In accordance with the Standard for Classification and Labeling of Chemical Substance and Safety Data Sheet, Article 10 Paragraph 1 - Korea

SAFETY DATA SHEET

Redox standard +250 mV

SDS Number: AA10487-0000000027

In accordance with the Standard for Classification and Labeling of Chemical Substance and Safety Data Sheet, Article 10 Paragraph 1

Section 1. Chemical product and company identification

A. Product name : Redox standard +250 mV

B. Relevant identified uses of the substance or mixture and uses advised against

Product use : Laboratory chemicals.

C. Manufacturer / Importer / Distributor : Manufacturer
Metrohm AG
Ionenstrasse
9100 Herisau
Schweiz
Tel.: +41 (0)71 353 85 85
Fax: +41 (0)71 353 89 01
E-Mail: info@metrohm.com
Web: www.metrohm.com

Supplier
Hwashin Instrument Co., Ltd.
10, Nonhyeon-ro 81-Gil
Gangnam-Gu
Seoul 06237
Korea

Tel.: +82 (2) 3450 5600
Fax: +82 (2) 3450 5700
E-Mail: sales@hwashin.net

e-mail address of person responsible for this SDS : datasheet@metrohm.com

Emergency telephone number of the company : + 49 (0)6132-84463 (24 h, GBK GmbH)

Section 2. Hazards identification

A. Hazard classification : Not classified.

This product was evaluated in accordance with the Industrial Safety and Health Act and the Chemical Control Act, and determined to be 'not classified'.

B. GHS label elements, including precautionary statements

Signal word : No signal word.

Hazard statements : No known significant effects or critical hazards.

Precautionary statements

Prevention : Not applicable.

Response : Not applicable.

Storage : Not applicable.

Disposal : Not applicable.

Section 2. Hazards identification

C. Other hazards which do not result in classification

None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	Common name	Identifiers	%
Ferrate(4-), hexakis(cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	-	CAS: 14459-95-1	≤2.8
tripotassium hexacyanoferrate	-	CAS: 13746-66-2	≤2.2
disodium hydrogenorthophosphate	-	CAS: 7558-79-4	≤3
potassium dihydrogenorthophosphate	-	CAS: 7778-77-0	≤1
sodium hydroxide	sodium hydroxide	CAS: 1310-73-2	≤0.1

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

A. Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

B. Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

C. Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if symptoms occur. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

D. Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.

E. Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

A. <u>Extinguishing media</u>

Suitable extinguishing media : Use dry chemical, CO2, water spray (fog) or foam. Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : Do not use water jet.

Section 5. Fire-fighting measures

B. Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
phosphorus oxides
metal oxide/oxides

C. Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special precautions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Section 6. Accidental release measures

A. Personal precautions, protective equipment and emergency procedures : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment.

B. Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

C. Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

A. Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

B. Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

A. Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Ferrate(4-), hexakis(cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)- -	**Ministry of Employment and Labor (Republic of Korea, 1/2020). [Cyanides as CN] Absorbed through skin.** TWA: 5 mg/m³, (as CN) 8 hours.
tripotassium hexacyanoferrate	**Ministry of Employment and Labor (Republic of Korea, 1/2020). [Cyanides as CN] Absorbed through skin.** TWA: 5 mg/m³, (as CN) 8 hours.
sodium hydroxide	**Ministry of Employment and Labor (Republic of Korea, 1/2020).** CEIL: 2 mg/m³

Biological exposure indices

No exposure indices known.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

B.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal protective equipment

C.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Eye protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9. Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

A. Appearance

Physical state	:	Liquid.
Color	:	Yellow.
B. Odor	:	Odorless.
C. Odor threshold	:	Not applicable.
D. pH	:	7
E. Melting/freezing point	:	Not available.
F. Boiling point, initial boiling point, and boiling range	:	Not available.
G. Flash point	:	Not available.
Fire point	:	Not available.
H. Evaporation rate	:	Not available.
I. Flammability (solid, gas)	:	Not available.
J. Lower and upper explosive (flammable) limits	:	Not available.
K. Vapor pressure	:	Not available.
L. Solubility in water	:	Not available.
M. Vapor density	:	Not available.
N. Relative density	:	Not available.
Density	:	1.06473 g/cm³ [20°C (68°F)]
O. Partition coefficient: n-octanol/water	:	Not applicable.
P. Auto-ignition temperature	:	Not available.
Q. Decomposition temperature	:	Not available.
R. Viscosity	:	Not available.
S. Molecular weight	:	Not applicable.

Particle characteristics

Median particle size : Not applicable.

Section 10. Stability and reactivity

A. Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
B. Conditions to avoid	:	Keep away from heat, sparks and flame.
C. Incompatible materials	:	No specific data.
D. Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

A. Information on the likely routes of exposure : Not available.

Potential acute health effects

Inhalation : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Eye contact : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Inhalation : No specific data.

Ingestion : No specific data.

Skin contact : No specific data.

Eye contact : No specific data.

B. Health hazards

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
Ferrate(4-), hexakis (cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	LD50 Oral	Rat	3613 mg/kg	-	-
tripotassium hexacyanoferrate	LD50 Dermal [OECD 402]	Rat - Male, Female	>2000 mg/kg	-	-
	LD50 Oral [OECD 401]	Rat	>5110 mg/kg	-	-
disodium hydrogenorthophosphate	LC50 Inhalation Dusts and mists [OECD 403]	Rat - Male, Female	>0.83 mg/l	4 hours	Mortality: None.
	LD50 Dermal [OECD 402]	Rat - Male, Female	>2000 mg/kg	-	-
	LD50 Oral [OECD 420]	Rat - Female	>2000 mg/kg	-	-
potassium dihydrogenorthophosphate	LC50 Inhalation Vapor [OECD 403]	Rat - Male, Female	>0.83 mg/l	4 hours	test substance: CAS no. 7558-80-7 (read-across)
	LD50 Dermal [OECD 402]	Rabbit - Male, Female	>2000 mg/kg	-	-
	LD50 Oral [OECD 420]	Rat - Female	>2000 mg/kg	-	test substance: CAS no. 7758-11-4 (read-across)

Conclusion/Summary : Based on available data, the classification criteria are not met.

Irritation/Corrosion

Section 11. Toxicological information

Product/ingredient name	Result	Species	Score	Exposure	Observation	Remarks
Ferrate(4-), hexakis (cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	Eyes - Mild irritant [OECD 405]	Rabbit	-	-	-	-
	Skin - Not irritant [OECD 404]	Rabbit	-	-	-	-
tripotassium hexacyanoferrate	Eyes - Irritant [OECD 405]	Rabbit	-	-	-	-
	Skin - Not irritant [OECD 439]	Human	-	-	-	-
disodium hydrogenorthophosphate	Eyes - Not irritant [OECD 405]	Rabbit	-	0.5 minutes	-	-
	Skin - Not irritant [OECD 404]	Rabbit	-	24 hours	-	-
potassium dihydrogenorthophosphate	Eyes - Not irritant [Draize Test]	Rabbit	-	0.5 minutes	-	-
	Skin - Not irritant [Draize Test]	Rabbit	-	4 hours	-	-

Conclusion/Summary

Skin : Based on available data, the classification criteria are not met.

Eyes : Based on available data, the classification criteria are not met.

Respiratory : Not available.

Sensitization

Product/ingredient name	Route of exposure	Species	Result	Remarks
Ferrate(4-), hexakis (cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	Respiratory	Guinea pig	Not sensitizing	-
	skin	Guinea pig	Not sensitizing	-
tripotassium hexacyanoferrate	skin	Mouse	Not sensitizing [OECD 429]	-
disodium hydrogenorthophosphate	skin	Mouse	Not sensitizing [OECD 429]	-

Conclusion/Summary

Skin : Based on available data, the classification criteria are not met.

Respiratory : Based on available data, the classification criteria are not met.

CMR - ISHA Article 42 Occupational Exposure Limits

Not available.

Mutagenicity

Section 11. Toxicological information

Product/ingredient name	Test	Experiment	Result	Remarks
tripotassium hexacyanoferrate	OECD 471	Subject: Bacteria Metabolic activation: with and without	Negative	Salmonella typhimurium
disodium hydrogenorthophosphate	OECD 473	Experiment: In vitro Subject: Mammalian-Human Metabolic activation: with and without	Negative	-
	-	Experiment: In vitro Subject: Mouse Metabolic activation: with and without	Negative	-
	OECD 487	Subject: Mammalian-Human Metabolic activation: with and without	Negative	-
potassium dihydrogenorthophosphate	-	Experiment: In vitro Subject: Mammalian-Animal Metabolic activation: with and without	Negative	-
	OECD 487	Experiment: In vitro Subject: Mammalian-Human Metabolic activation: with and without	Negative	Micronucleus-test

Conclusion/Summary : Based on available data, the classification criteria are not met.

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Potential chronic health effects

Chronic toxicity

Not available.

Conclusion/Summary : Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
Ferrate(4-), hexakis(cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	3613	N/A	N/A	N/A	N/A

Section 12. Ecological information

A. Ecotoxicity

Product/ingredient name	Result	Species	Exposure	Remarks
Ferrate(4-), hexakis (cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	Acute EC50 32 mg/l	Daphnia	48 hours	-
tripotassium hexacyanoferrate	Acute EC50 >1000 mg/l Static [OECD 209]	Activated sludge	-	-
	Acute EC50 3.1 mg/l Static [OECD 201]	Algae - *Raphidocelis subcapitata*	72 hours	-
	Acute EC50 59 mg/l Static [OECD 202]	Daphnia - *Daphnia magna*	48 hours	-
	Acute LC50 >100 mg/l Static [OECD 203]	Fish - *Cyprinus carpio*	96 hours	-
disodium hydrogenorthophosphate	Acute EC50 >1000 mg/l Static [OECD 209]	Activated sludge	3 hours	-
	Acute EC50 >100 mg/l Static [OECD 201]	Algae - *Desmodesmus subspicatus*	72 hours	-
	Acute EC50 >100 mg/l Static [OECD 202]	Daphnia - *Daphnia magna*	48 hours	-
	Acute LC50 >100 mg/l [OECD 203]	Fish - *Oncorhynchus mykiss*	96 hours	-
potassium dihydrogenorthophosphate	Acute EC50 >1000 mg/l Static [OECD 209]	Activated sludge	3 hours	-
	Acute EC50 >100 mg/l Static [OECD 201]	Algae - *Desmodesmus subspicatus*	72 hours	-
	Acute EC50 >100 mg/l Static [OECD 202]	Daphnia - *Daphnia magna*	48 hours	-
	Acute LC50 >100 mg/l [OECD 203]	Fish - *Oncorhynchus mykiss*	96 hours	-
sodium hydroxide	Acute EC50 40.4 mg/l	Crustaceans - *Ceriodaphnia*	48 hours	-

Conclusion/Summary : Based on available data, the classification criteria are not met.

Section 12. Ecological information

B. Persistence and degradability

Conclusion/Summary : There are no data available on the mixture itself.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Ferrate(4-), hexakis(cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-	-	-	Not readily

C. Bioaccumulative potential

Not available.

D. Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

E. Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

A. Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

B. Disposal precautions : This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	UN	IMDG	IATA
A. UN number	Not regulated.	Not regulated.	Not regulated.
B. UN proper shipping name	Not regulated.	Not regulated.	Not regulated.
C. Transport hazard class(es)	Not regulated.	Not regulated.	Not regulated.
Label			
D. Packing group	Not regulated.	Not regulated.	Not regulated.
E. Environmental hazards	No.	Marine Pollutant: No	No.

F. Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according to IMO instruments : Not applicable.

Section 15. Regulatory information

A. Regulation according to ISHA

ISHA article 117 (Harmful substances prohibited from manufacture) : None of the components are listed.

ISHA article 118 (Harmful substances requiring permission) : None of the components are listed.

Exposure Limits of Chemical Substances and Physical Factors

The following components have an OEL:
Ferrate(4-), hexakis(cyano-C)-, tetrapotassium, trihydrate,(OC-6-11)-

tripotassium hexacyanoferrate

sodium hydroxide

ISHA Enforcement Regs Annex 19 (Exposure standards established for harmful factors) : None of the components are listed.

ISHA Enforcement Regs Annex 21 (Harmful factors subject to Work Environment Measurement) : None of the components are listed.

ISHA Enforcement Regs Annex 22 (Harmful Factors Subject to Special Health Check-up) : None of the components are listed.

Standard of Industrial Safety and Health Annex 12 (Hazardous substances subject to control) : The following components are listed: iron and its compounds

B. Regulation according to Chemicals Control Act

Article 11 (TRI) : The following components are listed: Inorganic cyanide compounds, Inorganic cyanide compounds

Article 18 Prohibited (K-Reach Article 27) : None of the components are listed.

Article 19 Subject to authorization (K-Reach Article 25) : None of the components are listed.

Article 20 Toxic Chemicals (K-Reach Article 20) : Not applicable

Article 20 Restricted (K-Reach Article 27) : None of the components are listed.

Article 39 (Accident Precaution Chemicals) : None of the components are listed.

Section 15. Regulatory information

C. Dangerous Materials Safety Management Act : Not regulated.

D. Wastes regulation : Dispose of contents and container in accordance with all local, regional, national and international regulations.

E. Other regulations in Korea and International regulations

Article 2 of Youth Protection Act on Substances Hazardous to Youth : Not applicable.

Existing Chemical Substances Subject to Registration : The following components are listed: Sodium hydroxide

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	: All components are listed or exempted.
Canada	: All components are listed or exempted.
China	: All components are listed or exempted.
Eurasian Economic Union	: **Russian Federation inventory**: All components are listed or exempted.
Japan	: **Japan inventory (CSCL):** All components are listed or exempted.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
Thailand	: All components are listed or exempted.
United States	: All components are active or exempted.
Viet Nam	: All components are listed or exempted.

Section 16. Other information

A. References : - Registry of Toxic Effects of Chemical Substances
- United States Environmental Protection Agency ECOTOX

B. Date of issue/Date of revision : 2023/10/17

Date of previous issue : No previous validation

C. Version : 1

Date of printing : **2023/10/17**

Other

Indicates information that has changed from previously issued version.

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
N/A = Not available
SGG = Segregation Group
UN = United Nations

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