

LIMITING VALUES FOR STEEL GRADES WITH [NORMAL] HARDNESS REQUIREMENTS (H GRADES)

(EN 10083-2:1996)

Steel Designation	Symbol	Limit	Distance, in mm, from Quenched End, in HRC																				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
C45E		max 58	57	55	53	49	41	34	31	28	27	26	25	24	23	22	21	20	19	18	17	16	
C45E	+H	min 48	49	40	33	24	22	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
C45E		max 60	60	59	57	53	47	39	34	31	30	29	28	27	26	25	24	23	22	21	20	19	
C45E	+H	min 51	45	35	27	15	14	23	22	21	20	—	—	—	—	—	—	—	—	—	—	—	
C45E		max 62	61	60	57	51	44	37	34	33	32	31	30	29	28	27	26	25	24	23	22	21	
C45E	+H	min 55	54	37	30	18	17	26	25	24	23	22	21	20	—	—	—	—	—	—	—	—	
C50E		max 63	62	61	60	58	55	50	49	36	35	34	33	32	31	29	28	—	—	—	—	—	
C50E	+H	min 56	53	44	34	31	30	30	29	28	27	26	25	24	23	20	—	—	—	—	—	—	—
C55E		max 65	64	63	62	60	57	52	45	37	36	35	34	33	32	30	29	28	27	26	25	24	23
C55E	+H	min 58	55	47	37	33	32	31	30	29	28	27	26	25	24	22	20	—	—	—	—	—	—
C60E		max 67	66	65	63	62	59	54	47	39	37	36	35	34	33	31	30	—	—	—	—	—	—
C60E	+H	min 60	57	50	39	35	33	32	31	30	29	28	27	26	25	23	21	—	—	—	—	—	—

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C45 vs C45E vs C45S vs C45N ?? Understanding the Differences in EN 10083-2 Medium Carbon Steels

Descrição

When selecting a medium carbon steel for manufacturing **shafts, axles, spindles, gears, or pins**, **C45** and its variants ?? **C45E**, **C45S**, and **C45N** ?? often come into consideration. While they may appear similar, there are key differences in composition, cleanliness, and intended applications.

In this article, **Steelmet Industries** offers a clear, professional comparison of these **EN 10083-2** grades so that design engineers, buyers, and manufacturers can make informed choices.

• What is C45 Steel?

C45 is a medium carbon, non-alloy steel known for its **good tensile strength, toughness, and wear resistance**. It is widely used for components that need to withstand **moderate stress and impact**, and can be hardened via heat treatment.

But as demand for better machinability, surface finish, and **cleaner steel** increased, variants like **C45E**, **C45S**, and **C45N** were introduced to meet specific needs.

Chemical Composition Comparison

Property	C45 (General)	C45E	C45S	C45N
Carbon (C)	0.42??0.50%	0.42??0.50%	0.42??0.50%	0.42??0.50%
Manganese (Mn)	0.50??0.80%	0.50??0.80%	0.50??0.80%	0.50??0.80%
Phosphorus (P) max	0.045%	0.035%	0.035%	0.035%
Sulphur (S) max	0.045%	0.035%	0.035%	0.035%
Special Control	??	Low P & S	Machinability improved	Normalized condition

Δ??? Key Differences Explained

- **C45** → Standard grade without any special requirements. Suitable for general use when price is a key factor.
- **C45E** → E denotes **special cleanliness**, meaning lower **phosphorus and sulphur** content for better mechanical properties and weldability.
- **C45S** → S denotes **improved machinability**, achieved by controlled addition of sulphur for **faster turning and machining** operations.

- **C45N** → N indicates delivery in a **normalized condition** (controlled cooling), improving toughness and structural uniformity.

Δ??i, • Applications of C45 and Its Variants

Application Type	Suitable Grade
General-purpose shafts	C45
Precision-machined parts	C45S
Welded structures	C45E
Impact-resistant components	C45N

These steels are used across **automotive, agricultural, construction, and machinery manufacturing** sectors.

Δ??§ Machining & Heat Treatment Summary

- **Hardening Temperature:** ~820°C–860°C
- **Tempering Range:** 550°C–700°C
- **Condition of Supply:** Black bar, peeled, ground, or bright bar
- **Machinability:** Best in C45S > C45E > C45

- **Weldability:** Better in C45E due to controlled impurities

δ?• Availability from Steelmet Industries

Steelmet Industries offers **C45 family grades** in:

- Rounds, Squares, Flats, Hexagons, and Custom Profiles
- Hot Rolled, Peeled, Ground, and Bright Finishes
- Fully compliant with EN 10083-2, with optional vacuum degassing (VD route) for critical applications

Customers across industries value our traceability, dimensional consistency, and support for both prototype and volume orders.

δ??? Questions about material selection or finish?

Get expert guidance for your component design or sourcing needs.

δ??± WhatsApp us at +91 712 2728071

δ??¬ Or send us a message through our [contact form](#).

We're here to support your project from concept to production.

δ?§ Frequently Asked Questions (FAQ)

Q1: Can I use C45 instead of C45E or C45S?

A: For non-critical or low-cost applications, yes. But for precision machining or welding, C45E or C45S are more suitable.

Q2: Is there any price difference between these grades?

A: Yes, C45 is typically the most economical, while C45E and C45S may have a slight premium due to added processing.

Q3: Do you supply bright bars in C45E or C45S?

A: Yes. At Steelmet Industries, both grades are regularly supplied as **bright drawn or ground bars** with tight tolerances.

Q4: Are these grades available with vacuum degassing (VD route)?

A: Yes, we offer **VD route options** on request for improved quality and reliability, especially for forged or machined components.

ð??? Summary

C45 and its variants – **C45E, C45S, and C45N** – may appear interchangeable at first glance, but each has its advantages. Selecting the right one can improve your **machining efficiency, weld quality**, or **overall performance**.

Design teams, purchase departments, and OEMs looking for **dependable, quality-controlled steel** will benefit from choosing the right grade – and the right partner.

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