

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

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

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Item 3 (a) of the provisional agenda:

**Hazard communication issues:**

**Revision of section 9 of Annex 4**

### Report from the correspondence group on the revision of Section 9 of the SDS

Transmitted by the expert from Germany on behalf of the  
correspondence group

#### Introduction

1. This document reports about the status of work of the informal correspondence group on the revision of Section 9 of the SDS.
2. In the following, the correspondence group wishes to outline the results of the work achieved so far in order to keep the Sub-Committee up-dated.

#### Status of work

3. As outlined in previous reports the group had decided to introduce guidance for each of the properties given in Annex 4 Section 9. This guidance is supposed to clarify what kind of data is expected for each of the properties. The purpose is improving the quality and consistency of Section 9 in the SDS.
4. The group agreed to divide the properties/data required in Section 9 of the SDS into three tables with regard to their presentation in Annex 4 of the GHS.
  - (a) Table A4.3.9.1 is foreseen for basic physical chemical properties and safety characteristics which are mandatory in the sense that a line for each of these properties is required in every SDS even if they are not applicable or data is not available;
  - (b) Table A4.3.9.2 is foreseen for properties/safety characteristics and test results that should be indicated in case a substance or mixture is classified in the respective physical hazard class. Data which is deemed relevant with regard to a specific physical hazard but not resulting in classification (e.g. negative test results close to the criterion) may also be indicated in this Table.
  - (c) Table A4.3.9.3 is foreseen for additional properties/safety characteristics and test results that should be indicated, as appropriate, for a substance or mixture on the SDS. Any further relevant physical properties/safety characteristics of the substance or mixture not identified in this table should also be included in this part of the SDS.

5. The reason for this division into three tables is that the group found it useful to structure the properties for the purposes of giving guidance to the writer of the SDS (which is the purpose of Annex 4 to the GHS!). Furthermore, the group agreed that this division into three tables is not necessarily useful for the reader/user of the SDS and therefore does not intend to require such a division for the layout of the SDS itself.
6. In order to clarify these considerations as good as possible, the group has come up with a refined text for the introductory paragraphs in A4.3.9 of Annex 4.
7. The current status of these proposed amendments are presented in the Annex to this document. Table A4.3.9.1 and A4.3.9.2 have been discussed by the group and the current status is shown in the Annex to this document. Table A4.3.9.3 has not yet been fully discussed and therefore contains only one exemplary entry.
8. Amendments to Table 1.5.2 in Chapter 1.5 of the GHS are supposed to be kept to an absolute minimum. So far the following two changes are foreseen:
  - (a) The evaporation rate is proposed to be deleted because it is effectively covered by the vapour pressure and all aspects that are important with regard to occupational safety, and the risk of exposure can be dealt with based on the vapour pressure and the saturated vapour concentration;
  - (b) Particle characteristics are proposed to be added because they are important information for health hazard assessment and for physical hazard classification of solids.

## **Further work**

9. The entries for Table A4.3.9.3 have not yet been discussed/finalized but will be worked out as the next steps of the group.
10. The group on the revision of Section 9 requests the Sub-Committee to consider the draft text that has been worked out so far and asks for comments or suggestions in order to be able to take them into account rather at this stage than later after finalizing a proposal.
11. The group will report about its further progress during the next meeting again.

## Annex

### Draft Annex 4 Section 9 – clean version

#### “A4.3.9 SECTION 9: Physical and chemical properties and safety characteristics

A4.3.9.1 Clearly describe/identify the properties and safety characteristics as specified in the following three tables. The three tables below also provide guidance on how information may be provided on the SDS.

*NOTE: The properties presented in the three tables below can be presented without any division (that is, as a list). However, the division of the properties into three tables may also be used on the SDS.*

A4.3.9.2 In cases where the specific properties or safety characteristics required by Chapter 1.5, Table 1.5.2 do not apply or are not available under a particular subheading, this should be clearly indicated.

A4.3.9.3 Generally the information given in this section of the SDS should relate to standard conditions for temperature and pressure (temperature of 20 °C and absolute pressure of 101.3 kPa). If other conditions apply, these should be indicated together with the respective property.

A4.3.9.4 Data on the SDS should be provided in appropriate units of measure. Where the data relate to a hazard class, the units of measure should be as specified in the criteria for that hazard class.

A4.3.9.5 If relevant for the interpretation of the information or numeric value given, indicate the determination method (e.g. open-cup/closed-cup for flash point) or state whether the value was calculated.

A4.3.9.6 In the case of a mixture, valid data for the whole mixture should be provided if technically feasible. In case data for the whole mixture cannot be provided, data for the most relevant ingredient(s) may be provided; in this case it should be clearly indicated to which ingredient(s) the data apply.

A4.3.9.7 Other appropriate physical or chemical parameters or safety characteristics, in addition to those listed below, may also be included in this section of the SDS.

**Table A4.3.9.1: Basic physical and chemical properties and safety characteristics**

This table lists basic physical and chemical properties and safety characteristics. Relevant information as required should be indicated for every property listed in this table.

If specific properties or safety characteristics do not apply (based on the respective information about applicability in the column 'Remarks/Guidance') they should still be listed in the SDS with the statement "not applicable".

If information on specific properties or safety characteristics is not available, they should still be listed in the SDS with the statement "not available". It is recommended that, where appropriate, a short explanation is included as to why the data is not available, e. g. "melts", "decomposes", "dissolves".

<b>Property</b>	<b>Remarks/Guidance</b> All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate
Physical state	<ul style="list-style-type: none"> <li>– generally at standard conditions</li> <li>– for definitions for gas, liquid and solid see chapter 1.2</li> </ul>
Colour	<ul style="list-style-type: none"> <li>– indicate the colour of the substance or mixture as supplied</li> <li>– in cases where one SDS is used to cover variants of a mixture which may have different colours the term 'various' can be used to describe the colour (see A4.3.1.1 for an SDS for variants of a mixture)</li> </ul>
Odour	<ul style="list-style-type: none"> <li>– give a qualitative description of the odour if it is well-known or described in the literature</li> <li>– if available, indicate the odour threshold (qualitatively or quantitatively)</li> </ul>
Density and/or Relative density	<ul style="list-style-type: none"> <li>– generally at standard conditions</li> <li>– for liquids and solids it is recommended to indicate the density</li> <li>– for gases it is recommended to indicate the relative density based on air at 20 °C as reference</li> <li>– for mixtures indicate at least a range for the density</li> </ul>
Relative vapour density	<ul style="list-style-type: none"> <li>– applicable to liquids only</li> </ul>
Melting point/freezing point	<ul style="list-style-type: none"> <li>– not applicable to gases</li> <li>– at standard pressure</li> <li>– indicate up to which temperature no melting point was observed in case the melting point is above the measuring range of the method</li> <li>– indicate if decomposition or sublimation occurs prior to or during melting</li> <li>– for waxes and pastes the softening point/range may be indicated instead</li> <li>– for mixtures indicate if it is technically not possible to determine the melting point/freezing point</li> </ul>
Boiling point or initial boiling point and boiling range	<ul style="list-style-type: none"> <li>– generally at standard pressure (a boiling point at lower pressure might be indicated in case the boiling point is very high or decomposition occurs before boiling)</li> <li>– indicate up to which temperature no boiling point was observed in case the boiling point is above the measuring range of the method</li> <li>– indicate if decomposition occurs prior to or during boiling</li> <li>– for mixtures indicate if it is technically not possible to determine the boiling point or range; in that case indicate also the boiling point of the lowest boiling ingredient</li> </ul>

Property	Remarks/Guidance All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate
Vapour pressure	<ul style="list-style-type: none"> <li>– generally at standard temperature</li> <li>– indicate the vapour pressure at 50 °C for volatile fluids in addition (in order to enable distinction between gases and liquids based on the definitions in chapter 1.2)</li> <li>– in cases where one SDS is used to cover variants of a liquid mixture or liquefied gas mixture indicate a range for the vapour pressure</li> <li>– for liquid mixtures or liquefied gas mixtures indicate a range for the vapour pressure or at least the vapour pressure of the most volatile ingredient(s) where the vapour pressure is predominantly determined by this/these ingredient(s)</li> <li>– for liquid mixtures or liquefied gas mixtures the vapour pressure may be calculated using the activity coefficients of the ingredients</li> <li>– the saturated vapour concentration (SVC) may be indicated in addition. The saturated vapour concentration can be estimated as follows:  <math display="block">SVC \text{ (in ml/m}^3\text{)} = VP \text{ (in hPa = mbar)} \cdot 987.2</math> <math display="block">SVC \text{ (in mg/l)} = VP \text{ (in hPa = mbar)} \cdot MW \cdot 0.0412</math>           where  <i>VP</i> is the vapour pressure and  <i>MW</i> is the molecular weight         </li> </ul>
Solubility	<ul style="list-style-type: none"> <li>– generally at standard temperature</li> <li>– indicate the solubility in water</li> <li>– the solubility in other (non-polar) solvents may also be included</li> </ul>
Partition coefficient n-octanol/water (log value)	<ul style="list-style-type: none"> <li>– not applicable to inorganic and ionic liquids</li> <li>– generally not applicable to mixtures</li> <li>– may be calculated (using QSAR – Quantitative structure-activity relationship)</li> <li>– indicate whether the value is based on testing or on calculation</li> </ul>
pH	<ul style="list-style-type: none"> <li>– not applicable to gases</li> <li>– applicable to aqueous liquids and solutions (the pH is linked to aqueous media by definition; measurements carried out in other media do not give the pH)</li> <li>– indicate the concentration of the test substance in water</li> </ul>
Kinematic viscosity	<ul style="list-style-type: none"> <li>– applicable to liquids only</li> <li>– use preferably mm<sup>2</sup>/s as unit (as the classification criteria for the hazard class aspiration hazard are based on this unit)</li> <li>– the dynamic viscosity may be indicated in addition. The kinematic viscosity is linked to the dynamic viscosity by the density:  <math display="block">\text{Kinematic viscosity (mm}^2\text{/s)} = \frac{\text{Dynamic viscosity (mPa} \cdot \text{s)}}{\text{Density (g/cm}^3\text{)}}</math> </li> <li>– for non-Newtonian liquids indicate thixotropic or rheopexic behaviour</li> </ul>
Particle characteristics	<ul style="list-style-type: none"> <li>– applicable to solids only</li> <li>– indicate the particle size (median and range)</li> <li>– if available and appropriate, further properties may be indicated in addition:           <ul style="list-style-type: none"> <li>- size distribution (range)</li> <li>- shape and aspect ratio</li> <li>- specific surface area</li> </ul> </li> </ul>

Property	Remarks/Guidance All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate
Lower and upper explosion/flammability limits	<ul style="list-style-type: none"> <li>- not applicable to solids</li> <li>- for flammable liquids indicate at least the lower explosion limit</li> <li>- if the flash point is approximately <math>&gt; -25\text{ }^{\circ}\text{C}</math> it might be not possible to determine the upper explosion limit at standard temperature. In that case it is recommended to indicate the upper explosion limit at elevated temperature</li> <li>- if the flash point is <math>&gt; +20\text{ }^{\circ}\text{C}</math> the same holds for both, the lower and upper explosion limit</li> </ul>
Flash point	<ul style="list-style-type: none"> <li>- not applicable to gases, aerosols and solids</li> </ul> <p><u>for mixtures:</u></p> <ul style="list-style-type: none"> <li>- indicate a value for the mixture itself if available, otherwise indicate the flash point(s) of those substances with the lowest flash point(s) as these are generally the main contributing ones</li> </ul>
Auto-ignition temperature	<ul style="list-style-type: none"> <li>- applicable to gases and liquids only</li> </ul> <p><u>[for mixtures:</u></p> <ul style="list-style-type: none"> <li>- indicate a value for the mixture itself if available, otherwise indicate 'no data available' because the auto-ignition temperature of the mixture may be lower than that of the ingredient with the lowest auto-ignition temperature]</li> </ul>
Decomposition temperature	

**Table A4.3.9.2: Data relevant with regard to physical hazard classes**

This table lists the properties/safety characteristics and test results that should be indicated in case a substance or mixture is classified in the respective physical hazard class. Data which is deemed relevant with regard to a specific physical hazard but not resulting in classification (e.g. negative test results close to the criterion) may also be indicated here.

The name of the hazard class the data relates to may be indicated together with the data but it is not necessary to do so because the resulting classification/category is indicated in Section 2 of the SDS. Thus, the data can be listed in the same way as the data according to Table A4.3.9.1.

Unless otherwise specified, the test methods referred to in this Table are described in the UN Manual of Tests and Criteria.

<b>GHS Chapter</b>	<b>Hazard class</b>	<b>Property/Safety characteristic/Test result and Remarks/Guidance</b> All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate [and available]
2.1	Explosives	<ul style="list-style-type: none"> <li>– indicate the sensitivity to shock, generally determined by the UN gap test: test 2 (a)</li> <li>– indicate the effect of heating under confinement, generally determined by the Koenen test: test 2 (b)</li> <li>– indicate the effect of ignition under confinement, generally determined by test 2 (c)</li> <li>– indicate the sensitiveness to impact, generally determined by test 3 (a)</li> <li>– indicate the sensitiveness to friction, generally determined by test 3 (b)</li> <li>– indicate the thermal stability, generally determined by test 3 (c)</li> </ul>
2.2	Flammable gases (including chemically unstable gases)	<p><u>for pure flammable gases:</u></p> <ul style="list-style-type: none"> <li>– indicate the lower and upper flammability limits (generally at standard conditions)</li> <li>– indicate the <math>T_{Ci}</math> (maximum content of flammable gas which, when mixed with nitrogen, is not flammable in air, in %) as per ISO 10156</li> </ul> <p><u>for flammable gas mixtures:</u></p> <ul style="list-style-type: none"> <li>– indicate the flammability limits, if tested (note that assignment of category 1 is compulsory if classification as flammable gas is based on the calculation as per ISO 10156)</li> </ul>
2.3	Aerosols	<ul style="list-style-type: none"> <li>– indicate the percentage of flammable components unless the Aerosol is classified as category 1 based on the Note in paragraph 2.3.2.2 in Chapter 2.3.</li> </ul>
2.4	Oxidizing gases	<p><u>for pure oxidising gases:</u></p> <ul style="list-style-type: none"> <li>– indicate the <math>C_i</math> (coefficient of oxygen equivalency) as per ISO 10156</li> </ul> <p><u>for oxidising gas mixtures:</u></p> <ul style="list-style-type: none"> <li>– indicate 'Oxidising Cat. 1 (tested as per ISO 10156)' for tested mixtures or indicate the calculated Oxidising Power (OP) as per ISO 10156</li> </ul>

GHS Chapter	Hazard class	Property/Safety characteristic/Test result and Remarks/Guidance  All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate [and available]
2.5	Gases under pressure	<p><u>for pure gases:</u></p> <ul style="list-style-type: none"> <li>- indicate the critical temperature.</li> </ul> <p><u>for gas mixtures:</u></p> <ul style="list-style-type: none"> <li>- indicate the pseudo-critical temperature. It is estimated as the mole weighted average of the critical temperatures of the components as follows:</li> </ul> $\sum_{i=1}^n x_i \cdot T_{Crit_i}$ <p>where  <math>x_i</math> is molar fraction of component <math>i</math> and  <math>T_{Crit_i}</math> is the critical temperature of component <math>i</math></p>
2.6	Flammable liquids	<ul style="list-style-type: none"> <li>- no additional data is needed because the boiling point and the flash point are indicated based on Table A4.9.3.1</li> <li>- indicate information on sustained combustibility if exemption based on Test L.2, in accordance with Note 2 in chapter 2.6, paragraph 2.6.2, is considered</li> </ul>
2.7	Flammable solids	<ul style="list-style-type: none"> <li>- indicate the burning rate (or burning time for metal powders), generally determined by Test N.1</li> <li>- indicate whether the wetted zone has been passed or not</li> </ul>
2.8	Self-reactive substances and mixtures	<ul style="list-style-type: none"> <li>- indicate the decomposition energy (value and method of determination)</li> <li>- indicate the SADT (self-accelerating decomposition temperature) together with the volume the SADT relates to</li> <li>- indicate detonation properties (Yes/Partial/No), also in packaging where relevant</li> <li>- indicate deflagration properties (Yes rapidly/Yes slowly/No), also in packaging where relevant</li> <li>- indicate the effect of heating under confinement (Violent/Medium/Low/No), also in packaging where relevant</li> <li>- indicate the explosive power if applicable (Not low/Low/None)</li> </ul>
2.9	Pyrophoric liquids	<ul style="list-style-type: none"> <li>- indicate whether spontaneous ignition or charring of the filter paper occurs, generally determined by Test N.3 (e.g. "the liquid ignites spontaneously in air" or "a filter paper with the liquid chars in air")</li> </ul>
2.10	Pyrophoric solids	<ul style="list-style-type: none"> <li>- indicate whether spontaneous ignition occurs when poured or within five minutes thereafter, generally determined by Test N.2 (e.g. "the solid ignites spontaneously in air")</li> <li>- indicate whether pyrophoric properties could be altered over time, e.g. by formation of a protective surface layer through slow oxidation</li> </ul>
2.11	Self-heating substances and mixtures	<ul style="list-style-type: none"> <li>- indicate whether spontaneous ignition occurs, include possible screening data and/or method used (generally Test N.4) and note the maximum temperature rise obtained</li> </ul>
2.12	Substances and mixtures which, in contact with water, emit flammable gases	<ul style="list-style-type: none"> <li>- indicate the identity of the emitted gas, if known</li> <li>- indicate whether the emitted gas ignites spontaneously</li> <li>- indicate the gas evolution rate, generally determined by Test N.5 (unless the test has not been completed e.g. because the gas ignites spontaneously)</li> </ul>
2.13	Oxidizing liquids	<ul style="list-style-type: none"> <li>- indicate whether spontaneous ignition occurs when mixed with cellulose, generally determined by Test O.2 (e.g. "the mixture with cellulose (which was prepared for Test O.2) ignites spontaneously")</li> </ul>



GHS Chapter	Hazard class	<b>Property/Safety characteristic/Test result and Remarks/Guidance</b> All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate [and available]
2.14	Oxidizing solids	<ul style="list-style-type: none"> <li>– indicate whether spontaneous ignition occurs when mixed with cellulose, generally determined by Test O.1 or Test O.3 (e.g. "the mixture with cellulose (which was prepared for UN Test O.1 or O.3) ignites spontaneously")</li> </ul>
2.15	Organic peroxides	<ul style="list-style-type: none"> <li>– indicate the SADT (self-accelerating decomposition temperature) together with the volume the SADT relates to</li> <li>– indicate detonation properties (Yes/Partial/No), also in packaging where relevant</li> <li>– indicate deflagration properties (Yes rapidly/Yes slowly/No), also in packaging where relevant</li> <li>– indicate the effect of heating under confinement (Violent/Medium/Low/No), also in packaging where relevant</li> <li>– indicate the explosive power if applicable (Not low/Low/None)</li> <li>– indicate the decomposition energy (value and method of determination), if available</li> </ul>
2.16	Corrosive to metals	<ul style="list-style-type: none"> <li>– indicate which metals are corroded by the substance or mixture (e.g. "corrosive to aluminium" or "corrosive to steel" etc.), if available</li> <li>– indicate the corrosion rate and whether it refers to steel or aluminium, generally determined by Test C.1 (Section 37.4 of the Manual of Tests and Criteria), if available</li> <li>– include a reference to other Sections of the SDS with regard to compatible or incompatible materials (e.g. to packaging compatibilities in Section 7 or to incompatible materials in Section 10), as appropriate</li> </ul>

**Table A4.3.9.3 Further safety characteristics**

This table lists additional properties/safety characteristics and test results that should be indicated, as appropriate, for a substance or mixture on the SDS. Any further relevant physical properties/safety characteristics of the substance or mixture not identified in this table should also be included in this section of the SDS.

Safety characteristic and/or test result	<b>Remarks/Guidance</b> All relevant information to protect people and the environment such as a short description, value(s), unit, conditions (e.g. temperature, pressure), method, each as appropriate [and available]
SADT (self-accelerating decomposition temperature)	<ul style="list-style-type: none"> <li>– applicable to substances and mixtures which may generate dangerous amounts of heat and gas, or vapour under normal conditions and which are not stabilized</li> <li>– indicate the volume for which the SADT is given</li> </ul>
... to be decided	...