

Algoma 100

Superior surface quality and notch toughness
High strength, structural quality heat-treated steel plate



Algoma 100 is the cost-effective choice for applications which require high strength with superior weldability, good formability, and improved notch toughness with good resistance to brittle fracture at low surface temperatures. Typical applications include highway trailers, forestry and mining equipment and other uses where weight is a critical factor. Algoma's improved surface capabilities make this product particularly suited for exposed, off-highway applications.

While Algoma 100 is available in the thickness range indicated below, specific thicknesses from 0.236" (6mm) to 2.75" (70mm) may be ordered to the following specifications:

- CSA G40.21-100Q (CSA G40.21-700Q)
- CSA G40.21-100QT (CSA G40.21-700QT)
- ASTM A514 Grade S (ASTM A514M Grade S) 2.5" (63.5mm) max

Dimensions

Thickness range: 0.188" (5mm) – 2.75" (70mm)
Maximum width: 152" (3860mm)
Maximum length: 960" (24400mm)

The stock plate size most commonly available through Algoma's distributor network is 96" x 288" (2440mm x 7315mm).

Notch Toughness

Algoma 100 is produced to a minimum CVNL average value of 20 ft-lbs at -50°F (27 Joules at -45°C). Other testing temperatures and Charpy V-Notch values may be available on request.

Notch toughness (impact) testing may be conducted and reported if requested at the time the order is placed.

Hardness

Algoma 100 is heat-treated to develop yield strength. This results in a through-thickness hard product with a hardness range of 240-300 HBW, although there is no minimum hardness specified for this grade. Hardness values will be reported if requested at the time the order is placed.

Forming (Up to 90°)

Algoma 100's low alloy levels and consistent properties make it ideal for cold forming.

Plate up to 1" (25.4mm) thick can be cold bent to a minimum inside bend radius of 2t (where t is the plate thickness), with the bend axis transverse to the rolling direction (i.e.

across the grain), and a radius of 3t when bending parallel to the rolling direction.

For plate over 1" to 2.5" (25.4mm to 65mm) thick, a radius of 3t should be used for cold forming with the bend axis transverse to the rolling direction, and a radius of 4t when bending parallel to the rolling direction.

Maximum Temperatures for Hot Forming and Stress-Relief

Algoma 100 can be heated to approximately 1000°F (535°C) for about 20 minutes, for hot forming or stress relief operations. Additional time at this temperature may result in some loss of mechanical properties.

Chemical Composition - Heat Analysis (% maximum)

| Thickness | C | Mn | P | S | Si | Cr | Mo | B |
|--|------|------|-------|-------|------|------|------|-------|
| 0.188" (5mm) to 0.250" (6.35mm) | 0.17 | 1.50 | 0.025 | 0.015 | 0.45 | 0.25 | 0.20 | 0.003 |
| Over 0.250" (6.35mm) to 1.00" (25.4mm) | 0.21 | 1.50 | 0.025 | 0.015 | 0.45 | 0.20 | 0.20 | 0.003 |
| Over 1.00" (25.4mm) to 2.75" (70mm) | 0.21 | 1.50 | 0.025 | 0.015 | 0.45 | 0.65 | 0.40 | 0.003 |

Notes:

1. The molybdenum content will vary according to thickness.
2. To meet the required mechanical properties, Algoma may use additional alloy elements, which it will report to purchasers.

Mechanical Properties (transverse)

| Tensile Strength Minimum | Tensile Strength Maximum | Yield Strength Minimum | Elongation (percent) Minimum In 2" (50mm) |
|--------------------------|--------------------------|------------------------|---|
| 110 ksi (760 MPa) | 130 ksi (900 MPa) | 100 ksi (700 MPa) | 16* |

*See elongation adjustment in ASTM A6 for thicknesses of 0.311" (8mm) or less.

Welding

Algoma 100 exhibits excellent weldability. Because of its low alloy content, this grade can be welded using simple procedures and common, readily available consumables.

As Algoma 100 is a grade that can be specified as 700 QT under CSA W59-03 or grade 100 under AWS D1.1- 99, it is recommended that matching strength electrodes are used (E110XX or equivalent (E76XX)) conforming to CSA W59-03 clause 5.5.1.6 and CSA W48-01, for structural welds.

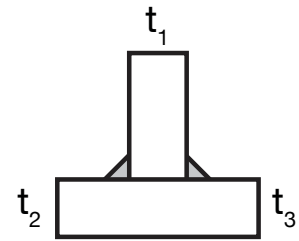
In the case of fillet welds, E4918 (E7018) electrodes may be used provided that the welds are appropriately sized and electrodes are categorized as low hydrogen H4 designation.

High heat inputs when using conventional arc welding processes should be used cautiously, particularly for thinner thicknesses, since the leaner chemistries of these gauges are more susceptible to a reduction of mechanical properties and hardness along the heat-affected zone.

Electroslag and electrogas processes are not suitable for the Algoma 100 grade because of their inherent high heat input.

Preheat and Interpass Temperatures

Algoma recommends the following preheat and interpass temperatures, which should be monitored with temperature crayons, thermocouples, etc. Higher preheat temperatures may be required when the weld metal hydrogen level is greater than 4ml/100g deposited weld metal, or when higher joint restraint is present.



| Combined plate thickness ($t_1+t_2+t_3$) | H4 Designation | |
|--|----------------|----------------|
| | Low restraint | High restraint |
| $\leq 1.25"$ (32mm) | no preheat | no preheat |
| $\leq 1.50"$ (38mm) | no preheat | no preheat |
| $\leq 2.25"$ (57mm) | no preheat | 120°F (50°C) |
| $\leq 2.75"$ (70mm) | 120°F (50°C) | 210°F (100°C) |
| $\leq 4.00"$ (100mm) | 210°F (100°C) | 300°F (150°C) |
| $> 4.00"$ (100mm) | 255°F (125°C) | 300°F (150°C) |

*Ambient temperature is assumed as 68°F (20°C).

The Dearden-O'Neill Carbon Equivalent (C.E.) of Algoma 100 is:

| Thickness | Nominal Aim Carbon Equivalent | Maximum Carbon Equivalent |
|---|-------------------------------|---------------------------|
| 0.188" (5mm) to 0.25" (6.35mm) | 0.38 0.41* | 0.43 0.46* |
| Over 0.250" (6.35mm), to 1.00" (25.4mm) | 0.44 | 0.49 |
| Over 1.00" (25.4mm) to 2.75" (70mm) | 0.56 | 0.62 |

The carbon equivalent calculated from the mill test report should be used for critical applications.

* When certified to CSA G40.21-100Q or 100QT and/or ASTM A514 grade S