

20MnCr5 / 1.7147

Case-Hardening Steel · EN 10084

1.7147

Low-carbon case-hardening steel

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1. OVERVIEW

20MnCr5 (DIN material number 1.7147) is a low-carbon chromium-manganese case-hardening steel standardised under EN 10084. After carburizing and quenching it develops a hard, wear-resistant surface layer (58–62 HRC) while retaining a tough, impact-resistant core. Its good hardenability, fine grain structure and consistent mechanical properties make it one of the most widely specified case-hardening grades for high-load gear and transmission components across the wind, mining, cement, oil-and-gas, and heavy-transport industries.

2. EQUIVALENT GRADES

Standard	Grade / Designation	Notes
EN / DIN	20MnCr5 / 1.7147	Primary designation on this datasheet
AISI / SAE	5120	Nearest North-American equivalent
DIN (old)	20CrMn5	Legacy DIN naming
JIS	SMnC420	Japanese Industrial Standard equivalent
GB (China)	20CrMn	Chinese national standard approximate

3. CHEMICAL COMPOSITION (EN 10084, heat analysis, % by mass)

Element	Symbol	Min %	Max %	Typical %
Carbon	C	0.17	0.22	0.19
Silicon	Si	—	0.40	0.25
Manganese	Mn	1.10	1.40	1.25
Phosphorus	P	—	0.025	≤ 0.020
Sulfur	S	—	0.035	≤ 0.025
Chromium	Cr	1.00	1.30	1.15

Values shown are for guidance only. Final chemistry is certified on the mill test certificate (MTC 3.1/3.2) for each heat.

4. MECHANICAL PROPERTIES AFTER HEAT TREATMENT

Section Size (mm)	Tensile Strength (MPa)	Yield Strength (MPa)	Elongation A (%)	Reduction of Area Z (%)	Hardness (HB)
≤ 11	1230 – 1570	≥ 930	≥ 17.5	≥ 30	363 – 438
≤ 30	930 – 1230	≥ 690	≥ 8	≥ 20	278 – 363
≤ 63	780 – 1080	≥ 540	≥ 9	≥ 25	232 – 327

Properties depend on section size, heat treatment route and test position. Values serve as reference only.

5. HEAT TREATMENT SPECIFICATIONS

Process	Temperature Range	Cooling Medium	Purpose
Soft Annealing	650 – 700 °C	Controlled furnace cool	Improve machinability
Normalising	850 – 880 °C	Air cool	Grain refinement, stress relief
Carburizing	900 – 950 °C	Water / oil / air / salt bath / cooling box	Case depth build-up
Core Hardening	850 – 880 °C	Water / oil / air / salt bath	Core strength
Case Hardening	810 – 840 °C	Water / oil / air / salt bath	Surface hardness ≥ 58 HRC
Tempering	150 – 200 °C	Air	Stress relief, toughness tuning
Hot Forging	1100 – 850 °C	—	Open die or closed die forging
Hot Rolling	Start ≤ 1220 °C Finish > 900 °C	—	Ring rolling

6. TYPICAL HARDNESS AFTER CARBURIZING & QUENCHING

Location	Hardness	Notes
Case (surface)	58 – 62 HRC	Achievable at standard carburizing depth
Core	28 – 35 HRC	Depends on section size and quench severity
As-annealed	≤ 207 HB	Condition for delivery in soft-annealed state

7. AVAILABLE PRODUCT FORMS

Product Form	Typical Size Range	Applicable Process
Forged Round Bars & Rods	Dia. 50 – 1 500 mm	Open die forging
Seamless Rolled Rings & Flanges	OD 200 – 5 000 mm, H up to 800 mm	Ring rolling
Forged Shafts & Gear Shafts	L up to 10 000 mm	Open die forging
Pinion Shafts & Spindles	Dia. 50 – 800 mm	Open die forging
Forged Discs, Plates & Blocks	Thickness 30 – 600 mm	Open die forging
Forged Housings & Sleeves	Per customer drawing	Open die forging
CNC Machined Components	Per customer drawing	Forging + machining

8. QUALITY ASSURANCE & INSPECTION

Inspection Item	Standard / Method
Chemical analysis (full)	Spectrometric analysis, MTC 3.1 / 3.2
Mechanical testing	Tensile, yield, elongation, reduction, impact
Hardness testing	Brinell (HB) / Rockwell (HRC) per EN ISO 6506 / 6508
Ultrasonic testing (UT)	EN 10228-3 / ASTM A388 or customer spec.
Magnetic particle testing (MT)	EN ISO 9934 or customer spec.
Liquid penetrant testing (PT)	EN ISO 3452 or customer spec.
Dimensional inspection	Full size report per drawing

Inspection Item	Standard / Method
Visual inspection	Surface condition confirmed
Heat treatment records	Full cycle documentation supplied

9. PRICING & LEAD TIME

Item	Details
Indicative unit price	From USD 2.00 / kg (subject to order size, spec. and market)
Standard lead time	15 – 30 working days
Expedited service	7 – 10 working days for simple geometries (on request)
MOQ	Small batch to full production run — no fixed minimum
Trade terms	FOB / CIF / DDP / DDU (Jiangyin, Jiangsu, China)
Payment	T/T, L/C or as agreed

10. TYPICAL APPLICATIONS

Industry	Typical Parts
Wind Energy	Gearbox ring gears, planet gears, pinion shafts, gear wheels
Mining & Cement	Grinding pinion shafts, eccentric shafts, slewing ring races
Sugar Mills	Gear shafts, pinion shafts, roller shafts, flanged couplings
Oil & Gas	Herringbone gear shafts, mud pump gears, PDC cutter bodies
Railway & Transport	Transmission shafts, ring gears, planet gears, bearing rings
General Machinery	Crankshafts, gear couplings, conveyor pulley shafts, speed reducers

DISCLAIMER — This datasheet is provided for reference purposes only. All values are typical or indicative. Final specification, chemistry, mechanical properties and inspection scope must be confirmed by drawing, purchase order and applicable standards. Jiangsu Liangyi Co., Limited reserves the right to modify specifications without notice.

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