

Technical Data Sheet (TDS)

- Feed Grade Ferrous Sulfate Monohydrate (FSM) Issue Date: 24 FEB 2026 | Version: V1.0

1. Product Overview

- **Product Name:** Ferrous Sulfate Monohydrate (Feed Grade, FSM)
- **CAS Number:** 13463-43-9 | **Molecular Formula:** $\text{FeSO}_4 \cdot \text{H}_2\text{O}$ | **Molecular Weight:** 169.92 g/mol
- **Chemical Nature:** Inorganic trace mineral salt, the **anhydrous-concentrated form** of ferrous sulfate (higher Fe^{2+} content than heptahydrate). Fe^{2+} is the **only bioavailable iron form** for monogastric animals (pigs, poultry, aquatic).
- **Core Characteristics:** High bioavailable Fe^{2+} content ($\geq 30.0\%$), low water content (minimizes oxidation), good flowability, cost-effective, and compliant with global feed safety standards.
- **Core Application:** Essential feed additive for all livestock, poultry and aquatic animals. Provides iron for hemoglobin, myoglobin and enzyme synthesis; prevents iron deficiency anemia, improves growth performance, enhances immunity and reproductive efficiency. Ideal for young animals (piglets, chicks, fry) with high iron demand.

2. Technical Specifications (Feed Grade, GB/T 21695-2008)

Item	Standard Requirement	Test Method
Appearance	Pale green crystalline powder, odorless	Visual Inspection
$\text{FeSO}_4 \cdot \text{H}_2\text{O}$ Purity	$\geq 98.0\%$	Complexometric Titration
Fe^{2+} Content	$\geq 30.0\%$	Redox Titration ($\text{K}_2\text{Cr}_2\text{O}_7$)
pH Value (5% Aqueous, 25°C)	3.0 - 4.0	Digital pH Meter
Loss on Drying	5.0% - 8.0%	105°C Constant Weight Method
Insoluble Matter in Water	$\leq 0.05\%$	Gravimetric Method
Heavy Metals (as Pb)	≤ 5 ppm	Atomic Absorption Spectrometry (AAS)
Arsenic (As)	≤ 2 ppm	Atomic Fluorescence Spectrometry (AFS)
Cadmium (Cd)	≤ 1 ppm	AAS
Mercury (Hg)	≤ 0.1 ppm	Cold Vapor Atomic Absorption
Chloride (Cl^-)	$\leq 0.01\%$	Volumetric Method
Microbiological Limits	Meet GB 13078.1	Plate Count & Microbiological Detection
Particle Size (Typical)	80-120 mesh (customizable)	Sieve Analysis

3. Product Advantages (Feed Grade Focus)

1. **High Bioavailability:** Fe^{2+} is directly absorbable by animal intestines; no conversion required (unlike Fe^{3+} which is inactive for monogastric animals). Far superior to iron oxide/iron carbonate in absorption rate.
2. **High Iron Concentration:** 30.5% Fe^{2+} content (2x higher than ferrous sulfate heptahydrate), reducing feed addition amount and transportation/storage costs.
3. **Low Oxidation Risk:** Low water content (1 mole H_2O) minimizes Fe^{2+} oxidation to inactive Fe^{3+} during storage and feed processing, ensuring long-term effectiveness.
4. **Excellent Processing Stability:** Resistant to high temperatures of feed pelleting/extrusion ($\leq 180^\circ\text{C}$); no Fe^{2+} loss under standard feed production conditions.
5. **Cost-Effective:** The most economical bioavailable iron source for feed formulation, balancing iron supply and feed cost optimization.

4. Application & Dosage Guide (Feed Formulation)

4.1 Target Species & Core Benefits

- **Piglets (0-30 kg):** Prevents iron deficiency anemia (common in suckling piglets); improves growth rate and survival rate; enhances resistance to diarrhea.

- **Poultry (Chicks/Layers/Broilers):** Prevents pale combs/wattles and reduced egg production; improves hatchability and chick vitality; boosts broiler growth performance.
- **Aquaculture (Fish/Shrimp/Fry):** Prevents anemia and reduced oxygen-carrying capacity; improves growth and survival rate in fry; enhances stress resistance.
- **Ruminants (Calves/Sheep):** Supplements iron for young ruminants; prevents anemia and poor growth; improves milk production in dairy cows.

4.2 Recommended Inclusion Levels (Fe²⁺ content, ppm in total compound feed)

Species	Growth/Production Stage	Recommended Fe ²⁺ Level	Corresponding FSM Dosage
Pigs	Suckling/Weaned Piglets (0-30 kg)	150 - 200	0.049% - 0.065%
Pigs	Growers/Finishers (30-120 kg)	80 - 120	0.026% - 0.039%
Poultry	Chicks (0-21 days)	120 - 180	0.039% - 0.059%
Poultry	Layers/Broilers (21+ days)	50 - 80	0.016% - 0.026%
Aquaculture	Fry/Fingerlings	100 - 150	0.032% - 0.049%
Aquaculture	Grow-out Fish/Shrimp	60 - 100	0.019% - 0.032%
<i>Note: Adjust dosage based on iron content of other feed ingredients (e.g., corn, soybean meal), animal age and environmental conditions. Higher levels may be needed during stress/disease outbreaks.</i>			

5. Handling & Formulation Guidelines

1. **Premixing is Mandatory:** Due to low dosage requirement, premix FSM with an inert carrier (e.g., corn starch, wheat middlings, diatomaceous earth) at a ratio of **1:100 to 1:200** to create a trace mineral premix. This ensures uniform distribution in the main feed batch.
2. **Avoid Oxidation:** Mix FSM in closed systems; minimize prolonged air exposure during premixing/feed production. Do not store premixes for more than 3 months (sealed storage only).
3. **Compatibility Control:** **Do not mix FSM directly with strong alkaline feed additives** (e.g., calcium carbonate, sodium bicarbonate, DCP in high concentration) or strong oxidizers (e.g., potassium permanganate). Separate in premix formulation to prevent Fe²⁺ oxidation/precipitation.
4. **Processing Timing:** Add FSM premix at the **cooling stage** of pelleting ($\leq 60^{\circ}\text{C}$) if mixing with alkaline ingredients; can be added at any stage for acid-based feed formulations.
5. **Water Solubility:** Suitable for liquid feed/drinking water supplementation for young animals (e.g., piglet milk replacer, chick drinking water); dissolve completely before use.

6. Packaging, Storage & Shelf Life

- **Standard Packaging:** 25 kg moisture-proof PP woven bags with double PE inner liners (sealed, anti-oxidation, anti-caking).
- **Bulk Packaging:** 500 kg / 1000 kg jumbo bags with inner PE liners (for large feed mills, closed loading/unloading).
- **Sample Packaging:** 100 g / 500 g HDPE plastic bottles (sealed, for quality testing).
- **Custom Packaging:** Available upon request (small bags for premix manufacturers).

7. Quality Assurance & Control

1. **Production Standards:** Produced in a GMP-compliant facility with ISO 9001 (Quality Management) and ISO 22000 (Food Safety) certifications. Using high-purity iron and sulfuric acid as raw materials; closed production process to prevent oxidation.
2. **Batch Testing:** Every batch undergoes rigorous testing for Fe²⁺ content, purity, oxidation rate, heavy metals and microbiology. A detailed English COA is provided with each shipment, including Fe²⁺ /Fe³⁺ ratio test (Fe³⁺ $\leq 1.0\%$).