



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

If you are selecting steel for gears, shafts, or automotive components, you’ve likely come across **16MnCr5**, **18MnCr5**, and **20MnCr5** – 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.

• What are  $^{16}\text{MnCr5}$ ,  $^{18}\text{MnCr5}$ , and  $^{20}\text{MnCr5}$ ?

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**.

### Chemical Composition Comparison (as per EN 10084)

Grade	C (%)	Mn (%)	Cr (%)	P max (%)	S max (%)
16MnCr5	0.14	1.00	1.30	0.025	0.035
18MnCr5	0.15	1.10	1.40	0.025	0.035
20MnCr5	0.17	1.10	1.40	0.025	0.035

**Observation:**

As we move from 16MnCr5 to 20MnCr5:

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

## • Mechanical Properties (After Case Hardening)

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

## • 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

## • Machinability & Heat Treatment

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

## • 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

• Full Traceability

• Vacuum Degassed (VD Route) Option

• IS, EN, DIN, AISI, and SAE Equivalents available

For inquiries: Visit [www.steelmet.in](http://www.steelmet.in) or contact us today.

## • Frequently Asked Questions (FAQ)

**Q1: Can I replace 16MnCr5 with 20MnCr5?**

A: In most cases, yes 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.

## • 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** 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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1. 16MnCr5 vs 20MnCr5
2. 18MnCr5
3. carburizing steel grades
4. case hardening
5. EN 10084
6. EN standard steel grades
7. engineering steel
8. low alloy steel
9. Machinable Steel
10. steel grades comparison
11. Steelmeter Industries
12. automotive steel
13. bright steel bars
14. vd route steel

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