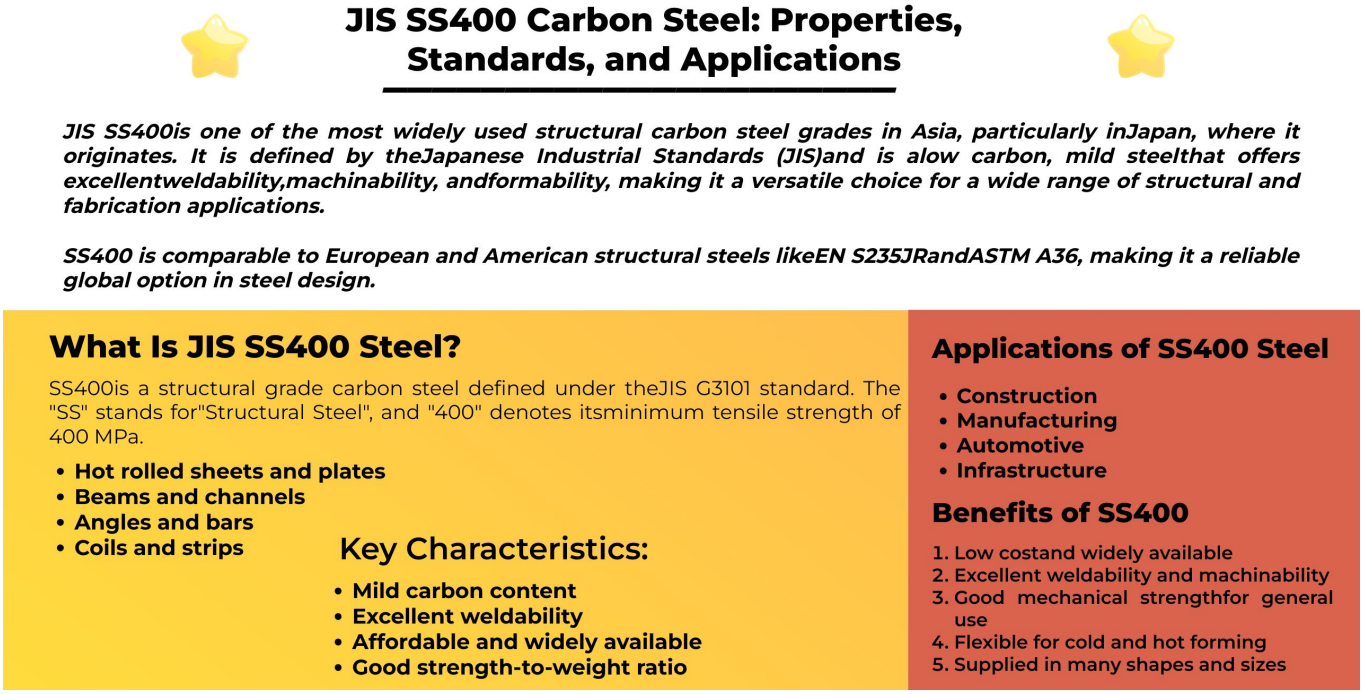
JIS SS400 Carbon Steel, Properties, Standards, and Applications

Original link：https://gengfeisteel.com/knowledge/jis-ss400-carbon-steel/



1. Introduction

JIS SS400 is one of the most widely used structural carbon steel grades in Asia, particularly in **Japan**, where it originates. It is defined by the **Japanese Industrial Standards (JIS)** and is a **low carbon, mild steel** that offers excellent **weldability**, **machinability**, and **formability**, making it a versatile choice for a wide range of structural and fabrication applications.

SS400 is comparable to European and American structural steels like **EN S235JR** and **ASTM A36**, making it a reliable global option in steel design.

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2. What Is JIS SS400 Steel?

SS400 is a structural grade carbon steel defined under the **JIS G3101 standard**. The "SS" stands for **"Structural Steel"**, and "400" denotes its **minimum tensile strength of 400 MPa**.

It is typically supplied as:

- Hot rolled sheets and plates
- Beams and channels
- Angles and bars
- Coils and strips

Key Characteristics:

- Mild carbon content
- Excellent weldability
- Affordable and widely available
- Good strength-to-weight ratio

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3. SS400 and the JIS G3101 Standard

JIS G3101:

This is the Japanese Industrial Standard that specifies:

- **Hot rolled steel for general structural use**
- Covers **SS330**, **SS400**, **SS490**, and **SS540** grades
- Defines chemical and mechanical requirements, dimensional tolerances, and testing methods

SS400 is the most commonly used grade in this family.

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4. Chemical Composition

Below is the typical **chemical composition** of SS400 according to JIS G3101:

Element	Maximum Content (%)
Carbon (C)	≤ 0.25
Manganese (Mn)	≤ 1.40
Phosphorus (P)	≤ 0.050
Sulfur (S)	≤ 0.050

Note: Exact composition may vary depending on thickness and product form (e.g., bar vs. plate).

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5. Mechanical Properties

Property	Value
Yield Strength (MPa)	≥ 245 (thickness ≤ 16mm)
Tensile Strength (MPa)	400 – 510
Elongation (%)	≥ 21 (for plates ≤ 25mm)
Hardness (Brinell)	~120 – 160 HB
Modulus of Elasticity	~200 GPa

The mechanical strength of SS400 makes it suitable for load-bearing structures in non-critical environments.

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6. Equivalent Grades Comparison

Standard	Grade	Remarks
JIS G3101	SS400	Japanese Standard
ASTM	A36	Similar mechanical properties
EN 10025	S235JR	European equivalent
GB/T 700	Q235B	Chinese equivalent
ISO	Fe360B	International approximation

Always confirm actual mechanical and chemical properties before substitution.

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7. Sub-Grades and Designations

SS400 may sometimes be designated with additional symbols for product form:

Designation	Meaning
SS400B	Rolled steel for general structure
SS400C	Steel plates and strips
SS400D	Steel bars
SS400E	Enhanced weldability

Check mill certifications to confirm exact grade and sub-grade used.

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8. Forms and Dimensions

SS400 is available in various **product forms**:

Product Form	Typical Dimensions
Hot Rolled Coils	1.2 mm – 25 mm thickness
Steel Plates	Up to 2000 mm width
I-Beams and Channels	Standard lengths (6–12 m)
Angles	Equal/unequal angles, various sizes
Flat Bars	10 × 3 mm to 300 × 25 mm

Custom dimensions are also possible through cutting and fabrication.

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9. Manufacturing Process

SS400 steel is typically produced using the **Basic Oxygen Furnace (BOF)** or **Electric Arc Furnace (EAF)** methods, followed by:

- Hot rolling into coils, plates, or shapes
- Cooling in open air
- Surface treatments (optional) like pickling or oiling

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10. Welding, Machinability, and Formability

Welding

- Excellent weldability
- Suitable for MIG, TIG, SMAW, and FCAW
- No preheating required under standard conditions

Machinability

- Easy to cut, drill, and mill
- Works well with both CNC and manual equipment

Formability

- Can be bent, punched, and shaped
- Ideal for press-brake forming and roll forming

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11. Surface Finishes

Finish Type	Description
Mill Finish	As-rolled surface, untreated
Pickled & Oiled (P&O)	Cleaned of oxides and rust, coated with oil
Galvanized	Zinc coating for corrosion resistance
Painted or Primed	For enhanced weather resistance

Surface finish selection depends on final use and environment.

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12. SS400 vs. Other Mild Steels

Property	SS400	ASTM A36	S275JR
Yield Strength	≥ 245 MPa	≥ 250 MPa	≥ 275 MPa
Weldability	Excellent	Excellent	Good
Availability	Widely used in Asia	North America	Europe
Cost	Low	Low	Medium

13. Applications of SS400 Steel

Construction

- Steel frames and columns
- Prefabricated buildings
- Roofing support and scaffolding

Manufacturing

- Equipment frames and machine bases
- Sheet metal components
- Storage racks and platforms

Automotive

- Trailer chassis and parts
- Industrial vehicles

Infrastructure

- Bridges and guardrails
- Towers and support structures

Others

- Agricultural equipment
- Containers and enclosures
- Shipbuilding (non-critical components)

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14. Benefits of SS400

✅ **Low cost** and widely available
✅ **Excellent weldability and machinability**
✅ **Good mechanical strength** for general use
✅ **Flexible for cold and hot forming**
✅ **Supplied in many shapes and sizes**

15. Limitations and Considerations

⚠️ **Not suitable for highly corrosive environments** without coating
⚠️ **No notch toughness guarantees**
⚠️ **Not ideal for pressure vessels or critical safety parts**
⚠️ **Yield strength lower than high-strength low-alloy (HSLA) steels**

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16. Frequently Asked Questions (FAQs)

Q1: Is SS400 magnetic?

Yes. SS400 is a **ferrous material** and shows magnetic properties.

Q2: Can SS400 be used outdoors?

Yes, but it must be **galvanized or painted** to prevent rust.

Q3: What welding method is best for SS400?

Any standard welding technique (MIG, TIG, SMAW) works well without preheating.

Q4: How does SS400 compare to Q235?

Both are very similar in composition and performance. Q235 is the **Chinese counterpart**.

Q5: Does SS400 meet international standards?

Yes, it's widely accepted in **Asian and global markets**, but always cross-check with **ASTM or EN equivalents** if needed.

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17. Conclusion

JIS SS400 steel is a **foundational material** in the structural steel industry, particularly in **Asia and global export markets**. Its **low cost, good strength, weldability, and availability in various forms** make it a go-to choice for **construction, manufacturing, and infrastructure** applications.

Whether you are sourcing hot-rolled coils for sheet metal fabrication, or I-beams for building construction, **SS400 offers dependable performance** and **easy workability**—all while keeping costs in check.