Astralloy
a NUCOR company

AstraWear 500F

A 500 BHN Wear Resistant Steel

Chemical Composition* – % Weight								
C	Mn	P	S	Si	Ni	Cr	Mo	B
.31	1.55	.025	.010	.40	1.50	1.50	.50	.003

Physical Properties – Typical Values at 68°F				
BHN Hardness	Tensile Strength	Yield Strength	Elongation in 2"	Charpy Test Toughness Index
470 – 530	230 ksi	205 ksi	10%	22 ft. lbs. Longitudinal @ -40°F

C Equivalent

$$C_{eq} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni+Cu}{15}$$

Thickness Range - in.	C.Eq
0.375 – 1.00	≤ .59
>1.00 – 2.00	≤ .72

AstraWear 500F is a water tempered martensitic steel, with 500 BHN (51.5 HRC), typical hardness and resistant to wear from very severe abrasion. Its mechanical properties, high wear resistance, hardness, and strength make AstraWear 500F steel ideal for use in applications requiring resistance to sliding abrasion and where 400 BHN steels do not provide a long enough service life.

Compared with conventional steels, like A572-50 (S355), AstraWear 500F offers an improvement of up to 5 times the equipment lifespan. Consequently, it allows for a significant reduction in the required design thickness.

AstraWear 500F steel is especially suited for applications in quarries, construction, mines, cement plants, and the iron and steel industry, among others.

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.

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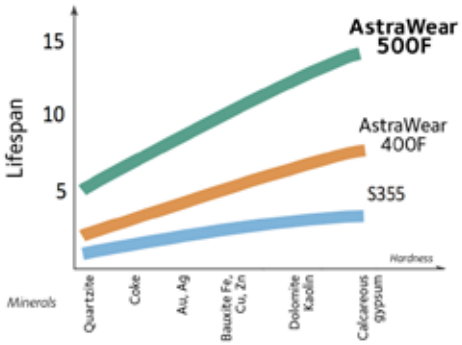
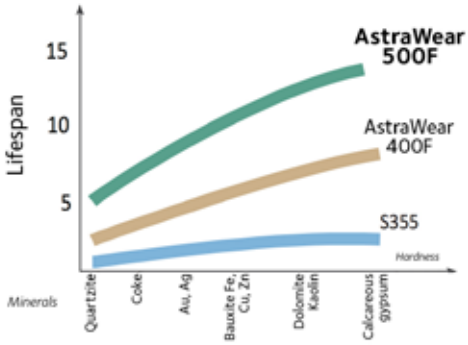
Wear Resistant Properties

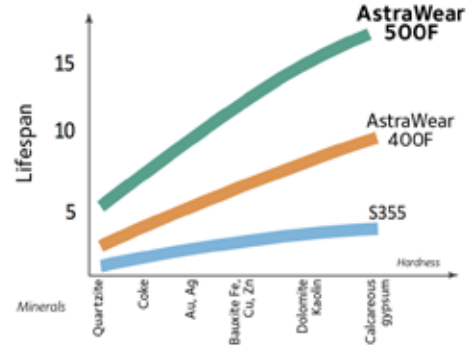
Low Energy Impact – Dry media



Low Energy Impact – Wet media



High Energy Impact



Wear test data

CUTTING

All classic thermal cutting processes are compatible with AstraWear 500F (gas, plasma, laser).

0.3" to 0.4" thick plates do not need preheating as long as thermal cutting is performed at a temperature above 60°F. Where that is not possible or with plates thicker than 1.6", preheating to 200° – 300°F is recommended.

Cutting with water jet or shearing can also be used.

	Thickness	
Cutting Temperature	0.16" – 1.6"	>0.6"
≥ 60°F	w/o preheating	Preheating 212° – 302°F
< 60°F	Preheating 212° - 302°F	

MACHINING

Drilling and grinding can be performed with super carburized steel with HSSCO high-speed cobalt bits, using an oil lubricant whenever possible. However, classic high-speed steels may be used. Typical cutting parameters are:

DRILLING		Ø = 0.40"	Ø = 0.80"	Ø = 1.18"
Cutting speed	ft/min	13 – 20	13 – 20	13 – 20
Rotation	rev/min	130	65	40
Feed	in/rev	0.00394	0.00787	0.01181

THREADING		Ø = 0.40"	Ø = 0.80"	Ø = 1.18"
Cutting speed	ft/min	3.3 – 10	3.3 – 10	3.3 – 10
Rotation	rev/min	50	30	20

GRINDING	Depth (in)	Cutting speed (ft/min)	Feed (in/tooth)
HSSCO AR 12.0.5.5 (T15)	0.04 0.16 0.31	3.9 – 4.7 3.1 – 3.9 2.0 – 3.1	0.00315 0.00394 0.00591
F40M	0.04 – 0.20	2.7" – 7.9"	0.0059 – 0.0138

AstraWear 500F

BENDING

Thanks to its high level of refinement (low sulfur and phosphorus content), AstraWear 500F is easy to bend; provided the following conditions are observed:

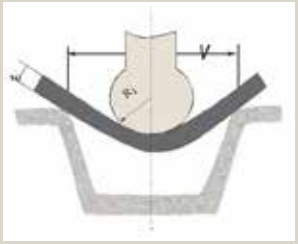
* Cutting (or grinding) of gas cut edges to limit hardened areas
* Sufficiently powerful equipment
* The minimum forming radius is respected

For plates under 0.8 in. thick, forming conditions are summarized in the following table:

th = thickness	Perpendicular to grain direction	Parallel to grain direction
Inner bend radius R_i (mini)	7 x th	9 x th
V die aperture (mini)	18 x th	22 x th

Please call regarding plates over 0.8 in.

Within these permissible bending parameters, the force required to shape a plate is a function of the length bent, metal thickness, die aperture, die shape (V or U), and punch shape.



The following table shows the bending forces, for minimum die aperture (V=18 th), required to bend plates in V for a 1m bend.

Thickness (in)	Bending force required per foot of band * (tons/ft)
0.20	18.298
0.40	35.061
0.60	51.829
0.78	70.123
	*± 10%

AstraWear 500F steel is unsuitable for thermo-forming at temperatures above 392°F.

WELDING

AstraWear 500F can be welded using the following parameters:

Preparation for welding

The surfaces to be welded must be dry, clean, ground and blasted to eliminate remnants of rust, flaking, grease, or paint, as well as rough edges from gas cutting.

Welding process

Any conventional fusion welding method can be used, such as submerged arc welding (SAW), shielded metal arc welding (SMAW), flux-cored arc welding (FCAW), MIG, MAG (GMAW), and TIG (GTAW).

Heat input should be limited to 3.94-11.81 kJ/in with a maximum interpass temperature of 390-430°F.

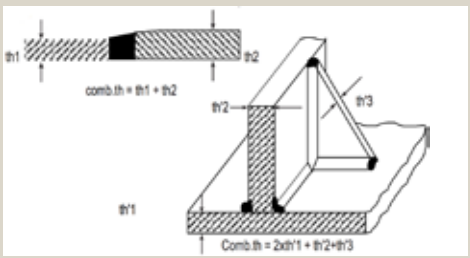
Welding consumable[s]

All products compliant with the following standards are acceptable:

Stick electrodes	MIG-MAG	Gas protected flux cored wire	Submerged arc welding wire flux
AFNOR NF A81-340 EY50 1NiMo Bxxx1xTBH			NF A 81-322 FP/x xx/xx xB xSA31 47 05 04
ASW A5-5-81 E 70xx	A5-28 ER 70 S-x	A5-29 E 7xT5-x	A5-23 F7P4-Exxx-A2
DIN DIN 1913 E51 55 BX			

Conditions prior to heating – Combined thicknesses

AstraWear 500F can be welded without risk of cracks and without preheating up to a combined plate thickness of 0.4 in.



For greater thicknesses, the following conditions are recommended:

	Preheating		
	w/o preheating	300°F	400°F
Comb. th	<0.4"	0.4" – 0.8"	>0.8"





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THICKNESS

AstraWear 500F is available in thicknesses ranging from 3/8" – 2".
Additional thicknesses are available upon request.

APPLICATIONS

* Quarries, construction, earth moving
  Screens, bulldozers
* Cement plants
  Scrapers, crushers
* Mines, coal mines
  Crushers, winding and unloading machines
* Iron and steel industry
  Guide plates and elevators

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