

## Product Data Sheet

# Crack-Free Martensitic Alloy with Titanium or Niobium Carbide Precipitates for Hardfacing and Hardbanding

### Wire Products: Metco 8247, Metco 8288

Patent Pending

#### 1 Introduction

Metco™ 8247 and Metco 8288 are specifically designed to form crack-free, hard weld deposits. They meet a unique materials requirement in that they possess high abrasion resistance similar to chromium carbide overlays (CCO) with extreme toughness and crack resistance. The unique behavior of Metco 8247 and Metco 8288 were developed using our exclusive Scoperta™ computational metallurgy process.

Metco 8247 and Metco 8288 form hardfacing deposits that are extremely tough and resistant to all forms of cracking. Many hardfacing materials have low toughness and as a result stress cracking or cross-checking can occur. Metco 8247 and Metco 8288 do not stress crack when welded properly. The high abrasion is provided in the form of isolated titanium carbides in Metco 8247 deposits or niobium carbides in Metco 8288 deposits. Another form of cracking — hot cracking or solidification cracking — can also occur in weld alloys with high toughness. Metco 8247 and Metco 8288 are specifically designed to avoid solidification cracking.

Susceptibility for both types of cracking will increase in high cooling rate processes such as welding without a preheat or welding on a cool substrate. Metco 8247 and Metco 8288 will generally be more resistant to cracking than hardfacing alloys of seemingly similar microstructure.

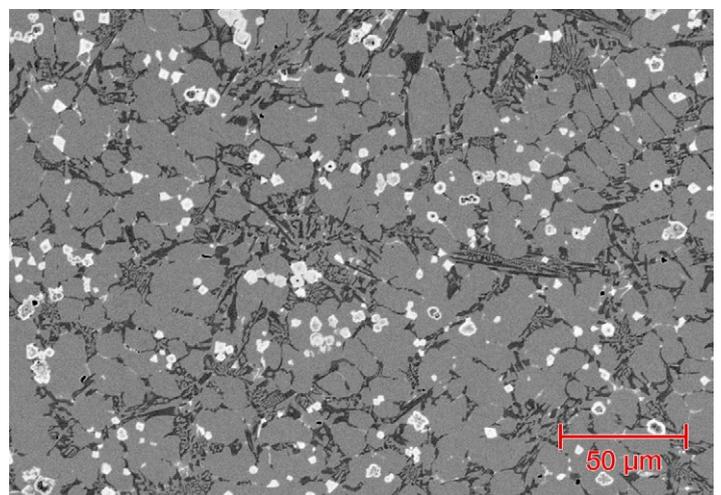
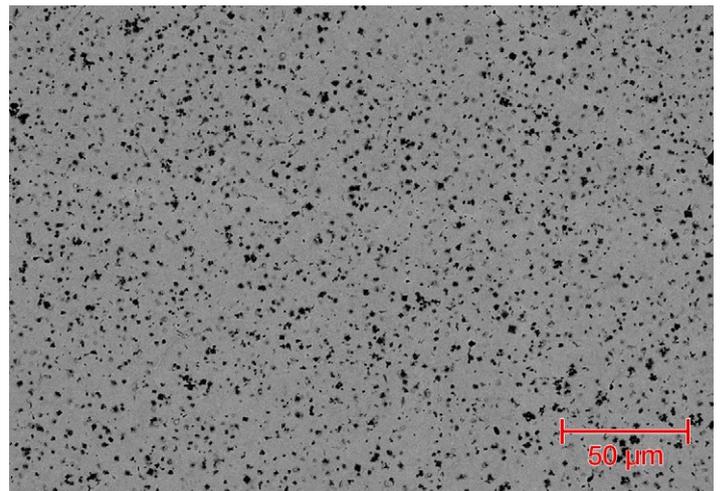
#### 1.1 Typical Uses and Applications

Specific applications include:

- Hardbanding applications
- Impact and abrasion resistance for ground engaging tools (GETs) used in mining and agriculture
- Crack-free hardfacing applications
- Impact-resistant hardfacing applications
- Drill pipe and stabilizer protection
- Downhole tools

#### Quick Facts

Classification	Alloy, Iron-Based
Chemistry	Proprietary
Manufacture	Composite wire
Abrasion Resistance	0.21 to 0.39 g lost or 28 to 50 mm <sup>2</sup> lost (ASTM G65A low stress abrasion)
Crack Resistance	High (crack-free)
Hardness	55 to 60 HRC
Purpose	Abrasion resistance
Process	GMAW, SAW



Typical microstructure of a Metco 8247 deposit (top) and a Metco 8288 deposit (bottom).

## 2 Material Information

### 2.1 Physical Properties and Characteristics

Product	Nominal Chemistry	Product Form	Size	Recommended Process	Previously Sold As
Metco 8247	Proprietary	Composite Wire	1.6 mm (0.063 in)	GMAW, SAW	Metco X9
Metco 8288	Proprietary	Composite Wire	1.6 mm (0.063 in)	GMAW, SAW	---

### 2.2 Key Selection Criteria

- Choose Metco 8247 or Metco 8288 for crack-free hardfacing or hardbanding applications
- Although both products can be applied crack-free, Metco 8247 is significantly more crack-resistant than Metco 8288
- Metco 8247 and Metco 8288 provide increased abrasive wear protection compared to competitive products
- Metco 8288 deposits exhibit slightly more abrasion resistance than deposits of Metco 8247
- Both Metco 8247 and Metco 8288 can be applied as a single- or multiple-layer deposit
- Metco 8247 and Metco 8288 deposits exhibit low casing wear
- Metco 8247 and Metco 8288 weld with low smoke and spatter providing a safer, cleaner welding environment

### 2.3 Related Products

- For increased service life in abrasive environments, Metco 8224 or Metco 8226 can be considered, however, these materials are not as crack-free as Metco 8247 or Metco 8288.
- For abrasion resistance in applications where the deposit must be non-magnetic such as drill stabilizers, choose Metco 8250.
- Metco Joining & Cladding offers a wide range of abrasion-resistant wire and powder materials that can be used for different coating processes and service conditions. Please contact your Account Representative for more information.



Weldability is improved with Metco 8247 (left) compared to competitive hardbanding materials (right). The cleaner, low spatter weld generated using welding Metco 8247 lowers both the post-weld grinding time and the potential for sub-surface porosity. The smoke-free weld deposition of Metco 8247 improves operator safety and allows the operator to better control the quality of the weld. Metco 8288 provides very similar welding results.



Trials using Metco 8247 or Metco 8288 on GETs in service. (left): Close-up of hardfaced GET. (right): Comparison of hardfaced and unhardfaced GETs. White arrows highlight the hardfaced GETs. Notice that the hardfaced GETs are longer and less worn, attesting to the abrasion resistance of Metco 8247 or Metco 8288.

**DSM-0211.4 – Martensitic Alloy with TiC or NbC**

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### 3 Key Coating Information

#### 3.1 Using Metco 8247 or Metco 8288

##### GMAW Parameters: 1.6 mm (0.063 in) Diameter Weld Wire

Application	Hardbanding	General Hardfacing
Desired Weld Thickness	2.4 to 3.2 mm (3/32 to 4/32 in)	5 to 7 mm (0.2 to 0.28 in)
Current	DCEP	DCEP
Voltage	27 to 32 V	27 to 32 V
Amperage	260 to 310 A	260 to 310 A
Wire Feed Speed	6600 mm/min (260 in/min)	6600 mm/min (260 in/min)
Shielding Gas	Ar 100%	Ar 100% or Ar 98% / O <sub>2</sub> 2%
Gas Flow Rate	14 to 19 l/min (30 to 40 ft <sup>3</sup> /h)	14 to 19 l/min (30 to 40 ft <sup>3</sup> /h)
Stickout	19 to 32 mm) 0.75 to 1.25 in)	25 to 32 mm (1.0 to 1.25 in)
Preheat	See Preheat / Rotational Speed Table	Dependant on substrate
Maximum Interpass Temperature	427 °C (800 °F)	427 °C (800 °F)
Torch Drag Angle	10° to 20°	5° to 15°
Torch Offset	6 to 32 mm (0.25 to 1.25 in)	N/A
Torch Oscillation Width	19 to 29 mm (0.75 to 1.125 in)	19 to 29 mm (0.75 to 1.125 in)
Oscillation Speed	50 to 70 cycles/min	50 to 70 cycles/min
Traverse Speed <sup>a</sup>	150 to 200 mm/min (6 to 8 in/min)	150 to 200 mm/min (6 to 8 in/min)
Post Weld Slow Cool Down	Required	Dependant on substrate

<sup>a</sup> See Preheat / Rotational Speed Table

##### Preheat / Rotational Speed

Tool Joint O.D. at Weld Section		Soak Temperature		Time for One Complete Revolution
mm	in	°C	°F	
79 to 111	3.125 to 4.375	107 to 135	225 to 275	90 ± 30 sec
105 to 133	4.125 to 5.250	200 to 220	391 to 428	120 ± 30 sec
133 to 159	5.250 to 6.250	218 to 246	425 to 475	140 ± 30 sec
159 to 162	6.250 to 6.375	260 to 288	500 to 550	165 ± 30 sec
175 to 184	6.875 to 7.250	288 to 316	550 to 600	170 ± 30 sec
200 to 216	7.875 to 8.500	311 to 343	600 to 650	375 ± 30 sec
175 to 184 with 177 mm I.D.	6.875 to 7.250 with 5 in I.D.	288 to 316	550 to 600	375 ± 30 sec

#### 3.2 Coating Parameter Availability

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

## 4 Commercial Information

### 4.1 Ordering Information and Availability

Product	Order No.	Form	Size	Package Size	Availability	Distribution
Metco 8247	1501835	Wire	1.6 mm (0.063 in)	12.5 kg (27.5 lb) wire basket	Stock	Global
Metco 8288	2266970	Wire	1.6 mm (0.063 in)	12.5 kg (27.5 lb) wire basket	Special Order	Global

### 4.2 Handling Recommendations

- Store in the original container in a dry location.

### 4.3 Safety Recommendations

See the SDS (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](http://www.metcojoiningcladding.com) (Resources – Safety Data Sheets).

Product	SDS No.
Metco 8247	50-2468
Metco 8288	50-2975

#### The Metco Joining & Cladding Difference:

Metco 8247 and Metco 8288 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.