



## 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.

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## 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.

