

D2 Tool Steel Properties

Working hardness, wear resistance, chemical composition, physical constants and the equivalent grades for D2, 1.2379 and SKD11, plus the limits that decide when D2 is the wrong steel. Reference summary of published D2 data, not an Aobo Steel specification.

Reference only. Aobo Steel supplies D2 tool steel in the annealed condition and does not specify heat treatment for customer tooling. Verify the values below against the applicable standard, the mill certificate and the tool design.

D2 Tool Steel Properties at a Glance

Property	Typical D2 Performance	Practical Meaning
Steel type	High-carbon, high-chromium cold-work tool steel	Used for wear-resistant cold-work tools
Main designations	D2 / 1.2379 / SKD11 / Cr12Mo1V1	Common global equivalent grade family
Annealed hardness	Approx. 217-255 HB	Suitable for machining and stock preparation
As-quenched hardness	Approx. 64-65 HRC	Maximum hardness before tempering
Common working hardness	Approx. 58-60 HRC	Practical range for most D2 tooling
Wear resistance	High to very high	Strong in abrasive cold-work applications
Toughness	Moderate to low	Not ideal for shock-loaded tools
Dimensional stability	Good	Lower distortion than many oil-hardening grades
Machinability	Difficult	Carbides increase tool wear and grinding cost
Corrosion resistance	Limited	D2 is not stainless steel
Typical supply condition	Annealed	Usually machined before final heat treatment

D2 Steel Chemical Composition

Element	Typical Range	Function in D2 Tool Steel
Carbon	1.40-1.60%	Increases hardness and supports carbide formation
Chromium	11.00-13.00%	Forms chromium carbides and improves hardenability
Molybdenum	0.70-1.20%	Improves hardenability and tempering resistance
Vanadium	0.50-1.10%	Supports wear resistance and grain control
Manganese	Up to about 0.60%	Supports hardenability
Silicon	Up to about 0.60%	Supports deoxidation and strength
Nickel	Up to about 0.30%	Usually residual or minor alloying element
Iron	Balance	Base metal

D2 Steel Physical Properties

Physical Property	Typical Value	Practical Meaning
Density	Approx. 7.67-7.80 g/cm ³	Useful for weight calculation and stock planning
Modulus of elasticity	Approx. 200-210 GPa	Indicates elastic stiffness under load
Specific heat	Approx. 460-470 J/kg·K	Relevant to heating and thermal response
Thermal conductivity	Approx. 20-24 W/m·K	Lower than plain carbon steel, so heating must be controlled
Coefficient of linear thermal expansion	Approx. 10.5-12.7 x 10 ⁻⁶ /K	Important for heat treatment and precision tools
Magnetic behavior	Ferromagnetic	D2 is magnetic in normal tooling use

Critical Transformation Temperatures of D2 Steel

Transformation Temperature	Typical Value	Meaning
Ac1	Approx. 788°C	Austenite begins to form during heating
Ac3	Approx. 845°C	Austenite transformation largely complete during heating
Ar1	Approx. 769°C	Transformation begins during cooling
Ar3	Approx. 744°C	Transformation largely complete during cooling

Data source, the Aobo Steel D2 tool steel properties reference.

D2 Tool Steel Mechanical Properties

Property	Typical D2 Behavior	Selection Meaning
Hardness	Commonly 58-60 HRC after hardening and tempering	Main working range for wear-resistant tools
Wear resistance	High to very high	Suitable for abrasive contact and long production runs
Toughness	Moderate to low	Risk of chipping under impact or poor support
Compressive strength	High when hardened	Useful for punches, dies, coining tools, and extrusion tools
Dimensional stability	Good after controlled heat treatment	Suitable for precision dies and gauges
Machinability	Difficult	Higher processing cost than A2 or O1
Ductility	Low in hardened condition	Tool design should avoid sharp stress concentration

D2 Steel Equivalent Grades

Standard / Country	Equivalent Grade
AISI / SAE	D2
ASTM	ASTM A681 D2
UNS	T30402
DIN / W.-Nr.	1.2379
EN / DIN designation	X153CrMoV12 or X155CrMoV12-1
JIS	SKD11
China GB	Cr12Mo1V1
British Standard	BD2
ISO	160CrMoV12
Korea KS	STD11

When You Should Not Choose D2 Tool Steel

Avoid D2 When	Reason	Better Direction
Heavy shock or sudden impact is severe	D2 has limited toughness	S7 or other shock-resisting steels
Stainless-steel galling is severe	Adhesive wear and material pickup may occur	Coated tools, M2, or alternative tooling systems
Corrosion resistance is critical	D2 is not stainless steel	440C or other stainless grades
High-temperature service or thermal fatigue is continuous	D2 is a cold-work steel	H13, H11, or other hot-work steels
Short-run tooling needs easy machining	D2 is harder and costlier to process	A2, O1, or lower-cost alternatives
Tool geometry has sharp stress concentration	D2 may chip or crack	Improve design or use a tougher grade
The part requires very complex machining	High carbide content raises cost	Easier-machining grades may reduce total cost

Table notes

- When properly austenitized and air-quenched, D2 usually shows a very small size change, often around 0.0005 in./in.
- A commonly reported machinability rating for D2 is around 45, using a basic 1% carbon steel rated at 100 as the reference.

Aobo Steel, tool steel supplier

Aobo Steel supplies forged tool steel from Huangshi, Hubei, China, where the local supply chain covers ESR melting, vacuum degassing and LF refining, forging, hot rolling, turned and peeled bar, heat treatment and third party inspection. We have worked in tool steel since 2003 and supply to order in cold work grades such as D2, D3 and O1, hot work grades such as H10 and H13, and stainless grades 420, 440C and 4Cr13. D2 is supplied in the annealed condition with mill test certificates to EN 10204 3.1.

Reference data compiled from published D2 property data and the Aobo Steel D2 Tool Steel Properties reference page.

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Scan to open the full D2 properties page with the selection rules and the grade comparison.