


Ferromanganese (FeMn)

| | | | |
|---|--|---|---|
|  | Price range in 2020 for High Carbon Ferromanganese | 830,00 €/t – 1053,00 €/t 985,00 \$/t – 1191,00 \$/t | Get access to the current market prices |
| | Formula | FeMn | |
| | CAS no. | 12604-53-4 | |
| | EC no. | 924-609-4 | |
| | Description | Manganese alloys include various ferromanganese and silicomanganese grades. High-carbon ferromanganese (HCFeMn) with a manganese content of 70-80 wt.% and a carbon content of 6-7 wt.% is the most widely used ferroalloy in terms of quantity. Ferromanganese alloys are produced by carbothermic reduction of ores containing iron and manganese oxide in a smelting-reduction furnace. During the production process, slags with a high content of manganese oxide are formed, which can be refined in further process steps to ferro-silicon manganese, low-carbon ferro-manganese (LCFeMn) or to manganese metal. | |

Physical Properties

| | | | | | | |
|---------------|---|--------------------------|-----------------------------|--------------------------|--------------------------|--------------------------|
| General | The melting point and density of ferromanganese depends on its manganese and carbon content | | | | | |
| Abrasion | good resistance to abrasion | | | | | |
| Corrosion | good resistance to corrosion | | | | | |
| Magnetism | high magnetism | | | | | |
| | High carbon FeMn75 | | Medium carbon FeMn80 | | Low carbon FeMn85 | |
| Density | 7,3 g/cm ³ | 0,264 lb/in ³ | 7,4 g/cm ³ | 0,267 lb/in ³ | 7,3 g/cm ³ | 0,264 lb/in ³ |
| Melting point | 1070-1260 °C | 1958-2300°F | 1250-1260 °C | 2282-2300°F | 1250-1260 °C | 2282-2300°F |

Source: Volkert, G. & Frank, K.-D.: Die Metallurgie der Ferrolegerungen

CO2 Emissions

| | | |
|---------------------------|-----------|--------------------------------|
| Upstream emission factors | Scope 2 * | Scope 3 ** |
| | - | 2,789 tCO ₂ / tFeMn |

Source: worldsteel association

Actually requested materials based on [metalsHub](#) transactions

| Material name | size [mm] | Composition, as percentages by mass | | | | | Packaging | Pallet | |
|----------------------------|-----------|-------------------------------------|----|------|------|------|-----------|---------------|-------------|
| | | Mn | C | Si | P | S | | | |
| HCFeMn75-80 (fines) | Min. | 2 | 75 | 6,00 | - | - | - | 1 mt big bags | euro pallet |
| | Max. | 10 | 80 | 8,00 | 1,50 | 0,25 | 0,05 | | |
| HCFeMn75-80 (fines) | Min. | 10 | 85 | 6,00 | - | - | - | 2 mt big bags | euro pallet |
| | Max. | 50 | 90 | 8,00 | 1,50 | 0,25 | 0,05 | | |

The DIN standard of Ferromanganese / Ferrosilicomanganese (DIN 17564)

| Designation | | Material name | Composition, as percentages by mass | | | | | | | | | |
|-----------------|--------------------------------------|---------------|-------------------------------------|----|-------------------|---|-------------------|------|------|-------------------|------|------|
| | | | Mn ¹⁾ | C | Fe | N | P | S | Si | Ti | V | |
| Ferro-manganese | Low carbon grade | FeMn85C01 | Min. | 80 | 0,05 | - | - | - | - | - | - | - |
| | | | Max. | 92 | 0,5 ²⁾ | - | - | 0,25 | 0,03 | 1,0 ³⁾ | 0,02 | 0,02 |
| | Low phosphorus and low carbon grade | FeMn85C01P015 | Min. | 80 | 0,05 | - | - | - | - | - | - | - |
| | | | Max. | 92 | 0,5 ²⁾ | - | - | 0,15 | 0,03 | 1,0 ³⁾ | 0,02 | 0,02 |
| | Nitrogen-containing low carbon grade | FeMn85NC01 | Min. | 80 | 0,05 | - | 2,0 ³⁾ | - | - | - | - | - |
| | | | Max. | 92 | 0,5 ²⁾ | - | 2,5 ³⁾ | 0,15 | 0,03 | 1,0 ³⁾ | 0,02 | 0,02 |

*Scope 2 emissions (according to greenhouse gas protocol):

Upstream emissions or credits related to procurement/delivery of electricity and steam from site. Upstream emissions of exported by-product gas considering the potential savings in electricity generation.

**Scope 3 emissions (according to greenhouse gas protocol):

Other upstream emissions or credits related to procurement / delivery of pre-processed materials / by-products from site.

| | | | | | | | | | | | | |
|---|---|----------------|---------------------|---------------------|-------------------|---|-------------------|--------------------|------|-------------------|------|------|
| | Nitrogen-containing low carbon and low phosphorus grade | FeMn85NC01P015 | Min. | 80 | 0,05 | - | 2,0 ³⁾ | - | - | - | - | - |
| | | | Max. | 92 | 0,5 ²⁾ | - | 2,5 ³⁾ | 0,15 | 0,03 | 1,0 ³⁾ | 0,2 | 0,2 |
| | Medium carbon grade | FeMn80C1 | Min. | 75 ^{4) 6)} | 0,5 | - | - | - | - | - | - | - |
| | | | Max. | 85 ⁶⁾ | 2,0 ²⁾ | - | - | 0,10 ⁴⁾ | 0,03 | 1,0 ³⁾ | 0,02 | 0,02 |
| | Nitrogen-containing medium carbon grade | FeMn85NC1 | Min. | 80 | 0,5 | - | 1,0 ³⁾ | - | - | - | - | - |
| | | | Max. | 90 | 2,0 ²⁾ | - | 2,0 ²⁾ | 0,25 ⁴⁾ | 0,03 | 1,0 ³⁾ | 0,02 | 0,02 |
| | High carbon grade | FeMn75C7 | Min. | 75 ⁴⁾ | 6 | - | - | - | - | - | - | - |
| | | | Max. | 80 | 8 | - | - | 0,25 | 0,03 | 1,0 ⁵⁾ | 0,02 | 0,02 |
| | Low phosphorus, high carbon grade | FeMn75C7P015 | Min. | 75 ⁴⁾ | 6 | - | - | - | - | - | - | - |
| | | | Max. | 80 | 8 | - | - | 0,15 | 0,03 | 1,0 ⁵⁾ | 0,02 | 0,02 |
| Ferrosiliconmanganese | FeMn65Si | Min. | 58 ^{6) 7)} | 0,1 | - | - | - | - | 23 | - | - | |
| | | Max. | 72 ^{6) 7)} | 0,5 | - | - | 0,1 | 0,01 | 35 | 0,2 | 0,2 | |
| | FeMn70Si | Min. | 65 ⁷⁾ | 0,5 | - | - | - | - | 15 | - | - | |
| | | Max. | 75 ⁷⁾ | 2 | - | - | 0,2 | 0,01 | 25 | 0,2 | 0,2 | |
| 1) The manganese content shall not vary by more than 2 % within a consignment. | | | | | | | | | | | | |
| 2) Any lower maximum values within range given subject to agreement. | | | | | | | | | | | | |
| 3) Value applies to molten grades. Sintered grades with a nitrogen content of 5% to 8% available subject to agreement | | | | | | | | | | | | |
| 4) Lower minimum values subject to agreement. | | | | | | | | | | | | |
| 5) A maximum silicon content of 0,5 % shall be subject to agreement | | | | | | | | | | | | |
| 6) Lead content not to exceed 0,05 %. | | | | | | | | | | | | |
| 7) Boron content not to exceed 0,025 %. | | | | | | | | | | | | |

[Click here for the ASTM standard specification for Ferromanganese \(ASTM A99\)](#)

Interesting facts

Silicomanganese as Deoxidiser

As a deoxidizer, silicomanganese is more effective than either silicon or manganese alone, since the simultaneous reaction of the two elements with oxygen produces a manganous silicate, which is low-melting and readily separates from the steel.

As a desulfurizer, manganese forms stable, high-melting sulfide particles, thereby removing sulfur from the crystalline grain boundaries of the metal, where it can cause "hot shortness" (the inability to stand up to hot working).

Manganese as Desulfurizer

Applications

- Manganese is one of the most important deoxidising agents and also enables the desulphurisation of cast iron melts through the formation of manganese(II) sulphide.
- As a carbide-forming element, it leads to a reduction in carbon activity, so that solidification after the stable system is inhibited and thus white solidification is favoured.
- Manganese is a per-litiser that also has a stabilising effect on the austenite phase and refines the graphite.
- The addition of manganese has a positive effect on the flow behaviour during casting.
- Highly manganese-containing steels with an Mn content of 12-14 wt.% are fully austenitic and are widely used in industry due to their wear resistance
- Silico-manganese adds additional silicon which is a stronger deoxidizer and which also helps to improve some mechanical properties of steel. In each family carbon is controlled and is lowered when producing "refined" grades.

Risk and Safety Statements

Ferromanganese is not classified as hazardous under the CLP Regulation (1272/2008/EC) or as dangerous under the Dangerous Substances Directive (67/548/EEC), is not persistent bio accumulative and toxic (PBT) or very persistent and very bio accumulative (vPvB) as defined in Annex XIII of the REACH Regulation, and is not included in the ECHA candidate list of substances of very high concern.

Symbols (GHS)



Hazard Statements

H315

Causes skin irritation.

H320

Causes eye irritation.

H334

May cause allergy or asthma symptoms or breathing difficulties if inhaled.

H350

May cause cancer.

H360

May damage fertility or the unborn child.

Precautionary Statements

Prevention

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P280

Wear protective gloves, protective clothing, eye protection, and face protection.

P264

Wash thoroughly after handling.

P260

Do not breathe dust, fume, vapours, and spray.

P285

In case of inadequate ventilation, wear respiratory protection.

P270

Do not eat, drink, or smoke when using this product.

P231

Handle under inert gas.

P232

Protect from moisture.

Response

P302 + P352

If on skin, wash with plenty of water.

P333 + P313

If skin irritation occurs, get medical advice and/or attention.

P362

Take off contaminated clothing and wash it before reuse.

P305 + P351 + P338

If in eyes, rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337 + P313

If eye irritation persists, get medical advice and/or attention.

P304 + P341

If inhaled and breathing is difficult, remove person to fresh air and keep comfortable for breathing.

P342 + P311

If experiencing respiratory symptoms, call a doctor.

P308 + P313

If exposed or concerned, get medical advice and/or attention.

P314

Get medical advice and/or attention if you feel unwell.

Storage

P405

Store locked up.

P402

Store in a dry place.

P404

Store in a closed container.

Disposal

P501

Dispose of contents in accordance with local, regional, national, and international regulations.

Source: DLA (Defense Logistics Agency):