 <b>PAUL SCHERRER INSTITUT</b> <b>Process Description Handling of Chemicals</b>  Document responsible <b>Winfried Rendler (9670)</b>		<b>PB-9670-291</b>
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<b>Abstract:</b> This process description is intended to ensure that the laboratories available at PSI are used in accordance with requirements for occupational safety, environmental protection and economic efficiency. Aim of the process description is:  - to preserve the health and physical integrity of laboratory users, - to avoid and minimize accidents and consequential damage, - avoid environmental pollution.  This process description defines the basic behavior, provides information on particular hazards, and regulates the handling of chemicals.		<b>Authors:</b> Rauh, Mike (9670) Honegger, Monika (9672) Kissel, Patrick (9670)
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## 1 Other applicable documents

The documents listed here are not an exhaustive list. Only some of the most important documents for this process description are given.

### 1.1 Internal documents

AW-01-07-02 Sicherheit, Gesundheitsschutz und Umweltschutz am PSI

AW 96-19-176 Arbeitssicherheit und Gesundheitsschutz am PSI

PB-9670-37 Tragen Persönlicher Schutzausrüstung

### 1.2 External requirements

Verordnung über den Schutz vor gefährlichen Stoffen und Zubereitungen (Chemikalienverordnung, ChemV) 813.11.

DGUV Information 213-850 Sicheres Arbeiten in Laboratorien.

## 2 Scope

This process description applies to the procurement, handling and disposal of chemicals.

This process description is being checked for validity every three years.

## 3 Objective

The present process description shall ensure that the laboratories available at PSI are used in accordance with occupational safety, environmental protection and economic efficiency. The basic objectives are

- to preserve the health and physical integrity of the laboratory users,
- to avoid and minimize accidents and consequential damage,
- to avoid environmental pollution.

This process description defines the basic behaviors, provides information on particular hazards and regulates the handling of chemicals.

## 4 Terms and Abbreviations

**Chemical** chemical element and its compounds in natural form or obtained through a manufacturing process, including the additives necessary to maintain its stability and the impurities caused by the process used, but with the exception of solvents that can be removed without damage to the compounds stability and without changing to its composition.

MAK	Maximaler Arbeitsplatzkonzentrationswert
PSA	Persönliche Schutzausrüstung
SOP	Safe Operating Procedure

## 5 Laboratory regulations

### 5.1 Hazard analysis and substitution

The basic requirement for working with chemicals is appropriate training and instruction in the processes customary at PSI. A risk assessment must be carried out prior to any work and the assessment must be updated periodically. The risk assessment is carried out according to the STOP principle. When deciding on substitution, the resulting overall risk from the substances properties, the process and the possibilities of exposure must be assessed. The supervisors are responsible for compliance with the requirements given in this process description regarding employee protection when handling chemicals. For this, the supervisors are supported by the [technical specialist for chemistry](#).

The **STOP** principle

1. **Substitution (replacement) of safety hazards**  
Either eliminate safety hazards entirely or minimize them to such an extent that there are no longer any threats.  
Example: Replacing harmful substances with less harmful substances or using a safer process.
2. **Technical measures**  
Minimize hazards through the use of protective devices.  
Example: Use of ventilation and extraction systems. Working inside the fume hood.
3. **Organizational measures**  
Spatial and / or temporal separation of a source of danger from humans.  
Example: Limitation of working hours when working under high levels of hazardous substances.
4. **Personal measures**  
Individual protection of people through correct behavior and, if necessary, use of **personal protective equipment**.  
Example: Use of protective goggles and following rules of conduct in the form of operating instructions.

#### 5.1.1 Safe Operating Procedure

An SOP (Safe Operating Procedure) must be created prior to all recurring activities with chemicals and before carrying out recurring tests. Hereby all possible ways of incorporation of used chemicals and especially their properties (e.g. carcinogenic effects, fire and explosion hazards) must be taken into account. The SOP has to be checked and approved by the responsible supervisor. If necessary, the technical specialist for chemistry supports the supervisors. Experimental activity may only be started after approval of the SOP.

### 5.1.2 Procurement of chemicals

Orders for chemicals are processed at PSI using the “ChemOM” tool. This tool can be reached directly via the following link: <https://psi.openordering.de/ExternalServices/Saml2/Shibboleth/>

If “PSI monitored substances” are ordered, a hazard assessment and an instruction of the employees is always required. The hazard identification and the implementation of the measures must be documented. If necessary, the chemical safety specialist supports the managers. The ordering of these substances must be approved by the laboratory / department head.

### 5.1.3 Qualification of laboratory technicians

Before starting a new activity in the laboratory, the manager must check and assess the qualifications of the respective person working in the laboratory. If the qualification is judged to be insufficient, the qualifications required for the activities to be performed can be made up for by means of instructions. The instructions must be documented. The aim is to enable employees to carry out the work safely.

## 5.2 Order and cleanliness

- Workplaces must be kept free of contamination and cleaned after the end of the respective activity, since unclean workplaces represent a hazard through unintentional contact and accidental incorporation of chemicals.
- Work equipment and chemicals that are not required for the task at hand must be removed from the workplace.
- Always close containers and vessels with chemicals. Do not let vessels remain open.
- Chemical spills must be removed immediately. A Chemical binder named Chemizorb, which is used to absorb acids, alkalis or other solvents, is available from the central warehouse. If larger quantities leak or have been spilled, the PSI company fire brigade must be called via 3333. If hydrofluoric acid is spilled, the PSI company fire brigade must be contacted immediately. Information on this at <https://intranet.psi.ch/de/asi/fwchemiewehr>.
- If specific equipment is required in an emergency, it must be kept readily available during the experiment. The chemical safety specialist is available to answer any questions.
- The workplace must be left in a clean and tidy condition after use.
- The windows of the fume hoods are for safety and should not be covered with formulas and notes.

## 5.3 Labelling

Upright bottles containing chemicals in the amount required for hand use must be provided with the following information:

- name of the substance and the components of the preparation
- the danger symbols
- the date of manufacture
- name or abbreviation of the manufacturer

The PSI GHS label set is recommended for labeling chemicals. It can be obtained from the PSI central warehouse Article number: 13.150.0900 and 13.150.0901.

PAUL SCHERRER INSTITUT <b>PSI</b> Sektion Sicherheit		<b>lab safety</b>		label only for internal use sicherheit@psi.ch		<b>GHS Label</b>	
contains, product characterisation:				pictogram 1			
prepared on - date      prepared by - name				pictogram 2		<b>Abfall</b> <b>Waste</b>	
PSI Zentrallager, WWLA, 5232 Villigen PSI		Article No. 13.150.0901		13102302			

- The CLASI12 safety check for containers and labeling checklist serves as an aid.  
<https://intranet.psi.ch/en/safety/safety-chemikalien>
- The information required for labeling can be found in the respective safety data sheet for the chemical. These can be viewed in the ordering system for chemicals.
- In the case of very small containers such as test tubes and vials, it is sufficient to state the name of the substance or the internal sample name.

## Ethanol

CAS Nr. 64-17-5

H225: Flüssigkeit und Dampf leicht entzündbar.  
 H319: Verursacht schwere Augenreizung.

P233: Behälter dicht verschlossen halten.  
 P241: Explosiongeschützte elektrische Geräte/  
 Lüftungsanlagen/Beleuchtungsanlagen/... verwenden.  
 P243: Maßnahmen gegen elektrostatische Entladungen  
 treffen.  
 P305+P351+P338: BEI KONTAKT MIT DEN AUGEN:  
 Einige Minuten lang behutsam mit Wasser spülen.  
 Eventuell vorhandene Kontaktlinsen nach Möglichkeit  
 entfernen. Weiter spülen.  
 P210: Von Hitze, heißen Oberflächen, Funken,  
 offenen Flammen und anderen Zündquellen  
 fernhalten. Nicht rauchen.

# Gefahr





## 5.4 Working alone in the laboratory

Working alone must be registered and is only allowed under consideration of special circumstances. The manager has to use the process description PB-96-04-06 "Regulation of working alone on technical devices, experimental facilities and in laboratories at PSI" to check whether working alone may be carried out.

A person is said to be «working alone» if help cannot be provided immediately after an accident or in a critical situation, e.g. work out of sight or out of call range to others.

Working alone with flammable substances and chemicals in chemical laboratories is strictly prohibited. Work that is judged dangerous by a manager or a contact person is also prohibited.

In all cases of uncertainty as to whether the planned work may be carried out alone or not, a risk assessment must be prepared. The assessment is carried out by the manager together with the specialist in chemical safety.

## 5.5 Monitoring ongoing experiments

The workplace may only be left if continuous monitoring of the experiment is not required or if another person who has the necessary knowledge and skills can take over the monitoring.

Experiments that cannot be interrupted at the end of normal working hours may only be carried out without constant supervision if it is not possible to divide the time for the experiment differently and if the occurrence of dangerous conditions is reliably prevented by appropriate protective measures. The experiment must be marked with a sign. This board should contain the contact person, test information and measures in the event of an emergency. The warning sign «long-term test» is available from the central warehouse under item number: 27.698.6030.

## 5.6 Personal protective equipment

The PSI provides the personal protective equipment (PPE). Activities in the PSI laboratories are only permitted with the appropriate PPE.

When working with chemicals or dangerous substances, the following basic protective equipment in accordance with PB-9670-37 "Wear personal protective equipment" is mandatory:

- Safety goggles. The corrective glasses do not offer sufficient protection and are not considered protective glasses. The goggles must have side protection and must be tight-fitting. Safety goggles with cut lenses can be ordered internally at PSI. <https://intranet.psi.ch/de/safety/psasafety-glasses>.
- For safety reasons, contact lenses must not be worn in the laboratory. This also applies if protective goggles are worn. Contact lenses can capture chemicals from splashes or drops in the eye and can damage the cornea. Chemical reactions can cause serious injuries, especially if the contact lenses cannot be removed immediately.
- Laboratory coat (depending on the activity, only laboratory coats made of cotton are suitable) must always be worn closed. Only long-sleeved laboratory coats are to be worn.
- Long pants / long skirt.
- Closed shoes.

Depending on the activity, suitable protective gloves against chemicals or microorganisms must be worn. The type of gloves to be worn can be found in the relevant safety data sheet (MSDS). The chemical safety specialist is available for advice. Further information on PPE can be found in PB-9670-37 "Wearing personal protective equipment" and <https://intranet.psi.ch/de/safety/psachemical-gloves>.

## 5.7 Hygiene

- When wearing gloves, make sure that no other work equipment or objects such as door handles, telephones, devices and cupboards are contaminated. Disposable gloves (vinyl, nitrile, butyl, etc.) only offer short-term minimal protection and should be replaced immediately after contamination. Find out about special gloves in advance if you are working with very dangerous chemicals. Gloves must not be worn outside the laboratory (e.g. corridor / meeting room / cafeteria) due to the risk of contamination.
- The laboratory coat must not be worn outside the laboratory area (e.g. meeting room / cafeteria) due to the risk of contamination. It must be kept in the designated places and must not be taken into the office or home. Do not hang the lab coats on top of each other. Contaminated laboratory coats must be changed immediately. The laboratory coats should be washed regularly.
- Hands must be washed with the skin cleaning agents provided if they are contaminated, soiled or when leaving the laboratory area. Skin protectants can also be used for improved protection.
- Long hair (scalp hair / beard hair) can lead to hazards (e.g. contamination / thermal or mechanical effects) and must be securely fastened by tying, pinning, using hair nets etc.
- It is forbidden to bring food and luxury goods to the laboratory area or to consume them in the laboratory area.
- Containers that are normally intended to hold food or beverages must not be used to store chemicals.

## 5.8 Storing chemicals

- Chemicals are to be kept or stored in such a way that they do not endanger health or the environment.
- After use, chemicals should be returned to their original storage location.
- Chemicals should be stored in their original packaging if possible.
- Chemicals may only be stored in containers that are made of materials that can withstand the expected stress and are labeled according to their content.
- Chemicals are to be kept and stored in such a way that no dangerous reactions are possible if the containers are damaged.
- When storing several chemicals in the same area, make sure that they cannot cause any dangerous reactions. A table for the joint storage of chemicals (Appendix 1), as well as a list of chemicals that must not be stored together (Appendix 2) can be found in the appendix.
- Chemicals should generally be stored in such a way that misuse can be ruled out.
- Very toxic and poisonous substances and preparations must be kept locked up or in such a way that only competent or trained persons have access. Please note the PSI monitored substances.
- Containers with chemicals may only be stored in shelves, cupboards and other facilities up to a height from which they can still be safely removed and put down.
- Make sure that shelves and cupboards are not overcrowded.
- Only substances that do not develop aggressive vapors may be stored on the laboratory shelves and hanging cabinets.
- Highly volatile and heat-sensitive substances must be stored in the designated refrigerators.
- Containers with liquids must be stored in collecting trays.

## 5.9 Transferring chemicals

- Glass containers should be checked for any damage (tension, cracks, seals) before they are used.

- When transferring hazardous substances from barrels, canisters and other containers, suitable equipment (e.g. Fume hood, fume extraction, spill trays) must be used and, if necessary, electrically earthed (explosion protection).
- Use suitable funnels when filling chemicals into narrow-necked containers. In addition, when pouring a liquid, care should be taken to ensure that the air inside the container can escape unhindered.

### 5.10 Transporting chemicals

- Containers, which are not break-proof, must be supported on the container bottom when being carried. Containers may only be transported into other rooms with aids that enable them to be held and carried safely, such as a carrying basket with a safety tub, or a bucket.
- Transporting volatile and highly flammable chemicals together with people in elevators is prohibited. These include solvents, cryogenic liquefied gases, Dewar vessels with liquefied gases and all gas pressure bottles.
- The transport of chemicals on the PSI site and between PSI East and West must be carried out in accordance with Chapter 8 of the VAGT02 process instruction. For external transports, the dangerous goods regulations must be applied. Shipping and reception of dangerous goods are described in VAGT01 and FDGT10 see [Safety@PSI](#).

### 5.11 Working with flammable substances

- Flammable substances must be kept away from sources of ignition and electrostatic charge. Combustible materials are to be stored in fire-proof hazardous material cabinets. The flammable substances should be disposed of separately. FO-9670-213: Guideline for the procurement of safety storage cabinets for the storage of chemicals and solvents at PSI see [Safety@PSI](#)
- When working with highly flammable liquids, the necessary explosion protection measures must be taken.
- Caution is also required when handling peroxides. These have oxidizing and flammable properties, pay attention to the rules for joint storage of chemicals.

### 5.12 Evaporating in open vessels

- Open evaporation or heating of flammable liquids must be avoided.
- If flammable liquids have to be evaporated or heated in open vessels, this may only be done in the fume cupboard with the sash closed.
- Any vapors that arise should be collected at the point of exit and fed directly into the exhaust air system.
  - As an additional protective measure, sources of ignition, especially open flames, must be avoided.

### 5.13 Handling volatile solvents

- Containers with volatile solvents must not be left open. • Care must be taken when working in a vacuum, as the highly volatile substances can quickly evaporate. • When working with solvents, make sure there is good ventilation and find out about the MAK value.

### 5.14 Storing flammable liquids

- At workplaces, flammable liquids with a flash point below 55 ° C may only be stored for hand use in containers with a nominal volume of no more than 500 ml.
- The number of containers must be limited to what is absolutely necessary for the task at hand.
- For laboratories in which flammable liquids are regularly required, these may be stored in 5 l to 10 l metal safety canisters. Caution: When filling flammable liquids from 10 l metal canisters, the canisters must be electrically grounded to avoid electrostatic charging.
- Thin-walled glass containers must not be used for highly flammable rinsing liquids in manual use.
- Empty containers that contained chemicals and flammable liquids, must be cleaned adequately before they are disposed of or used in any other way.
- Highly volatile and heat-sensitive substances must be stored in the explosion-proof refrigerators provided for this purpose.

### 5.15 Working with hydrofluoric acid

- Information on handling hydrofluoric acid at PSI is provided in the AW-96-13-03.

### 5.16 Handling cryogenic gases

- Information on handling cryogenic Gases is provided in the AW-96-16-05.

### 5.17 Handling chemical wastes

- Individual types of waste are to be collected separately such that dangerous reactions are excluded.
- Solvent-dampened cloths and rags must never come into contact with small amounts of catalysts.
- Chlorinated and non-chlorinated solvent waste must be collected separately.
- Acids and bases must be disposed of separately.
- Metals with a catalytic effect must be disposed of separately.
- Collection containers for hazardous waste are to be stored within the laboratory in a way that they do not interfere with normal laboratory work or result in a hazard.
- To avoid electrostatic charges, the funnel and the collecting container must be connected and electrically grounded when transferring highly flammable, easily flammable or flammable liquid hazardous waste,.
- Waste containers in fume hoods must not be left open.
- Note the filling quantity of the waste canisters and dispose of them in good time to avoid overflows.

If you have any questions about the waste disposal station, please contact the chemicals administration office in advance.

### 5.18 Safety devices

- The fume hood sash must be kept free of writing and be kept closed in order to allow visibility inside, as well as to provide the best possible protection against emissions, dangerous reactions, implosions, etc.
- The fume hood is not a storage place for chemicals.
- When working with a vacuum, work should be carried out in the fume hood. If possible, a rotary evaporator can be placed in a chape, otherwise it should be provided with a protective shield.

- When working with toxic or flammable gases or when carrying out dangerous reactions, which can produce toxic or flammable gases, gas warning devices for the corresponding gas must be available in the laboratory.

### 5.19 Operation of equipment and handling of glassware

- Before using devices, always read the operating instructions or have yourself trained by a specialist.
- Operating instructions are to be kept at the location of the device.
- Before starting work or putting devices and apparatus into operation, a visual inspection for external damage as well as a leak test (water, gas, vacuum connections, etc.) must be carried out.
- Only laboratory equipment that has been approved for this purpose may be used. The use of leisure and household devices for experiments in the laboratory is not permitted.
- Never use damaged glass components (risk of injury). Defective, chemically contaminated glassware must be cleaned and properly disposed of (waste container for laboratory glass). Dispose of broken glass without cleaning (risk of injury).
- Dispose of syringes in syringe disposal boxes.
- Glassware must be pre-cleaned before being washed in the dishwasher.
- Use Woulff's bottles when working with a vacuum. In addition, the glassware must be flawless. Check glass parts for damage (risk of implosion).

### 5.20 Regular safety checks in the laboratory

- Cables, hoses and seals of all kinds on devices and apparatus must be checked periodically for embrittlement, material fatigue, damage, etc. and must be replaced if necessary. Water hoses must not be used to apply vacuum.
- Refrigerators must be checked regularly for icing and must be defrosted if necessary. To do this, the refrigerator must be completely emptied and the defrosted water collected in a container.
- Condensate flask of rotary evaporators and drying cabinets must regularly be emptied out.
- It is recommended to have a Diphoterine eye wash bottle available in every laboratory. At least one emergency eye wash for general applications. The eye wash bottles must be replaced after the shelf life has expired.
- If an eye shower that is operated with drinking water is used, its function must be checked weekly. The test must be documented.

### 5.21 Operation of centrifuges and ultracentrifuges

- Centrifuges may only be used by trained persons.
- The operating manual must be followed for the operation of centrifuges.
- People who work with ultracentrifuges must be trained by a manager before starting any work with ultracentrifuges.

## 6 What to do in an emergency

Before starting work in the laboratory, it is necessary to familiarize yourself with the precautions for emergencies (emergency numbers, locations of safety showers, eye washes, first aid kits and fire extinguishers, hydrofluoric acid acute sets, chemical binders) and if necessary, to keep specific emergency materials close at hand.

General behaviour in case of an emergency:

- Keep Calm.
- Look, think, act - i.e. avoid rash, unpremeditated actions.
- Pay attention to your own safety when you give assistance.
- Personal protection takes precedence over property protection.
- Warn people at risk and, if necessary, ask them to leave the danger zone.

## 6.1 First Aid

- Consult a doctor in the event of an accident that resulted in minor injuries, discomfort or skin reactions.
- In the event of accidents with serious injuries or injuries whose nature and severity cannot be assessed, an emergency doctor must be alerted immediately via the internal emergency number 3333.
- Provide first aid until the emergency doctor arrives.
- In the event of accidents involving chemicals, the relevant material safety data sheet must be kept ready.
- In the event of uncertainty or missing information on the substance, Tox Info Suisse can be called at any time on the telephone number 145. Tox Info Suisse provides medical information around the clock in the event of poisoning or suspected poisoning.















## 6.2 What to do in the event of fire / accidents involving chemicals

In the event of a fire or accidents involving chemicals (leaking chemicals, spilled toxic materials, etc.), people at risk must be brought to safety and the PSI fire brigade must be alerted via the internal emergency number 3333.

If possible close windows and doors.

## 7 Appendix 1

Green: Can be stored together; Yellow: Can be stored together under certain conditions; Red: Must be stored separately

		LGK	1	2	3	4.1	4.2	4.3	5	6.1	6.2	7	8	10/12	11/13	NG
	Explosive compounds	1	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
	Pressurized Gases	2	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Yellow	Yellow	Yellow
	Flammable liquids	3	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Yellow	Red	Red
	Flammable solids	4.1	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Yellow	Yellow	Red
	Self-igniting substances	4.2	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red
	Substances that form flammable gasses when in contact with water	4.3	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red
	Oxidising substances	5	Red	Red	Red	Red	Red	Red	Yellow	Red	Red	Red	Red	Red	Red	Red
	Toxic substances	6.1	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Yellow	Yellow	Yellow	Red
	Infectious substances	6.2	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red
	Radioactive substances	7	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red
	Corrosive substances	8	Red	Red	Red	Red	Red	Red	Red	Red	Yellow	Red	Red	Yellow	Yellow	Yellow
	Liquids that are harmful to health and the environment	10/12	Red	Yellow	Yellow	Yellow	Red	Red	Red	Red	Yellow	Red	Red	Yellow	Green	Yellow
	Solidss that are harmful to health and the environment	11/13	Red	Yellow	Red	Yellow	Red	Red	Red	Red	Yellow	Red	Red	Yellow	Yellow	Green
	Non-hazardous substances	NG	Red	Yellow	Red	Red	Red	Red	Red	Red	Red	Red	Red	Yellow	Yellow	Green

## 8 Anhang 2

### Examples of substances that cannot be stored together:

The following table contains examples of common laboratory chemicals that can react violently with one another and therefore may only be stored separately from one another. **This list is not exhaustive!**



Substance	Do not store together with....
Acetylene	Halogens, silver, mercury, copper, lead
Activated carbon	Oxidizing agents, calcium hypochlorite
Alkali metals	Water, halogenated alkanes, halogens, carbon dioxide, acids
Aluminium alkyls	Water
Ammonia (gas, solution)	Mercury, halogens, calcium hypochlorite, hydrofluoric acid, silver
Ammonium nitrate	Acids, metal powder, chlorates, nitrates, sulfur, flammable liquids, finely ground organic or flammable substances, silver
Flammable liquids	Ammonium nitrate, chromium (VI) oxide, halogens, peroxides, nitric acid, all oxidizing substances
Bromine, Chlorine	Ammonia, acetylene, butadiene, alkanes, hydrogen, metal powder, benzene
Chlorates, perchlorates	Ammonium salts, acids, metal powder, sulfur, f organic or flammable substances, phosphorus
Chrom(VI)-oxide	Acetic acid, naphthalene, camphor, glycerine, alcohols, flammable liquids, nitric acid
Cyanides	Acids
Acetic acid	Chromium (VI) oxide, nitric acid, alcohols, perchlorates, peroxides, permanganates, ethylene glycol, hypochlorites
Fluorine	store separately from all other substances
Hydrofluoric acid	Ammonia (gas or solution), alkalis, hypochlorites
Hypochlorites	Acids
Iodine	Acetylene, ammonia (gas or solution)
Hydrocarbons	Halogens, chromium (VI) oxide, peroxides
Copper	Acetylene, hydrogen
Oxalic acid	Silver, mercury
Perchlorsäure	Acetic anhydride, bismuth and bismuth alloys, alcohols, wood, paper
Permanganates	Glycerin, ethylene glycol, benzaldehyde, sulfuric acid
Peroxides	Metals and metal salts, alcohols, acetone, organic substances, nitromethane, flammable substances
Phosphorous	Sulfur, oxygen-containing compounds (e.g. chlorates)
Mercury	Acetylene, ammonia
Nitric acid (conc.)	Acetic acid, chromium (VI) oxide, cyanides, hydrogen sulfide, flammable substances, hypochlorites, hydrochloric acid, alcohols, ketones
Hydrochloric acid	Alkalis, cyanides, hypochlorites, sulfides, alkali metals, nitric acid
Acids	Bases, Cyanides, hypochlorites, sulphides, alkali metals
Sulfuric acid	Chlorates, perchlorates, permanganates, bases, cyanides
Hydrogen sulfide	conc. nitric acid
Sulfides	Acids
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds



## 9 Appendix 3

PSI has defined so-called “PSI monitored substances”. These are toxic and explosive substances.

Group 1a and 1b of the substance groups described in the annex of the ordinance of June 5, 2015 on protection against dangerous substances and preparations (Chemikalienverordnung, ChemV, SR 813.11) belong to the “PSI monitored substances”.

1	Gefahren- piktogramm	In Verbindung mit einem der H-Sätze
a.		H300 H310 H330 Lebensgefahr bei Verschlucken Lebensgefahr bei Hautkontakt Lebensgefahr bei Einatmen
b.		Alle Produkte mit diesem Gefahrenpiktogramm