

Material Product Data Sheet

Amdry DF-4B Diffusion Braze Alloy

Products: Amdry DF-4B

1 Introduction

Amdry™ DF-4B diffusion braze alloy was developed by Oerlikon Metco for repair and restoration of turbine engine components used in the aerospace and energy markets. The braze alloy is a spheroidal, gas-atomized, nickel-based powder with excellent chemical homogeneity and high purity that results in consistent processing results.

The addition of aluminum in Amdry DF-4B promotes gamma-prime (γ') strengthening while tantalum promotes solid solution hardening. Thus, Amdry DF-4B yields braze qualities not found in standard high-temperature braze alloys.

A diffusion cycle of 2 to 4 hours is typical for a post-braze thermal cycle for Amdry DF-4B to promote formation of a homogeneous diffusion interface between the joint and base metal.

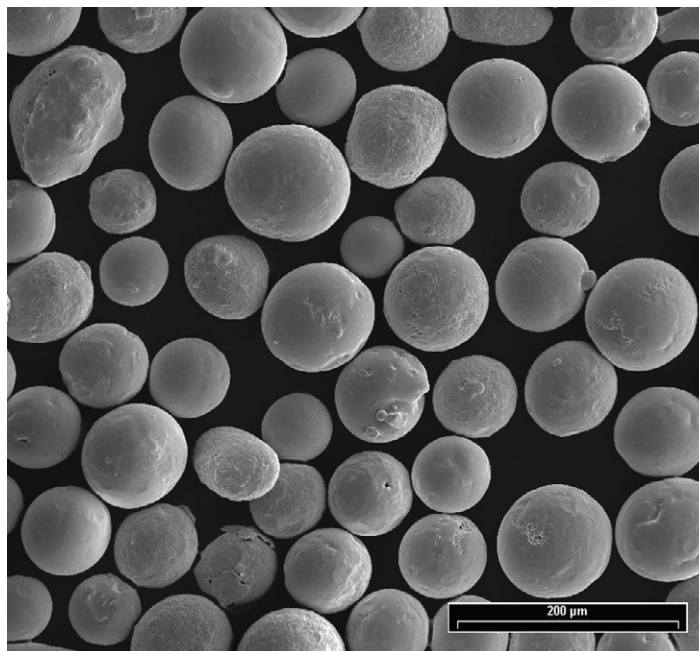
1.1 Typical Use and Applications

Usually used as a brazing filler metal for:

- Repair and restoration of turbine components
- Brazing and repair of superalloy components such as Rene 80, Rene 95, IN738, IN792 and MM247
- Thick build-ups of up to 1.5 mm (0.060 in) to repair worn or damaged areas when blended with a compatible superalloy powder
- Braze joints where the component service conditions require strong, tough, resilient joints
- Applications where the metallurgical properties of the braze joint or deposit must be similar to the base metal

Quick Facts

Classification	Nickel-based diffusion braze alloy
Chemical formula	Ni 14Cr 10Co 3.5Al 2.5Ta 2.75B 0.05Y
Manufacture	Gas Atomization
Morphology	Spheroidal
Density	7.65 g/cm ³
Melting point	1122 °C (2050 °F)
Purpose	Joining, repair and restoration
Process	Diffusion brazing
Gap size	0.05 – 0.25 mm (0.002 – 0.01 in)
Viscosity	Sluggish
Joint strength	Excellent
Ductility	Good



SEM of typical gas atomized braze filler metal powder particles

2 Material Information

2.1 Chemical Composition

Product	Weight Percent						
	Ni	Cr	Co	Al	Ta	B	Y
Amdry DF-4B	Balance	13.0 – 15.0	9.0 – 11.0	3.25 – 3.75	2.25 – 2.75	2.5 – 3.0	0.01 – 0.10

2.2 Particle Size Distribution

Product	Nominal Range	
	micrometers (µm)	Mesh (ASTM)
Amdry DF-4B	-106 +45 µm	-140 +325 mesh

Other particle size distributions may be available on request. Please contact your Oerlikon Metco Account Manager.

2.3 Key Selection Criteria

- Amdry DF-4B is available as a powder. Paste, tape or preforms to aid in application of DF-4B are available on a special order basis.
- Amdry DF-4B can also be special ordered pre-blended to specific ratios with a filler metal appropriate to the specific application.

2.4 Related Products

- Before considering an alternative product, customers should also review product compliance with required specifications.
- Amdry DF-3 diffusion braze alloy is similar in chemistry and brazing range to Amdry DF-4B, but can be used for

applications where a less viscous filler metal is desired to fill smaller gaps.

- Amdry 775 is a diffusion braze alloy that brazes at a lower temperature than Amdry DF-4B. Amdry 775 has high chromium content for excellent oxidation and corrosion resistance on superalloy and stainless steel components. Boron as the melt suppressant allows for diffusion and a homogeneous deposit.
- Oerlikon Metco produces a number products appropriate for diffusion brazing joining and repair applications. Please refer to Product Data Sheet DSMB-0005 for more information on these products and contact Oerlikon Metco with your specific requirements.

2.5 Customer Specifications

Amdry DF-4B	Rolls-Royce MSRR 9500/724
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3 Braze Processing Information

3.1 Key Processing Information

Substrate preparation	Clean and dry, free of oxides and organic contaminants. Nickel flash substrates rich in titanium or aluminum to improve flow through the joint.		
Flux requirements	None		
Recommended atmospheres	Vacuum		
Other atmospheres	None		
Melting range	Solidus	1065 °C	1950 °F
	Liquidus	1121 °C	2050 °F
Braze range	1149 °C – 1191 °C		2100 °F – 2175 °F
Recommended diffusion cycle	2 – 4 h @	1080 °C	1975 °F
Viscosity	Sluggish		
Recommended gap size	0.05 – 0.25 mm		0.002 – 0.01 in

3.2 Key Braze Joint Information

Joint strength	Excellent
Joint ductility	Good
Corrosion resistance	Excellent
Oxidation resistance	Excellent

3.3 Rebrazing

During the braze cycle, the braze filler metal interacts metallurgically with the substrate to alter the braze alloy's

chemical composition, resulting in an increased remelt temperature. The new melting temperature cannot be accurately predicted; therefore, each particular application must be investigated for variation. If a rebraze operation is designed as part of the original manufacturing process, or as a repair operation, it is important to determine the rebraze temperature. To ensure minimal effects on the original braze joint, it is best to braze at the upper limit of the braze range for the maximum time the part can withstand. It is then recommended that subsequent cycles be performed below the original braze temperature.

4 Commercial Information

4.1 Ordering Information and Availability

Product	Form	Order No.	Package Size	Availability	Distribution
Amdry DF-4B	Powder	1022164	5 lb (approx. 2.25 kg)	Stock	Global

Other product forms and packaging combinations are available on a special order basis. Braze paste, customized braze tape and preforms are available to meet specific customer requirements. Please contact your local Oerlikon Metco sales office or account representative for additional information.

4.2 Handling Recommendations

- Store in the original, closed container in a dry location.
- Tumble contents prior to use to prevent segregation.

4.3 Safety Recommendations

See the SDS 50-802 (Safety Data Sheet) for the product form and 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).