproof tanks

are designed to withstand an internal explosion without leakage; permanent deformations are permissible. Where the atmospheric pressure of 1 bar the maximum explosion pressure is measured at 10 bar (abs.)

3.6

tank types

for the purpose of this standard two tank types are distinguished:

Type S: Single skin

Type D: Double skin

3.7

operating pressure (p_o)

pressure inside the tank above the liquid during operating conditions

3.8

test pressure (p_{t1})

pressure to which the tank or compartment is subjected for testing

3.9

interstitial test pressure (p_{t2})

pressure to which the interstitial space between the skins is subjected for testing. It is only applicable for double skin tanks

3.10

nominal volume

volume stated on customer's order

3.11

actual volume

volume which is equal to or greater than the nominal volume

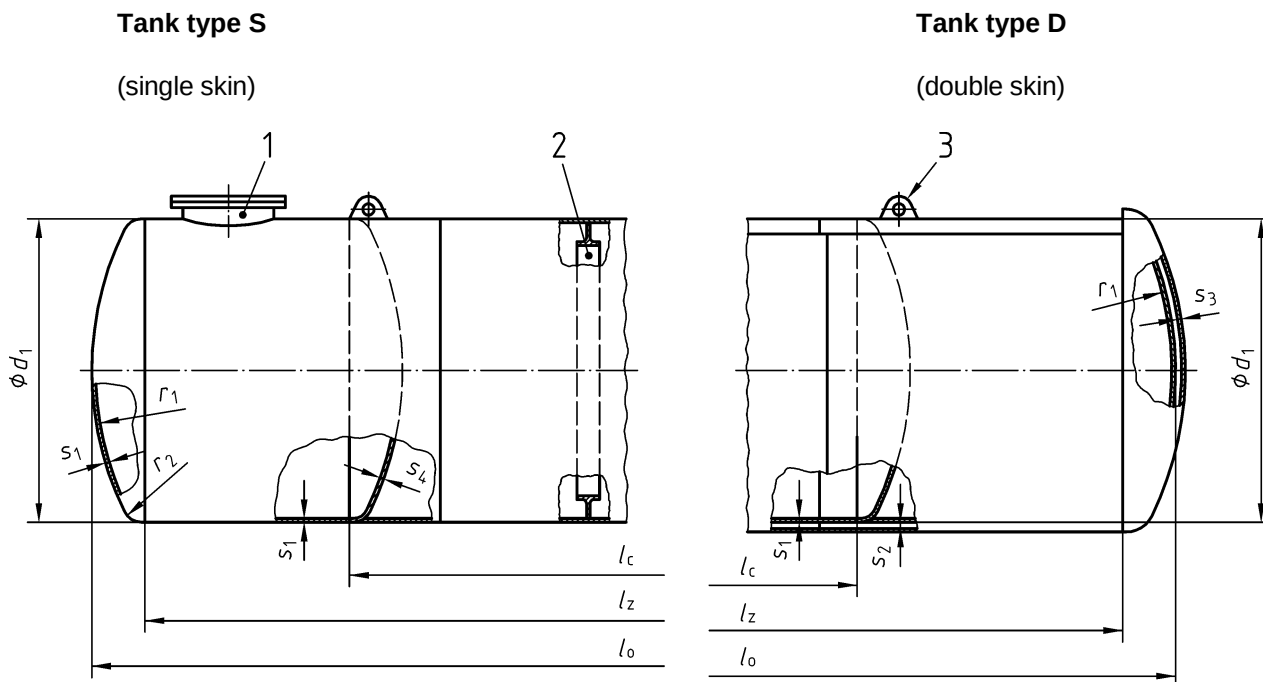
NOTE The safe working capacity of the tank should usually not exceed 97 % of the nominal volume in normal operating temperatures.

4 Symbols and abbreviations

For the purpose of this standard the following symbols apply:

Dimensions in mm

d_1	External nominal diameter of the tank
d_2	Inside diameter of the manhole
d_3	Diameter of the manhole cover
h_1	Length of the straight flange of the dished end
k_p	Pitch circle diameter
l_c	Length of the compartment of a tank without dished ends
l_o	Overall length of the tank
l_z	Length of the tank without dished ends
r_1	Crown radius of dished ends
r_2	Knuckle radius of dished ends
r_3	Knuckle radius of the outer dished end
s_1	Nominal thickness of inner skin and inner dished ends
s_2	Interstitial space
s_3	Nominal thickness of outer skin
s_4	Nominal thickness of outer dished ends
s_5	Nominal thickness of compartment dished ends
s_6	Nominal thickness of manhole flange and cover
s_7	Plate thickness of manhole body
γ	incline angle for T-joint welding



Key

- 1 nozzle detail see figure 3
- 2 example for stiffening ring see figure 4
- 3 lifting lug

Figure 1 — Example of tank symbols

5 Designation and purchaser's specification

Example for designation: A tank according to this standard with a nominal volume of 50 m³ and a nominal diameter $d_1 = 2500$ mm, tank class A and type D is designated as follows:

Tank	EN	12285-
1/50/2500/A/D		

The purchaser shall also provide the following information:

- a) number of compartments and their volumes,
- b) material specification,
- c) kind of external coating.

6 Materials

6.1 General

The manufacturer selects the material in accordance with the customer's instructions either by using the material specified by the purchaser or by nomination of intended liquids to be stored.

Annex B provides guidelines on material specifications in relation to storage media.

6.2 Materials for shell, dished ends and manholes

Carbon steel according to EN 10025 or austenitic stainless steel according to EN 10088-1 may be used if the mechanical properties are at least equal to those of S 235 JR (EN 10025).

In areas where low temperatures have to be considered (below -20°C) and in this case wall-thicknesses are 6 mm, at least carbon steel of grade S 235 J2G3 or equal shall be used.

6.3 Materials for tank accessories

Materials used for the fabrication of tank accessories if welded to the tank shall be compatible with the tank material.

6.4 Consumable

All welding rods/wires and other consumables shall be compatible with the basic material.

6.5 Material inspection documentation

Material inspection documentation of shell plates and dished ends shall for carbon steel according to EN 10025 be in accordance with the requirements of 2.2 of EN 10204: 1991 and for all other steel qualities shall be in accordance with 3.1 B of EN 10204: 1991.

7 Design

7.1 Forms of construction

Single skin tanks shall form an impermeable containment; they constitute the inner tank of a double skin tank.

7.2 Single skin tanks

Single skin tanks shall form an impermeable containment; they constitute the inner tank of a double skin tank.

7.3 Double skin tanks

For double skin tanks, a secondary skin is welded around the inner tank, which forms an impermeable self contained tank. The secondary skin shall cover at least 97 % of the nominal volume of the inner tank.

There shall be at least two sockets for the leak detection system and these shall be located at the highest point of the interstitial space. The interstitial space shall be connected to a leak detection system in order to monitor the integrity of the tank permanently.

For leak detection systems see prEN 13160–1 to –7.

7.4 Dished ends

Dished ends shall be used for external ends and to separate compartments.

The following dimensions shall apply: $r_1 \leq d_1$ $r_2 \geq d_1/30$.

7.5 Compartments

The nominal wall thicknesses of dished ends separating the compartments (compartment dished ends) are given in Table 3. For classes A and B a different form of dished ends separating the compartments is possible, where $r_1 = d_1$, but without knuckle radius r_2 and without straight flange.

A compartment dished end with a knuckle radius and a straight flange is equivalent to a reinforcement ring at the same position.

7.6 Dimensions

7.6.1 Material thickness

The nominal wall thickness of the inner tank shell, outer tank shell and dished ends shall be specified by the manufacturer in rounded millimetres, and shall be at least as given in Table 3.

Table 3 — Nominal wall thickness for inner and outer skin of tanks, dished ends and compartment dished ends

Tank classes	Class A		Class B		Class C	
Nominal diameter of the tank d_1 in mm	Nominal shell thickness in mm					
	s_1 inner skin	s_3 outer skin	s_1 inner skin	s_3 outer skin	s_1 inner skin	s_3 outer skin
800 up to 1600	5	3	5	3	5	3
1601 up to 2000	6	3	6	3	6	3
2001 up to 2500	6	4	7	4	7	4
2501 up to 3000	7	4	9	4	9	4
Nominal diameter of the tank d_1 in mm	Nominal wall thickness of dished ends in mm					
	s_1 inner skin	s_4 outer skin	s_1 inner skin	s_4 outer skin	s_1 inner skin	s_4 outer skin
800 up to 1600	5	3	5	3	5	3
1601 up to 2000	6	3	6	3	6	3
2001 up to 2500	6	5	7	5	7	5
2501 up to 3000	7	5	9	5	9	5
Nominal diameter of the tank d_1 in mm	Nominal wall thickness of compartment dished ends in mm					
	s_5		s_5		s_5	
800 up to 1600	5		5		10	
1601 up to 2000	6		6		14	
2001 up to 2500	6		7		16	
2501 up to 3000	7		9		18	

7.6.2 Secondary skin – Circumferential angle

The secondary skin shall enclose at least 300 degrees of the circumference of the tank, leaving not more than 60 degrees on the top uncovered.

In cases where the manhole diameter exceeds $d_1/2$, the manhole shall be provided with a secondary skin.

7.6.3 Interstitial space

The interstitial space gap should be as small as practically possible but suitable for the leak detection system to function.

7.7 Tolerances

7.7.1 The overall length of the inner tank

The tolerance on the overall length of the tank shall be $\pm 1\%$ of the real length stated by the manufacturer.

7.7.2 Wall thickness

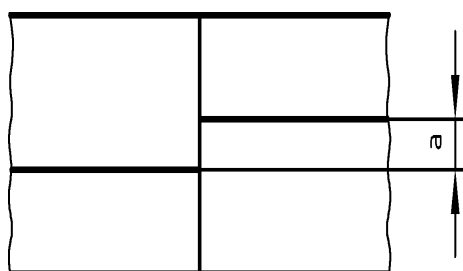
The minimum thicknesses of dished ends after forming and for shell plates shall be at least 92 % of the nominal wall thickness according to Table 3. The thickness of shell plates shall be in accordance with EN 10051:1991, Table 2.

7.7.3 Circumference of dished ends

For the dished ends, the tolerances shall be $-0/+6$ mm for $d_1 \leq 2000$ mm, and $-0/+10$ mm for $d_1 > 2000$ mm based on the calculated circumference of d_1 .

7.8 Shell plate arrangement

Cross seams are not allowed. Longitudinal welds are not allowed in the bottom half of the tank.



Key

a minimum distance: $5 \times$ wall thickness but not less than 25 mm.

Figure 2 — Shell-plate arrangement for inner and outer skin

7.9 Manholes and inspection covers

Unless otherwise specified by the purchaser, the tanks shall be equipped with at least one inspection cover per compartment. In cases where inspection covers are not allowed, the tanks shall have one manhole of at least $d_2 = 600$ mm. No part of a compartment shall be more than 10 m from a manhole. Single skin tanks shall always have a manhole.

The manufacturer shall decide whether manholes (inspection covers, nozzles) shall be of set-through or set-on-type. Nozzles and flanges shall either be welded inside and outside, or by full penetration.

For the dimensions of the manholes and their components see Table 4.

Table 4 — Dimensions of manhole components

Inside diameter d_2 mm	Plate thickness of manhole body s_7 mm	Diameter of cover d_3 mm	Pitch circle diameter k_p mm	Bolt hole diameter mm	Flange thickness and cover thickness		Bolts	
					s_6 mm		Thread size	Number
					Class A	Class B and C		
600 ^a	6	720	680	18	12	16	M 16	32
800	7	920	880		12	20		44
1000 ^b	7	1120	1080		--	20		48
^a If a manhole is required and no specification is given by the purchaser this diameter shall be used.								
^b For tanks of class C inside diameters of the manhole (d_2) exceeding 800 mm are not permitted.								

Instead of the manhole covers shown in the figure 3 and dimensioned in Table 4, ribbed or embossed covers may be used in class A tanks with a plate thickness at least equal to the thickness of the inner tank s_1 . A ribbed or embossed cover shall withstand the test pressure p_{t1} .

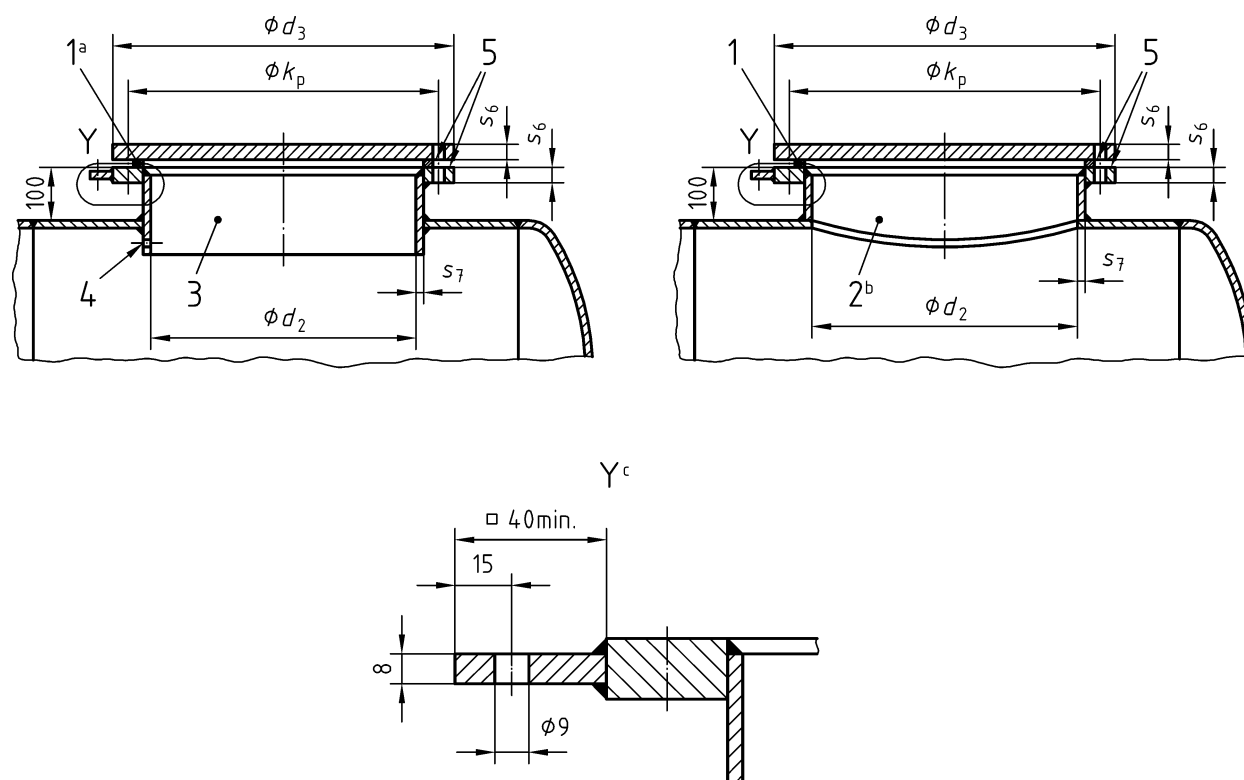
Inspection covers for tanks of class A with $d_1 \leq 1250$ mm and tanks of classes B and C with $d_1 \leq 1000$ mm. The diameter of the inspection cover shall not be larger than 300 mm and not smaller than 120 mm, and the thickness of the inspection cover shall be equal to the minimum thickness of the inner tank.

7.10 Structural bolts

Structural bolts used shall be in accordance with EN ISO 898-1, with a property class being at least 4.6. The material chosen shall be compatible with the tank material.

7.11 Tank fittings, pipes and nozzles

All tank fittings, pipes and nozzles, shall be situated on the manhole cover or in the single skin top of the tank. For tanks of class C only the set-through nozzles shall be used. A penetration of the double skin is not allowed (exception: nozzles for leak detection system). Fittings and all other openings shall have a minimum distance of 50 mm to welded seams.



Key

- 1 Gasket
- 2 set-through nozzle
- 3 set-on nozzle
- 4 vent or pressure relief device of 10 mm diameter
- 5 surface roughness of facing: $\sqrt{R_z \cdot 160}$

- a Gaskets shall be suitable for the purpose.
- b For set-through-nozzles a vent of 10 mm diameter or equivalent opening shall be provided in the manhole neck at the highest practical point.
- c Connection for earthing and use for cathodic corrosion protection if required.

Figure 3 — Examples for manhole

7.12 Stiffening rings

The following methods of construction may be used:

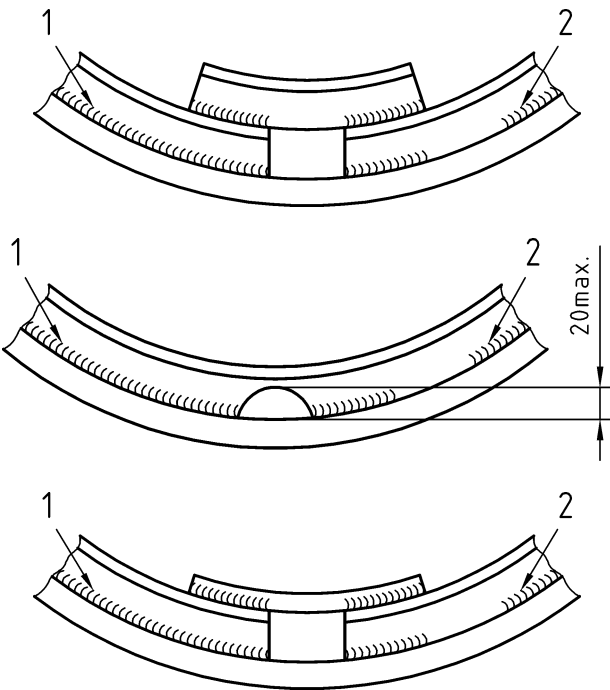


T 80 x 80 according to EN 10055, or 100 x 12.

The number of stiffening rings depends on tan to tan length (l_c) of each compartment and shall be in accordance with Table 5.

Table 5 — Number of required stiffening rings in accordance with length of each compartment

Length of the compartment in mm	Number of rings
$l_c \leq 7800$	—
$7800 < l_c \leq 11700$	1
$11700 < l_c \leq 15600$	2
$15600 < l_c$	3



Key

- 1 Welding for tank class B and C and for tank calss A with internal coating
- 2 Welding for tank class A without internal coating

Figure 4 — Examples for design details of stiffening rings

Apertures as shown in figure 4 should be located at the top and bottom of the stiffening rings to allow un-obstructed flow of liquids, vapour or gases.

Where internal coating is asked for, continuous welding shall be used on stiffening rings.

Alternatively, instead of using stiffening rings ($l_c \geq 7800$ mm), the wall thickness of inner tanks may be increased. In this case the wall thickness of the inner tank shall be the greater of the following:

- a) nominal wall thickness according to table 3

$$b) \quad s_1 = 0,4 + \frac{1,4 d_1}{1000} \text{ (rounded up to full mm)} \quad \text{(rounded up to full mm)}$$

7.13 Lifting lugs

Each tank shall be provided with lifting lugs. The number of liftings lugs shall be at least 1 for a tank up to 20 m³ nominal volume and not less than 2 above 20 m³. The lug(s) shall be positioned to enable the tank to be lifted in a horizontal position.

Lifting lugs fully welded to the tanks shall be provided in sufficient size and quantity to enable the empty tank to be lifted.

The lifting lugs shall be provided with a lifting hole of at least 60 mm minimum diameter.

In order to prevent deformation and for maintaining integrity of the coating, a reinforcement plate shall be provided or the lifting lug(s) shall be made of suitable size.

8 Fabrication

8.1 Plate preparation

The plate edges shall be visually examined for laminations by the manufacturer. Where such faults are found the plate shall be deemed unsuitable for fabrication of the tank.

8.2 Shell plate forming

All plates shall be formed to the required curvature over the full width or length of the plate as might be applicable. The manufacturer shall ensure that there is continuity of curvature at the longitudinal butt welds.

8.3 Types of joints

The types of welded joints shall be in accordance with Table 6. All internal attachments shall be continuously welded.

8.4 Welding procedures, welders' qualifications

Welding procedures shall be in accordance with EN 288–1, EN 288–2, EN 288–3 and welders' qualifications shall be in accordance with EN 287–1.

Table 6 — Types of welded joints

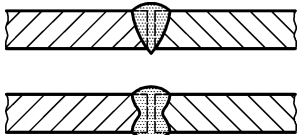
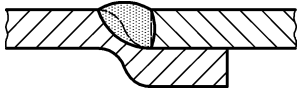
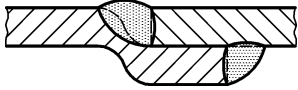
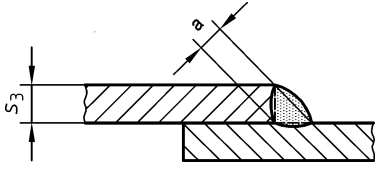
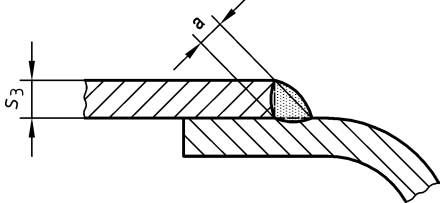
No.	Types of welded joints	Class of tanks and liquid (liquid-touched wall)
1	Square butt joint 	For class A, B and C and all liquids For inner skin Plate misalignment may not exceed $0,3 s_1$, $0,3 s_3$ or 2mm
2a	Joggled butt joint 	For class A and hydrocarbon liquids For double and single skin Not permissible with inner coating
2b	Joggled butt joint 	For class A, B and C
3a	Overlap joint 	For class A, B and C For outer skin $a = 0,7 s_3$
3b	Overlap joint 	For class A, B and C For outer skin $a = 0,7 s_3$

Table 6 — Types of welded joints (continued)

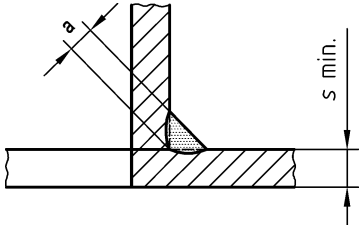
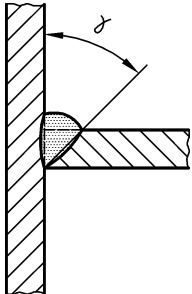
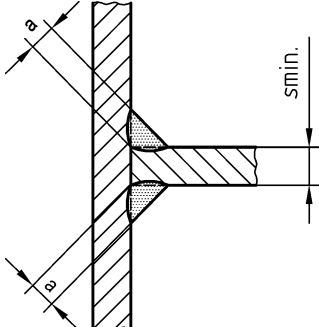
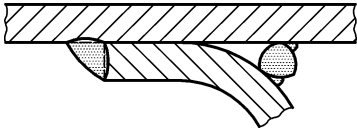
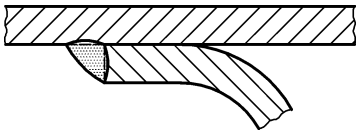
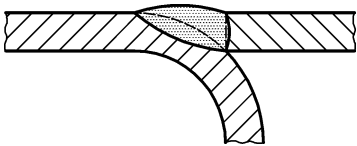
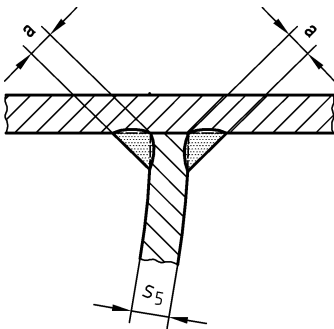
No.	Types of welded joints	Class of tanks and liquid (liquid-touched wall)
4	Fillet weld in T-joint 	For class A, B and C For nozzles in the outer skin $a = 0,7 s_{\min}$ $s_{\min}$ = thickness of the thinner plate
5	Fillet weld (full penetration) in T-joint 	For class A, B and C For manholes, nozzles and inspection covers $\gamma = 45^\circ$
6	Double fillet weld in T-joint 	For class A, B and C For manholes, nozzles and stiffening rings $a = 0,7 s_{\min}$ $s_{\min}$ = thickness of the thinner plate

Table 6 — Types of welded joints (concluded)

No.	Types of welded joints	Class of tanks an liquid (liquid-touched wall)
7a	Fillet weld in overlap joint 	For class A, B and C For compartment dished ends with knuckle radius
7b	Fillet weld in overlap joint 	For class A, B and C For compartment dished ends with knuckle radius Not permissible with inner coating
8	Butt joint 	For class A and B For compartment dished ends with knuckle radius Not permissible with inner coating
9	Double fillet weld in T-joint 	For class A and B For compartment dished ends without knuckle radius $a = 0,7 s_5$

8.5 External coating

8.5.1 General

General Each tank shall be provided with an external protective coating. All coatings, when applied by the tank manufacturer, shall be in accordance with the coating manufacturer's instructions. Where the temperature of carbon steel can fall below normal operating temperatures and the tanks are used for products without corrosion inhibitor, the tanks shall be provided with internal coating.

In addition to any national requirements the external coating shall meet at least the requirements given in 7.5.2 and 7.5.3.

8.5.2 Surface preparation

The surface shall be prepared in accordance with the coating manufacturer's specifications for application to ensure permanent adhesion of the external coating.

Where impressed current cathodic protection is required by the purchaser all surfaces shall be prepared by grit blasting to at least SA 2.5 as defined in EN ISO 8501-1.

8.5.3 Surface coating

Table 7 shows the external coatings permitted, the minimum thickness, and minimum test voltage. External coatings shall not contain chlorofluorocarbons (CFCs).

Table 7 — External coating - minimum thickness and minimum test voltage

Coating material		Min. thickness mm	External surface coating tested to the following minimum test voltage V
Bitumen	with fabric reinforcement	3	14 000
	without reinforcement	5	20 000
Epoxy		0,7	6 000
Glassfibre (GRP)		2	15 000
Polyurethane		0,8	6 000
PVC		1,25	10 000
NOTE The minimum test voltages indicated are related to the minimum thickness mentioned in this table. If the thickness is increased, the voltages should also be increased. Coatings can be tested at higher voltage than indicated.			

9 Testing

9.1 General

The following tests shall be carried out in the manufacturer's workshop.

9.2 Pressure testing

Single skin and inner tanks of double skin tanks and the interstitial space shall be tested in accordance with Table 8. No leakage may be observed during the pressure testing.

Table 8 — Test pressure P_{t1} and P_{t2}

Test	Tank class		
	A	B	C
	Test pressure p_{t1} and p_{t2} in bar	Test pressure p_{t1} and p_{t2} in bar	Test pressure p_{t1} and p_{t2} in bar
Prototype test	0,75 air/liquid	2,0 air/liquid	10,0 or 11,0 liquid
Leak tightness test of interstitial space	0,4 air/liquid	0,6 air/liquid	0,6 air/liquid
Leak tightness test of tank	0,75 liquid or 0,3 air	2,0 liquid or 0,3 air	2,0 liquid

9.3 Testing of the external coating

Before leaving the workshop the external coating of each and every tank should be submitted to a high voltage test in order to prove its integrity. The minimum test voltage is given in Table 7.

NOTE Owing to possible damage during transport, storage and handling, it is essential that this test is repeated on the site by the installer immediately before lowering the tank into the pit.

10 Handling and installation

10.1 Handling

The tank shall only be lifted by the liftings lugs provided by the tank manufacturer. The lifting lugs have to be designed to lift the tank with the inner compartments empty.

10.2 Installation

Tanks designed to this standard allow for an earth cover of up to 1,5 m and for the tank to withstand imposed traffic loads from a properly constructed roadway. This will provide a reasonable safety factor.

A greater or lower earth cover may require calculation.

The access chamber shall be designed in such a way to prevent loads from the traffic area above being transmitted to the tank.

The methods used to secure the tank in the excavation shall not damage the coating of the tank.

NOTE For further information see annex A.

11 Marking of the tank and manufacturer's statement

11.1 Marking of the tank

Each tank shall be marked using a durable label which shall be corrosion resistant and resistant to the stored product.

The label shall be fixed to the tank on or close to the manhole of the tank.

The label shall contain the following information as a minimum:

- Name and address of manufacturer
- Year of manufacture
- Serial number of tank
- Designation in accordance with 3
- Type of coatings
- Mass of empty tank
- Type of leak detection liquid (when supplied)

In addition each compartment shall be provided with a label indicating the nominal volume in m³ of that compartment.

11.2 Manufacturer's statement

The manufacturer shall provide a statement for each tank giving at least the information included in 10.1 and the material chosen.

11.3 Drawings

The manufacturer shall provide a drawing showing all important dimensions, compartments and connections.

Annex A (informative)

Transport, storage and installation procedure

A.1 Transport

The tank should be placed on the vehicle in such a way to ensure that the surface coating of the tank is not damaged.

The tanks should be carefully fixed on the vehicle to prevent movement while being transported, using webbing or other fixing methods, which will not damage the tank coating.

The tank should be controlled while suspended by the use of guide ropes when placing the tank in position. Where two lifting lugs are used the lifting angle between the guide ropes should not exceed 120°.

A.2 Storage

When stored on site before installation the tanks should be placed on a level surface, free from protrusions, and on a suitable base to protect the coating (i. e. sand, foam etc.). The position should be chosen to avoid accidental damage from site traffic and the tanks should be restrained from rolling.

A.3 Installation procedure

A.3.1 Planning

Prior to commencement of the installation the site conditions should be determined and recorded, the type of ground will determine the need and type of ground support. Overhead cables and underground service should be plotted.

The installation should be set out, taking care not to undermine any existing structures or damage underground services.

A.3.2 Ground works

Proper care should be taken to ensure that the excavation does not collapse, the use of sheet piling or other proved methods should be adopted.

De-watering facilities should be provided in cases of high water table.

Owing to possible damage during transport, storage and handling, it is essential that the coating of each tank should be subject to a high voltage test in accordance with Table 7. Where coating is damaged it should be repaired and retested.

The tank should be securely fixed in the installation using a suitable method to prevent any movement of the tank (e. g. anchored to a concrete base).

The tank should be installed on a levelled base.

A.3.3 Backfill materials

The backfill used should be non-cohesive granular material which will surround the tank to give adequate support and restrain.

The choice of backfill used may well depend upon the native soils and their compatibility with the coating of the tank. For possible combinations see Table A.1.

All backfill material should be washed, graded and free flowing, free from ice, clay, organic materials and free of heavy objects. The minimum bulk density should be 1500kg/m³.

Table A.1 — Recommended backfill according to coating used

BACKFILL COATING	Sand	Gravel	Stone crushings
Bitumen	--	X	X
Epoxy	--	—	X
Glassfibre	--	—	—
Polyurethane	--	—	—
PVC	--	—	—
-- Recommended — Possible X Not recommended (but eventually according to coating producers instructions possible, see 7.5.1)			

Sand

Sand should be well graded and shall have less than 8 % passing a 75 µm screen with the largest particle size less than 3 mm.

Gravel

The backfill material should not have more than 3 % passing a 2,4 mm screen. The material shall be well-rounded pea gravel with a mix of particle size not less than 3 mm and not more than 20 mm.

Stone crushings

Stone crushings with angular particle size of not less than 3 mm not more than 16 mm, not more than 3 % should pass a 2,4 mm screen.

A.3.4 Installing backfill

Sufficient backfill should be placed on the excavation base before the tank is lowered in the excavation.

Backfill should be carefully placed around the installation.

The installer should compact the backfill and where necessary use mechanical methods to ensure the backfill reaches all parts of the excavation.

Sufficient backfill should be placed above the top of the tank.

A.3.5 Access chamber

An access chamber being liquid tight and capable of preventing any spilt liquid being stored from entering the environment should be fitted to the tank.

Annex B (informative)

Evaluation of liquid-material-combinations for storage tanks according to this standard

B.1 General

This Annex provides evaluations of chemical loads resulting from liquids stored in tanks as described in this standard, considering specific materials used and specific working conditions.

Owing to the number of possible liquid-material-combinations, the list cannot be final and complete and should always be open for new liquids and new materials to be added.

NOTE This Annex applies to above- and underground tanks. It should be considered, as far as this standard is concerned, that the groups C and F relate to underground tanks.

B.2 Criteria for evaluation

B.2.1 Conditions for resistance

B.2.1.1 Design for tanks

The tank should be manufactured in accordance with the standard.

The materials defined by EN 10025 and EN 10088-1 may be used. In addition to that P235GH and P265GH of EN 10028-2 may also be used.

The positive-liquid list provides information about the use of the relevant liquid when storing in tanks whose liquid-touched wall consists of the following materials:

Table B.1 — Tank materials

Steel specification	Material Code	Standard
S235JRG1	1.0036	EN 10025
S235JR	1.0037	EN 10025
S235JRG2	1.0038	EN 10025
S235J2G3	1.0116	EN 10025
S275J2G3	1.0144	EN 10025
P235GH	1.0345	EN 10028-2
P265GH	1.0425	EN 10028-2
X2CrNi 1911	1.4306	EN 10088-1
X6CrNiTi 1810	1.4541	EN 10088-1
X6CrNiMoTi 17 122	1.4571	EN 10088-1
X4CrNiMo 17 121	1.4401	EN 10088-1
X2CrNiMo 17 122	1.4404	EN 10088-1
X2CrNiMo 18 143	1.4435	EN 10088-1

B.2.1.2 Purity of liquids

The evaluations of resistance of materials are valid for tradable and technically pure liquids only. The evaluations are not valid for waste or mixtures containing an undefined number and concentration of liquid-additions or impurities.

B.2.1.3 Conditions

The safe working of a tank during its lifetime needs to consider the liquid-material combination. Therefore, conditions in B 2.2 to B 4.3.2 are defined. The conditions belonging to a material-liquid combination are identified in table B 2. The liquid-material combination is safe when the conditions are fulfilled.

B.2.2 Condition for an evaluation

B.2.2.1 Liquid-material-combinations are considered valid when

- the decrease of the wall thickness caused by corrosion (area-corrosion) does not exceed 0,1 mm per year
and
- local corrosion is not expected.

B.2.2.2 Liquid-material-combinations are not considered valid when one of the listed points is given:

- the decrease of the wall thickness by area-corrosion exceeds 0,1 mm per year,
- liquids will cause stress corrosion at the working temperature,
- other local corrosions, e. g. pitting corrosion, are to be expected under the given conditions,
- the liquid can react with the tank wall in a dangerous way (e. g. catalytic decomposition of the liquid).

B.3 Evaluation of liquids not mentioned in the positive-liquid-list

The storage of liquids, which are not mentioned in the positive-liquid-list, may also be approved if the qualification of the liquid-material-combination according to B 2.2.1, B 2.2.2 and B 4.2 is demonstrated by using the form shown in appendix 1, laboratory tests or relevant literature.

If required by national regulation, the references by laboratory tests or relevant literature should be confirmed according to the national rules.

NOTE Information usually is sent to the national competent authority.

B.4 Use of the positive-liquid-list

B.4.1 Classification¹⁾ of the flammable liquids into danger classes (Table B.2 column 5)

- | | | |
|----|---------------------|--|
| 1) | Danger class A: | Liquids with a flamepoint not exceeding 100°C, which do not show any property of danger class B regarding water solubility, namely |
| | Danger class A I: | Liquids with a flash point below 21°C, |
| | Danger class A II: | Liquids with a flash point of 21°C up to 55°C, |
| | Danger class A III: | Liquids with a flash point above 55°C up to 100°C |

1) Danger classes of liquids of this Standard should not be interpreted as tank classes defined in 3.1.4

- 2) Danger class B: Liquids with a flash point below 21°C, which are water soluble at 15°C or the flammable liquid elements of which are water soluble at 15°C.

B.4.2 Classification of the tanks according to their working conditions (Table B.2 columns 7, 9 and 11)

B.4.2.1 Pressureless tanks

Group A: Pressureless tank without specific precautions against heating up.

Group B: Pressureless tank with a temperature under working conditions measured directly at the tank wall not exceeding 40°C (e. g. aboveground tank standing in a room or tank with specific precaution against heating up). Maintaining a light coloured coating is considered as suitable precaution against radiated heat.

Group C: Pressureless tank with a temperature under working conditions measured directly at the tank wall not exceeding 30°C (e. g. underground tank, 0,8 m earth-covered, or tank with an equivalent isolation).

B.4.2.2 Tanks with internal working pressure (less than 0,5 bar)

Group D: Tank with internal working pressure without any precaution against radiated heat.

Group E: Tank with internal working pressure with a temperature under working conditions measured directly at the tank wall not exceeding 40°C (e. g. aboveground tank standing in a room or tank with specific precaution against heating up). Maintaining a light coloured coating is considered a suitable precaution against radiated heat.

Group F: Tank with internal working pressure with a temperature under working conditions measured directly at the tank wall not exceeding 30°C (e. g. underground tank, 0,8 m earth-covered, or tank with an equivalent isolation).

B.4.3 Conditions for the use of the liquids (Table B.2 columns 8, 10 and 12)

B.4.3.1 Conditions related to liquids

Code/purity

A: Free from water

A1: Mass of water ≤ 10 %

A2: Mass of water $< 0,05$ %

A3: Mass of water $< 0,08$ % and free from amines

A4: Mass of water $< 0,001$ %

A5: Mass of water $< 0,3$ %

A6: Mass of water $< 0,1$ %

A7: Mass of water $< 0,2$ %

B: Free from bromide and chloride

B1: Mass of hydrocarbon mixtures shall only consist of aliphatic and alicyclic settled hydrocarbonates, mono-olefines and aromatic hydrocarbonates.

B2: Only alcohols free from bromide and chloride and without further functional groups in the molecule (only OH groups in hydrocarbon groundstructure)

- C: Free from acid (pH value 6,5 to 8,5)
- C1: Free from sulphur acid
- C2: Alkaline (pH value > 8,5)
- C3: pH value ≤ 7
- C4: pH value 3 to 6
- C5: Mass of formic acid $\leq 2 \%$
- C6: Mass of sulphur trioxide > 25 %
- C7: pH value of the water 5 to 9
- D: Mass of chloride < 0,5 %; pH value 5 at minimum
- E: Free from mixtures; except necessary stabilizers
- E1: Free from iron salts
- E2: Free from arsen-V-connections
- F: Free from fluoride
- F1: Mass of fluoride < 0,5 % and mass of chloride < 350 ppm
- G: Free from ammonium salts
- I: Only with inhibitors against corrosion, e. g. amines or ammonia
- L: Not free from water
- L1: Mass of water > 0,05 %; no copper, tin or lead as part of the metal alloy
- S: Free from sulphur

B.4.3.2 Conditions related to working conditions

Code

- H, H1, Temperature of the liquid under working conditions, in particular when heating, filling and evacuating
- H2,H3: the tank, should not exceed 30°C.
- H4: Temperature of the liquid under working conditions, in particular when heating, filling and evacuating the tank, should not exceed 40°C.
- H5: Temperature of the liquid under working conditions, in particular when heating, filling and evacuating the tank, should not exceed 65°C.
- H6: Temperature of the liquid under working conditions, in particular when heating, filling and evacuating the tank, should not exceed 100°C.
- H7: Tanks should be installed in a manner to take into account heating, caused by climatic changes. The temperature at the tank wall should not exceed 25°C.

H8: Temperature of the liquid under working conditions, in particular when heating, filling and evacuating the tank, should not exceed 200°C.

K1: Inner tank wall completely free from rust

K2: Material free from copper

K3: When changing the liquid the tanks should be passivated by an oxal solution before filling.

M: The tanks should be installed in such a manner that the temperature of the liquid does not exceed 30°C.

N: Nitrogen or another suitable inert gas should be introduced into the tanks in order to create a permanent overpressure.

T: At the time of filling it is essential that the tank is technically free from water and should be tightly sealed to avoid moisture increase. Where moisture may gain entry condition N is applicable.

T1: It is essential that the tank under working condition is properly vented. The vent should have an air drying system to avoid moisture entering the tank.

U: Only solution liquids (alcalic solutions) and their defined mixtures of which (or of its components) the acceptance with the tank material is proved or certified according to 3.

U1: The solution is permitted for warm hydrous solutions of ammonium nitrate in concentration of more than 80 % and 93 % at maximum assuming that

a) the pH value of the liquid measured in a 10 % hydrous solution is between 5 and 7 and

b) the solutions do not include more than 0,2 % flammable liquids and chloreous compounds of chlorine with a chloreous content of more than 0,2 %.

The tanks are provided with a shut-off-device, which is designed in such a way that no overpressure will exist in the tank and which protects the tank against leakage and the increase of foreign liquids. The shut-off-device of the tank should be designed in such a way that the stored ammonium nitrate will not effect its operation.

B.4.4 Explanation of the abbreviations in the positive-liquid-list

act.	Active
aq.	Aqueous
b.p.	Start of boiling (boiling point)
conc.	Concentration
ctg.	Containing
f.p.	Flash point
liq.	Liquid
n.i.l.	Only solvents mentioned in the positive-liquid-list
p(50)	Vapour pressure at 50°C
soln.	Solution
subst.	Substance
u.o.n.	Unless otherwise named in the positive-liquid-list
°C	Degrees centigrade
+	Liquid is allowed
-	Liquid is not allowed
0	Liquid has not been evaluated
UN-Nr.	Number for the marking of the medium according to a medium list prepared by the United Nations

Table B.2 — Positive-liquid-list

No.	Liquid	UN-No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
1	Acetal, with a f.p. of -18 to below 21°C	1088	102	0,16	A I	≤ 0,83	++++++	AC	++++++		++++++	
2	Acetal, with a f.p. below -18°C	1088	102	0,16	A I	0,83	++++++	AC	++++++		++++++	
3	Acetaldehyde	1089	21	2,8	B	0,79	---+++	EN	---+++	N	---+++	N
4	Acetaldol	2839	182	≤ 0,010		1,11	++++++	AC	++++++		++++++	
5	Acetic acid, aq. soln. ctg. 50 to 80% of pure acid	2790	≥ 101	≤ 0,125		≤ 0,08	-----		++++++	BH4	++++++	B
6	Acetic acid, aq. soln. ctg. over 25% to below 50% of pure acid	2790	≥ 100	≤ 0,125		≤ 1,06	-----		++++++	BH4	++++++	B
7	Acetic acid, aq. soln. ctg. more than 80% of pure acid	2789	≥ 104	≤ 0,125		≤ 1,08	-----		++++++	BH4	++++++	B
8	Acetic acid, technical grade, purity 99,7% min.	2789	118	0,08		1,06	-----		++++++	BH4	++++++	B
9	Acetic anhydride	1715	140	0,04	A II	1,09	-----		++++++		++++++	
10	Acetoin, monomeric, 85% aq. soln.	2621	≥ 140	≤ 0,050		1,02	-----	M1	-----	M1	0 0 0 0 0 0	
11	Acetone	1090	56	0,84	B	0,8	++++++	C	++++++		++++++	
12	Acetone cyanohydrin, stabilized	1541	115	0,02	A III	0,93	++++++	C3	++++++	C3	++++++	C3
13	Acetone oil, with a f.p. of -18 to below 0°C	1091	75	≤ 1,000	A I	0,89	0 0 0 0 0 0		++++++		++++++	
14	Acetone oil, with a f.p. of 0 to below 21°C	1091	75	≤ 1,000	A I	0,89	0 0 0 0 0 0		++++++		++++++	

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
15	Acetonitrile	1648	80	0,37	B	0,79	++++++		++++++		++++++	
16	Acetophenone		202	≤ 1,000	A III	1,03	++++++	C	++++++	B	++++++	B
17	Acetylacetone	2310	140	0,07	A II	0,98	-----		---+++	AN	---+++	AN
18	Acrolein, stabilized	1092	53	0,92	A I	0,87	-----+	MN	-----+	MN	-----+	M
19	Acrylamide, aq. soln.	2074	≥ 100	≤ 0,125		≤ 1,12	-----		0 0 + 0 0 +	H3	0 0 + 0 0 +	H3
20	Acrylonitrile, stabilized	1093	77	0,4	A I	0,81	--+--+	M	--+--+	M	--+--+	M
21	Acrylic acid, stabilized	2218	141	0,03	A II	1,06	0 0 0 0 0 0		--+--+	M	--+--+	M
22	Adhesives, in flammable solvent, n.i.l., liq., with a f.p. of -18 to below 0°C and a b.p. over 35°C	1133	≥ 35	≤ 1,750	A I	≤ 1,20	++++++	U	++++++	U	++++++	U
23	Adhesives, in flammable solvent, n.i.l., liq., with a f.p. of 0 to below 21°C and a b.p. over 50°C	1133	≥ 50	≤ 1,100	A I	≤ 1,20	++++++	U	++++++	U	++++++	U
24	Adhesives, in flammable solvents, n.i.l., liq., with a f.p. of 21 to 55°C and a b.p. over 50°C	1133	≥ 50	≤ 1,100	A II	≤ 1,20	++++++	U	++++++	U	++++++	U

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
25	Adhesives, in flammable solvents, n.i.l., liq., with a f.p. of 55 up to 61°C and a b.p. over 100°C	1133	≥ 100	≤ 0,200	A III	≤ 1,20	++++++	U	++++++	U	++++++	U
26	Adhesives, in flammable solvents, n.i.l., liq., with a f.p. over 61 to 100°C and a b.p. over 100°C		≥ 100	≤ 0,200	A III	≤ 1,20	++++++	U	++++++	U	++++++	U
27	Adhesives, in flammable solvents, n.i.l., liq., with a f.p. below -18°C and a b.p. over 35°C	1133	≥ 35	≤ 1,750	A I	≤ 1,20	++++++	U	++++++	U	++++++	U
28	Adhesives, in flammable solvents, n.i.l., viscous, with a f.p. of -18 to below 0°C and a b.p. over 35°C	1133	≥ 35	≤ 1,750	A I	≤ 1,20	++++++	U	++++++	U	++++++	U
29	Adhesives, in flammable solvents, n.i.l., viscous, with a f.p. of 0 to below 21°C and a b.p. over 50°C	1133	≥ 50	≤ 1,100	A I	≤ 1,20	++++++	U	++++++	U	++++++	U
30	Adhesives, in flammable solvents, n.i.l., viscous, with a f.p. below -18°C and a b.p. over 35°C	1133	≥ 35	≤ 1,750	A I	≤ 1,20	++++++	U	++++++	U	++++++	U
31	Alcoholic beverages, with a f.p. of 21 to 55°C	3065	78	0,31		≤ 1,00	++++++	BC	++++++	B	++++++	B

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
32	Alcoholic beverages, with a f.p. over 55°C up to 61°C	3065	78	0,31		≤ 1,00	+	+	+	+	+	+
33	Alcohols, injurious to health, u.o.n., liq. with a f.p. over 61°C, and a b.p. over 35 to below 200°C	2810	≥ 35	≤ 1,750	A III	≤ 1,00	0	0	0	0	0	0
34	Alcohols, injurious to health, u.o.n., liq., with a f.p. over 61°C and a b.p. of 200°C min.	2810	≥ 200	≤ 0,030	A III	≤ 1,00	0	0	0	0	0	0
35	Alcohols, toxic, u.o.n., liq., with a f.p. of 21 to 55°C and a b.p. over 35 to below 200°C	2929	35	1,75	A II	1	0	0	0	0	0	0
36	Alcohols, toxic, u.o.n., liq., with a f.p. of 21 to 55°C and a b.p. of 200°C min.	2929	≥ 200	≤ 0,030	A II	≤ 1,00	0	0	0	0	0	0
37	Alcohols, toxic, u.o.n., liq., with a f.p. over 55°C up to 61°C and a b.p. over 35 to below 200°C or more	2929	≥ 35	≤ 1,750	A III	≤ 1,00	0	0	0	0	0	0
38	Alcohols, toxic, u.o.n., liq., with a f.p. over 55°C up to 61°C and a b.p. of 200°C min.	2929	≥ 200	≤ 0,030	A III	≤ 1,00	0	0	0	0	0	0

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
39	Alcohols, toxic, u.o.n., with a f.p. of -18 to below 21°C and a b.p. of 35°C max.	1986	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
40	Alcohols, toxic, u.o.n., with a f.p. of -18°C to below 21°C and a b.p. over 35°C	1986	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
41	Alcohols, toxic, u.o.n., with a f.p. below -18°C and a b.p. of 35°C max.	1986	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
42	Alcohols, toxic, u.o.n., with a f.p. below -18°C and a b.p. over 35°C	1986	≥ 35	≤ 1750	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
43	Alcohols, toxic, u.o.n., liq., with a f.p. over 61°C and a b.p. over 35 to below 200°C	2810	≥ 35	≤ 1,750	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
44	Alcohols, toxic, u.o.n., with a f.p. over 61°C and a b.p. of 200°C min.	2810	≥ 200	≤ 0,030	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
45	Alcohols, injurious to health, u.o.n., with a f.p. of -18 to below 21°C and a b.p. of 35°C max.	1987	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2
46	Alcohols, not toxic or corrosive, u.o.n., with a f.p. of -18 to below 21°C and a b.p. of 35°C max.	1987	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2
47	Alcohols, injurious to health, u.o.n., with a f.p. of -18 to below 21°C and a b.p. over 35°C	1987	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2
48	Alcohols, not toxic or corrosive, u.o.n., with a f.p. of -18 to below 21°C and a b.p. over 35°C	1987	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2
49	Alcohols, not toxic or corrosive, u.o.n., with a f.p. of -18 to below 21°C and a b.p. over 50°C	1987	≥ 50	≤ 1,100	A I	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2
50	Alcohols, not toxic or corrosive, u.o.n., with a f.p. of 21 to 55°C and a b.p. over 50°C	1987	≥ 50	≤ 1,100	A II	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2
51	Alcohols, not toxic or corrosive, u.o.n., with a f.p. over 55°C up to 61°C and a b.p. over 100°C	1987	≥ 100	≤ 0,200	A III	≤ 1,00	0 0 0 0 0 0		+	B2	+	B2

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
52	Alcohols, not toxic or corrosive, u.o.n., with a f.p. over 61°C up to 100°C and a b.p. over 100°C		≥ 100	≤ 0,200	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
53	Alcohols, injurious to health, u.o.n., with a f.p. below -18°C and a b.p. of 35°C max.	1987	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
54	Alcohols, not toxic or corrosive, u.o.n., with a f.p. below -18°C and a b.p. of 35°C max.	1987	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
55	Alcohols, injurious to health, u.o.n., with a f.p. below -18°C and a b.p. over 35°C	1987	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
56	Alcohols, not toxic or corrosive, u.o.n., with a f.p. below -18°C and a b.p. over 35°C	1987	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
57	Alcohols, not toxic or corrosive, u.o.n., with a f.p. below -18°C and a b.p. over 50°C	1987	≥ 50	≤ 1,100	A I	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
58	Alcohols, not toxic or corrosive, u.o.n., with a f.p. over 100°C,		≥ 100	≤ 0,200		≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.															
			°C	mbar		kg/l	1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435											
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions										
	1	2	3	4	5	6	7	8	9	10	11	12										
59	Alcohols, injurious to health, u.o.n., liq., with a f.p. of 21 to 55°C and a b.p. of 50 to 200°C	1987	≥ 50	≤ 1,100	A II	≤ 1,00	0 0 0 0 0 0		+	+	+	+	+	+	B2	+	+	+	+	+	+	B2
60	Alcohols, injurious to health, u.o.n., liq., with a f.p. of 21 to 55°C and a b.p. of 200°C	1987	≥ 200	≤ 0,030	A II	≤ 1,00	0 0 0 0 0 0		+	+	+	+	+	+	B2	+	+	+	+	+	+	B2
61	Alcohols, injurious to health, u.o.n., liq., with a f.p. over 55 up to 61°C and a b.p. below 200°C	1987	≥ 50	≤ 1,100	A III	≤ 1,00	0 0 0 0 0 0		+	+	+	+	+	+	B2	+	+	+	+	+	+	B2
62	Alcohols, injurious to health, u.o.n., liq., with a f.p. over 55 up to 61°C and a b.p. of 200°C min.	1987	≥ 200	≤ 0,030	A III	≤ 1,00	0 0 0 0 0 0		+	+	+	+	+	+	B2	+	+	+	+	+	+	B2
63	Alcohols, highly toxic on swallowing or skin contact, u.o.n., with a f.p. of -18 to below 21°C and a b.p. over 35°C	1986	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		+	+	+	+	+	+	B2	+	+	+	+	+	+	B2
64	Alcohols, highly toxic on swallowing or skin contact, u.o.n., with a f.p. below -18°C and a b.p. over 35°C	1986	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		+	+	+	+	+	+	B2	+	+	+	+	+	+	B2

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
65	Alcohols, highly toxic on swallowing or skin contact, u.o.n., with a f.p. below -18°C and a b.p. of 35°C max.	1986	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		+ + + + + +	B2	+ + + + + +	B2
66	Alcohols, highly toxic on swallowing or skin contact, u.o.n., with a f.p. of -18 to below 21°C and a b.p. of 35°C max.	1986	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		+ + + + + +	B2	+ + + + + +	B2
67	Alcohols, highly toxic on inhalation, u.o.n., with a f.p. below 21°C and a b.p. of 35°C max.	2929	≥ 20	≤ 3,000	A I	≤ 1,00	0 0 0 0 0 0		+ + + + + +	B2	+ + + + + +	B2
68	Alcohols, highly toxic on inhalation, u.o.n., with a f.p. below 21°C and a b.p. over 35°C	2929	≥ 35	≤ 1,750	A I	≤ 1,00	0 0 0 0 0 0		+ + + + + +	B2	+ + + + + +	B2
69	Alcohols, highly toxic, u.o.n., liq., with a f.p. of 21 to 55°C and a b.p. over 35°C to below 200°C	2929	≥ 35	≤ 1,750	A II	≤ 1,00	0 0 0 0 0 0		+ + + + + +	B2	+ + + + + +	B2
70	Alcohols, highly toxic, u.o.n., liq., with a f.p. of 21 to 55°C and a b.p. of 200°C min.	2929	≥ 200	≤ 0,030	A II	≤ 1,00	0 0 0 0 0 0		+ + + + + +	B2	+ + + + + +	B2

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
71	Alcohols, highly toxic, u.o.n., liq., with a f.p. over 55 up to 61°C and a b.p. over 35°C to below 200°C	2929	≥ 35	≤ 1,750	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
72	Alcohols, highly toxic, u.o.n., liq., with a f.p. over 55°C up to 61°C and a b.p. of 200°C min.	2929	≥ 200	≤ 0,030	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
73	Alcohols, highly toxic, u.o.n., liq., with a f.p. over 61°C and a b.p. over 35°C to below 200°C	2810	≥ 35	≤ 1,750	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
74	Alcohols, highly toxic, u.o.n., liq., with a f.p. over 61°C and a b.p. of 200°C min.	2810	≥ 200	≤ 0,030	A III	≤ 1,00	0 0 0 0 0 0		++++++	B2	++++++	B2
75	Aldrin preparation, liq., ctg. 7 to 75% act. subst., with a f.p. of -18 to below 21°C and a b.p. of 35°C max.	2762	≥ 20	≤ 3,000	A I	≤ 1,40	-----		0 0 0 0 0 0		++++++	ACU
76	Aldrin preparation, liq., ctg. 7 to 75% act. subst., with a f.p. of -18 to below 21°C and a b.p. over 35°C	2762	≥ 35	≤ 1,750	A I	≤ 1,40	-----		0 0 0 0 0 0		++++++	ACU
77	Aldrin preparation, liq., ctg. 7 to 75% act. subst., with a f.p. of 21 to 55°C and a b.p. over 35°C	2995	≥ 35	≤ 1,750	A II	≤ 1,40	-----		-----		++++++	ACU

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
78	Aldrin preparation, liq., ctg. 7 to 75% act. subst., with a f.p. over 61°C and a b.p. over 35°C	2996	≥ 35	≤ 1,750	A III	≤ 1,40	-----		-----		++++++	ACU
79	Aldrin preparation, liq., ctg. over 75 up to 100% act. subst., with a f.p. over -18 to below 21°C and a b.p. of 35°C max.	2762	≥ 20	≤ 3,000	A I	≤ 1,50	-----		0 0 0 0 0 0		++++++	ACU
80	Aldrin preparation, liq., ctg. over 75 up to 100% act. subst., with a f.p. of -18 to 21°C and a b.p. over 35°C max.	2762	≥ 35	≤ 1,750	A I	≤ 1,50	-----		0 0 0 0 0 0		++++++	ACU
81	Aldrin preparation, liq., ctg. over 75 up to 100% act. subst., with a f.p. of 21 to 61°C and a b.p. over 35°C	2995	≥ 35	≤ 1,750	A II	≤ 1,50	-----		-----		++++++	ACU
82	Aldrin preparation, liq., ctg. over 75 up to 100% act. subst., with a f.p. over 61°C and a b.p. over 35°C	2996	≥ 35	≤ 1,750	A III	≤ 1,50	-----		-----		++++++	ACU
83	Allyl acetate	2333	103	0,18	A I	0,93	0 0 + 0 0 +	ECH3	0 0 - 0 0 +	H3N	0 0 - 0 0 +	H3N
84	Allyl isothiocyanate, stabilized	1545	151	0,03	A II	1,02	++++++	A	++++++	BC	++++++	BC

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
85	Allyl mustard oil, stabilized	1545	151	0,03	A II	1,02	+	+	+	+	+	+
86	Amino-p-xylene, liq.	1711	≥ 218	≤ 0,030	A III	≤ 0,98	+	+	+	+	+	+
87	2-amino-m-xylene, liq.	1711	≥ 214	≤ 0,030	A III	≤ 0,98	+	+	+	+	+	+
88	4-amino-m-xylene, liq.	1711	≥ 218	≤ 0,030	A III	≤ 0,98	+	+	+	+	+	+
89	5-amino-m-xylene, liq.	1711	≥ 221	≤ 0,030	A III	≤ 0,97	+	+	+	+	+	+
90	3-amino-o-xylene, liq.	1711	≥ 221	≤ 0,030	A III	≤ 0,99	+	+	+	+	+	+
91	Aminonitrobenzenes, isomer mixture, liq.	1661	≥ 284	≤ 0,010		≤ 1,44	+	+	+	+	+	+
92	2-(2-aminoethoxy)ethanol	3055	232	≤ 0,010		1,06	+	+	+	+	+	+
93	3-(2-aminoethylamino)propylamine	2735	200	≤ 0,010		0,94	+	+	+	+	+	+
94	N-(2-aminoethyl)ethanolamine	1760	244	≤ 0,010		1,04	+	+	+	+	+	+
95	N,N'-bis(2-aminoethyl)ethylenediamine	2259	260	0,02		0,98	+	+	+	+	+	+
96	N-aminoethylpiperazine	2815	220	≤ 0,010	A III	0,99	0	0	0	0	0	0
97	1-aminonaphthalene, liq.	2077	299	≤ 0,010		1,13	+	+	+	+	+	+
98	2-aminonaphthalene, liq.	1650	306	≤ 0,010		1,06	+	+	+	+	+	+

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar								
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
99	2'-aminophenetole	2311	233	≤ 0,010	A III	1,05	0 0 0 0 0 0		+	+	+	+
100	3'-aminophenetole	2311	≥ 248	≤ 0,010		≤ 1,03	0 0 0 0 0 0		+	+	+	+
101	4'-aminophenetole	2311	250	≤ 0,010		1,07	0 0 0 0 0 0		+	+	+	+
102	2-aminopropane	1221	32	2,1	B	0,69	+	BG	+		+	
103	N,N'-bis(3-aminopropyl)ethylenediamine	2735	200	≤ 0,010		0,96	+		+	B	+	D
104	Ammonia solutions, 10 to 35%, density: 0,88 to 0,957 at 15°C, in water	2672	≥ 22	≤ 3,000		≤ 0,96	+		+		+	
105	Ammonium nitrate, aq. soln., hot, conc. over 80% up to 93%	2426	≥ 140	≤ 0,125		≤ 1,41	- - - - -		0 0 0 0 0 0		+	U1
106	Ammonium polysulfide solns.	2818	≤ 100	≤ 0,125		≤ 1,10	+	C2	+	C2	+	C2
107	Ammonium sulfide soln. with a f.p. of 21 to 61°C	2683	≥ 40	≤ 1,510		1,03	+	C2	+	C2		
108	Ammonium sulfide, solns. with a f.p. over 61°C	2683	≥ 40	≤ 1,510		1,03	+	C2	+	C2	+	C2
109	Amyl alcohol, with a f.p. of -18 to below 21°C	1201	100	0,11	A II	0,82	+	ABC	+	B	+	B
110	Amyl alcohol, with a f.p. of 21 to below 55°C	1201	100	0,11	A II	0,82	+	ABC	+	B	+	B

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
111	Aniline	1547	184	≤ 0,010		1,02	++++++	K3	++++++		++++++	
112	m-anisidine	2810	251	≤ 0,010		1,1	-----		++++++		++++++	
113	o-anisidine	2431	225	≤ 0,010	A III	1,09	-----		++++++		++++++	
114	Anisole	2222	155	0,03	A II	1	++++++		++++++		++++++	
115	Aviation turbine fuel ASTM D 1695 Jet A	1223	≥ 150	≤ 0,030	A II	≤ 0,85	++++++	I	++++++		++++++	
116	Aviation turbine fuel ASTM D 1695 Jet A1	1223	≥ 150	≤ 0,030	A II	≤ 0,85	++++++	I	++++++		++++++	
117	Aviation turbine fuel ASTM D 1695 Jet B, with a f.p. of -18 to below 0°C	1863	≥ 100	≤ 0,200	A I	≤ 0,80	++++++	I	++++++		++++++	
118	Aviation turbine fuel ASTM D 1695 Jet B, with a f.p. of 0 to below 21°C	1863	≥ 100	≤ 0,200	A I	≤ 0,80	++++++	I	++++++		++++++	
119	Aviation turbine fuel JP-1	1223	≥ 150	≤ 0,030	A II	≤ 0,83	++++++	I	++++++		++++++	
120	Aviation turbine fuel JP-4, with a f.p. of -18 to below 0°C	1863	≥ 100	≤ 0,200	A I	≤ 0,80	++++++	I	++++++		++++++	
121	Aviation turbine fuel JP-4, with a f.p. of 0 to below 21°C	1863	≥ 100	≤ 0,200	A I	≤ 0,80	++++++	I	++++++		++++++	

Table B.2 (continued)

No.	Liquid	UN-No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
122	Aviation turbine fuel JP-5, with a f.p. over 55 up to 61°C	1223	≥ 150	≤ 0,030	A III	≤ 0,85	++++++	I	++++++		++++++	
123	Aviation turbine fuel JP-5, with a f.p. over 61 up to 100°C		≥ 150	≤ 0,030	A III	≤ 0,85	++++++	I	++++++		++++++	
124	Aviation turbine fuel JP-6, with a f.p. of -18 to below 0°C	1863	≥ 100	≤ 0,200	A I	≤ 0,80	++++++	I	++++++		++++++	
125	Aviation turbine fuel JP-6, with a f.p. of 0 to below 21°C	1863	≥ 100	≤ 0,200	A I	≤ 0,80	++++++	I	++++++		++++++	
126	Aviation turbine fuel JP-7, with a f.p. over 55 up to 61°C	1223	≥ 150	≤ 0,030	A III	≤ 0,85	++++++	I	++++++		++++++	
127	Aviation turbine fuel JP-7, with a f.p. over 61°C up to 100°C		= 150	≤ 0,030	A III	≤ 0,85	++++++	I	++++++		++++++	
128	Azacycloheptane	2493	139	0,05	B	0,88	0 0 0 0 0 0		++++++	B	++++++	D
129	Benzaldehyde		178	≤ 0,010	A III	1,05	++++++	AC	++++++	AB	++++++	AB
130	Benzene	1114	80	0,37	A I	0,88	++++++	ACS	++++++		++++++	

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
131	Benzonitrile	2224	191	≤ 0,010	A III	1,01	++++++	A	++++++		++++++	
132	Benzothiol	2337	169	≤ 0,010	A II	1,08	-----		++++++		++++++	
133	Benzylamine, with a f.p. over 61°C	1719	185	≤ 0,010	A III	0,99	++++++		++++++	B	++++++	D
134	Benzyl chloride, stabilized	1738	179	≤ 0,010	A III	1,1	0 0 0 0 0 0		0 0 0 0 0 0		- - + - - +	M
135	Benzyltrimethylamine	2619	185	≤ 0,010	A II	0,9	++++++	BG	++++++	B	++++++	D
136	Benzylidene chloride	1886	205	≤ 0,010	A III	1,26	- - - + + +	CET	0 0 0 0 0 0		0 0 0 0 0 0	
137	Bicyclo[2.2.1]hepta-2,5-diene, stabilized, with a f.p. of -18 to below 21°C	2251	89	0,29	A I	0,91	0 0 0 0 0 0		++++++		++++++	
138	Bicyclo[2.2.1]hepta-2,5-diene, stabilized, with a f.p. below -18°C	2251	89	0,29	A I	0,91	0 0 0 0 0 0		++++++		++++++	
139	Bis(trimethylsilyl)amine	1993	126	0,08	A I	0,78	0 0 0 0 0 0		- - - + + +	T	- - - + + +	T
140	Bitumen, in petroleum distillates, liq., with a f.p. of -18 to below 21°C and a b.p. over 50°C	1999	≥ 50	≤ 1,000	A I	≤ 1,20	++++++		++++++		++++++	

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
141	Bitumen, in petroleum distillates, liq., with a f.p. of 21 to 55°C and a b.p. over 100°C	1999	≥ 100	≤ 0,200	A II	≤ 1,20	+	+	+	+	+	+
142	Bitumen, in petroleum distillates, liq., with a f.p. over 55 up to 61°C and a b.p. over 150°C	1999	≥ 150	≤ 0,030	A III	≤ 1,20	+	+	+	+	+	+
143	Bitumen, in petroleum distillates, liq., with a f.p. over 61°C up to 100°C and a b.p. over 150°C		≥ 150	≤ 0,030	A III	≤ 1,20	+	+	+	+	+	+
144	Bitumen, in petroleum distillates, viscous, with a f.p. of -18 up to 21°C and a b.p. over 50°C	1999	≥ 50	≤ 1,000	A I	≤ 1,20	+	+	+	+	+	+
145	Bitumen, in petroleum distillates, liq., with a f.p. over 100°C		≥ 150	≤ 0,030		≤ 1,20	+	+	+	+	+	+

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point	Vapour pressure at 50°C	Danger class	Density	Material No.					
			°C	mbar		kg/l						
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425		1.4306, 1.4541		1.4571, 1.4401, 1.4404, 1.4435	
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
146	Brake fluid, hydraulic, with a f.p. of 0 to below 21°C		100	≤ 1,000	A I	≤ 1,01	+	+	+	+	+	+
147	Brake fluid, hydraulic, with a f.p. of 21 to 55°C		100	≤ 1,000	A II	≤ 1,01	+	+	+	+	+	+
148	Brake fluid, hydraulic, with a f.p. over 55 up to 61°C		100	≤ 1,000	A III	≤ 1,01	+	+	+	+	+	+
149	Brake fluid, hydraulic, with a f.p. over 61 up to 100°C		100	≤ 1,000	A III	≤ 1,01	+	+	+	+	+	+
150	Brake fluid, hydraulic, with a f.p. below 0°C		100	≤ 1,000	A I	≤ 1,01	+	+	+	+	+	+
151	1-bromo-2-methylpropane	2342	92	0,28	A I	1,27	+	+	+	+	+	AC
152	2-bromo-2-methylpropane	2342	74	0,47	A I	1,22	+	+	+	+	+	AC
153	1-bromo-3-chloropropane	2688	142	0,05	A III	1,6	+	+	+	+	+	AC
154	1-bromo-3-methylbutane	2341	121	0,09	A II	1,26	+	+	+	+	+	A
155	Bromobenzene	2514	156	0,03	A II	1,5	+	+	+	+	+	

Table B.2 (continued)

No.	Liquid	UN- No.	Boiling point °C	Vapour pressure at 50°C mbar	Danger class	Density kg/l	Material No.					
							1.0036, 1.0037, 1.0038, 1.0116, 1.0144, 1.0345, 1.0425	1.4306, 1.4541	1.4571, 1.4401, 1.4404, 1.4435			
							Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions	Group of tank A B C D E F	Qualifying conditions
	1	2	3	4	5	6	7	8	9	10	11	12
156	1-bromobutane, with a f.p. below 21°	1126	101	0,18	A I	1,28	++++++	AC	-----		++++++	A
157	1-bromobutane, with a f.p. of 21°C min.	1126	101	0,18	A II	1,28	++++++	AC	-----		++++++	A
158	2-bromobutane	2339	91	0,23	A I	1,26	++++++	AC	-----		++++++	AC
159	Bromoethane	1891	38	1,48	A I	1,46	++++++	AC	-----		0 0 0 0 0 0	
160	2-bromopentane	2343	116	0,11	A I	1,22	++++++	AC	-----		++++++	AC
161	1-bromopropane, with a f.p. of -18 to below 21°C	1993	71	0,51	A I	1,35	++++++	AC	-----		++++++	AC
162	1-bromopropane, with a f.p. of 21 to 55°C	1993	71	0,51	A II	1,35	++++++	AC	-----		++++++	AC
163	2-bromopropane	2344	60	0,74	A I	1,32	++++++	AC	-----		++++++	AC
164	3-bromopropene	1099	70	0,51	A I	1,43	-----		-----		-----	EHN
165	Butanedione	2346	88	0,35	A I	0,99	-----		++++++		++++++	
166	Butanethiol, isomer mixture, with a f.p. of -18 to below 21°C	2347	≥ 64	≤ 0,650	A I	≤ 0,85	-----		++++++		++++++	