metco
joining & cladding

Product Data Sheet
Hardfacing Alloy with Extremely Hard, Cubic Molybdenum Borides

Wire Products: Metco 8226, Metco 8226-SLW

Protected by United States patent US10329647B2 with patents in other countries granted or pending.

1 Introduction

Metco™ 8226 and Metco 8226-SLW are comprised of an iron-based alloy specifically designed to produce overlays using conventional wire welding processes that replicate the microstructure of tungsten carbide PTA overlays.

Metco 8226 and Metco 8226-SLW homogeneously grow extremely hard molybdenum boride particles throughout the entire weld bead. These molybdenum boride particles are harder and smaller than the tungsten carbide hard phase in PTA weld overlays — a characteristic that enhances impact resistance.

Metco 8226 and Metco 8226-SLW are particularly suitable for applications where resistance to gouging, slurry erosion or high-stress abrasion is required. Coatings pair the toughness required for high impact applications with superb wear resistance that rival most other wear-resistant coatings on the market. The resulting welded microstructure of these materials looks similar to tungsten carbide - nickel PTA overlays while simultaneously avoiding the long, needle-like particles known to cause problematic embrittlement in chromium carbide overlays and many nanostructured steel alloys.

Metco 8226 achieves optimal performance with a single welded layer. Metco 8226-SLW is designed to be deposited as additional layers over Metco 8226 when thicker deposits are desired for additional service life. While multiple welded layers generally reduces overall performance, the combination of Metco 8226-SLW over Metco 8226 results in performance equal to a single layer of Metco 8226.

1.1 Typical Uses and Applications

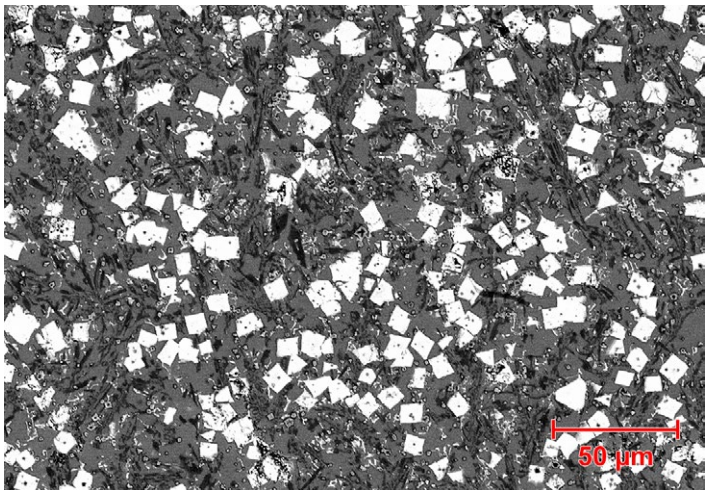
Metco 8226 and Metco 8226-SLW overlays are suggested for use in any application where wear resistance to gouging, slurry erosion or high-stress abrasion is required. These applications include:

- Shaker screens
- Grader blades and other ground engaging tools
- Chute blocks
- Pipe inner walls
- Mill liners
- Slurry pipes
- Shovel wear packages
- Cutter rings
- Primary and secondary crusher teeth
- Grouser risers
- Other mining applications

Quick Facts

Classification	Alloy, iron-based
Chemistry	Proprietary
Manufacture	Composite wire
Abrasion Resistance	
Metco 8226 [a]	0.09 to 0.11 g loss
Metco 8226-SLW [a]	0.11 to 0.13 g loss
Metco 8226 +Metco 8226-SLW	0.09 to 0.11 g loss (ASTM G65A low stress abrasion)
Service Temperature	540 °C (1000 °F)
Impact Resistance	> 6 000 impacts @ 20 J without failure
Overlay Hardness	
Metco 8226 [a]	65 to 70 HRC
Metco 8226-SLW [a]	60 to 65 HRC
Hard Phase	
Metco 8226 [a]	> 40%
Metco 8226-SLW [a]	> 30%
Purpose	Gouging, slurry erosion, high stress abrasion and high impact resistance
Processes	GMAW, OA, SAW

[a] Single layer



Typical as-welded coating microstructure of Metco 8226. Note distribution of complex Molybdenum Boride particles with hardness of approx. 2600 HV.

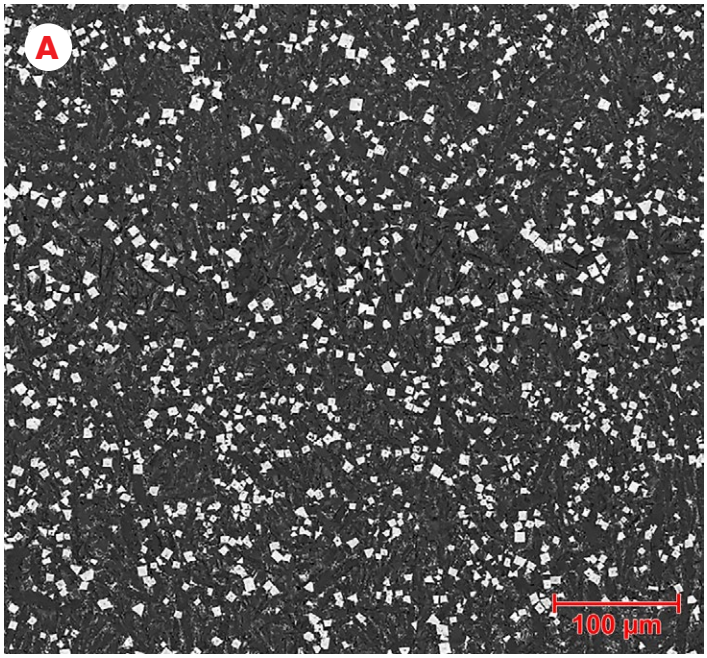
2 Material Information

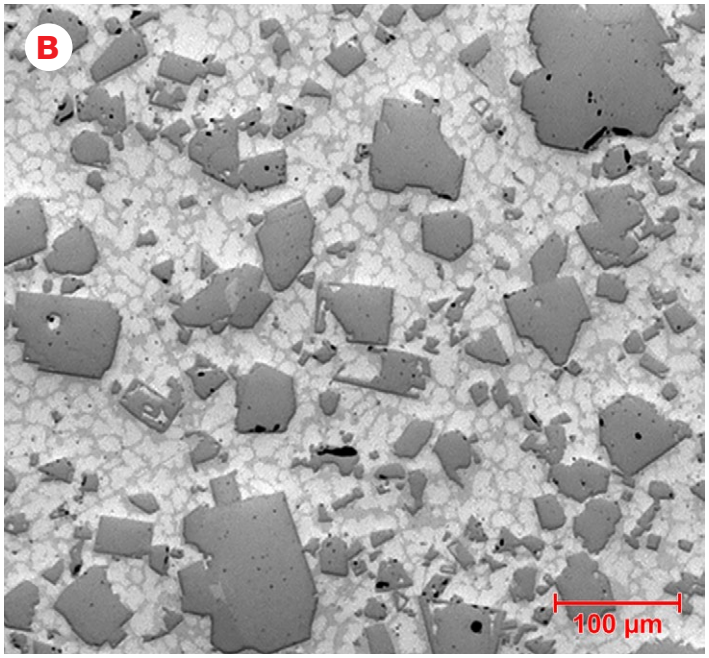
2.1 Physical Properties and Characteristics

Product	Nominal Chemistry	Product Form	Size	Recommended Process	Previously Sold As
Metco 8226	Proprietary FeCrNbMoBC alloy	Composite Wire	2.8 mm (0.11 in) 3.2 mm (0.125 in)	OA, SAW	Vecalloy 752
Metco 8226-SLW			3.2 mm (0.125 in)	OA, SAW	

2.2 Key Selection Criteria

- **Fine-Scale Microstructure:** Metco 8226 and Metco 8226-SLW form a unique microstructure that exhibits good high stress abrasion and gouging resistance. The microstructure somewhat mimics the structure of a tungsten carbide-based (WC) matrix composite hardfacing. The thermodynamics of Metco 8226 and Metco 8226-SLW deposits drive the precipitation of extremely hard, cubic, complex molybdenum borides. These complex borides have a very high hardness comparable to WC, and are roughly 10 to 50 µm in size with an inter-particle spacing of 75 µm or less. Furthermore, the complex boride particles are embedded in a hard, martensitic matrix that also contains a high fraction of fine-scale carbides and borides. The combined high hardness of both the molybdenum boride particles and the matrix result in a structure that is very resistant to high stress abrasion and gouging.
- **Homogeneity:** Metco 8226 and Metco 8226-SLW form a high fraction of both carbides and borides as precipitates. The microstructure is the same throughout the deposit, whether near the weld interface or the deposit surface. The carbide size and spacing is very homogeneous throughout the entire deposit. The carbides do not float nor settle, and there are no regions that are enriched or depleted of the hard borides and carbides.
- **Consistent Performance:** The homogeneous microstructure results in consistent performance from the surface of the weld down to the weld interface. For example, ASTM G65 testing on the weld surface and halfway into the weld thickness generate the same results. The entire weld thickness will perform according the performance specifications of the material.





Microstructure comparison of Metco 8226 deposit **[A]** versus WC-Ni GMAW deposit **[B]**. Note the fine hard phase and more homogeneous structure created by Metco 8226 versus the very large hard phase particles in the GMAW deposit.

2.3 Related Products

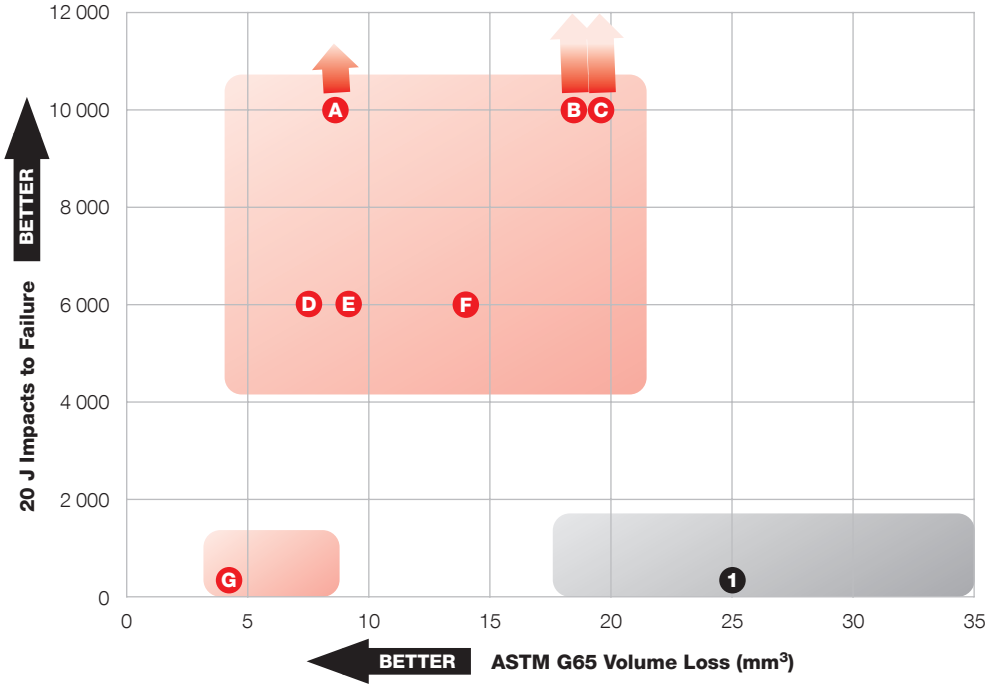
- Choose Metco 8224 when higher impact resistance is needed. However, compared to Metco 8224, deposits of Metco 8226 have a good compromise between abrasion performance and impact performance, with impact resistance that is still better than many common hard facing materials. Metco 8226 delivers a uniquely high level of hard phase constituents (carbides + borides) that can be achieved using the GMAW process. Deposits contain an elevated level of hard phases that provide additional resistance to high stress abrasion and gouging compared to Metco 8224. In addition, Metco 8224 is chromium-free and should be considered for applications where the use of chromium is a concern.

- If yet higher gouging and wear resistance is still needed, Metco 51059A, applied using PTA or laser cladding, can be used. It produces a microstructure with a higher volume fraction of larger carbides.

- Metco 8233 can be used in applications where even higher impact resistance is required or additional functionality such as non-magnetism or compatibility with Mn-steel substrates is needed. Metco 8233, however, is not as abrasion resistant as Metco 8226

- Metco Joining & Cladding provides a wide range of other products designed for mining applications. Products are available in wire and powder form appropriate for application using thermal spray, PTA, laser cladding and other welding processes. Please contact your Metco Joining & Cladding Account Manager for more information..

Impact vs. Abrasion Resistance of Hard Facing Materials



A Metco 8224
GMAW, OA
Cr-free, heat treatable

B Metco 1040A
PTA, Laser Cladding
Mn steel compatible,
non-cracking, non magnetic

C Metco 8233
OA, SAW
Mn-steel compatible
non-magnetic

D Metco 1030A
PTA, Laser Cladding
Cr-free, heat treatable

E Metco 8226
GMAW
gouging resistant

F Metco 1051A
PTA, Laser Cladding

G PlasmaDur 51027
PTA, 60/40 WC-Ni

1 Chromium Carbides (CCO)
GMAW. OA, SAW

3 Key Coating Information

3.1 Using Metco 8226 and Metco 8226-SLW

Deposit Metco 8226 as stringer beads or oscillated beads up to 8 mm (0.315 in) using GMAW, SAW or OA processes. Metco 8226 should be welded as a single layer deposit.

When multiple layer deposits are desired, overlay a single layer of Metco 8226 with subsequent layers of Metco 8226-SLW using SAW or OA welding processes. This combination will maintain the compositional and performance characteristics of a single layer of Metco 8226. Attempting to deposit multiple layers of Metco 8226 will reduce the impact resistance of the overlay.

Metco 8226-SLW can be used on its own as a single layer or multiple layer deposit. However, performance results are best when Metco 8226-SLW is applied over a single layer of Metco 8226.

The effective performance of Metco 8226 and Metco 8226-SLW should not be underestimated. Many customers achieved significantly better results when compared to multiple layers of standard and complex CCO (Chromium Carbide Overlays) and performance approaching that of far more costly tungsten carbide overlays.

3.2 Coating Parameters and Development

Starting parameters for Metco 8226 and Metco 8226-SLW are available upon request.

For specific coating application requirements, the services of Metco Joining & Cladding's Coating Solution Centers are available. Please contact your Metco Joining & Cladding Account Manager for more information.

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Wire Diameter	Package Size	Availability	Distribution
Metco 8226	1305722	0.109 in (2.78 mm)	25 kg (55 lb) spool	Stock	Global
Metco 8226	1305724	0.109 in (2.78 mm)	250 kg (550 lb) drum	Special Order	Global
Metco 8226	2366995	0.125 in (3.2 mm)	25 kg (55 lb) spool	Stock	Global
Metco 8226	2366966	0.125 in (3.2 mm)	250 kg (550 lb) drum	Special Order	Global
Metco 8226-SLW	2427199	0.125 in (3.2 mm)	25 kg (55 lb) spool	Stock	Global
Metco 8226-SLW	2427200	0.125 in (3.2 mm)	250 kg (550 lb) drum	Special Order	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.

4.3 Safety Recommendations

See SDS 50-2310 (Safety Data Sheet) in the localized version applicable to the country where the material will be used. SDS are available from the Metco Joining & Cladding web site at www.metcojoiningcladding.com (Resources – Safety Data Sheets).

The Metco Joining & Cladding Difference:

Metco 8226 and Metco 8226-SLW were developed using our patented and proprietary **Scoperta™** high throughput computational metallurgical process to evaluate millions of candidate alloy compositions. Potential candidates are then experimentally evaluated using an advanced screening process where both properties and alloy microstructure are measured.

The combined **Scoperta** computational and experimental approach allows Metco Joining & Cladding to rapidly design the final material with a much better accuracy than conventional empirically-based methodologies.

Information is subject to change without prior notice.

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DSM-0203.6 – FeMoCr – Molybdenum Boride Hardfacing Alloy