

Quotients

Introduction

- The GHS provides different means for classifying a preparation
 - Data on the preparation itself
 - Data on a similar preparation (“*bridging principle*“)
 - Data on the raw material ingredients of the preparation
- The *Quotients* are the results of applying the data provided by the raw materials into the formulae and / or to the limits presented by the legislation
- The *Quotients* aid not only in understanding the calculated results, but also in seeing from where hazards are arising (what ingredients are causing them).

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Quotient Basics

In the *Maintenance of Preparations*, you can access the **Quotients** here:

The screenshot displays the 'Maintenance of preparations' software interface. The main window shows the 'GHS classification' section with various hazard and warning entries. A 'Quotients' dialog box is open, listing several categories of quotients, with 'Toxicological values (3.1)' selected. The dialog box also shows a list of specific quotients, including 'Skin and eye corrosion and irritation (3.2, 3.3)', 'Respiratory or skin sensitization (3.4)', 'Cell harming substances (3.5 - 3.7)', 'Specific target organ systemic toxicity (3.8, 3.9)', 'Hazardous to the aquatic environment (4.1)', 'Hazardous to the ozone layer (5.1)', and 'EU hazard symbols and risk phrases'. The main window also shows a 'Formulation' tab with fields for 'Preparation', 'Product code', and 'Variant'. A 'Transport' tab is also visible, showing 'ADR: 3' and 'DOT: 3'. The interface includes a menu bar, a toolbar, and a status bar at the bottom.

All applicable classes of **Health** and **Environmental Hazards** will be accessible. Ones that are greyed-out, do not apply to this preparation:

Toxicological Values (3.1)

- Here you can see the **basic country** to which your ChemGes is set. This indicates for which country, the data is provided for the ingredient substances and the result is calculated.
- The **Results** list the calculation results on a country-specific basis, showing the GHS nuances taken into consideration in the application of the formulae.
- The **Limits** table is taken from the legislation and marked in yellow. The results are superimposed upon that table.
- This lists the **substances** that are contained at or above their **consideration limit** and are thus applied to the formula.
- Here are the corresponding **percentages** at which each of the substances under #4, are contained in the preparation.
- These are the **toxicological values** and their corresponding categories within class 3.1, per raw material.
- This indicates that if the ‚tox-Value‘ of a substance is not available, the ‚default value‘ as given in the GHS, that corresponds to the category in which the substance is classified, is given.

The calculated ATEs of the preparation are then considered the LD50/LC50 of the preparation, and thus lead to classification.

The screenshot shows the 'Toxicological values' software interface. Red arrows and numbers 1-7 point to specific features:

- 1: GHS type dropdown menu (USA).
- 2: Result column in the table.
- 3: Limits table header.
- 4: Percentage column in the substance table.
- 5: Toxicological values and categories in the substance table.
- 6: Toxicological values and categories in the substance table.
- 7: Red values are default values from GHS.

The formula for ATE_{mix} is shown as:

$$\frac{100}{ATE_{mix}} = \sum \frac{C_i}{ATE_i}$$

The interface also includes a status bar with the following text: [Esc] Exit, [F1] Change of the GHS type, [Ctrl G] Only output of selected GHS types.

Skin and eye corrosion and irritation (3.2, 3.3)

1. Shows the final classification **result** of the preparation.
2. The *standard limits* that are applied for classification.
3. The *pH value* for the whole preparation, if there is one, is used for the classification.
4. List of **substances** that have reached the consideration limit and are thus used in the classification.
5. The **classification** of these ingredients.
6. *Special limits* for classification, that apply to these ingredients and are used in the classification of the mixture.

Software window: Skin and eye corrosion and irritation

GHS Type: USA

Type of hazard	Category	Total %		Standard limits (simplified)
		Cat.1	Cat.2	
3.2 Skin corrosion/irritation	2	5	70	1: 5%; 1-2: 1%; 2: 10%
3.3 Serious eye damage/eye irritation	2	5	70	1: 3%; 1-2: 1%; 2: 10%

pH value: ?

Product code	Description	%	Corrosive/Irritant		Special limits
			Skin	Eyes	
25068-38-6	reaction product: bisphenol-A-(epichlorhydrin) ...	50,0000	2	2	3.3/2: 5%, 3.2/2: 5%
108-88-3	toluene	20,0000	2		
141-78-6	ethyl acetate	10,0000		2	
67-63-0	propan-2-ol	5,0000		2	
78-92-2	butanol	5,0000		2	
50-00-0	formaldehyde ... %	5,0000	1	1	3.2/1: 25%, 3.2/2: 5%, 3.3/2: 5%

[Esc] Exit [F1] Change of the GHS type

Respiratory or skin sensitization

1. Shows the final **classification result** of the preparation.
2. Lists the **standard limits** that lead to classification.
3. These are the **substances** that are contained at or above their consideration limit and are thus used for classification.
4. Here are the **classifications** and *special limits* of the ingredient raw materials.

Sensitizing substances

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GHS type USA

Type of hazard	Category	Total - %			Standard limits
		1	1A	1B	
Skin sensitization	1	55	0	0	1%
Respiratory sensitization		0	0	0	Solid/liquid: 1%, gaseous: 0,2%

Product code	Description	%	Category		Special limits
			Skin	Resp. syst.	
25068-38-6	reaction product: bisphenol-A-(epichlorhydrin) ...	50,0000	1		
50-00-0	formaldehyde ... %	5,0000	1		Skin: 0,2%

[Esc] Exit [F1] Change of the GHS type

Cell harming substances (3.5-3.7)

1. Shows the final **classification results** of the preparation.
2. These are the *standard limits* applied to the substances for classification.
3. The list of **substances** that are contained in the preparation at or above their consideration limit and are thus used for classification.
4. Here are the classifications and *special limits* of the raw materials.

In this example, the *special limits* applied are the IARC and NTP classification of a substance. Please see *OSHA HCS Appendix F*, on the application of this data for classification.

Cell harming substances

GHS type USA

Type of hazard	Cat.	1A	1B	2	Lactation	Standard limits
3.5 Germ cell mutagenicity	2	0	0	5		1A, 1B: 0,1%; 2: 1%
3.6 Carcinogenicity	1B	0	5	0		1A, 1B: 0,1%
3.7 Reproductive toxicity	2	0	0	20	0	1A, 1B: 0,1%; 2: 3%; Lactation: 0,1%

Product code	Description	%	Category			Special limits
			3.5 Muta.	3.6 Carc.	3.7 Repr.	
108-88-3	toluene	20,0000			2	
50-00-0	formaldehyde ... %	5,0000	2	1B		IARC: 1, NTP: K

[Esc] Exit [F1] Change of the GHS type

Specific target organ systemic toxicity (3.8, 3.9), Hazardous to the aquatic environment (4.1)

1. Shows the final **calculated classification** of the preparation.
2. These are the *standard limits* from the legislation, that lead to classification.
3. Here are the **substances** contained at or above their consideration limit and thus used in the calculation of the classification.
4. This is the **classification** of each individual substance.
5. Any *special limits* applicable to the substances.

Specific system organ systemic toxicity	category	1	2	3	Standard limits
3.8 Single exposure	3	0	0	40	1,2: 1%; 1-2: 1%; 3: 20%
3.9 Repeated exposure	2	0	20		1,2: 1%; 1-2: 1%

Product code	Description	%	Single Exposure	Repeated Exposure	Special limits
108-88-3	toluene	20,0000	3	2	
141-78-6	ethyl acetate	10,0000	3		
67-63-0	propan-2-ol	5,0000	3		
78-92-2	butanol	5,0000	3		

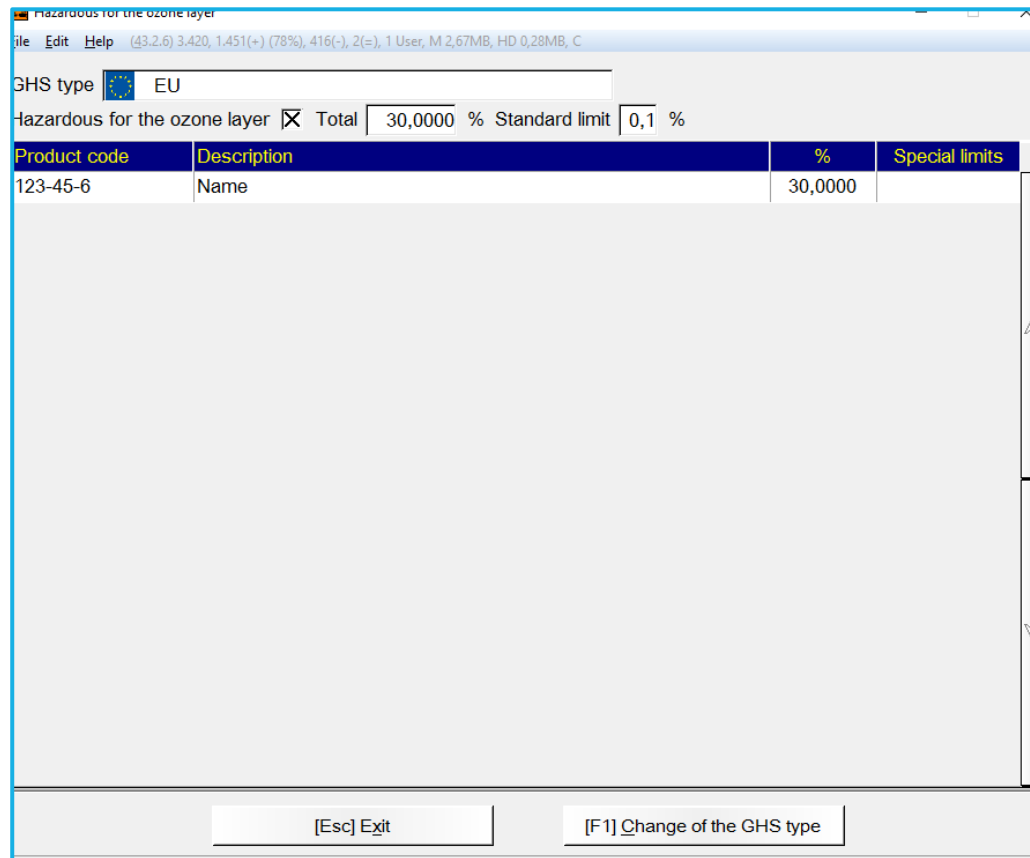
Aquatic environment	Calculated tox value	Total % (x.M)				Standard limits
		1	2	3	4	
acute	-	30	0	0	0	1: ≥25%; 2: 10x1+2≥25%; 3: 100x1+10x2+3≥25%
chronic	-	30	25	0	0	1: ≥25%; 2: 10x1+2≥25%; 3: 100x1+10x2+3≥25%; 4: 1+2+3+4≥25%

Product code	Description	%	acute	chronic	Special limits
123-45-6	Name	30,0000	1	1	water hazard
25068-38-6	reaction product: bisphenol-A-(epichlorhydrin...	25,0000		2	

Hazardous to the ozone layer

This screen shows the **substances** that lead to classification as Hazardous to the ozone layer. For each substance, it shows the following:

- At what **percentage** it is contained.
- Any **special limits** that apply.



The screenshot shows a software window titled "Hazardous for the ozone layer". The window has a menu bar with "file", "Edit", and "Help". Below the menu bar, there is a "GHS type" dropdown menu set to "EU". Below that, there is a checkbox labeled "Hazardous for the ozone layer" which is checked, followed by "Total" and a text input field containing "30,0000", and then "% Standard limit" and another text input field containing "0,1 %".

Product code	Description	%	Special limits
123-45-6	Name	30,0000	

At the bottom of the window, there are two buttons: "[Esc] Exit" and "[F 1] Change of the GHS type".

More detailed Information can be found in the Manual to ChemGes

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