मानकः पथप्रदर्शकः

# COMPENDIUM OF INDIAN STANDARDS ON

# FERROALLOYS


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# INTRODUCTION

**Ferroalloys** are alloys of iron (Fe) and one or more elements like Si, Mn, Cr, Al, Ni, V, Mo etc which are used as deoxidisers and/ or alloy additives in the steel manufacturing process. Ferroalloys are intermediate products which are extensively used in Iron and Steel making.

This compendium aims at providing a compilation and brief overview of Indian Standards related to Ferroalloys.

## Table 1: Indian Standards on Ferroalloys

| Sl no. | Indian Standard no. | Title |
|---|---|---|
| | | |
| 1 | IS 1110:2023 | Ferrosilicon - Specification |
| 2 | IS 1170 : 1992 | Ferrochromium - Specification |
| 3 | IS 1171 : 2011 | Ferromanganese - Specification |
| 4 | IS 12908 : 1990 | Ferroaluminium - Specification |
| 5 | IS 13164 : 1991 | Ferrosilicomagnesium - Specification |
| 6 | IS 1466 : 1985 | Specification for ferrovanadium |
| 7 | IS 1467 : 1993 | Ferrotungsten - Specification |
| 8 | IS 1468 : 2000 | Ferrotitanium - Specification |
| 9 | IS 1469 : 1993 | Ferromolybdenum - Specification |
| 10 | IS 1470 : 2013 | Silicomanganese - Specification |
| 11 | IS 1471 : 1988 | Specification for ferrophosphorus |
| 12 | IS 2024 : 1988 | Specification for ferrosilicochromium |
| 13 | IS 3011 : 1973 | Specification for ferrosilicozirconium |
| 14 | IS 3013 : 1991 | Ferroboron - Specification |
| 15 | IS 3014 : 1993 | Ferroniobium - Specification |
| 16 | IS 4409 : 2023 | Ferronickel - Specification |
| 17 | IS 7148 : 2024 | Ferro-Alloys for Welding Industry - Specification |

## Table 2: Indian Standard on Code for designation of ferroalloys

| Sl no. | Indian Standard no. | Title |
|---|---|---|
| **1** | IS 2085 : 1962 | Code for designation of ferro - alloys |

## Table 3- Indian Standards on Testing Methods and sampling related to Ferroalloys

| Sl no. | Indian Standard no. | Title |
|---|---|---|
| 1 | IS 1472 : 1977 | Methods for sampling ferro-alloys for determination of chemical composition |
| 2 | IS 1559:1961 | Method of chemical analysis of ferro- alloys |
| 3 | IS 1559 (Part 1) : 1988 | Methods of chemical analysis of ferro - Silicon: Part 1 determination of silicon |
| 4 | IS 1559 (Part 2) : 1982 | Methods of chemical analysis of ferrosilicon: Part 2 determination of carbon |
| 5 | IS 1559 (Part 3) : 1982 | Methods of chemical analysis of ferrosilicon: Part 3 determination of sulphur |
| 6 | IS 1559 (Part 4) : 1982 | Methods of chemical analysis of ferrosilicon: Part 4 determination of phosphorus |
| 7 | IS 1559 (Part 5) : 2003 | Chemical analysis of ferrosilicon: Part 5 determination of aluminium in ferrosilicon (Aluminium 0.05 To 1.75 Percent) |
| 8 | IS 1559 (Part 6) : 1982 | Methods of chemical analysis of ferrosilicon: Part 6 determination of calcium |
| 9 | IS 1559 (Part 7) : 1982 | Methods of chemical analysis of ferrosilicon: Part 7 determination of manganese |
| 10 | IS 12614 (Part 1) : 1988 | Methods of chemical analysis of ferromolybdenum: Part 1- determination of molybdenum |
| 11 | IS 12614 (Part 2) : 1988 | Methods of chemical analysis of ferro-molybdenum: Part 2- determination of total carbon |
| 12 | IS 12614 (Part 3) : 1988 | Methods of chemical analysis of ferro-molybdenum: Part 3- determination of silicon |
| 13 | IS 12614 (Part 4) : 1988 | Methods of chemical analysis of ferro-molybdenum: Part 4- determination of sulphur |
| 14 | IS 12614 (Part 5) : 1988 | Methods of chemical analysis of ferro-molybdenum: Part 5- determination of phosphorus |
| 15 | IS 12614 (Part 6) : 1988 | Methods of chemical analysis of ferro-molybdenum: Part 6- determination of copper |
| 16 | IS 12614 (Part 7) : 1988 | Methods of chemical analysis of ferro-molybdenum: Part 7- determination of aluminium |
| 17 | IS 17319 : 2020/ ISO 6352 : 1985 | Ferronickel — Determination of Nickel Content — Dimethylglyoxime Gravimetric Method |
| 18 | IS 17320:2020/ ISO 11400:1992 | Nickel, Ferronickel and Nickel Alloys — Determination of Phosphorus Content — Phosphovanadomolybdate Molecular Absorption Spectrometric Method |
| 19 | IS 17321 : 2020/ ISO 8343 : 1985 | Ferronickel - Determination of Silicon Content - Gravimetric Method |

| | | |
|---|---|---|
| 20 | IS 17322 : 2020/ ISO 7527 : 1985 | Nickel, Ferronickel and Nickel Alloys - Determination of Sulfur Content - Iodimetric Titration Method after Induction Furnace Combustion |
| 21 | IS 17323 : 2020/ ISO 7526 : 1985 | Nickel, Ferronickel and Nickel Alloys - Determination of Sulfur Content - Infra-Red Absorption Method After Induction Furnace Combustion |
| 22 | IS 17324 : 2020/ ISO 7524 : 1985 | Nickel, Ferronickel and Nickel Alloys - Determination of Carbon Content - Infra-Red Absorption Method after Induction Furnace Combustion |
| 23 | IS 17325 : 2020/ ISO 7520 : 1985 | Ferronickel - Determination of Cobalt Content - Flame Atomic Absorption Spectrometric Method |
| 24 | IS 17835 : 2022/ ISO 23156 : 2021 | Ferronickel- Determination of phosphorus manganese chromium copper and cobalt contents Inductively coupled plasma atomic emission spectrometric method |
| 25 | IS 15396 : 2003 | Chemical analysis of ferro - Silicon zirconium alloys |
| 26 | IS 3295 (Part 1) : 1969 | Methods of chemical analysis of ferro boron: Part 1 analysis for carbon, silicon and aluminium |
| 27 | IS 3295 (Part 2) : 1970 | Method of chemical analysis of ferroboron: Part 2 determination of boron |
| 28 | IS 15765 : 2008 | Method of sampling ferro alloys for sieve analysis and size determination |

## Overview on Indian Standards on Ferroalloys

**IS 1110 : 2023 – Ferrosilicon:** The standard covers requirements of ferrosilicon with a minimum of 15% and maximum 95 % silicon by mass. IS 1110:2023 covers different grades of ferrosilicon based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, Packing, Marking and other requirements for ferrosilicon.

**IS 1170 : 1992- Ferrochromium:** The standard covers requirements of ferrochromium with a minimum of 45% and maximum 95 % chromium by mass. IS 1170:1992 covers different grades of ferrochromium based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, packing, marking and other requirements for ferrochromium.

**IS 1171 : 2011- Ferromanganese:** The standard covers requirements of ferromanganese with a minimum of 65% and maximum 95 % manganese by mass. IS 1171:2011 covers different grades of ferromanganese based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, packing, marking and other requirements for ferromanganese.

**IS 12908:1990- Ferroaluminium:** The standard covers requirements of Ferroaluminium with a minimum of 35% and maximum 50 % aluminium by mass. IS 12908:1990 covers different grades of Ferroaluminium based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, packing, marking and other requirements for Ferroaluminium.

**IS 13164 : 1991- Ferrosilicomagnesium:** This standard covers the requirements of ferrosili-comagnesium used in ferrous and non-ferrous industry.

**IS 1466:1985- Ferrovanadium:** 1S 1466:1985 specifies requirements of Ferrovanadium and covers different grades of Ferrovanadium based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, packing, marking and other requirements for Ferrovanadium.

**IS 1467 : 1993- Ferrotungsten:** This standard covers the requirements of Ferro- tungsten, with a minimum titanium content of 75 percent and a maximum titanium content of 95 percent by mass, used in ferrous industry and for nuclear applications.

**IS 1468: 1993- Ferrotitanium:** This standard covers the requirements of ferrotitanium with a minimum titanium content of 20 percent and a maximum titanium content of 75 percent by mass.

**IS 1469:1993- Ferromolybdenum:** The standard covers requirements of ferromolybdenum with a minimum of 55% and maximum 75% molybdenum by mass. IS 1469:1993 covers different grades of ferromolybdenum based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, packing, marking and other requirements for ferromolybdenum.

**IS 1470 : 2013- Silicomanganese:** This standard covers the requirements and condition of delivery for silicomanganese used by iron and steel industry and foundries.

**IS 1471 : 1988- Ferrophosphorus:** This standard covers the requirements and condition of delivery for ferrophosphorus commonly used in iron and steel industry.

**IS 2024 : 1988- Ferrosilicochromium:** This standard covers the requirements and condition of delivery for ferrosilicochromium commonly used in iron and steel industry.

**IS 3011 : 1973- Ferrosilicozirconium:** This standard covers the requirements for ferrosilicozirconium commonly used in iron and steel industry.

**IS 3013 : 1991- Ferroboron:** This standard covers the requirements of ferroboron used in ferrous industry.

**IS 3014 : 1993- Ferroniobium:** This standard covers the requirements of Ferroniobium used in Ferrous industry and for nuclear applications.

**IS 4409:2023- Ferronickel:** The standard covers requirements of ferronickel with a minimum of 15% and maximum 80% nickel by mass. IS 4409:2023 covers different grades of ferronickel based on chemical compositions. The standard specifies chemical composition, size range, sampling plan, packing, marking and other requirements for ferronickel.

**IS 7148:2024- Ferro-Alloys for Welding Industry** : This standard prescribes the requirements of ferro-alloys used in the manufacture of welding electrodes.