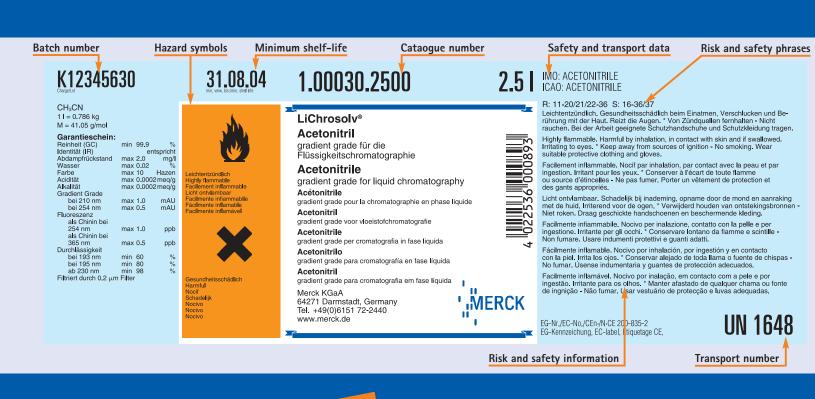
# Safety in the Laboratory





R 65 ■ Harmful: may cause lung damage if

**R 67** ■ Vapours may cause drowsiness and

**R 68** ■ Possible risks of irreversible effects.

ombination of risk phrases (R)

berating extremely flammable gas.

R 14/15 ■ Reacts violently with water,

R 20/21 ■ Harmful by inhalation and in

R 20/21/22 ■ Harmful by inhalation, in

R 20/22 ■ Harmful by inhalation and if

R 21/22 ■ Harmful in contact with skin and if

R 23/24 ■ Toxic by inhalation and in contact

R 23/24/25 ■ Toxic by inhalation, in contact

R 24/25 ■ Toxic in contact with skin and if

R 26/27 ■ Very toxic by inhalation and in

R 26/27/28 ■ Very toxic by inhalation, in

R 26/28 ■ Very toxic by inhalation and if

R 27/28 ■ Very toxic in contact with skin and

R 36/37 ■ Irritating to eyes and respiratory

R 36/37/38 ■ Irritating to eyes, respiratory

R 37/38 ■ Irritating to respiratory system and aquatic environment.

R 36/38 ■ Irritating to eyes and skin.

R 39/23 ■ Toxic: danger of very serious

R 39/23/24 ■ Toxic: danger of very serious

R 39/23/24/25 ■ Toxic: danger of very se-

R 39/23/25 ■ Toxic: danger of very serious

R 39/24 ■ Toxic: danger of very serious

R 39/25 ■ Toxic: danger of very serious

irreversible effects through inhalation.

in contact with skin and if swallowed.

R 39/26/28 ■ Very toxic: danger of very

irreversible effects in contact with skin

irreversible effects if swallowed.

inhalation and skin contact.

through inhalation.

R 39/27/28 ■ Very toxic: danger of very

serious effects in contact with skin and if

R 42/43 ■ May cause sensitization by

R 48/20 ■ Harmful: danger of serious

damage to health by prolonged exposure

R 48/20/21 ■ Harmful: danger of serious

through inhalation and in contact with skin.

damage to health by prolonged exposure

R 39/28 ■ Very toxic: danger of very serious

R 39/26/27 ■ Very toxic: danger of very

irreversible effects if swallowed

and in contact with skin.

and if swallowed.

rreversible effects in contact with skin.

R 39/24/25 ■ Toxic: danger of very serious

irreversible effects in contact with skin and if

R 39/26 ■ Very toxic: danger of very serious

serious irreversible effects through inhalation

R 39/26/27/28 Very toxic: danger of very

serious irreversible effects through inhalation

serious irreversible effects through inhalation

R 39/27 ■ Very toxic: danger of very serious

irreversible effects through inhalation and if

contact with skin and if swallowed.

rious irreversible effects through inhalation, in

irreversible effects through inhalation and in

contact with skin and if swallowed.

R 23/25 ■ Toxic by inhalation and if swallowed. through inhalation and if swallowed.

contact with skin and if swallowed.

R 15/29 ■ Contact with water liberates toxic,

The Merck Chemical Database on CD-ROM

CNEMUAL ONLINE
The Merck Catalogue – chemdat.merck.de

Risk and Safety Phrases

R 2 ■ Risk of explosion by shock, friction, fire R 66 ■ Repeated exposure may cause skin

dryness or cracking.

Risk phrases (R)

R 1 ■ Explosive when dry.

**R 7** ■ May cause fire.

R 10 ■ Flammable

R 11 ■ Highly flammable.

**R 12** ■ Extremely flammable.

R 14 ■ Reacts violently with water.

**R 3** ■ Extreme risk of explosion by shock,

**R 4** ■ Forms very sensitive explosive metallic

**R 6** ■ Explosive with or without contact with

**R 8** ■ Contact with combustible material may

**R 9** ■ Explosive when mixed with combustible

**R 15** ■ Contact with water liberates extremely

**R 16** ■ Explosive when mixed with oxidizing

R 18 ■ In use, may form flammable/explosive

**R 17** ■ Spontaneously flammable in air.

R 19 ■ May form explosive peroxides

**R 21** ■ Harmful in contact with skin.

R 20 ■ Harmful by inhalation.

**R 22** ■ Harmful if swallowed.

R 24 ■ Toxic in contact with skin.

**R 27** Very toxic in contact with skin.

**R 29** ■ Contact with water liberates toxic gas.

**R 30** ■ Can become highly flammable in use.

**R 31** ■ Contact with acids liberates toxic gas.

**R 32** ■ Contact with acids liberates very

**R 33** ■ Danger of cumulative effects.

**R 37** ■ Irritating to respiratory system.

**R 39** ■ Danger of very serious irreversible

R 40 ■ Limited evidence of a carcinogene

**R 42** May cause sensitization by inhalation.

**R 41** ■ Risk of serious damage to eyes.

**R 43** ■ May cause sensitization by skin

**R 44** ■ Risk of explosion if heated under

**R 46** May cause heritable genetic damage.

**R 49** ■ May cause cancer by inhalation.

**R 50** ■ Very toxic to aquatic organisms.

**R 52** ■ Harmful to aquatic organisms.

**R 53** ■ May cause long-term adverse effects

**R 58** ■ May cause long-term adverse effects

**R 61** May cause harm to the unborn child.

**R 62** ■ Possible risk of impaired fertility.

**R 63** ■ Possible risk of harm to the unborn

**R 59** Dangerous for the ozone layer.

**R 51** ■ Toxic to aquatic organisms.

**R 48** ■ Danger of serious damage to health by

**R 34** ■ Causes burns.

R 35 Causes severe burns

**R 36** Irritating to eyes

R 38 ■ Irritating to skin.

R 45 ■ May cause cancer.

in the aquatic environment

**R 56** ■ Toxic to soil organisms.

**R 60** ■ May impair fertility.

**R 54** ■ Toxic to flora.

R 55 Toxic to fauna.

**R 57** ■ Toxic to bees.

**R 26** Very toxic by inhalation

**R 28** Very toxic if swallowed.

**R 23** ■ Toxic by inhalation.

R 25 ■ Toxic if swallowed

friction, fire or other sources of ignition.

**R 5** ■ Heating may cause an explosion.

## In Emergencies

- 1. Stay calm
- 2. Make emergency call
- 3. Without placing yourself at risk, rescue victims from the area of immediate danger
- 4. Position injured persons appropriately and comfort 5. Prevent any further damage

breathe fumes.

S 14.2 ■ Keep away from oxidizing and acidic S 43.2 ■ In case of fire, use water or powder

S 42 ■ During fumigation/spraying wear

S 43.3 ■ In case of fire, use powder extin-

S 43.4 ■ In case of fire, use carbon dioxide.

S 43.6 ■ In case of fire, use sand. Never use

S 43.7 ■ In case of fire, use metal-fire

S 43.8 ■ In case of fire use sand, carbon

**S 45** ■ In case of accident or if you feel

**S 46** If swallowed, seek medical advice

**S 47** Keep at temperature not exceeding.

°C. (to be specified by the manufacturer).

S 47.1 ■ Keep at temperature not exceeding

S 48 ■ Keep wetted with ... (to be specified

**S 49** Keep only in the original container.

**S** 50 ■ Do not mix with ... (to be specified by

S 50.3 ■ Do not mix with strong acids, strong

S 52 ■ Not recommended for interior use on

container at hazardous or special waste collec-

bases, non-ferrous metals or their salts.

S 51 ■ Use only in well-ventilated areas.

S 53 ■ Avoid exposure – obtain special

S 56 ■ Dispose of this material and its

S 57 ■ Use appropriate container to avoid

S 59 ■ Refer to manufacturer/supplier for

S 60 ■ This material and its container must

**S 61** ■ Avoid release to the environment.

Refer to special instructions/Safety data

S 62 If swallowed, do not induce vomiting

remove casualty to fresh air and keep at rest.

S 64 ■ If swallowed, rinse mouth with water

1/2 ■ Keep locked up and out of reach of

3/7 ■ Keep container tightly closed in a cool

3/9/14 ■ Keep in a cool, well-ventilated place

away from ... (to be specified by the manu-

3/9/14.1 ■ Keep in a cool, well-ventilated

**3/9/14.2** ■ Keep in a cool, well-ventilated

place away from oxidizing and acidic sub-

stances as well as heavy-metal compounds.

**3/9/14.3** ■ Keep in a cool, well-ventilated

**3/9/14.4** ■ Keep in a cool, well-ventilated

3/9/14.5 ■ Keep in a cool, well-ventilated

place away from water and alkalis.

compounds, acids and alkalis.

place away from iron.

place away from acids.

place away from reducing agents, heavy-metal

seek medical advice immediately and show

S 63 ■ In case of accident by inhalation

(only if the person is conscious).

environmental contamination.

this container or label.

information on recovery/recycling.

be disposed of as hazardous waste.

immediately and show this container or label

unwell, seek medical advice immediately (show

dioxide or powder extinguisher. Never use

(to be specified by the manufacturer).

suitable respiratory equipment.

quisher. Never use water.

powder. Never use water

the label where possible).

by the manufacturer)

the manufacturer).

large surface areas.

S 48.1 ■ Keep wet with water.

S 50.1 ■ Do not mix with acids.

S 50.2 ■ Do not mix with alkalis.

## **Emergency phone numbers**

Medical Sérvice:

Poison Information Centre:

> Fire brigade:

## **Important details:**

- **1. Who** is calling from where?
- 2. What has happend? **3. Where** did it happen?

**4. How many** people are

injured/affected?

## **5. When** did it happen?

**Criteria:** Organic peroxides which are combustible even if not in contact with combustible materials. Other substances and preparations which as a rule are not combustible themselves, but which in contact with combustible materials, mainly through oxygen evolution, considerably increase the fire hazard and the intensity of a fire.

under defined test conditions detonate.

quickly deflagrate or explode upon

Precaution: Avoid impact, knocks,

heating wen partially confined.

friction, sparks, fire and heat.

combustible substances.

Risk of ignition: The substance promotes fire once started and impedes fire

**Precaution:** Avoid all contact with

Criteria: Liquids with a flash point below 21 °C that are not extremely flammable. Solid substances and to a source of ignition may be easily inflamed and then continue to burn

flames, sparks and sources of heat.

Criteria: Liquids with a flash point below 0 °C and a boiling point of max. 35 °C. Gases and gas mixtures which are flammable in air at normal pressure

**Precaution:** Keep away from naked flames, sparks and sources of heat.

Criteria: Inhalation, swallowing or

In the event of serious evidence of absorption, especially carcinogenic, mutagenic and reproduction-toxic **Precaution:** All contact with the human

> seek medical advice immediately. Particular attention is drawn to the risks associated with certain substances. Observe special regulations when handling these substances!

## **Hazard Symbols**

**Criteria:** Chemicals and preparations which may react exothermically without atmospheric oxygen, and which

Criteria: Inhalation, swallowing or absorption through the skin in very small amounts can cause considerable damage to health, and may sometimes be lethal. In the event of serious evidence of severe, possibly irreversible damage to health by single, repeated or prolonged

**Precaution:** All contact with the human body must be avoided. if you feel unwell, seek medical advice immediately!



C: Corrosive **Criteria:** Total damage to living tissues or when this result can be predicted. **Precaution:** Take special measures to protect eyes, skin and clothes.

Do not inhale vapours! In case of

accident or if you feel unwell, seek

the event of evidence of severe, possibly

irreversible damage to health by single,

**Precaution:** All contact with the human

body must be avoided. Particular atten-

tion is drawn to substances which are

mutagenic or reproduction-toxic effect.

suspected to have a carcinogenic,

Xi: Irritant

Criteria: Without being corrosive

immediate, prolonged or repeated

may cause inflammations. Risk of

contact with skin or mucous membranes

sensitization by skin contact (if classi-

repeated or prolonged absorption,

especially in suspected carcinogenic,

mutagenic and reproduction-toxic

effects. Risk of sensitization by

inhalation (classified R 42).

medical advice immediately!



preparations which on brief exposure or smoulder. **Precaution:** Keep away from naked

F+: Extremely flammable

and average temperatures.



absorption through the skin in small amounts can cause considerable damage to health, and may sometimes be lethal. severe, possibly irreversible damage to health by single, repeated or prolonged

body must be avoided. If you feel unwell, carcinogenic, teratogenic or mutagenic



Criteria: Liberation into aquatic and non-aquatic environments would present or may present immediate or delayed damage for one or more components of the environment may lead to immediate or delayed damage of the ecological system through alteration of the natural balance. Some substances

mental compartments. **Precaution:** Depending on the risk potential do not allow to enter sewerage systems, soil or environment. Observe special disposal regulations!

or their degradation products may si-

multaneously affect different environ-

- 1 Slightly polluting substance.

## What to do with used solvents and chemicals?

Merck has developed a Retrologistics® system to collect, transport and recycle used and surplus substances according to the slogan "back to pro-

If you are interested in the implementation of a similar recycling-system in your country we would be pleased to share our know-how.

## **General Precautions Safety Rules**

Hazardous substances may only be kept at the workplace in quantities hat are just sufficient to ensure continuity of work.

R 48/20/21/22 ■ Harmful: danger of serious S 12 ■ Do not keep the container sealed.

S 13 ■ Keep away from food, drink and

S 14 ■ Keep away from ... (to be specified by

S 14.1 ■ Keep away from reducing agents,

heavy-metal compounds, acids and alkalis.

S 14.3 ■ Keep away from iron.

S 14.5 ■ Keep away from acids.

S 14.6 ■ Keep away from alkalis.

S 14.7 ■ Keep away from metals.

agents and flammable materials.

S 15 ■ Keep away from heat.

S 14.11 ■ Keep away from flammable

S 14.12 ■ Keep away from alkalines and

S 16 ■ Keep away from sources of ignition

S 17 ■ Keep away from combustible material.

**S 18** Handle and open container with care.

S 20 ■ When using do not eat or drink.

S 23 ■ Do not breathe gas/fumes/vapour,

S 21 ■ When using do not smoke.

S 22 ■ Do not breathe dust.

S 23.1 ■ Do not breathe gas.

S 23.2 ■ Do not breathe vapour.

S 23.4 ■ Do not breathe fumes.

S 24 ■ Avoid contact with skin.

medical advice

**S 25** ■ Avoid contact with eyes.

S 23.5 ■ Do not breathe fumes/spray.

S 26 ■ In case of contact with eyes, rinse

nmediately with plenty of water and seek

S 27 ■ Take off immediately all contaminated

S 28 After contact with skin, wash immedia-

tely with plenty of ... (to be specified by the

S 28.1 ■ After contact with skin, wash

S 28.2 ■ After contact with skin, wash

S 28.3 ■ After contact with skin, wash

S 28.4 ■ After contact with skin, wash

immediately with plenty of soap and water.

immediately with plenty of soap and water, if

immediately with plenty of polyethylene glycol

S 28.5 After contact with skin, wash imme-

diately with plenty of polyethylene glycol 400.

S 28.6 After contact with skin, wash imme-

diately with plenty of polyethylene glycol 400

S 28.7 ■ After contact with skin, wash

immediately with plenty of acidic soap and

S 30 ■ Never add water to this product.

S 33 ■ Take precautionary measures against

S 35 ■ This material and its container must

S 36 Wear suitable protective clothing.

S 38 ■ In case of insufficient ventilation.

S 40 To clean the floor and all objects

S 40.1 ■ To clean the floor and all objects

contaminated by this material, use plenty of

ontaminated by this material, use ... (to be

wear suitable respiratory equipment.

S 39 ■ Wear eye/face protection.

specified by the manufacturer).

then rinse with plenty of water.

S 29 ■ Do not empty into drains.

be disposed of in a safe way.

S 37 ■ Wear suitable gloves.

possible also with polyethylene glycol 400.

300 and ethanol (2:1) followed by plenty of

immediately with plenty of water.

S 23.3 ■ Do not breathe spray.

substances as well as heavy-metal compounds.

S 14.8 ■ Keep away from oxidizing and acidic wate

S 14.4 ■ Keep away from water and alkalis.

S 14.9 Keep away from flammable organic

S 14.10 ■ Keep away from acids, reducing

animal feeding stuffs.

the manufacturer).

Laboratories are to observe the National "Guidelines for Laboratories." Our reagents are intended exclusively for use in the laboratory.

damage to health by prolonged exposure

R 48/20/22 ■ Harmful: danger of serious

damage to health by prolonged exposure

R 48/21 ■ Harmful: danger of serious damage

R 48/21/22 ■ Harmful: danger of serious

damage to health by prolonged exposure in

damage to health by prolonged exposure if

R 48/23 ■ Toxic: danger of serious damage

R 48/23/24 ■ Toxic: danger of serious

damage to health by prolonged exposure

through inhalation and in contact with skin.

R 48/23/24/25 ■ Toxic: danger of serious

through inhalation, in contact with skin and if

R 48/24 ■ Toxic: danger of serious damage to

health by prolonged exposure in contact with

R 48/24/25 ■ Toxic: danger of serious

contact with skin and if swallowed.

damage to health by prolonged exposure in

R 48/25 ■ Toxic: danger of serious damage

health by prolonged exposure if swallowed.

R 50/53 ■ Very toxic to aquatic organisms,

R 51/53 ■ Toxic to aquatic organisms,

may cause long-term adverse effects in the

may cause long-term adverse effects in the

R 52/53 ■ Harmful to aquatic organisms,

may cause long-term adverse effects in the

R 68/20 ■ Harmful: possible risk of irreversi-

irreversible effects through inhalation and in

R 68/20/21/22 ■ Harmful: possible risk of

R 68/20/21 ■ Harmful: possible risk of

irreversible effects through inhalation, in

R 68/20/22 Harmful: possible risk of

R 68/21/22 ■ Harmful: possible risk of

irreversible effects through inhalation and if

**R 68/21** ■ Harmful: possible risk of irreversible

irreversible effects in contact with skin and if

R 68/22 ■ Harmful: possible risk of irreversible

contact with skin and if swallowed.

effects in contact with skin.

**S** 1 ■ Keep locked up.

by the manufacturer).

manufacturer).

**S 3** • Keep in a cool place.

S 2 ■ Keep out of reach of children

S 4 ■ Keep away from living quarters.

S 5.1 ■ Keep contents under water

S 6.2 ■ Keep contents under argon.

S 6.3 ■ Keep under carbon dioxide.

S 7 ■ Keep container tightly closed.

S 9 ■ Keep container in a well-ventilated place

The letter "E" as a prefix to a risk phrase draws

text, e.g. RE20: "Also harmful by inhalation")

attention to Note E (the word "also" precedes the

S 6.1 ■ Keep under nitrogen

S 8 Keep container dry.

S 5.2 ■ Keep contents under petroleum.

**S 5.3** ■ Keep contents under paraffin oil.

S 6 ■ Keep under ... (to be specified by the

S 5 ■ Keep contents under ... (to be specified

ble effects through inhalation.

contact with skin.

amage to health by prolonged exposure

R 48/23/25 ■ Toxic: danger of serious

to health by prolonged exposure in contact with

through inhalation and if swallowed.

contact with skin and if swallowed.

R 48/22 ■ Harmful: danger of serious

hrough inhalation, in contact with skin and if

We therefore assume that users, through their technical training and need to observe when handling the chemicals.

Since, as a rule, only small quantities are handled in the laboratory, any risk to health can generally be ruled out by close observance of the advice printed on the label.

S 41 ■ In case of fire and/or explosion do not 3/9/14.6 ■ Keep in a cool, well-ventilated

S 43 ■ In case of fire, use ... (never use water) 3/9/14.8 ■ Keep in a cool, well-ventilated

place away from alkalis.

place away from metals.

acids and alkalis.

from iron.

from alkalis.

from metals.

acids and alkalis.

heavy-metal compounds.

heavy-metal compounds

from water and alkalis.

**3/9/14.7** ■ Keep in a cool, well-ventilated

place away from oxidizing and acidic sub-

container in a cool, well-ventilated place away

container in a cool, well-ventilated place away

from reducing agents, heavy-metal compounds,

container in a cool, well-ventilated place away

from oxidizing and acidic substances as well as

container in a cool, well-ventilated place away

container in a cool well-ventilated place away

container in a cool well-ventilated place away

**3/9/49** ■ Keep only in the original container

**3/14** ■ Keep in a cool place away from ... (to

3/14.1 ■ Keep in a cool place away from

reducing agents, heavy-metal compounds,

**3/14.2** ■ Keep in a cool place away from

oxidizing and acidic substances as well as

**3/14.4** ■ Keep in a cool place away from

**3/14.7** ■ Keep in a cool place away from

**3/14.8** ■ Keep in a cool place away from

**7/8** ■ Keep container tightly closed and dry.

**7/9** ■ Keep container tightly closed and in a

**7/47** ■ Keep container tightly closed and at a

temperture notexceeding ...°C (to be specified

**20/21** ■ When using do not eat, drink or

24/25 ■ Avoid contact with skin and eyes.

27/28 ■ After contact with skin, take off

immediately all contaminated clothing, and

wash immediately with plenty of ... (to be spe-

29/35 ■ Do not empty into drains; dispose of

this material and its container in a safe way.

29/56 ■ Do not empty into drains, dispose of

this material and its container at hazardous or

**36/37** ■ Wear suitable protective clothing

**36/37/39** ■ Wear suitable protective clo-

**36/39** ■ Wear suitable protective clothing

**37/39** ■ Wear suitable gloves and eye/face

temperature not exceeding ...°C (to be speci-

**47/49** ■ Keep only in the original container at

thing, gloves and eye/face protection.

oxidizing and acidic substances

by the manufacturer).

cified by the manufacturer)

special waste collection point.

and eye/face protection

fied by the manufacturer)

3/14.3 ■ Keep in a cool place away from iron.

3/14.5 ■ Keep in a cool place away from acids.

**3/14.6** ■ Keep in a cool place away from alkalis.

from ... (to be specified by the manufacturer).

3/9/14/49 ■ Keep only in the original

3/9/14.1/49 ■ Keep only in the original

**3/9/14.2/49** ■ Keep only in the original

**3/9/14.3/49** ■ Keep only in the original

3/9/14.4/49 ■ Keep only in the original

**3/9/14.5/49** ■ Keep only in the original

**3/9/14.6/49** ■ Keep only in the original

3/9/14.7/49 ■ Keep only in the original

**3/9/14.8/49** ■ Keep only in the original

from oxidizing and acidic substances.

in a cool well-ventilated place.

be specified by the manufacturer).

professional experience, are familiar with the precautions that they

Anyone handling chemicals should always observe the following safety rules, whether the label carries a hazard warning or not.

- Always wear eye protection; wear protective gloves wherever possible.
- Carry out as much work as possible in an efficient fume cupboard or at least in a well-ventilated area,
- wearing respiratory equipment as required. Avoid all contact with skin, eyes and mucosal tissue.
- Immediately rinse splashes from the skin using plenty of cold water; use polyethylene glycol to rinse off lipophilic substances.
- Corrosive substances entering the eye should be thoroughly rinsed out with a gentle jet of water (e.g. eye shower). Hold the eyelids wide open and move the eyes in all directions. Consult an eye specialist immediately,
- stating the chemical substance involved. Immediately remove any clothing that has become contaminated with dangerous materials.
- Be sure to seek medical advice in the event of an accident or if you feel unwell. Do not eat, drink or smoke in the laboratory
- Observe the rules of the Safety Data Sheets and For further safety precautions and advice

for pregnant women

See national guidelines and puplications. In Germany e.g. publication M039 "Safety at Work", issued by BG Chemie, 69021 Heidelberg, Germany.

# **Storage Classes**

Each product is assigned to a storage class (LGK) according to its hazard properties. The definition of storage classes conforms with the concept of combined storage of chemicals laid down by the VCI (German Chemical Industrieal Federation) This system is based on the laws, regulations and technical rules of Germany

LGK Definition LGK Definition

- Explosive Materials (2<sup>nd</sup> German Explosives Act: Storage groups 1.1-1.4)
- **2A** Compressed, liquified or pressure-dissolved
- **2B** Pressurized gas packages (aerosols containers)
- **3A** Flammable liquid materials (Flp below 55 °C)
- **3B** Flammable liquids (German VbF Hazard Class: A III)
- **4.1A** Flammable solid materials (2<sup>nd</sup> German Explosives Act:
- Storage groups I-III) **4.1B** Flammable solid materials
- (EC Method A 10)
- **4.2** Self-igniting materials 4.3 Materials which form flammable gases in contact with water.

**5.1A** Oxidizing agents

(German TRGS 515 group 1)

- **9** n.n.
- **10** Flammable liquids (if not LGK 3A or 3B) 11 Flammable solids

**5.1B** Oxidizing agents

group 2+3)

**5.1C** Oxidizing agents

group A-C)

**6.1A** Flammable toxic

materials

**5.2** Organic peroxides

6.1B Non-flammable toxic

**6.2** Infectious materials

**8** Corrosive materials

**8A** Flammable corrosive

materials

materials

Radioactive materials

**8A** Non-flammable corrosive

(German TRGS 515

(German TRGS 511

12 Non-flammable liquids in non-flammable packages 13 Non-flammable solids in

non-flammable packages

## **Water Pollution Classes**

- **Polluting** substance. **Highly** polluting substance.

## Reuse instead of disposals

For transfrontier waste transports or other waste management services please note that these are subject to national/international restrictions/ For information or support contact your local partner or the Retrologistics®

Fax: ++49 6151 72-8580, e-mail: retrologistik@merck.de, Internet: www.retrologistics.com

## **Dangerous Chemicals**

Α			Boron trichloride	<b>₽</b> T	T+ R 14-26/28-34 S 9-26-28.6-36/37/39-45	Cresoles		R 24/25-34 S 36/37/39-45	Ethylamine	F+ X	xi R 12-36/37 S 16-26-29	Isobutanol	×	xi R 10-37/38-41-67 S 7/9-13-26-37/39-46	0			S	
Acetaldehyde	F+ <b>X</b>	x <sub>n</sub> R 12-36/37-40 S 16-33-36/37	Boron trifluoride	₩ T+	R 14-26-35 S 9-26-28.1-36/37/39-45	Croton- aldehyde	<b>₽</b> <sup>T+</sup> <b><u>*</u></b>	R 11-24/25-26-37/38-41-48/22-50-68 S 26-28.1-36/37/33-45-61	N-Ethylaniline		R 23/24/25-33 S 28.1-37-45	Isobutyl methyl ketone	<b>*</b>	x <sub>n</sub> R 11-20-36/37-66 S 9-16-29	Oxalic acid	×	x <sub>n</sub> R 21/22 S 24/25	Selenium	R 23/25-33-53 S 20/21-28.1-45-61
Acetic acid 100%	1	R 10-35 S 23.2-26-45	Bromine	<b>₽</b> <sup>T+</sup> <b>=3</b>	R 26-35-50 S 7/9-26-45-61	Cumene hydro-	₽ ₹	R 7-21/22-23-34-48/20/22-51/53 S 3/7-14.11-36/37/39-45-61	Ethyl bromoacetat	te	T+ R 26/27/28 S 7/9-26-45	Isobutyric acid	×	x <sub>n</sub> R 21/22	Р			Selenium dioxide	R 23/25-33-50/53 S 20/21-28.1-45-60-61
Acetic anhydride	5	R 10-20/22-34 S 26-36/37/39-45	Bromoacetic acid	£ 🔁 💆	R 23/24/25-35-50 S 26-36/37/39-45-61	<u>.</u>	<b>X</b> n <u>¥</u>	D 11 00 50/50 05 07	Ethylene		<sub>F+</sub> R 12 S 9-16-33	Isobutyryl chlor	ide 🔥 📴	R 11-35 S 16-23.2-26-36-45	n-Pentane	F+ Xn	R 12-51/53-65-66-67 S 9-16-29-33-61-62	Silicon tetrachloride	R 14-35-37 S 7/8-26-36/37/39-45
Acetone	<u>₩</u>	xi R 11-36-66-67 S 9-16-26	Bromoethane (Ethyl bromide)	<u>₩</u> ××	x <sub>n</sub> R 11-20/22-40 S 36/37	D			Ethylenediamine	<u>*                                    </u>	R 10-21/22-34-42/43 S 23.2-26-36/37/39-45	Isohexane	<b>★</b> Xn <b>½</b>	R 11-38-48/20-51/53-62-65-67 S 9-29-33-36/37-61-62	Peracetic acid	<b>=</b>	R 7-20/21/22-35-50		R 34-50/53 S 26-45-60-61
Acetonitrile	<u>₩</u> ×	x <sub>n</sub> R 11-20/21/22-36 S 16-36/37	Bromoform	€ ±	R 23-36/38-51/53 S 28.1-45-61	1,2-Dibromoethane	<b>₽</b>	R 45-E23/24/25-36/37/38-51/53	Ethylene glycol dimethyl ether (1,2-Dimethoxyethan		R 60-61-11-19-E20 S 53	Isooctane	<b>★</b> Xn <b></b>	R 11-38-50/53-65-67 S 9-16-29-33-60-61-62	≈ 40 %  Perchloric acid ≥ 50 %	*	S 3/7-14.1-36/37/39-45-61 R 5-8-35 S 23.2-26-36/37/39-45	Sodium	R 14/15-34 S 5.3-8-43.7-45
Acetyl chloride		R 11-14-34 S 9-16-26-45	Bromomethane (Methyl bromide)	€ **	R 23/25-36/37/38-48/20-50-59-68 S 15-27-36/39-38-45-59-61	Dibromomethane	××	S 53-45-61 in R 20-52/53	Ethylene glycol- monomethyl ether	<b></b>	R 60-61-10-E20/21/22 S 53-45	Isopropyl acetat	te 🐞 🗶	xi R 11-36-66-67 S 16-26-29-33	o-Phenetidine p-Phenetidine		R 23/24/25-33 S 28.1-36/37-45	Sodium azide	R 28-32-50/53 S 28.1-45-60-61
Acrolein	<b>№</b> T+ <b>½</b>	R 11-24/25-26-34-50 S 23.1-26-28.1-36/37/39-45-61	1,3-Butadiene	F+ 🔬	R 45-46-12 S 53-45	1,2-Dichlorobenzene		S 24-61 R 22-36/37/38-50/53	(2-Methoxyethanol)		R 45-46-12-E23-36/37/38 S 53-45	<b>L</b> Lead		R 61-62-E20/22-33	Phenol		R 23/24/25-34-48/20/21/22-68 S 24/25-26-28.6-36/37/39-45	Sodium chlorate	Xn R 9-22 S 2-13-17-46
Acrylamide		R 45-46-E20/21-E25-36/38-43-E48/23/24/25-62 S 53-45	Butane		<sub>F+</sub> R 12 S 9-16	Dichlorodimethyl-	× ×	S 23.2-60-61 R 11-36/37/38			S 53-45	Lead(II) acetate		S 53-37-45 R 61-33-40-E48/22-50/53-62	1,2-Phenylene- diamine	<b>№ ½</b>	R 20/21/25-36-40-43-50/53-68 S 28.1-36/37-45-60-61	Sodium cyanide	R 26/27/28-32-50/53 S 7-28.1-29-45-60-61
Acrylic acid	<b>1</b>	R 10-20/21/22-35-50 S 26-36/37/39-45-61	1-Butene	F	F+ R 12 S 9-16-33	silane 1,2-Dichloroethane		R 45-11-E22-36/37/38 S 53-45	<b>F</b> 2-Fluorobenzal-		xn R 10-22-38	Lead(IV) acetate		S 53-45-60-61  R 61-E20/22-33-50/53-62	Phenylhydrazine	<b>№ ½</b>	R 45-E23/24/25-36/38-43-E48/23/24/25-50-68 S 53-45-61	Sodium dichromate	R 45-46-60-61-8-E21-E25-E26-34- 42/43-E48/20/21/22-50/53 S 53-45-60-61
Acrylonitrile	<b>№</b>	R 45-11-E23/24/25-37/38-41-43-51/53 S 53-9-16-45-61	Butylamine		R 11-20/21/22-35 S 3-16-26-29-36/37/39-45	Dichloroisocyanuric		R 22-31-36/37-50/53	dehyde Formaldehyde		R 23/24/25-34-40-43	Lithium		S 53-45-60-61 R 14/15-34	Phosgene		T+ R 26-34 S 9-26-36/37/39-45	Sodium dithionite	Xn R 7-22-31 S 7/8-26-28.1-43.6
Allyl alcohol	<b>№</b>	R 10-23/24/25-36/37/38-50 S 36/37/39-38-45-61	Butyronitrile		R 10-23/24/25 S 45	acid sodium salt Dichloromethane	X	S 8-26-41-60-61	solution 37% Formamide		S 26-36/37/39-45-51 R 61	Lithium	<u>**</u>	S 8-43.7-45 R 15	Phosphoric acid, ≥ 85%		R 34 S 26-36/37/39/-45	Sodium fluoride	R 25-32-36/38 S 22-36-45
Allylamine	<u>₽</u>	R 11-23/24/25-51/53 S 9-16-24/25-45-61	C			(Methylene chloride) N,N-Diethylaniline		S 23.2-24/25-36/37 R 23/24/25-33-51/53	Formic acid,	5	S 53 R 35	aluminium hydr		S 7/8-24/25-43.6	Phosphorus (red)	<u>&amp;</u>	R 11-16-52/53 S 7-43.1-61	Sodium hydroxide	R 35 S 26-37/39-45
Aluminium chloride (anhydrous)	<u>*                                    </u>	S 7/8-28.1-45	Cadmium chloride	₹ T+ <b>¥</b>	R 45-46-60-61-E25-E26-E48/23/25-50/53 S 53-45-60-61	Diethyl ether	F+ X	S 28.1-37-45-61 n R 12-19-22-66-67 S 9-16-29-33	≥98% Furfural		S 23.2-26-45 R 21-23/25-36/37-40	M Magnesium	رين	R 15-17	di–Phosphorus pentoxide		R 35 S 22-26-45	Sodium hydroxide solution ≥ 5 %	R 35 S 26-36/37/39-45
4-Aminophenol Ammonia	<b>X</b> <sup>Xn</sup> <b>₹</b>	R 20/22-50/53-68 S 28.1-36/37-60-61 R 10-23-34-50	Carbon disulfide		R 11-36/38-48/23-62-63 S 16-33-36/37-45	Diethyl sulfate		S 9-16-29-33 R 45-46-E20/21/22-34	Ш		S 26-36/37/39-45	Maleic anhydrid		S 7/8-43.6 R 22-34-42/43	Phosphorus tribromide		R 14-34-37 S 26-45	Sodium nitrite	R 8-25-50 S 45-61
(anhydrous)  Ammonia solution	<b>₩</b>	S 9-16-26-36/37/39-45-61 R 34-50	Carbon monoxide	F+ 🔐	R 61-12-E23-E48/23 S 53-45	Diisobutyl ketone	<b>A</b> X	S 53-45 R 10-37	n-Heptane	Xn ¥	R 11-38-50/53-65-67	Mercury	4V.	S 22-26-36/37/39-45  R 23-33-50/53	Phosphorus trichloride	₩ T+	R 14-26/28-35-48/20 S 7/8-26-36/37/39-45	Sodium perchlorate	
≥ 25%  Ammonium		S 26-36/37/39-45-61 R 45-46-60-61-2-8-E21-E25	Carbon tetrachlori	ide 🚂 💆	R 23/24/25-40-48/23-52/53-59 S 23.2-36/37-45-59-61	Diisopropyl ether	<i>\lambda</i>	S 24 R 11-19-66-67	n-Hexane	Xn ¥	S 9-16-29-33-60-61-62 R 11-38-48/20-51/53-62-65-67	Mercury(II) ace	tate 🔼 T+ 🕦	S 7-45-60-61  R 26/27/28-33-50/53	Phosphoryl chlorid		R 14-22-26-35-48/23 S 7/8-26-36/37/39-45	Sodium peroxide	R 8-35 S 8-27-39-45
dichromate (stabilized)	***************************************	E26-34-42/43-E48/23-50/53 S 53-45-60-61	Chloral hydrate		R 25-36/38 S 25-45	N,N-Dimethyl-		S 9-16-29-33 R 61-E20/21	Hydriodic acid		S 9-16-29-33-36/37-61-62 R 34	Mercury(I)-		S 13-28.1-36-45-60-61	Potassium	<b>*</b>	R 14/15-34 S 5.3-8-43.6-45	Sulfuric acid, ≥ 96%	R 35 S 26-30-45
Ammonium fluoride	<b>Q</b>	R 23/24/25 S 26-45	Chloramine T		3 7-22-20-30/37/39-45	acetamide		S 53-45 R 12-20/22-34 S 3-16-26-29-36/37/39-45	Hydrobromic acid ≥ 40%		S 26-36/37/39-45 R 34-37 S 7/9-26-36/37/39-45	chloride (Calomo Mercury(II) chlo		R 28-34-48/24/25-50/53	Potassium bromate	e 🚵 😡	R 45-9-E25	Sulfuryl chloride	R 14-34-37 S 26-45
Aniline	€ 5	R 23/24/25-40-41-43-48/23/24/25-68-50 S 26-27-36/37/39-45-46-61-63	Chlorine	<b>№</b>	R 23-36/37/38-50 S 9-45-61	40 % N,N-Dimethylaniline		S 3-16-26-29-36/37/39-45 R 23/24/25-40-51/53	Hydrochloric acid, 10 < 25 %		xi R 36/37/38 S 26	Methane		S 36/37/39-45-60-61	Potassium chlorate		x <sub>n</sub> R 9-20/22	т	520 10
o-Anisidine		R 45-E23/24/25-68 S 53-45-61	Chloroacetic acid		R 25-34-50 S 23.2-37-45-61	Dimethyl carbonate		S 28.1-36/37-45-61	Hydrochloric acid, ≥ 25 %		R 34-37 S 26-36/37/39-45	Methanol	<u>→</u>	S 9-16-33 R 11-23/24/25-39/23/24/25	Potassium cyanide		S 13-16-27 R 26/27/28-32-50/53 S 7-28.1-29-45-60-61	Tetrachloroethylene	R 40-51/53
Antimony(III) chloride	<b>E</b>	3 20 10 01	Chloroacetonitrile Chloroacetyl		R 23/24/25-51/53 S 45-61 R 14-23/24/25-35-48/23-50	Dimethyl ether	. N. E	S 9-16 + R 12	Hydrofluoric acid ≥ 7 %		R 26/27/28-35 S 7/9-26-28.1-36/37/39-45	(Methyl alcohol)  Methylamine	F+ X	S 7-16-36/37-45 Xn R 12-20-37/38-41 S 16-26-39	Potassium dichromate	₩ T+ <b>½</b>	R 45-46-60-61-8-E21-E25-E26- 34-42/43-E48/23-50/53	Tetrahydrofuran	S 23.2-36/37-61  R 11-19-36/37 S 16-29-33
Antimony(III) fluoride	€ 5	R 23/24/25-51/53 S 7-26-45-61	chloride 3-Chloroaniline		S 7/8-9-26-36/37/39-45-61 R 23/24/25-33-50/53	N,N-Dimethyl-		S 9-16-33 R 61-F20/21-36	Hydrogen		F+ R 12 S 9-16-33	Methyl mercaptan	<b>№</b> F+ <b>× <u>*</u></b>	R 12-23-50/53 S 16-25-60-61	Potassium fluoride		S 53-45-60-61 R 23/24/25	Thallium	R 26/28-33-51/53 S 13-28.1-45-61
Arsenic		R 23/25 S 20/21-28.1-45	Chlorobenzene	Yn Yv	S 28.6-36/37-45-60-61 R 10-20-51/53	formamide Dimethyl sulfate		S 53-45 + R 45-E25-E26-34-43-68	Hydrogen bromide (anhydrous)		R 35-37 S 7/9-26-45		tone 🐞 🛭 😡	T <sub>+</sub> R 11-26/28-34-37-40-43 S 16-26-28.1-36/37/39-45	Potassium hydroge		S 26-45 R 34-37	and compounds Toluene	Nn R 11-38-48/20-63-65-67 S 36/37-46-62
trans-Azobenzene	₩ ₹	3 33-43-00-01	1-Chloro-2,4-	Xn ¥	S 24/25-61 R 23/24/25-33-50/53	Dinitrobenzenes		S 53-45 R 26/27/28-33-50/53	Hydrogen chloride		R 23-35 S 9-26-36/37/39-45	N			sulfate Potassium	<u>*                                    </u>	S 26-36/37/39-45 R 22-35		R 23/24/25-33-50 S 28.1-36/37-45-61
Azoxybenzene	×	x <sub>n</sub> R 20/22 S 28.1	dinitrobenzene Chloroethylene		S 28.1-37-45-60-61 R 45-12	Dinitrophenols	₩ T+ <b>½</b>	S 28.1-36/37-45-60-61 R 23/24/25-33-50/53	Hydrogen peroxide 8 < 35 % H <sub>2</sub> O <sub>2</sub>	_	xn R 22-41 S 26-39	2-Naphthol	<b>X</b> <sup>Xn</sup> <b>¥</b>	R 20/22-50 S 24/25-61	hydroxide Potassium hydro-	<u>*                                    </u>	S 26-36/37/39-45 R 22-35	Trichloroacetic acid	R 35-50/53 S 26-36/37/39-45-60-61
В			(Vinyl chloride)  Chloroform	<b>₩</b> X	S 53-45 xn R 22-38-40-48/20/22	•		S 28.1-36/37-45-61 n R 11-19-36/37-40-66 S 9-16-36/37-46	Hydrogen sulfide		R 12-26-50 S 9-16-36-38-45-61	Nitric acid, 65%		R 35 S 23.2-26-36/37/39-45	xide solution 47 %	) ***	S 26-36/37/39-45	1,1,1-Trichlorethane	R 20-59 S 24/25-59-61
Barium peroxide		xn R 8-20/22 S 13-27	Chlorophenols	Xn ¥	S 36/37 R 20/21/22-51/53	Dipropyl ether	.Mr.	R 11-19-66-67	Hydroquinone (1,4-Dihydroxybenzolene)	<b>X</b> n <u><b>₹</b></u>	R 22-40-41-43-50-68 S 26-36/37/39-61	Nitric acid, 100%	<b>*</b>	R 8-35 S 23.2-26-36-45	perchlorate		S 13-22-27	Trichlorethylene	R 45-36/38-52/53-67-68 S 53-45-61
Benzaldehyde		xn R 22 S 24	Chlorosulfonic aci	id 📻	S 28.1-61 R 14-35-37			S 9-16-29-33	1		Danier -	Nitroaniline		R 23/24/25-33-52/53 S 28.1-36/37-45-61	Potassium permanganat	<b>X</b> n <u>₹</u>	R 8-22-50/53 S 60-61	1,1,2-Trichloro- trifluoroethane	R 59 S 61
Benzene		R 45-46-11-36/38-E48/23/24/25-65 S 53-45	Chlorotoluenes	Xn ¥	R 20-51/53	E Ethane	<u>, , , , , , , , , , , , , , , , , , , </u>	R 12			R 20/21-50 S 23.2-25-61	Nitrobenzene	<b>₩</b>	3 20.3 30/37 +3 01	Propane 1 Propanel		F+ R 12 S 9-16	V	2 0.
p-Benzoquinone (p-Quinone)	€ 5	3 20 20.1 +3 01	Chromium(VI)		S 24/25-61 R 45-46-9-E24/25-E26-35-	Ethanol		R 12 S 9-16-33	lodoacetic acid		R 25-35 S 22-36/37/39-45	Nitrogen dioxid	<b>SE</b>	S 9-26-28.1-36/37/39-45	1-Propanol		xi R 11-41-67 S 7-16-24-26-39	Xylene	x <sub>n</sub> R 10-20/21-38 S 25
Benzoyl chloride (with 25% water)	<b>5</b>	R 34 S 26-45	Oxide Cabalt(II) ablavida		42/43-E48/23-62-50/53 \$ 53-45-60-61	(Ethyl alcohol)		R 11 S 7-16	lodomethane (Methyl iodide)	365	R 21-23/25-37/38-40 S 36/37-38-45	Nitromethane		x <sub>n</sub> R 5-10-22 S 41	2-Propanol		xi R 11-36-67 S 7-16-24/25-26	mixture of isomers	S 25
Benzoyl peroxide	<b>*</b>	3 3/7-14.9-24-36/37/39	Conner(II) sulfate		R 49-E22-42/43-50/53 S 53-22-45-60-61	Ethanolamine  Ethyl costate	<u>* * </u>	R 20/21/22-34 S 26-36/37/39-45	Isoamyl alcohol		x <sub>n</sub> R 10-20-37-66 S 46	1-Nitropropane	×	x <sub>n</sub> R 10-20/21/22 S 9	Propylene oxide	F+ 🔐	R 45-46-12-E20/21/22-36/37/38 S 53-45	Z	D 22 44 50/52
Benzyl chloride		R 45-E22-E23-37/38-41-E48/22 S 53-45	Copper(II) sulfate	<b>X</b> <sup>Xn</sup> <b>¥</b>	R 22-36/38-50/53 S 22-60-61	Ethyl acetate	<b>★</b> ×	R 11-36-66-67 S 16-26-33	Isobutane		F+ R 12 S 9-16	4-Nitrotoluene	<b>№</b>	R 23/24/25-33-51/53 S 28.1-37-45-61	Pyridine	<b>*</b>	x <sub>n</sub> R 11-20/21/22 S 26-28.1	Zinc sulfate	R 22-41-50/53 S 22-25-60-61

## Literature

- Academic Laboratory Chemical Hazards Guidebook Accident and Emergency Management • Chemical Hazards of the Workplace
- Chemical Information Manual The Classification, Packaging and Labelling of Dangerous Substances
- CRC Handbook of Laboratory Safety • First Aid Manual for Chemical Accidents
- Fundamentals of Environmental Compliance Inspection • Hazardous and Toxic Materials: Safe Handing and Disposal