UN/SCETDG/44/INF.8
UN/SCEGHS/26/INF.3

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

10 September 2013

Sub-Committee of Experts on the Transport of Dangerous Goods

Forty-fourth session
Geneva, 25 November – 4 December 2013
Item 10 (c) of the provisional agenda
Issues relating to the Globally Harmonized System of Classification and Labelling of Chemicals: pyrophoric gases

Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals

Twenty-sixth session
Geneva, 4 – 6 December 2013
Item 2 (g) of the provisional agenda
Classification criteria and hazard communication

Proposal to include pyrophoric gas in the GHS (Track-Changes)

Transmitted by the expert from the United States of America

1. This document contains the text of GHS Chapter 2.2, Annex 1 and Annex 3, as amended in accordance with the proposed list of amendments in document ST/SG/AC.10/C.3/2013/69; ST/SG/AC.10/C.4/2013/8. Amendments are shown in visible mode ("track-changes").

2. Where no change is proposed for certain hazard or precautionary statements assigned to flammable gases in Annex 3, Sections 1 and 2, the text is highlighted for the convenience of the Sub-committee of Experts on the GHS. Experts are invited to consider whether the full title of the hazard chapter should be included in the assignment.

Chapter 2.2

Flammable gases (including chemically unstable gases) and pyrophoric gases

2.2.1 Definitions

2.2.1.1 A *flammable gas* is a gas having a flammable range with air at 20 °C and a standard pressure of 101.3 kPa.

2.2.1.2 A *chemically unstable gas* is a flammable gas that is able to react explosively even in the absence of air or oxygen.

2.2.1.3 A *pyrophoric gas* is a substance or mixture in a gaseous state that will ignite spontaneously in air at a temperature of 54.4 ºC or below.

2.2.2 Classification criteria

2.2.2.1 A flammable gas is classified in one of the two categories for this class according to the following table:

Table 2.2.1: Criteria for flammable and pyrophoric gases

Category	Criteria
1	Gases, which at 20 °C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.
2	Gases, other than those of Category 1, which, at 20 °C and a standard pressure of 101.3 kPa, have a flammable range while mixed in air.
Pyrophoric Gas	Gases which ignite spontaneously in air at a temperature of 54.4 ºC or below.

NOTE 1: Ammonia and methyl bromide may be regarded as special cases for some regulatory purposes.

NOTE 2: Aerosols should not be classified as flammable gases. See Chapter 2.3.

NOTE 3: Pyrophoric gases should not be classified as flammable gases, category 1 or 2. Spontaneous ignition for pyrophoric gases is not always immediate, and there may be a delay.

2.2.2.2 A flammable gas, in category 1 and ~~that~~ 2, or pyrophoric gas which is also chemically unstable, is additionally classified in one of the two categories for chemically unstable gases using the methods described in Part III of the Manual of Tests and Criteria according to the following table:

Table 2.2.2: Criteria for chemically unstable gases

Category	Criteria
A	Flammable gases which are chemically unstable at 20°C and a standard pressure of 101.3 kPa
B	Flammable gases which are chemically unstable at a temperature greater than 20°C and/or a pressure greater than 101.3 kPa

2.2.3 Hazard communication

General and specific considerations concerning labelling requirements are provided in *Hazard communication: Labelling* (Chapter 1.4). Annex 1 contains summary tables about classification and labelling. Annex 3 contains examples of precautionary statements and pictograms which can be used where allowed by the competent authority.

~~3. Table 2.2.3: Label elements for flammable gases (including chemical unstable gases)~~

	~~**Flammable gas**~~		~~**Chemically unstable gas**~~	
	~~**Category 1**~~	~~**Category 2**~~	~~**Category A**~~	~~**Category B**~~
~~**Symbol**~~	~~Flame~~	~~*No symbol*~~	~~*No additional symbol*~~	~~*No additional symbol*~~
~~**Signal word**~~	~~Danger~~	~~Warning~~	~~*No additional signal word*~~	~~*No additional signal word*~~
~~**Hazard statement**~~	~~Extremely flammable gas~~	~~Flammable gas~~	~~May react explosively even in the absence of air~~	~~May react explosively even in the absence of air at elevated pressure and/or temperature~~

Table 2.2.3: Label elements for flammable gases (including chemically unstable gases) and pyrophoric gases

	Flammable gas		**Chemically unstable gas**		**Pyrophoric Gas**
	Category 1	**Category 2**	**Category A**	**Category B**	**Pyrophoric Gas**
Symbol	Flame	*No symbol*	*No additional symbol*	*No additional symbol*	Flame
Signal word	Danger	Warning	*No additional signal word*	*No additional signal word*	Danger
Hazard statement	Extremely flammable gas	Flammable gas	May react explosively even in the absence of air	May react explosively even in the absence of air at elevated pressure and/or temperature	Catches fire spontaneously if exposed to air

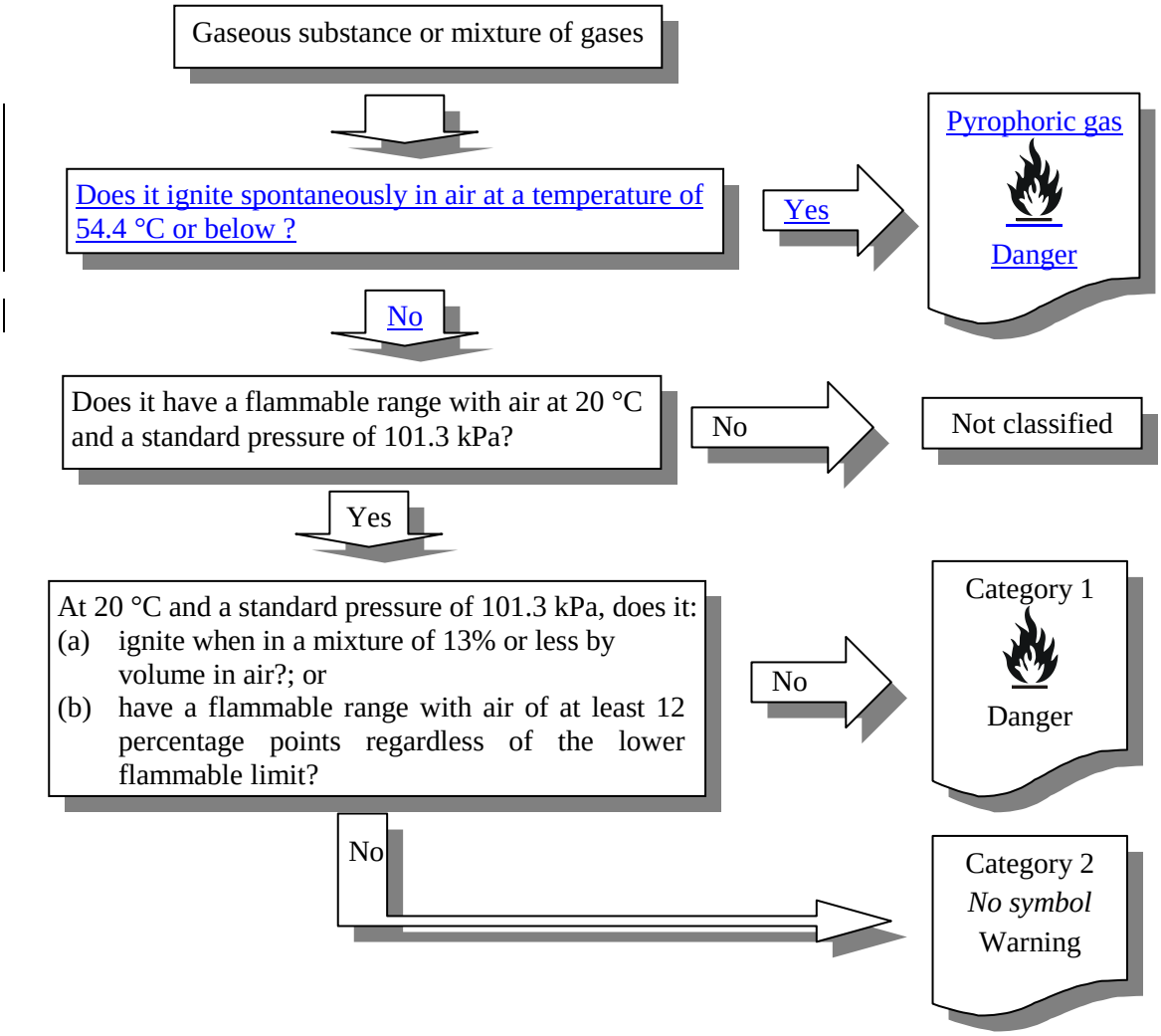
2.2.4 Decision logic and guidance

The decision logic and guidance, which follow, are not part of the harmonized classification system, but have been provided here as additional guidance. It is strongly recommended that the person responsible for classification studies the criteria before and during use of the decision logic.

2.2.4.1 Decision logic for flammable **and pyrophoric** gases

To classify a flammable gas, data on its flammability are required. To classify a pyrophoric gas, data on its ability to ignite with air is required. The classification is according to decision logic 2.2 (a).

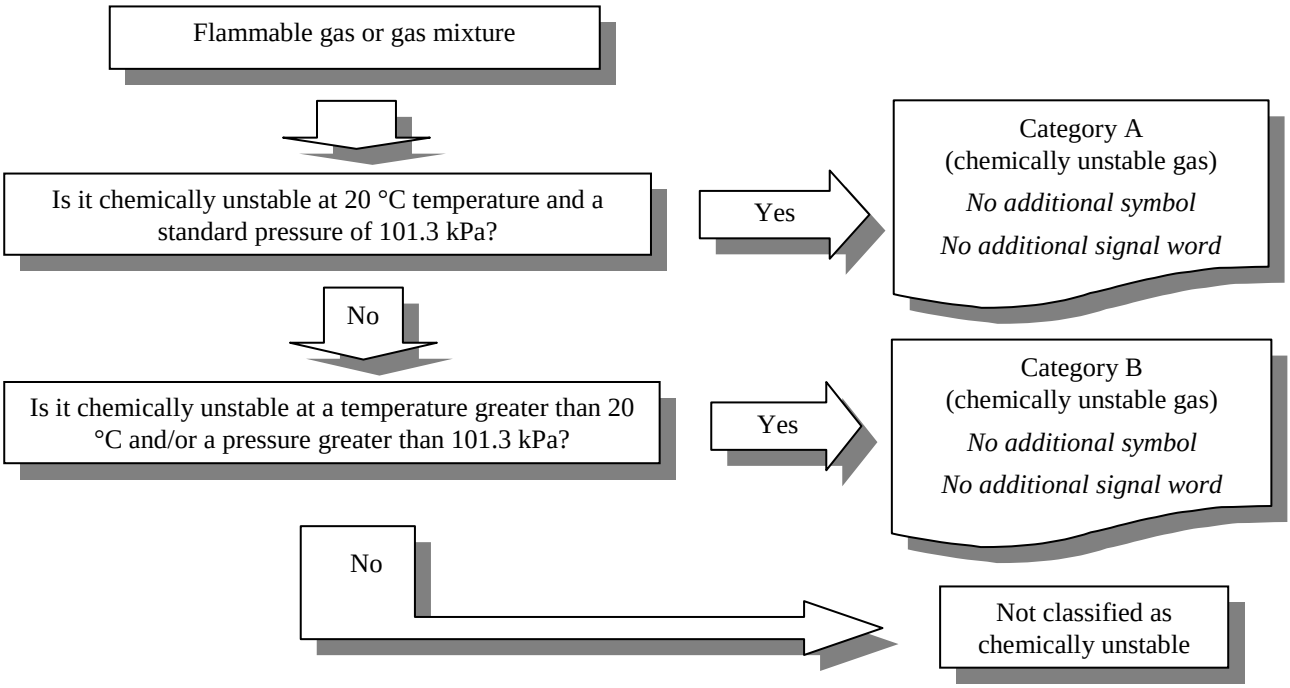
Decision logic 2.2 (a)


Gaseous substance or mixture of gases
Does it ignite spontaneously in air at a temperature of 54.4 °C or below ?
Yes
Pyrophoric gas
Danger
No
Does it have a flammable range with air at 20 °C and a standard pressure of 101.3 kPa?
No
Not classified
Yes
At 20 °C and a standard pressure of 101.3 kPa, does it:
(a) ignite when in a mixture of 13% or less by volume in air?; or
(b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit?
No
Category 1
Danger
No
Category 2
No symbol
Warning

2.2.4.2 ***Decision logic for chemically unstable gases***

To classify a flammable gas as chemically unstable, data on its chemical instability are required. The classification is according to decision logic 2.2 (b).

Decision logic 2.2 (b)



2.2.4.3 ***Guidance***

2.2.4.3.1 Flammability should be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010 "Gases and gas mixtures – Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets"). Where insufficient data are available to use these methods, tests by a comparable method recognized by the competent authority may be used.

2.2.4.3.2 Chemical instability should be determined in accordance with the method described in Part III of the Manual of Tests and Criteria. If the calculations in accordance with ISO 10156:2010 show that a gas mixture is not flammable it is not necessary to carry out the tests for determining chemical instability for classification purposes.

2.2.4.3.3 Pyrophoricity should be determined using any of the following methods:

IEC 60079-20-1 ed1.0 (2010-01))

DIN 51794

2.2.5 Example: Classification of a flammable gas mixture by calculation according to ISO 10156:2010

Formula

$$\sum_{i}^{n} \frac{V_i\%}{T_{ci}}$$

where:

Vi % = the equivalent flammable gas content;

Tci = the maximum concentration of a flammable gas in nitrogen at which the mixture is still not flammable in air;

i = the first gas in the mixture;

n = the nth gas in the mixture;

Ki = the equivalency factor for an inert gas versus nitrogen;

Where a gas mixture contains an inert diluent other than nitrogen, the volume of this diluent is adjusted to the equivalent volume of nitrogen using the equivalency factor for the inert gas (K_i).

Criterion:

$$\sum_{i}^{n} \frac{V_i\%}{T_{ci}} > 1$$

Gas mixture

For the purpose of this example the following is the gas mixture to be used

$$2\%\ (H_2) + 6\%(CH_4) + 27\%(Ar) + 65\%(He)$$

Calculation

1. Ascertain the equivalency factors (Ki) for the inert gases versus nitrogen:

   Ki (Ar) = 0.5

   Ki (He) = 0.5

2. Calculate the equivalent mixture with nitrogen as balance gas using the Ki figures for the inert gases:

$2\%(H_2) + 6\%(CH_4) + [27\% \times 0.5 + 65\% \times 0.5](N_2) = 2\%(H_2) + 6\%(CH_4) + 46\%(N_2) = 54\%$

3. Adjust the sum of the contents to 100%:

$$\frac{100}{54} \times [2\%(H_2) + 6\%(CH_4) + 46\%(N_2)] = 3.7\%(H_2) + 11.1\%(CH_4) + 85.2\%(N_2)$$

4. Ascertain the Tci coefficients for the flammable gases:

   Tci H_2 = 5.7%

   Tci CH_4 = 14.3%

5. Calculate the flammability of the equivalent mixture using the formula:

$$\sum_{i}^{n} \frac{V_i\%}{T_{ci}} = \frac{3.7}{5.7} + \frac{11.1}{14.3} = 1.42 \qquad \textbf{1.42 > 1}$$

Therefore the mixture is <u>flammable</u> in air.

A1.2 Flammable gases (including chemically unstable gases) and pyrophoric gases **(see Chapter 2.2 for classification criteria)**

Classification		*Labelling*				**Hazard statement codes**
Hazard class	**Hazard category**	*Pictogram*		*Signal word*	*Hazard statement*	
		GHS	**UN Model Regulations**[a]			
Flammable gases (including chemically unstable gases) and pyrophoric gases	**1**			**Danger**	Extremely flammable gas	H220
	2	*No pictogram*	*Not required*	**Warning**	Flammable gas	H221
	A (chemically unstable gases)	*No additional pictogram*	*Not required*	*No additional signal word*	*Additional hazard statement:* May react explosively even in the absence of air	H230
	B (chemically unstable gases)	*No additional pictogram*	*Not required*	*No additional signal word*	*Additional hazard statement:* May react explosively even in the absence of air at elevated pressure and/or temperature	H231
	Pyrophoric gas			**Danger**	Catches fire spontaneously if exposed to air	H250

[a] Under the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, the symbol, number and border line may be shown in black instead of white. The background colour stays red in both cases.

A3.1.2.3 In addition to individual hazard statements, a number of combined hazard statements are given in Table A3.1.2. The alphanumerical codes for the combined statements are constructed from the codes for the individual statements that are combined, conjoined with the plus ("+") sign. For example, H300 + H310 indicates that the text to appear on the label is "Fatal if swallowed or in contact with skin".

A3.1.2.4 All assigned hazard statements should appear on the label unless otherwise specified in 1.4.10.5.3.3. The competent authority may specify the order in which they appear. Also, where a combined hazard statement is indicated for two or more hazard statements, the competent authority may specify whether the combined hazard statement or the corresponding individual statements should appear on the label, or may leave the choice to the manufacturer/supplier.

Table A3.1.1: Hazard statement codes for physical hazards

Code (1)	Physical hazard statements (2)	Hazard class (GHS chapter) (3)	Hazard category (4)
H200	Unstable explosive	Explosives (chapter 2.1)	Unstable explosive
H201	**Explosive; mass explosion hazard**	Explosives (chapter 2.1)	Division 1.1
H202	**Explosive; severe projection hazard**	Explosives (chapter 2.1)	Division 1.2
H203	**Explosive; fire, blast or projection hazard**	Explosives (chapter 2.1)	Division 1.3
H204	**Fire or projection hazard**	Explosives (chapter 2.1)	Division 1.4
H205	**May mass explode in fire**	Explosives (chapter 2.1)	Division 1.5
H220	**Extremely flammable gas**	Flammable gases (chapter 2.2)	1
H221	**Flammable gas**	Flammable gases (chapter 2.2)	2
H222	**Extremely flammable aerosol**	Aerosols (chapter 2.3)	1
H223	**Flammable aerosol**	Aerosols (chapter 2.3)	2
H224	**Extremely flammable liquid and vapour**	Flammable liquids (chapter 2.6)	1
H225	**Highly flammable liquid and vapour**	Flammable liquids (chapter 2.6)	2
H226	**Flammable liquid and vapour**	Flammable liquids (chapter 2.6)	3
H227	**Combustible liquid**	Flammable liquids (chapter 2.6)	4
H228	**Flammable solid**	Flammable solids (chapter 2.7)	1, 2
H229	**Pressurized container: may burst if heated**	Aerosols (chapter 2.3)	1, 2, 3
H230	**May react explosively even in the absence of air**	Flammable gases (including chemically unstable gases) (chapter 2.2)	A (Chemically unstable gases)
H231	**May react explosively even in the absence of air at elevated pressure and/or temperature**	Flammable gases (including chemically unstable gases) (chapter 2.2)	B (Chemically unstable gases)
H240	**Heating may cause an explosion**	Self-reactive substances and mixtures (chapter 2.8); and Organic peroxides (chapter 2.15)	Type A
H241	**Heating may cause a fire or explosion**	Self-reactive substances and mixtures (chapter 2.8); and Organic peroxides (chapter 2.15)	Type B

Code (1)	Physical hazard statements (2)	Hazard class (GHS chapter) (3)	Hazard category (4)
H242	**Heating may cause a fire**	Self-reactive substances and mixtures (chapter 2.8); and Organic peroxides (chapter 2.15)	Types C, D, E, F
H250	**Catches fire spontaneously if exposed to air**	Flammable gases and pyrophoric gases (chapter 2.2) Pyrophoric liquids (chapter 2.9); Pyrophoric solids (chapter 2.10)	Pyrophoric gas 1 1
H251	**Self-heating; may catch fire**	Self-heating substances and mixtures (chapter 2.11)	1
H252	**Self-heating in large quantities; may catch fire**	Self-heating substances and mixtures (chapter 2.11)	2
H260	**In contact with water releases flammable gases which may ignite spontaneously**	Substances and mixtures which, in contact with water, emit flammable gases (chapter 2.12)	1
H261	**In contact with water releases flammable gas**	Substances and mixtures which, in contact with water, emit flammable gases (chapter 2.12)	2, 3
H270	**May cause or intensify fire; oxidizer**	Oxidizing gases (chapter 2.4)	1
H271	**May cause fire or explosion; strong oxidizer**	Oxidizing liquids (chapter 2.13); Oxidizing solids (chapter 2.14)	1
H272	**May intensify fire; oxidizer**	Oxidizing liquids (chapter 2.13); Oxidizing solids (chapter 2.14)	2, 3
H280	**Contains gas under pressure; may explode if heated**	Gases under pressure (chapter 2.5)	Compressed gas Liquefied gas Dissolved gas
H281	**Contains refrigerated gas; may cause cryogenic burns or injury**	Gases under pressure (chapter 2.5)	Refrigerated liquefied gas
H290	**May be corrosive to metals**	Corrosive to metals (chapter 2.16)	1

Table A3.2.2: Codification of prevention precautionary statements

Code (1)	Prevention precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
P202	**Do not handle until all safety precautions have been read and understood.**	Flammable gases (including chemically unstable gases) (chapter 2.2)	A, B (chemically unstable gases)	
		Germ cell mutagenicity (chapter 3.5)	1A, 1B, 2	
		Carcinogenicity (chapter 3.6)	1A, 1B, 2	
		Reproductive toxicity (chapter 3.7)	1A, 1B, 2	

Code (1)	Prevention precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
P210	**Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.**	Explosives (chapter 2.1)	Divisions 1.1, 1.2, 1.3, 1.4, 1.5	
		Flammable gases and pyrophoric gases(chapter 2.2)	1, 2, Pyrophoric gas	
		Aerosols (chapter 2.3)	1, 2, 3	
		Flammable liquids (chapter 2.6)	1, 2, 3, 4	
		Flammable solids (chapter 2.7)	1, 2	
		Self-reactive substances and mixtures (chapter 2.8)	Types A, B, C, D, E, F	
		Pyrophoric liquids (chapter 2.9)	1	
		Pyrophoric solids (chapter 2.10)	1	
		Oxidizing liquids (chapter 2.13)	1, 2, 3	
		Oxidizing solids (chapter 2.14)	Types A, B, C, D, E, F	
		Organic peroxides (chapter 2.15)	1, 2, 3	
P222	**Do not allow contact with air.**	Flammable gases and pyrophoric gases (chapter 2.2)	Pyrophoric gas	*– if emphasis of the hazard statement is deemed necessary*
		Pyrophoric liquids (chapter 2.9)	1	*– if emphasis of the hazard statement is deemed necessary.*
		Pyrophoric solids (chapter 2.10)	1	
P233	**Keep container tightly closed.**	Flammable liquids (chapter 2.6)	1, 2, 3	*– if the liquid is volatile and may generate an explosive atmosphere.*
		Flammable gases and pyrophoric gases (chapter 2.2)	Pyrophoric gas	
		Pyrophoric liquids (chapter 2.9)	1	
		Pyrophoric solids (chapter 2.10)	1	
		Acute toxicity, inhalation (chapter 3.1)	1, 2, 3	*– if the chemical is volatile and may generate a hazardous atmosphere.*
		Specific target organ toxicity, single exposure; respiratory tract irritation (chapter 3.8)	3	

Code (1)	Prevention precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
P243	**Take action to prevent static discharges.**	Flammable liquids (chapter 2.6)	1, 2, 3	*– if the liquid is volatile and may generate an explosive atmosphere.* *– may be omitted where local or national legislation introduces more specific provisions.*
P244	**Keep valves and fittings free from oil and grease.**	Oxidizing gases (chapter 2.4)	1	

P280	**Wear protective gloves/protective clothing/eye protection/face protection.**	Explosives (chapter 2.1)	Unstable explosives and divisions 1.1, 1.2, 1.3, 1.4, 1.5	Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.
		Flammable gases and pyrophoric gases (chapter 2.2)	Pyrophoric gas	Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.
		Flammable liquids (chapter 2.6)	1, 2, 3, 4	Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.
		Flammable solids (chapter 2.7)	1, 2	
		Self-reactive substances and mixtures (chapter 2.8)	Types A, B, C, D, E, F	
		Pyrophoric liquids (chapter 2.9)	1	
		Pyrophoric solids (chapter 2.10)	1	
		Self-heating substances and mixtures (chapter 2.11)	1, 2	
		Substances and mixtures which, in contact with water, emit flammable gases (chapter 2.12)	1, 2, 3	
P280 *(cont'd)*	**Wear protective gloves/protective clothing/eye protection/face protection.**	Oxidizing liquids (chapter 2.13)	1, 2, 3	Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.
		Oxidizing solids (chapter 2.14)	1, 2, 3	
		Organic peroxides (chapter 2.15)	Types A, B, C, D, E, F	
		Acute toxicity – dermal (chapter 3.1)	1, 2, 3, 4	*– Specify protective gloves/clothing.* Manufacturer/supplier or the competent authority may further specify type of equipment where appropriate.

Code (1)	Prevention precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
		Skin corrosion (chapter 3.2)	1A, 1B, 1C	– *Specify protective gloves/clothing and eye/face protection.* Manufacturer/supplier or the competent authority may further specify type of equipment where appropriate.
		Skin irritation (chapter 3.2)	2	– *Specify protective gloves.* Manufacturer/supplier or the competent authority may further specify type of equipment where appropriate.
		Skin sensitization (chapter 3.4)	1, 1A, 1B	
		Severe eye damage (chapter 3.3)	1	– *Specify eye/face protection.* Manufacturer/supplier or the competent authority may further specify type of equipment where appropriate.
		Eye irritation (chapter 3.3)	2A	
		Germ cell mutagenicity (chapter 3.5)	1A, 1B, 2	Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.
		Carcinogenicity (chapter 3.6)	1A, 1B, 2	
		Reproductive toxicity (chapter 3.7)	1A, 1B, 2	

Table A3.2.3: Codification of response precautionary statements

Code (1)	Response precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
P370	**In case of fire:**	Explosives (chapter 2.1)	Unstable explosives and divisions 1.1, 1.2, 1.3, 1.4, 1.5	
		Flammable gases and pyrophoric gases (chapter 2.2)	Pyrophoric gas	
		Oxidizing gases (chapter 2.4)	1	
		Flammable liquids (chapter 2.6)	1, 2, 3, 4	
		Flammable solids (chapter 2.7)	1, 2	
		Self-reactive substances and mixtures (chapter 2.8)	Types A, B, C, D, E, F	
		Pyrophoric liquids (chapter 2.9)	1	
		Pyrophoric solids (chapter 2.10)	1	
		Substances and mixtures which, in contact with water, emit flammable gases (chapter 2.12)	1, 2, 3	
		Oxidizing liquids (chapter 2.13)	1, 2, 3	
		Oxidizing solids (chapter 2.14)	1, 2, 3	
		Organic peroxides (chapter 2.15)	Types A, B, C. D, E, F	
P377	**Leaking gas fire: Do not extinguish, unless leak can be stopped safely.**	Flammable gases (chapter 2.2)	1, 2	
P378	**Use ... to extinguish.**	Flammable gases and pyrophoric gases (chapter 2.2)	Pyrophoric gas	*– if water increases risk.* ... Manufacturer/supplier or the competent authority to specify appropriate media.
		Flammable liquids (chapter 2.6)	1, 2, 3, 4	
		Flammable solids (chapter 2.7)	1, 2	
		Self-reactive substances and mixtures (chapter 2.8)	Types B, C, D, E, F	
		Pyrophoric liquids (chapter 2.9)	1	
		Pyrophoric solids (chapter 2.10)	1	
		Substances and mixtures which, in contact with water, emit flammable gases (chapter 2.12)	1, 2, 3	
		Oxidizing liquids (chapter 2.13)	1, 2, 3	

Code (1)	Response precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
		Oxidizing solids (chapter 2.14)	1, 2, 3	
		Organic peroxides (chapter 2.15)	Types B, C, D, E, F	
P381	**In case of leakage, eliminate all ignition sources.**	Flammable gases (chapter 2.2)	1, 2	
P370 + P378	**In case of fire: Use ... to extinguish.**	Flammable gases and pyrophoric gases (chapter 2.2)	Pyrophoric gas	*– if water increases risk.* **...** Manufacturer/supplier or the competent authority to specify appropriate media.
		Flammable liquids (chapter 2.6)	1, 2, 3, 4	
		Flammable solids (chapter 2.7)	1, 2	
		Self-reactive substances and mixtures (chapter 2.8)	Types C, D, E, F	
		Pyrophoric liquids (chapter 2.9)	1	
		Pyrophoric solids (chapter 2.10)	1	
		Substances and mixtures which, in contact with water, emit flammable gases (chapter 2.12)	1, 2, 3	
		Oxidizing liquids (chapter 2.13)	1, 2, 3	
		Oxidizing solids (chapter 2.14)	1, 2, 3	
		Organic peroxides (chapter 2.15)	Types C, D, E, F	

Table A3.2.4: Codification of storage precautionary statements

Code (1)	Storage precautionary statements (2)	Hazard class (3)	Hazard category (4)	Conditions for use (5)
P403	**Store in a well-ventilated place.**	Flammable gases (chapter 2.2)	1, 2	
		Oxidizing gases (chapter 2.4)	1	
		Gases under pressure (chapter 2.5)	Compressed gas Liquefied gas Refrigerated liquefied gas Dissolved gas	
		Flammable liquids (chapter 2.6)	1, 2, 3, 4	*– for flammable liquids Category 1 and other flammable liquids that are volatile and may generate an explosive atmosphere.*
		Self-reactive substances and mixtures (chapter 2.8)	Types A, B, C, D, E, F	*– except for temperature controlled self-reactive substances and mixtures or organic peroxides because condensation and consequent freezing may take place.*
		Organic peroxides (chapter 2.15)	Types A, B, C, D, E, F	
		Acute toxicity, inhalation (chapter 3.1)	1, 2, 3	*– if the chemical is volatile and may generate a hazardous atmosphere.*
		Specific target organ toxicity, single exposure; respiratory tract irritation (chapter 3.8)	3	
		Specific target organ toxicity, single exposure; narcotic effects (chapter 3.8)	3	

A3.3.4.6 Where a substance or mixture is classified for a number of health hazards, generally the most stringent set of precautionary statements should be selected. This applies mainly for the preventive measures. With respect to phrases concerning "Response", rapid action may be crucial. For example, if a chemical is carcinogenic and acutely toxic then the first aid measures for acute toxicity will take precedence over those for longer term effects. In addition, medical attention to delayed health effects may be required in cases of incidental exposure, even if not associated with immediate symptoms of intoxication.

A3.3.4.7 To protect people with different reading abilities, it might be useful to include both precautionary pictograms and precautionary statements in order to convey information in more than one way (see 1.4.4.1 (a)). It should be noted, however, that the protective effect of pictograms is limited and the examples in this annex do not cover all precautionary aspects to be addressed. While pictograms can be useful, they can be misinterpreted and are not a substitute for training.

A3.3.5 Matrix of precautionary statements by hazard class/category

A3.3.5.1 This matrix lists the recommended precautionary statements for each hazard class and hazard category of the GHS by type of precautionary statement (see A3.2.2.1) except for general precautionary statements. In each case the precautionary statement has the applicable code on the line immediately above.

FLAMMABLE GASES (INCLUDING CHEMICALLY UNSTABLE GASES) and PYROPHORIC Gases

(Chapter 2.2)

(Flammable gases)

Symbol
Flame

Hazard category	Signal word	Hazard statement
1	Danger	H220 Extremely flammable gas

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
P210 **Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.**	P377 **Leaking gas fire:** **Do not extinguish, unless leak can be stopped safely.** P381 **In case of leakage, eliminate all ignition sources.**	P403 **Store in a well-ventilated place.**	

FLAMMABLE GASES (INCLUDING CHEMICALLY UNSTABLE GASES) and PYROPHORIC Gases

(Chapter 2.2)

(Flammable gases)

Symbol
No symbol

Hazard category	**Signal word**	**Hazard statement**
2	Warning	H221 Flammable gas

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
P210 **Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.**	P377 **Leaking gas fire: Do not extinguish, unless leak can be stopped safely.** P381 **In case of leakage, eliminate all ignition sources.**	P403 **Store in a well-ventilated place.**	

FLAMMABLE GASES (INCLUDING CHEMICALLY UNSTABLE GASES) and PYROPHORIC Gases
(Chapter 2.2)
(Chemically unstable gases)

Symbol
No additional symbol

Hazard category	Signal word	Hazard statement	
A	*No additional signal word*	H230	May react explosively even in the absence of air
B	*No additional signal word*	H231	May react explosively even in the absence of air at elevated pressure and/or temperature

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
P202 **Do not handle until all safety precautions have been read and understood.**			

~~*4.*~~*3.*

4. ***Note:*** *This table lists only the precautionary statement that is assigned due to the chemical instability of the gas. For the other precautionary statements that are assigned based on the flammability see the respective tables for flammable gases.*

FLAMMABLE GASES (INCLUDING CHEMICALLY UNSTABLE GASES) and PYROPHORIC Gases
(Chapter 2.2)
(Pyrophoric gases)

Symbol Flame

Hazard category	**Signal word**	**Hazard statement**
Pyrophoric gas	Danger	H250 Catches fire spontaneously if exposed to air

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
P210 **Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.** P222 **Do not allow contact with air.** *– if emphasis of the hazard statement is deemed necessary.* P233 **Keep container tightly closed.** P280 **Wear protective gloves/protective clothing/eye protection/face protection.** Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.	P370 + P378 **In case of fire: Use ... to extinguish** *– if water increases risk.* ...Manufacturer/supplier or the competent authority to specify appropriate media.		