Chemical Composition of AISI 4130 Alloy Steel

This reference table summarizes typical composition ranges and how each element contributes to the metallurgical behavior of AISI 4130 alloy steel.

Element	Typical range / limit	Metallurgical role	More detailed technical reading
Carbon (C)	**0.28-0.33%**	Strength and hardenability	This carbon level is high enough to give 4130 a clear strength and heat-treatment advantage over mild steel, but still low enough to keep weldability more practical than in higher-carbon alloy steels.
Manganese (Mn)	**0.40-0.60%**	Strength and hardenability support	Manganese helps the steel respond more effectively to heat treatment and contributes to the general strength level of the grade. It also supports hot-working and forging behavior in combination with the Cr-Mo system.
Silicon (Si)	**0.15-0.30% in one published source; 0.15-0.35% in another**	Deoxidation and base strengthening	The slight difference in published silicon range reflects source-by-source summary variation. In practical terms, silicon is not the defining alloy element in 4130, but it contributes to steel cleanliness and base matrix strength.
Chromium (Cr)	**0.80-1.10%**	Main hardenability addition	Chromium is one of the core reasons 4130 is grouped as a Cr-Mo low-alloy steel. It improves through-hardening response and supports the higher strength levels achievable after heat treatment.
Molybdenum (Mo)	**0.15-0.25%**	Hardenability and elevated-strength support	Molybdenum works with chromium to improve hardenability and helps 4130 retain useful strength under more severe service than plain carbon steel. It is one of the defining differences between 4130 and non-Cr-Mo structural grades.
Phosphorus (P)	**0.035% max in AZoM; 0.040% max in another published composition sheet**	Controlled impurity	Phosphorus is kept low because excessive phosphorus can reduce toughness and ductility. When different web sources show 0.035 or 0.040 max, the safe reading is that this is a controlled low-level impurity limit rather than a functional alloy addition.
Sulfur (S)	**0.040% max**	Controlled impurity	Sulfur is also restricted to maintain toughness and reduce hot-shortness risk. It is not present to define performance in the way carbon, chromium, or molybdenum do.

Element	Typical range / limit	Metallurgical role	More detailed technical reading
Nickel (Ni)	**0.25% max in one published composition sheet**	Residual / limited element	Nickel is not a defining alloy addition in standard AISI 4130 chemistry, but some published commercial composition sheets list it as a residual maximum. This is useful to show when you want the table to look more complete and technical.
Copper (Cu)	**0.35% max in one published composition sheet**	Residual / limited element	Like nickel, copper is not the main design element in 4130, but some commercial datasheets show it as a residual upper limit. It is better read as a controlled non-primary element than as part of the core alloy design.
Iron (Fe)	**Balance**	Base metal matrix	Iron forms the balance of the steel. The behavior of 4130 comes from how the Cr-Mo additions modify this iron-carbon matrix.

Note: ranges above are presented in the reference-summary style of the supplied table. Where published commercial sheets differ slightly, the engineering reading should follow the applicable material specification and mill test certificate for the delivered stock.