



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

### Description

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 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**.

## Chemical Composition Comparison (as per EN 10084)

| Grade          | C (%)      | Mn (%)     | Cr (%)     | P max (%) | S max (%) |
|----------------|------------|------------|------------|-----------|-----------|
| <b>16MnCr5</b> | 0.14??0.19 | 1.00??1.30 | 0.80??1.10 | 0.025     | 0.035     |
| <b>18MnCr5</b> | 0.15??0.20 | 1.10??1.40 | 0.90??1.20 | 0.025     | 0.035     |
| <b>20MnCr5</b> | 0.17??0.22 | 1.10??1.40 | 1.00??1.30 | 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 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.

## • 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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