How to choose European standard low alloy high strength steel S355JR S355J0 S355J2？

The European standard low-alloy high-strength steel plates **S355JR**, **S355J0**, and **S355J2** are classified under **EN 10025-2**, with their key differences lying in **impact toughness grades** (low-temperature impact resistance) and **minimum service temperatures**. Below is a detailed comparison:

Here is a detailed **chemical composition analysis** of the European standard low-alloy high-strength structural steels **S355JR, S355J0, and S355J2** (based on **EN 10025-2**) in table format:

Chemical Composition (EN 10025-2) – % by Weight (Max, Unless Specified)

Element	S355JR	S355J0	S355J2	Remarks
C (Carbon)	≤0.22	≤0.20	≤0.20	Lower C improves weldability & toughness.
Si (Silicon)	≤0.55	≤0.55	≤0.55	Deoxidizer; excess may reduce ductility.
Mn (Manganese)	≤1.60	≤1.60	≤1.60	Enhances strength & hardenability.
P (Phosphorus)	≤0.035	≤0.030	≤0.025	Strict limits for **J0/J2** to reduce brittleness.
S (Sulfur)	≤0.035	≤0.030	≤0.025	Lower S improves impact toughness.
N (Nitrogen)	≤0.012	≤0.012	≤0.012	Controlled to prevent aging effects.
Al (Aluminum)	-	≥0.020*	≥0.020*	*Min. for grain refinement in **J0/J2**.
CEV (Carbon Equivalent)	≤0.40	≤0.40	≤0.40	**CEV = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15** (indicates weldability).

1. Impact Toughness & Temperature Requirements

Grade	Impact Test Temperature	Minimum Avg. Impact Energy (Longitudinal)	Suitable Service Temperature
S355JR	+20°C	≥27 Joules (J)	Room temperature (no low-temp requirement)
S355J0	0°C	≥27 J	Low-temperature down to **0°C**
S355J2	-20°C	≥27 J	Low-temperature down to **-20°C**

S355J2: Best low-temperature performance (e.g., Arctic applications, offshore structures).

S355J0: Moderate low-temperature resistance (e.g., cold winters near 0°C).

S355JR: No guaranteed toughness below +20°C (general structural use).

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2. Additional Key Differences

Deoxidation Process:

JR: May be rimmed steel (though often replaced by killed steel in modern production).

J0/J2: Must be **killed steel** (Al-treated or fine-grained) for enhanced low-temperature ductility.

Chemical Composition:

J0 and J2 have stricter controls on **P (phosphorus)** and **S (sulfur)** to reduce brittleness.

Typical Applications:

S355JR: Buildings, machinery (non-cold environments).

S355J0: Bridges, structures in regions with occasional sub-zero temps.

S355J2: Offshore platforms, wind towers, or infrastructure in **-20°C** climates.

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3. Nomenclature & Standards

S355: Minimum yield strength of **355 MPa**.

J: Indicates **longitudinal Charpy impact testing**.

R/0/2: Impact test temperatures (**+20°C/0°C/-20°C**).

Standards: EN 10025-2 (superseded by EN 10025:2004, but grade definitions remain).

Selection Guide

For **room temperature**: **S355JR** (cost-effective).

For **low-temperature** service: Match **J0** (0°C) or **J2** (-20°C) to avoid brittle fracture.

For **harsher conditions** (e.g., -40°C),

consider **S355K2** or **S355NL** (normalized steel).

Note: Always verify additional requirements (e.g., **Z-direction properties**, weldability) in project specifications.

Production Capability of S355JR/S355J0/S355J2 Steel Plates in Chinese Mills

Chinese steel mills (e.g., Baowu, Ansteel, Shagang) can produce **S355JR, S355J0, and S355J2** plates in a wide range of dimensions, complying with **EN 10025-2**. The exact capabilities depend on the mill's equipment (e.g., rolling mills, heat treatment lines). Below are typical production ranges for thickness, width, and length.

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1. Thickness Range (mm)

Production Method	Typical Thickness	Remarks
Hot Rolling (HR)	1.5 ~ 400	Most mills produce **6–120mm** routinely; plates >150mm require special orders.
Normalized Rolling (N)	5 ~ 120	Improves properties (e.g., low-temperature toughness for **S355J2**).
TMCP (Thermo-Mechanical Control Process)	5 ~ 80	Some mills use TMCP as an alternative to normalization.

Notes:

Ultra-thick plates (>200mm) require heavy-duty mills (e.g., Baowu's 5m mill, Ansteel's 5500mm mill).

Thin plates (<6mm) may be supplied as coils, then cut-to-size.

2. Width Range (mm)

Mill Type	Typical Width	Remarks
Standard Hot Rolling	1500 ~ 2500	Common in small/medium mills.
Wide & Heavy Plate Mills	2500 ~ 5000	Baowu's 5m mill supports **up to 5350mm**.
Extra-Wide Plates	Custom (>5000)	Requires special processing.

3. Length Range (mm)

Production Method	Typical Length	Remarks
Single Plate Rolling	3000 ~ 18000	Most mills supply **6–12m** standard lengths.
Extra-Long Plates	≤ 26000	Dependent on mill capacity (e.g., Shagang, NISCO).
Coil (Cut-to-Length)	Custom	Max. coil weight ~30 tons.

4. Production Capability of Major Chinese Mills

Mill	Max. Thickness (mm)	Max. Width (mm)	Max. Length (mm)	Remarks
Baowu (Baosteel)	400	5350	26000	World-class 5m mill.
Ansteel	400	4300	25000	5500mm mill.
Shagang	120	3500	18000	Focuses on medium-thick plates.
NISCO (Nanjing Steel)	150	3500	20000	Strong in TMCP technology.

5. Special Requirements & Notes

Oversized Plates: Thickness >400mm or width >5000mm requires custom orders (may involve imports).

Tolerances: EN 10029 specifies tighter tolerances than Chinese standards (e.g., ±0.3mm for 20mm plates).

Delivery Condition: Options include As-Rolled (AR), Normalized (N), or TMCP, affecting dimensional accuracy.

Summary of Typical Chinese Mill Capabilities

Thickness: Standard **6–120mm**, ultra-thick up to **400mm** (subject to availability).

Width: Common **1500–3500mm**, extra-wide **≤5350mm**.

Length: Standard **6–18m**, extra-long **≤26m**.

Recommendation: Confirm exact requirements (especially for **thick/wide plates**) with mills in advance, as lead times may vary.