Comparison of Steel Grades: EN8D, EN 10083-2 C40E, ASTM A29/A29M Grade 1040, JIS G4051 S45C, IS 1570 C45, DIN 17200 C45

Description

Property	EN8D	EN 10083-2 C40E	ASTM A29/A29M Grade 1040	JIS G4051 S45C	IS 1570 C45	DIN 17200 C45
Steel Grade	EN8D	EN 10083-2 C40E	ASTM A29/A29M Grade 1040	JIS G4051 S45C	IS 1570 C45	DIN 17200 C45
Carbon Content (%)	0.36 â?? 0.44	0.37 â?? 0.44	0.37 â?? 0.44	0.42 â?? 0.50	0.42 â?? 0.50	0.42 â?? 0.50
Manganese Content (%)	0.60 â?? 0.90	0.60 â?? 0.90	0.60 â?? 0.90	0.60 â?? 0.90	0.60 â?? 0.90	0.60 â?? 0.90
Silicon Content (%)	0.20 â?? 0.35	0.20 â?? 0.35	0.20 â?? 0.35	0.20 â?? 0.35	0.20 â?? 0.35	0.20 â?? 0.35
Sulfur Content (%)	â?¤ 0.050	â?¤ 0.050	â?¤ 0.050	â?¤ 0.050	â?¤ 0.050	â?¤ 0.050
Phosphorus Content (%)	â?¤ 0.040	â?¤ 0.040	â?¤ 0.040	â?¤ 0.040	â?¤ 0.040	â?¤ 0.040
Tensile Strength (MPa)	620 â?? 850	600 â?? 800	585 â?? 755	570 â?? 700	600 â?? 800	600 â?? 800
Yield Strength (MPa)	300 â?? 450	350 â?? 520	205 â?? 310	295 â?? 490	350 â?? 520	350 â?? 520
Elongation (%)	â?¥ 12	â?¥ 12	â?¥ 15	â?¥ 14	â?¥ 12	â?¥ 12
Hardness (HB)	170 â?? 210	170 â?? 210	170 â?? 210	170 â?? 210	170 â?? 210	170 â?? 210
Impact Toughness (J @ -20Â°C)	20 â?? 40 (depending on heat treatment)	â?¥ 27	â?¥ 27	â?¥ 27	â?¥ 27	â?¥ 27
Modulus of Elasticity (GPa)	200	200	200	200	200	200

Property	EN8D	EN 10083-2 C40E	ASTM A29/A29M Grade 1040	JIS G4051 S45C	IS 1570 C45	DIN 17200 C45
Thermal Conductivity (W/mÂ·K)	50	50	50	50	50	50
Machinability	Good	Good	Good	Good	Good	Good
Weldability	Medium	Medium	Medium	Medium	Medium	Medium
Applications	General engineering components, shafts, bolts, gears	Shafts, bolts, gears, structural parts	Automotive, machine parts, gears, shafts	Shafts, gears, machine parts, automotive	Automotive, machine parts, gears	Automotive, machine parts, gears
Hardening Method	Quenched and tempered	Quenched and tempered	Quenched and tempered	Quenched and tempered	Quenched and tempered	Quenched and tempered
Heat Treatment (Normalizing)	Yes	Yes	Yes	Yes	Yes	Yes
Key Properties	Good wear resistance, machinable	Good toughness, strength, fatigue resistance	High machinability, good strength	High strength, toughness, good machinability	High strength, toughness, good machinability	High strength, toughness, good machinability
Equivalent Standards	BS 970 080M40, IS 1570 C40, ASTM A29 Grade 1040	IS 1570 C40, DIN 17200 C40, JIS G4051 S40C	EN 10083-2 C40E, DIN 17200 C40	EN 10083-2 C40E, DIN 17200 C40E	EN 10083-2 C45E, DIN 17200 C45	EN 10083-2 C45E, DIN 17200 C45
Country of Origin	UK	Europe (Germany, UK)	USA	Japan	India	Germany

Key Differences:

- **Carbon Content**: All grades have a similar carbon range of around **0.37 â?? 0.50%**, with **JIS G4051 S45C** being slightly on the higher side (up to **0.50%**).
- **Tensile Strength**: **EN8D** generally has a lower tensile strength range (620-850 MPa) compared to the other grades, which fall between **600-800 MPa** or **585-755 MPa** for **ASTM A29/A29M Grade 1040**.
- **Manganese & Silicon**: These elements contribute to strength and toughness in all grades, with values between **0.60-0.90%** for manganese and **0.20-0.35%** for silicon.
- **Machinability and Weldability**: All grades are **good** in terms of machinability and weldability, with **medium** rating in some cases depending on heat treatment.

- **Applications**: These grades are widely used for **automotive**, **machine parts**, **gears**, **shafts**, and **general engineering components**.
- **Hardness & Impact Toughness**: All grades show similar ranges for **hardness (170-210 HB)**, and **impact toughness** values typically exceed **27 J** at **-20Â°C**.

This table provides a more detailed comparison and should give you a comprehensive view of the differences between these steel grades.

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