

Material Product Data Sheet

Amdry Activated Diffusion Braze Alloys

Products:

Amdry 485/509, Amdry 718B, Amdry 775, Amdry 788, Amdry 8249, Amdry 8626, Amdry BRB, Amdry BRB-325, Amdry D-15, Amdry DF-3, Amdry DF-3-325, Amdry DF-6A, Amdry MM509B-C, Amdry MM509B-F

1 Introduction

Amdry™ nickel and cobalt Activated Diffusion Braze (ADB) alloys are designed for restoration and repair of aircraft and industrial gas turbine components. These components, which are constructed of superalloy materials and operate under very demanding conditions, are subject to wear, thermal fatigue and foreign object damage. Component replacement is very expensive, hence cost-effective repair and restoration processes were developed. Diffusion brazing using a diffusible braze alloy is well-proven as a highly successful, cost-effective process to return previously worn and damaged parts to service.

Amdry ADB alloys are produced and available as powders. They are manufactured by dry gas atomization, insuring consistency, purity and conformity to rigid aerospace and industrial standards. For many crack repair and surface restoration processes, the ADB alloy is blended with a superalloy powder. Many of these superalloy materials are available from Metco Joining & Cladding (see Product Data Sheet DSM-0239 for more information).

While blending of the ADB alloy with a superalloy powder can be done by the customer, pre-blends in desired ratios can be supplied. Blends can also be supplied as braze paste, tape or preforms for a more precise and cost-effective method of application. Metco Joining & Cladding also offers proprietary ADB alloys for turbine OEM's. These products, available individually or as blends with specific superalloy materials, are only available to OEM-approved users.

1.1 Typical Use and Applications

Blended in various ratios with superalloy or filler powders for

- Crack repair and surface restoration on superalloy turbine components such as blades, vanes, shrouds and combustors.
- General repair and restoration of superalloy components.
- Brazing of superalloy details for high temperature service conditions.
- Blended with filler powders such as pure nickel or nickel-chromium for wide-gap brazing applications.

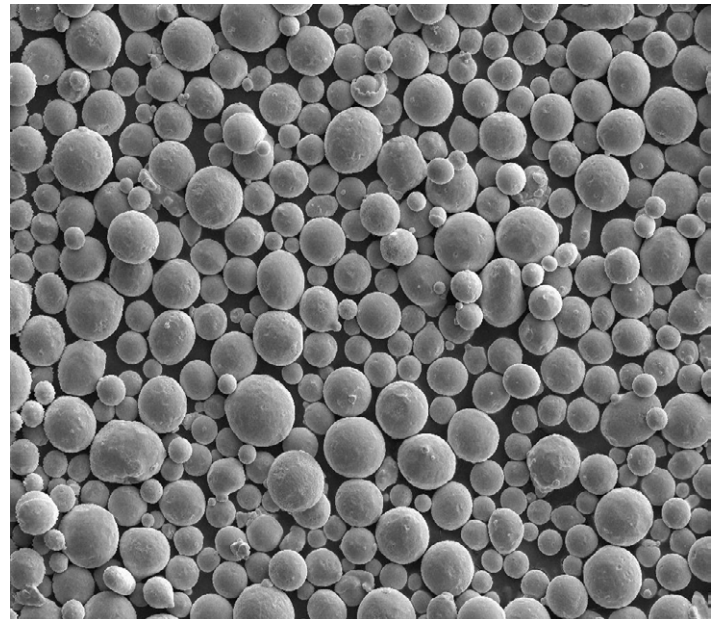
DSM-0243.3 – Amdry™ Activated Diffusion Braze Alloys

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Quick Facts

Classification	Nickel- and cobalt-based Activated Diffusion Braze alloy powders
Chemical formula	Various
Manufacture	Gas Atomization
Morphology	Spheroidal
Purpose	Repair, restoration, joining
Process	Diffusion and high-temperature brazing
Viscosity*	Medium to sluggish

* Varies depending on the specific ADB alloy chosen



SEM of typical, gas atomized superalloy powder particles

2 Material Information

2.1 Nominal Chemistry and Particle Size Distribution

Product	Nominal Chemistry	Nominal Particle Size Distribution	
	Wt. %	Micrometers (µm)	Mesh (ASTM)
Amdry 485/509		Proprietary Blend	
Amdry 718B	Ni 18.5Cr 18Fe 5(Cb+Ta) 3Mo 2.5B 1Ti 0.5Al 0.5C	-106 +45	-140 +325
Amdry 775	Ni 14.5Cr 3.5B	-106 +45	-140 +325
Amdry 788	Co 22Cr 21Ni 14W 2B 2Si	-106 +45	-140 +325
Amdry 8249		Proprietary Blend	
Amdry 8626-2		Proprietary Blend	
Amdry 8626-4		Proprietary Blend	
Amdry BRB	Ni 13.5Cr 9.5Co 4Al 2.5B	-150 +45	-100 +325
Amdry BRB-325	Ni 13.5Cr 9.5Co 4Al 2.5B	-45 +10	-325 +10 µm
Amdry D-15	Ni 15Cr 10.25Co 3.5Ta 3.5Al 2.3B	-125 +45	-120 +325
Amdry DF-3	Ni 20Cr 20Co 3B 3Ta 0.5La	-106 +45	-140 +325
Amdry DF-3-325	Ni 20Cr 20Co 3B 3Ta 0.5La	-45	-325
Amdry DF-6A	Ni 20Cr 3Ta 3.2B 0.1Y	-106 +45	-140 +325
Amdry MM509B-C	Co 24Cr 10Ni 7W 3.5Ta 2.5B 0.6C	-106 +45	-140 +325
Amdry MM509B-F	Co 24Cr 10Ni 7W 3.5Ta 2.5B 0.6C	-45 +5	-325 +5 µm

Note:
 Proprietary Alloy: Proprietary ADB alloy product available to OEM approved customers.
 Proprietary Blend: Proprietary ADB alloy product blended in a specified ratio with a superalloy powder available to OEM approved customers.

2.2 Chemical Composition (by weight %) of Non-Proprietary Products

	Amdry 718B	Amdry 775	Amdry 788	Amdry BRB / BRB-325	Amdry D-15	Amdry DF-3 / Amdry DF-3-325	Amdry DF-6A	Amdry MM509B-C / Amdry MM509B-F
Al	0.3–0.7			3.5–4.5	3.2–3.7			
B	2.1–2.5	3.0–4.0	1.8–2.2	2.25–2.75	2.1–2.5	2.8–3.2	2.8–3.5	2.0–3.0
C	0.02–0.08							0.55–0.65
Co			Bal.	9.0–10.0	9.5–11.0	19.0–21.0		Bal.
Cr	16.5–20.4	13.0–17.0	20.0–23.0	13.0 – 14.0	14.8–15.8	19.0–21.0	19.0–21.0	22.5–24.5
Fe	16.0–19.9							
La			0.02–0.10			0.01–0.10		
Mo	2.7–3.2							
Nb+Ta	4.6–5.3							
Ni	Bal.	Bal.	20.0–23.0	Bal.	Bal.	Bal.	Bal.	9.0–11.0
Si			1.8–2.2					
Ta					3.0–3.8	2.5–3.5	2.5–3.5	3.0–4.0
Ti	0.7–1.1							0.15–0.30
W			13.0–15.0					6.5 – 7.5
Y							0.04–0.15	
Zr								0.30–0.60

2.3 Key Selection Criteria

- Choose the Amdry superalloy powder material that:
 - Meets the required customer material specification
 - Has the best metallurgical compatibility with the substrate material
 - Is compatible with the superalloy blend powder
 - Meets the particle size best suited for the repair application
 - Has a viscosity appropriate for the repair area or joint to be brazed
 - Has a braze range suitable to the component and component substrate
- Typical blend ratios of braze alloy to superalloy are 50/50, 60/40 and 40/60; however, excellent results can be obtained with other ratios. Braze tests are recommended to achieve optimal results.
- Metco Joining & Cladding can offer these products pre-blended with an appropriate superalloy material as powder, paste, tape or tape preforms. Please see the Commercial Section of this document and the data sheet for Amdry Braze Pastes or Amdry Braze Tapes and Preforms for additional information.

- Proprietary blends are available to meet Pratt Whitney specifications. Please refer to the Customer Specifications section.

2.4 Related Products

- Amdry 400 and Amdry B-93, while often used in turbine repair processes on older engines, do not offer the diffusion advantages of ADB alloys. These materials are not recommended for new turbine applications. Furthermore, wherever possible, it is suggested that older repair processes be updated to use an appropriate ADB braze alloy.
- Amdry superalloy materials are often blended with superalloy powders. Please see the Materials Data Sheets for each product and data sheet for Superalloy Powders) for more information. These products include:

Amdry 625	Amdry 8670
Amdry 718	Amdry MM509
Amdry 738	Amdry Rene 80
Amdry 8625	

2.5 Customer Specifications

Superalloy Product	Customer Specification
Amdry 485/509*	Pratt & Whitney PWA 1185, Blend 1
Amdry 718B	GE B50TF203, Class A Tulsa Airfoil Repair MS 1089
Amdry 775	GE B50TF207, Class A Honeywell EMS 54752, Type VIII MTU MTS 1295 Pratt & Whitney PWA 36962 Rolls-Royce Ltd. MSRR 9500/719 Tulsa Airfoil Repair MS 1090
Amdry 788	MTU MTS 1523-1
Amdry 8249*	Pratt & Whitney PWA 36117 Blend 2
Amdry 8626*	Pratt & Whitney PWA 36119 Blend 1, 2, 3 or 4 (specify when ordering)
Amdry BRB	Chromalloy Arizona BZ003, Type 10 Honeywell EMS 54752, Type XIX MTU MTS 1391
Amdry D-15	GE B50A942, Class A GE B50TF173, Class A Tulsa Airfoil Repair MS 1085
Amdry DF-3	Honeywell EMS 54752, Type XVIII
Amdry DF-3-325	Tulsa Airfoil Repair MS 2033
Amdry DF-6A	Honeywell EMS 54752, Type XIV Honeywell EMS 54752, Type XV
Amdry MM509B-C	GE B50A989, Class A
Amdry MM509B-F	GE B50A989, Class B

* Proprietary product that is only available to users approved by Pratt and Whitney.

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 into the joint.
Flux requirements	None
Recommended atmospheres	Vacuum
Other atmospheres	Some ADB alloys are tolerant of H ₂ atmospheres. Please check specific product datasheet for further information.
Recommended diffusion cycle	2 – 4 h @1080 °C (1975 °F)

3.2 Solidus, Liquidus, Braze Range, Viscosity and Gap Size (non-proprietary products)

Product	Viscosity	Solidus	Liquidus	Braze Range	Gap Size
Amdry 718B	Sluggish	1140 °C 2020 °F	1232 °C 2250 °F	1232 – 1274 °C 2250 – 2325 °F	0.05 – 0.38 mm 0.002 – 0.015 in
Amdry 775	Medium	1021 °C 1870 °F	1052 °C 1925 °F	1066 – 1204 °C 1950 – 2200 °F	0.012 – 0.1 mm 0.0005 – 0.004 in
Amdry 788	Sluggish	1160 °C 2120 °F	1241 °C 2265 °F	1218 – 1260 °C 2225 – 2300 °F	0.05 – 0.15 mm 0.002 – 0.006 in
Amdry BRB / Amdry BRB-325	Medium	1055 °C 1931 °F	1120 °C 2048 °F	1177 – 1232 °C 2150 – 2250 °F	0.05 – 0.5 mm 0.002 – 0.02 in
Amdry D-15	Medium	1093 °C 2000 °F	1163 °C 2125 °F	1175 – 1220 °C 2150 – 2230 °F	0.05 – 0.25 mm 0.002 – 0.010 in
Amdry DF-3 / Amdry DF-3-325	Medium	1050 °C 1920 °F	1121 °C 2050 °F	1191 – 1218 °C 2175 – 2225 °F	0.05 – 0.1 mm 0.002 – 0.004 in
Amdry DF-6A	Medium	1052 °C 1925 °F	1060 °C 2120 °F	1170 – 1218 °C 2140 – 2225 °F	0.05 – 0.25 mm 0.002 – 0.01 in
Amdry MM509B-C / Amdry MM509B-F	Sluggish	1130 °C 2065 °F	1165 °C 2130 °F	1175 – 1260 °C 2150 – 2300 °F	0.05 – 0.1 mm 0.002 – 0.004 in

3.3 Key Braze Joint Information (non-proprietary products)

Product	Joint Strength	Joint Ductility	Corrosion Resistance	Oxidation Resistance
Amdry 718B	Excellent	Good	Excellent	Excellent
Amdry 775	Excellent	Excellent	Excellent	Excellent
Amdry 788	Excellent	Good	Excellent	Excellent
Amdry BRB / Amdry BRB-325	Excellent	Good	Excellent	Good
Amdry D-15	Good	Good	Excellent	Excellent
Amdry DF-3 / Amdry DF-3-325	Excellent	Good	Excellent	Excellent
Amdry DF-6A	Excellent	Good	Excellent	Excellent
Amdry MM509B-C / Amdry MM509B-F	Excellent	Good	Excellent	Excellent

3.4 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 485/509	Paste (CNT)	1031859 1031861	3 lb (approx. 1.36 kg) cartridge 8 oz (approx. 225 g) syringe	Special Order	Global
Amdry 718B	Powder	1001415	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 775	Powder	1001423	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 788	Powder	1032401	5 lb (approx. 2.25 kg)	Stock	Global
Amdry 8249 ^a	Paste (CNT)	1030142	8 oz (approx. 225 g) syringe	Special Order	Global
Amdry 8626-2	Powder	1030092	10 lb (approx. 4.5 kg)	Special Order	Global
Amdry 8626-4	Paste (CNT)	1041224	3.5 oz (approx. 99 g) syringe	Special Order	Global
Amdry BRB	Powder	1001763	5 lb (approx. 2.25 kg)	Special Order	Global
Amdry BRB-325	Powder	1001764	5 lb (approx. 2.25 kg)	Special Order	Global
Amdry D-15	Powder	1001791	5 lb (approx. 2.25 kg)	Stock	Global
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
Amdry DF-6A	Powder	1018627	10 lb (approx. 4.5 kg)	Stock	Global
Amdry MM509B-C	Powder	1030113	10 lb (approx. 4.5 kg)	Stock	Global
Amdry MM509B-F	Powder	1030109	10 lb (approx. 4.5 kg)	Special Order	Global

^a Blend 2

Please note that other product forms (paste, tape and preforms) are available on request.

For commercial information on proprietary blends, please see the applicable data sheet for the braze filler metal. Customized braze filler metal / superalloy blends in the form of powder, paste, braze tape and preforms are available to

meet specific customer requirements. Please contact your local Metco Joining & Cladding 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 (Safety Data Sheet) in the product form and the version localized for the country where the material will be used. SDS are available from the Oerlikon web site at www.metcojoiningcladding.com (Resources – Safety Data Sheets).

Product	SDS
Amdry 485/509 (CNT paste)	50-864
Amdry 718B	50-952
Amdry 775	50-1436
Amdry 788	50-837
Amdry 8249 (CNT paste)	50-985
Amdry 8626-2	50-995
Amdry 8626-4	50-995
Amdry BRB	50-798
Amdry BRB-325	50-798
Amdry D-15	50-800
Amdry DF-3	50-801
Amdry DF-3-325	50-801
Amdry DF-6A	50-824
Amdry MM509B-C	50-953
Amdry MM509B-F	50-953

Information is subject to change without prior notice.