



Astralloy 140 ksi

High Strength Quenched and Tempered, Fine Grained Structural Steel

Chemical Composition* – % Weight

C	Mn	P	S	Si	Ni	Cr	Mo
.25	1.70	0.025	.010	.80	2.00	1.25	.70

Physical Properties – Typical Values at 68°F

BHN Hardness	Tensile Strength	Yield Strength	Carbon Equivalent
270 – 310**	142 – 167 ksi	140 ksi	≤ 2.00" – 0.62 > 2.00" – 0.77

Astralloy 140 ksi is a fine-grained, general structural steel that yields a minimum tensile strength of 140 ksi (960 MPa). This high-strength alloy plate achieves its mechanical properties by being water quenched and tempered. This structural alloy provides the opportunity to reduce component weight by offering a high strength to weight ratio along with improved ductility. It is formable and weldable when following good shop practice and has a service temperature which ranges from -50°F (-46°C) to 800°F.

Astralloy 140 ksi is optimal for use in mining equipment, forestry (427°C) equipment, construction equipment, structural steel works, raw material handling, quarries, shredders, crushers, forestry equipment, cranes, buckets, blades, bridges, shears, booms, hoists, and transport trailers.

Each manufacturing mill has its own proprietary chemical composition and heat-treating process. Astralloy Steel Products will be happy to provide mill specifications upon request.

Note: The data contained in this document is accurate at time of printing, and intended for use as a general guide.
* Typical maximum values. Mill certifications are available upon request. ** Values are calculated numbers.



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CUTTING (all gauges)

Astralloy 140 ksi plate can be thermally cut using conventional methods of laser, plasma and oxy-fuel cutting techniques provided that a +60°F minimum plate temperature is used prior to cutting. No preheat is required when cutting this grade.

WELDING (2" and under)

Astralloy 140 ksi plate can be welded using conventional welding practices such as SMAW, GMAW and SAW provided low-hydrogen filler metal and welding practices are employed. Postweld heat treatment (stress relief) is not recommended for Astralloy 140 ksi as it may cause cracking in the heat affected zone.

WELDING AND FLAME CUTTING

Due to its high yield strength, Astralloy 140 ksi requires special care during plate processing.

For general welding instructions, please consult the EN 1011. In order to ensure that the tensile strength of the weld metal fulfills the requirements of the base metal, the heat input and interpass temperature must be limited during welding. Experience has shown that the welding conditions should be chosen so that the cooling time $t_{a/5}$ does not exceed 12 seconds. This is applicable when using suitable filler materials of a corresponding yield strength class.

The high yield strength of the base material must be taken into account when choosing the filler material. It should be considered that increased heat input leads to lower tensile properties in the weld metal. If a stress relieving heat treatment is planned during or after plate processing, this must also be considered when selecting the filler materials.

To avoid hydrogen-induced cold cracking, only filler materials, which add very little hydrogen to the base metal, may be used. Therefore, shielded arc welding should be preferred. For manual arc welding, electrodes with basic coating (type HD<5 ml/100 g in accordance with ISO 3690), and dried according to the manufacturer's instructions, should be used.

FORMING AND ROLLING (2" and under)

Following good shop forming practices and uniform load application, Astralloy 140 ksi plate can be formed to a minimum radius of 3t (3 x thickness) against a bend line transverse to the rolling direction and 4t against a bend line that is parallel to the rolling direction. Good shop practices include a minimum plate temperature of +60°F, grinding plate edges, conditioning and lubricating forming dies and applying

uniform bending force. The recommended minimum bottom die opening should be at least 16 times the plate thickness. Because of the enhanced mechanical properties of this plate, the bending forces required to form the plate will be greater and more plate "springback" can be expected to occur.

COLD FORMING (over 2")

Cold forming means forming below the maximum allowable stress relief temperature (560°C/1040°F). Astralloy 140 ksi can be cold formed with regard to its high yield strength. Flame cut or sheared edges in the bending area should be ground before cold forming. Cold forming is related to a hardening of the steel and to a decrease in toughness. Depending on the relevant design code this can result in the need of larger bending radiuses than indicated in the chart. For larger cold forming amounts we recommend you consult the steel producer prior to ordering.

During the processing, the necessary safety measures have to be taken, so that nobody will be exposed to a danger by a possible fracture of the work piece during the forming process.

The following geometrics can usually be achieved by cold forming without the formation of surface defects (where t is the plate thickness):

	Minimum Bending Radius	Minimum Die Width
Transverse direction	3 t	9 t
Longitudinal direction	4 t	12 t

HOT FORMING (all gauges)

If the temperature of 560°C (1040°F) is exceeded, the initial tempering will be altered so that the mechanical properties are affected. To regain the initial properties new quenching and tempering become necessary. However, water quenching of a formed work piece or component will often be less effective than the original quenching in the plate mill so that the fabricator may not be able to reestablish the properties required and therefore hot forming is not suitable.

Finally, it is fabricator's responsibility to obtain the required values of the steel through an appropriate heat treatment.



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