

EU Safety and Risk Phrases:

Introduction

The Material Safety Data Sheets (MSDS) for any purchased chemical substances must be acquired from the supplier, and academic/industry guidance sources should be checked in the case of any activity produced chemicals, such as gases, vapours or dusts.

Below is a full list of the European Safety (S) and Risk (R) numbers and phrases which may appear on Material Safety Data Sheets (MSDS) and/or the packaging and labels of hazardous substances under the requirements of the Chemical (Hazard, Information and Packaging for Supply) Regulations 2002. They are a helpful aid when undertaking risk assessments in compliance with the Control of Substances Hazardous to Health Regulations (COSHH) and the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).

Risk (R)-phrases:

Phrase	Explanation
R1	Explosive when dry.
R2	Risk of explosion by shock, friction, fire or other sources of ignition.
R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R4	Forms very sensitive explosive metallic compounds.
R5	Heating may cause an explosion.
R6	Explosive with or without contact with air.
R7	May cause fire.
R8	Contact with combustible material may cause fire.
R9	Explosive when mixed with combustible material.
R10	Flammable
R11	Highly flammable
R12	Extremely flammable
R13 (obsolete)	Extremely flammable liquid gas (This R-phrase is no

	longer designated)
R14	Reacts violently with water.
R15	Contact with water liberates extremely flammable gases.
Merck R15.1	Contact with acid liberates extremely flammable gases.
R16	Explosive when mixed with oxidizing substances.
R17	Spontaneously flammable in air
R18	In use, may form flammable/explosive vapour-air mixture.
R19	May form explosive peroxides.
R20	Harmful by inhalation.
R21	Harmful in contact with skin
R22	Harmful if swallowed.
R23	Toxic by inhalation.
R24	Toxic in contact with skin.
R25	Toxic if swallowed.
R26	Very toxic by inhalation.
R27	Very toxic in contact with skin
R28	Very toxic if swallowed.
R29	Contact with water liberates toxic gas.
R30	Can become highly flammable in use.
R31	Contact with acids liberates toxic gas.
Merck R31.1	Contact with alkalis liberates toxic gas.
R32	Contact with acids liberates very toxic gas.
R33	Danger of cumulative effects.
R34	Causes burns.
R35	Causes severe burns.

R36	Irritating to eyes.
R37	Irritating to respiratory system.
R38	Irritating to skin.
R39	Danger of very serious irreversible effects.
R40	Possible risk of cancer. CAUTION: Until 2001 this R-phrase was used for possible mutagenic or teratogenic risks as well. These risks are now labelled with R68!
R41	Risk of serious damage to eyes.
R42	May cause sensitization by inhalation.
R43	May cause sensitization by skin contact.
R44	Risk of explosion if heated under confinement.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R47 (obsolete)	May cause deformities. (This R-phrase is no longer designated)
R48	Danger of serious damage to health by prolonged exposure.
R49	May cause cancer by inhalation.
R50	Very toxic to aquatic organisms.
R51	Toxic to aquatic organisms.
R52	Harmful to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.
R54	Toxic to flora.
R55	Toxic to fauna.
R56	Toxic to soil organisms.
R57	Toxic to bees.
R58	May cause long-term adverse effects in the

	environment.
R59	Dangerous for the ozone layer.
R60	May impair fertility.
R61	May cause harm to the unborn child.
R62	Possible risk of impaired fertility.
R63	Possible risk of harm to the unborn child.
R64	May cause harm to breastfed babies.
R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking.
R67	Vapours may cause drowsiness and dizziness.
R68	Possible risks of irreversible effects.

Combinations of R-phrases:

Phrase	Explanation
R14/15:	Reacts violently with water, liberating extremely flammable gases.
R15/29:	Contact with water liberates toxic, extremely flammable gas.
R20/21:	Harmful by inhalation and in contact with skin.
R21/22:	Harmful in contact with skin and if swallowed.
R20/22:	Harmful by inhalation and if swallowed.
R20/21/22:	Harmful by inhalation, in contact with skin and if swallowed.
R21/22:	Harmful in contact with skin and if swallowed.
R23/24:	Toxic by inhalation and in contact with skin.
R24/25:	Toxic in contact with skin and if swallowed.
R23/25:	Toxic by inhalation and if swallowed.

R23/24/25:	Toxic by inhalation, in contact with skin and if swallowed.
R24/25:	Toxic in contact with skin and if swallowed.
R26/27:	Very toxic by inhalation and in contact with skin.
R27/28:	Very toxic in contact with skin and if swallowed.
R26/28:	Very toxic by inhalation and if swallowed.
R26/27/28:	Very toxic by inhalation, in contact with skin and if swallowed.
R36/37:	Irritating to eyes and respiratory system.
R37/38:	Irritating to respiratory system and skin.
R36/38:	Irritating to eyes and skin.
R36/37/38:	Irritating to eyes, respiratory system and skin.
R39/23:	Toxic: danger of very serious irreversible effects through inhalation.
R39/24:	Toxic: danger of very serious irreversible effects in contact with skin.
R39/25:	Toxic: danger of very serious irreversible effects if swallowed.
R39/23/24:	Toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R39/23/25:	Toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R39/24/25:	Toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R39/23/24/25:	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R39/26:	Very toxic: danger of very serious irreversible effects through inhalation.
R39/27:	Very toxic: danger of very serious irreversible effects in contact with skin.
R39/28:	Very toxic: danger of very serious irreversible effects

	if swallowed.
R39/26/27:	Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
R39/26/28:	Very toxic: danger of very serious irreversible effects through inhalation and if swallowed.
R39/27/28:	Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
R39/26/27/28:	Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R42/43:	May cause sensitization by inhalation and skin contact.
R48/20:	Harmful: danger of serious damage to health by prolonged exposure through inhalation.
R48/21:	Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
R48/22:	Harmful: danger of serious damage to health by prolonged exposure if swallowed.
R48/20/21:	Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R48/20/22:	Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R48/21/22:	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R48/20/21/22:	Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R48/23:	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R48/24:	Toxic: danger of serious damage to health by prolonged exposure in contact with skin.
R48/25:	Toxic: danger of serious damage to health by prolonged exposure if swallowed.

R48/23/24:	Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R48/23/25:	Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R48/24/25:	Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R48/23/24/25:	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R50/53:	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R51/53:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R52/53:	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R68/20:	Harmful: possible risk of irreversible effects through inhalation.
R68/21:	Harmful: possible risk of irreversible effects in contact with skin.
R68/22:	Harmful: possible risk of irreversible effects if swallowed.
R68/20/21:	Harmful: possible risk of irreversible effects through inhalation and in contact with skin.
R68/20/22:	Harmful: possible risk of irreversible effects through inhalation and if swallowed.
R68/21/22:	Harmful: possible risk of irreversible effects in contact with skin and if swallowed.
R68/20/21/22:	Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.

Safety (S)-phrases:

Phrase	Explanation
S1	Keep locked up.
S1/2	Keep locked up and out of the reach of children.
S2	Keep out of the reach of children.
S3	Keep in a cool place.
S3/7	Keep container tightly closed in a cool place.
S3/7/9 (obsolete)	Keep container tightly closed in a cool, well-ventilated place. (Phrase deleted (6 August 2001), but may still appear in MSDS/labels not modified since then)
S3/9 (obsolete)	Keep in a cool, well-ventilated place. (Phrase deleted (6 August 2001), but may still appear in MSDS/labels not modified since then)
S3/9/14	Keep in a cool, well-ventilated place away from (incompatible materials to be indicated by the manufacturer).
S3/9/14/49	Keep only in the original container in a cool, well-ventilated place away from ... (incompatible materials to be indicated by the manufacturer).
S3/9/49	Keep only in original container in a cool, well-ventilated place.
S3/14	Keep in a cool place away from ... (incompatible materials to be specified by the manufacturer).
S4	Keep away from living quarters.
S5	Keep contents under ... (appropriate liquid to be specified by the manufacturer).
S6	Keep under ... (inert gas to be specified by the manufacturer).
S7	Keep container tightly closed.
S7/8	Keep container tightly closed and dry.
S7/9	Keep container tightly closed and in a well-ventilated place.

S7/47	Keep container tightly closed and at a temperature not exceeding ... °C (to be specified by the manufacturer).
S8	Keep container dry.
S9	Keep container in a well-ventilated place.
S10	-
S11	-
S12	Do not keep the container sealed.
S13	Keep away from food, drink and animal feedstuffs.
S14	Keep away from ... (incompatible materials to be indicated by the manufacturer).
S15	Keep away from heat.
S16	Keep away from sources of ignition -- No smoking.
S17	Keep away from combustible material.
S18	Handle and open container with care.
S19	-
S20	When using do not eat or drink.
S20/21	When using do not eat, drink or smoke.
S21	When using do not smoke.
S22	Do not breathe dust.
S23	Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer).
S24	Avoid contact with the skin.
S24/25	Avoid contact with skin and eyes.
S25	Avoid contact with eyes.
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S27	Take off immediately all contaminated clothing.
S27/28	After contact with skin, take off immediately all

	contaminated clothing, and wash immediately with plenty of ... (to be specified by the manufacturer).
S28	After contact with skin, wash immediately with plenty of ... (to be specified by the manufacturer).
S29	Do not empty into drains.
S29/35	Do not empty into drains; dispose of this material and its container in a safe way.
S29/56	Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point.
S30	Never add water to this product.
S31	-
S32	-
S33	Take precautionary measures against static discharges.
S34	Avoid shock and friction. (Phrase deleted (6 August 2001), but may still appear in MSDS/labels not modified since then)
S35	This material and its container must be disposed of in a safe way.
S36	Wear suitable protective clothing.
S36/37	Wear suitable protective clothing and gloves.
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S36/39	Wear suitable protective clothing and eye/face protection.
S37	Wear suitable gloves.
S37/39	Wear suitable gloves and eye/face protection.
S38	In case of insufficient ventilation, wear suitable respiratory equipment.
S39	Wear eye/face protection.
S40	To clean the floor and all objects contaminated by this material, use ... (to be specified by the

	manufacturer).
S41	In case of fire and/or explosion do not breathe fumes.
S42	During fumigation/spraying wear suitable respiratory equipment (appropriate wording to specified by the manufacturer).
S43	In case of fire, use ... (indicate in the space the precise type of fire-fighting equipment. If water increases the risk, add 'Never use water').
S44	If you feel unwell, seek medical advice (show label where possible). (Phrase deleted (6 August 2001), but may still appear in MSDS/labels not modified since then)
S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S46	If swallowed, seek medical advice immediately and show container or label.
S47	Keep at temperature not exceeding ... °C (to be specified by the manufacturer).
S47/49	Keep only in the original container at a temperature not exceeding ... °C (to be specified by the manufacturer).
S48	Keep wet with ... (appropriate material to be specified by the manufacturer).
S49	Keep only in the original container.
S50	Do not mix with ... (to be specified by the manufacturer).
S51	Use only in well-ventilated areas.
S52	Not recommended for interior use on large surface areas.
S53	Avoid exposure -- obtain special instructions before use.
S54	-
S55	-
S56	Dispose of this material and its container to

	hazardous or special waste collection point.
S57	Use appropriate container to avoid environmental contamination.
S58	-
S59	Refer to manufacturer/supplier for information on recovery/ recycling.
S60	This material and its container must be disposed of as hazardous waste.
S61	Avoid release to the environment. Refer to special instructions/safety data sheets.
S62	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
S63	In case of accident by inhalation: remove casualty to fresh air and keep at rest.
S64	If swallowed, rinse mouth with water (only if the person is conscious).

New or Expectant Mothers

Any reference to a chemical having known, or possible, teratogenic, mutagenic or cancerous effects should be an indication for the avoidance of exposure of the pregnant worker to the substance. In some cases this may not mean the same as avoidance of use as it may still be possible to use such high hazard substances if exposure is prevented by the control methodology e.g. glove box, fume cupboard, etc.

Risk phrases

The EU has developed a system of risk and safety codes and phrases for use in the MSDSs of member countries.

If you use or may be exposed to chemicals, the most relevant risk phrases to look out for are:-

- R39 – Danger of very serious irreversible effects
- R40 - Limited evidence of carcinogenic effects
- R45 - May cause cancer
- R46 - may cause heritable genetic damage
- R49 - May cause cancer by inhalation
- R61 - May cause harm to the unborn child

- R63 - Possible risk of harm to the unborn child
- R64 - May cause harm to breast-fed babies
- R68 - Possible risk of irreversible effects

Carcinogenic

Carcinogenic substances cause cancer. For the purpose of classification and labelling, carcinogenic substances are divided into three categories.

- Category 1 — substances known to be carcinogenic to humans and for which there is sufficient evidence to establish a causal association between human exposure to a substance and the development of cancer.
- Category 2 — substances that should be regarded as if they are carcinogenic to humans and there is sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer.
- Category 3 — substances that cause concern for humans owing to possible carcinogenic effects, but in respect of which the available information is not adequate for making a satisfactory assessment.

Substances classified as carcinogenic Category 1 or 2 are assigned the symbol letter “T”, the symbol for toxic and the risk phrase — R45 May cause cancer; or, if there is a carcinogenic risk only when the substance is inhaled, risk phrase — R49 May cause cancer by inhalation.

Substances classified as carcinogenic Category 3 should be assigned the symbol letters “Xn”, the symbol for harmful and the risk phrase — R40 Limited evidence of a carcinogenic effect.

Mutagenic

Mutagenic substances are substances that cause heritable genetic damage. In common with carcinogenic substances, mutagenic substances are divided into three categories.

- Category 1 — substances known to be mutagenic to humans, because there is sufficient evidence to establish a causal association between human exposure to a substance and heritable genetic damage.
- Category 2 — substances that should be regarded as if they are mutagenic to humans, because there is sufficient evidence to provide a strong presumption that human exposure to the substance may result in the development of heritable genetic damage.
- Category 3 — substances that cause concern for humans owing to possible mutagenic effects, because there is evidence from appropriate mutagenicity studies, but this is insufficient to place the substance in Category 2.

Substances classified as mutagenic Category 1 or 2 are assigned the symbol letter “T”, the symbol for toxic and the risk phrase — R46 May cause heritable genetic damage.

Substances classified as mutagenic Category 3 should be assigned the symbol letters “Xn”, the symbol for harmful and the risk phrase — R68 Possible risk of irreversible effects.

Substances Toxic for Reproduction

Substances toxic for reproduction if inhaled or ingested or penetrate the skin may cause infertility in humans or adverse effects in human offspring. In common with carcinogens and mutagens, substances toxic for reproduction are divided into three categories.

- Category 1 — Substances known to impair fertility in humans and substances known to cause developmental toxicity in humans.
- Category 2 — Substances for which there is sufficient evidence to provide a strong presumption that they impair fertility in humans or cause developmental toxicity to humans.
- Category 3 — Substances that cause concern for human fertility and developmental toxic effects on humans.

For advice on any of the above topics please contact Candice Schmid, University Health and Safety Adviser (occupational.hygiene@ed.ac.uk).