मानकः पथप्रदर्शकः

# COMPENDIUM OF INDIAN STANDARDS ON

# STAINLESS STEEL


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## INTRODUCTION

This compendium gives a list and brief description of the various raw materials, products and test methods standards formulated by BIS on Stainless Steel. These standard have been formulated by MTD 16, Alloy steel and Forgings sectional committee of BIS. This compendium also gives a list of product standards wherein the standards formulated by Metallurgical Engineering department (MTD) are used as raw materials.

### 1. INDIAN STANDARDS FOR RAW MATERIALS USED IN STAINLESS STEEL MANUFACTURING

i. **IS 2549 : 2023 — Processed ferrous scrap — Code for classification –**
*This standard classifies:*
   a. *Ferrous scrap generated at steel processing and product manufacturing sites (termed as Prompt Scrap);*
   b. *Ferrous scrap generated post end of useful life (Obsolete Scrap); and*
   c. *Ferrous scrap generated at steel manufacturing units (Home Scrap) which can be sold to market rather recycling internally.*

ii. **IS 1170 : 1992 — Ferrochromium -** *This standard specifies chemical composition and size range of low carbon, medium carbon, high carbon, high nitrogen and carbon free ferro chromium used in ferrous industry.*

iii. **IS 1470 : 2013 — Silicomanganese -***This standard specifies chemical composition and size range of eight grade of silico manganese with silicon content varying from 16 to 28% and Manganese content varying from 50 to 74%.*

iv. **IS 4409 : 2023 — Ferronickel -** *This standard specifies chemical composition and size range of five grades of ferro nickel with nickel content varying from 15 to 80%.*

v. **IS 1110 : 2023 — Ferrosilicon -***This standard specifies chemical composition and size range of thirteen grades of ferrosilicon with silicon content varying from 15 to 95%.*

### 2. INDIAN STANDARD FOR BILLETS , BLOOMS AND SEMI FINISHED PRODUCTS

i. **IS 14650 : 2023 — Unalloyed and alloyed steel ingot and semi-finished products for re-rolling purposes -***This standard covers the requirement of unalloyed and alloyed steel ingots and semi-finished products for rolling into different products conforming to applicable Indian Standard. The standard refers to the various product standards for chemical composition.Key tests mentioned in standard include ladle analysis for verifying chemical composition, macro examination to assess internal features, sulphur print tests for sulphur distribution, inclusion content checks to detect non-metallic inclusions and dimensional checks tests.*

ii. **IS 6529 : 1996 — Stainless steel blooms billets and slabs for forging-***This standard covers the requirements of Blooms, Billets and Slabs made of Stainless Steel to be further used for forgings. It specifies different steel designation and the chemical composition from which the Stainless Steel Blooms, Billets and Slabs could be manufactured and the test method to test the chemical composition of the steel has also been specified. The standard specifies requirements of Heat Treatment, Hardness and dimension tolerances and Corrosion Resistance.*

### 3. INDIAN STANDARDS FOR FLAT PRODUCTS

i. **IS 6911: 2017 — Stainless steel plate, sheet and strips-***The standard specifies the requirements for stainless steel plates, sheets, and strips used in various applications, including industrial, architectural, and household uses excluding utensils and kitchen appliances. It covers chemical composition, mechanical and physical properties of 34 grades of ferritic stainless steel (e.g., 409, 430)***,**

*9 grades of martensitic stainless steel (e.g., 410, 420), 77 grades of austenitic stainless steel (e.g., 304, 316, 321), and 10 grades of duplex stainless steel.*

ii. **IS 5522 :2014 — Stainless steel plate, sheet and strip for utensils -** *This standard specifies the requirements for stainless steel sheets and strips for utensils. It covers the chemical composition, mechanical properties, surface finish, and tolerances of two grades of austenitic (e.g., 304, 316) and one grade of ferritic (e.g., 430) stainless steel types stainless steel materials used in kitchenware and food-related applications.*

iii. **IS 15997 : 2012 — Low nickel austenitic stainless steel plate, sheet, and strip for utensils and kitchen appliances -** *This standard specifies the chemical composition ,mechanical and physical properties for six grades of low nickel austenitic stainless steel (N1, N2, N3, N5, N6, N7) with nickel content varying from 0.2 to 6 % and thickness from 0.20mm to 50mm , used in the manufacture of utensils and kitchen appliances.*

## 4. INDIAN STANDARDS FOR LONG PRODUCTS

i. **IS 6603: 2024 — Stainless steel semi-finished products, bars, wire rods and bright bars -***This standard specifies the chemical composition ,mechanical and physical properties for semi-finished products, hot or cold formed bars, wire rods and bright bars of 71 grades of corrosion resisting stainless steels for general purposes. It covers austenitic, ferritic, martensitic, duplex, and precipitation-hardening stainless steels*

ii. **IS 6528 : 2024 — Stainless steel wire -***This standard covers the requirement for 80 grades of austenitic, ferritic, martensitic, duplex, and precipitation-hardening stainless steel wire for general corrosion resistance, supplied in the form of round, flat, and shaped wire (such as square, hexagonal, rectangular or any other shape wire). The wire can be supplied in coils or in straightened and cut lengths. The standard defines mechanical properties such as tensile strength, elongation, bend, torsion, and wrapping tests.. Dimensional tolerances are provided for round, square, hexagonal, and flat wires, along with limits on out-of-roundness for round wires.*

iii. **IS 10631 : 1983 — Specification for stainless steel for welding electrode core wire -***This standard covers the chemical composition for thirteen grades of stainless steel in the form of billets and wire rods used for manufacturing of welding electrode core wire along with their size and tolerances.*

iv. **IS 10632 (Part 1,2,3) : 1983 — Specification for non magnetic stainless steels for electrical applications, Part 1 General requirements, Part 2 Specific requirements for binding wires, Part 3 Specific requirements for sheets, strips and plates -** *This standard covers the two grades of non-magnetic stainless steels :Grade A - lOCr13Ni13,Grade B - 04Crl8Ni12, The standard is published in three parts. Part 1 covers the general requirements and specifies grade A and grade B to be used for binding wires and sheets, strips and plates .Part 2 covers the requirements for chemical composition, mechanical , physical and magnetic properties for nonmagnetic stainless steel tinned round wires and flattened wires for binding of armatures and rotors and Part 3 covers the same requirements for nonmagnetic stainless-steel sheets, strips and plates for use in electrical machines and parts that shall not disturb a magnetic field.*

v. **IS 4454 (Part 4) : 2001 — Steel wires for mechanical springs Part 4 Stainless steel wire -***This standard covers three grades of stainless steel wire to be used in mechanical springs Austenitic stainless steel grades are included in this standard which has chromium content over 12%. The standards specify chemical composition and mechanical test such as tensile strength, wrapping test, bend test, torsion test etc. The standard covers wire diameter from 0.20 mm to 10 mm and tensile strength from 1050 to 2200 Mpa.*

vi. **IS 9294 : 2023 — Cold-rolled stainless steel strips for razor blade -***The standard specifies chemical composition, hardness, microstructure structure and carbide density requirement of one grade X66Cr13 of cold rolled stainless steel used for razor blade*

vii. **IS 11169 (Part 2) 2023- Steels for cold heading/cold extrusion applications specification: Part 2 Stainless steels -***This standard covers the chemical, mechanical and physical requirements for wrought stainless steels intended for cold heading and are delivered as wires, wire rods or bars. It applies to ferritic, martensitic and austenitic stainless steels.*

viii. **IS 18755 : 2024 — Tri-Ply (Ss-Al-Ss) material used for manufacture of utensils and kitchen appliances -***This standard covers the requirements of Tri-Ply (SS-AL-SS) material supplied in the form of sheets, strips and circles for the manufacture of utensils and kitchen appliances.Tri-Ply is made by cladding a sheet of aluminium of grade 19000/19500/31000 is laminated between stainless steel 302/304 on one side and induction compatible stainless steel 430/439 on the other side.The standard specifies tensile requirements, T peel strength, thermal adhesion test and also describes the test method for the same*

## 5. INDIAN STANDARDS ON TEST METHODS

| TEST | STANDARDS |
|---|---|
| **Chemical Composition Test** | i. ***IS 228 (Part 1)*** *– Determination of carbon (Gravimetric and volumetric methods)*<br>ii. ***IS 228 (Part 2)*** *– Determination of sulfur (Evolution method)*<br>iii. ***IS 228 (Part 3)*** *– Determination of phosphorus (Volumetric method)*<br>iv. ***IS 228 (Part 4)*** *– Determination of manganese (Volumetric method)*<br>v. ***IS 228 (Part 5)*** *– Determination of silicon (Gravimetric method)*<br>vi. ***IS 228 (Part 6)*** *– Determination of nickel (Gravimetric method)*<br>vii. ***IS 228 (Part 7)*** *– Determination of chromium (Gravimetric method)*<br>viii. ***IS 228 (Part 8)*** *– Determination of copper (Electrolytic method)*<br>ix. ***IS 228 (Part 9)*** *– Determination of aluminum (Gravimetric method)*<br>x. ***IS 228 (Part 10)*** *– Determination of tungsten (Gravimetric method)*<br>xi. ***IS 228 (Part 11)*** *– Determination of molybdenum (Gravimetric method)*<br>xii. ***IS 228 (Part 12)*** *– Determination of vanadium (Colorimetric method)*<br>xiii. ***IS 228 (Part 13)*** *– Determination of cobalt (Gravimetric method)*<br>xiv. ***IS 228 (Part 14)*** *– Determination of nitrogen (Gas-volumetric method)*<br>xv. ***IS 228 (Part 15)*** *– Determination of titanium (Colorimetric method)*<br>xvi. ***IS 228 (Part 16)*** *– Determination of boron (Curcumin method)*<br>xvii. ***IS 228 (Part 17)*** *– Determination of arsenic (Silver diethyldithiocarbamate method)*<br>xviii. ***IS 228 (Part 18)*** *– Determination of tin (Gravimetric method)*<br>xix. ***IS 228 (Part 19)*** *– Determination of lead (Volumetric and gravimetric methods)*<br>xx. ***IS 228 (Part 20)*** *– Determination of oxygen (Fusion method)*<br>xxi. ***IS 9879 : 1996 -*** *Method for emission spectrometric analysis of austenitic and ferritic stainless steels point to plane technique (Instrumental method)* |
| **Tensile Test** | i. ***IS 1608 (Part 1) : 2022/ISO 6892-1 : 2019*** *— Metallic materials — Tensile testing Part 1 Method of test at room temperature*<br>ii. ***IS 1608 (Part 2) : 2020/ISO 6892-2 : 2018*** *— Metallic Materials — Tensile Testing Part 2 Method of Test at Elevated Temperature*<br>iii. ***IS 1608 (Part 3) : 2018/ISO 6892-3 : 2015*** *— Metallic materials — Tensile testing Part 3 method of test at low temperature* |
| **Hardness Test** | i. ***IS 1500 (Part 1) : 2019 /ISO 6506-1 : 2014*** *- Metallic materials —Brinell hardness test Part 1 test method*<br>ii. ***IS 1586 (Part 1) : 2018/ISO 6508-1 : 2016*** *- Metallic materials —Rockwell hardness test Part 1 test method*<br>iii. ***IS 1501 (Part 1) : 2020/ISO 6507-1:2018*** *- Metallic materials — Vicker's hardness Test Part 1 Test method* |

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| **Bend Test** | i. ***IS 1599 : 2023/ISO 7438 : 2020*** *—Metallic materials —Bend test* |
| **Corrosion Resistance Testing in Stainless Steel** | i. ***IS 10461 (Part 1) : 1994*** *- Resistance to inter - Granular corrosion of austenitic stainless steels - Method for determination - Part 1 : corrosion test in nitric acid medium by measurement of loss in mass (Huey Test)*<br>ii. ***IS 10461 (Part 2): 1994*** *Resistance to intergranular corrosion of austenitic stainless steels - Method for determination: Part 2 corrosion test in a sulphuric acid/copper sulphate medium in the presence of copper turnings (Monypenny Strauss Test) in the presence of copper turnings (Monypenny Strauss Test)* |
| **Erichsen Cupping Test** | i. ***IS 10175 : 2018/ ISO 20482 : 2013*** *Metallic materials — Sheet and strip — Erichsen cupping test.* |
| **Impact Test** | i. ***IS 1757 (Part 1) : 2020/ISO 148-1 : 2016*** *— Metallic materials — Charpy pendulum impact test Part 1 Test method* |

## Digital Platforms of BIS

**BIS website** : www.bis.gov.in

**BIS care App :** https://play.google.com/store/apps/details?id=com.bis.bisapp&hl=en_IN

**Facebook :** https://www.facebook.com/IndianStandards/

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