Established 1875

8 Blackwood Business Park,
Ash Road South, Wrexham Industrial Estate,
Wrexham. LL13 9UG

# Ferrous Sulphate Heptahydrate Solution (FS200)
## Safety Data Sheet

### 1. Identification of the Substance and Company

**1.1 Product Identifier**

| | |
|---|---|
| **Other names:** | **Iron Sulphate solution, Iron Sulphate Heptahydrate solution, Pickling Liquor** |

**1.2 Relevant Identified Uses**

The pickling process in steel plants and tube plants is a surface treatment process of coils and tubes prior to coating of these articles. In order to generate a suitable surface on the belts/strips remaining iron oxides (and some other minor impurities) and the first surface layer of iron are removed in continuous pickling lines or tanks by treating the belt/strip/tube with sulphuric acid. The resulting liquid Ferrous Sulphate solution is produced. The iron salts are then crystallised and removed from solution.

Uses: The uses of Ferrous Sulphate will be covered in the exposure scenario annex, which will accompany this document.

**1.3 Details of supplier**

| | |
|---|---|
| **Company:** | Higgi Limited, 8 Blackwood Business Park, Ash Road South, Wrexham Ind. Estate, Wrexham. LL13 9UG |
| **Telephone:** | +44 (0) 1978 664766 |
| **Normal Hours:** | 08:00 – 16:30 Monday – Thursday, 08:00 – 14:30 on Friday |
| **Email:** | sales@higgi.co.uk |

**1.4 Emergency Telephone number**

| | |
|---|---|
| **Emergency:** | Out of hours – please call mobile number +44 (0) 7967 303568 |

### 2. Hazards Identification

**2.1 Classification**

| Hazard Classification: CLP regulations (EC)1272/2008 | | | |
|---|---|---|---|
| **Name** | **Hazard Class** | **Hazard Category** | **Hazard Statement (code)** |
| Ferrous Sulphate | Skin irritation<br>Serious damage/eye irritation | Skin Irrit. 2<br>Eye Damage 2 | H315: Causes skin irritation<br>H319: Causes serious eye irritation |

**2.2 Label according to CLP regulations (EC)1272/2008**

GHS07: Exclamation mark –

Signal word – Warning

***Hazard statements:***
H315: Causes skin irritation.
H319: Causes serious eye irritation.

***Precautionary statements:***
P264: Wash hands and exposed skin thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

## 2.3 Other hazards

For aqueous solutions of Ferrous Sulphate the classification Corrosive to Metals should be given as required under CLP.
The corresponding hazard category is Met Corr 1 and Hazard statement is H290: May be corrosive to metals.

Independent studies/tests carried out by Scientific Services Derby (A Division of SureScreen Dignostics Ltd) for Ferrous Sulphate solution at 20% and 30% concentrations were conducted between March and August 2011. Results concluded 'all samples were below the required corrosion rate of 6.25mm/year. Therefore, under the remit of ADR/CDG regulations for the Carriage of Dangerous Goods by Road outlined within the CLP regulations the above stated strengths of solution fall well below the required threshold according to a test specification quoted in OJEU UN recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria, Table 2.16.1.

## 3. Composition / Information on Ingredients

| Substance | CAS-Nr. | Einecs No. | Registration No. | Classification (CLP Regs) | Range (%) by weight |
|---|---|---|---|---|---|
| Ferrous Sulphate | 7720-78-7 | 231-753-5 | 01-2119513203-57-XXXX | H302, H315, H319 | >10 <30 |

The full text of the hazard statements mentioned in this section can be found in section 16.
The classification of Corrosive to metals H290 only applies to aqueous solutions of high concentrations and therefore is not included above. See section 2.3 Other hazards.

## 4. First Aid Measures

### 4.1 Description of first aid measures

**Skin contact**: Wash off with water, if symptoms persist, call a physician.
**Eye contact**: Rinse immediately with plenty of lukewarm water, also under the eyelids, for several minutes, consult a physician.
**Inhalation**: Supply fresh air, rinse mouth and nose with water, if symptoms persist, call a physician.
**Ingestion**: Call a physician immediately, do NOT induce vomiting, rinse mouth with water, drink 1 or 2 glasses of water or milk. Never give anything by mouth to an unconscious person.

### 4.2 Most important symptoms and effects

Can be acutely toxic but it's main symptoms will be irritation to the eye.

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

Seek medical attention if symptoms persist.

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Extinguishing media which shall not be used for safety reasons - None.

### 5.2 Special hazards arising from the substance

Sulphur Dioxide and Trioxide may be released when heating above the decomposition temperature.

### 5.3 Advice for fire-fighters

In the event of fire, wear self-contained breathing apparatus. Fire-fighters must wear fire resistant personal protective equipment.

## 6. Accidental Release Measures

### 6.1 Personal precautions

Refer to protective measures listed in section "Handling and Storage". Wear protective suit and boots, if aerosols or mist are formed, use half mask with combination filter B/P2.

### 6.2 Environmental precautions

Cover the drains to prevent the product from entering the environment. If the product contaminates rivers and lakes or drains inform respective authorities. Restrict the spread of the spillage by using inert absorbent material (sand, gravel) solutions only.

### 6.3 Methods for cleaning up

Remove larger spills using a vacuum truck. Dilute residues with water and neutralise with lime or limestone powder. Must be disposed of in accordance with local and national regulations.

## 7. Handling and Storage

### 7.1 Handling

The work place and work methods shall be organised in such a way that direct contact with the product is prevented or minimised.
Wear gloves in a suitable material such as PVC, Neoprene or Natural rubber. Please observe the instructions regarding permeability and breakthrough time, which are provided by the supplier of the gloves. Also consider the specific local conditions under which the product is used, such as the danger of cuts, abrasion and the contact time. Tightly fitting safety goggles must be worn.

### 7.2 Storage

Keep away from incompatible products. Avoid freezing. Avoid high temperatures.
Plastic material - Plastic (PE, PP, PVC), Fiberglass-reinforced polyester, Epoxy-coated concrete, Titanium, Acidproof or rubber-coated steel.
Materials to avoid - Non acid-proof metals (such as aluminium, copper and iron), Bases, Unalloyed steel, Galvanised surfaces.

## 8. Exposure Controls and Personal Protection

### 8.1 Control parameters (Occupational Exposure Limits (OELs)

Current OELs (GESTIS International Limit Values Institut fuer Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA)

| Country in EU with OEL for the relevant substance | Iron Salts (as Fe) | |
|---|---|---|
| | 8 hr TWA ($mg/m^3$) | STEL ($mg/m^3$) |
| Belgium | 1.0 | - |
| Denmark | 1.0 | - |
| Hungary | 6.0 (Resp) | - |
| Spain | 1.0 | - |
| United Kingdom | 1.0 | 2.0 |
| TWA - Time Weighted Average measured over an 8 hour period | | |
| STEL - Short Term Exposure Limit Value – 15 minute duration | | |
| Resp - Respirable fraction of dust | | |

**Derived DNELs for consumer and worker from the studies available from the REACH dossier**
DNELs that have been derived for the registration dossier of this substance are not included here due to the current methodology used to derive such levels. Currently a program of updating the derivation of DNELs is being carried out by the lead registrant and consortium as part of a post registration update and this SDS will be updated as and when this program is completed.

### 8.2 Control Measures

To protect eyes wear suitable safety glasses and or safety goggles. Wear appropriate work wear to protect skin from contact. Check the resistance to chemicals of the protective gloves with the supplier of the gloves. Use only gloves conform to 89/686/EEC. Wear duration at permanent contact: gloves made of nitrile rubber, thickness of the glove material: 0.38 mm, breakthrough time (maximal wear duration): > 480 min. At occasional contact (splashes): gloves made of nitrile rubber, thickness of the glove material: 0.38 mm
Breakthrough time (maximal wear duration): > 480 min this will include work overalls plus suitable gloves. If a dust is created then wear a suitable FFSP2 mask (EN149).

## 9. Physical and Chemical Properties

| Property | Value used |
|---|---|
| **Appearance at 20°C/ 1013 hPa** | Light green-blue liquid that turns brown after exposure to light and air |
| **Form and Odour** | Light green with a slight acidic odour (threshold n/a) |
| **pH** | 2.2 (20% solution) |
| **Melting point** | 60°C as Heptahydrate |
| **Boiling point** | >300°C as Heptahydrate |
| **Relative density** | 1.101 at 20°C of solution |
| **Vapour pressure** | Not applicable |
| **Surface tension** | Not applicable |
| **Water solubility** | >100 g/l at 20°C |
| **Partition coefficient ($K_{ow}$[4])** | Not applicable, inorganic |
| **Flash point** | Not classified |
| **Flammability** | Not classified |
| **Explosive properties** | Not classified |
| **Oxidising properties** | Known to be reducing agents |
| **Granulometry** | Not applicable |
| **Stability in organic solvents** | Stable in organic solvents |
| **Dissociation constant** | Not applicable |
| **Viscosity** | Not determined |

*Only properties that apply to the substance will be included in the table above

## 10. Stability and Reactivity

### 10.1 Reactivity
Product can be reactive under the correct conditions (oxidising agents).

### 10.2 Chemical stability
Loses water progressively from 56°C to 300°C. Aqueous solutions are oxidised slowly by air when hot, the rate of oxidation is increased by the addition of alkali or exposure to light.

### 10.3 Possibility of hazardous reactions
Rapid oxidation will occur if product comes into contact with oxidising agents.

### 10.4 Conditions to avoid
Avoid contact with oxidising agents. Thermal decomposition at 400°C.

### 10.5 Incompatible materials
Oxidising agents.

### 10.6 Hazardous decomposition products
If heated to above 600°C the product may give off acidic fumes of $SO_3$ Sulphur Trioxide and $SO_2$ Sulphur Dioxide.

## 11. Toxicological Information

**Acute toxicity**
The overall pattern of oral toxicity for iron salts is that they are harmful if swallowed. The human oral lethal dose is approximately 1000 mg/kg and 500-2000 mg/kg in rats. Toxic effects may, however, be produced by much lower doses especially when administered systemically. There is limited evidence that inhaled soluble iron salts are tolerated by rats plus limited evidence that inhaled soluble iron salts do not impair lung function and the dermal lethal dose would be greater than 2000 mg/kg. The dermal limit dose of Ferrous Chloride in rats is greater than 2,000 mg/kg (>881 mg Fe/kg) and thus should be used to compare against Ferrous Sulphate. This suggests little potential for systemic toxicity in humans after dermal contact.

Dose descriptor: Oral – $LD_{50}$s 300-2000 mg/kg bw
Dermal – $LD_{50}$s >2000 mg/kg bw
Inhalation – No data

**Skin corrosion / irritation**
Ferrous Sulphate is skin irritant based on (2:1 animals majority) in rabbit test and is an eye irritant. Read across from Ferrous Sulphate and Ferric Chloride, indicates that solutions have the same or a lower classification than the solid and that classification based on pH would be overly cautious. On this basis an irritant classification, Skin Irritation Cat 2. H315: Causes skin irritation should be applied to solutions based on rules for mixtures. This classification therefore applies to this solution as the concentration ≥ 10%. Ferrous Sulphate should not be seen as corrosive just as an irritant.

**Eye damage / irritation**
Results are available for a GLP-compliant guideline study (Johnson, 2003), which showed that a 25% solution of Ferrous Sulphate Heptahydrate caused no more than mild redness and chemosis after instillation into the rabbit eye. The predicted classification based on reading across of several iron salts would be a classification between no classification and causes serious eye damage however due to the lack of test data and low pH a precautionary approach has be taken with classification as Eye Damage Cat 2.

**Respiratory / Skin sensitisation**
Ferrous Sulphate Heptahydrate has been tested in a guideline, GLP, Local Lymph Node Assay (Stitzinger, 2010: reliability 1). In this test Ferrous Sulphate gave a clear negative result and is therefore not considered a skin sensitiser. Results of a reliable LLNA test were clearly negative for Ferrous Sulphate Heptahydrate. There are a few case studies in which human subjects showed signs of sensitisation to iron; however overall these data are poor and do not provide convincing evidence of a positive reaction in humans. There is also poor evidence in animal studies of sensitisation as a result of exposure to iron. The widespread exposure of iron and its role in biological processes, together with the extensive use of dietary supplements suggest that sensitisation is not a concern.

NB. Within the REACH registration process a technical grade was registered attracting a skin sensitizer hazard due to a high level of Nickel impurities. The Nickel impurity for this grade is less than 30mg/kg so this does not apply.

**Germ cell mutagenicity**
With regard to their mutagenic properties, iron salts have been extensively tested in microbial and mammalian systems in vitro, and in mammalian and insect tests in vivo. There are inconsistencies in the in vitro findings, with a small number of studies returning positive results. This has been attributed to DNA damage following reduction of Fe(III) to Fe(II) with free radical or superoxide formation and subsequent redox recycling. This contrasts with the consistently negative results obtained in vivo where, presumably, more efficient control mechanisms exist that protect the body from iron-induced oxidative damage. It is concluded that iron salts are not genotoxic.

**Carcinogenicity**
Due to it's potential pro-oxidant effects, there has been extensive research into possible links between iron and cancer development. These include many clinical investigations into the effects of oral (dietary) iron salts in humans and links to cancer. Although iron has been implicated in the development of cancers at various sites because of its role as a pro-oxidant, the UK Scientific Advisory Committee on Nutrition concluded that there is not enough evidence to reach conclusions for any specific links (EVM, 2003).

**Reproductive toxicity**
Results from recent guideline oral screening studies performed on Ferrous Chloride and Ferrous Sulphate gave NOAELs for reproductive and developmental effects of ≥500 mg/kg body weight/day or ≥1000 mg/kg body weight/day (no adverse effects were observed), respectively. These findings are considered to be relevant to Ferric as well as Ferrous salts, as oxidation of Ferrous to Ferric occurs in the low pH of stomach before ingested iron is absorbed into the body. In humans, iron supplementation of about 5.8 to 11.7 mg/kg bw/day (for a 60kg individual) is routinely prescribed throughout pregnancy with no adverse effects on pregnancy outcome. Evidence of adverse effects on male testes has only been observed at acutely toxic, overload doses, at which some of the experimental animals died.

Dose descriptor: Oral – $LD_{50}$s ≥1000 mg/kg bw day
Dermal – No data
Inhalation – No data

**Repeated dose toxicity**
No human data is available for Ferrous Sulphate and repeated dose toxicity and even though effects are shown in some animal studies the overall conclusion is that no classification should be assigned for all endpoints oral, inhalation and dermal. NOAEL 49 days ~ 100mg/kg Ferrous Sulphate Heptahydrate, result = no effect.

**Aspiration hazard**
No data, not an aspiration hazard.

## 12. Ecological Information

### 12.1 Toxicity
In general toxic effects will not be seen by the presence of Ferrous Sulphate in the environment. However Ferrous Sulphate may present a toxic hazard to environmental species under specific conditions. For example, it is possible that Ferrous iron salts could have toxic effects in circumstances where the following conditions apply and persist: pH is low (<5), iron concentration is high (of the order of the apparent E(L)C50 values), oxygen content is very low, background concentrations of Ferrous iron are low. Such conditions would need to result in dissolved iron concentrations in the order of 1 to 10 mg/l and would not be expected to arise from the industrial production and use patterns for this product.

### 12.2 Persistence and degradability
An in-depth analysis of the oxidation and precipitation of iron was carried out by CEFIC as part of the recent European Chemicals Bureau classification process of Ferrous Sulphate (ECB, 2004b). A review of the scientific literature on the oxidation of Ferrous Sulphate reveals the following: Ferrous Sulphate reacts with water to form Ferrous Hydroxide ($Fe(OH)_2$), moderately insoluble. Any precipitate would in turn undergo further oxidation to form Ferric Hydroxide ($Fe(OH)_3$) which is highly insoluble. Formation of Ferric Hydroxide at pH levels above 5.0 limits the presence of iron in aqueous systems.

For inorganic metal salts the concept of biodegradation is not applicable in general (OECD, 2001). Removal of iron from solution via precipitation and abiotic processes is dominant. Iron is abundant in the environment from natural mineral sources and iron transformations and the whole iron cycle in the environment is a combination of abiotic and biological processes.

In summary, in the environment, a number of important steps follow from any releases. In effect, Ferrous and Ferric ions can be treated together because the Ferrous ion is rapidly transformed to Ferric ion under the conditions found at typical points of release. Ferric ions released into (or generated in) water will rapidly precipitate as highly insoluble oxides and oxo-Hydroxides. These stable compounds are exactly the forms in which iron is found naturally in the earth's crust.

### 12.3 Bio accumulative potential
Biologically, iron is an essential trace element for organisms including micro-organisms, plants and animals. Iron plays an important role in biological processes, and iron homeostasis is under strict control.

### 12.4 Mobility in soil
Soil is the primary reservoir of naturally occurring iron. It has its own surface geochemical cycle. Iron can be mobilised from soil or sediment to surface waters as colloidal Ferric Hydroxide, fine suspended particulates and inbound to clay silt. Factors like pH, $CO_2$ concentration, redox conditions, availability of organic and inorganic complexing agents and soil type contribute to reactions of iron in soil.

### 12.5 Results of PBT and vPvB assessment
The criteria for persistence, bioaccumulation potential and toxicity are not met. The substance is not PBT or vPvB.

**PNEC $_{Water}$** - Any concentration of iron in water that can be considered as stable can only be due to the complexing effects of natural constituents in the water, bearing in mind that the amount in water will already be at saturation. This concentration will vary with location. It is not realistically possible to consider that any addition to the aquatic compartment can be stable, and therefore no PNEC can be set for water.
**PNEC $_{Sediment}$** - 49.5 g Fe/kg dwt, Indicative only, in the absence of intrinsic toxicity.
**PNEC $_{Soil}$** - 55.0 g/kg dwt, Indicative only, in the absence of intrinsic toxicity
**PNEC $_{Oral\ (secondary\ poisoning)}$** - widespread use of iron salts as human and veterinary dietary supplements, strongly suggest that effects resulting from long-term exposure at realistic environmental concentrations are very unlikely to occur.

## 13. Disposal Considerations
This product is classified as hazardous waste and as such is covered by local waste legislation. Do not discharge directly into watercourse or any other controlled watercourse. Waste disposal according to EC-regulations 2006/12/EC and 91/689/EEC in the corresponding versions, covering waste and dangerous waste.

## 14. Transport Information

Not classified as hazardous for transport.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations

Observe in addition the national legislative regulations. UK - Requirements in relation to drinking water treatment chemicals are set out in Regulation 31 of the Water Supply (Water Quality) Regulations 2000, as amended (UK only). There are specification limits on quality in relation to Ferrous Sulphate under the Drinking Water Inspectorate in the UK (UK only).

### 15.2 Chemical Safety Assessment

A chemical safety assessment has been carried out for this substance and full details of this can be found in the formal Chemical Safety Report (CSR) document held by each registrant. Details, which were seen to add value, have been included in the relevant sections of this SDS. Also see the Annex of this SDS for the relevant exposure scenarios written for Ferrous Sulphate.

## 16. Other Information

**Revision**

This safety data sheet has been produced / revised in line with REACH Regulation 1907/2006 as amended by (EU) 2015/830. Information in this safety data sheet was collected and used where necessary from the work undertaken to produce a REACH Registration dossier and Chemical Safety Report for Ferrous Sulphate. This revision is the current version dated **17th November 2016**
And supersedes previous version dated 01st June 2012.

**Hazard and Precautionary Statements according to CLP Regulations (EC)1272/2008):**

Hazard statements:
H290: May be corrosive to metals (only applies to aqueous solutions)
H302: Harmful if swallowed
H315: Causes skin irritation
H319: Causes serious eye irritation
Precautionary statements:
P264: Wash hands and exposed skin thoroughly after handling
P280: Wear protective gloves/protective clothing/eye protection/face protection
P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302+P352: IF ON SKIN: Wash with plenty of soap and water
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

**References**

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# Ferrous Sulphate Annex 1 – Exposure Scenarios

The current document includes all relevant occupational and environmental exposure scenarios (ES) for the production and use of Ferrous Sulphate as required under the REACH Regulation (Regulation (EC) No 1907/2006). For the development of the ES the Regulation and the relevant REACH Guidance have been considered. For the description of the covered uses and processes, the "R.12 – Use descriptor system" guidance (Version: 2, March 2010, ECHA-2010-G-05-EN), for the description and implementation of risk management measures (RMM) the "R.13 – Risk management measures" guidance (Version: 1.1, May 2008), for the occupational exposure estimation the "R.14 – Occupational exposure estimation" guidance (Version: 2, May 2010, ECHA-2010-G-09-EN) and for the actual environmental exposure assessment the "R.16 – Environmental Exposure Assessment" (Version: 2, May 2010, ECHA-10-G-06-EN) was used. The following exposure scenarios are taken directly from the Chemical safety report for iron salts that was made available via the ALFe REACH Consortium. The exposure scenarios included in this annex are those related to the use of Ferrous Sulphate for the customers in the supply chain and the steel industry. The intended use numbers (IU) indicate which exposure scenarion should be used in conjunction with what is agreed by the customers down the supply chain.

| IU number | ES code | Identified use (IU) |
|---|---|---|
| 4 | ES4 | Water treatment: treatment of raw and potable water |
| 5 | ES 5 | Water treatment: treatment of waste waters and WWTP sludge |
| 17 | ES13b | Use in Agrochemicals (professional) |
| 18 | ES13c | Use in Agrochemicals (consumer) |