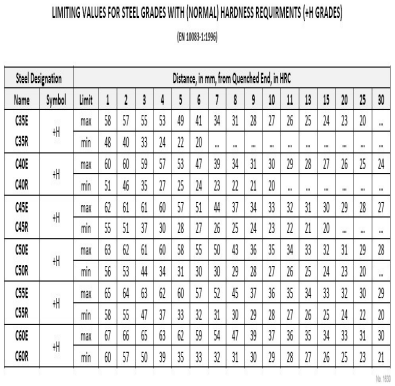

LIMITING VALUES FOR STEEL GRADES WITH (NORMAL) HARDNESS REQUIRMENTS (+H GRADES)

(EN 10083-1:1996)

Steel Designation		Distance, in mm, from Quenched End, in HRC															
Name	Symbol	Limit	1	2	3	4	5	6	7	8	9	10	11	13	15	20	25	30
C35E	+H	max	58	57	55	53	49	41	34	31	28	27	26	25	24	23	20	..
C35R		min	48	40	33	24	22	20	..	..	..	..	..	..	..	..	..	..
C40E	+H	max	60	60	59	57	53	47	39	34	31	30	29	28	27	26	25	24
C40R		min	51	46	35	27	25	24	23	22	21	20	..	..	..	..	..	..
C45E	+H	max	62	61	61	60	57	51	44	37	34	33	32	31	30	29	28	27
C45R		min	55	51	37	30	28	27	26	25	24	23	22	21	20	..	..	..
C50E	+H	max	63	62	61	60	58	55	50	43	36	35	34	33	32	31	29	28
C50R		min	56	53	44	34	31	30	30	29	28	27	26	25	24	23	20	..
C55E	+H	max	65	64	63	62	60	57	52	45	37	36	35	34	33	32	30	29
C55R		min	58	55	47	37	33	32	31	30	29	28	27	26	25	24	22	20
C60E	+H	max	67	66	65	63	62	59	54	47	39	37	36	35	34	33	31	30
C60R		min	60	57	50	39	35	33	32	31	30	29	28	27	26	25	23	21

No. 1030

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

DescriÃ§Ã£o

When selecting a medium carbon steel for manufacturing **shafts, axles, spindles, gears, or pins**, **C45** and its variants â?? **C45E**, **C45S**, and **C45N** â?? 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.

ð??• 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.

ð?§ª Chemical Composition Comparison

Property	C45 (General)	C45E	C45S	C45N
Carbon (C)	0.42â??0.50%	0.42â??0.50%	0.42â??0.50%	0.42â??0.50%
Manganese (Mn)	0.50â??0.80%	0.50â??0.80%	0.50â??0.80%	0.50â??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	â??	Low P & S	Machinability improved	Normalized condition

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ð??? Key Differences Explained

- **C45** â?? Standard grade without any special requirements. Suitable for general use when price is a key factor.
- **C45E** â?? â??Eâ?• denotes **special cleanliness**, meaning lower **phosphorus and sulphur** content for better mechanical properties and weldability.
- **C45S** â?? â??Sâ?• denotes **improved machinability**, achieved by controlled addition of sulphur for **faster turning and machining** operations.
- **C45N** â?? â??Nâ?• indicates delivery in a **normalized condition** (controlled cooling), improving **toughness and structural uniformity**.

â??ï¸• 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.

ð??§ Machining & Heat Treatment Summary

- **Hardening Temperature**: ~820â??860Â°C
- **Tempering Range**: 550â??700Â°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

ð?• 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**.

ð??? Questions about material selection or finish?

Get expert guidance for your component design or sourcing needs.
ð??± WhatsApp us at +91 712 2728071
ð??¬ Or send us a message through our contact form.

Weâ??re here to support your project â?? from concept to production.

ð?§ 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 â?? **C45E**, **C45S**, and **C45N** â?? 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 â?? and the right partner.

Categoria

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