

4. Basic knowledge of Lab Safety

Topics:

- How must a laboratory be built and organized?
- The GHS Symbols
- Biological hazard

How must a laboratory be built and organized?

In the FCOS policies you can find out how a laboratory has to be built and organized.



The image shows the table of contents for the document. It is titled 'Inhalt' and lists sections 1 through 5 with their respective page numbers. Section 5, 'Bau und Einrichtungen', is the most detailed, with sub-sections 5.1 through 5.3.5. The page number 3 is shown at the bottom right.

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The most important «tool» for the laboratory manager!



EKAS



The **Federal Coordination Commission for Occupational Safety FCOS** is the central information and coordination office for safety and health at work. It coordinates the preventive measures, the tasks in the execution and the uniform application of the rules. Their decisions are binding.

Examples of policies of FCOS (EKAS)



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössische Koordinationskommission
für Arbeitssicherheit EKAS



Guidelines of FCOS for the Occupational Safety Wegleitung der EKAS durch die Arbeitssicherheit

Verfasserin:
Suva
Arbeitssicherheit Luzern
Bereich Support & Grundlagen
Postfach
6002 Luzern
www.wegleitung.ekas.ch

EKAS Richtlinie

Nr. 1825

Flammable liquids Brennbare Flüssigkeiten

Lagern und Umgang

Ausgabe Mai 2005

EKAS Richtlinie

Nr. 1941

liquid gas Flüssiggas, Teil 1

Behälter, Lagern, Umschlagen und Abfüllen

Ausgabe Juli 2012

and so on

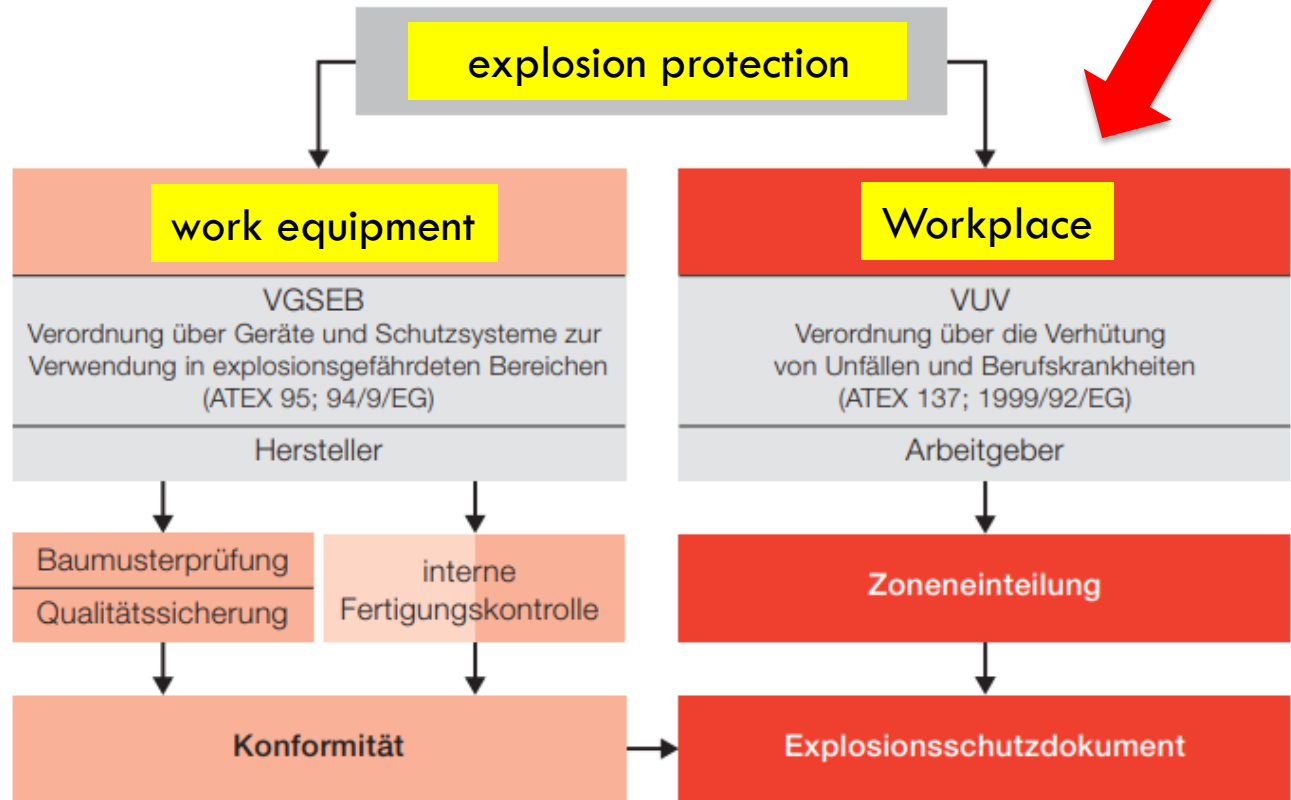
Explosion protection measures

Rules for the prevention of accidents and occupational diseases

Explosionsschutz

- Grundsätze
- Mindestvorschriften
- Zonen

suvapro
Sicher arbeiten



Regulations for equipment and protective systems in potentially explosive areas

Grundlagen für Explosionsschutzmassnahmen an Arbeitsmitteln und am Arbeitsplatz.

and so on

Proper lab infrastructure: Essential to minimize risks when working with dangerous chemicals (see also the FCOS Policies).

Fume hoods



safety cabinets



good and stable media supply



Biosafety cabinets



Important for the safety organization: Safety rules, safety infrastructure and materials for personal protection.

Emergency niches



Goggles



access control



Respiratory protection



Appropriate gloves



Lab Coat

The safety and environmental manual for the HCI version 2020 is for all employees and students online available on our website; link: www.su-management.ethz.ch

Safety and Environmental Manual for the HCI

Version 2024



The most important rules: Page 8
Technical facilities: Page 48

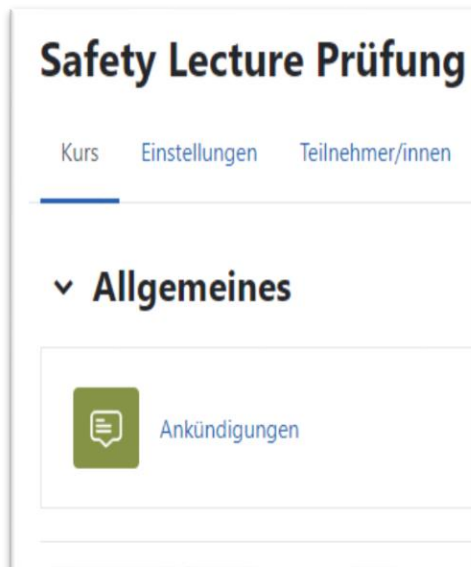


März 2024 / Thomas Mäder

Note: The complete edition of the Safety and Environmental Manual for the HCI version 2024 will no longer be printed. Instead, all employees and students will receive a printed abridged version (= pocket book brochure) containing the QR code to the complete online version on our website.

Safety Lecture Examination


The Safety Lecture exam is mandatory for all persons working in laboratories, and for all assistants working in the practical labs at the HCI. The Safety Lecture exam (either in German or English) must be taken under supervision and passed by all persons, including doctoral students, postdocs, assistants, but also visiting scientists, who work in laboratories and intend to work with chemicals and biologically active substances. This does not apply to staff in the administration and service units, or all students. The Safety Lecture exam contains 10 questions (random generator), which must be answered in free text in a maximum of 30 minutes.

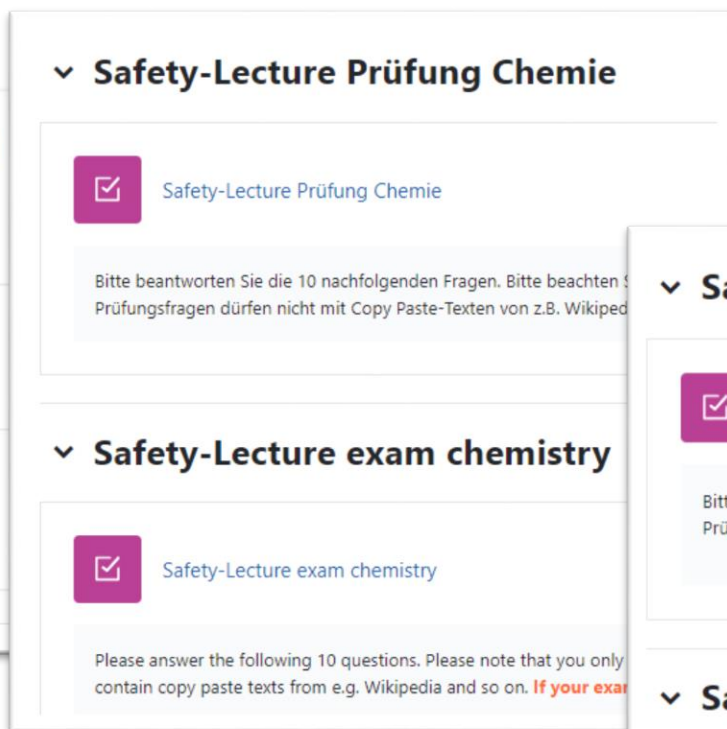


Safety Lecture Prüfung


Kurs Einstellungen Teilnehmer/innen

▼ **Allgemeines**

 Ankündigungen




▼ **Safety-Lecture Prüfung Chemie**

 Safety-Lecture Prüfung Chemie

Bitte beantworten Sie die 10 nachfolgenden Fragen. Bitte beachten Sie, dass Prüfungsfragen dürfen nicht mit Copy Paste-Texten von z.B. Wikipedia usw. beantwortet werden.

▼ **Safety-Lecture exam chemistry**

 Safety-Lecture exam chemistry

Please answer the following 10 questions. Please note that you only contain copy paste texts from e.g. Wikipedia and so on. **If your exam**



▼ **Safety-Lecture Prüfung Biologie**

 Safety-Lecture Prüfung Biologie

Bitte beantworten Sie die 10 nachfolgenden Fragen. Bitte beachten Sie, dass S Prüfungsfragen dürfen nicht mit Copy Paste-Texten von z.B. Wikipedia usw. be

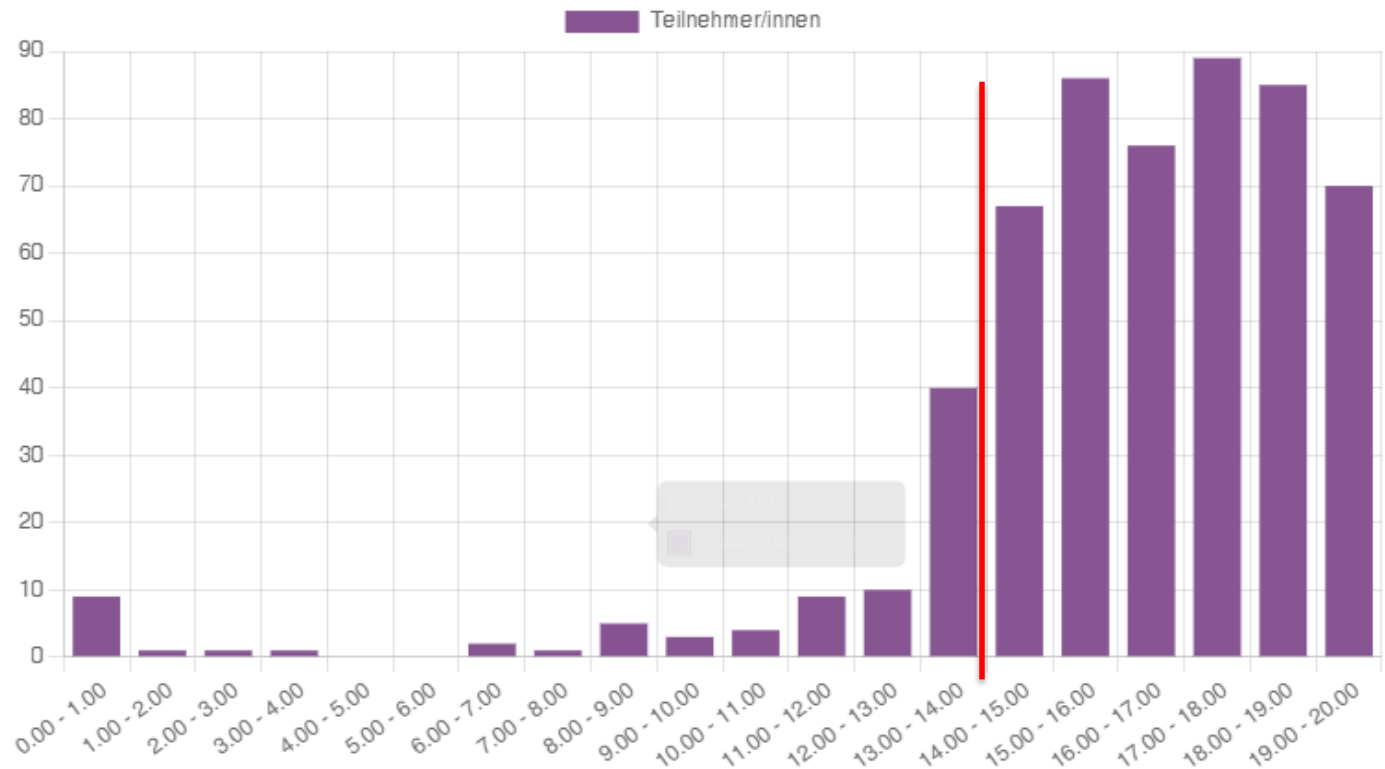
▼ **Safety-Lecture exam biology** Hervorgehoben

Status März 2024: > 2000 Safety Lecture Exam were completed!

14 out of 20 points are required to pass the Safety Lecture exam. The following statistic prove that the exam is neither too difficult nor too easy.

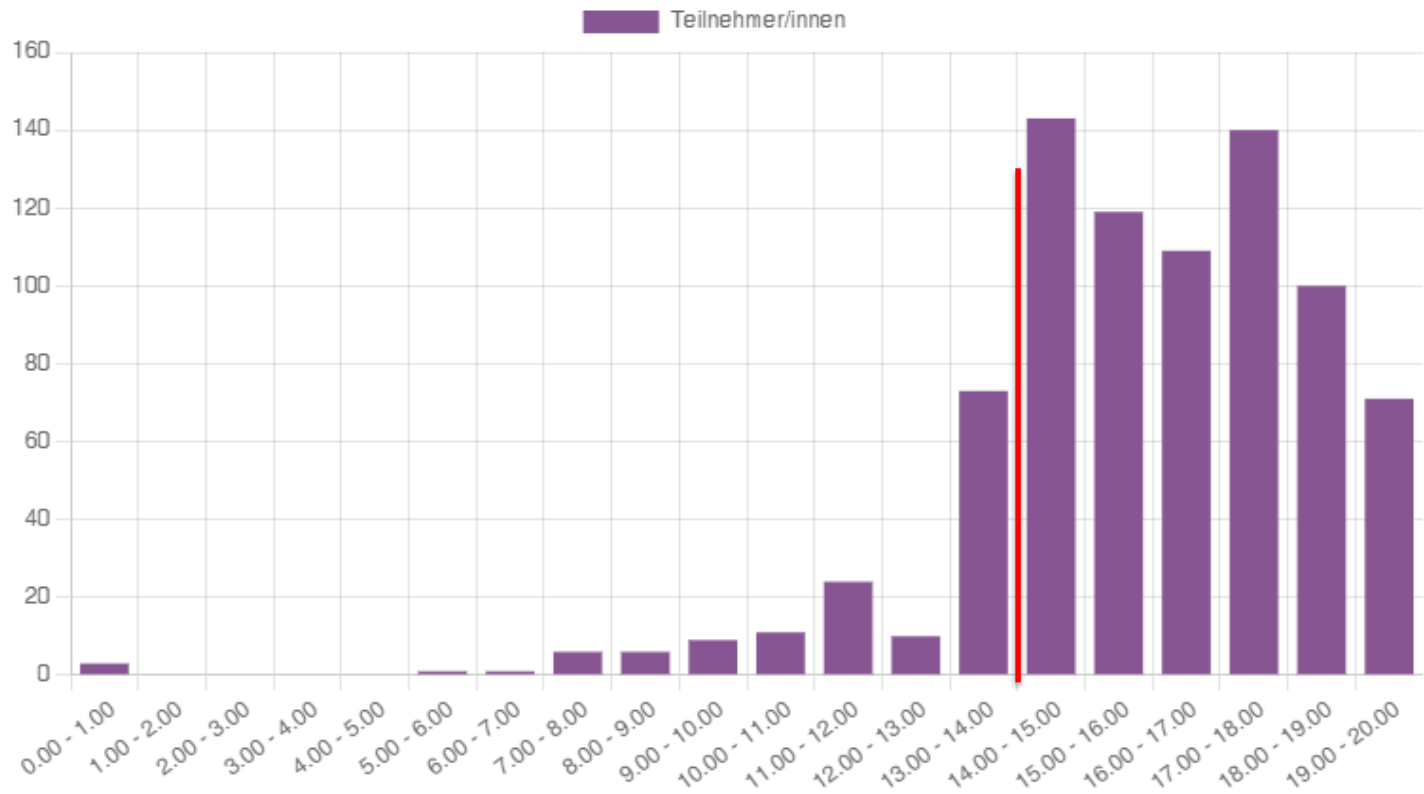
Safety Lecture Exam in German

Gesamtzahl der Teilnehmer/innen, die einzelne Bewertungstufen erreicht haben



Safety Lecture Exam in English

Gesamtzahl der Teilnehmer/innen, die einzelne Bewertungstufen erreicht haben



The GHS symbols





The GHS Symbols

GHS - Globally Harmonized System for the Classification and Labeling of Chemicals

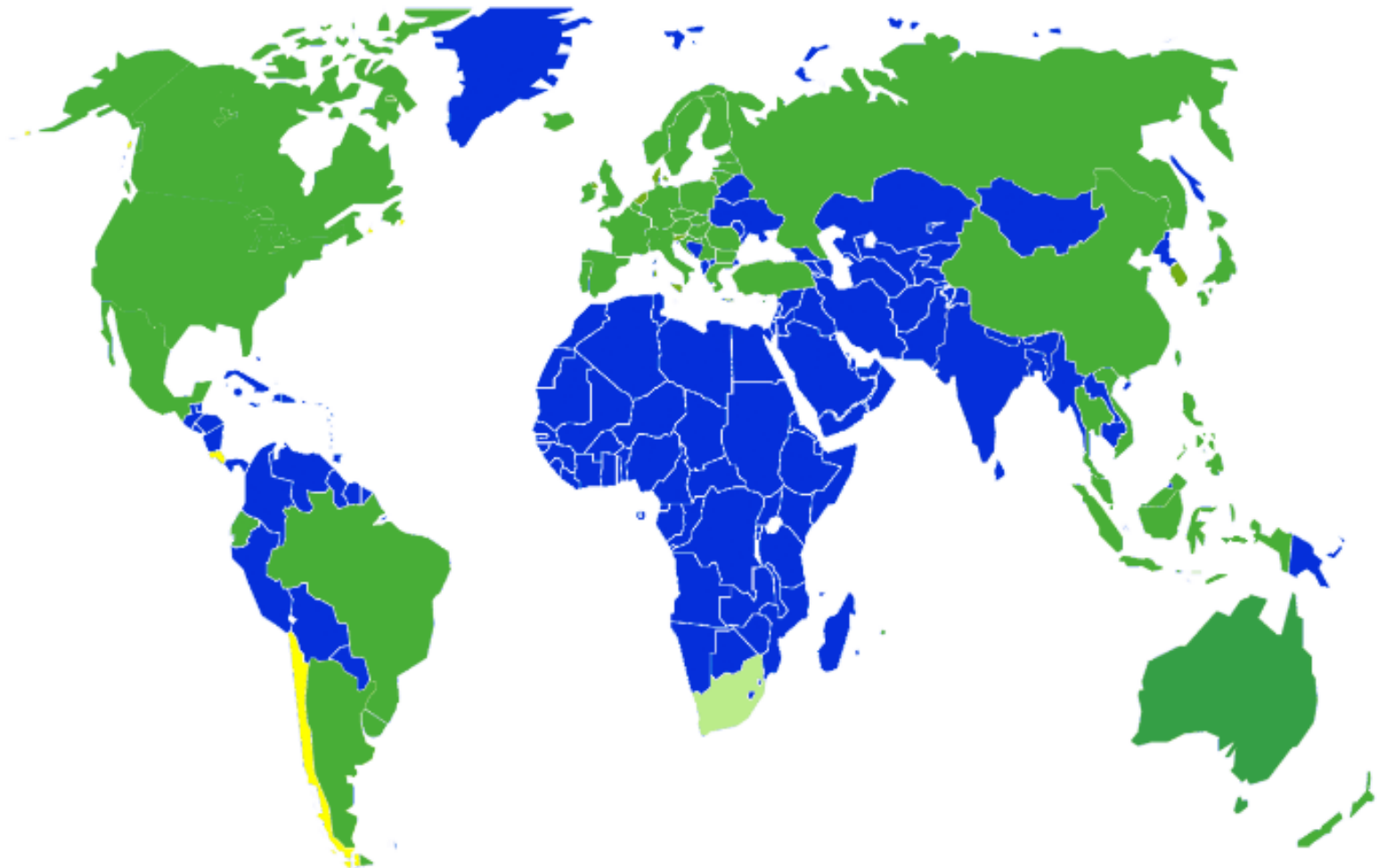
The GHS is an internationally agreed-upon standard managed by the United Nations that was set up to replace the assortment of hazardous material classification and labelling schemes previously used around the world. GHS is not legally binding. It has to be implemented by states into national law. In Switzerland, the implementation takes place in several steps by amending existing regulations. Since January 20, 2009, chemicals for industrial and industrial use in Switzerland may be classified and labeled according to GHS.

The GHS contains in particular:

- Criteria for the classification and labeling of chemical substances and mixtures
- Elements communicating the dangers of substances and mixtures.

Current status of GHS implementation worldwide

- : Länder/Regionen mit voller GHS-Umsetzung.
 - : Länder/Regionen mit freiwilliger GHS-Umsetzung.
 - : Länder/Regionen mit noch nicht abgeschlossener GHS-Umsetzung.
 - : Länder/Regionen, in denen GHS nicht umgesetzt oder verfügbar ist.
- (Quelle: DHI Group)



Globally Harmonized System of Classification and Labelling of Chemicals (GHS Rev. 9, 2021)

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At its tenth session (11 December 2020), the "Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals" adopted a set of amendments to the eighth revised edition of the GHS which include :

- the revision of chapter 2.1 (explosives) to better address their explosion hazard when they are not in their transport configuration;
- the revision of decision logics
- The revision of the classification and labelling summary tables in Annex 1;
- the revision and further rationalization of precautionary statements and
- the updating of references to OECD test guidelines for the testing of chemicals in chapters 9 and 10.

The ninth revised edition of the GHS takes account of these amendments which were adopted as document [ST/SG/AC.10/48/Add.3](#).

You will find below, the electronic version of GHS Rev.9, available for free for consultation purposes in the six UN official languages (Arabic, Chinese, English, French, Russian and Spanish). The files are published on this page as soon as they become available for each linguistic version.

Printed versions and electronic editable versions are available for sale at the United Nations Publications section at: <https://shop.un.org>. Requests to reproduce excerpts or to photocopy should be addressed to the Copyright Clearance Center at copyright.com.

GHS Rev.9 (files)

Title	Published	English	French	Chinese	Spanish	Arabic
ST/SG/AC.10/30/Rev.9 - GHS Rev.9	14/09/2021	pdf	pdf	pdf	pdf	pdf
ST/SG/AC.10/30/Rev.9/Corr.1 - GHS Rev.9 - Corr.1	08/05/2023	pdf	pdf			

Responsible authority

The United Nations Economic Commission for Europe (**UNECE**)

The **United Nations Economic Commission** for Europe, abbreviated **UNECE**, also **UN/ECE**, in short also **ECE**, is one of five regional commissions of the Economic and Social Council of the United Nations, whose main objective is to promote pan-European economic integration





The EU has implemented the GHS with the CLP Regulation


The **CLP Regulation** (for *Classification, Labelling and Packaging*) is a European Union regulation from 2008, which aligns the European Union system of classification, labelling and packaging of chemical substances and mixtures to the Globally Harmonized System.

It is expected to facilitate global trade and the harmonized communication of hazard information of chemicals and to promote regulatory efficiency.

The regulation requires companies to appropriately classify, label and package their substances and mixtures before placing them on the market. It aims to protect workers, consumers and the environment by labelling that reflects a particular chemical's possible hazards.

☰ MENÜ

🔍 SCHNÜCCHE 🔍

 Suchtipps

Brauchen Sie weitere Suchoptionen? Nutzen Sie die [Erweiterte Suche](#)

EUROPA > EUR-Lex-Startseite > Suchergebnisse > EUR-Lex - C 1272-20221217 - DE

← Zurück zur Ergebnisliste 1/306

Dokument 02008R1272-20221217

   [Teilen](#)

Konsolidierter Text: Verordnung (EG) Nr. 1272/2008 des Europäischen Parlaments und des Rates vom 16. Dezember 2008 über die Einstufung, Kennzeichnung und Verpackung von Stoffen und Gemischen, zur Änderung und Aufhebung der Richtlinien 67/548/EWG und 1999/45/EG und zur Änderung der Verordnung (EG) Nr. 1907/2006 (Text von Bedeutung für den EWR)Text von Bedeutung für den EWR

















































[Zum ursprünglichen Rechtsakt](#) (🟢 In Kraft)

[Zur geltenden Fassung \(20/04/2023\)](#)

ELI: <http://data.europa.eu/eli/reg/2008/1272/2022-12-17>

⌵ Alle ausklappen ⌵ Alle einklappen

⌵ **Verfügbare Sprachen und Formate**

	BG	ES	CS	DA	DE	ET	EL	EN	FR	GA	HR	IT	LV	LT	HU	MT	NL	PL	PT	RO	SK	SL	FI	SV
HTML																								
PDF																								

⌵ **Mehrsprachige Anzeige**

Text

Informationen zum Dokument

 In „Meine Artikel“ speichern

 Aktueller Link

 Permalink

 Angaben herunterladen

🔄 Alle Fassungen verbergen

20/04/2023

17/12/2022

01/03/2022

26/07/2019

EUR-Lex is a legal information system that provides immediate and free access to the legislation of the European Union.

REACH (for the protection of human health and the environment)

Registration, Evaluation, Authorizations and Restriction of Chemicals (REACH) is a European Union regulation dating from 18 December 2006. REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment.

One of the major elements of the REACH regulation is the requirement to communicate information on chemicals up and down the supply chain. This ensures that manufacturers, importers, and also their customers are aware of information relating to health and safety of the products supplied. Having detailed information on the substances present in their products will allow retailers to work with the manufacturing base to substitute or remove potentially harmful substances from products.

LEGISLATION

CONSULTATIONS

INFORMATION ON CHEMICALS

SUPPORT

ECHA > Legislation > REACH > Understanding REACH

REACH

Understanding REACH

Substance Identification

Registration

Understanding REACH

REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals.

stances; not only those used in
lives, for example in cleaning products,
mixture and electrical appliances.
most companies across the EU.

es. To comply with the regulation,
s linked to the substances they
to demonstrate to ECHA how the
communicate the risk management

n restrict the use of substances in
rious substances should be substituted

REACH stands for Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force on 1 June 2007.

How does REACH work?

REACH establishes procedures for collecting and assessing information on the properties and hazards of substances.

Companies need to register their substances and to do this they need to work together with other companies who are registering the same substance.

ECHA receives and evaluates individual registrations for their compliance, and the EU

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QUESTIONS AND ANSWERS

- Questions Answers on REACH
- Questions and Answers on Import of substances into the EU
- Questions and Answers on Only Representative of non-EU manufacturer

SEE ALSO UNDER THE CHEMICALS IN OUR LIFE WEBSITE



- How are chemicals controlled
- Industry to register chemicals
- Safety precautions and exposure

ECHA (European Chemicals Agency) is an EU authority that regulates the technical, scientific and administrative aspects of the registration, evaluation and authorization of chemicals in accordance with the Regulation.

Nanomaterials

Assessment of regulatory needs

PBT assessment

Endocrine disruptor assessment

Cooperation with authorities and stakeholders

Addressing substances of concern



LEGISLATION

CONSULTATIONS

INFORMATION ON CHEMICALS

SUPPORT

ECHA > Legislation

Legislation



The **REACH** Regulation aims to improve the protection of human health and the environment from the risks that can be posed by chemicals.

▪ [Read more](#)



The **CLP** Regulation ensures that the hazards presented by chemicals are clearly communicated to workers and consumers in the EU through classification and labelling of chemicals.

▪ [Read more](#)



The **BPR** aims to improve the functioning of the biocidal products market in the EU, while ensuring a high level of protection for humans and the environment.

▪ [Read more](#)



The **PIC Regulation** administers the import and export of certain hazardous chemicals and places obligations on companies who wish to export these chemicals to non-EU countries.

▪ [Read more](#)



The **Chemical Agents Directive (CAD)** and the **Carcinogens, Mutagens or Reprotoxic substances Directive (CMRD)** provide a framework for setting occupational exposure limits, forming an integral part of the EU's mechanism for protecting the health of workers.

▪ [Read more](#)



The **Waste Framework Directive** sets out measures addressing the adverse impacts of the generation and management of waste on the environment and human health, and for improving efficient use of resources which are crucial for the transition to a circular economy.

▪ [Read more](#)



The **POPs Regulation** bans or severely restricts the production and use of persistent organic pollutants in the European Union.

▪ [Read more](#)



The revised **Drinking Water Directive** aims to protect citizens and the environment from the harmful effects of contaminated drinking water and to improve access to drinking water.

▪ [Read more](#)



GHS in Switzerland

With the publication of the **Chemicals Ordinance (ChemO)** of 14 January 2009, the Federal Council has taken a first step towards the introduction of the GHS in Switzerland. Since 1 February 2009, chemicals (substances and preparations) may be placed on the market in Switzerland for professional use if they have been classified, labeled and packaged in accordance with the rules of the CLP Regulation. In doing so, Switzerland avoids barriers to trade in cross-border trade in chemicals. The existing high level of protection when handling chemical products is maintained.

Allgemeine Informa

Dieser Text ist in Kraft

- Abkürzung
- Beschluss
- Inkrafttreten
- Quelle
- Sprache(n) der Veröff
- Chronologie
- Änderungen
- Zitate

Home > Classified Compilation > 8 Health - Employment - Social security > 81 Health > 813.11 Ordinance of 5 June 2015 on Protection against Dangerous Substances and Preparations (Chemicals Ordinance, ChemO)

General information	
This text is in force	
Abbreviation	ChemO
Decision	June 5, 2015
In force	July 1, 2015
Source	AS 2015 1903
Publication language	DE FR IT EN

813.11

Expand all | Article overview | Collapse all

English is not an official language of the Swiss Confederation. This translation is provided for information purposes only and has no legal force.

Ordinance on Protection against Dangerous Substances and Preparations (Chemicals Ordinance, ChemO)

of 5 June 2015 (Status as of 1 January 2024)

The Swiss Federal Council,

based on Article 19 paragraphs 2 and 3 of the Animal Welfare Act of 16 December 2005¹,
 on the Chemicals Act of 15 December 2000² (ChemA),
 on Article 26 paragraph 3, 29, 30a–30d, 38 paragraph 3, 39 paragraph 1, 41 paragraph 3, 44 paragraphs 2 and 3, 46 paragraphs 2 and 3 and 48 paragraph 2 of the Federal Act of 7 October 1983³ on the Protection of the Environment (EPA),
 and on Article 9 paragraph 2 letter c, 27 paragraph 2 and 48 paragraph 2 of the Waters Protection Act of 24 January 1991⁴,
 and in implementation of the Federal Act of 6 October 1995⁵ on Technical Barriers to Trade,⁵

ordains:

Additional information	
Notes	
Annex 3 is not published in the AS.	

Tools	
Language comparison	

Zusätzliche Informa

Hinweis
Anhang 3 ist in der A
veröffentlicht.

Werkzeug

Sprachenvergleich

Alle Fassungen

GHS pictograms - 9 hazard symbols and their meaning



GHS01 Explosive



GHS04 Compressed Gas



GHS07 Harmful



GHS02 Flammable



GHS05 Corrosive



GHS08 Health Hazard



GHS03 Oxidizing



GHS06 Toxic



GHS09 Environmental Hazard

GHS - Hazard Pictograms and Related Hazard Classes



Explosing Bomb

- Explosive
- Self-reactives
- Organic Peroxides



Corrosion

- Skin corrosion/burns
- Eye damage
- Corrosive to metals



Flame Over Circle

- Oxidizing gases
- Oxidizing liquids
- Oxidizing solids



Gas Cylinder

- Gases under pressure



Environment

- Aquatic toxicity



Skull & Crossbones

- Acute toxicity (fatal or toxic)



Exclamation Mark

- Irritant (eye & skin)
- Skin sensitizer
- Acute toxicity
- Narcotic effects
- Respiratory tract irritant
- Hazardous to ozone layer (non-mandatory)



Health Hazard

- Carcinogen
- Mutagenicity
- Reproductive toxicity
- Respiratory sensitizer
- Target organ toxicity
- Aspiration toxicity



Flame

- Flammables
- Pyrophorics
- Self-heating
- Emits flammable gas
- Self-reactives
- Organic peroxides

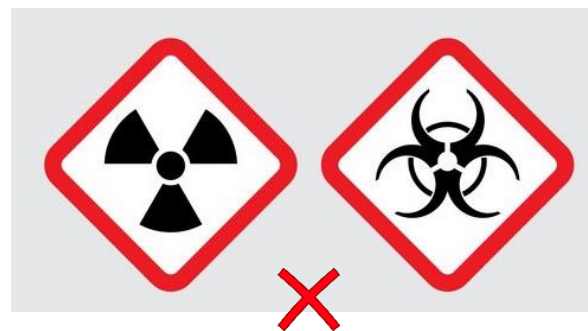


Biohazard

- Biohazardous infectious materials

Why are there only **9 GHS** symbols?

Why not 2 more GHS symbols such as biohazard or radioactivity?



The GHS concept mainly regulates the system of chemicals Classification, Labelling and Packaging on a global level. The biological hazards, radiation protection, etc. are other regulatory systems.

Signal Words

- **Danger / Gefahr** – more severe hazards
- **Warning / Achtung** – less severe hazards



DANGER

TOLUENE

**HIGHLY FLAMMABLE LIQUID
AND VAPOR!**

May be fatal if swallowed and enters airways.
Causes damage to central nervous system if inhaled.
Do not breathe vapors.
Keep away from heat, sparks and flame - No smoking.

**PROTECTIVE GLOVES, EYE/FACE PROTECTOR
AND VAPOR RESPIRATOR ARE REQUIRED IN THIS AREA.**



WARNING

CARBON DIOXIDE

**CONTAINS GAS UNDER PRESSURE
MAY EXPLODE IF HEATED
MAY BE HARMFUL IF INHALED**

May displace oxygen in breathing air and lead
to suffocation and death, particularly
in confined spaces.
Protect from sunlight.
Store in a well-ventilated place.



WEAR PROTECTIVE GLOVES AND EYE/FACE PROTECTION.

Hazard class




The GHS describes the nature and severity of a chemical hazard by hazard class and hazard category:

For hazardous substances, the **GHS hazard** class indicate the type of physical hazard, human health hazard, or environmental hazard.


Examples of hazard classes:

Flammable gases (including chemically unstable and pyrophoric gases)






Entzündbare Gase (einschließlich chemisch instabiler und pyrophorer Gase) [[Bearbeiten](#) | [Quelltext bearb](#)]

Hazard class Gefahrenklasse	Gefahrenklasse- Gefahrenkategorie-Code	Unterkategorie	Piktogramm	Signalwort	Gefahren- hinweis	
 2.2. Entzündbares Gas	1A	Flam. Gas 1A	GHS02 	Gefahr	<u>H220</u>	
		Pyr. Gas pyrophore Gase	GHS02 	Gefahr	<u>H220-232</u>	
		Chemisch instabiles Gas ^[Anm. 1]	Chem. Unst. Gas A	GHS02 	Gefahr	<u>H220-230</u>
			Chem. Unst. Gas B	GHS02 	Gefahr	<u>H220-231</u>
	1B	Flam. Gas 1B	GHS02 	Gefahr	<u>H221</u>	
	2	Flam. Gas 2	–	Achtung	<u>H221</u>	

Gases under pressure Further examples of hazard classes (Gefahrenklasse)

Gefahrenklasse	Gefahrenklasse-Gefahrenkategorie-Code	Piktogramm	Signalwort	Gefahrenhinweis	entspricht im Gefahrgut	entspricht RL 67/548/EWG (veraltet) [Anm. 1]
2.5 verdichtetes Gas	Press. Gas (Comp.)	GHS04 	Achtung	H280	Klasse 2 	keine Entsprechung
2.5 verflüssigtes Gas	Press. Gas (Liq.)	GHS04 	Achtung	H280		
2.5 tiefgekühltes verflüssigtes Gas	Press. Gas (Ref. Liq.)	GHS04 	Achtung	H281		
2.5 gelöstes Gas	Press. Gas (Diss.)	GHS04 	Achtung	H280		

Flammable liquids

Gefahrenklasse	Gefahrenklasse-Gefahrenkategorie-Code	Piktogramm	Signalwort	Gefahrenhinweis	entspricht im Gefahrgut	entspricht RL 67/548/EWG (veraltet)
2.6 Entzündbare Flüssigkeiten	Flam. Liq. 1	GHS02 	Gefahr	H224	Klasse 3 	 F+ R12
	Flam. Liq. 2	GHS02 	Gefahr	H225		 F R11
	Flam. Liq. 3	GHS02 	Achtung	H226		Kein Symbol R10[Anm. 1]
	Flam. Liq. 4[Anm. 2]	–	–	Achtung	H227[Anm. 3]	Keine Entsprechung[Anm. 4]

Serious eye damage/eye irritation

Gefahrenklasse 3.3	Gefahrenklasse- Gefahrenkategorie-Code	Piktogramm	Signalwort	Gefahrenhinweis
Gesundheitsgefahren				
 Schwere Augenschädigung/Augenreizung	Eye Dam. 1	GHS05 	Gefahr	H318
	Eye Irrit. 2	GHS07 	Achtung	H319
	Eye Irrit. 2B ^[Anm. 1]	–	Achtung	H320 ^[Anm. 2]



Carcinogenicity

Gefahrenklasse 3.6	Gefahrenklasse- Gefahrenkategorie-Code	Piktogramm	Signalwort	Gefahrenhinweis
Gesundheitsgefahren				
 Karzinogenität	Carc. 1A	GHS08 	Gefahr	H350
	Carc. 1B			
	Carc. 2	GHS08 	Achtung	H351

Hazard classes for the environmental hazard

Note: **There are two GHS pictograms for environmental hazard!**


Water hazard long-term (chronic)

Gefahrenklasse	Gefahrenklasse-Gefahrenkategorie-Code	Piktogramm	Signalwort
4.1	Umweltgefahren		
chronisch gewässergefährdend	Aquatic Chronic 1	GHS09 	Achtung
	Aquatic Chronic 2	GHS09 	–
	Aquatic Chronic 3	–	–
	Aquatic Chronic 4	–	–

Water hazard short terms (acute)

Gefahrenklasse	Gefahrenklasse-Gefahrenkategorie-Code	Piktogramm	Signalwort
4.1	Umweltgefahren		
akut gewässergefährdend	Aquatic Acute 1 ^[Anm. 1]	GHS09 	Achtung
	Aquatic Acute 2 ^[Anm. 3]	–	–
	Aquatic Acute 3 ^[Anm. 6]	–	–

Ozone layer harmful

Gefahrenklasse	Gefahrenklasse-Gefahrenkategorie-Code	Piktogramm	Signalwort	Gefahrenhinweis
5.1	Umweltgefahren			
die Ozonschicht schädigend	Ozone 1	GHS07 	Achtung	H420

<https://de.wikipedia.org/wiki/Gefahrenklasse>

New hazard classes 2023

The European Commission has published a Delegated Regulation amending CLP Regulation, which sets out new hazard classes and criteria for the classification, labelling and packaging of substances and mixtures.

It applies to all chemical substances and mixtures placed on the EU market under REACH. It also applies to active substances in biocidal products and plant protection products, which are normally prioritised for harmonised classification in the EU.

This EU legislation is binding to manufacturers, importers, downstream users and distributors placing substances on the European Union market. Member States will also refer to the new hazard classes and criteria when making proposals for harmonised classification and labelling.

The new hazard classes are:

- ED HH in Category 1 and Category 2 (Endocrine disruption for human health)
- ED ENV in Category 1 and Category 2 (Endocrine disruption for the environment)
- PBT (persistent, bioaccumulative, toxic), vPvB (very persistent, very bioaccumulative)
- PMT (persistent, mobile, toxic), vPvM (very persistent, very mobile)

New EU hazard statements:

Hazard class and category code	Hazard statement code	Hazard statement
ED HH 1	EUH380	May cause endocrine disruption in humans
ED HH 2	EUH381	Suspected of causing endocrine disruption in humans
ED ENV 1	EUH430	May cause endocrine disruption in the environment
ED ENV 2	EUH431	Suspected of causing endocrine disruption in the environment
PBT	EUH440	Accumulates in the environment and living organisms including in humans
vPvB	EUH441	Strongly accumulates in the environment and living organisms including in humans
PMT	EUH450	Can cause long-lasting and diffuse contamination of water resources
vPvM	EUH451	Can cause very long-lasting and diffuse contamination of water resources

Always be informed about updates and changes!




Hazard category

The GHS **hazard category** is the subdivision of the criteria within each hazard class. For example, the flammable liquids hazard class can be divided into 4 categories, with category 1 for flammable liquids being the greatest hazard.

The categorization - Two examples




Example of categorization for *Flammable liquids*:

FLAMMABLE LIQUIDS			
Category 1	Category 2	Category 3	Category 4
			No pictogram
Danger Extremely flammable liquid and vapor	Danger Highly flammable liquid and vapor	Warning Flammable liquid and vapor	Warning Combustible liquid
FP <=23C and BP <=35C	FP <=23C and BP >35C	FP >23C and <=60C	FP >60C and <=93C

The flash point (FP) of a material is the "lowest liquid temperature at which, under certain standardized conditions, a liquid gives off vapours in a quantity such as to be capable of forming an ignitable vapour/air mixture"

Boiling point (BP): The temperature at which the vapor pressure of a liquid equals the ambient pressure.



 <p>Hexan</p> <p>Teflonverschluss</p>	$ \begin{array}{cccccc} H & H & H & H & H & H \\ & & & & & \\ H-C & -C & -C & -C & -C & -C-H \\ & & & & & \\ H & H & H & H & H & H \end{array} $ <p>Klare, farblose Flüssigkeit</p> <p>Vorkommen Erdöl</p>	<p>Molmasse 86,175 g/mol</p> <p>AGW 50 ml/m³ (TRGS 900)</p> <p>Dichte 0,6593 g/cm³</p> <p>Schmelzpunkt -95,27 °C</p> <p>Siedepunkt +68,72 °C</p> <p>Wasserlöslichkeit bei 25 °C 10 mg/l</p> <p>Brechungsindex (20°C) 1,3727</p> <p>Explosionsgrz. 1,1 bis 7,5 Vol.-% (Luft)</p> <p>Flammpunkt -22 °C</p> <p>Zündpunkt +225 °C</p>
<p>Piktogramme</p> <p>GHS 02</p> <p>GHS 07</p> <p>GHS 08</p> <p>GHS 09</p> <p>Gefahr</p>	<p>Gefahrenklassen + Kategorie</p> <p>Entzündbare Flüssigkeiten 2</p> <p>Ätz-/Reizwirkung auf die Haut 2</p> <p>Reproduktionstoxizität (F) 2</p> <p>Spez. Zielorgantoxizität e. ZNS 3</p> <p>Spez. Zielorgantoxizität w. 2</p> <p>Aspirationsgefahr 1</p> <p>Gewässergefährdend chron. 2</p>	<p>HP-Sätze (siehe auch Hinweis)</p> <p>H 225, 304, 315, 336, 361f, 373, 411</p> <p>P 210, 261, 273, 280-1-3, 301+310, 331, 304+340, 403+235</p> <p>Entsorgung G 1</p>
<p>Etikett drucken</p>	<p>Dt. Bezeichnung</p> <p>Synonyme (deutsch)</p>	<p>Engl. Bezeichnung</p> <p>Synonyme (engl.)</p>
<p>CAS 110-54-3</p>	<p>Hexan</p> <p><i>n</i>-Hexan</p>	<p>Hexane</p> <p><i>n</i>-Hexane</p>

Toxic







Acute Toxicity (Oral/Dermal/Inhalation): oral (ingestion by mouth), dermal (skin) or inhalation (inhalation) by gases/vapors/dust

The **categorization with the LD₅₀ values** (= abbreviation for "lethal dose of a toxin, radiation, or pathogen is the dose required to kill half the members of a tested population after a specified test duration).

Acute Toxicity	Category 1	Category 2	Category 3	Category 4	Category 5
Oral (mg/kg)	≤5	>5 ≤50	>50 ≤300	>300 ≤2000	Criteria • Anticipated oral LD ₅₀ between 2000 and 5000 mg/kg; • Indication of significant effect in humans;* • Any mortality at class 4;* • Significant clinical signs at class 4;* • Indications from other studies;* *If assignment to a more hazardous class is not warranted.
Dermal (mg/kg)	≤50	>50 ≤200	>200 ≤1000	>1000 ≤2000	
Gases (ppm)	≤100	>100 ≤500	>500 ≤2500	>2500 ≤5000	
Vapors (mg/l)	≤0.5	>0.5 ≤2.0	>2.0 ≤10	>10 ≤20	
Dusts & Mists (mg/l)	≤0.05	>0.05 ≤0.5	>0.5 ≤1.0	>1.0 ≤5	

Example of categorization *Acute toxicity, oral*:

ACUTE TOXICITY: ORAL				
Category 1	Category 2	Category 3	Category 4	Category 5
				No pictogram
Danger Fatal if swallowed	Danger Fatal if swallowed	Danger Toxic if swallowed	Warning Harmful if swallowed	Warning May be harmful if swallowed

NOTE: Criteria for classification is acute LD50 or LC50. OSHA did not adopt Category 5 for acute toxicity.

Notice that the category numbers go from low to high with lower numbers being more severe.

Kaliumcyanid, Cyankali KCN		
 <p>Teflonverschluss</p>	<p>In dunkler Flasche unter Verschluss aufbewahren</p> <p>Weißer Kristalle</p>	<p>Molmasse 65,116 g/mol</p> <p>AGW 1 mg/m³ E Dichte 1,55 g/cm³ Schmelzpunkt +622 °C Wasserlöslichkeit 100g H₂O lösen bei 20 °C 71,6 g</p>
<p>Piktogramme</p> <p>GHS 06 GHS 09 Gefahr</p>	<p>Gefahrenklassen + Kategorie</p> <p>Akute Toxizität oral 2 Akute Toxizität dermal 1 Akute Toxizität inhalativ 2 Gewässergefährdend akut/chron. 1</p>	<p>HP-Sätze (siehe Hinweis)</p> <p>H 300, 310, 330, 410, EUH032 P 260, 262, 264.1, 273, P280.1-4+6+7, P301+310, 302+350, Entsorgung besondere Hinweise</p>
	Deutscher Name	Englischer Name
CAS 151-50-8	Kaliumcyanid	Potassium cyanide

Programm	Gefahrenklasse und Gefahrenkategorie		H-Sätze	
 Gefahr	Ätzwirkung auf die Haut, Kategorien	1	H314	
		1A		
1B				
1C				
	Schwere Augenschädigung, Kategorie	1	H318	
 Gefahr	Akute Toxizität, Kategorien	oral	H300	
		dermal	1,2	H310
		inhalativ		H330
	Akute Toxizität, Kategorien	oral	3	H301
		dermal		H311
		inhalativ		H331
 Gefahr	Akute Toxizität, Kategorien	oral	4	H302
		dermal		H312
		inhalativ		H332
	Hautreizend, Kategorie	2	H315	
	Augenreizung, Kategorie	2	H319	
Sensibilisierung der Haut, Kategorie	1, 1A, 1B	H317		
 Gefahr Gefahr	Spezifische Zielorgan-Toxizität (einmalige Exposition), Kategorie	Atemwegsreizung	3	H335
		narkotisierende Wirkungen		H336
	Sensibilisierung der Atemwege, Kategorie	1, 1A, 1B	H334	
	Keimzellmutagenität, Kategorien	1A, 1B	H340	
		2	H341	
	Karzinogenität, Kategorien	1A, 1B	H350 ²	
		2	H351	
	Reproduktionstoxizität, Kategorien	1A, 1B	H360 ³	
		2	H361 ³	
	Zusatzkategorie für Wirkungen auf/über Laktation		H362 ⁴	
	Spezifische Zielorgan-Toxizität (einmalige Exposition), Kategorien	1	H370	
		2	H371	
	Spezifische Zielorgan-Toxizität (wiederholte Exposition), Kategorien	1	H372	
		2	H373	
	Aspirationsgefahr, Kategorie	1	H304	

HAZARD RISK ASSESSMENT MATRIX

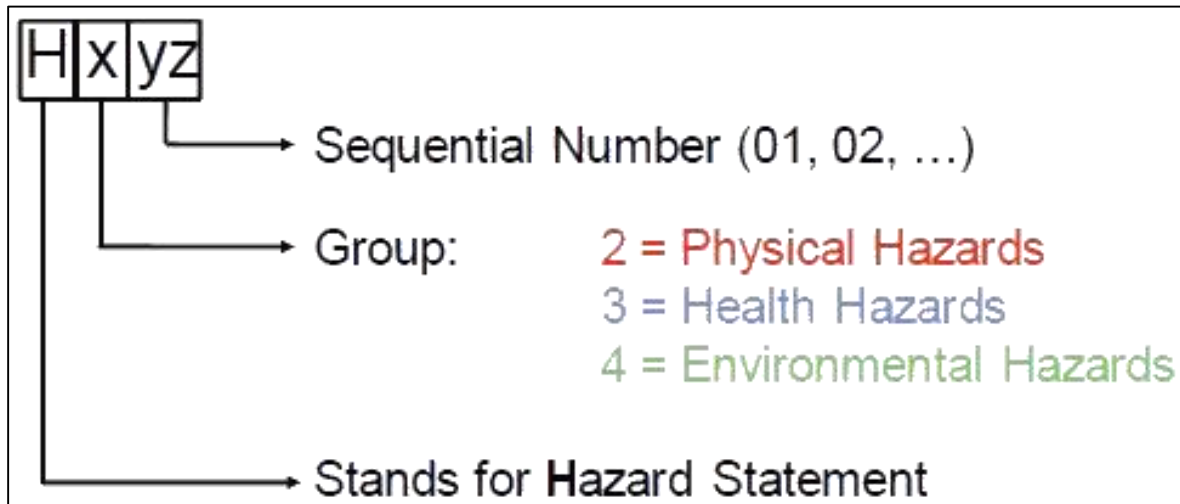
Frequency of Occurrence	Hazard Categories			
	1 Catastrophic	2 Critical	3 Serious	4 Minor
(A) Frequent	1A	2A	3A	4A
(B) Probable	1B	2B	3B	4B
(C) Occasional	1C	2C	3C	4C
(D) Remote	1D	2D	3D	4D
(E) Improbable	1E	2E	3E	4E

Unacceptable
 High
 Medium
 Low

The meaning of the category labels

- **Skin Corrosion/Irritation**
 - Categories **1A, 1B, 1C** (severe skin burns and eye damage)
 - Category **2** (skin irritation)
- **Serious Eye Damage/Eye Irritation**
 - Category **1** (serious eye damage)
 - Category **2** (severe eye irritation)
- **Respiratory or Skin Sensitization - inhalation allergens - skin allergen**
- **Germ Cell Mutagenicity**
 - Category **1A** (Substances known to cause inheritable mutations in germ cells of humans)
 - Category **1B** (substances with high probability)
 - Category **2** (substances with a potential)
- **Carcinogenicity**
 - Category **1A** (Substances known to have carcinogenic potential for humans)
 - Category **1B** (Substances presumed to have carcinogenic potential for humans)
 - Category **2** (Suspected human carcinogens)
- **Reproductive Toxicology**
- **Target Organ Systemic Toxicity - Single Exposure**
- **Target Organ Systemic Toxicity - Repeated Exposure**
- **Aspiration Toxicity**

Hazard statements (H statements)



H200 - Unstable explosives.

H201 - Explosive; mass explosion hazard.

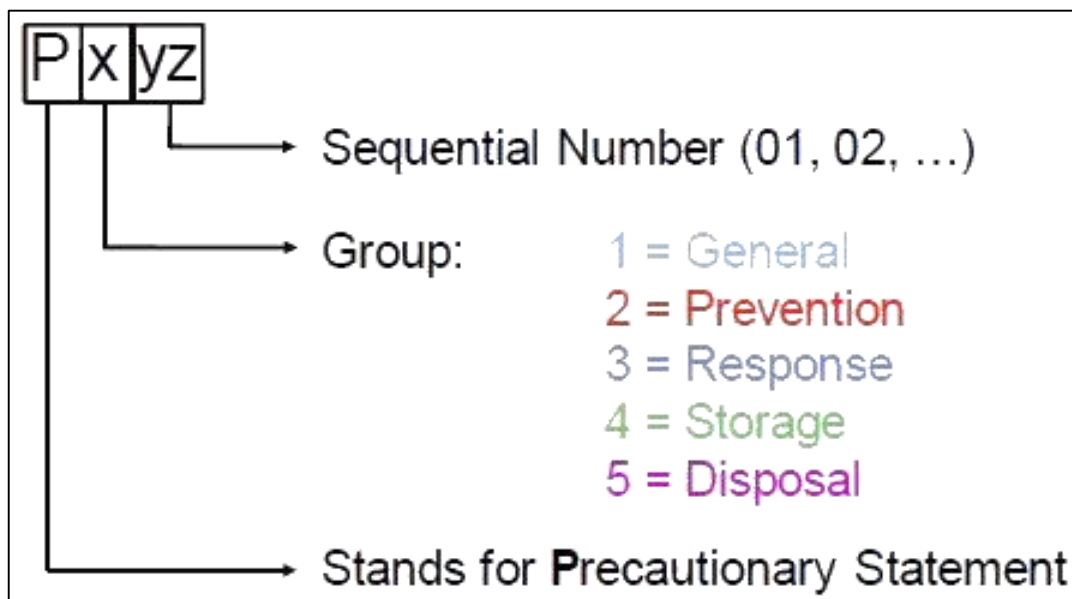
H202 - Explosive, severe projection hazard.

H203 - Explosive; fire, blast or projection hazard.

H204 - Fire or projection hazard.

and so on

Precautionary statements (P statements)



P101 - If medical advice is needed, have product container or label at hand.

P102 - Keep out of reach of children.

P103 - Read label before use.

P201 - Obtain special instructions before use.

P202 - Do not handle until all safety precautions have been read and understood.

P210 - Keep away from heat/sparks/open flames/hot surfaces – No smoking.

and so on

The Basic Parts of A GHS-Compliant Label

1 →

n-Propyl Alcohol

UN No. 1274

CAS No. 71-23-8

2 →

DANGER

3 →

Highly flammable liquid and vapor. Causes serious eye damage.
May cause drowsiness and dizziness.

4 →

Keep away from heat/sparks/open flames/hot surfaces. No smoking. Avoid breathing fumes/mist/vapours/spray. Wear protective gloves/protective clothing/eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present. Continue rinsing.

5 →

Fill Weight: 18.65 lbs.

Lot Number: B56754434

Gross Weight: 20 lbs.

Fill Date: 6/21/2013

Expiration Date: 6/21/2020

See SDS for further information.

Acme Chemical Company • 711 Roadrunner St. • Chicago, IL 60601 USA • www.acmechem.com • 123-444-5567



1. **Product Identifier** - Should match the product identifier on the Safety Data Sheet.

2. **Signal Word** - Either use "Danger" (severe) or "Warning" (less severe)

3. **Hazard Statements** - A phrase assigned to a hazard class that describes the nature of the product's hazards

4. **Precautionary Statements** - Describes recommended measures to minimize or prevent adverse effects resulting from exposure.

5. **Supplier Identification** - The name, address and telephone number of the manufacturer or supplier.

6. **Pictograms** - Graphical symbols intended to convey specific hazard information visually.

International Placards for the Transportation of Dangerous Goods

Hazardous substances:

The hazard arises during manufacture, storage or use.

Dangerous goods:

These are only those substances that pose a danger during transport of some kind.

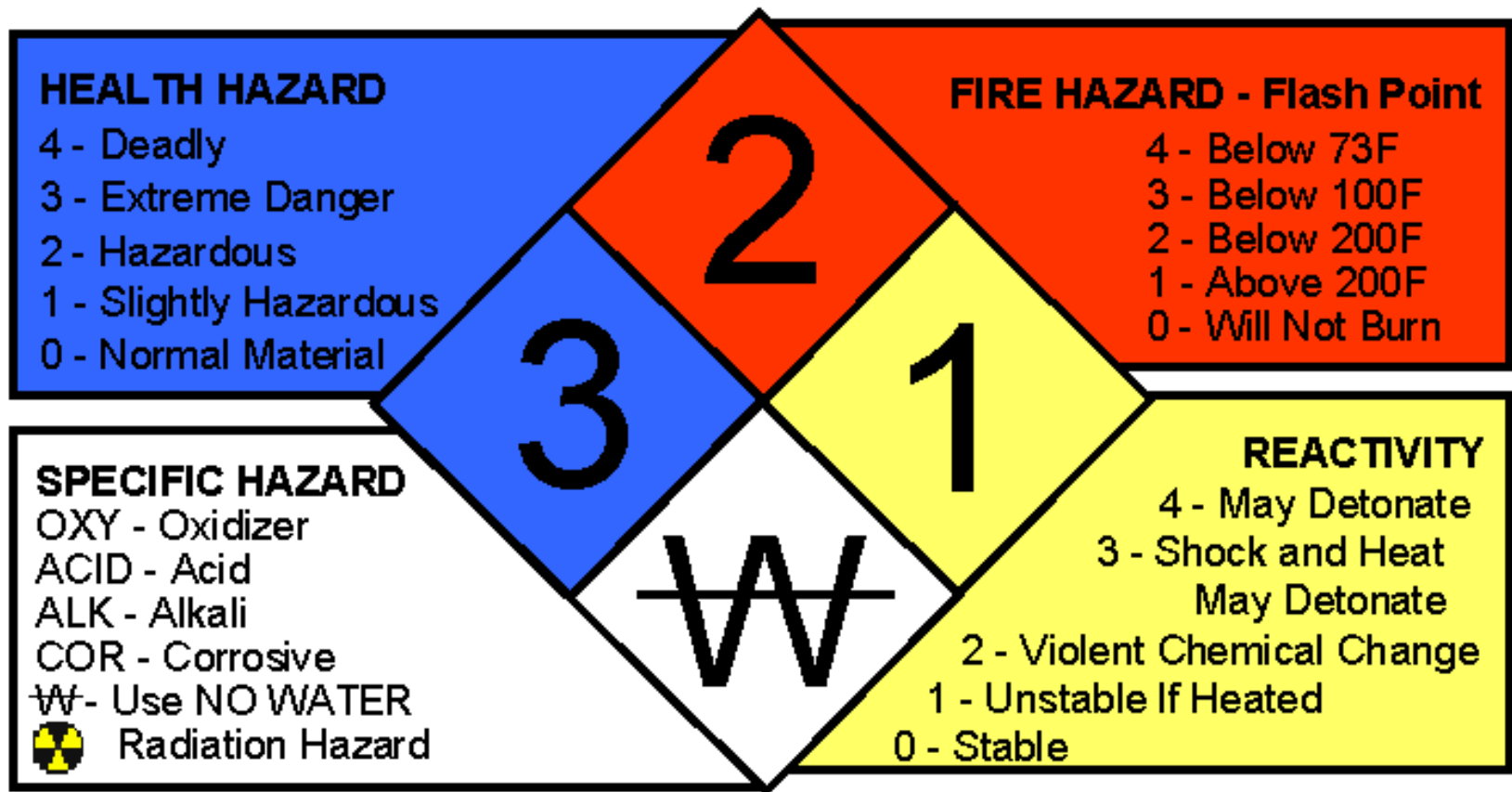
Class 1 Explosives	Class 2 Gases	Classes 3 and 4: Flammable liquids and solids	Other GHS transport classes	Non-GHS transport pictograms	
 Divisions 1.1–1.3	 Flammable gases	 Flammable liquids	 Oxidizing substances	 Infectious substances	 Radioactive material
 Divisions 1.4	 Non-flammable non-toxic gases	 Flammable solids	 Organic peroxides	 Miscellaneous dangerous substances and articles	 Radioactive material
 Divisions 1.5	 Toxic gases	 Substances liable to spontaneous combustion	 Toxic substances	 Radioactive material	
 Divisions 1.6		 Substances which in contact with water emit flammable gases	 Corrosive substances	 Corrosive substances	

Apart from the GHS symbols, there are many others to consider.

Note: Many old safety sign symbols (e.g. Fire, Prohibition, Hazard) were replaced.



US chemical hazard diamond



The US-based **National Fire Protection Association** (NFPA) has a standard NFPA 704 using a diamond with four colored sections each with a number indicating severity 0 - 4 (0 for no hazard, **4 indicates a severe hazard**). The red section denotes flammability. The blue section denotes health risks. Yellow represents reactivity (tendency to explode). The white section denotes special hazard information.

Something is wrong here. Can you see it?



AMMONIA, ANHYDROUS (ANHYDROUS AMMONIA)

DANGER:
HARMFUL IF INHALED.
CONTAINS GAS UNDER PRESSURE: MAY EXPLODE IF HEATED.
CAUSES SEVERE SKIN BURNS AND EYE DAMAGE.
CORROSIVE TO RESPIRATORY TRACT.
FLAMMABLE GAS.
VERY TOXIC TO AQUATIC LIFE.

Use in accordance with ANSI/CGA G-2.1 and 29 CFR 1910.111. Do not breathe gas. Do not get in eyes, on skin, or on clothing. Use and store only outdoors or in a well ventilated place. Keep away from heat/open flames/sparks/ hot surfaces - No Smoking. Eliminate all ignition sources if safe to do so. Leaking gas fire: do not extinguish, unless leak can be stopped safely. Use only with equipment of compatible materials of construction and rated for cylinder pressure. Use a back flow preventive device in the piping. Protect from sunlight when ambient temperature exceeds 52 °C/125 °F. Close valve after each use and when empty. Do not open valve until connected to equipment prepared for use. Wear protective gloves/protective clothing/eye protection/respiratory protection and/or face protection. Avoid release to the environment. Dispose of contents/container in accordance with container supplier/owner instructions. Do not handle until all safety precautions have been read and understood. Read and follow the Safety Data Sheet (SDS) before use. CAS: 7664-41-7

FIRST AID:

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/physician if feeling unwell.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
IF ON SKIN (OR HAIR): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. Immediately call a poison center or doctor/physician.
IF SKIN IRRITATION OCCURS: Get medical advice/attention.



DO NOT
REMOVE THIS
PRODUCT LABEL.

Airgas.
an Air Liquide company

Airgas Specialty Products

2530 Sever Road • Suite 300 • Lawrenceville, GA 30043
800-295-2225 • 800-528-4963 (Emergency)
Safety Data Sheets available at www.airgas.com

117266 (R110)

Ammonia (Anhydrous)

DANGER



Fatal if inhaled. Causes severe skin burns and eye damage. Contains gas under pressure, may explode if heated. Very toxic to aquatic life.

Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.

Skin Contact (or Hair): Remove/Take off immediately all contaminated clothing. Rinse Skin with water/shower.

Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.

Store in a locked cabinet. Protect from sunlight. Store in a well-ventilated place.

See Material Safety Data Sheet for further details regarding safe use of this product.

ABC Chemical Supply

123 Nearby Blvd. Anytown, US 12345

(987) 654-3210

Something is wrong here. Can you see it?

AMMONIA, ANHYDROUS (ANHYDROUS AMMONIA)



DANGER:

HARMFUL IF INHALED.
CONTAINS GAS UNDER PRESSURE. MAY EXPLODE IF HEATED.
CAUSES SEVERE SKIN BURNS AND EYE DAMAGE.
CORROSIVE TO RESPIRATORY TRACT.
FLAMMABLE GAS.
VERY TOXIC TO AQUATIC LIFE.

Use in accordance with ANSI/CGA G-2.1 and 29 CFR 1910.111. Do not breathe gas. Do not get in eyes, on skin, or on clothing. Use and store only outdoors or in a well ventilated place. Keep away from heat/open flames/sparks/ hot surfaces - No Smoking. Eliminate all ignition sources if safe to do so. Leaking gas fire: do not extinguish, unless leak can be stopped safely. Use only with equipment of compatible materials of construction and rated for cylinder pressure. Use a back flow preventive device in the piping. Protect from sunlight when ambient temperature exceeds 52 °C/125 °F. Close valve after each use and when empty. Do not open valve until connected to equipment prepared for use. Wear protective gloves/protective clothing/eye protection/respiratory protection and/or face protection. Avoid release to the environment. Dispose of contents/container in accordance with container supplier/owner instructions. Do not handle until all safety precautions have been read and understood. Read and follow the Safety Data Sheet (SDS) before use. CAS: 7664-41-7

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IF SKIN IRRITATION OCCURS: Get medical advice/attention.



DO NOT REMOVE THIS PRODUCT LABEL.

Airgas.
an Air Liquide company

Airgas Specialty Products
2530 Sever Road • Suite 300 • Lisle, IL 60532 • USA
800-295-2225 • 800-528-4900 • 708-295-2225
Safety Data Sheets available at www.airgas.com

11756 (05/16)

Ammonia (Anhydrous)



DANGER



Fatal if inhaled. Causes severe skin burns and eye damage. Contains gas under pressure; may explode if heated. Very toxic to aquatic life.
Contact with eyes: Flush eyes immediately with plenty of water for 15 minutes and seek medical advice immediately.
Skin Contact (or Hair): Remove/Take off immediately all contaminated clothing. Rinse Skin with water/shower.
Inhalation: Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. Seek medical advice.
Store in a locked cabinet. Protect from sunlight. Store in a well-ventilated place.

See Material Safety Data Sheet for further details regarding safe use of this product.

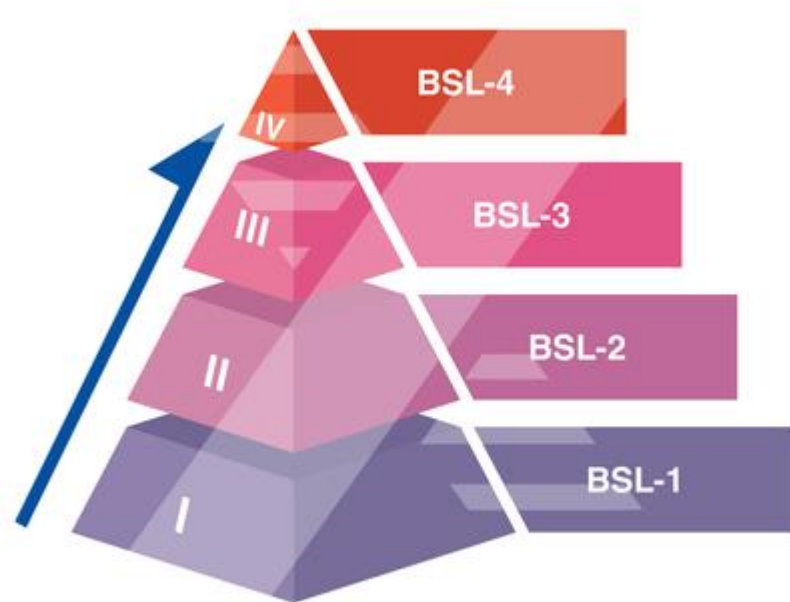
ABC Chemical Supply

123 Nearby Blvd. Anytown, US 12345

(987) 654-3210

In the Safety Data Sheet of ammonia, it is less toxic in the USA (category 4, GHS symbol exclamation mark) than in Europe (category 3, GHS symbol skull and crossbones!)

Biological hazard



BSL = Biosafety level

The organisms are divided into four groups. The classification is based on the risk they pose according to the current state of scientific knowledge, i.e. the harmful properties and the probability that these will have an effect.

The groups are described as follows:

Group 1: Organisms that have no or negligible risk (e.g., genetically non-pathogenic E.coli strains).

Group 2: Organisms that pose a low risk (e.g., human rhinoviruses).

Group 3: Organisms that pose a moderate risk (e.g., Salmonella typhi, HIV).

Group 4: Organisms that pose a high risk (e.g. Ebola).



When handling organisms of groups 1 - 4, biological laboratories are classified analogously into safety levels L1 - L4.

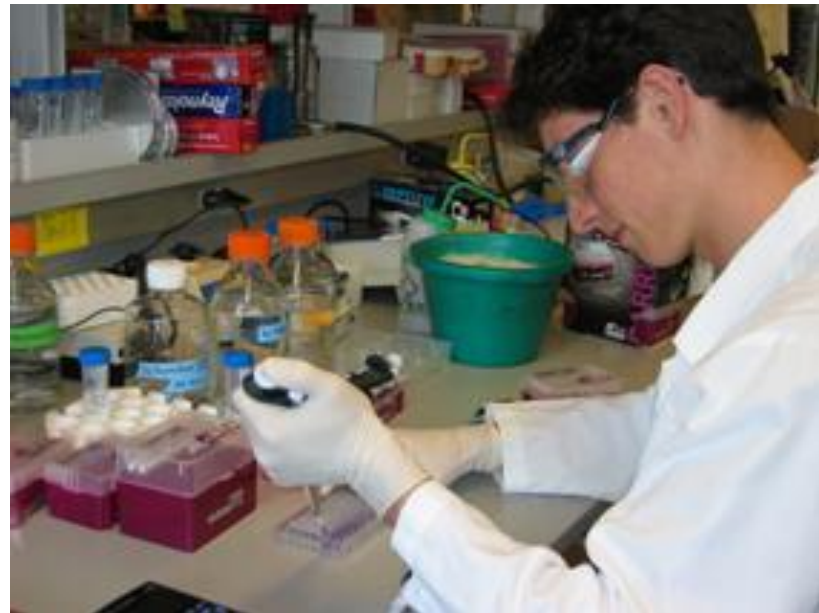
The Regulation on the Protection of Workers against Risks from Microorganisms (SAMV) specifies the measures that must be taken to protect personnel when handling and being exposed to microorganisms. In addition, the regulations of the «Einschliessungsverordnung (ESV)» must be observed in the case of genetically modified, pathogenic and invasive organisms.



This level is for work with minimal potential hazard to laboratory personnel and the environment.

Specific considerations for a BSL-1 laboratory include the following:

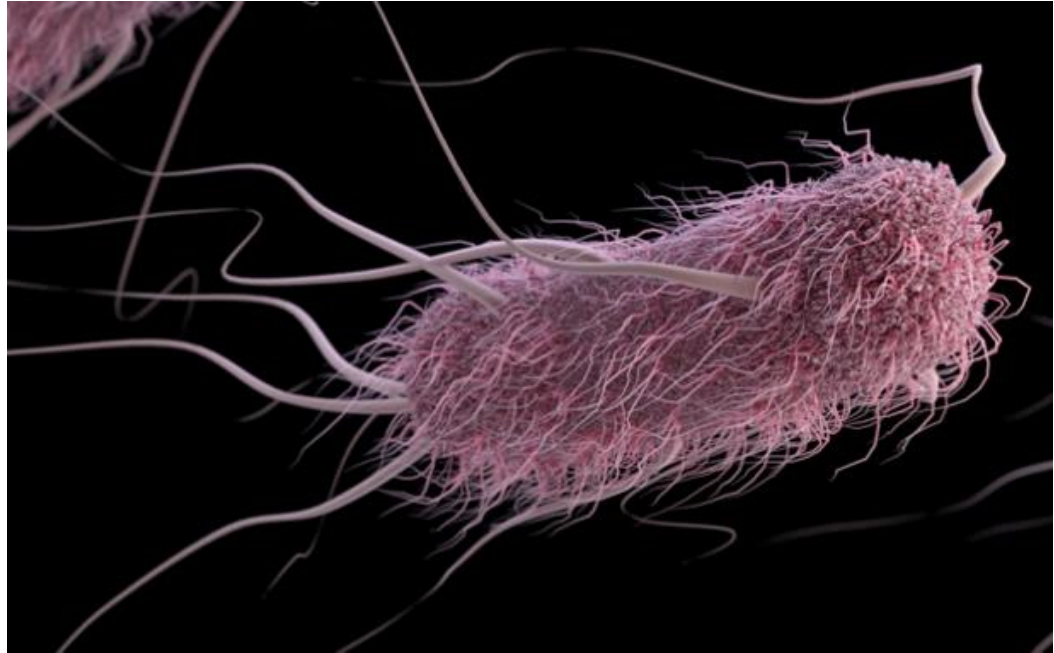
- Standard microbiological practices are followed.
- **Work can be performed on an open lab bench or table.**
- Safety equipment.
- Personal protective equipment, (lab coats, gloves, eye protection) are worn as needed.
- Facility construction.
- A sink must be available for hand washing.
- The lab should have doors to separate the working space with the rest of the facility.

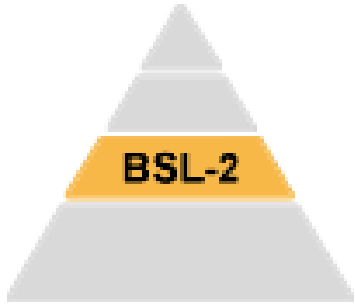


An **example** of a microbe that is typically worked with at a BSL-1 is a nonpathogenic (= a nonpathogenic microbe is one that is not capable of causing disease) strain of *E. coli*.

Escherichia coli also known as ***E. coli***) is a Gram-negative, facultatively anaerobic, rod-shaped bacterium of the genus *Escherichia* that is commonly found in the lower intestine of warm-blooded organisms (endotherms).

Most *E. coli* strains are harmless, but some serotypes can cause serious food poisoning in their hosts, and are occasionally responsible for product recalls due to food contamination.





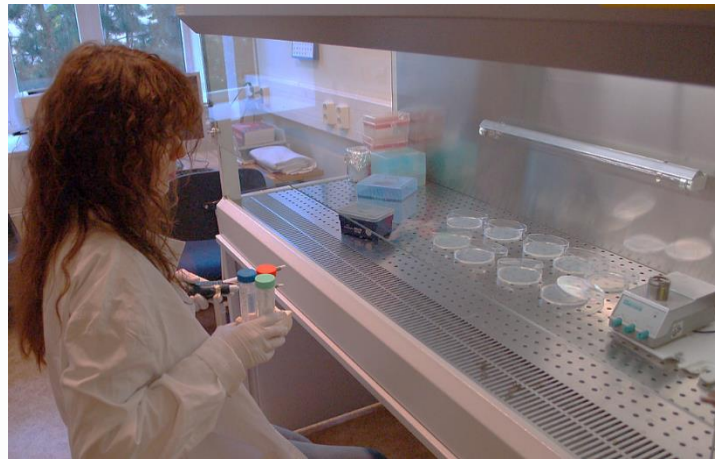
This level is for work with moderate potential hazard to personnel and the environment. It includes various bacteria and viruses that cause only mild disease to humans.



**DO NOT ENTER
AUTHORIZED
PERSONNEL ONLY**

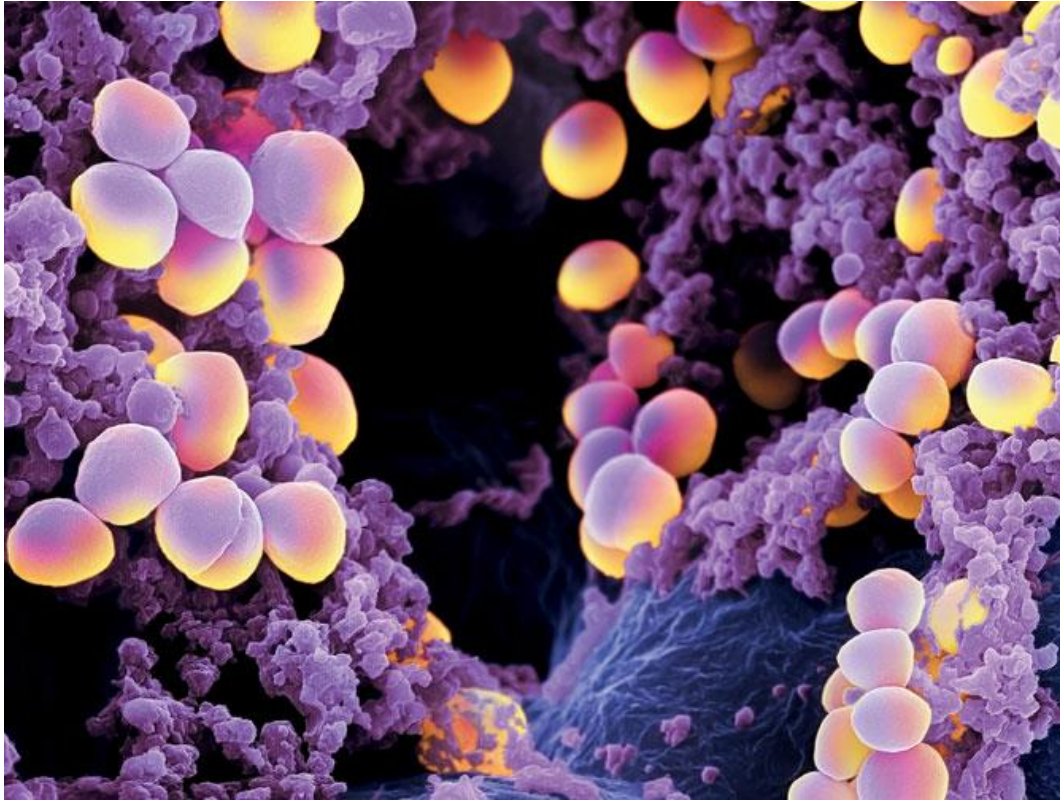
In addition to BSL-1 considerations, **BSL-2 laboratories** have the following containment requirements:

- Access to the laboratory is restricted when work is being conducted.
- Safety equipment: Appropriate personal protective equipment (PPE) is worn, including lab coats and gloves. Eye protection and face shields can also be worn, as needed.
- **All procedures that can cause infection from aerosols or splashes are performed within a biological safety cabinet (BSC).**



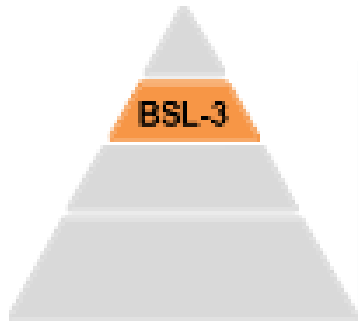
- **An autoclave** or an alternative method of decontamination is available for proper disposals.
- **Facility construction:** The laboratory has self-closing doors. A sink and eyewash are readily available. There is a facility for personal decontamination in the work area.

An example of a microbe that is typically worked with at a BSL-2 laboratory is *Staphylococcus aureus*.



Staphylococcus aureus is a gram-positive coccal bacterium that is a member of the Firmicutes, and is frequently found in the respiratory tract and on the skin.

***S. aureus* is not always pathogenic, it is a common cause of skin infections such as abscesses, respiratory infections such as sinusitis, and food poisoning.**



This level is for work, which may cause serious or potentially lethal disease after inhalation. It includes various bacteria, parasites and viruses that can cause severe to fatal disease in humans but for which treatments exist.



**DO NOT ENTER
AUTHORIZED
PERSONNEL ONLY**

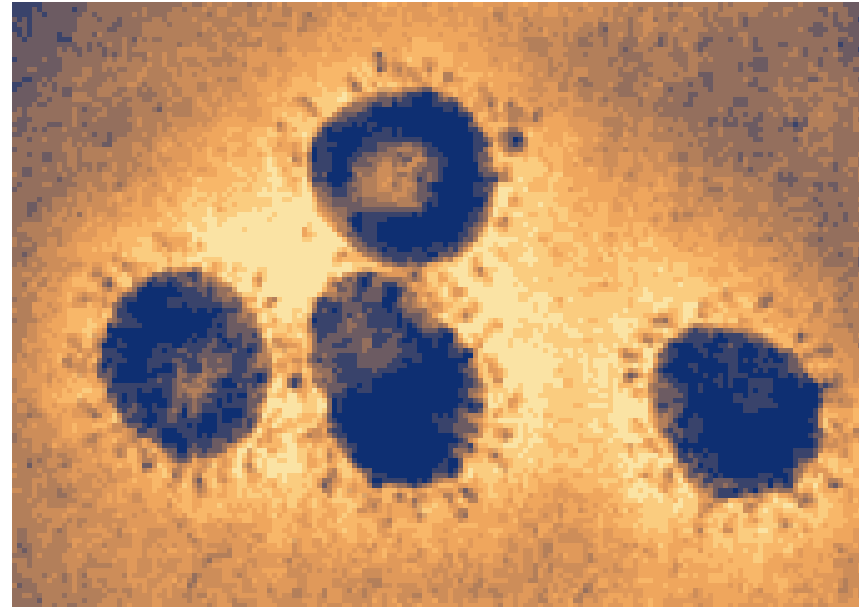
In addition to BSL-2 considerations, **BSL-3 laboratories** have the following containment requirements:

- Laboratorians are under medical surveillance and might receive immunizations for microbes they work with.
- **Access to the laboratory is restricted and controlled at all times.**
- **Safety equipment:** Appropriate PPE must be worn, and respirators might be required. All work with microbes must be performed within an appropriate BSC.
- **Facility construction:** The work area is spatially separated from other areas. Access to the work area must be through an airlock (separate room). There is a device for personal decontamination in the work area. There is a negative atmospheric pressure in the work area compared to the immediate surroundings. Supply and exhaust air to the work area is filtered by HEPA filters. There is a device for the inactivation of microorganisms in the outflow of sinks, pipes and showers.



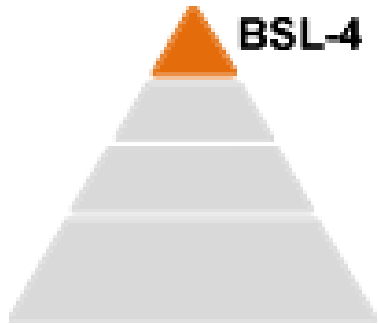
Two examples of microbes worked with in a BSL-3 laboratory is *Mycobacterium tuberculosis* (the bacteria that causes tuberculosis) and SARS coronavirus.

Severe acute respiratory syndrome (SARS) is a viral respiratory disease of zoonotic origin caused by the SARS coronavirus (SARS-CoV). Between November 2002 and July 2003, an outbreak of SARS in southern China caused an eventual 8096 cases and 774 deaths reported in multiple countries with the majority of cases in Hong Kong (9.6% fatality rate) according to the World Health Organization (WHO). Within weeks, SARS spread from Hong Kong to infect individuals in 37 countries in early 2003. It then was eradicated by January the following year.



Currently in the headlines is the **Corona Virus**.





This level is for work with dangerous and exotic agents that pose a **high individual risk** of aerosol-transmitted laboratory infections, agents which cause severe to fatal disease in humans for which vaccines or other treatments are not available.



**DO NOT ENTER
AUTHORIZED
PERSONNEL ONLY**

Personnel change clothes before entering, and when leaving they must shower (a special sluice system). All materials are decontaminated before leaving.

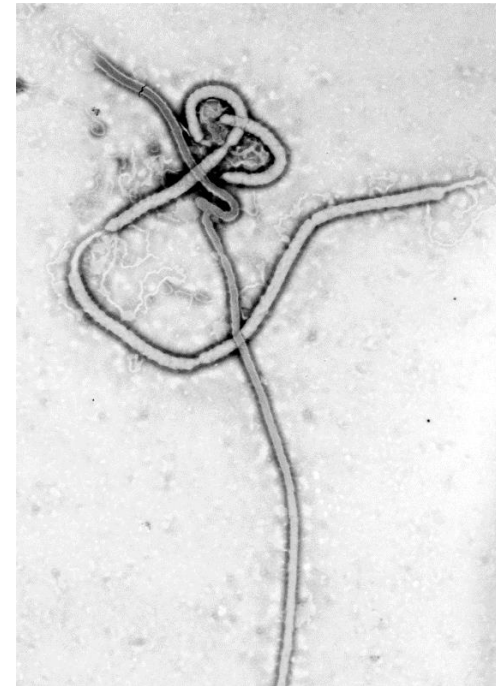
Safety equipment: All work with the microorganisms must be carried out in a suitable biosafety cabinet BSC Class III (= a gas-tight sealed container designed for handling objects, hazardous substances or pathogens of infectious diseases). Class III BSCs have a HEPA-filtered air supply and a double HEPA-filtered exhaust. They provide the ultimate protection for personnel, product and the environment, or by wearing an air-supplied full-body positive pressure suit.



Facility construction: The laboratory is located in a separate building or in an isolated and confined area of the building. The laboratory has its own supply and exhaust air as well as vacuum lines and decontamination systems.

Two examples of microbes worked with in a BSL-4 laboratory include **Ebola** and **Marburg viruses**.

Each species of the genus *Ebolavirus* has one member virus, and four of these cause Ebola virus disease (EVD) in humans, a type of hemorrhagic fever having a very high case fatality rate; the fifth, Reston virus, has caused EVD in other primates. *Zaire ebolavirus* is the type species (reference or example species) for *Ebolavirus*, and has the highest mortality rate of the ebolaviruses, and is also responsible for the largest number of outbreaks of the five known members of the genus, including the 1976 Zaire outbreak and the outbreak with the most deaths (2014).



For Bio Scientists: What is Ethidium bromide (EtBr)?

Ethidium bromide, also known as ethidium bromide, is a red phenanthridine dye used in molecular biology for the detection of nucleic acids, DNA and RNA. **EtBr is classified as highly mutagenic, possibly carcinogenic or teratogenic.** EtBr is very toxic when inhaled, especially in crystalline form, and it is also easily absorbed through the skin.

Ethidium Bromide- CAS# 1239-45-8; also known as homidium bromide, EtBr, 3,8-Diamino-5-ethyl-6-phenylphenanthridinium bromide

- Can be fatal if inhaled.
- Ingestion of dust is toxic.
- Suspected of causing genetic defects (mutagen).
- Irritating to the skin, eyes, mucous membranes and respiratory tract.
- Skin contact may cause inflammation and discoloration.
- May be absorbed through the skin. Contact will stain the skin purple.



Signal Word: **DANGER**

- Hazards may be different depending on the form of the material such as dust, liquid, gel and also the concentration.
- Materials containing less than 0.1% of Ethidium Bromide will not require the same precautions as substances containing larger concentrations.

Toxicological Data:

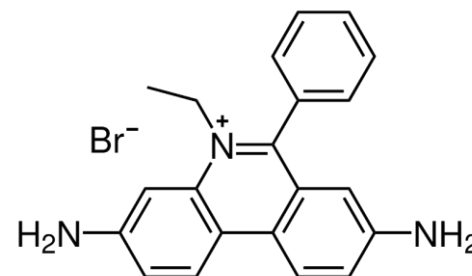
ORAL (LD50): 1,503 - 2,177 mg/kg [Rat]

SUBCUTANEOUS (LD50): 110 mg/kg [Mouse]

INTRAVENOUS (LD50): 16 mg/kg [Rat]

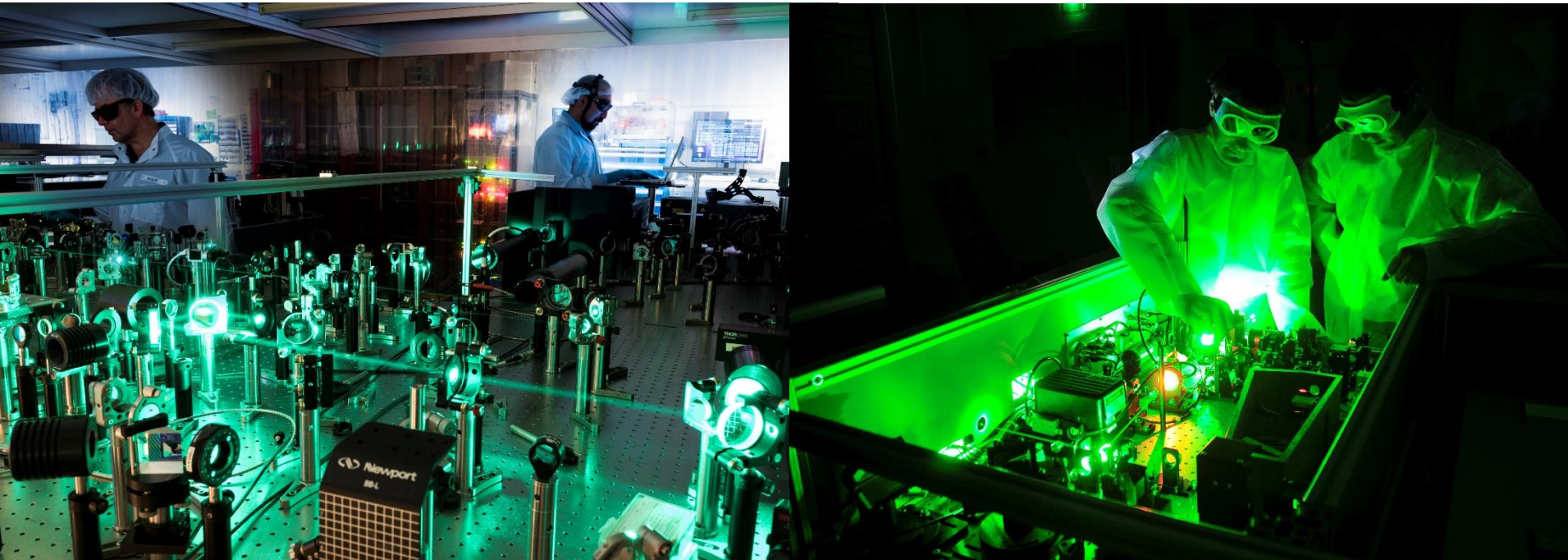
INHALATION (LC50): 0.0118 - 0.134 mg/l 1 hour [Rat]

Always refer to the Safety Data Sheet for the most detailed information



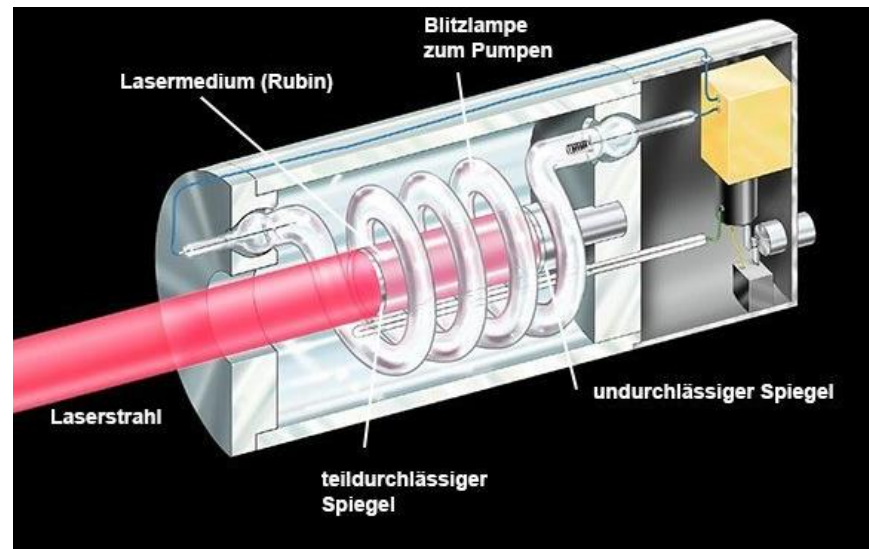
Physics & Laser Labs

Traditionally, physics is divided into five content areas: Mechanics, Heat Theory or Thermodynamics, Electricity Theory or Electrics, Optics, and Atomic and Nuclear Physics.



Definition Laser:

Lasers (Light Amplification by Stimulated Emission of Radiation) are sources of radiation for coherent, quasi-monochromatic and sharply focused radiation in the visible and adjacent regions of the electromagnetic spectrum (far infrared, infrared, ultraviolet and X-rays). In principle, every laser consists of three components: First, an active laser medium, by which the properties of the laser are largely determined, e.g., a gas, a crystal, or a diode. Second, a pump mechanism that supplies energy to the laser medium, e.g., a flash lamp or an electrically driven gas discharge. Third, a laser resonator, a system of mirrors and other optical elements that provides feedback and thus induced emission of the radiation. Depending on the special design and the choice of components, there is a whole range of different types of lasers, which differ mainly in the achievable powers (between a few microwatts and many kilowatts) and frequency characteristics.

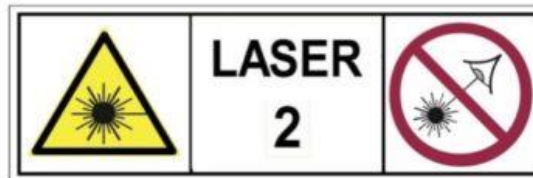


Operators of Class 3B or 4 laser equipment must appoint a **laser protection officer** in writing and must take suitable measures to ensure that no one can be exposed to unauthorized radiation even in areas with openly accessible laser radiation, i.e. that no one is exposed to laser radiation in excess of the maximum permissible radiation. As a rule, this protection goal can only be achieved if such laser areas are separated by structural measures and monitored in such a way that they can only be entered by authorized persons with the necessary protective equipment.

Laser laboratories are marked with laser warning lamps. If laser equipment is in operation, the laser warning lamp in front of the laboratory room is illuminated. Laser laboratories in operation may only be entered with the laser protection officer.



IEC 1068/14



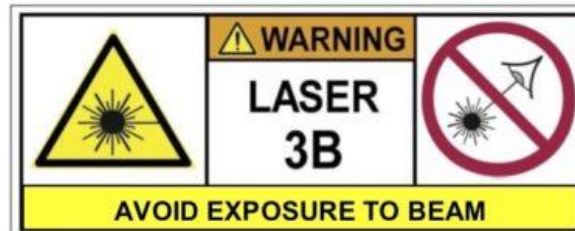
IEC 1070/14



IEC 1071/14



IEC 1072/14



IEC 1073/14



IEC 1074/14

New technologies and associated new dangers and risks are appearing at ever shorter intervals!



Lightsaber with over 2,200 degrees Celsius

The construction of "the Hacksmith" does not consist directly of light, but of an extremely hot flame of propane gas and oxygen, which is kept in shape by a laminar flow nozzle. This means that the substances do not spread uncontrollably through the room, but instead form a burning jet that ends up looking like a lightsaber. And this blade of fire is really something: At over 2,200 degrees Celsius, the "lightsaber" melts all kinds of materials - even steel doors!