



## TITANIUM BORON ALUMINUM GRAIN REFINERS

In casthouse applications, the control of grain size is absolutely essential in maintaining product consistency and quality, reducing costs, and maintaining high levels of productivity. The controlled addition of AMG Aluminum's titanium boron aluminum grain refiners to molten aluminum releases nucleant particles that promote equiaxed, fine grain structures throughout the cast alloy, thus avoiding formation of columnar crystals. Casting speed can also be increased.

The addition of a titanium boron aluminum grain refiner improves homogeneity and allows for a uniform distribution of alloying elements, reduces porosity, eliminates hot tearing in cast structures, improves responsiveness to subsequent heat treatment, and enhances mechanical properties and machinability in the fabrication process.

Continuous injection of titanium boron aluminum rod is a highly effective treatment for all aluminum alloys.

There are two distinct types of particles seen in the microstructure of titanium boron aluminum grain refiners: TiB<sub>2</sub> particles (grain refining nuclei, typically 1-2 microns in size), which do not dissolve in liquid aluminum and TiAl<sub>3</sub> plates (larger than TiB<sub>2</sub>, typically 30-50 microns in size) which dissolve readily in liquid aluminum. Both types of particles play an essential role in the grain refining process.

Decades of research and development into the application of aluminum grain refiners have made titanium boron aluminum the preferred choice of casthouses world-wide. AMG Aluminum leads the world in the development and production of highly effective grain refining agents for the aluminum industry.

Chemical Composition (maximum unless shown as a range)

Alloy	Designation	Color Code	B	Si	Fe	Ti	V	Ni	Others		Form
									Each	Total	
1.7% Ti - 1.4% B			1.10-1.70	0.20	0.30	1.30-2.20	0.20		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
2.5% Ti - 2.5% B			2.00-3.00	0.20	0.30	2.00-3.00	0.20		0.03	0.10	Button
3% Ti - 0.2% B	AA-H2220		0.15-0.25	0.20	0.30	2.70-3.30	0.15		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
3% Ti - 1% B	AA-H2214		0.70-1.10	0.20	0.30	2.80-3.40	0.05		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
	CEN-92250		0.80-1.20	0.30	0.30	2.70-3.50	0.20		0.04	0.10	
5% Ti - 0.1% B	AA-H2201		0.10-0.20	0.30	0.35	4.50-5.50	0.25		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
5% Ti - 0.2% B	AA-H2207		0.15-0.25	0.30	0.35	4.50-5.50	0.25		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
	CEN-92252		0.15-0.25	0.30	0.30	4.50-5.50	0.25		0.04	0.10	
5% Ti - 0.6% B	AA-H2202		0.50-0.70	0.20	0.30	4.50-5.50	0.20		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
	CEN-92254		0.50-0.80	0.30	0.30	4.50-5.50	0.20		0.04	0.10	
5% Ti - 1% B	AA-H2252		0.80-1.20	0.20	0.30	4.50-5.50	0.20		0.03	0.10	Waffle, Sheared Ingot, Button, Rod
	CEN-92256		0.90-1.10	0.30	0.30	4.50-5.50	0.20		0.04	0.10	
10% Ti - 1% B	AA-H2211		0.90-1.50	0.30	0.35	9.00-11.00	0.50	0.05	0.03	0.15	Waffle, Sheared Ingot, Button, Rod



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