

# Material Product Data Sheet

## Amdry DF-3 Diffusion Braze Alloys

**Products:**

**Amdry DF-3, Amdry DF-3-325**

**1 Introduction**

The Amdry™ DF-3 family of materials was developed by Oerlikon Metco as diffusion braze alloys for turbine engine component repair and restoration. The powders are high purity, spheroidal and inert gas-atomized with excellent chemical homogeneity and ensuring consistent processing results.

These braze alloys produce good results on both nickel and cobalt based substrates. The high chromium content provides improved joint strength and excellent oxidation and corrosion resistance. Brittle phases are minimized when the boron is diffused out of the braze joint or deposit, leaving a more ductile, machinable deposit.

Amdry DF-3 braze alloys are less viscous than some other repair alloys, so tight or deep cracks can be repaired.

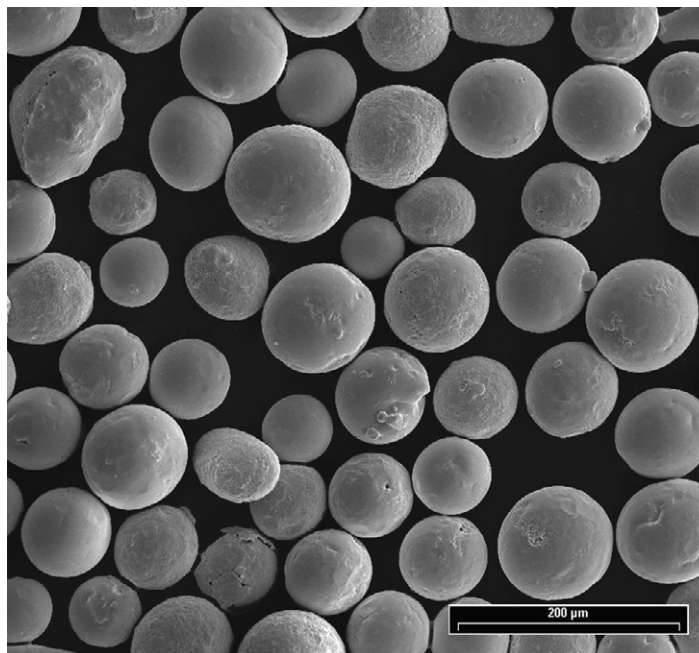
**1.1 Typical Use and Applications**

Usually used as a brazing filler metal for:

- Braze repair or restoration of nickel or cobalt based superalloy components
- Braze repair of tight or deep cracks
- Braze repair of worn or damaged areas, or brazed replacement of component sections, when Amdry DF-3 is blended with a suitable superalloy powder
- Joining or repair of superalloy substrates such as Rene 80, IN738, IN959, IN625, MA-754 and MM247 where the braze interface must be very similar to the parent material
- Wide-gap applications with build-ups of up to 1.5 mm (0.06 in) when mixed with a compatible superalloy powder

**Quick Facts**

Classification	Nickel-based diffusion braze alloy
Chemical formula	Ni 20Cr 20Co 3B 3Ta 0.05La
Manufacture	Gas Atomization
Morphology	Spheroidal
Density	7.65 g/cm <sup>3</sup>
Melting point	1121 °C (2050 °F)
Purpose	Joining, repair and restoration
Process	Diffusion brazing
Gap Size	0.05 – 0.1 mm (0.002 – 0.004 in)
Viscosity	Medium
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	B	Ta	La
Amdry DF-3	Balance	19.0 – 21.0	19.0 – 21.0	2.8 – 3.2	2.5 – 3.5	0.01 – 0.10
Amdry DF-3 -325	Balance	19.0 – 21.0	19.0 – 21.0	2.8 – 3.2	2.5 – 3.5	0.01 – 0.10

### 2.2 Particle Size Distribution

Product	Nominal Range	
	micrometers (µm)	Mesh (ASTM)
Amdry DF-3	-106 +45 µm	-140 +325 mesh
Amdry DF-3 -325	-45 µm	-325 mesh

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

### 2.3 Key Selection Criteria

- Choose the powder that meets the required customer material specification, and/or the particle size distribution suitable to the application method to be used.
- Amdry DF-3 is available as a powder. Paste, tape or pre-forms to aid in application of DF-3 are available on a special order basis.
- Amdry DF-3 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-4B diffusion braze alloy has a chemistry similar to that of Amdry DF-3. Amdry DF-4B can be used on the same base metals when a more viscous flow is desirable.
- Amdry BRB diffusion braze alloy can be used in place of Amdry DF-3 when lower brazing temperatures are desirable.

### 2.5 Customer Specifications

Amdry DF-3	Honeywell EMS 54752, Type XVIII
Amdry DF-3-325	Tulsa Airfoil Repair MS 2033

## 3 Braze Processing and Joint 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	Type	Pure dry H <sub>2</sub>	
	Dew point	≤ -52 °C	≤ -60 °F
Melting range	Solidus	1050 °C	1920 °F
	Liquidus	1121 °C	2050 °F
Braze range	1191 – 1218 °C		2175 – 2225 °F
Recommended diffusion cycle	2 – 4 h @	1080 °C	1975 °F
Viscosity	Medium		
Recommended gap size	0.05 – 0.1 mm	0.002 – 0.004 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-3	Powder	1005575	5 lb (approx. 2.25 kg)	Special Order	Global
Amdry DF-3-325	Powder	1001792	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 50-801 (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](http://www.oerlikon.com/metco) (Resources – Safety Data Sheets).