

SAFETY DATA SHEET

Registered under No.

RPB 00186476 . 08 . 42936Valid from July 26, 2016
to July 26, 2021

Federal Agency on Technical Regulating and Metrology

The information-analytical centre

«Safety of substances and materials»

FGUP «VNII SMT»

Head (signature) / A.A. Toporkov

NAME:

Technical (under ND)

FERROSILICON

Chemical (under IUPAC)

FERROSILICON

Trade name

Ferrosilicon of different grades

Synonyms

Alloy of iron and silicon

Code of Russian Classification of Production (OKP):

082100

Code from Harmonized System Codes:

7202200000

Identification code and name of the main regulatory, technical and information document for the product (GOST, TU, OST, STO, (M)SDS, etc.)

GOST 1415-93 «Ferrosilicon. Technical requirements and delivery conditions»

HAZARD IDENTIFICATION

Signal word: Dangerous

Brief (wordy) characteristics: Moderately dangerous material by influence on organism. Ferrosilicon fume possesses moderate fibrogenic properties – it can affect lungs as a result of long and repeated influence by inhalation. Ferrosilicon with fraction of total mass of silicon from 30% up to 90% with the size of the particles less than 3.2 mm in contact with water evolves combustible hydrogen generating dangerous concentrations when mixing with air in closed, not aired premises and phosphine and arsine toxic by inhalation. It can cause long-term negative consequences for aquatic organisms.

Detailed characteristics: in 16 attached points of the safety data sheet.

| MAIN DANGEROUS COMPONENTS: | Threshold limit value, mg/m ³ | Danger class | CAS No. | EC No. |
|----------------------------|-------------------------------------------|--------------|-----------|-----------|
| Ferrosilicon | Not determined | none | 8049-17-0 | none |
| Silicon | 6/2 (silicon dioxide with content 10-70%) | 3 | 7440-21-3 | 231-130-8 |

APPLICANT: Joint Stock Company «KUZNETSKIE FERROSPLAVY» Novokuznetsk
(Organization name) (city)

Type of applicant: producer, supplier, seller, exporter, importer
(cross unnecessary out)

OKPO Code: 00186507

Phone in case of emergency: (3843) 398-143

Head of the organization-applicant:

/ K.A. Korennaya /
(in full)

Safety Data Sheet meets the Requirements of UNO ST/SG/AC.10/30 “SGS (GHS)”

IUPAC - Nomenclature of organic compounds of the International union of theoretical and applied chemistry

GHS - Globally Harmonized System of Classification and Labeling of Chemicals

OKP – All-Russian production classifier

OKPO – All-Russian classifier of enterprises and organizations

TNVED - Foreign Economic Activity Commodity Nomenclature

CAS No. – substance number in the Register of Chemical Abstracts Service

EC No. - substance number in the Register of European Chemicals Agency

PDK r.z.- maximum permissible concentration of chemical substance in the working zone air, mg/m³

Safety Data Sheet (Material Safety Data Sheet) – translation into Russian - Safety Sheet of Chemical Products (substance, mixture, material, industrial by-product)

Safety Data Sheet corresponds to:

- the regulations of EC “Regulation No. 1907/2006 concerning Registration, Evaluation, Authorization and Restriction of Chemicals (REACH Regulations, Evaluation, Authorization and Restriction of Chemicals) 01-2119485286-28”.

Signal word: - the words used to draw attention to danger level of chemical products and selected in conformity with the State Standard (GOST) 31340-2013.

1. Identification of chemical products and information about producer and/or supplier

1.1 Identification of chemical products

1.1.1. Technical name: Ferrosilicon [1].

1.1.2 Brief recommendations on application (including restrictions on application): Metallurgical and foundry industry [1]

1.2. Information about producer and/or supplier

1.2.1. Full official organization name: Joint Stock Company “Kuznetskie Ferrosplavy” (JSC “KF”)

1.2.2. Address (postal and legal): 1.2.3. 654077, Novokuznetsk, Obnorsky str. 170

1.2.4. Ph. Nos. including for extraordinary consultations and limits in time: 1.2.5. (3843)398 – 143 / 398 – 127 / 398 – 120

1.2.6. Fax No.: (3843)373 – 918

1.2.7. E-mail: 1.2.8. hudovsi@kfw.ru

2. Danger (dangers) identification

2.1. General degree of danger of chemical products (information about danger classification according to the RF legislation (GOST 12.1.007-76) and GHS (Globally Harmonized System of Classification and Labeling of Chemicals) (GOST 32419-2013, GOST 32423-2013, GOST 32424-2013, GOST 32425-2013)

According to GOST 12.1.007-76 the product is applied to moderately dangerous substances by degree of influence on organism, 3d class of danger [1].

Classification by GHS of ferrosilicon of the size less than 3,2 mm having dangerous properties:

- chemical product evolving combustible gases in contact with water, 3d class;
- chemical product possessing acute toxicity by influence on organism by inhalation, 3d class;
- chemical product possessing selective toxicity on target organs by one-time influence, 3d class;
- chemical product possessing selective toxicity on target organs and/or systems by repeated or long influence, 2d class;
- chemical product posing danger to environment, 4th class [4,29].

2.2. Information about warning marking under GOST 31340-2013

2.2.1. Signal word DANGER

2.2.2 Symbols (signs) of danger



2.2.3 Brief characteristic of danger (H-phases)

H261: By contact with water it emits flammable gases

H331: Toxic by inhalation.

H373: It can affect lungs as a result of long-term negative or repeated influence by inhalation.

H413: It can cause long-term negative consequences for aquatic organisms [1,4]

3. Composition (information about components)

3.1. General information about the product

| | | |
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- 3.1.1. Chemical name: (under IUPAC) Ferrosilicon [1].
- 3.1.2. Chemical formula: none
- 3.1.3. General characteristics of composition: (taking into account the grade assortment; method of production) Ferrosilicon is an alloying alloy of iron and silicon with the minimum content of silicon of 8,0 % by mass and maximum - 95 % by mass produced by recovery.
Ferrosilicon is delivered in lumps of 25 kg max by mass; in ingots 45 kg max by mass and as crushed sieved particles of 1-7 size classes [1].

3.2. Components

(name, numbers of CAS and EC (if available), mass fraction (it should be 100% in sum), PDK кя (maximum permissible concentration) or OBUVrz, danger classes, references to the data sources)

| Components [1] | Mass fraction, % [1] | PDK rz, mg/m ³ [1] | Danger class | CAS No. [5] | EC No. [5] |
|--------------------------|-----------------------------|----------------------------------------------|--------------|-------------|------------|
| Ferrosilicon, including: | Up to 100 | Not established | none | 8049-17-0 | none |
| - Silicon | 8-95 (subject to the grade) | 6/2 (silica dioxide with contentt 10 - 70%) | 3 | | 231-130-8 |
| - Iron | others | 10/- | 4 | 7439-89-6 | 231-096-4 |

Note: ferrosilicon as the controlled impurities subject to the grade contains: C 0,1-1,0 %, S up to 0,02% , P 0,03-0,10%, Al 1,0-3,5%, Mn 0,3-1,0% and Cr 0,2-0,8% [1].

4. Measures of first aid

4.1. Observable symptoms

4.1.1. If intoxicated by inhalation :

By inhalation of high fume concentration - irritation of upper respiratory tract, weakness, cough, sneezing, headache, disturbance of breath rhythm.

Danger of inhalation poisoning is connected with influence of the evolved gases – phosphine and arsine.

In easy cases phosphine causes pains in the field of diaphragm, giving to back, feeling of cold, later - bronchitis.

By poisoning of average degree- fear, fever, vomiting, sharp apnoea, retrosternal pains, dry cough, burning pain in back of the head, noise in ears, absence of appetite, thirst.

Lethal outcome is possible only after some days, but at high concentration it can instantly come [6].

At the moment of contact with arsine there are no any symptoms. Poisoning develops usually after 3-8 hours after poison inhalation. The first symptoms: uncertain feeling of illness and strong weakness; then dizziness, headaches, pain under spoon, feeling of cold and constraint of breath, sometimes easy blue disease, nausea, vomiting. Later vomiting becomes continuous, vomit masses - contain bile, then blood, jaundice develops.

In heavy cases lethal outcome is possible.

In easy cases influence can be limited by dizziness, weakness, headaches, nausea, pain under spoon, vomiting, easy jaundice, sensitivity frustration. In easier cases only nausea, headache [6].

4.1.2. Influence on skin:

Consequences of mechanical influence of FeSi particles.

4.1.3. Ingress in eyes: Lacrimation, colic, reddening as a result of mechanical influence of FeSi particles.
Emitting gases have irritant effect [3].

4.1.4. If poisoned by oral introduction (by ingestion): Foul eructation, nausea, sometimes vomiting and diarrhoeia, appetite loss, weakness can be caused by influence of fluoric hydrogen coming in air from ferrosilicon or formed ferrosilicon dust by inhalation or engulfment [6].

4.2. Means of the first aid for injured persons

4.2.1. If poisoned by inhalation: Removal from the infected atmosphere, fresh air, full rest, warmth, pure clothes, cardiacs, strong sweet tea, coffee. To seek urgently medical attention, inform medical staff that poisoning with poisonous gases [3,6] is possible.

4.2.2. If influenced on skin: To wash with running water, if necessary to call for the doctor [3,6].

4.2.3. By ingress in eyes To wash by running water, to seek medical attention [3,6] upon occurrence of symptoms of irritation.

4.2.4. If poisoned by oral introduction To seek urgently medical attention, to inform medical staff that poisonous gases poisoning [6] is possible.

4.2.5. Contraindications: No data [2].

5. Measures and means for providing fire and explosion safety

5.1. General characteristics of fire-and-explosion safety: FeSi fume is combustible substance subject to chemical self-ignition [7,8].
Ferrosilicon with the size of particles over 3,2 mm is not combustible in normal conditions, fire and explosion safe.
Ferrosilicon of the size less than 3.2 mm with Si mass fraction 30-90% emits in moisture conditions toxic phosphine and explosion-fire-hazardous hydrogen.
Intensity of gas evolution increases in process of humidifying and increase of surface of the alloy particles in mass unit. Total volume of gas evolving of lump ferrosilicon is about 20 l/t per day. Quantity of hydrogen in the emitting gases is more than 92% by volume; quantity of phosphine in the emitting gases is 0,8-1,6 % by volume [1].

5.2. Indices of fire-and-explosion danger: Values of low concentration limit of flame spread (NKPR) and self-ignition temperature (tcB) of aerosol of various FeSi grades are in the Table 1 [1].

Table 1

| Index | Grades | | | |
|------------------------------|--------|----------------|----------------|--------|
| | FeSi90 | FeSi75 | FeSi65 | FeSi45 |
| NKPR, g/m ³ | 240 | 150 | 400 | 1000 |
| Self-ignition temperature, C | 980 | More than 1000 | More than 1000 | - |

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Indices of fire-and-explosion danger of FeSi fume is given in the Table 2 [1].

Table 2

| Grade of alloy | Temperature spontaneous combustion, °C | Maximum pressure of explosion, kPa | Speed of increase of pressure at explosion, kPa * s ⁻¹ | Minimum energy of ignition, mJ |
|----------------|----------------------------------------|------------------------------------|-------------------------------------------------------------------|--------------------------------|
| FESI90 | более 1000 | 700 | 22000 | 1280 |
| FESI 75 | 860 | 620 | 26000 | 280 |
| FESI 65 | более 1000 | 40 | 6000 | - |
| FESI 45 | 640 | - | - | - |

Additional information.

Hydrogen:

Temperature spontaneous combustion, 510°C Concentrated limits of flame spread is 4.12-75% of volume in the air; 4.1-96% in oxygen The minimum energy of ignition is 0,017 mJ; the maximum normal speed of flame spread is 2.7 km/s;

The maximum pressure of explosion 760 kPa [7].

Phosphine:

Temperature of spontaneous ignition is 40C. It is unstable thermally, capable to spontaneous auto-oxidation in the air at the room temperature with formation of di-phosphine; in mixture with oxygen blows up [7].

Arsine:

Ignition temperature is 260°C. Concentration limits of flame spread is about 9-90%. The minimum explosive content of oxygen is about 6,2%. The minimum retarding concentration of nitrogen is about 70%. [7].

5.3. The danger caused by products of burning and-or thermodestruction:

Lump product are not subject to burning and thermodestruction. Fume is combustible, it can form dangerously explosive mixtures with air [1].

5.4. Recommended means of fire suppression

Powder compounds. Dry sand, asbestic cloth, carbon dioxide fire extinguishers [7,8].

5.5. The forbidden means of fire suppression

Water and foam [7,8].

5.6. Individual protecting means while fire suppressing:

Fireproof suit completed with self-rescuer SPI-20 [9].

5.7. Specificity when fire suppressing:

Under influence of water explosive/fire-hazardous hydrogen and toxic and combustible gas (fluoric hydrogen). Fine-dispersed structures with oxidizers interact with explosion [28].

6. Measures on prevention and liquidation of emergency and extreme situations and their consequences

6.1. Measures on prevention of harmful influence on people, environment, buildings, constructions, etc. in emergency and extreme situations

6.1.1. Necessary actions of the general character in emergency and extreme situations

To isolate dangerous zone in radius min. 200 m. To remove unauthorized persons. To enter a dangerous zone in protective means. To observe measures of fire safety. No smoking. To eliminate sources of fire and sparks. First aid should be rendered to the suffered people or to send victims for medical observation [9].

6.1.2. Individual protective means in emergency situations:
(for emergency brigades and personnel)

For chemical survey and Head of works – PDU-3 within 20 minutes. For emergency brigades - isolating protective suit KIKH-5 completed with isolating gas mask IP-4M. In the absence of the specified samples: protective general military suit L-1 or L-2 completed with industrial gas mask with holder. Small-size industrial gas mask PFM-1, gloves made of dispersion of butyl rubber, special footwear for protection against influence of oil and mineral oil. At small concentration in air (at excess of maximum concentration limit to 100 times) - overalls for protection against dust influence, the independent protective individual complete set with power feed to the zone of breath of the cleared air by the holder PZU, PZ-2, filtering respirator “FORT-P2”, universal respirator “Snezhok-KU-M”[9].

6.2. Operation procedure when liquidating emergency and extreme situations

6.2.1. Actions if leaks, flood, scatterings:
(including safety measures providing protection of environment)

To inform local Russian Consumer Supervision service. Not permit to fall in reservoirs, cellars, water drain. Undamaged product should be collected with observance of safety measures and by agreement with the manufacturer to direct to destination or for processing. The rests should be covered with dry inert material, collected with the top layer of earth in dry tanks, marked and directed for liquidation to the places agreed with the territorial bodies Russian Consumer Supervision service [9].

6.2.2. Actions if fire:

Not to use water! Not to permit ingress of water in tanks and on the product. To extinguish only with powder compounds. To organize evacuation of people taking into account the direction of movement of toxic products of burning [9].

7. Rules of storage of chemical production and treatment with it during cargo handling works

7.1. Safety measures when treating with chemical products

7.1.1. Systems of Engineering Measures

Forced-air and exhaust system of ventilation or natural ventilation in working premises, application of technological processes with minimum dust formation and devices of dust trapping. Observance of preventive fire-fighting regulations, performance of equipment, communications and armature of artificial illumination in the explosion-proof execution, equipment of workplaces with primary fire extinguishing means, use of personal protective means [1,6].

7.1.2. Environment protection measures:

The main requirements providing environment preservation are:

- The periodic control of harmful substances content in the air of the working zone;
- Gas and dust cleaning constructions while production processing;
- Control of industrial drains for the content of harmful substances in admissible concentration in them;
- Air cleaning in the working premises to the established norms before dump in the dumping atmosphere;
- Prevention of FeSi ingress in systems of the household and storm water drain, in open reservoirs, on soil [1].

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7.1.3. Recommendations for safe moving and transportation:

Ferrosilicon of all grades with the size of particles less than 3,2 mm and more than 3,2 mm, packed into steel drums and (or) in compact wooden boxes are transported by the covered rolling stock.

Ferrosilicon with mass fraction of silicon no more than 50% packed into specialized rigid or flexible containers is transported by the open rolling stock.

Ferrosilicon in ingots max. 45 kg by mass, in lumps max. 25 kg by mass, crushed by size classes with the size of particles from 10 to 315 mm is transported in bulk by the open rolling stock or in universal - containers with water-proof loading apertures.

In case of internal and international transportation ferrosilicon is delivered according to the regulations and corresponding agreements acting at this type of transport[1].

7.2. Rules of storage of chemical products

7.2.1 Conditions and terms of safe storage:

(including storing warranty period, working life; substances and materials incompatible for storing)

Packed ferrosilicon should be stored in closed premises with natural ventilation in stacks by grades, size and years of manufacturing.

Ferrosilicon transported in bulk including in specialized containers is stored on platforms under cover or in the closed premises with natural ventilation in stacks, bins or bunkers by grades, size and years of manufacturing.

Premises can be of any design with concrete or asphalt concrete.

Grounds should have firm covering, be even with a small bias to edges (1:100). By perimeter of the grounds drainage channels should be built.

Ferrosilicon storage should be carried out in the conditions excluding ingress of moisture.

Period of storage:

- Under cover: grades FeSi45, FeSi65 and FeSi70–1 year; grades FeSi 75 and FeSi90 - 2 years.
- In closed premises: grade FeSi 45 - 2 years;
- grade FeSi65 - 3 years; grades FeSi75 and FeSi90 - 10 years[1, 10].

7.2.2 Tare and package

Ferrosilicon is packed in universal or specialized containers (flexible or rigid). By agreement with consumer the product can be packed in steel drums or compact wooden boxes manufactured according to the regulatory documentation.

It is permissible to apply for FeSi packing: previously used tare: steel drums, wooden boxes.

Ferrosilicon intended for export is packed according to the requirements of the foreign trade contract. Ferrosilicon intended for long storage should be packed in drums painted with black color. Ferrosilicon with the size of particles from 10 to 315 mm, in ingots and in lumps is not allowed to pack [1,10].

7.3. Safety measures and storage rules in life:

Not applied in everyday life [1].

8. Means of control of dangerous influence and personal protective means.

- 8.1. The parameters of the working zone which are subject to obligatory control (PDK rz or OBUV rz): PDKrz (maximum permissible concentration) = 6/2 mg/m³ – crystal silicon dioxide if its content in fume from 10 to 70 % [1,2].
- 8.2. Measures to ensure the content of harmful substances in admissible concentrations: Installation and maintenance of continuous operation of forced-air and exhaust ventilating system with the corresponding devices of dust catching; natural ventilation. Application of technological processes with minimum dust formation. The control of content of harmful substances in the air of the working zone according to the requirements of GOST 12.1.005 and GN 2.2.5. 1313-03 [1,3,6].

8.3. Personal protection means of personnel

- 8.3.1. General recommendations: To avoid direct contact with dust of the product, to use protective clothes. Regular cleaning of premises and industrial areas from dust and scatterings using dry method. To observe rules of personal hygiene, not to smoke and not to accept food at the workplace. To make preliminary and periodic medical inspections of the personnel involved in works with ferrosilicon when hiring. Not to admit persons younger 18 years and pregnant women [6] to work.
- 8.3.2. Protection of respiratory organs (types SIZOD): Personal protection means of respiratory organs (SIZOD), aerosol respirators
- 8.3.3. Protective clothes (material, type) (special clothing, special shoes, hand protection, eye protection): Overalls for protection against dust influence, protective tight glasses, mittens or gloves, special shoes [1,11].
- 8.3.4. Personal protection means by use in life: Not applied in everyday life [1].

9. Physical and chemical properties

- 9.1. Physical condition: Solid substance, odorless [1].
(aggregate condition, colour, smell)
- 9.2. The parameters characterizing basic properties of chemical production, first of all dangerous ones:
(temperature indices, pH, solubility, factor of n-octanol/water and other parameters typical for this kind of product, etc.)
- Melting temperature: 1180-1350 °C [28].
- Bulk density: 1,2-3,2 g/cm³ [28].
- Solubility: It is insoluble in water and oils [3,28].
- Intensity of gas evolution of humidified FeSi powders of the fractions 0-3 mm: Grade FeSi45 - 0,094 dm³/kg-h;
Grade FeSi65 - 0,053 dm³/kg-h;
Grade FeSi75 - 0,142 dm³/kg-h; (0,030 dm³/kg-h;- for dry polydisperse);
Grade FeSi90 - 0,022 dm³/kg-h [1].

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10. Stability and reactivity

- 10.1. Chemical stability:
(please, specify decomposition products for non-stable products)
- The material is stable under normal conditions, dangerous polymerization does not happen. Ferrosilicon with the mass fraction of silicon 50-60% is subject to scattering because of leboite (the unstable phase α - FeSi₂ passes in stable (β -FeSi₂ with alloy increase in volume), and also in presence of impurities of phosphorus, aluminium and calcium in the alloy [12].
- 10.2. Reactivity:
- Reacts with water, acids, alkalis [3].
At 1000°C strong reducer in pyrometallurgical processes [12].
- 10.3. Conditions which should be avoided:
(including dangerous manifestations while contacting with the incompatible substances and materials)
- Ferrosilicon of the fraction less than 3.2 mm because of presence of impurities can emit extremely dangerous gas - phosphine; by humidifying – arsine; both gases are toxic [3, 28]. Intensity of gas evolution increases in process of humidifying and increase of the alloy surface [1,6,28].

11. Information about toxicity

- 11.1. General characteristic of influence:
(estimation of degree of danger (toxicity) of influence on organism and the most typical of danger manifestations)
- Ferrosilicon is the substance moderately dangerous by degree of influence on organism. Ferrosilicon fume is low-toxic, has moderate fibrogenic properties [1,6].
Acute poisoning is possible owing to emitting of phosphorous hydrogen (phosphine) - the poisonous gas effecting nervous system, breaking metabolism, influencing blood vessels, respiratory organs, liver, kidneys. While long inhalation can lead to lethal outcome [6].
In case of ferrosilicon humidifying the arsenic hydrogen (arsine) forms - poisonous gas of hemolytic action. Dissolving in plasma and circulating in organism it harmfully influences on internal organs, mainly on liver and kidneys. Contacting with erythrocytes it causes their hemacytolysis (destruction) and formation of methaemoglobin [6].
- 11.2. Ways of influence:
(inhalation, peroral, by ingress on skin and in eyes)
- Inhalation, falling on skin and mucous membranes of eyes, in digestion organs [3,6].
- 11.3. Damaged organs, tissues and systems of man:
- Respiratory system, digestion organs
- 11.4. Data on influences hazardous to health by direct contact with substance, and also consequences of such influences: (irritating action on the upper respiratory tracts, eyes, skin including skin-resorptive action; sensitization)
- Ferrosilicon causes irritating action by ingress in the upper respiratory tracts, can cause mechanical influence on skin and mucous membranes of eyes. The emitting gases (phosphine and arsine) possess acute irritating action.
Ferrosilicon does not possess skin-resorptive action, sensitizing action was not revealed [3,6].
- 11.5. Information about dangerous future consequences of influence of the product on organism (influence on reproduction function, carcinogenicity, cumulative effect and other chronic influences)
- Cumulative effect is weak. Influence on reproduction function, mutagen and cancerogenic actions of ferrosilicon have not been studied [3,6].

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11.6. Indicators of acute toxicity:

Ferrosilicon

(DL₅₀ (LD₅₀), way of ingress (v/zh, n/k), kind of animal;

DL₅₀ (mg/kg), the way of ingress, kind of animal

CL₅₀ (LK₅₀), exposition time (h), kind of animal)

> 5000 mg/kg v/zh rats

20000 n/k rabbits [8]

CL₅₀ (mg/m³) time of exposition, h, kind of animal CL₅₀ - is not reached [3].

12. Information about influence on the environment

12.1. General characteristic of influence on objects of environment (atmospheric air, reservoirs, soil, including signs of influence)

In large concentration it can pollute various objects of environment: to add extraneous smell to the atmospheric air, to change organoleptic properties of water, to effect fatally on inhabitants of reservoirs, to cause braking of processes of biochemical oxygen consumption and delay in growth of plants [13].

12.2. Ways of influence on environment:

Infringement of storage rules, transportation, unorganized placing of wastes, dumping on relief and in reservoirs.

12.3 The most important characteristics of influence on environment

12.3.1 Hygienic standards:

(admissible concentrations in the atmospheric air, water, in fish reservoirs, soil)

| Components | PDK atm air or OBUV atm air, mg/m ³ (LPV ¹ , class of danger) [H] | PDK water ² or ODU water, mg/l, (LPV, class of danger) [15] | PDK fishery ³ or OBUV fishery, Mg/l (LPV, class of danger) [16] | PDK or ODK of soil, mg/kg (LPV) [17] |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Ferrosilicon | OBUV atm.air = 0,02/- mg/m ³ , ferroalloy dust (iron - 51%, silicon -47%) /by iron | PDK water = 0,3 mg/l, (iron), org. okr, 3d class PDK water = 10 mg/l, (silicon), org. okr, 2d class | PDK fishery = 0,1 mg/l, (iron), toxic, 4 th class of danger; 0,05 mg/l, tox., for sea reservoirs | not revealed |
| Phosphorous hydrogen (phosphine): | PDK atm.air=0,01/0,001 mg/m ³ , rez, 2d class | Not revealed. | Not revealed. | Not revealed. |
| Arsenic hydride (arsine) emitting while contacting with water | PDK atm.air =0,002, rez., 2d class | Not revealed. | PDK fishery = 0,05 mg/l, (arsenic, for all forms soluble in water), tox, 3d class; 0,01 mg/l, tox, 3d class for sea reservoirs | Not revealed. |

¹ LPV - limiting indicator of harm (tox- toxicological; st. - sanitary-toxicological; org- organoleptic; reflex - reflectory; res. - resorptive; ref.-res.- reflectory-resorptive, fish- fishery (change of commodity qualities of trade water organisms); gen - general sanitary).

² Water of water objects of economic-drinking and cultural and everyday water use

³ Water of water objects having fishery value (including sea)

12.3.2 Indicators of ecological toxicity:

No data [3,13].

(CL, EU for fishes (96 hours), Daphnias (48 hours), seaweed (72 or 96 hours), etc.)

12.3.3 Migration and transformation in the environment at the expense of biological decomposition and other processes (oxidation, hydrolysis, etc.):

It is not transformed in the environment [3].

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13. Recommendations on waste disposal (rests)

- 13.1. Security measures while handling with wastes formed by application, storage, transportation. Safety measures when working with wastes are similar to the applied ones at work with ferrosilicon (refer to the items 5.7 and 8 of safety data sheet).
- 13.2. Information about places and ways of neutralization, recycling or liquidation of wastes of substance (material), including tare (packing). Wastes, non-returnable tare should be delivered to be eliminated to refuse dumps for industrial wastes or to the places approved by the local sanitary or nature protection bodies [18].
- 13.3. Recommendations on waste disposal formed when applying in life. It is not applied in everyday life [1].

14. Information about transportation

- 14.1 UN number: 1408 [19]
(according to the recommendations of the UNO about transportation of dangerous cargoes)
- 14.2 Proper shipping and/or transport name: FERROSILICON with mass fraction of silicon no less than 30% but less than 90%
Ferrosilicon (grade, size class) [1,19].
- 14.3 Types of transport used All types of transport. Ferrosilicon by the internal and international transportation is transported according to the rules and corresponding agreements effective for this type of transport [1].
- 14.4 Classification of danger of the cargo under the GOST 19433-88: Ferrosilicon with the mass fraction of silicon from 30% up to 90% and the particle size over 3.2 up to 315 mm is not classified as dangerous cargo under the GOST 19433-88.
Ferrosilicon with mass fraction of silicon from 30% up to 90% and the particle size less than 3.2 up to 315 mm is classified as dangerous cargo.
Class of danger 4
Sub-class 4.3
Classification code number 4323 (under the GOST 19433-88)
Classification code number 4363 by railway transportation
Sign of danger according to the drawing 4b is main, the drawing 6a – additional [1, 10, 20, 26].
- class
 - sub-class
 - classification code number (under the GOST 19433-88 and by railway transportation)
 - numbers of drawings, danger signs
- 14.5 Classification of danger of the cargo under the UNO recommendations on dangerous cargo transportation: For ferrosilicon relating to the dangerous cargoes:
- class or sub-class 4.3
 - additional danger 6.1 [19, 26]
 - UNO packing group III [19]
- 14.6 Transport marking (manipulation signs under the GOST 14192-96) Transport marking (manipulation signs and information inscriptions) under the GOST 14192-96.
Manipulation sign - «Protect from moisture» [1,21].

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14.7. Emergency cards (by railway, sea, etc. transportations)

For ferrosilicon, which is classified as dangerous cargo:
the emergency card No. 408 by railway transportation;
the emergency cards F-G, S-N by sea transportation;
code of danger 462 - the solid toxic substance reacting with water
and emitting flammable gases;
classification code WT 2 [24,26].
For ferrosilicon, which is not dangerous cargo, they are not required
[1, 9, 20, 23].

15. Information about the national and international legislation

15.1. The national legislation

15.1.1 Laws of the Russian Federation:

«About protection of environment».
«About sanitary-and-epidemiologic well-being of population».

15.1.2 The documents regulating requirements on protection of human and environment

Not required.

15.2. The international legislation

15.2.1. The international conventions and agreements (whether the product is regulated by the Montreal Protocol, the Stockholm convention, etc.)

The product does not fall under effect of the international agreements and regulations.

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16. Additional information

16.1. Data on revision of safety data sheet: the safety data sheet has been re-registered after expiration date. The previous safety data sheet No. 00186476 08259058 dated 27.07.2011.

16.2. The list of data sources used for preparation of the safety data sheet:

- GOST 1415-93 (ISO 5445-80) with the amendment No. 1 Ferrosilicon. Technical requirements and delivery conditions.
- GN 2.2.5.1313-03 "Maximum permissible concentration (PDK) of harmful substances in working zone air". GN 2.2.5.2308-07 "Approximate safe levels of influence (PZK) of harmful substances in working zone air". Hygienic standards. - M: Russian register of potentially dangerous chemical and biological substances of Ministry of Health of Russia, 2003, 2008.
- Harmful substances in industry. T 3. Inorganic and element organic compounds. Directory for chemists, engineers and physicians./Edited by N.V. Lazareva and I.D. Gadaskina.: Chemistry, 1977.
- GOST 31340-2007. Precautionary marking of chemical production. General requirements.
- ESIS (European chemical Information Substances) / Data Sheet: Result for EC.
- Harmful substances in industry. T 2. Inorganic and element organic compounds. Directory for chemists, engineers and physicians./Under editorship of N.V. Lazareva.: Chemistry, 1971.
- A.Ya. Korolchenko. Fire-hazardous / dangerously explosive substances and materials and means of suppression. Directory in two parts. "Pozhnauka", 2000, 2004.
- Fire hazard of substances and materials applied in chemical industry. Directory/Edited by Rjabova I.V. - ~M.; "Chemistry", 1970.
- Safety rules and order of liquidation of emergencies with dangerous cargoes when transporting by railway/ approved by Ministry of Railways of Russia № TsM-407 d.d. 25.11.96 and Ministry of emergency situations of Russia № 9-733/3-2 d.d. 31.10.96. M: Ministry of Railways of the Russian Federation, 1997.
Emergency cards for dangerous cargoes transported by railways of the CIS, the Latvian Republic, the Lithuanian Republic, the Estonian Republic ("Transport" 2000)
- GOST 26590-85 Ferroalloys. Packing, marking, transportation and storage with the amendments 1, 2, 3. .
- Collective and individual protection means. Control of protective means. Encyclopedia «Ekometria» from the series of reference works on ecological and medical measurements. M: FID «Delovoy Express», 2002.
- Chemical encyclopedia./Edited by Knunyants I.L. and others. M: Soviet Encyclopedia, 1990.
- Ya.M. Grushko. Harmful inorganic compounds in industrial sewage. Directory.- L.: Chemistry, 1979.
- GN 2.1.6.1338-03 "Maximum permissible concentration (maximum concentration limit) of polluting substances in atmospheric air in populated areas". GN 2.1.6.2309-07 "Approximate safe levels of influence (OBUV) of polluting substances in atmospheric air of populated areas". Hygienic specifications.- M: Russian Register of potentially dangerous chemical and biological substances of Ministry of Health of Russia, 2003, 2008.
- GN 2.1.5.1315-03 "Maximum permissible concentration (maximum concentration limit) of chemical substances in water of water objects of economic-drinking and cultural and general water use". GN 2.1.5.2307-07 "Approximate admissible levels (ODU) of chemical substances in water of water objects of economic-drinking and cultural and general water use". Hygienic specifications. - M: Russian register of potentially dangerous chemical and biological substances of Ministry of Health of Russia, 2003, 2008.
- Standards on quality of water of water objects of fishery aim, including standards on maximum permissible concentration of harmful substances in waters of water objects of fishery aim. Approved by the Order No. 20 d.d. 18.01.2010 of Federal Agency on fishery.
- Maximum permissible concentration (maximum concentration limit) of chemical substances in soil. Decision of the Main state health officer of the Russian Federation d.d. 23.01.06, No. 1. GN 2, approved on January 19, 2006 - M., Federal centre of hygiene and epidemiology of Federal Supervision Agency for Customer Protection and Human Welfare, 2006.
- Sanitary-and-epidemiologic rules and standards. Sanitary regulations and norms 21.7.1322-03. Hygienic requirements for disposal and neutralization of wastes of production and consumption.
- Recommendations on transportation of dangerous cargoes. Typical rules. 16th amended edition. The United Nations Organization. New York and Geneva, 2009.

20. GOST 19433-88. Dangerous cargoes. Classification and marking - M: Publishing house of standards, 1988.
21. GOST 14192-96. Marking of cargoes. - M: Publishing house of standards, 1998.
22. Rules of transportation of dangerous cargoes by motor transport. - M: Ministry of transport of the Russian Federation, 1996.
23. The international sea code on dangerous cargoes. Code MMOG, book 1,2. - Sankt-Petersburg: ZAO TSNIIMF, 2007.
24. The European agreement on international road transportation of dangerous cargoes. DOPOG. The United Nations Organization. New York and Geneva, 2006.
25. Rules of transportation of dangerous cargoes by railways. Ministry of Railways of the Russian Federation - M: Transport, 1997.
26. Rules of transportations of dangerous cargoes. Appendix 2 to “Agreement about international railway cargo traffic (SMGS)”, Ministry of Railways of the Russian Federation, 2009.
27. A.K. Chernyshev and others. Indices of danger of substances and materials. T1/A/edited by Gusev V.K.- M: Fund of I.D.Sytin, 1999.
28. Ferroalloys. Directory: Metallurgy. 1992
29. GOST 32419-2013. Classification of dangers of chemical products. General requirements.