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Gas cylinders — Gas properties and associated classification (FTSC) codes

Bouteilles à gaz — Propriétés des gaz et codes de classification associés (FTSC)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 23, *Transportable gas cylinders*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 14456:2015), which has been technically revised. It also incorporates the Amendment ISO 14456:2015/Amd.1:2019.

The main changes are as follows:

— corrections to CAS numbers and FTSC codes;

— consequential revisions as a result of a new edition of ISO 5145;

— addition of new FTSC codes for commonly used gases and liquids.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document establishes a method of allocating a four-digit code number (FTSC) to any gases and liquids that are transported under pressure or mixture of gases contained in cylinders. This code number categorizes the gas, liquids that are transported under pressure or gas mixture in terms of its physical-chemical properties and/or flammability, toxicity, state of gas, and corrosiveness (see 4.1). FTSC is the abbreviation of these properties.

The FTSC code enables gases and liquids that are transported under pressure or gas mixtures to be assigned to one of the 15 “compatible” gas groups.

The properties and the selection criteria are aligned as appropriate with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).[11]

Gas cylinders — Gas properties and associated classification (FTSC) codes

1 Scope

This document gives a list of FTSC (fire potential, i.e. "oxidizing power and flammability", toxicity, state of the gas, and corrosiveness) codes determined according to the relevant properties of gases and of some liquids that are transported under pressure.

It does not cover material compatibility with gases which is covered by the ISO 11114 series.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
gas mixture
combination of different single gases and/or liquids deliberately mixed in specified proportions resulting in a homogeneous gaseous mixture

[SOURCE: ISO 10286:2021, 3.5.2, modified]

3.2
liquefied gas
gas, which, when packaged for transport, is partially liquid (or solid) at temperatures above −50 °C

[SOURCE: ISO 10286:2021, 3.5.4]

3.3
compressed gas
gas, which, when packaged under pressure for transport, is entirely gaseous at −50 °C

Note 1 to entry: This category includes all gases with a critical temperature less than or equal to −50 °C.

[SOURCE: ISO 10286:2021, 3.5.3]

3.4
lethal concentration 50
LC_{50}
concentration of a substance in air exposure to which, for a specified length of time, is expected to cause the death of 50 % of the entire defined experimental animal population after a defined time period

Note 1 to entry: Lethal concentration is usually measured as ppm (volume fraction) or mg/m^3.

[SOURCE: ISO 10298:2018, 3.1, modified — Note 1 to entry has been changed.]

4 Gas properties - Numerical gas code (FTSC)

4.1 General

The code number assigned to a gas or liquid is based on the following four physical-chemical properties:

a) category I (F): fire potential, i.e. “oxidizing power and flammability”, which defines the gas behaviour with respect to combustion;

b) category II (T): acute toxicity;

c) category III (S): gas state, defining the physical state of the fluid in the cylinder at 15 °C within a given pressure range;

d) category IV (C): corrosiveness (ability to damage or destroy living tissues: eyes, skin and mucous membranes, or the potential for an acid/base chemical reaction).

Each category is subdivided into different characteristics (subdivisions), each identified by a different digit. In this way, a gas in a given state is characterized by a series of four digits (one digit per category) as illustrated in 4.1.2 to 4.1.5.

Annex A includes examples of how FTSC codes are rationalized for new entries to this document.

4.2 Fire potential, category I

Subdivision 0: inert (any gas not classified under subdivisions 1 to 5 below).

Subdivision 1: supports combustion (gas having an oxidizing power equal to or less than a mixture containing 23,5 % of oxygen in nitrogen).

Subdivision 2: flammable (gas having flammability limits in air).

NOTE 1 See ISO 10156 for more information.

Subdivision 3: pyrophoric (spontaneously flammable).

Subdivision 4: oxidizing (gas having an oxidizing power greater than a mixture containing 23,5 % O_2 in N_2).

NOTE 2 See ISO 10156 for more information.

Subdivision 5: chemically unstable (flammable and subject to rapid decomposition or polymerization).

NOTE 3 When considering the properties of gases from subdivisions 1 and 4, the following applies:

a) subdivision 4 considers the risk of accelerating combustion more than air does;

b) for gas/material compatibility with gases under pressure of subdivisions 1 and 4, it is considered that the risk of ignition exists when the oxygen partial pressure is more than 30 bar[1)];

c) for valve outlet selection (for example, see ISO 5145), the risk is to mix a flammable gas (subdivision 2 and/or 3) with a gas of subdivision 1 and/or 4.

4.3 Acute toxicity, category II

Subdivision 0: supporting human life.

Subdivision 1: non-toxic LC_{50} (1 h) > 0,5 % by volume (5 000 ppm).

Subdivision 2: toxic; 0,02 % by volume (200 ppm) < LC_{50} (1 h) ≤ 0,5 % by volume (5 000 ppm).

1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

Subdivision 3: very toxic LC_{50} (1 h) ≤ 0,02 % by volume (200 ppm).

NOTE See ISO 10298 for more information. For LC_{50} values, see ISO 10298:2018, Table B.1.

4.4 State of the gas (in the cylinder at 15 °C), category III

All pressures for compressed gases are working pressures according to the definition given in ISO 10286.

For liquefied gases, this is the developed pressure at 65 °C (normally equal to the cylinder test pressure).

Subdivision 0: liquefied gas of 35 bar or less.

Subdivision 1: liquefied gas at a pressure greater than 35 bar.

Subdivision 2: liquid withdrawal – liquefied gas (optional).

Subdivision 3: dissolved gas.

Subdivision 4: gas phase withdrawal at 35 bar or less.

Subdivision 5: compressed gas between 35 bar and 250 bar (Europe).

Subdivision 6: compressed gas between 35 bar and 207 bar (North America).

Subdivision 7: compressed gas above 207 bar and up to 350 bar (North America) or above 250 bar up to 350 bar (Europe).

NOTE 1 Subdivisions 5 and 6 have been adopted as a result of a compromise between the European and the North American approach. The European preference for a limit of 250 bar reflects the current tendency towards higher pressure applications. The current North American practice requires a limit of 207 bar for which their pressure reducing valves are designed. This is the working pressure at the referenced temperature of 15 °C. Therefore, three pressure classes have been retained. Other jurisdictions can use different values.

Either subdivision 5 or subdivision 6 shall be used, never both. The selection of either subdivision will determine the applicable pressure for subdivision 7.

Subdivision 5 or 6: medium pressure range, each user being required to select one subdivision exclusively to determine the upper limit of the medium pressure range.

Subdivision 7: high pressure range, the lower limit of which depends on the subdivision selected for the medium pressure range.

After the introduction of subdivisions 5, 6, and 7, a number of pressure ranges have been (or are being) established to make the selection of the proper cylinder valve outlet connection (e.g. 500 bar, 800 bar, sub atmospheric pressure). These ranges have been chosen to protect downstream regulators and other ancillary equipment from over-pressurized conditions. Consequently, for Table 2 to Table 16, the third digit (S) used for all compressed gases is “5” to indicate that this is a compressed gas.

NOTE 2 Subdivisions 8 and 9 have been allocated for liquid withdrawal cylinders of cryogenic gases in the US.

4.5 Corrosiveness, category IV

Subdivision 0: non-corrosive.

Subdivision 1: non-halogen acid forming.

Subdivision 2: basic.

Subdivision 3: halogen acid forming.

NOTE See ISO 13338 for more information. For corrosiveness subdivisions, see ISO 13338:2022, Table 1.

5 List of gases and liquids with the corresponding FTSC codes

5.1 Basic principles and single gases

The FTSC code enables the assignment of any gas (including gas mixtures) or any liquid to be packaged under pressure to one of the 15 “compatible” gas groups listed in the table below.

NOTE The only purpose of the numerical code is to group compatible gases together in order that particular valve outlets can be assigned to each group. Use of the code is limited only to the assignment of valve outlets.

Table 1 — Characteristics of groups

Group	Characteristics
1	Non-flammable, non-toxic gases and qualifying gas mixtures, less stable thermally than group 3
2[a]	Carbon dioxide
3	Non-flammable, non-toxic, and thermally stable gases (except carbon dioxide) and qualifying gas mixtures
4	Non-flammable, toxic, and corrosive (or corrosive by hydrolysis) gases and qualifying gas mixtures
5[a]	Air
6	Flammable and non-toxic gases and qualifying gas mixtures
7	Flammable, toxic, and corrosive (basic) gases and qualifying gas mixtures
8	Flammable, toxic, and corrosive (acidic) or non-corrosive gases and qualifying gas mixtures
9	Spontaneously flammable gases and qualifying gas mixtures
10[a]	Oxygen
11[a]	Nitrous oxide
12	Oxidizing, toxic, and/or corrosive gases and qualifying gas mixtures
13	Flammable gases and qualifying gas mixtures subject to rapid decomposition or polymerization
14[a]	Acetylene
15	Oxidizing, non-toxic, and non-corrosive gas mixtures

[a] Groups 2, 5, 10, 11 and 14 only contain one single gas and are assigned to individual named gases from which mixtures and other gases are excluded.

5.2 Assignment of a gas mixture to a group

For the purposes of this document, a gas mixture is defined as an intentional combination of two or more gases, which can be either in the gaseous phase or liquefied under pressure when in a gas cylinder.

NOTE This document does not attempt to identify gas mixtures which can be safely and satisfactorily prepared; this is the responsibility of the gas manufacturer. It does not describe any methods or techniques for preparing gas mixtures.

The principle of allocation of a four-digit numerical code (FTSC) to gas mixtures is the same as that for single gases. The allocation of the FTSC code to a gas mixture, which allows the assignment of this mixture to one of the group of gases and gas mixtures (see Table 1), depends on the flammability, oxidizing power, toxicity and corrosiveness of the final mixture. The determination of flammability and oxidizing power is given in ISO 10156, that of toxicity in ISO 10298, and that for corrosiveness in ISO 13338.

Mixtures containing spontaneously flammable gases (i.e. pyrophoric gases such as silane in Table 10) shall be considered as spontaneously flammable gas mixtures if the content of the pyrophoric gas(es) is more than 1 % (by volume).

Table 16 gives the complete list of gases in alphabetical order.

5.3 Tables of compatible groups of gases and liquids

Table 2 — Gases and gas/liquid mixtures belonging to group 1 (non-flammable, non-toxic gases and gas mixtures, less stable thermally than group 3)

Gas	FTSC code	Synonym	CAS Registry Number®[b]
Bromochlorodifluoromethane	0100	R12B1	353–59–3
Bromochloromethane[a]	0100	Halon 1011	74–97–5
Bromotrifluoromethane	0100	Trifluorobromomethane, R13B1	75–63–8
Chlorodifluoromethane	0100	Monochlorodifluoromethane, R22	75–45–6
Chlorodifluoromethane and Chloropentafluoroethane	0100	R502	azeotropic mixture
Chloroheptafluorocyclobutane[a]	0100	C317	377–41–3
Chloropentafluoroethane	0100	Monochloropentafluoroethane, R115	76–15–3
1-Chloro-1,2,2,2-tetrafluoroethane	0100	R124	2837–89–0
1-Chloro-2,2,2-trifluoroethane	0100	R133a	75–88–7
Chlorotrifluoromethane	0100	Monochlorotrifluoromethane, R13	75–72–9
Chlorotrifluoromethane and Trifluoromethane	0100	R503	azeotropic mixture
1,2 - dibromo-1,1-difluoroethane[a]	0100		75-82-1
1,2-Dibromotetrafluoroethane[a]	0100	R114B2	124–73–2
1,2-Dichlorodifluoroethylene	0100	R1112a	79–35–6
Dichlorodifluoromethane	0100	R12	75–71–8
Dichlorodifluoromethane and 1,1-Difluoroethane	0100	R500	azeotropic mixture
Dichlorofluoromethane	0100	R21	75–43–4
1,2-Dichlorohexafluorocyclobutane[a]	0100	C316	356–18–3
1,1-Dichlorotetrafluoroethane	0100	R114a	374–07–2
1,2-Dichlorotetrafluoroethane	0100	R114	76–14–2
2,2-Dichloro-1,1,1–trifluoroethane[a]	0100	R123	306–83–2
Difluoromethane, Pentafluoroethane, and 1,1,1,2-Tetrafluoroethane	0100	R407A, R407B, R407C	zeotropic mixture
Heptafluoropropane	0100	R227	431–89–0
Hexafluoroethane	0100	Perfluoroethane, R116	76–16–4
Hexafluoropropylene	0100	Hexafluoropropene, R1216	116–15–4
Methylene bromide[a]	0100	Dibromomethane	74-95-3
Octafluorobut-2-ene	0100	R1318	360–89–4
Octafluorocyclobutane	0100	Perfluorocyclobutane, RC318	115–25–3
Octafluoropropane	0100	Perfluoropropane, R218	76–19–7
Pentachlorofluoroethane[a]	0100		29756–45–4
Pentafluoroethane	0100	R125	354–33–6
Pentafluoroethane, 1,1,1-Trifluoroethane, and 1,1,1,2-Tetrafluoroethane	0100	R404A	zeotropic mixture

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] Chemical Abstracts Service (CAS) Registry Number® is a trademark of the American Chemical Society (ACS). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Table 2 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®[b]
Pentafluoroethyliodide[a]	0100		354–64–3
Perfluorobutane	0100	R610	355–25–9
Sulfur hexafluoride	0100		2551–62–4
1,1,1,2-Tetrachlorodifluoroethane (solid)	0100	R112a	76–11–9
1,1,2,2-Tetrachlorodifluoroethane[a]	0100	R112	76–12–0
Tetrachloromethane[a]	0100	Carbon tetrachloride	56-23-5
1,1,2,2-Tetrafluoro-1-chloroethane	0100	R124a	354–25–6
1,1,1,2-Tetrafluoroethane	0100	R134a	811–97–2
1,1,2-Trichloroethene[a]	0100	Trichloroethylene	79-01-6
Trichlorofluoromethane[a]	0100	Trichloromonofluoromethane, R11	75–69–4
1,1,1-Trichlorotrifluoroethane[a]	0100	R113a	354–58–5
1,1,2-Trichlorotrifluoroethane[a]	0100	R113	76–13–1
Trifluoromethane	0100	Fluoroform, R23	75–46–7

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] Chemical Abstracts Service (CAS) Registry Number® is a trademark of the American Chemical Society (ACS). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Table 3 — Gases belonging to group 2 (carbon dioxide)

Gas	FTSC code	Synonym	CAS Registry Number®
Carbon dioxide	0110	Carbonic acid anhydride, R744	124–38–9

Table 4 — Gases and gas mixtures belonging to group 3 (non-flammable, non-toxic, and thermally stable gases and gas mixtures)

Gas	FTSC code	Synonym	CAS Registry Number®
Argon	0150		7440–37–1
Helium	0150		7440–59–7
Krypton	0150		7439–90–9
Neon	0150		7440–01–9
Nitrogen	0150		7727–37–9
Xenon	0110[a]		7440–63–3
Tetrafluoromethane	0150	Carbon tetrafluoride, R14	75–73–0

[a] FTSC code due to the gas having a critical temperature above 15 °C.

Table 5 — Gases and gas mixtures belonging to group 4 (non-flammable, toxic, and corrosive (or corrosive by hydrolysis) gases and gas mixtures)

Gas	FTSC code[c]	Synonym	CAS Registry Number®
Antimony pentafluoride[a]	0303		7783–70–2
Arsenic pentafluoride	0303		7784-36-3
Boron trichloride	0203	Boron chloride	10294–34–5
Boron trifluoride	0253	Boron fluoride	7637–07–2
Bromoacetone[a]	(0303)-**2203**[b]		598–31–2
Bromodifluoromethane	0100	R22B1	1511-62-2
Carbonyl fluoride	0213	Fluorophosgene	353–50–4
Cyanogen chloride	0303		506–77–4
Deuterium chloride	0213		7698–05–7
Deuterium fluoride	0203		14333–26–7
Dibromodifluoromethane[a]	0100	R12B2	75–61–6
Dichloro-2-chlorovinyl arsine[a]	0303	Lewisite	541–25–3
Diphosgene[a]	0303		503–38–8
Ethyldichloroarsine[a]	0303		598–14–1
Germanium tetrachloride[a]	0203	Germanium chloride	10038-98-9
Germanium tetrafluoride	0203	Germanium fluoride	7783-58-6
Hexafluoroacetone	0203	1,1,1,3,3,3,-hexafluoro-2-propanone	684–16–2
Hydrogen bromide	0203	Hydrobromic acid (anhydrous)	10035–10–6
Hydrogen chloride	0213	Hydrochloric acid (anhydrous)	7647–01–0
Hydrogen fluoride[a]	0203	Hydrofluoric acid (anhydrous)	7664–39–3
Hydrogen iodide	0203	Hydroiodic acid (anhydrous)	10034–85–2
Iodotrifluoromethane	(0200)-**0100**[b]	Trifluoromethyl iodide	2314–97–8
Methyl bromide	(0300)-**2200**[b]	Bromomethane	74–83–9
Methyldichloroarsine[a]	0303		593–89–5
Methyl iodide[a]	0223	Iodomethane	74-88-4
Nitrosyl chloride	0303		2696–92–6
Octafluorocyclopentene[a]	0220		559-40-0
Perfluoro-2-butene	(0200)- **0100**[b]	Octafluorobutene; R1318	360–89–4
Phenylcarbylamine Chloride[a]	(0303)-**2303**[b]		622–44–6
Phosgene	0303	Carbonyl chloride	75–44–5
Phosphorus pentafluoride	0203		7647–19–0
Phosphorus trifluoride	0203		7783–55–3
Silicon tetrachloride[a]	0203		10026–04–7
Silicon tetrafluoride	0253	Tetrafluorosilane	7783–61–1
Sulfur dioxide	0201	R764	7446–09–5
Sulfur tetrafluoride	0303		7783–60–0

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] Some gases with an FTSC code of 0100 are listed in Table 5 because they historically have been assigned valve outlet connections specified for this group, see ISO 5145.

Table 5 *(continued)*

Gas	FTSC code[c]	Synonym	CAS Registry Number®
Sulfuryl fluoride	0200	Sulfuryl difluoride	2699–79–8
Tungsten hexafluoride	0203		7783–82–6
Uranium hexafluoride (liquid/solid, class 7)	0303		7783–81–5
NOTE The FTSC codes in brackets are from ISO 5145:1990. [2)] This explains why the corresponding gases are in this table.			

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] Some gases with an FTSC code of 0100 are listed in Table 5 because they historically have been assigned valve outlet connections specified for this group, see ISO 5145.

Table 6 — Gases belonging to group 5 (air)

Gas	FTSC code	Synonym	CAS Registry Number®
Air	1050		132259–10–0

Table 7 — Gases and gas mixtures belonging to group 6 (flammable and non-toxic gases and gas mixtures)

Gas	FTSC code	Synonym	CAS Registry Number®
Allene	2100	Propadiene	463–49–0
Bromotrifluoroethylene	2100	R113B1	598–73–2
Butane	2100		106–97–8
1-Butene	2100	Butylene	106–98–9
Cis-2-Butene	2100	Butylene	590–18–1
Trans-2-Butene	2100	Butylene	624–64–6
1-Chloro-1,1-difluoroethane	2100	R142b	75–68–3
Chlorofluoromethane	2100	R31	593–70–4
Cyclobutane	2100		287-23-0
Deuterium	2150		7782–39–0
1,2-Dichloroethylene[a]	2120	1,2-Dichloroethene	540-59-0
Dichloromethane[a]	2100		75-09-2
1,1-Difluoroethane	2100	Ethylidene fluoride, R152a	75–37–6
Difluoromethane	2100	Methylene fluoride, R32	75–10–5
1,1-Difluoroethylene	2110	Vinylidene fluoride, R1132a	75–38–7
Dimethylether	2100	Methyl ether	115–10–6
2,2-Dimethylpropane[a]	2100	Tetramethylmethane	463–82–1
Ethane	2110	R170	74–84–0
Ethylacetylene	2100	1-Butyne	107–00–6
Ethyl chloride[a]	2100	Chloroethane, R160	75–00–3

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

2) Now withdrawn. Replaced by ISO 5145:2017.

Table 7 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®
Ethylene	2150	Ethene, R1150	74–85–1
Ethyl ether[a]	2100	Diethyl ether	60–29–7
Ethyl fluoride	2100	Fluoroethane, R161	353-36-6
Ethyl mercaptan[a]	2100	ethanethiol	75-08-1
Hydrogen	2150		1333–74–0
Hydrogen absorbed in metal alloy (reversible metal hydride)	2130		
Isobutane [a]	2100	Trimethylmethane, R600	75–28–5
Isobutylene	2100	2-Methylpropene, Isobutene	115–11–7
Methane	2150	R50	74–82–8
Methylacetylene	2100	Allylene; Propyne	74–99–7
3-Methyl-1-butene[a]	2100	Isoamylene,Isopropylethylene	563–45–1
Methyl ethyl ether	2100	Ethyl methyl ether	540–67–0
Methyl fluoride	2110	Fluoromethane, R41	593–53–3
Methyl formate[a]	2100	Methyl methanoate	107-31-3
Methyl sulfide[a]	2100	Dimethyl sulfide	75-18-3
Natural gas	2150		mixture
Propane	2100	R290	74–98–6
Propylene	2100	Propene, R1270	115–07–1
2,3,3,3-Tetrafluoropropene	2100	R1234yf	754–12–1
Tetramethylsilane[a]	2100		75-76-3
1,1,1-Trifluoroethane	2100	R143a	420–46–2

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

Table 8 — Gases and gas mixtures belonging to group 7 (flammable, toxic, and corrosive (basic) gases and gas mixtures)

Gas	FTSC code	Synonym	CAS Registry Number®
Ammonia	2102	R717	7664–41–7
Dimethylamine	2102		124–40–3
Monoethylamine[a]	2102	Ethylamine, R631	75–04–7
Monomethylamine	2102	Methylamine, R630	74–89–5
Trimethylamine	2102		75–50–3
Trisilylamine[a]	3202	Silanamine, N,N-disilyl-	13862-16-3

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

Table 9 — Gases and gas mixtures belonging to group 8 (flammable, toxic, and corrosive (acidic) or non-corrosive gases and gas mixtures)

Gas	FTSC code	Synonym	CAS Registry Number®
Acrylonitrile[a]	2200		107-13-1
Arsine	2300		7784–42–1
Carbon disulfide[a]	2100		75-15-0
Carbon monoxide	2250		630–08–0
Carbonyl sulfide	2201	Carbonoxylsulfide	463–58–1
Chloromethane	(2200)-**2100** [b]	Methyl chloride, R40	74–87–3
Cyanogen	2200		460–19–5
Cyclopropane	(2200)-**2100** [b]	Trimethylene	75–19–4
Deuterium selenide	2301		13536–95–3
Deuterium sulfide	2201		13536–94–2
Dichlorosilane	2203		4109–96–0
Dimethylsilane	(2300)-**2100** [b]		1111–74–6
Germane	2200		7782–65–2
Heptafluorobutyronitrile[a]	2300		375–00–8
Hexafluorocyclobutene	2100		697–11–0
Hydrogen selenide	2301		7783–07–5
Hydrogen sulfide	2201		7783–06–4
Methyl disulfide[a]	2200		624-92-0
Methyl mercaptan	2201	Methanethiol	74–93–1
Methylsilane	(2300)-**2100** [b]		992–94–9
Monochlorosilane	3203		13465-78-6
Nickel carbonyl[a]	2300	Nickel tetracarbonyl	13463–39–3
Pentafluoropropionitrile	2300		422–04–8
Perfluorobutadiene	2200		685-63-2
Tetraethyl lead[a]	2300		78–00–2
Tetramethyl lead[a]	2200		75–74–1
Trichlorosilane[a]	2203		10025-78-2
Trifluoroacetonitrile	2200		353–85–5
Trifluoroethylene	2200		359–11–5
Trimethylsilane	(2300)-**2100** [b]		993–07–7

NOTE The FTSC codes in brackets are from ISO 5145:1990. This explains why the corresponding gases are in this table.

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

Table 10 — Gases and gas mixtures belonging to group 9 [pyrophoric (spontaneously flammable) gases and gas mixtures]

Gas	FTSC code	Synonym	CAS Registry Number®
Diethylzinc[a]	3100		557–20–0
Pentaborane[a]	3300		19624–22–7
Phosphine	3310		7803–51–2
Silane	3150	Silicon tetrahydride	7803–62–5
Triethyl aluminium[a]	3100		97–93–8
Triethyl borane	3200		97–94–9
Trimethylborane	3200	Trimethylboron	593-90-8
Trimethylstibine[a]	3300		594–10–5
Trisilane[a]	3100		7783-26-8

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

Table 11 — Gases belonging to group 10 (oxygen)

Gas	FTSC code	Synonym	CAS Registry Number®
Oxygen	4050		7782–44–7

Table 12 — Gases belonging to group 11 (nitrous oxide)

Gas	FTSC code	Synonym	CAS Registry Number®
Nitrous oxide	4110		10024–97–2

Table 13 — Gases and gas mixtures belonging to group 12 (oxidizing, toxic, and/or corrosive gases and qualifying gas mixtures)

Gas	FTSC Code	Synonym	CAS Registry Number®
Bis-trifluoromethylperoxide	4300		927–84–4
Bromine pentafluoride[a]	4303		7789–30–2
Bromine trifluoride[a]	4303		7787–71–5
Chlorine	4203		7782–50–5
Chlorine dioxide	4203		10049-04-4
Chlorine pentafluoride	4303		13637–63–3
Chlorine trifluoride	4203		7790–91–2
Fluorine	4343		7782–41–4
Iodine pentafluoride[a]	4303		7783–66–6
Nitric oxide	4351	Nitrogen(II) oxide	10102–43–9
Nitrogen dioxide	4301		10102–44–0
Nitrogen tetroxide	4301	Dinitrogen tetroxide	10544–72–6
Nitrogen trifluoride	4150		7783–54–2
Nitrogen trioxide	4301	Dinitrogen trioxide	10544–73–7

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

Table 13 *(continued)*

Gas	FTSC Code	Synonym	CAS Registry Number®
Nitrosyl fluoride	4303		7789-25-5
Nitryl fluoride	4303		10022-50-1
Oxygen difluoride	4343		7783–41–7
Ozone	4330		10028–15–6
Perchloryl fluoride	4200		7616-94-6
Tetrafluorohydrazine	4343		10036–47–2

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

Table 14 — Gases and gas mixtures belonging to group 13 (flammable gases and gas mixtures subject to rapid decomposition or polymerization)

Gas	FTSC code	Synonym	CAS Registry Number®
1,3-Butadiene, stabilized	5100		106–99–0
Chlorotrifluoroethylene, stabilized	5200	R1113	79–38–9
Diborane	5350		19287–45–7
Digermane[a]	5200		13818-89-8
Ethylene oxide	5200	Oxirane	75–21–8
Hydrogen cyanide, stabilized[a]	5301	Hydrocyanic acid (anhydrous)	74–90–8
Methyl vinyl ether, stabilized	5100	Methoxyethylene	107–25–5
Propylene oxide[a]	5100	Methyl oxirane	75–56–9
Stibine	5300	Antimony hydride	7803–52–3
Tetrafluoroethylene, stabilized	5100	R1114	116–14–3
Vinyl bromide, stabilized	5100		593–60–2
Vinyl chloride, stabilized	5100	Chloroethylene, R1140	75–01–4
Vinyl fluoride, stabilized	5100	Fluoroethylene, R1141	75–02–5

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

Table 15 — Gases and gas mixtures belonging to group 14 (acetylene)

Gas	FTSC code	Synonym	CAS Registry Number®
Acetylene	5130	Ethyne	74–86–2

Table 16 — Gases in alphabetical order

Gas	FTSC code	Synonym	CAS Registry Number®
Acetylene	5130	Ethyne	74–86–2
Acrylonitrile[a]	2200		107-13-1
Air	1050		132259-10-0
Allene	2100	Propadiene	463–49–0
Ammonia	2102	R717	7664–41–7
Antimony pentafluoride[a]	0303		7783–70–2
Argon	0150		7440–37–1
Arsenic pentafluoride	0303		7784-36-3
Arsine	2300		7784–42–1
Bis-trifluoromethylperoxide	4300		927–84–4
Boron trichloride	0203	Boron chloride	10294–34–5
Boron trifluoride	0253	Boron fluoride	7637–07–2
Bromine pentafluoride[a]	4303		7789–30–2
Bromine trifluoride[a]	4303		7787–71–5
Bromoacetone[a]	(0303)-**2203**[b]		598–31–2
Bromochlorodifluoromethane	0100	R12B1	353–59–3
Bromochloromethane[a]	0100	Halon 1011	74–97–5
Bromodifluoromethane	0100	R22B1	1511-62-2
Bromotrifluoroethylene	2100	R113B1	598–73–2
Bromotrifluoromethane	0100	Trifluorobromomethane, R13B1	75–63–8
Butane	2100		106–97–8
1,3-Butadiene, stabilized	5100		106–99–0
1-Butene	2100	Butylene	106–98–9
Cis-2-Butene	2100	Butylene	590–18–1
Carbon dioxide	0110	Carbonic acid anhydride, R744	124–38–9
Carbon disulfide[a]	2100		75-15-0
Carbon monoxide	2250		630–08–0
Carbonyl fluoride	0213	Fluorophosgene	353–50–4
Carbonyl sulfide	2201	Carbonoxylsulfide	463–58–1
Chlorine	4203		7782–50–5
Chlorine dioxide	4203		10049-04-4
Chlorine pentafluoride	4303		13637–63–3
Chlorine trifluoride	4203		7790–91–2
1-Chloro-1,1-difluoroethane	2100	R142b	75–68–3
Chlorodifluoromethane	0100	Monochlorodifluoromethane, R22	75–45–6
Chlorodifluoromethane and Chloropentafluoroethane	0100	R502	azeotropic mixture
Chlorofluoromethane	2100	R31	593–70–4
Chloroheptafluorocyclobutane[a]	0100	C317	377–41–3

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] FTSC code due to the critical point of the gas of above 15 °C.

Table 16 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®
Chloromethane	(2200)-**2100** [b]	Methyl chloride, R40	74–87–3
Chloropentafluoroethane	0100	Monochloropentafluoroethane, R115	76–15–3
1-Chloro-1,2,2,2-tetrafluoroethane	0100	R124	2837–89–0
1-Chloro-2,2,2-trifluoroethane	0100	R133a	75–88–7
Chlorotrifluoroethylene, stabilized	5200	R1113	79–38–9
Chlorotrifluoromethane	0100	Monochlorotrifluoromethane, R13	75–72–9
Chlorotrifluoromethane and Trifluoromethane	0100	R503	azeotropic mixture
Cyanogen	2200		460–19–5
Cyanogen chloride	0303		506–77–4
Cyclobutane	2100		287-23-0
Cyclopropane	(2200)-**2100** [b]	Trimethylene	75–19–4
Deuterium	2150		7782–39–0
Deuterium chloride	0213		7698–05–7
Deuterium fluoride	0203		14333–26–7
Deuterium selenide	2301		13536–95–3
Deuterium sulfide	2201		13536–94–2
Diborane	5350		19287–45–7
1,2-dibromo-1,1-difluoroethane[a]	0100		75-82-1
Dibromodifluoromethane[a]	0100	R12B2	75–61–6
1,2-Dibromotetrafluoroethane[a]	0100	R114B2	124–73–2
Dichloro-2-chlorovinyl arsine[a]	0303	Lewisite	541–25–3
1,2-Dichlorodifluoroethylene	0100	R1112a	79–35–6
Dichlorodifluoromethane	0100	R12	75–71–8
Dichlorodifluoromethane and 1,1-Difluoroethane	0100	R500	azeotropic mixture
1,2-Dichloroethylene[a]	2120	1,2-Dichloroethene	540-59-0
Dichlorofluoromethane	0100	R21	75–43–4
1,2-Dichlorohexafluorocyclobutane[a]	0100	C316	356–18–3
Dichloromethane[a]	2100		75-09-2
Dichlorosilane	2203		4109–96–0
1,1-Dichlorotetrafluoroethane	0100	R114a	374–07–2
1,2-Dichlorotetrafluoroethane	0100	R114	76–14–2
2,2-Dichloro-1,1,1–trifluoroethane[a]	0100	R123	306–83–2
Diethylzinc [a]	3100		557–20–0
1,1-Difluoroethane	2100	Ethylidene fluoride, R152a	75–37–6
1,1-Difluoroethylene	2110	Vinylidene fluoride, R1132a	75–38–7
Digermane[a]	5200		13818-89-8

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] FTSC code due to the critical point of the gas of above 15 °C.

Table 16 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®
Difluoromethane	2100	Methylene fluoride, R32	75–10–5
Difluoromethane, Pentafluoroethane and 1,1,1,2-Tetrafluoroethane	0100	R407A, R407B, R407C	zeotropic mixture
Dimethylamine	2102		124–40–3
Dimethylether	2100	Methyl ether	115–10–6
2,2-Dimethylpropane[a]	2100	Tetramethylmethane	463–82–1
Dimethylsilane	(2300)-**2100** [b]		1111–74–6
Diphosgene[a]	0303		503–38–8
Ethane	2110	R170	74–84–0
Ethylacetylene	2100	1-Butyne	107–00–6
Ethyl chloride[a]	2100	Chloroethane, R160	75–00–3
Ethyldichloroarsine[a]	0303		598–14–1
Ethylene	2150	Ethene, R1150	74–85–1
Ethylene oxide	5200	Oxirane	75–21–8
Ethyl ether[a]	2100	Diethyl ether	60–29–7
Ethyl fluoride	2100	Fluoroethane, R161	353-36-6
Ethyl mercaptan[a]	2100	Ethanethiol	75-08-1
Fluorine	4343		7782–41–4
Germane	2200		7782–65–2
Germanium tetrachloride[a]	0203	Germanium chloride	10038-98-9
Germanium tetrafluoride	0203	Germanium fluoride	7783-58-6
Helium	0150		7440–59–7
Heptafluorobutyronitrile[a]	2300		375–00–8
Heptafluoropropane	0100	R227	431–89–0
Hexafluoroacetone	0203	1,1,1,3,3,3,-hexafluoro-2-propanone	684–16–2
Hexafluorocyclobutene	2100		697–11–0
Hexafluoroethane	0100	Perfluoroethane, R116	76–16–4
Hexafluoropropylene	0100	Hexafluoropropene, R1216	116–15–4
Hydrogen	2150		1333–74–0
Hydrogen absorbed in metal alloy (reversible metal hydride)	2130		
Hydrogen bromide	0203	Hydrobromic acid (anhydrous)	10035–10–6
Hydrogen chloride	0213	Hydrochloric acid (anhydrous)	7647–01–0
Hydrogen cyanide, stabilized[a]	5301	Hydrocyanic acid (anhydrous)	74–90–8
Hydrogen fluoride[a]	0203	Hydrofluoric acid (anhydrous)	7664–39–3
Hydrogen iodide	0203	Hydroiodic acid (anhydrous)	10034–85–2
Hydrogen selenide	2301		7783–07–5
Hydrogen sulfide	2201		7783–06–4
Iodine pentafluoride[a]	4303		7783–66–6

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] FTSC code due to the critical point of the gas of above 15 °C.

Table 16 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®
Iodotrifluoromethane	(0200)-**0100** [b]	Trifluoromethyl iodide	2314–97–8
Isobutane [a]	2100	Trimethylmethane, R600	75–28–5
Isobutylene	2100	2-Methylpropene, Isobutene	115–11–7
Krypton	0150		7439–90–9
Methane	2150	R50	74–82–8
Methylacetylene	2100	Allylene, Propyne	74–99–7
Methyl bromide	(0300)-**2200** [b]	Bromomethane	74–83–9
3-Methyl-1-butene[a]	2100	Isoamylene, Isopropylethylene	563–45–1
Methyldichloroarsine[a]	0303		593–89–5
Methyl disulfide[a]	2200		624-92-0
Methylene bromide[a]	0100	Dibromomethane	74-95-3
Methyl ethyl ether	2100	Ethyl methyl ether	540–67–0
Methyl fluoride	2110	Fluoromethane, R41	593–53–3
Methyl formate[a]	2100	Methyl methanoate	107-31-3
Methyl iodide[a]	0223		74-88-4
Methyl mercaptan	2201	Methanethiol	74–93–1
Methylsilane	(2300)-**2100** [b]		992–94–9
Methyl sulfide[a]	2100	Dimethyl sulfide	75-18-3
Methyl vinyl ether, stabilized	5100	Methoxyethylene	107–25–5
Monochlorosilane	3203		13465-78-6
Monoethylamine[a]	2102	Ethylamine, R631	75–04–7
Monomethylamine	2102	Methylamine, R630	74–89–5
Natural gas	2150		Mixture
Neon	0150		7440–01–9
Nickel carbonyl[a]	2300	Nickel tetracarbonyl	13463–39–3
Nitric oxide	4351	Nitrogen(II) oxide	10102–43–9
Nitrogen	0150		7727–37–9
Nitrogen dioxide	4301		10102–44–0
Nitrogen tetraoxide	4301	Dinitrogen tetraoxide	10544–72–6
Nitrogen trifluoride	4150		7783–54–2
Nitrogen trioxide	4301	Dinitrogen trioxide	10544–73–7
Nitrosyl chloride	0303		2696–92–6
Nitrosyl Fluoride	4303		7789-25-5
Nitrous oxide	4110		10024–97–2
Nitryl fluoride	4303		10022-50-1
Octafluorobut-2-ene	0100	R1318	360–89–4
Octafluorocyclobutane	0100	Perfluorocyclobutane, RC318	115–25–3
Octafluorocyclopentene[a]	0220		559-40-0

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] FTSC code due to the critical point of the gas of above 15 °C.

Table 16 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®
Octafluoropropane	0100	Perfluoropropane, R218	76–19–7
Oxygen	4050		7782–44–7
Oxygen difluoride	4343		7783–41–7
Ozone	4330		10028–15–6
Pentaborane[a]	3300		19624–22–7
Pentachlorofluoroethane[a]	0100		29756–45–4
Pentafluoroethane	0100	R125	354–33–6
Pentafluoroethane, 1,1,1-Trifluoroethane and 1,1,1,2-Tetrafluoroethane	0100	R404A	zeotropic mixture
Pentafluoroethyliodide[a]	0100		354–64–3
Pentafluoropropionitrile	2300		422–04–8
Perchloryl fluoride	4200		7616-94-6
Perfluorobutadiene	2200		685-63-2
Perfluorobutane	0100	R610	355–25–9
Perfluoro-2-butene	(0200)-**0100** [b]	Octafluorobutene, R1318	360–89–4
Phenylcarbylamine chloride[a]	(0303)-**2303** [b]		622–44–6
Phosgene	0303	Carbonyl chloride	75–44–5
Phosphine	3310		7803–51–2
Phosphorus pentafluoride	0203		7647–19–0
Phosphorus trifluoride	0203		7783–55–3
Propane	2100	R290	74–98–6
Propylene	2100	Propene, R1270	115–07–1
Propylene oxide[a]	5100	Methyl oxirane	75–56–9
Silane	3150	Silicon tetrahydride	7803–62–5
Silicon tetrachloride[a]	0203		10026–04–7
Silicon tetrafluoride	0253	Tetrafluorosilane	7783–61–1
Stibine	5300	Antimony hydride	7803–52–3
Sulfur dioxide	0201	R764	7446–09–5
Sulfur hexafluoride	0100		2551–62–4
Sulfur tetrafluoride	0303		7783–60–0
Sulfuryl fluoride	0200	Sulfuryl difluoride	2699–79–8
1,1,1,2-Tetrachlorodifluoroethane (solid)	0100	R112a	76–11–9
1,1,2,2-Tetrachlorodifluoroethane[a]	0100	R112	76–12–0
Tetrachloromethane[a]	0100	Carbon tetrachloride	56-23-5
Tetraethyl lead[a]	2300		78–00–2
1,1,2,2-Tetrafluoro-1-chloroethane	0100	R124a	354–25–6
1,1,1,2-Tetrafluoroethane	0100	R134a	811–97–2
Tetrafluoroethylene, stabilized	5100	R1114	116–14–3
Tetrafluorohydrazine	4343		10036–47–2

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] FTSC code due to the critical point of the gas of above 15 °C.

Table 16 *(continued)*

Gas	FTSC code	Synonym	CAS Registry Number®
Tetrafluoromethane	0150	Carbon tetrafluoride, R14	75–73–0
2,3,3,3-Tetrafluoropropene	2100	R1234yf	754–12–1
Tetramethyl lead[a]	2200		75–74–1
Tetramethylsilane[a]	2100		75-76-3
Trans-2-Butene	2100	Butylene	624–64–6
1,1,2-trichloroethene[a]	0100	Trichloroethylene	79-01-6
Trichlorofluoromethane[a]	0100	Trichloromonofluoromethane, R11	75–69–4
Trichlorosilane[a]	2203		10025-78-2
1,1,1-Trichlorotrifluoroethane[a]	0100	R113a	354–58–5
1,1,2-Trichlorotrifluoroethane[a]	0100	R113	76–13–1
Triethyl aluminium[a]	3100		97–93–8
Triethyl borane	3200		97–94–9
Trifluoroacetonitrile	2200		353–85–5
1,1,1 -Trifluoroethane	2100	R143a	420–46–2
Trifluoroethylene	2200		359–11–5
Trifluoromethane	0100	Fluoroform, R23	75–46–7
Trimethylamine	2102		75–50-3
Trimethylborane	3200	Trimethylboron	593-90-8
Trimethylsilane	(2300)-**2100** [b]		993–07–7
Trimethylstibine[a]	3300		594–10–5
Trisilane[a]	3100		7783-26-8
Trisilylamine[a]	3202	Silanamine, N,N-disilyl-	13862-16-3
Tungsten hexafluoride	0203		7783–82–6
Uranium hexafluoride (liquid/solid, class 7)	0303		7783–81–5
Vinyl bromide, stabilized	5100		593–60–2
Vinyl chloride, stabilized	5100	Chloroethylene, R1140	75–01–4
Vinyl fluoride, stabilized	5100	Fluoroethylene, R1141	75–02–5
Xenon	0110[c]		7440–63–3

NOTE The FTSC codes in brackets are from ISO 5145:1990.

[a] Some products, being liquid at normal ambient conditions, are included since they can be supplied in non-pressurized containers. They are included in this grouping because valve outlets are necessary when these products are supplied together with a propellant in a pressurized container.

[b] To be consistent with ISO 10298, the former FTSC code is completed by the new one in bold figures corresponding to the new toxicity level.

[c] FTSC code due to the critical point of the gas of above 15 °C.

Annex A
(informative)

Chemical and hazard data related to additional proposed FTSC entries

A.1 Presentation

A.1.1 Format of the information

The format of the information is a separate table for each proposed FTSC entry and includes the following:

a) Chemical identification

b) The proposed FTSC code

c) Transport information

d) Fire potential data

e) Toxicity data

f) Physical state data

g) Corrosivity data

h) Conclusion if the proposed FTSC code is supported by the data or not

A.1.2 Major sources of the information in Table A.1 to Table A.32

a) ECHA C & L Inventory

b) Industry Safety Data Sheets

c) Chemical Abstracts Services SciFinder[n]

d) National Institutes of Health (NIH) PubChem

e) UN Model Regulations 22nd revised edition

f) Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

g) IMDG Code

h) 49 CFR Parts 171-185

i) Engineering References (e.g. Matheson Gas Databook)

A.2 Rationale for introduction of new FTSC codes

Table A.1 to Table A.32 provide information for each proposed FTSC entry.

Table A.1 — 1,2-dibromo-1,1-difluoroethane – Proposed FTSC Code 0100 (Tables 2 and 16)

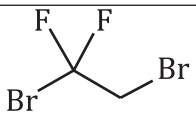
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	1,2-dibromo-1,1-difluoroethane		IUPAC Name
Synonyms	132b-B2		ASHRAE Refrigerant Code
CAS Number	75-82-1		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder^n
Molecular weight	223,842		CAS SciFinder^n, NIST
Transport information	Not regulated		
End-use			
Typical withdraw method			
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**0**	None	Multiple SDS's
Toxicity	**1**	LC_0 22 500 ppm/15 min LC_{50} 20 000 ppm/2H GHS literature supports the non-toxic designation	U.S. Army, Chemical Corps Medical Laboratories Research Reports., #23(1950) Prehled Prumyslove Toxikologie; Organicke Latky, Marhold, J., Prague, Czechoslovakia, Avicenum, 1986, -(134), 1986 ECHA Database Multiple SDS's
State	**0**	Liquid, Bp: 92,5 °C; Mp: -61 °C; Density 2,223 8 g/cm^3 @ 20 °C	Based on experimental data from multiple literature references.
Corrosiveness	**0**	Skin and eye irritant	ECHA Database Multiple SDS's
Conclusion	Accepted		

Table A.2 — Tetrachloromethane – Proposed FTSC Code 0100 (Tables 2 and 16)

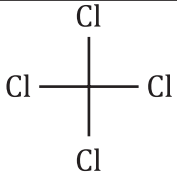
Gas/Chemical information		
Item	**Value**	**Reference/Note**
Name	Tetrachloromethane	IUPAC Name (preferred)
Synonyms	Carbon tetrachloride	Common industry name
CAS Number	56-23-5	CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula		CAS SciFinder^n
Molecular weight	153,82	CAS SciFinder^n, NIST
Transport information	Regulated	UN 1846 Division 6.1 PG II PSN: CARBON TETRACHLORIDE
Proposed FTSC code justification		

Table A.2 *(continued)*

FTSC category	Code	Gas property	Reference/Note
Fire potential	**0**	None	Multiple SDS's
Toxicity	**1**	Toxic if swallowed, by skin contact or by inhalation. Carbon tetrachloride is one of the most potent hepatotoxins (toxic to the liver). GHS Acute Toxicity Category 3 by inhalation LC_{50} Inhalation - Rat - 4 h - 8 000 ppm	Transport regulations GHS Database Multiple SDS's
State	**0**	Liquid, Bp: 76,8 °C, Mp: -23 °C Density: 1,594 0 g/cm^3 20 °C	European Chemicals Agency Multiple SDS's
Corrosiveness	**0**	Is a mild skin and eye irritant	ECHA Database Multiple SDS's
Conclusion	Accepted The proposed code works if the toxicity is extrapolated by conversion of the 4-hour data to 1-hour data.		

Table A.3 — Trichloroethylene – Proposed FTSC Code 0100 (Tables 2 and 16)

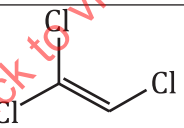
Gas/Chemical information		
Item	**Value**	**Reference/Note**
Name	1,1,2-Trichloroethene	IUPAC Name
Synonyms	Trichloroethylene	CAS SciFinder^n
CAS Number	79-01-6	CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula		CAS SciFinder^n
Molecular weight	131,39	CAS SciFinder^n
Transport information	Regulated	UN 1710, Division 6.1, PG III [PSN:TRICHLOROETHYLENE]
Proposed FTSC code justification		
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**0**	None, flash point above 200 °C. When involved in a fire, evolves extremely toxic fumes (phosgene).	Multiple SDS's
Toxicity	**1**	Toxic if swallowed, by skin contact or by inhalation. LC_{50} 8 450 ppm 4 hr 16 900 ppm 1 hr	Transport regulations Multiple SDS's LC_{50} from PubChem (1953) ACTA Pharma and Toxicological
State	**0**	Liquid, Bp: 87 °C; Fp: -86 °C	Multiple literature references and SDS's
Corrosiveness	**0**	Is an irritant but does not cause eye or skin damage	ECHA Database Multiple SDS's
Conclusion	Accepted		

Table A.4 — Arsenic pentafluoride – Proposed FTSC Code 0303 (Tables 5 and 16)

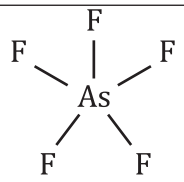
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Arsenic pentafluoride		IUPAC Name
Synonyms	Arsorane, pentafluoro-		CAS SciFinder^n
CAS Number	7784-36-3		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder^n
Transport information	Regulated		Should be shipped as UN 3304 COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S., Division 2.3 and Class 8.
Proposed FTSC code justification			
FTSC Category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**0**	None	Multiple SDS's
Toxicity	**3**	LC_{50} 178 PPM	LC_{50} from ISO 10298 CGA P-20
State	**0**	Liquified Gas, Bp: -52,8 °C, Mp: --79,8 °C Tc = 84,58 °C, Vapour pressure: 11 790 mmHg @ 20 °C (equivalent to 14,7 bar-gauge). At 15 °C the pressure will be less.	Transport regulations definition of a liquified gas Matheson Gas Databook CAS SciFinder^n
Corrosiveness	**3**	Is halogen forming	Well understood chemistry of fluorinated metalloids.
Conclusion	Accepted		

Table A.5 — Bromodifluoromethane – Proposed FTSC Code 0100 (Tables 5 and 16)

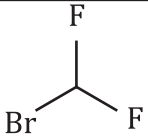
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Bromodifluoromethane		IUPAC Name
Synonyms	R-13B1		CAS SciFinder^n
CAS Number	1511-62-2		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder^n
Molecular weight	130,92		CAS SciFinder^n
Transport information	Regulated		UN 3163 LIQUIFIED GAS, N.O.S (Bromodifluoromethane)
Use information	Is supplied as mixture in helium		SDS
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**

Table A.5 *(continued)*

Fire potential	**0**	Used as gaseous fire suppressant in maritime field	
Toxicity	**1**	LC_{50} Rat Inhalation Vapour 430 g/m^3 LC_{50} 80,305 ppm	SDS's
State	**0**	Liquified Gas, Bp: -15,5 °C, Mp: --145 °C Tc = 84,58 °C, Density 1,883 g/cm3 @ 20 °C Vapour pressure: 3,77 bar @ 21,1 °C	CAS SciFinder^n SDS's
Corrosiveness	**0**	Not corrosive, but is reported to be a skin and eye irritant	SDS's
Conclusion	Accepted		

Table A.6 — Germanium tetrachloride – Proposed FTSC Code 0203 (Tables 5 and 16)

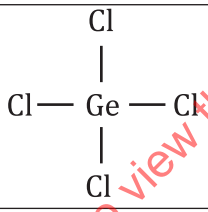
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Germanium chloride		IUPAC Name
Synonyms	Germanium tetrachloride		Common industry name
CAS Number	10038-98-9		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder^n
Molecular weight	214,42		CAS SciFinder^n
Transport information	Regulated		Is shipped under UN 3390, Toxic by Inhalation Liquid, Corrosive, N.O.S. with an LC_{50} lower than or equal to 1 000 ml/m3 and saturated vapour concentration greater than or equal to 10 LC_{50}
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**0**	None	Multiple SDS's
Toxicity	**2**	Toxic if swallowed, by skin contact or by inhalation. Should report an LC_{50} for final validation LC_{50} 1-hour 379 ppm LC_{50} 1-hour of HCl is 2 810 ppm. Using bridging principle of 1 GeCl4 → 4HCl, LC_{50} calculated from HCL is 702 ppm Inhalation, mouse: LC_{50} = 44 000 mg/m3/2H; 3 535 ppm/4 h	Reach database GHS instructions SDS (several manufacturers)

Table A.6 *(continued)*

State	**0**	Liquid, Bp: 83 °C, Mp: −49,5 °C, Vapour pressure: 76 mmHg (20 °C)	European Chemicals Agency Multiple SDS's
Corrosiveness	**3**	Is halogen forming. The material is corrosive to skin and can cause serious eye damage and is classified as category 1B for skin corrosion and category 1 for eye damage.	ECHA Database PubChem Multiple SDS's
Conclusion	Accepted		

Table A.7 — Germanium Tetrafluoride – Proposed FTSC Code 0203 (Tables 5 and 16)

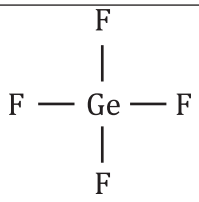
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Tetrafluorogermane		IUPAC Name
Synonyms	Germanium tetrafluoride		Common industry name
CAS Number	7783-58-6		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder[n]
Molecular weight	148,61		CAS SciFinder[n], NIST
Transport information	Regulated		UN 3308 LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S.
End-Use	Semiconductor manufacturing		Industry survey
Typical withdraw method	As a gas		Industry survey
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**0**	None	Multiple SDS's
Toxicity	**2**	1/4 of LC_{50} (HF) = 1 307/4 = 326,75 ppm	Derived from decomposition to HF which is accepted practice for fluoride gases for which there is no experimental data. By analogy to several fluorinated gases (e.g. PF_3, PF_5) in ISO 10298 where there is no experimental data for the gas
State	**0**	Liquified Gas, Bp: -36,5 °C, Tc = 93,7 °C, Vapour pressure: 7,95 Bar-gauge @ 15 °C 5 bar @ 10 °C	Matheson Gas Databook, Multiple SDS's Industry Experience
Corrosiveness	**3**	Is halogen acid forming. The material is corrosive to skin and can cause serious eye damage and is classified as category 1B for skin corrosion and category 1 for eye damage.	ECHA Database Multiple SDS's
Conclusion	Accepted		

Table A.8 — Methyl iodide – Proposed FTSC Code 0223 (Tables 5 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Iodomethane		IUPAC Name (preferred)
Synonyms	Methyl iodide		CAS SciFinder^n
CAS Number	74-88-4		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula	——— I		CAS SciFinder^n
Molecular weight	141,94		CAS SciFinder^n
Transport information	Regulated		UN 2644 Methyl Iodide Division 6.1 PG I
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**0**	None	Multiple SDS's
Toxicity	**2**	GHS databases and SDS's report the material has an acute toxicity of category 2 or category 3. The consensus seems to be Category 3. LC_{50} Rat 4 h inhalation 4,076 mg/l (= 4 hr 702 ppm = 1 hr of 1 404 ppm) LC_{50} Inhalation - rat - 4 h - 1,300 mg/m3	European Chemicals Agency (ECHA) SDS's Acute Exposure Guideline Level (AEGL), U.S. EPA
State	**2**	Liquid, Bp: 42,5 °C, Mp: -66,5 °C Vapour pressure: 544 mbar at 20 °C, Density 2,28 g/cm^3 at 20 °C	CAS SciFinder^n SDS's
Corrosiveness	**3**	The GHS literature indicates the material is an irritant but not corrosive. However, chemical nature fits "3" due to the formation of hydroiodic acid when exposed to water.	European Chemicals Agency (ECHA) SDS's
Conclusion	Accepted		

Table A.9 — Monochlorosilane – Proposed FTSC Code 2203 (Tables 9 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Chlorosilane		IUPAC Name
Synonyms	Monochlorosilane		CAS SciFinder^n
CAS Number	13465-78-6		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula	H_3Si ——— Cl		CAS SciFinder^n
Molecular weight	141,94		CAS SciFinder^n
Transport information	Regulated		UN3309 LIQUEFIED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S. (CHLOROSILANE), 2.3 (2.1;8)
Uses	Intermediate used for the production of ultrapure silicon in the semiconductor industry.		Industry research
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**

Table A.9 *(continued)*

Fire potential	**3**	Extremely flammable gas with a reported flash point of -90 °C.	Multiple SDS's
Toxicity	**2**	GHS databases and SDS's report the material has an acute toxicity of category 2 or category 3. LC50 inhalation rat (ppm) 4 257 ppm/1 h	European Chemicals Agency (ECHA) SDS's
State	**0**	Liquified gas, Bp: -30,4 °C, Mp: -118 °C Vapour pressure: 6,56 bar-g @ 25 °C, Density 1,145 g/cm^3 at -113 °C. Cannot find critical temperature.	CAS SciFinder^n SDS's
Corrosiveness	**3**	The GHS literature and transport regulations support the corrosive classification.	European Chemicals Agency (ECHA) SDS's
Conclusion	Accepted Gas should be placed in Table 9, not Table 5 as gas is flammable, toxic and corrosive (acidic) and is a group 8 gas.		

Table A.10 — Trichlorosilane – Proposed FTSC Code 2203 (Tables 5 and 16)

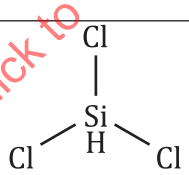
Gas/Chemical information		
Item	**Value**	**Reference/Note**
Name	Trichlorosilane[a]	IUPAC Name
Synonyms	Silane, trichloro-	European Chemicals Agency (ECHA)
CAS Number	10025-78-2	CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula		CAS SciFinder^n
Molecular weight	135,45	CAS SciFinder^n
Transport information	Regulated	UN 1295 TRICHLOROSILANE Division 4.3 and Class 8 and Class 3 subsidiary hazards.
Uses	Precursor to ultrapure silicon in the semiconductor industry.	Industry research
Proposed FTSC code justification		
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Extremely flammable gas with a reported flash point of –27 °C.	Multiple SDS's
Toxicity	**2**	GHS literature reports the material as a category 3 or 4 acute toxic inhalation material. Transport regulations do not classify the material as toxic. Some SDS's state the material is category 3 acute toxic by inhalation material. ISO 10298 (2 780 ppm/1 h)	European Chemicals Agency (ECHA) SDS's ISO 10298

Table A.10 *(continued)*

State	**0**	Liquid, Bp: -30 4 °C, Mp: –126,6 °C Vapour pressure: 533 mbar at 14,5 °C, Density 1,383 0 g/cm3 @ 0 °C. Critical temperature 205,9 °C	CAS SciFinder[n] SDS's
Corrosiveness	**3**	The GHS literature and transport regulations support the corrosive classification.	European Chemicals Agency (ECHA) SDS's
Conclusion	Accepted		

Table A.11 — Cyclobutane – Proposed FTSC Code 2100 (Tables 7 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Cyclobutane		IUPAC Name
Synonyms			CAS SciFinder[n]
CAS Number	287-23-0		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder[n]
Molecular weight	56,11		CAS SciFinder[n]
Transport information	Regulated		UN 2601, Division 2.1 Flammable Gas
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable gas	ISO 10156, UN Model Regulations
Toxicity	**1**	By analogy with other similar hydrocarbons in Table 7	Transport regulations GHS Literature
State	**0**	Liquified Gas, Bp: 12,51 °C, Mp: –91 °C, Tc = 186,78 °C, Vapour pressure: 1 180 mmHg (1,57 Bar-abs) at 25 °C.	Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.
Corrosiveness	**0**	Well established as a non-corrosive gas	Transport regulations And by analogy with other simple hydrocarbons. GHS literature
Conclusion	Accepted		

Table A.12 — 1,2-Dichloroethylene – Proposed FTSC Code 2120 (Tables 7 and 16)

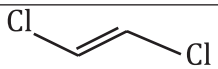
Gas/Chemical information		
Item	**Value**	**Reference/Note**
Name	1,2-Dichloroethylene[a]	Common industrial name
Synonyms		IUPAC Name
CAS Number	540-59-0	CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula		CAS SciFinder[n]

Table A.12 *(continued)*

Transport information	Regulated		UN 1150 1,2-DICHLOROETHYLENE Class 3 Flammable Liquid PG II
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point 6 °C, closed cup.	Transport regulations
Toxicity	**1**	Not toxic per transport regulations. GHS classification databases classify as Category 4 acute toxicity.	UN Model Regulations European Chemicals Agency (ECHA) SDS's
State	**0**	Liquid, Bp: 26-28 °C, Mp: -99 °C, Density: 1,28 g/cm^3 (approx.) Vapour Pressure: 180-265 mmHg This material is normally discharged via liquid withdrawal.	SDS, CAS SciFinder^n
Corrosiveness	**0**	Not corrosive or an irritant	GHS Classification databases and SDS's
Conclusion	Accepted		

Table A.13 — Dichloromethane – Proposed FTSC Code 2100 (Tables 7 and 16)

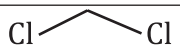
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Dichloromethane[a]		IUPAC Name
Synonyms	Methylene chloride		CAS SciFinder^n
CAS Number	75-09-2		CAS SciFinder^n European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder^n
Molecular weight	84,93		CAS SciFinder^n
Transport information	Regulated		UN 1593 DICHLOROMETHANE Division 6.1 PG III
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	MC has no flash point in a conventional closed tester, but it forms flammable vapour-air mixtures at approximately 100 °C (212 °F), or higher. It has a lower explosion limit of 12 %, and an upper explosion limit of 19 % in air. It has an autoignition temperature of 556,1 °C (1 033 °F), and a boiling point of 39,8 °C (104 °F). It is heavier than water with a specific gravity of 1,3. It is slightly soluble in water.	OSHA 1910.1052 App A It does have some flammability as a vapour, the allocated code for Fire potential should be a 2 to prevent inadvertent mixing with oxidizers.
Toxicity	**1**	GHS literature supports the material is not toxic by inhalation	European Chemicals Agency (ECHA) SCIP Database SDS's

Table A.13 *(continued)*

State	**0**	Liquid, Bp: 39,75 °C, Mp: -97 °C Vapour pressure: 350 mbar @ 20 °C, 440 mm Hg at 77 °F	National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina.
Corrosiveness	**0**	Well established as an irritant only	GHS Classification databases
Conclusion	Accepted		

Table A.14 — Ethylmercaptan – Proposed FTSC Code 2100 (Tables 7 and 16)

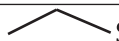
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Ethylmercaptan[a]		Common industrial name
Synonyms	Ethanethiol		IUPAC Name
CAS Number	75-08-1		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFindern
Transport information	Regulated		UN 2363 ETHYL MERCAPTAN Class 3 Flammable Liquid PG I
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point = -45 °C. Highly flammable. A very dangerous fire hazard.	Transport regulations Chemical Reactivity Worksheet (CRW)
Toxicity	**1**	Not toxic per transport regulations. GHS classification databases classify as Category 4 acute toxic material by inhalation.	UN Model Regulations European Chemicals Agency (ECHA)
State	**0**	Liquid, Bp: 35 °C, Mp: -144,4 °C Vapour pressure: 442 mmHg at 20 C	CAS SciFinder[n]
Corrosiveness	**0**	Well established as an irritant only	GHS Classification databases
Conclusion	Accepted		

Table A.15 — Hydrogen absorbed in metal alloy (reversible metal hydride) - Proposed FTSC Code 2130 – (Tables 7 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Hydrogen absorbed in metal alloy		Common industrial name
Synonyms			
CAS Number	No specific CAS number		
Chemical formula	H2:M		
Transport information	Regulated		UN 3468 HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM Division 2.1 Flammable Gas: Also UN 3479 FUEL CELL CARTRIDGES
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**

Table A.15 *(continued)*

Fire potential	**2**	Well known flammable gas	Transport regulations Chemical Reactivity Worksheet (CRW)
Toxicity	**0**	Hydrogen is well-known not to be toxic	See Hydrogen
State	**3**	ISO 16111 is a standard for metal hydride assemblies which limits the maximum developed pressure to 25 MPa (250 bar). The transport regulations require metal hydride storage systems to meet ISO 16111 as per P205.	
Corrosiveness	**0**	Hydrogen is well-known not to be corrosive	See Hydrogen
Conclusion	Not accepted The proposed FTSC code would require addition of “absorbed” to subdivision 3 of the state code in this document as is done in CGA P-47. Working group agreed to postpone this entry during the 23 May 2022 meeting.		

Table A.16 — Methyl formate – Proposed FTSC Code 2100 – (Tables 7 and 16)

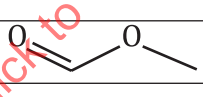
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Methyl formate[a]		Common industrial name
Synonyms			IUPAC Name
CAS Number	107-31-3		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder[n]
Transport information	Regulated		UN 1243, Class 3 Flammable Liquid
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point < -32 °C.	Transport regulations
Toxicity	**1**	Not toxic per transport regulations. GHS classification databases classify as Category 4 acute toxicity. Acute oral toxicity: Species: Rat LD_{50}: 1,500 mg/kg Acute dermal toxicity: Species: Rat LD_{50}: > 4,000 mg/kg Acute inhalation toxicity: Species: Rat LC_{50}: 5,2 mg/l Exposure time: 4 h	UN Model Regulations European Chemicals Agency (ECHA) SDS’s

Table A.16 *(continued)*

State	**0**	Liquid, Bp: 31,5 °C, Fp: -99,8 °C Vapour pressure: 400 mmHg at 21 °C	CAS SciFinder[n]
Corrosiveness	**0**	Well established as an irritant only. GHS Category 2 irritant for eyes and skin.	GHS Classification databases
Conclusion	Accepted		

Table A.17 — Methyl sulfide – Proposed FTSC Code 2100 (Tables 7 and 16)

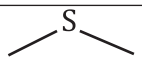
Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Methyl sulfide[a]		Common industrial name
Synonyms	Dimethyl sulfide		IUPAC Name
CAS Number	75-18-3		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder[n]
Transport information	Regulated		UN 1164, Class 3 Flammable Liquid
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point < 0°F. Highly flammable.	Transport regulations Chemical Reactivity Worksheet (CRW)
Toxicity	**1**	Not toxic per transport regulations. GHS classification databases classify as Category 4 acute toxicity. LC_{50} 1 hr rat 40 250 ppm LD_{50} Dermal > 5 g/Kg LD_{50} Oral 3 300 mg/kg	UN Model Regulations European Chemicals Agency (ECHA) SDS's
State	**0**	Liquid, Bp: 37,3 °C, Fp: -98,3 °C Vapour pressure: 400 mmHg at 21 °C	SDS's
Corrosiveness	**0**	Well established as an irritant only. GHS Category 2 irritant for eyes and skin.	GHS Classification databases
Conclusion	Accepted		

Table A.18 — Tetramethylsilane – Proposed FTSC Code 2100 (Tables 7 and 16)

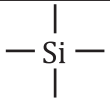
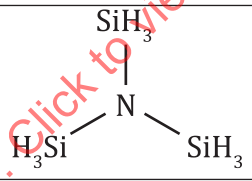
Gas/Chemical information		
Item	**Value**	**Reference/Note**
Name	Tetramethylsilane[a]	IUPAC Name
Synonyms	TMS	Common acronym
CAS Number	75-76-3	CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula		CAS SciFinder[n]
Molecular weight	88,22	CAS SciFinder[n]

Table A.18 *(continued)*

Transport information	Regulated	UN 2749 TETRAMETHYLSILANE Class 3 Flammable Liquid, PG I

Proposed FTSC code justification			
FTSC Category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point -18 °C, closed cup.	Transport regulations
Toxicity	**1**	Not toxic per transport regulations. GHS databases not showing toxic	UN Model Regulations European Chemicals Agency (ECHA) SDS's
State	**0**	Liquid, Bp: 26,6 °C, Mp: -99 °C Density: 0,641 g/cm3 Vapour Pressure 750 mbar @ 20 °C.	SDS, CAS SciFinder[n]
Corrosiveness	**0**	Not corrosive or an irritant	GHS Classification databases and SDS's
Conclusion	Accepted		

Table A.19 — Trisilylamine – Proposed FTSC Code 2100 (Tables 8 and 16)

Gas/Chemical information		
Item	**Value**	**Reference/Note**
Name	Trisilylamine[a]	Common Industry Name
Synonyms	N,N-Disilylsilanamine	IUPAC Name
CAS Number	13862-16-3	CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula		CAS SciFinder[n]
Molecular weight	107,33	CAS SciFinder[n]
Transport information	Regulated	UN 3491 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 1 000 ml/m3 and saturated vapour concentration greater than or equal to 10 LC_{50}, PG I

Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**3**	Flash Point -48 °C	GHS databases and SDS's report material as highly flammable vapour and liquid.
Toxicity	**2**	GHS databases and SDS's state material is fatal if inhaled LC_{50} inhalation rat 1 h 438 ppm ATE US (gas) 219 ppm/4 h REACH LC_{50}-4 h = 99 ppm 1996 Air Liquide LC_{50} 4 hr 219,5 ppm	According to the classification provided by companies to ECHA in REACH registrations this substance is fatal if inhaled

Table A.19 *(continued)*

State	**0**	Liquid, Bp: 52 °C, Mp: -106 °C	SDS
Corrosiveness	**2**	GHS databases and SDS's indicate material causes severe eye and skin damage.	GHS Classification databases and SDS's According to the classification provided by companies to ECHA in REACH registrations, causes severe skin burns and eye damage
Conclusion	Accepted		

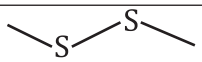
Table A.20 — Acrylonitrile – Proposed FTSC Code 2200 (Tables 9 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Acrylonitrile[a]		Common Industry Name
Synonyms	prop-2-enenitrile		IUPAC Name
CAS Number	107-13-1		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder[n]
Molecular weight	53,06		CAS SciFinder[n]
Transport information	Regulated		UN 1093, Class 3 Flammable Liquid, PG I, Division 6.1 subsidiary risk [PSN: ACRYLONITRILE, STABILIZED]
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point -27 °C, closed cup.	Transport regulations
Toxicity	**2**	GHS databases indicate material is acute toxicity Cat 3 for all 3 routes of entry NIOSH IDLH 85 PPM LC_{50} Rat 500 ppm 4 hr LC_{50} Rat 425 PPM 4 hr	European Chemicals Agency (ECHA) Carpenter et al. 1949 Jaeger et al. 1974 https://www.cdc.gov/niosh/idlh/107131.html
State	**0**	Liquid, Bp: 52 °C, Mp: -106 °C, Density: 0,800 4 g/cm^3 @ 25 °C. Vapour Pressure: 100 mm Hg at 73,4 °F (EPA, 1998)	SDS
Corrosiveness	**0**	GHS databases and SDS's indicate material causes severe eye and skin damage	GHS Classification databases and SDS's
Conclusion	Accepted		

Table A.21 — Carbon disulfide – Proposed FTSC Code 2100 (Tables 9 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Carbon disulfide[a]		IUPAC Name
Synonyms	Dithiocarbonic anhydride		PubChem
CAS Number	75-15-0		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula	S═C═S		CAS SciFinder[n]
Molecular weight	76,14		CAS SciFinder[n]
Transport information	Regulated		UN 1131, Class 3 Flammable Liquid, PG I, Division 6.1 subsidiary risk [PSN: CARBON DISULPHIDE]
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point: -30 °C, closed cup.	Transport regulations, SDS's GHS databases
Toxicity	**1**	GHS databases and SDS's indicate material is acute toxicity Category 4 LC_{50} 4 hr 10,35 mg/L (6 646 ppm/ 1 hr)	GHS Classification databases and SDS's
State	**0**	Liquid, Bp: 46 °C, Mp: -111,5 °C, Vapour pressure = 274 mbar 25 °C, Density 1,263 2 g/cm3	SDS's, CAS SciFinder[n]
Corrosiveness	**0**	GHS databases indicate material skin and eye irritant, usually Category 2 skin, Category 2a eye	GHS Classification databases and SDS's
Conclusion	Accepted		

Table A.22 — Methyl disulfide – Proposed FTSC Code 2200 (Tables 9 and 16)

Gas/Chemical information			
Item	**Value**		**Reference/Note**
Name	Disulfide, dimethyl		IUPAC Name
Synonyms	Methyl disulfide Dimethyl disulfide		Common Industry names
CAS Number	624-92-0		CAS SciFinder[n] European Chemicals Agency (ECHA)
Chemical formula			CAS SciFinder[n]
Molecular weight	94,20		CAS SciFinder[n]
Transport information	Regulated		UN 2381, Class 3 Flammable Liquid, PG II, Division 6.1 subsidiary risk [PSN:DIMETHYL SULPHIDE]
Proposed FTSC code justification			
FTSC category	**Code**	**Gas property**	**Reference/Note**
Fire potential	**2**	Well established as a flammable liquid, Flash Point 15 °C, closed cup.	Transport regulations, SDS's GHS databases