Technical selenium

Date of issue: 18.10.2003 **Revision No. / Revision date: 17 / 09.02.2021**

SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identification:
Name: Selenium
Trade name: Technical selenium
IUPAC Name: -
UN No.: 3288
CAS No.: 7782-49-2
WE No.: 231-957-4
Index No.: 034-001-00-2
REACH registration No.: 01-2119981706-25-0003

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses:
ES1: manufacture;
ES2: manufacture: recovery;
ES3: formulation: melting of selenium metal and alloying of metals;
ES4: intermediate, manufacture of selenium compounds;
ES5: coating of surfaces;
ES6: use of selenium containing alloys in the production of electronic devices,
ES7: coated drums, TFT, semiconductive layers and other articles;
ES8: thin film production by Physical Vapor Deposition (PVD);
ES9: vulcanization of rubber.
Uses advised against: not known.

1.3 Details of the supplier of the material safety data sheet:

KGHM Polska Miedź S.A.
"GŁOGÓW" Copper Smelter
ul. Żukowicka 1 67-200 Głogów

Person responsible for preparing the MSDS: Agnieszka Piechota, phone no.: (+48 76) 747 82 21, e-mail: agnieszka.piechota@kghm.com

1.4 Emergency telephone numbers:
Emergency contact during transport (available 24/7):
Main number: +48 (22) 18 55 505
Product Code: 59 102
United States: (205) 419 5174
United Kingdom: 020 3575 1069
Germany: 035 022 4433 98
Manufacturer (Poland): (+48 76) 747 65 01 – available 24/7
Fire Department (Poland): (+48) 998 – available 24/7
General European Emergency Number: 112 – available 24/7

SECTION 2. Hazards identification

2.1. Classification of the substance or mixture:

Acute Tox. 3; H331 – Toxic if inhaled.
Acute Tox. 3; H301 – Toxic if swallowed.
STOT RE 2; H373 – May cause damage to organs through prolonged or repeated exposure.
Aquatic Chronic 4; H413 – May cause long lasting harmful effects to aquatic life.

2.2. Label elements:

GHS06 **GHS08**

Signal Word: "DANGER"

Hazard statements (H):

H331 – Toxic if inhaled.
H301 – Toxic if swallowed.
H373 – May cause damage to organs through prolonged or repeated exposure.
H413 – May cause long lasting harmful effects to aquatic life.

Precautionary statements (P):

P270 – Do not eat, drink or smoke when using the product.
P301+310 – IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P314 – Get medical advice/attention if you feel unwell.
P405 – Store locked up.
P501 – Dispose of contents/container to producer of product.

2.3 Other hazards:

Freshly precipitated selenium reacts with water at temperature >50°C forming toxic Hydrogen selenide creating explosive mix with air.
The substance does **not** meet classification criteria for PBT and vPvB.
The substance is **not** a substance identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

SECTION 3. Composition/information on ingredients

3.1 Substances:

No.	Name of substance	CAS No.	Index No.	Content [mass fraction in %]	Hazard Class and Category Code(s)	Hazard statement Code(s)	Specific Conc. Limit, M-factor, ATE
1	Selenium	7782-49-2	034-001-00-2	77≤ c≤ 99	Acute Tox. 3 Acute Tox. 3 STOT RE 2 Aquatic Chronic 4	H331 H301 H373 H413	-
2	Water	7732-18-5	-	3 ≤ c ≤ 24	-	-	-

3.	Tellurium	13494-80-9	-	up to 0.5	-	-	-

3.2. Mixtures

n/a

SECTION 4. First Aid measures

4.1 Description of first aid measures:

Respiratory tract: Take the victim out of the place of exposure. Provide calmness in any position. Protect against loss of body heat. If the victim does not breathe, provide artificial respiration with a respirator (do not attempt the mouth-to-mouth procedure). Necessary immediate medical help.

Contact with eyes: Immediately rinse with a lot of cool water, running water would be best, for about 15 minutes. Avoid intensive water jet because conjunctiva may become damaged. **Necessary immediate medical help**.

Note: Persons endangered to eye intoxication should be instructed about the necessity and method of immediate flushing.

Skin contact: Remove clothes, wash the intoxicated skin with a lot of running water with soap at room temperature. In case changes and/or ailments occur, seek medical attention.

Ingestion: After ingestion, the victim should induce vomiting, after each vomiting, flush the mouth with water. Unconscious persons should not be administered anything orally. Immediate medical help necessary.

4.2 Most important symptoms and effects, both acute and delayed:

Symptoms of acute intoxication according to ways of exposure:

- alimentary route: metallic taste in mouth, garlicky smell of inhaled air, nausea, vomiting, raised body temperature, headaches;
- respiratory route: irritation of mucosa of upper respiratory ways with symptoms of dry cough, sneeze, dyspnoea; at increased concentrations difficulties with breathing, inflammation and lungs edema;
- eyes contact: pain, lacrimation and redness of conjunctiva; may lead to chemical burns and damages of cornea;
- skin contact: inflammation, changes of skin colour; intoxication of naked, moist skin may cause redness, pain and chemical burns with necrosis.

Long-term exposure: Symptoms syndrome called selenosis: stomach and intestine disorders, injuries to parenchymatous organs (jaundice), nervous system disorders (nervousness, emotional disorders, depression, vertigoes), anaemia, nails atrophy, hair fall, acute tooth decay, skin diseases.

4.3 Indication of any immediate medical attention and special treatment needed:

If the victim is unconscious, make sure that the respiratory tract is not obstructed and place the victim in a recovery position. Provide medical assistance.

SECTION 5. Firefighting measures

5.1 Extinguishing media:

Suitable extinguishing media: Extinguishing powders for metals, powdered dolomite.

Unsuitable extinguishing media: Do not use water or extinguishing agents containing water.

5.2 Special hazards arising from the substance or mixture:

Solid substance in the form of powder of melting point 220°C. When heated up, reacts with atmospheric oxygen, what can lead to fire and explosion. As a result of combustion, selenium dioxide is formed which is toxic to humans and environment.

In air, combusts with blue flame.

5.3 Information for fire-fighters:

Personnel participating in extinguishing a fire should wear gastight protective clothing with breathing apparatus.

Additional information:

Tanks within the range of fire should be cooled with sprayed water, do not let the water penetrate to the tank, remove them from the area if possible.

Notify those in the surroundings about the fire. Remove all personnel not participating in the breakdown liquidation procedure from the area of hazard. Call fire department or police department. If possible, remove containers from fire hazard area. Do not let the fire water, contaminated with the substance, to penetrate surface or underground water.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

6.1.1 For non-emergency personnel:

Do not inhale dusts. Avoid direct contact. In case of choosing evacuation route consider the direction of the dust/fume movement.

6.1.2 For emergency responders: Avoid dust generation, do not inhale dusts. Avoid direct contact. Apply clothing protecting against chemicals as well as eye protection. In case of dust formation, wear dust mask.

Additional information:

Notify those in the surroundings about the emergency. Remove all personnel not participating in the breakdown liquidation procedure from the area of hazard. Call fire department and police if necessary. Protect the spilt substance against rain and wind by covering it with canvas cover.

6.2 Environmental precautions:

Do not let the substance penetrate sewage system or water, secure catch basing bates and sink basins. Protect the spilt substance against propagation due to wind or rain by covering with foil.

6.3 Methods and material for containment and cleaning up:

Operations can only be undertaken with full isolation of the body from the environment. Collect the spilt substance to closed container, avoid generation of dust. Substance collected together with impurities (soil, sand and other) to be treated as hazardous waste.

6.4 Reference to other sections:

Disposal considerations in section 13.

Additional information:

Use personal protection equipment isolating the body (gastight suit equipped with isolating equipment protecting the respiratory system). Liquidate the sources of ignition. Avoid generation of dust. Avoid direct contact with the substance.

SECTION 7. Handling and storage

7.1 Precautions for safe handling:

During handling: do not eat, drink, smoke, avoid contact with the substance, avoid inhalation of dust, observe personal hygiene principles. Avoid generation of dust within the works stand. Use only in identified premises with proper local exhaust ventilation with housing around the area of emission to aerial environment and general ventilation (ventilation installation and equipment should correspond to conditions established due to fire or explosion hazard). In case of insufficient ventilation, apply proper protection clothing and equipment (as provided in section 8). Containers with the substance should be tight closed and identified. Avoid open flame anywhere near the substance and temperature exceeding 50°C.

7.2 Conditions for safe storage, including any incompatibilities:

Store at room temperature, do not let continuous contact with air. Warehouse should be fireproof with mechanical ventilation and explosion-proof electrical installation, floor with electro-conductive lining.

Do not store near acids, bases or oxidants.

Detailed ventilation requirements described in Section 8.2.1.

7.3 Specific end use(s):

Identified uses are listed in section 1.2.

SECTION 8. Exposure control/personal protection

8.1 Control parameters:

The following current national occupational exposure limit values apply:

Selenium and its compounds, except selanium – calculated as Se:

No.	Country	TLV-TWA [mg/m^3]	TLV-STEL [mg/m^3]
1.	Poland	0.1	0.3

Note:

User is obliged to control the work environment against concentration or intensity of harmful substances within frequency and range necessary to determine exposure rate of the employees according to national legislation in force.

Legal basis:

Regulation of the Minister of Family, Labour and Social Policy of June 12th, 2018 on the highest allowable concentrations and intensities of agents harmful for health at the workplace (Official Journal of 2018 item 1286);

The derived no-effect levels (DNELs) for selenium - workers:

- Long-term exposure, inhalation, DNEL = 0.05 mg/m^3
- Long-term exposure, skin contact, DNEL = 7mg/kg of body weight per day

The derived no-effect levels (DNELs) for selenium - the general public:

- Long-term exposure, after swallowing, DNEL = 4.3 µg/kg of body weight per day
- Long-term exposure, inhalation, DNEL = 0.015 mg/m^3
- Long-term exposure, skin contact, DNEL = 4.3 mg/kg of body weight per day

Determination in air at the workplace (Poland):

PN-Z-04468:2015-10 – polish version: Air purity protection. Identification of selenium and its compounds at the work stands with atomic absorption spectrometry method.

8.2 Exposure controls:

8.2.1 *Appropriate engineering controls at industrial settings*

Necessary local exhaust ventilation with housing in case of dust emission to air as well as general ventilation of the room. Suction holes of the local ventilation to be located at the working surface or below. Intake ventilators of the general ventilation in upper part of the room and uptake ventilators in lower part. Ventilation installations must correspond to conditions established due to fire and explosion hazard. Equipment for selenium processing should be tight.

8.2.2 *Individual protection measures, such as personal protective equipment*

Eye and face protection:

In case of hazard of exposure, wear goggles protecting against fine dust. Do not wear contact lenses.

Skin protection: Wear protective clothing of materials coated with butyl, Viton, polyvinyl chloride;.

Hands and feet protection: Wear protective gloves made of neoprene, nitrile, butyl, vinyl chloride; protective leather shoes.

Respiratory protection: Depending on the substance concentration in the work environment, use: half-mask equipped with filter of class P3 (up to 20 NDS) or mask equipped with filter of class P3 (up to 100 NDS). In case of emergency, if the substance concentration is not known, apply personal protection equipment isolating the organism (isolating respiratory system protective equipment).

Thermal hazards: Not applicable

Hygiene means: Immediately remove contaminated clothing and store in closed containers, clean before next use. Wash your hands and face after working with the substance. Do not eat and drink during substance handling.

8.2.3 Environmental exposure controls:

Environmental exposure should be controlled in compliance with national environment protection legislation in force.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties:

a) *Physical state*: formless, moist powder;
b) *Colour:* dark grey;
c) *Odour*: odourless;
d) *Melting point/freezing point:* 221 °C; freezing point not determined;
e) *Boiling point or initial boiling point and boiling range:* 685 °C;
f) *Flammability*: n.a. inflammable product;
g) *Lower and upper explosion limit:* n.a.;
h) *Flash point:* n.a.;
i) *Auto-ignition temperature:* n.a.;
j) *Decomposition temperature:* n.a.;
k) *pH:* n.a.;
l) *Kinematic viscosity:* n.a.;
m) *Solubility:* in water 3.774µg/L at 21.2°C; soluble in chloroform,
n) *Partition coefficient n-octanol/water (log value):* n.a.;
o) *Vapour pressure:*
at temperature 234 °C – 1.33 Pa
at temperature 287 °C – 13.3 Pa
at temperature 348 °C – 133 Pa
p) Density and/or relative density: Se density at temp. 20 °C: 4.81 g/cm^3; bulk density: 1.88 g/cm^3;
q) *Relative vapour density:* n.a.;
r) *Particle characteristics:* L50: 15.83 µm; L10: 3.35 µm; L90: 54.93 µm.

9.2 Other information:
Heat of combustion in oxygen 223 kJ/g.

SECTION 10. Stability and reactivity

10.1 Reactivity
Selenium reacts violently with pure oxygen and halogens with emission of significant amount of heat, creating toxic dioxide and toxic halides.

10.2 Chemical stability:
The substance is stable under normal conditions.

10.3 Possibility of hazardous reactions:
Dangerously reacts with sodium peroxide, silver oxide, nitric acid, nitrogen trichloride, chlorates, chromium trichloride, bromates, carbides (lithium, calcium, barium), alkali metals and alkali soil metals.

10.4 Conditions to avoid:
Do not heat up the substance above 50 °C due to the possibility of occurrence of the following reaction:
$3Se + 3H_2O = H_2SeO_3 + 3H_2Se\uparrow$ as a result of which toxic products are formed; the symptom of the reaction is an odour of rotten radish characteristic of hydrogen selenide.

10.5 Incompatible materials:

Pure oxygen, halogens, sodium peroxide, silver oxide, nitric acid, nitrogen trichloride, chlorates, chromium trichloride, bromates, carbides (lithium, calcium, barium), alkali metals and alkali soil metals.

10.6 Hazardous decomposition products:

Do not form under normal conditions.

SECTION 11. Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008:

a) acute toxicity:

Acute toxicity (oral):

Selenium is listed in harmonized classification and labelling of hazardous substances (table 3.1. appendix VI of CLP) and is classified as: toxic if swallowed (**Acute Toxicity 3;H301**).

Acute toxicity (inhalation):

Selenium is listed in harmonized classification and labelling of hazardous substances (table 3.1. appendix VI of CLP) and is classified as: toxic if inhaled (**Acute Toxicity 3;H301**).

Acute toxicity (skin contact):

on the basis of available data the classification criteria are not met.

Lethal and toxic concentrations and doses:

LD_0 (rat, orally) – 5000 mg/kg (OECD Guideline 401; Prinsen M. K. [1996a])

LC_0 4h (rat, inhalation) – 5,67 mg/l of air (EPA OPP 81-3; Bennick J. [1996])

LD_{50} (rabbit, rat, skin) – no data

b) skin corrosion/irritation:

on the basis of available data the classification criteria are not met.

c) serious eye damage/ eye irritating:

on the basis of available data the classification criteria are not met.

d) respiratory tract or skin sensitization:

on the basis of available data the classification criteria are not met.

e) germ cell mutagenicity:

on the basis of available data the classification criteria are not met.

f) carcinogenicity:

on the basis of available data the classification criteria are not met.

g) reproductive toxicity:

on the basis of available data the classification criteria are not met.

h) specific target organ toxicity — single exposure:

on the basis of available data the classification criteria are not met.

i) specific target organ toxicity — repeated exposure:

Selenium is listed in harmonized classification and labelling of hazardous substances (chart 3.1. appendix VI of CLP) and is classified as may causing damage to organs through prolonged or repeated exposure (**STOT RE 1; H372**)

j) aspiration hazard:

on the basis of available data the classification criteria are not met.

Additional information:

Toxin action of selenium is multithreaded, i.e. consists in competitive action in relation to sulphur contained in biologically active compounds. Selenium is cumulated in liver, kidneys, nails and hair. Selenium is excreted with urine, sweat and exhaled air (garlicky smell).

Information related to possible exposure ways, product properties related symptoms and possible product exposure effects described in section 4.2.

11.2 Information on other hazards:

None

SECTION 12. Ecological information

12.1 Toxicity:

Selenium is listed in harmonized classification and labelling of hazardous substances (table 3.1. appendix VI of CLP) and is classified as substance which may cause long-term adverse effects to aqueous organisms (**Aquatic Chronic 4; H413**).

Toxic concentration for aqueous animal and plant organisms:

LC_{50}/96 h fish *Oncorhynchus mykiss*: > 26,2 µg/l

NOEC/28d fish *Oncorhynchus mykiss*: 1,57 µg/l

LC_{50}/48 h crustaceans *Daphnia magna*: > 160,3 µg/l

NOEC/21d crustaceans *Daphnia magna*: 3,42 µg/l

EC_{50}/72 algea *Pseudokirchnerella subcapitata:* 0,547 µg/

12.2 Persistence and degradability:

Selenium is persistent in water. It is oxidized in time by oxygen present in water to ions of Se^{+4} i Se^{+6} which form unsoluble salts with ions of metals other than alkali metals.

12.3 Bioaccumulative potential:

Selenium is drawn and cumulated from soil by plants. Some of them, called plant selenium index (e.g. milkvetch, broom) may cumulate from 1 g/kg to 15 g/kg of Se. Pasture or feeding of animals with such plants may lead to intoxication.

Selenium is a trace element of high biological activity. Both deficiency and excess of selenium is harmful. Selenium toxic hazard occurs at content in soil exceeding 2 mg/kg.

12.4 Mobility in soil:

Selenium compounds behaviour in environment is determined by complex geochemical properties as well as multivalency of the element (Se^{6+}, Se^{4+}, Se^{0}, Se^{2-}). These factors contribute to the emergence of various forms of Se, potentially bio-available in soil solution. Soil nad climate factors significantly affect this element availability. The increase of ambient temperature and soil pH favours selenium migration in the environment and its absorption by plants and other soil organisms.

Total amount of selenium in soil is strictly dependant on the type and kind of soil, showing a strict dependence on the granulometric composition of the soil.

12.5 Results of PBT and vPvB assessment.

Product is not classified as PBT and vPvB.

12.6. Endocrine disrupting properties:

Not applicable. The substance is **not** a substance identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

12.7 Other adverse effects:

Not known.

SECTION 13. Disposal considerations

13.1 Waste treatment methods:

Waste treatment: Do not dispose of to sewage system. Do not store at municipal landfills. Do not let the substance to contaminate surface and underground water and soil. Consider the opportunity to reuse. Store in tightly closed containers resistant to waste and atmospheric conditions.

Waste management according to the Directive of the European Parliament and Council 2008/98/EC of November 19th, 2008 on waste and repealing certain Directives (Official Journal EC L 312 of 22.11.2008 with subsequent amendments).

Packages: Disposable packages must be handed over to an authorized collector of package waste. Multiple use packages can be still used after previous cleaning.

Waste management according to the Directive of the European Parliament and Council 94/62/EC of December 20th, 1994 on packages and waste packages (Official Journal EC L 365 of 31.12.1994, with subsequent amendments).

Methods of neutralization of harmless waste: Consolidation on hazardous waste landfill. Do not neutralize applying thermal methods and do not dispose to sewerage. Selenium compounds (except cadmium orange) are compounds harmful to environment.

SECTION 14: Transport information

14.1 UN number or ID number:: 3288

14.2 UN proper shipping name:

ADR/RID: TOXIC SOLID, INORGANIC N.O.S.

14.3 Transport hazard classes: RID/ADR: 6.1;

14.4 Packing group: RID/ADR: III;

14.5 Environmental hazards

Due to toxic effects of the product on aquatic organisms, means of transport should be labelled with the following mark:

14.6. Special precautions for user:

Do not damage the containers. In case of unintentional product release: liquidate the leakage (seal, place damaged container in a protection packaging. Collect spilt substance to airtight tank and treat as hazardous waste. These actions can be taken if total person – environment isolation is provided. Personal protection measures as described in section 8.2.2.

14.7. Maritime transport in bulk according to IMO instruments: N/A
Additional information:
Trade name of goods: Technical selenium
Class/Classification Code: RID/ADR: T5,
Limited and exempted quantities: RID/ADR: 5 kg / E1
Warning labels: RID/ADR: 6.1,

Special provisions: RID/ADR: 274;
Other data: special provisions of 5.2.1.8, 5.3.6 and 5.4.1.1.18 apply.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

Category of the substance according to Seveso III Directive/substances listed in the annex I to the Directive of the Council 96/82/EC of December 9th, 1996, on control of significant breakdowns hazard related to hazardous substances (Official Journal L 192, 08/07/1998, with subsequent amendments): toxic substance.
Provisions of law:
Commission Regulation (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).
Act of February 25th, 2011 on chemical substances and their mixtures (Official Journal 11.63.322); Regulation (EC) No. 1907/2006 of the European Parliament and Council of December 18th, 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC; Regulation of the European Parliament and Council (EC) No. 1272/2008 dated December 16th, 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006; Regulation of the European Parliament and Council (EC) No 1336/2008 of 16 December 2008 amending Regulation (EC) No 648/2004 in order to adapt it to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (Official Journal L 354 from 31.12.2008); Regulation of the Minister of Labour and Social Policy of June 6th, 2014 on the highest allowable concentrations and intensities of substances harmful for health in the work environment (Official Journal No. 817); Act of August 19th, 2011 on transportation of hazardous goods (Official Journal 227.1367); Act of December 14th, 2012, on waste (Official Journal 0.21.2013); Regulation of the Board of Ministers of August 24th, 2004, on the list of works banned for adolescents and conditions of their employing for some works. (Official Journal 04.200.2047, with subsequent amendments).

15.2 Chemical safety assessment:

Chemical safety assessment for selenium has been carried out.

SECTION 16. Other information

16. Other information

Amendments have been made to sections: 1.4; the MSDS has been updated in accordance with Commission Regulation (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Explanations of abbreviations and acronyms used in the MSDS:

CAS number – means numerical identification assigned to chemical substance by the American organization of Chemical Abstract Service (CAS), enabling substance identification.

Index number – it is an identification code given in part 3 of the annex VI to the Regulation of the European Parliament and Council (EC) No. 1272/2008 dated December 16th, 2008, on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006;

WE number – the number assigned to chemical substance in EINECS -. European Inventory of Existing Chemical Substances, or the number assigned to chemical substance in ELINCS - European List of Notified Chemical Substances or the number in chemical substances inventory included in "No-longer polymers" document.

Registration number – number given by ECHA after substance/intermediate registration by the manufacturer/importer according to REACH Decree.

UN number – unequivocal marking of hazardous substances and goods assigned by United Nations Central Committee to provide international recognition and use.

IUPAC name – name of a substance given by IUPAC - *International Union of Pure and Applied ChemistryCommittee*

TLV-TWA – the highest admissible concentration/threshold limit value – weighted average value – concentration of toxic chemical whose impact on an employee during 8-hour daily shift and average weekly time of work provided in the Labour Code during the period of his occupational activity should not cause negative changes of his health condition and of health condition of his next generations.

TLV-STEL – the highest admissible short term concentration/short term exposure limit – weighted average of concentration of the specified, toxic chemical compound which should not cause negative changes of an employee's health if present in the work environment for not longer than 15 minutes and not more often than twice per shift with occurrences separated by more than 1 hour.

LD_{50} – dose of toxic substance expressed in milligrams per kilogram of body mass which causes death of 50% of the tested population after specified period of exposure.

LD_0 – dose of toxic substance expressed in milligrams per kilogram of body mass which does not cause death of any member of the tested population after specified period of exposure.

LC_{50} – concentration of a substance in the inhaled air, expressed in milligrams per litre, which causes death of 50% of the tested population after specified period of exposure.

LC_{50} – concentration of a substance in the inhaled air, expressed in milligrams per litre, which does not cause death of any member of the tested population after specified period of exposure.

EC_{50} – substance dose expressed in milligrams per litre causing the given pharmacological effect (e.g. inhibition of growth) at 50% of the tested population within specified time.

NOEC – (*no observed effect concentration*) – the highest concentration of the toxin, which during defined time of a test does not cause any noticeable changes in tested organisms.

Sources of information used during preparation of the MSDS:

- Own results of qualitative and quantitative analyses of technical selenium;
- Selenium Chemical Safety Report (2013);
- ECHA:https://echa.europa.eu/pl/information-on-chemicals/registered-substances;
- TOXNET – Toxicology Data Network (http://toxnet.nlm.nih.gov/);

Necessary training: Post-related training within the scope of safe use of a substance considering its hazardous properties for humans and environment.

Information contained in the material safety data sheet is to describe the product within the scope of safety requirements. User is responsible for taking any steps in order to meet the provisions of the national law and to create safe conditions for use of the product. User is held responsible for effects resulting from improper application of this product.

Further information can be obtained under the telephone numbers given in section 1.