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Material Product Data Sheet
Iron-Based Specialty Thermal Spray Powders

Thermal Spray Powder Products:
Diamalloy 1008, Diamalloy 1009, Diamalloy 1010

1 Introduction

Diamalloy™ 1008 is a patented hardfacing material developed for corrosive wear applications below 650 °C (1200 °F) applied using the DiamondJet™ HVOF spray process. This multi-component powder produces cost-effective coatings with optimum hardness, adhesive and abrasive wear resistance and toughness. Corrosive wear resistance is superior to coatings of ferritic and martensitic stainless steels. This material may be used as an economical, thermal sprayed alternative to chromium plating with similar performance to extend component life, comparable finishes after grinding, and added advantages such as faster material buildup rates.

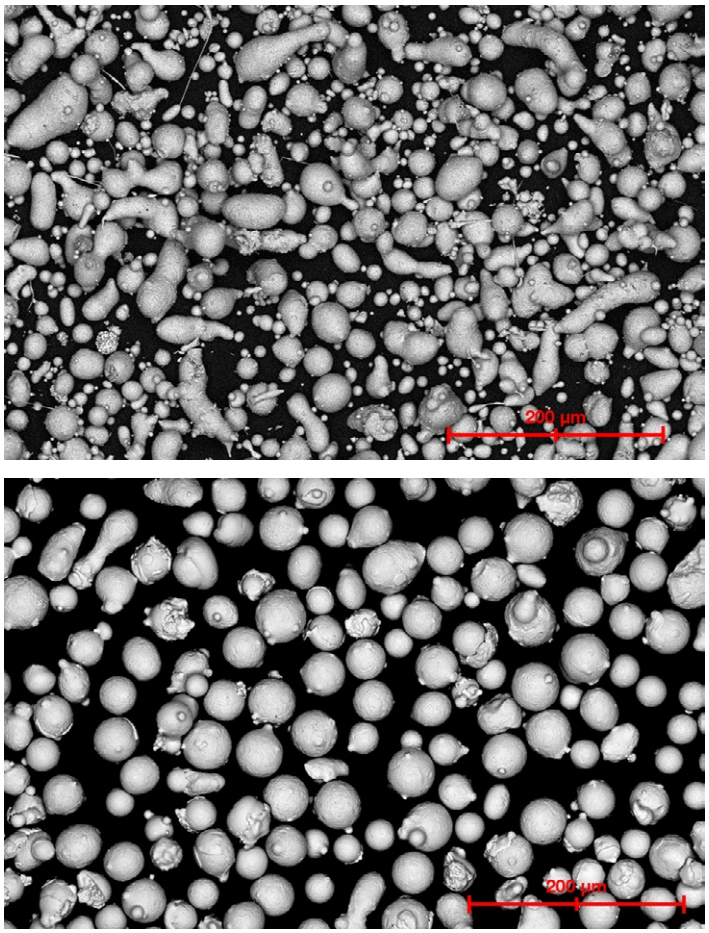
Diamalloy 1009 coatings combine excellent wear, abrasion, strength and corrosion properties. The chemistry of this material consists of an iron-based matrix with highly disordered borocarbides. These structures result in coatings with high hardness and salt spray corrosion resistance that make HVOF-sprayed coatings of Diamalloy 1009 a potential thermal sprayed alternative for hard chrome plating.

Diamalloy 1010 is an iron-chromium alloy with significant nickel content and molybdenum added for improved oxidation and corrosion resistance. It can be used in high temperature applications, especially those involving sliding and abrasion wear such as exhaust valves on internal combustion engines.

1.1 Typical Uses and Applications

- Hard bearing surfaces: bearing journals, fuel pump rotors, sleeves
- Resist abrasive grains: cylinder liners, pistons, pump plungers, hydraulic rams, crankshaft bearings
- Resist fretting (intended or non-intended motion): machine bedways, wear rings, press fits, bearing seats
- Resist particle erosion (low temperature): exhaust fans, hydroelectric valves
- Salvage and buildup on grindable steel: mis-machined parts, worn parts
- High temperature environments to resist oxidation
- Applications where sliding and abrasive wear resistance is required

Quick Facts	
Classification	Iron-based
Chemistry	FeCrNi[Mo]C
Manufacture	Atomized
Morphology	Spheroidal / irregular or spheroidal
Purpose	Hardface corrosive wear resistance
Service Temperature	≤ 650 °C (1200 °F)
Process	HVOF



SEM photomicrograph morphology of Diamalloy 1008 (top) and Diamalloy 1009 (bottom)

2 Material Information

2.1 Chemical Composition (nominal wt. %)

Product	Fe	Cr	Mo	Ni	Si	B	Cu	C
Diamalloy 1008	Balance	18	12	4	3.5	3	2.5	0.6
Diamalloy 1009	Balance	33	---	8	---	4.8	---	0.6
Diamalloy 1010	Balance	28	4.5	16	1.5	---	---	1.75

2.2 Particle Size Distribution and Other Characteristics

Product	Nominal Particle Size Distribution (µm)	Morphology	Manufacturing Method
Diamalloy 1008	–45 +5.5	Spheroidal / Irregular	Atomized Blend
Diamalloy 1009	–53 +20	Spheroidal	Gas Atomized
Diamalloy 1010	–45 +16	Spheroidal	Gas Atomized

Upper particle size determined by sieve analysis, lower particle size analysis by laser diffraction (Microtrac).

2.3 Key Selection Criteria

- Diamalloy 1008, Diamalloy 1009 and Diamalloy 1010 are designed for application using the HVOF spray process.
- Diamalloy 1008 and Diamalloy 1009 can be used as an effective and economical alternatives to hard chromium plating, as well as thermal sprayed Cr_3C_2-NiCr coatings and tool steel-based coatings. These two materials are also superior to NiCrFeSiBC-type coating in terms of economics, but also exhibit excellent wear resistance.
- Diamalloy 1009 is best suited for less critical, cost-sensitive applications.
- Diamalloy 1008 and Diamalloy 1010 are recommended for those applications where high temperature oxidation plays a critical role; however, Diamalloy 1010 offers superior oxidation and corrosion resistance compared to Diamalloy 1008.
- Diamalloy 1009 and Diamalloy 1010 offer a more favorable combination of wear and corrosion resistance compared to Diamalloy 1008.
- Diamalloy 1009 and Diamalloy 1010 can be used in applications where sliding wear, abrasion resistance and higher hardness is desired.
- The high chromium content combined with the nickel content of Diamalloy 1009 and Diamalloy 1010 contribute to the excellent corrosion resistance of these two alloys.

2.4 Related Products

- To maximize the corrosion resistance of Diamalloy 1008 coatings, use a sealer such as Metcoseal™ AP or other appropriate sealer product.
- If greater coating thickness is required, the use of a bond coat such as Diamalloy 4008NS is strongly recommended.
- Better wear resistance and acceptable corrosion resistance can be achieved with atmospheric plasma sprayed self-fluxing alloys such as Metco 12C, Metco 14E, Metco 15E, Metco 15F or Metco 16C-NS. For HVOF spray, Diamalloy 2001 can be used. When fused, coatings are fully dense, virtually free of porosity and metallurgically bonded to the substrate. However, these materials can also be used in the as-sprayed condition provided that coating wear properties and bond strength are sufficient for the application.
- If significantly higher wear resistance is required for applications below 500 °C (930 °F), tungsten carbide cobalt powders such as WOKA 31XX and WOKA 32XX series products should be chosen.
- Choose Metco 5803 or Metco 5803-1 [WC 12Co 25Ni-based superalloy] to produce coatings that have an excellent combination of wear and corrosion resistance. Coatings of these materials applied using the HVOF process have corrosion resistance and fatigue properties comparable to hard chromium plating. The coatings are resistant to wear by abrasion, contact with hard surfaces, particle erosion and fretting at temperatures up to 500 °C (930 °F).
- If high temperature wear and oxidation resistance is required at temperatures up to 800 °C (1470 °F), Cr_3C_2-NiCr products such as WOKA 71XX, WOKA 72XX or WOKA 73XX series can be used. These coatings are excellent hard chromium alternatives with especially good corrosion resistance in chloride, acidic and alkaline environments.

3 Coating Information

3.1 Key Thermal Spray Coating Information

Specification		Diamalloy 1008
Spray Process		HVOF
Spray Gun		DiamondJet 2700
Deposit Efficiency (approx.)	%	70
Macrohardness	HR15N	85 – 86
Microhardness	HV0.3	740 – 750
Porosity	vol. %	1.5 – 2.0
Surface Roughness Ra (as sprayed)	µm µin	5.6 – 6.3 220 – 250
Finishing Recommendations		Grind using silicon carbide or aluminum oxide wheels

Data is provided for reference. Results are typical using Oerlikon Metco starting parameters with the coating process and spray gun listed here. Variations in spray parameters or the use of different equipment can result in significant differences in coating results.

3.2 Coating Parameters

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.

Recommended HVOF Spray Guns
DiamondJet (water-cooled)

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
Diamalloy 1008	1000802	5 lb (approx. 2.25 kg)	Stock	Global
Diamalloy 1009	1078836	5 kg (approx. 11 lb)	Special Order	Global
Diamalloy 1010	1078424	5 kg (approx. 11 lb)	Special Order	Global

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Tumble contents gently prior to use to prevent segregation.
- Open containers should be stored in a drying oven to prevent moisture pickup.

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 Oerlikon web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).

Product	SDS No.
Diamalloy 1008	50-328
Diamalloy 1009	50-1484
Diamalloy 1010	50-1539

www.oerlikon.com/metco
info.metco@oerlikon.com