

Product Data Sheet

Highly Corrosion Resistant, Easily Applied Nickel Chromium Molybdenum Alloy

Wire Products: Metco 8453

US patent protected with additional patents pending

1 Introduction

Metco™ 8453, previously sold as NickoShield 200, is an advanced thermal spray material designed specifically for application using the electric arc wire spray process to produce consistently high-quality corrosion-resistant coatings.

Coatings of Metco 8453 exhibit unique performance characteristics that include 69 MPa (10000 psi) bond strength. The quality and performance of Metco 8453 is retained over a wide application window, thus the coating quality is maintained even when hand sprayed. Metco 8453 has been designed using high-throughput, computational metallurgy to effectively deposit a NiCrMo alloy that is uniquely resistant to oxidation during the spray process.

Conventional NiCrMo superalloys are extremely corrosion resistant in bulk form. However, they were not designed for coating application using electric arc wire spray and often do not meet the expected performance of a NiCrMo superalloy in corrosive media. Metco 8453, however, is designed for electric arc wire spray coatings to provide the true corrosive benefits of a conventional NiCrMo superalloy composition.

As a bond coat, Metco 8453 is an excellent choice because of its high adhesion of ≥ 69 MPa (≥ 10000 psi), particularly to combat corrosive liquids or atmospheres. Its excellent bond strength and corrosion resistance makes it a very suitable bond coat for thermal sprayed ceramic top coats.

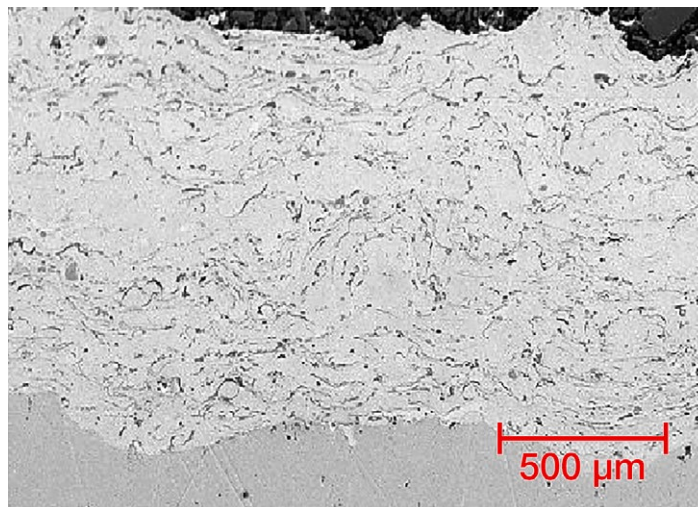
Because of its wide application window, ability to apply thick coatings and high bond strength, Metco 8453 is an excellent restoration material, particularly for applications such as pump shafts or other components subject to corrosive environments.

1.1 Typical Uses and Applications

Metco 8453 coatings are suggested for use in any application where corrosion resistance is required. The revolutionary improvement in consistent coating quality will typically result

Quick Facts

Classification	Alloy, Nickel-Based
Chemistry	Proprietary NiCrMo Alloy
Manufacture	Composite wire
Service Temperature	≤ 980 °C (1800 °F)
Microhardness	150 HV300
Bond Strength	≥ 69 MPa (10000 psi)
Deposit Efficiency	> 70 %
Maximum Coating Thickness	2 to 3 mm (0.08 to 0.12 in)
Thickness Readability	Yes, ≤ 1.5 mm (0.06 in)
Purpose	Corrosion resistance (acidic media)
Process	Electric Arc Wire Spray



Typical as-sprayed coating microstructure of Metco 8453.

in increased corrosion protection and coating lifetime over conventional NiCrMo superalloys.

Specific applications include:

- Refinery vessels
- Chemical processing vessels
- Boiler tubes
- Corrosion resistant bond coat (under ceramic top coats)
- Salvage and dimensional restoration

2 Material Information

2.1 Physical Properties and Characteristics

Product	Nominal Chemistry	Product Form	Size	Recommended Process	Previously Sold As
Metco 8453	Proprietary	Composite Wire	1.6 mm (0.063 in)	Electric Arc Wire	NickoShield 200

2.2 Key Selection Criteria

Metco 8453 produces very reliable, corrosion-resistant electric arc wire coatings that outperform conventional NiCrMo superalloys in similar environments.

■ **Coating Integrity:** The coating microstructure of Metco 8453 is significantly cleaner and lower in oxides compared to conventional NiCrMo materials applied using electric arc wire spray. This enables Metco 8453 coatings to have bond strengths of 69 MPa (10000 psi) or higher. In addition, the oxide content of Metco 8453 coatings are consistent over a variety of spray angles. The true benefit of Metco 8453 is the repeatable coating quality that is obtained over a large process window.

In addition, coatings of Metco 8453 retain their exceptionally high bond strength well after the performance of conventional NiCrMo superalloys drops off.

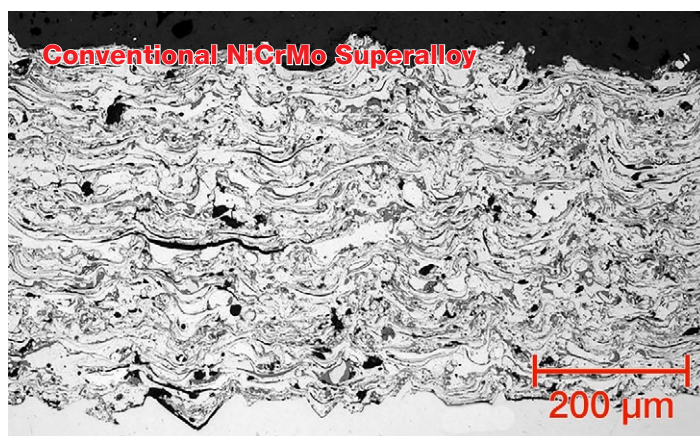
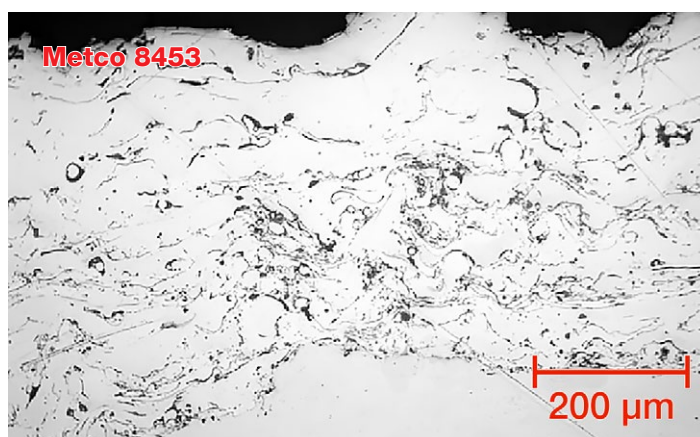
■ **Self-Sealing:** Porosity within a thermal spray coating presents pathways for corrosive media to reach the substrate. The result is typically coating failure in the form of spalling. Metco 8453 is unique, however, in that it possesses the ability to self-seal in highly corrosive environments, thereby filling the micro-pores. Self-sealing is the most effective method to form an impermeable, corrosion-resistant barrier between the substrate and the environment.

■ **Coating Microstructure:** NiCrMo superalloy materials are highly corrosion resistant in their bulk (e.g., cast or forged) form. However, when the same material is electric arc wire sprayed, these conventional alloys form a substantial fraction of oxides within the coating. That, combined with the inherent porosity of such coatings, significantly reduces the corrosion resistance of the coating compared to the bulk form of the material.

However, Metco 8453 forms electric arc wire coatings that have a much higher metallic fraction. Combined with its self-sealing capability, Metco 8453 coatings exhibit oxidation and corrosion resistance that is similar to that of bulk conventional NiCrMo superalloys. It therefore performs properly as a corrosion-resistant coating in service.

This difference is even clear to the naked eye, as the coating color of Metco 8453 is light gray — similar to that of bulk metal. On the other hand, the coating color of a conventional NiCrMo superalloy coating is darker, indicative of the significant oxides in the coating.

■ **Consistency:** When manually sprayed, the spray parameters (including spray angle, spray distance and traverse rates) can vary substantially. A coating that varies in quality across the spray process window will not perform as well as a coating that does not vary. As such, Metco 8453 is very 'applicator-friendly' in that it gives the same coating microstructure even with the motion and angle variability inherent in manual spray operations.

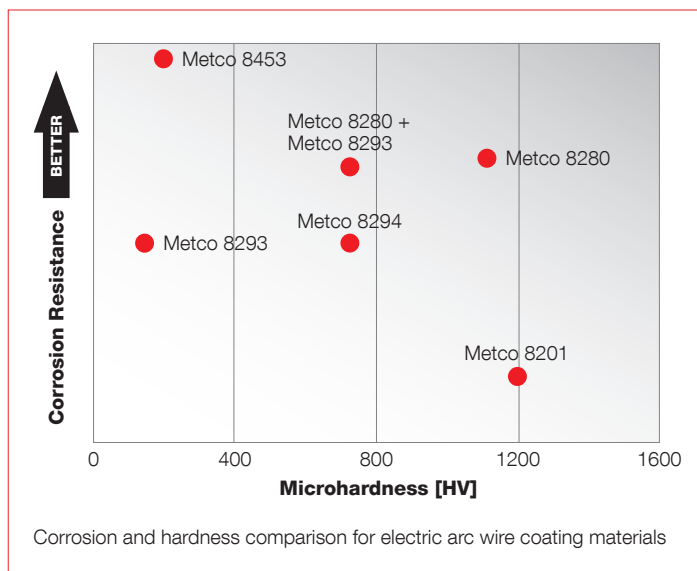


Metco 8453 (top) forms coatings with much lower oxide content than coatings of a conventional NiCrMo superalloy (bottom). In addition Metco 8453 splat interfaces are less contaminated with oxide layers and the coating splats are generally larger and more interconnected.

2.3 Related Products

- If a harder, more wear resistant electric arc wire coating is needed, consider iron-based Metco 8280. Coatings of Metco 8280 offer very good abrasion and sliding wear resistance. It forms amorphous coatings that offer quite good corrosion protection, although not as good as those of Metco 8453.
- If hot erosion and corrosion resistance is needed, consider Metco 8294. Metco 8294 is an iron-based material that produces hard, thickness readable coatings on iron-based alloys. While coatings of Metco 8294 offer very good corrosion resistance, they are not as resistant as coatings of Metco 8453.
- Another good choice for restoration and build-up is Metco 8293. Coatings of Metco 8293 have exceptionally high bond strength and offer the corrosion resistance of 300 series stainless steels. Like Metco 8294, it is an iron-based materials that is thickness readable on iron-based substrates, but is not as hard as coatings of Metco 8294, nor as corrosion resistant as coatings of Metco 8453.

- Oerlikon Metco produces a wide range of corrosion-resistant materials in wire and powder form, including a variety of superalloy materials and products optimized for different corrosion and service conditions. Please contact your Oerlikon Metco Account Manager for more information.



3 Key Coating Information

3.1 Using Metco 8453

Metco 8293 is currently available in 1/16 in (1.6 mm) cored wire. It can be used with most electric arc spray systems that can use that wire diameter and type. Partial starting point parameters are provided here.

Coating thickness per pass	0.05 to 0.08 mm (0.002 to 0.003 in)
Spray rate per 100 amps	76 g/min (10 lb/h)
Coverage	0.96 kg/m ² /0.1 mm (0.05 lb/ft ² /0.001 in)
Expected ASTM G65A test	1.5 g mass loss
Expected adhesion	> 69 MPa (10 000 psi)

3.2 Coating Parameter Availability

Please contact your Oerlikon Metco Account Representative for parameter availability. For specific coating application requirements, the services of Oerlikon Metco'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 8453	1501841	Wire	1.6 mm (0.063 in)	12.5 kg (27.5 lb) plastic spool	Special Order	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.

4.3 Safety Recommendations

See SDS 50-2311 (Safety Data Sheet) in the localized version applicable to the country where the material will be used. SDS are available from the Oerlikon web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).

The Oerlikon Metco Difference:

Metco 8453 was 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 Oerlikon Metco to rapidly design the final material with a much better accuracy than conventional empirically-based methodologies.