

1. Identification of the mixtures and of the company/undertaking

Product names:	Silicon (Si) slag / Ferrosilicon (FeSi) slag FeSi/Si refining slag, FSM slag, FeSi/Si sculls, Ladle sculls
Products application:	Manufacture of basic metals, incl. alloys. Alloying of steel melts: steel industry. Raw material in the production of SiMn alloys.
Address/Phone No.:	Elkem AS Foundry Products P.O. Box 334, Skøyen, NO-0213 Oslo, Norway Telephone: + 47 22 45 01 00 Telefax: + 47 22 45 01 11 http://www.foundry.elkem.com http://sds.efp@elkem.no
REACH and CLP helpdesk:	https://echa.europa.eu/support/helpdesks
Emergency Phone No:	Contact your local poison information service, see: http://www.eapcct.org/index.php?page=links USA: Poison Help (AAPCC): 1-800-222-1222 & PoisonHelp.org United Kingdom: Contact your GP or NHS 111 on 111 (for 24 hour health advice).

2. Hazards Identification

Classification of the products:	The products do not meet the criteria for hazard classification in accordance with Regulation (EC) No 1272/2008 (CLP) and the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 6 th revision.
Hazard pictogram:	Not applicable (N/A)
Signal word:	Not applicable (N/A)
H-phrases:	Not applicable (N/A)
P-phrases:	Not applicable (N/A)

Flammable and noxious gases may be formed in contact with moisture, acids or bases. See section 10 and 11. Depending on the composition, dust from the products if suspended in air might under certain conditions cause dust explosions. See section 10.

3. Composition/Information on compounds

Ferrosilicon (FeSi/FSM)-slag/sculls:

Compound	CAS No.	EINECS No.	REACH Reg. No.	Weight%	Hazard classification
					Regulation (EC) No1272/2008 (CLP)
Slags, elec. Furnace smelting, iron silicate* ("silicate")	102110-59-8	310-060-2	01-2119486867-15-0000	10-90	Not classified
Ferrosilicon*	8049-17-0	Provisional: 912-631-7	01-2119485286-28-0033	10-90	Not classified

* This PSI is based on the Chemical Safety Reports of Si/FeSi silicate (Slags,electric furnace smelting silicate, an UVCB substance) and of Ferrosilicon made according to the substance qualities covered by their respective registration dossier under REACH.

Silicon (Si)-slag/sculls:

Compound	CAS No.	EINECS No.	REACH Reg. No.	Weight%	Hazard classification
					Regulation (EC) No1272/2008 (CLP)
Slags, elec. Furnace smelting, iron silicate* ("silicate")	102110-59-8	310-060-2	01-2119486867-15-0000	10-90	Not classified
Silicon*	7440-21-3	231-130-8	01-2119480401-47-0065	10-90	Not classified

* This PSI is based on the Chemical Safety Reports of Si/FeSi silicate (Slags,electric furnace smelting silicate, an UVCB substance) and of Silicon made according to the substance qualities covered by their respective registration dossier under REACH.

4. First Aid Measures

Inhalation: Mechanical irritation caused by dust: Fresh air. See a physician on persistent feeling of discomfort.
Skin contact: Wash skin with water and/or a mild detergent.
Eye contact: Rinse eyes with water/saline solution. See a physician on persistent feeling of discomfort.
Ingestion: Remove the person affected from dust-exposed area. See inhalation.

5. Fire Fighting Measures

Extinguishing media: Dry sand, CO₂ or dry powder.

Special hazards arising from the mixture

Specific fire & explosion hazards: Flammability test and contact with water test under REACH (EC guideline) show the products to be non flammable and not flammable in contact with water.

However, addition of water or wet material to molten (hot) product, may cause explosion due to formation of flammable hydrogen gas, depending on the fraction of metallic material in the product.

6. Accidental Release Measures

Material in the form of dust should be collected in suitable containers. Damp product must be kept away from dry, and must not be collected and stored in closed containers. Dry dust can be vacuumed or swept up.

7. Handling and Storage

Handling: Avoid handling that generates dust build-up. Avoid inhalation of dust. See section 8. Avoid ignition sources (e.g. welding) in areas with high dust concentrations. Addition of wet material to molten metal in the products may cause explosions. See section 10.

Storage: The products must be kept in a well-ventilated place, and away from acids and bases. Open air storage is acceptable.

Inadequately ventilated containers:

It is advisable to allow 15 minutes of natural venting with fully open doors so that fresh air can freely enter the container before starting to unload/strip the containers.

Opening of containers should preferably be done outdoors, but only under conditions whereby the product is kept dry.

In case there is a need for immediate stripping (i.e. less than 15 minutes waiting), always wear a full face mask respirator with gas/vapour filter according to standard EN 14387 during the unloading period.

8. Exposure Controls/Personal Protection

A. Occupational exposure controls

Eye protection, eye flushing facilities and protective gloves. Ensure good ventilation. Wear a particulate respirator according to EN 149 FFP 2S in areas of inadequate ventilation. If exposure to phosphine and arsine is suspected from Ferrosilicon (FeSi) slag (see section 10 and 11) in areas of poor ventilation (e.g. storage holds, bunkers etc.), a self contained breathing apparatus or an air fed respirator should be worn.



Workplace Exposure Limits (HSE, EH40/2005),

Table 1: List of approved workplace exposure limits (as consolidated with amendments October 2007):

Substance	CAS number	8 hour TWA		15 minute STEL	
		ppm	mg/m ³	ppm	mg/m ³
Inhalable dust	-	-	10	-	-
Respirable dust	-	-	4	-	-
Phosphine gas (PH ₃)	7803-51-2	0.1	0.14	0.2	0.28
Arsine gas (AsH ₃)	7784-42-1	0.05	0.16	-	-

EU OEL: Commission Directive 2006/15/EC

Indicative occupational exposure limit values:

Substance	CAS number	8 hour		15 minute	
		ppm	mg/m ³	ppm	mg/m ³
Phosphine	7803-51-2	0.1	0.14	0.2	0.28

Elkem has devised a "Procedure for sampling, measuring and reporting of phosphine (PH₃), arsine (AsH₃) and airborne particulates" of the workplace atmosphere (1994). The low occupational exposure limit for arsine gas is due to the evidence for carcinogenicity in humans of inorganic arsenic compounds in general (IARC). The OELs for dust does not cover possible arsine/phosphine absorption from dust deposited on mucous membranes.

DNEL (Derived No Effect Level):

4 mg/m³, proposal for inhalable particles (determined as Si).

0.3 mg/m³, proposal for respirable particles (determined as Si).

PNEC (Predicted No Effect Concentration):

Not relevant.

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B. Environmental exposure controls

Target value and limit value for PM₁₀ and PM_{2.5} (Directive 2008/50/EC):

	Averaging period	Limit value	
PM ₁₀	One day	50 µg/m ³ ★	
PM ₁₀	Calendar year	40 µg/m ³	
PM _{2.5}	Calendar year	25 µg/m ³	
PM _{2.5}	Calendar year	20 µg/m ³	1 January 2020

★Not to be exceeded more than 35 times a calendar year.

9. Physical and Chemical Properties

Form	: Lump material including fines.
Appearance	: Solid material with two distinct compounds; one mix of silicates and one metal phase.
Colour	: The silicate mix is grey/green, the metal phase is silvery grey.
Odour	: Odourless.
pH	: See solubility.
Solubility (Water)	: 2.6 µg Si/l at pH 5.7-5.9 (20°C) silicate; diameter < 1 mm. : Ferrosilicon (FeSi) and Silicon (Si): Insoluble/Poorly soluble particles (PSP).
Melting point/freezing point	: 1220-1400 °C (101,3 kPa) for Ferrosilicon. : 1414 °C (101,3 kPa) for Silicon : 1150-1450 °C (101,3 kPa) for silicate
Initial boiling point and boiling range	: 2355-3265 °C (101.3 kPa) for Silicon. : NA for Ferrosilicon and silicate.
Flammability (solid, gas)	: Non flammable.
Auto-ignition temperature	: > 400 °C at 101.3 kPa for Ferrosilicon. : > 400 °C at 101.3 kPa for Silicon. : NA for silicate

10. Stability and Reactivity

Conditions to avoid:

Avoid generating sparks and other ignition sources (e.g. welding) in areas with high dust concentrations.

For Ferrosilicon (FeSi) slag: FeSi-particles suspended in air at concentrations above 100-300 g/m³ can cause dust explosions. For a given particle size, the ignition sensitivity and the violence of explosion decrease with decreasing Si/Fe ratio. Dust with Si/Fe ratio ≤ 2 and particle diameter > 10 µm, is considered not to represent any danger of explosion.

For Silicon (Si) slag: Silicon-particles suspended in air at concentrations above 100 g/m³ can cause dust explosions. Both ignition sensitivity and the violence of explosion increase with decreasing particle size. Silicon dust with particle diameter > 40 µm probably entails no danger of explosion.

Addition of wet material to molten (hot) metal in the products may cause explosions.

Materials to avoid:

Water/humidity, acids and bases.

Hazardous decomposition products:

Reaction with hydrofluoric acid (HF) or nitric acid (HNO₃) leads to the formation of toxic gases such as silicon tetrafluoride (SiF₄) or nitrous gases (NO_x).

Wet product will form highly flammable hydrogen gas if added to molten metal, due to decomposition of water.

Highly flammable hydrogen gas (H₂) and the highly flammable and very toxic gases phosphine and arsine (garlic-like smell), both heavier than air, may be formed if FeSi dust from the Ferrosilicon (FeSi) slag gets in contact with moisture, acids or bases. Storage locations must be well ventilated. Since the liberation of the gases is very slow, open air storage is acceptable.

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A prerequisite for phosphine and arsine gas formation is the presence of reactive phosphides or arsenides, such as e.g. Ca_3P_2 or Ca_3As_2 at the alloy phase-boundaries inside the alloy. Very low levels of P (< 0.02 %) and As (< 0.0005 % detection limit) in FeSi, in combination with rapid solidification that limits segregation of the alloying elements, effectively minimize the formation of such compounds and thus the probability of gas formation.

Phosphine (PH_3) and arsine (AsH_3) are both heavier than air and may concentrate at the bottom of closed containers. Densities (25 °C, 1 atm), PH_3 : 1.379 g/L, AsH_3 : 1.321 g/L, air: 1.225 g/L.

Phosphine (PH_3) gas may accumulate in inadequate ventilated/closed containers during shipment and storage, and in these cases special measures are needed during initial opening and unloading of containers (see sections 7 and 8).

11. Toxicological Information

The products do not meet the criteria for hazard classification according to Regulation (EC) No1272/2008 (CLP) and the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 6th revision.

Acute effects:

Inhalation: Finely divided dust may irritate and dehydrate mucous membranes.
Phosphine/arsine may be absorbed from FeSi dust in the Ferrosilicon slag deposited on mucous membranes. See section 8 and 10.
Containers: Phosphine/arsine may be inhaled inside and close to newly opened inadequate ventilated containers.

Skin contact: Dust may irritate the skin.

Eye contact: Dust may irritate and lead to dryness.

Chronic effects:

No adverse chronic effects of these products are expected, based on tests, practical experience and review of available scientific literature. Historic, epidemiological studies covering cohorts of workers in the Norwegian ferro-alloy industry have been carried out, showing there is no cancer risk from these products.

12. Ecological Information

The products are not characterised as dangerous for the environment.

MOBILITY: The products have poor mobility under normal environmental conditions.

PERSISTENCE: Not relevant.

BIOACCUMULATION: Not relevant, due to low mobility and non-dispersive use.

ECO-TOXICITY: The products do not meet the classification criteria for ecotoxicological endpoints in accordance with Regulation (EC) 1272/2008 (CLP) and the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 6th revision.

PNEC (Predicted No Effect Concentration): N/A

13. Disposal Considerations

The material should be recovered for recycling where possible.

Waste from the products is not considered as hazardous waste according to Commission Decisions 2000/532/EC and 2001/118/EC.

Prior to disposal of large quantities of this material, advice should be sought from the nearest Environment Agency.

14. Transport Information

UN no. 1408
IMO/BC-Code^{2), 3)}: 30-90% Si, Class 4.3
BC-no.: 022
IMO/BC-Code^{2), 3)}: 25-30% or > 90% Si, Class MHB

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IMDG-code ¹⁾	Assigned to class 4.3
ICAO/IATA ¹⁾	Assigned to class 4.3
ADR/RID ¹⁾	Assigned to class 4.3

- 1) Consignments of ferrosilicon with a chemical analysis as described in section 3 has been tested according to "United Nations Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria Part III - 33.4.1.4" and has passed the test. Consequently, the product is not classified as a Class 4.3 product.
- 2) The shipment must be stored under cover, but in open air, in the particle size in which it is to be shipped, for no less than three days prior to shipment.
- 3) IMO's "Code of Safe Practice for Solid Bulk Cargoes".

Environmental hazards

The products are not considered to cause harm to aquatic organisms (Lillicrap, 2011). The mixtures are not marine pollutants.

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:

Ferrosilicon UN 1408 with 30-90% Si. Ferrosilicon 25-30% or > 90% Si.

15. Regulatory Information

The text of this Product Safety Information is prepared in compliance with:

- Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and subsequent amendments.
- Regulation (EC) No 1272/2008 (CLP) of the European Parliament and of the Council of 16 December 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 (REACH).

Chemical Safety Assessment:

Ferrosilicon (FeSi)-slag:

Chemical Safety Assessments for the two individual ingredients; silicate (EC 310-060-2) and Ferrosilicon (Provisional EC 912-631-7) of the Ferrosilicon (FeSi) slag have been carried out according to REACH.

Silicon (Si)-slag:

Chemical Safety Assessments for the two individual ingredients; silicate (EC 310-060-2) and Silicon (EC 231-130-8) of the Silicon (Si) slag have been carried out according to REACH.

16. Other Information

According to Chapter 1.5.2 of the UN Globally Harmonized System of classification and labelling of chemicals (GHS), Article 58 (2)(a), and Article 59(2)(b) of (EC) No 1272/2008 (CLP), which amends REACH article 31(1), safety data sheets (SDS) are only required for substances and mixtures that meet the harmonized criteria for physical-, health- or environmental hazards. Since these products do not meet these criteria, a SDS according to 2015/830/EU is not issued. In order to communicate relevant HSE-(health, safety and environmental-) information, this product safety information (PSI) is provided instead.

REACH article 31(7) requires relevant exposure scenarios from the Chemical Safety Report (CSR) to be annexed to the SDS. However, according to REACH Annex I, section 0. (Introduction), subsection 0.6. no 4 and 5, exposure scenarios are only required for hazard-classified substances or mixtures. Since these products are not hazard-classified according to CLP, there is no requirement for exposure scenarios.

Changes from rev00 to rev01: contact details and links updated. Reference to DSD/DPD removed, reference to GHS and (EU) 2015/830 inserted. Legal disclaimer removed. Storage information updated.