16MnCr5 vs 18MnCr5 vs 20MnCr5 â?? Complete Case Hardening Steel Grade Comparison as per EN 10084

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If you are selecting steel for gears, shafts, or automotive components, youâ??ve likely come across **16MnCr5**, **18MnCr5**, and **20MnCr5** â?? the most popular **case hardening steel grades** standardized under **EN 10084**. But what exactly sets them apart?

In this post, Steelmet Industries breaks down the **differences, applications, compositions, and machinability** of these grades to help buyers and manufacturers choose the right material.

ð??• What are 16MnCr5, 18MnCr5, and 20MnCr5?

All three are **low-alloy, case-hardening (carburizing) steels** designed for parts that need a **tough core with a hard, wear-resistant surface**.

They primarily differ in their **carbon and manganese contents**, which affect **hardenability, case depth, and mechanical strength**.

ð??? Chemical Composition Comparison (as per EN 10084)

Grade	C (%)	Mn (%)	Cr (%)	P max (%)	S max (%)
16MnCr5	0.14â??0.19	1.00â??1.30	0.80â??1.10	0.025	0.035
18MnCr5	0.15â??0.20	1.10â??1.40	0.90â??1.20	0.025	0.035
20MnCr5	0.17â??0.22	1.10â??1.40	1.00â??1.30	0.025	0.035

Observation:
As we move from 16MnCr5 to 20MnCr5:

- Carbon content increases â?? deeper case hardening
- Manganese and chromium slightly increase â?? better hardenability and wear resistance

â??ï¸• Mechanical Properties (After Case Hardening)

Property	16MnCr5	18MnCr5	20MnCr5
Case Hardness (HRC)	58â??62	58â??63	60â??64
Core Tensile Strength	~900 MPa	~950 MPa	~1000 MPa
Case Depth	0.8â??1.2 mm	0.9â??1.3 mm	1.0â??1.4 mm

ð?§° Applications

Grade	Typical Uses
16MnCr5	Small gears, camshafts, transmission components, crankshafts
18MnCr5	Gearboxes, valve parts, pinions, moderately stressed transmission parts
20MnCr5	Heavy-duty gears, large shafts, automotive gear sets, highly stressed precision components

ð?§ª Machinability & Heat Treatment

- **Machinability:** All three grades are machine-friendly in the annealed condition.
- **Carburizing Range:** 880â??950Â°C
- **Hardening:** 800â??850Â°C followed by oil or water quenching
- **Tempering:** 150â??200Â°C (for stress relief)

ð??? Why Choose Steelmet Industries?

At **Steelmet Industries**, we supply **case hardening steels** like 16MnCr5, 18MnCr5, and 20MnCr5 in:

- **Rounds, Squares, Flats, Hexagons**
- **Custom profiles like D-bars, Half-rounds, Tapered flats**
- **Hot Rolled, Peeled, and Bright Bar Finishes**

â? **Full Traceability**
â? **Vacuum Degassed (VD Route) Option**
â? **IS, EN, DIN, AISI, and SAE Equivalents** available

ð??? For inquiries: Visit www.steelmet.in or contact us today.

â•? Frequently Asked Questions (FAQ)

Q1: Can I replace 16MnCr5 with 20MnCr5?
A: In most cases, yes â?? especially if you need better core strength and deeper case hardening. But always consult with your metallurgist or supplier.

Q2: Are these grades weldable?
A: They have limited weldability due to high carbon. Pre-heating and post-weld heat treatment are usually required.

Q3: Do these grades support induction hardening?
A: Yes, all three are suitable for both carburizing and induction hardening processes.

Q4: Is VD Route important for these grades?
A: Absolutely. Vacuum degassed material ensures **low hydrogen and gas content**, preventing failures during heat treatment.

â? Conclusion

Choosing between **16MnCr5, 18MnCr5, and 20MnCr5** depends on the required **case depth, wear resistance, and core strength** of the component. While all three grades meet the EN 10084 standard for case hardening steels, their slight variations in composition can significantly impact performance in service.

For example, **20MnCr5** offers deeper case hardening and higher tensile strength, making it ideal for **heavy-duty gears and shafts**, while **16MnCr5** remains a cost-effective choice for **moderately stressed automotive parts**.

These steels are widely available in **rounds, squares, flats, hexagons, and special profiles** through select suppliers with the capability to offer **tight dimensional tolerances**, **VD route options**, and **full traceability** â?? essential for critical components in transmission systems and precision machinery.

Manufacturers and OEMs looking to optimize performance while maintaining consistency can benefit from sourcing these grades from **reliable producers** who not only adhere to international standards but also offer customization and documentation support.

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