

# ASTM SAE AISI 4140 Alloy Steel

## Heat Treatment, Chemical Composition, Properties

### SAE AISI 4140 Steel

The 4140 alloy possesses high strength, high fatigue strength, toughness, torsional strength, as well as impact and abrasion resistance. Additionally, 4140 steel is highly ductile when annealed, although it requires more pressure due to its increased toughness compared to most carbon steels. It is easy to weld 4140 steel, but if welding is performed after hardening, it will require subsequent heat treatment.

### Applications

4140 steel is widely used in various industries, including oilfield tool manufacturing, machining of mechanical parts, automotive manufacturing, aerospace industry, forging and mold making, as well as construction and heavy equipment sectors. Its high strength, wear resistance, and excellent mechanical properties make it an ideal material choice. In the oilfield tools industry, it is used for manufacturing drill bits, casings, and other components. In mechanical manufacturing, it is commonly used for producing bearings, gears, and pins. In automotive manufacturing, it finds application in engine components and transmission systems. In the aerospace industry, it is used for manufacturing aircraft parts and satellite structures. It is also an important material in construction and heavy equipment fields, such as bridge components and crane parts.

### Data sheet & Specification

The following table provides the AISI SAE ASTM 4140 steel data sheet, including chemical composition, physical properties, mechanical properties, etc.

### Chemical Composition

C	Si	Mn	Cr	Mo	S	P
0.38-0.43	0.15-0.30	0.75-1.00	0.80-1.10	0.15-0.25	Max 0.040	Max 0.035

### 4140 Steel Heat Treatment

#### Forging

AISI 4140 alloy steel is forged at temperatures ranging from 926°C to 1205°C (1700

to 2200°F).

## Annealing

AISI 4140 alloy steel is annealed at 872°C (1600°F), followed by a slow furnace cooling.

## Hardening

AISI 4140 alloy steel can be hardened by cold working or by heating and quenching.

## Tempering

AISI 4140 alloy steel can be tempered at temperatures ranging from 205 to 649°C (400 to 1200°F) depending on the desired hardness level. Lower tempering temperatures can increase the hardness of the steel. For example, tempering at 316°C (600°F) can achieve a tensile strength of 1151 Mpa, while tempering at 538°C (1000°F) can achieve a tensile strength of 896 Mpa..

## 4140 steel grade comparison

AISI 4140 Alloy Steel Standard and Relevant Steel Specifications:

Brand Name	Ravne No.	Mat. No.	DIN	EN	AISI
42CrMoS4	792	1.7227	42CrMoS4	42CrMoS4	4140