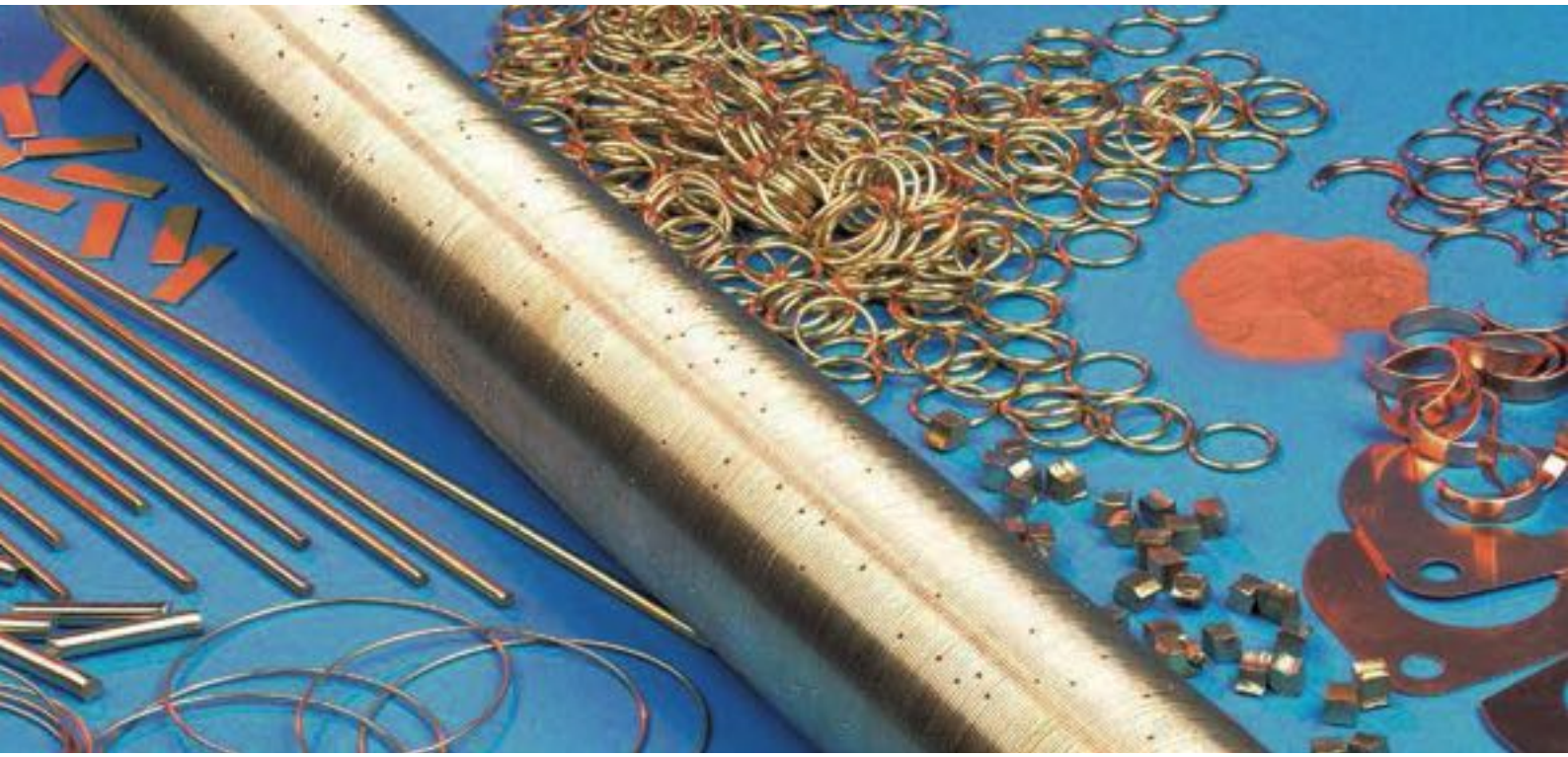
Johnson Matthey



ARGENTEL™
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BASE METAL BRAZING FILLER METALS

BASE METAL BRAZING FILLER METALS

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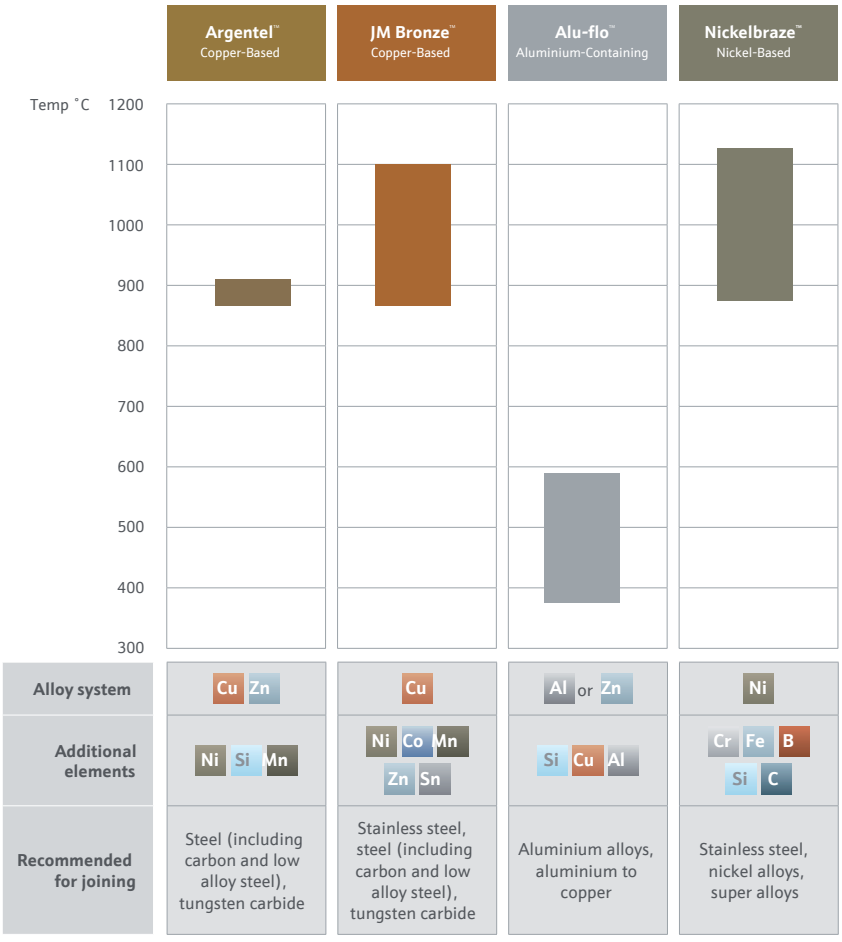
products at a glance



ARGENTEL™

PRODUCTS

argentel™ brazing filler metals

These copper-zinc based products are designed for braze/bronze welding applications. Typical applications involve joining tubular steel parts for automotive components, on bicycles and furniture. They have also been used to join steel to tungsten carbide in specific applications.

Argentel™

Specification						Properties		
Cu	Zn	Ni	Sn	Si	Mn	Melting Range °C	EN1044	ISO 17672
48	Bal.	10	-	0.2	-	890-920	CU305	Cu 773

Argentel™ is a braze/bronze welding filler metal that contains nickel, which makes the alloy stronger and harder but less fluid when molten than a standard Cu-Zn filler metal such as Argentel™ No.1 or Argentel™ 303.

Argentel™302

Cu	Zn	Ni	Sn	Si	Mn	Melting Range °C	EN1044	ISO 17672
60	Bal.	-	0.35	0.3	-	875-895	CU302	-

Argentel™ 302 and products of a similar composition contain controlled additions of tin and silicon. This improves the flow and surface appearance and gives reasonable filler metal penetration.

Argentel™No. 1

Cu	Zn	Ni	Sn	Si	Mn	Melting Range °C	EN1044	ISO 17672
60	39.7	-	-	0.3	-	875-895	CU301	Cu 470a

Argentel™ No. 1 and products of a similar composition (Formerly JM CZ6) are designed for use in a braze/bronze welding process joining steel components and also for brazing steel to tungsten carbide in tooling applications.

Argentel™303

Cu	Zn	Ni	Sn	Si	Mn	Melting Range °C	EN1044	ISO 17672
60	Bal.	-	0.2	0.3	0.15	870-900	CU303	Cu 670

Argentel™ 303 and products of a similar composition contain controlled additions of tin and silicon. This improves the flow and surface appearance and gives reasonable filler metal penetration. Recommended when brazing using a gas flux.

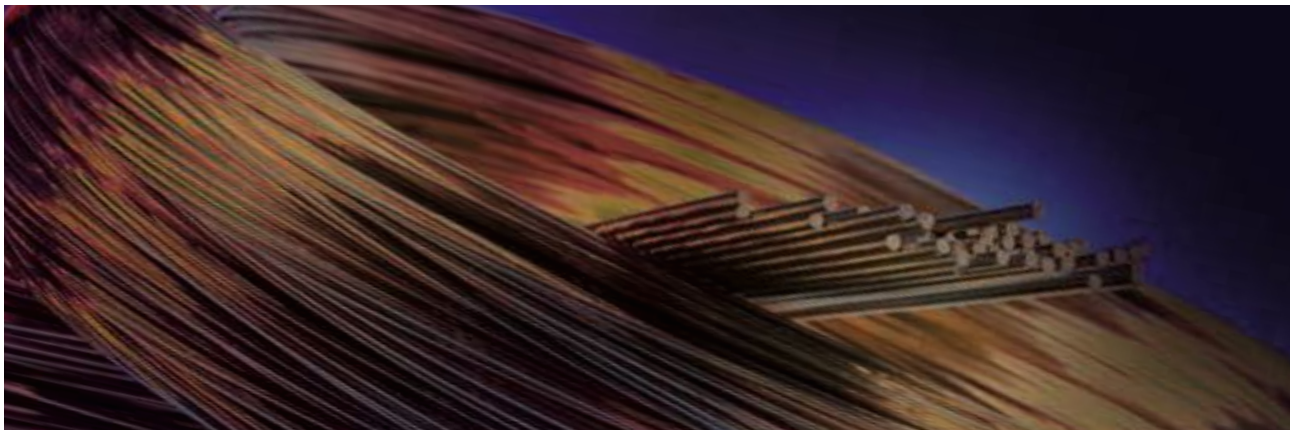
specifications

Available specifications and compositions may vary from those shown above. Argentel™ products will be supplied to the prevailing and commercially available specification at the time of order as agreed with the customer. Alternative products compositions may be available on request. These include Argentel™ 752 (Cu 27.5%, Zn 65%, Sn 7.5%) supplied as a brazing paste for brazing brake pad components.

conditions for use

Braze or bronze welding requires the use of a separate brazing flux. This can be introduced either by using a gas fluxing system or by applying a suitable brazing flux prior to assembly and heating of the components.

Tenacity™ No.20 Flux Powder is a high temperature brazing flux suitable for use with the Argentel™ product range. It is effective between 750-1000°C on copper, mild and low alloy steels and tungsten carbide. Tenacity™ No.125 Flux is also suitable.



JM BRONZE™

products

jm bronze™ and copper brazing filler metals

These copper-based brazing filler metals are used typically in furnace brazing and without a flux.

Copper 99.90%

Cu
99.9

Melting Range °C	1081
AWS A5.8	BCu-1
ISO 17672:2010	Cu 110

Copper (tough pitch) is an effective and inexpensive brazing filler metal for use when brazing all types of steels, as well as tungsten carbide in reducing atmosphere type brazing operations. Copper is very fluid when molten and when brazing carbon steel an interference type joint fit is required.
For brazing carbon steel, joint gaps in the range 0.00 to 0.05 mm are recommended. For stainless steel 0.025 to 0.075 mm.

Copper 99.95% OFHC

Cu
99.9

Melting Range °C	1081
EN1044: 1999	CU101
ISO 17672:2010	Cu 110

OFHC (oxygen-free high conductivity copper) is used for the vacuum furnace brazing of all types of steels, nickel alloys and tungsten carbide. As molten copper under a vacuum of 1 x 10^{-4} becomes volatile, a partial pressure vacuum brazing technique is commonly employed to suppress vaporisation. For brazing carbon steel, joint gaps in the range 0.00 to 0.05 mm are recommended. For stainless steel 0.025 to 0.075 mm.

B Bronze™

Cu	Ni	B
97	3	0.03

Melting Range °C	1081-1101
EN1044: 1999	CU105
ISO 17672:2010	Cu 186

B Bronze™ is a copper-nickel brazing filler metal with a controlled addition of boron. It was developed by Johnson Matthey for the furnace brazing of stainless steel and mild steel under reducing atmospheres. It will penetrate joint gaps ranging from an interference fit up to 0.5 mm and is used to braze mild steels where the gaps are too large for copper. It demonstrates resistance to interfacial corrosion on ferritic and austenitic stainless steels.

P Bronze™

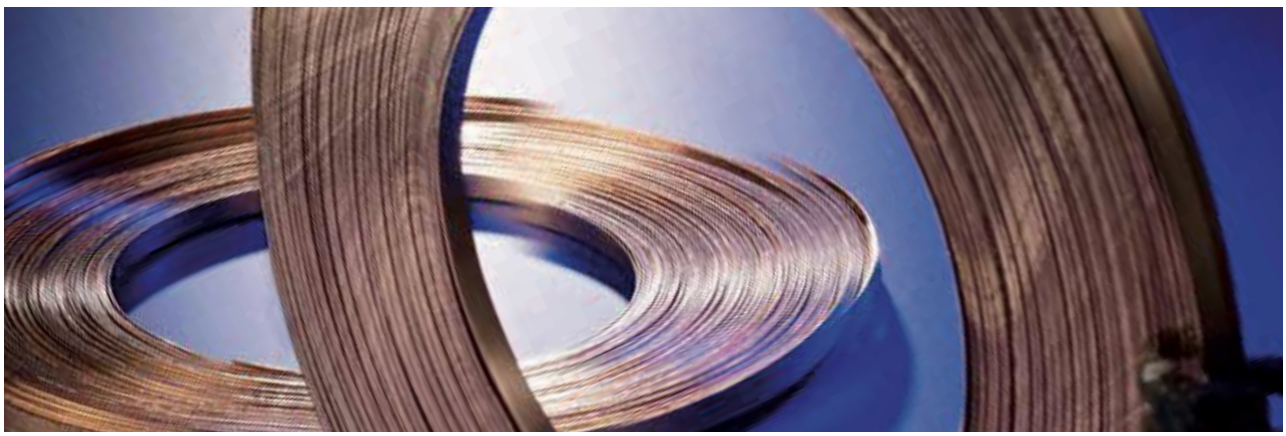
Cu	Sn	P
91.75	8	0.25

Melting Range °C	882-1027
Standard	CDA521

P Bronze™ is a copper-tin bronze alloy used for the brazing of mild steels where the gaps are too large for the use of copper (i.e. over 0.025 mm) or where a lower temperature than the melting temperature of copper is required, for example when brazing copper to steel components.
Typical applications include refrigeration dryers and automotive parts.

specifications

Available specifications and compositions may vary from those shown above. Copper products for brazing will be supplied to the prevailing and commercially available specification at the time of order as agreed with the customer. Copper brazing pastes are specially formulated to suit specific furnace conditions and hence may be supplied to different specifications from those listed.



JM BRONZE™

products

jm bronze™ brazing filler metals

The specialised Johnson Matthey Bronze™ filler metals shown here are principally used for the brazing of steel and tungsten carbide components. The addition of manganese with nickel or cobalt has been shown to improve wetting and bonding of the filler metal onto tungsten carbide.

C Bronze™

Cu	Ni	Mn
86.85	2.15	11
Melting Range °C		965-995
Specification		Proprietary

C Bronze™ is a copper-manganese-nickel brazing filler metal. It demonstrates resistance to interfacial corrosion on ferritic and austenitic stainless steels. C Bronze™ is also used for brazing tungsten carbide tools in reducing atmosphere furnace conditions where it shows good wetting and produces strong joints. Also used to braze 13% Cr stainless steel tube in a combined brazing and heat treatment operation.

D Bronze™

Cu	Co	Mn
86	4	10
Melting Range °C		980-1030
Specification		Proprietary

D Bronze™ is a copper-manganese-cobalt brazing filler metal that was developed for brazing tungsten carbide tipped rock drills. It shows good wetting, joint strength and allows for heat treatment of the drill shank during the brazing cycle. D Bronze™ can be brazed using induction heating equipment or in a reducing atmosphere furnace.

F Bronze™

Cu	Zn	Co	Mn
58	38	2	2
Melting Range °C			890-930
Specification			Proprietary

F Bronze™ is used to braze tungsten carbide tips into tools and drills or tungsten carbide segments onto surfaces to improve cutting, impact or wear resistance. F Bronze™ is used where the heat treatment of the steel drill shank is temperature critical. It can be brazed in air with Tenacity™ No. 125 Flux.

H Bronze™

Cu	Ni	Mn
52.5	9.5	38
Melting Range °C		880-920
Specification		AMS 4764

H Bronze™ is a specialised copper-manganese-nickel brazing filler metal. It is used on cemented tungsten carbide components where it has been shown to produce very strong joints. It is suitable for elevated service temperature applications up to 400°C.

J Bronze™

Cu	Ni	Mn
67.5	9	23.5
Melting Range °C		925-955
Specification		Proprietary

J Bronze™ is a copper-manganese-nickel brazing filler metal.
It is used on tungsten carbide to steel where it has been shown to produce very strong joints and is favoured where its brazing temperature matches the heat treatment temperature of the steel being brazed.

conditions for use

Tenacity™ No.125 Flux Powder is a high temperature brazing flux suitable for use with copper-based brazing filler metals such as D Bronze™, F Bronze™, H Bronze™ and J Bronze™. It is effective on copper and copper alloys, mild and low alloy steels and tungsten carbide. It has a working range of 750-1200°C.

ALU-FLO™

products

alu-flo™ aluminium brazing materials

Johnson Matthey supplies a range of filler metals and fluxes for brazing aluminium alloys such as 1000 series (e.g. 1100), 3000 series (e.g. 3003, 3004), 5005 and some 6000 alloys (eg.6061, 6031, 6951). Typical applications for these products include automotive air-conditioning parts, microwave components, refrigeration, air-conditioning and heat exchanger applications.
Available specifications and compositions may vary from those shown below and will be supplied to the prevailing and commercially available specification at the time of order as agreed with the customer.

Alu-flo™ HT

Specification		Properties		
Al	Si	Melting Range °C	EN1044	ISO 17672
88	12	575-585	AL104	Al 112

Alu-flo™ HT is the standard filler metal for brazing aluminium and is used for manufacturing HVAC&R components from aluminium alloys. Aluminium alloys from the 3000 and 6000 ranges may be joined successfully with this product. Alu-flo™ No.1 Flux Paste or Alu-flo™ No.5 216C Flux Powder should be used with solid forms of Alu-flo™ HT but are not necessary with product forms containing flux such as a brazing paste, flux-cored wire or strip with flux encapsulated into a central channel.

Alu-flo™ MT

Al	Si	Cu	Melting Range °C	EN1044	ISO 17672
86	10	4	520-585	AL201	Al 210

Alu-flo™ MT is less commonly used than Alu-flo™ HT and consequently is available in fewer product forms. It may be used for manufacturing components from the 3000 and 6000 ranges of aluminium alloys where there is a requirement to braze at a lower temperature than that of Alu-flo™ HT. Alu-flo™ No.1 or Alu-flo™ No.2 Flux Paste should be used with Alu-flo™ MT.

Alu-flo™ ZA-1

Al	Zn	Melting Range °C	EN1044	ISO 17672
22	78	441-471°C	-	-

Alu-flo™ ZA-1 is a zinc–aluminium filler metal that can be used as a product for repair of aluminium components or for joining non-critical parts. It has also been used for HVAC&R joints. However, it should be noted that Alu-flo™ ZA-1 joints can exhibit shrink-age gaps formed on cooling and galvanic corrosion when joining copper to aluminium. Consequently special consideration should be given before selecting it. This product is available as a flux-cored wire or strip with flux encapsulated into a central channel.

Alu-flo™ LT

Al	Zn	Melting Range °C	EN1044	ISO 17672
2	98	377-385°C	-	-

Alu-flo™ LT is a high melting point solder used for HVAC&R components made from aluminium alloys. It should be used with Alu-flo™ No.3 Flux Paste. However, because the flux is not active until approximately 35°C above the liquidus of Alu-flo™ LT, care should be taken to avoid erosion of the parent metals by the molten solder. For this reason use of this solder is often limited to hand feeding wire or rod into joints. Alu-flo™ LT may be used for copper to aluminium transition joints in HVAC&R applications.

ALU-FLO™

products

alu-flo™ fluxes for brazing aluminium

Alu-flo™ No.1 Flux Paste

Recommended for

- A working range of 450-650°C
- Excellent dispensability
- Use with aluminium silicon/Alu-flo™ HT filler metals
- Brazing aluminium alloys <620˚C.

Description

An active chloride-based aluminium brazing flux with corrosive flux residues.

Conforms to: **EN1045 FL10**

Flux Characteristics

Fluidity	Good
Activity	High
Life	Medium
Flux Residue Removal	30 min/60˚C
Standard Packaging	1kg

Alu-flo™ No.2 Flux Paste

Recommended for

- A working range of 575-650°C
- Excellent dispensability
- Use with aluminium silicon/Alu-flo™ HT filler metals
- Brazing aluminium alloys <600˚C.

Description

An active fluoride-based aluminium brazing flux with non-corrosive flux residues.

Conforms to: **EN1045 FL20**

Flux Characteristics

Fluidity	Good
Activity	Low
Life	Low
Flux Residue Removal	Not possible
Standard Packaging	1kg

Alu-flo™ No.3 Flux Paste

Recommended for

- A working range of 420-600°C
- Excellent dispensability
- Use with Alu-flo™ zinc-aluminium/ aluminium-silicon filler metals
- Brazing aluminium alloys <600˚C

Description

An active fluoride with the addition of cesium ($CsAlF_4$) to reduce the lower end of the working range. Can be used with Alu-flo™ ZA-1 and Alu-flo™ LT

Non-corrosive flux residues.

Flux Characteristics

Fluidity	Good
Activity	Medium
Life	Medium
Flux Residue Removal	Not possible
Standard Packaging	1kg

Alu-flo™ No.5 216C Grade Flux Powder

Recommended for

- A working range of 450-650°C
- Use with aluminium silicon/Alu-flo™ HT filler metals
- Brazing aluminium alloys <620˚C.

Description

An active chloride-based aluminium brazing flux with corrosive flux residues.

Conforms to: **EN1045 FL10**

Flux Characteristics

Fluidity	Good
Activity	High
Life	Medium
Flux Residue Removal	30 min/60˚C
Standard Packaging	0.5kg

conditions for use

Brazing aluminium requires more care than the brazing of copper to copper joints. Aluminium has approximately half the thermal conductivity of copper and a much lower melting temperature. Overheating can readily occur causing the material to distort and melt. Overheating will also result in poor quality joints and erosion of the aluminium by the brazing filler metal. Aluminium to copper joints are subject to galvanic corrosion and should be protected from water by coating with a suitable permanent barrier such as a paint, lacquer, plastic or rubber wrap.

NICKELBRAZE™

products

nickel-based brazing filler metals

Nickel-based brazing filler metals provide exceptional resistance to chemical corrosion and oxidation coupled with high strength at elevated temperatures. Consequently filler metals from this product group are widely used particularly within the aerospace, nuclear and automotive industries. The products in this range have a variety of compositions that result in differing melting ranges, alloy flow, brazing and joint characteristics.

Nickelbraze™ HTN1

Specification						Properties		
Ni	Cr	Fe	B	Si	C	Melting Range °C	EN1044	ISO 17672
Bal	14	4.5	3.1	4.5	0.7	980-1060	NI101	Ni 600

This general purpose nickel-based brazing filler metal produces high strength, oxidation and corrosion-resistant joints. It is used in highly stressed components and aero-engine applications.

Nickelbraze™ HTN1A

Ni	Cr	Fe	B	Si	Melting Range °C	EN1044	ISO 17672
Bal	14	4.5	3.1	4.5	980-1070	NI101	Ni 610

Nickelbraze™ HTN1A has restricted carbon content and is used for similar applications to HTN1 such as aero-engine and nuclear components.

Nickelbraze™ HTN2

Ni	Cr	Fe	B	Si	Melting Range °C	EN1044	ISO 17672
Bal	7	3	3.1	4.5	970-1000	NI102	Ni 620

This filler metal is the first choice for many applications except for very thin walled assemblies. Good alloy flow allows joint clearances of 0.025-0.1mm. Widely used for automotive EGR parts.

Nickelbraze™ HTN3

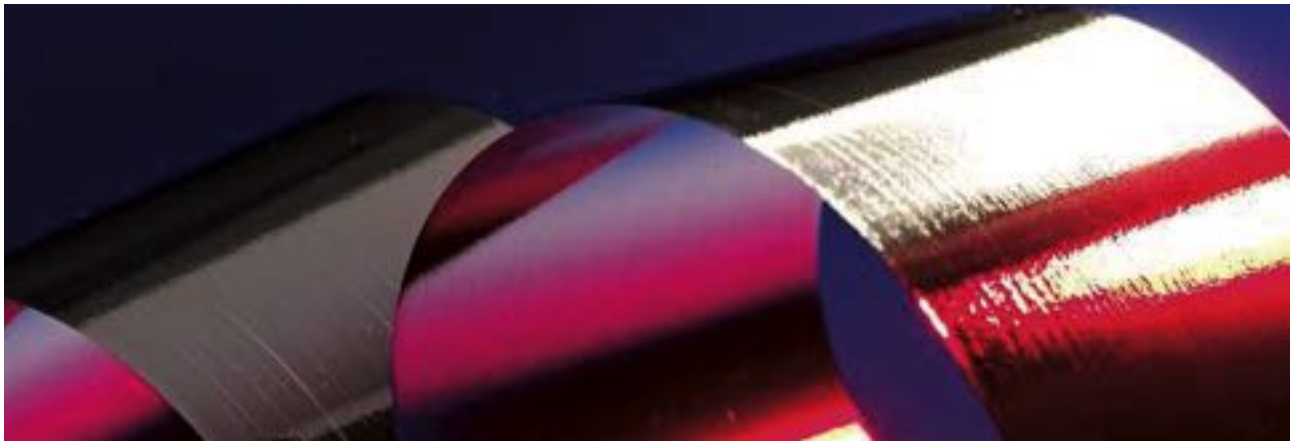
Ni	Fe	B	Si	Melting Range °C	EN1044	ISO 17672
Bal	0.5	3.1	4.5	980-1040	NI103	Ni 630

Nickelbraze™ HTN3 is again similar to HTN1 but finds applications in marginal brazing atmospheres offering good flow where tight joint tolerances are encountered.

Nickelbraze™ HTN4

Ni	Fe	B	Si	Melting Range °C	EN1044	ISO 17672
Bal	0.75	1.9	3.5	980-1070	NI104	Ni 631

This alloy composition produces a wide melting range which can produce large, ductile fillets. It is suitable for brazing components where tight joint tolerances are not possible.



NICKELBRAZE™ products

nickel-based brazing filler metals

These products are designed for use in furnace brazing applications on components for the aerospace, nuclear and automotive industries.

Nickelbraze™ HTN5

Specification			Properties		
Ni	Cr	Si	Melting Range °C	EN1044	ISO 17672
Bal	19	10.1	1080-1135	NI105	Ni 650

This filler metal is used for high strength, oxidation-resistant joints that can operate at elevated temperatures. It is used in aerospace, automotive catalyst and heat exchanger applications.

Nickelbraze™ HTN6

Specification		Properties		
Ni	B	Melting Range °C	EN1044	ISO 17672
Bal	11	875	NI106	Ni 700

Nickelbraze™ HTN6 is a free-flowing alloy that can be used on iron and nickel alloys and low chromium steels in exothermic atmospheres. Contact joint gaps are required.

Nickelbraze™ HTN7

Specification			Properties		
Ni	Cr	P	Melting Range °C	EN1044	ISO 17672
Bal	14	10.1	890	NI107	Ni 710

This filler metal is used on thin walled structures and on high temperature components. It shows low erosion on iron and nickel alloys. Contact joint gaps are required.

Nickelbraze™ HTN61

Specification				Properties		
Ni	Cr	P	Si	Melting Range °C	EN1044	ISO 17672
Bal	29	6	4	890	-	-

This filler metal is widely used for automotive EGR components. It wets well on stainless steel, has good joint strength and offers good resistance to chemical attack.

conditions for use

Nickel-based brazing filler metals are used in vacuum or reducing atmosphere furnace brazing applications and under these conditions there is no need to use a brazing flux.

Nickelbraze™ products are frequently supplied as a powder and incorporated with a binder into a paste by the customer. Johnson Matthey supplies special gel and cement type binders for this purpose. Special stop-off or parting compounds Stop-flo™ No.1 and Stop-flo™ No.2 are often used to prevent filler metal flow away from the joint area. These auxiliary products are shown on page 10 of this booklet.

product forms and availability

All Nickelbraze™ products are supplied to customer order only. Nickel-based brazing filler metals are available in powder form, as a paste, and some as melt spun foil or a specially made tape. Tape can also be used to manufacture preformed shapes such as washers.

Braze tape products consist of a high density layer of the brazing filler metal powder bound with a special organic binder or a plastic carrier binder. They can provide a precise method for applying controlled amounts of the filler metal. Tapes are available with or without an adhesive backing and can be produced from any alloy that is available as a powder.

Amorphous foils are available to special order in several different filler metal specifications in thicknesses ranging up to 0.076 mm.

AUXILIARY BRAZING PRODUCTS

auxiliary products for brazing

stop–flo Compounds

These products are parting compounds commonly called stop-offs. They are designed to prevent molten filler metal from flowing onto components or to keep holes and cut/milled areas free from filler metal. In addition, these products are also useful in keeping stacks of parts from sticking together during heat-treating, protecting threads from scaling, and for keeping parts from bonding to their furnace fixtures.

Stop-flo™ No.1

Recommended for

- Preventing molten filler metal flow during brazing
- Brazing processes from 700-1200°C
- Vacuum furnace, reducing atmosphere or air brazing processes
- Use on most common engineering materials

Description

A stop-off or parting compound formulated to prevent the flow of molten brazing filler metal across the surface of a component during the brazing process.

Product Characteristics

Available as a paste or paint.

Also supplied as a tape with adhesive backing.

Residue removal by brushing, air blasting or water washing.

Stop-flo™ No.2

Recommended for

- Use when brazing titanium alloy components
- Use on other reactive metal components
- Preventing molten filler metal flow during brazing
- Vacuum furnace, reducing atmosphere or air brazing processes

Description

A stop-off or parting compound formulated to prevent the flow of molten brazing filler metal across the surface of a titanium or reactive alloy component during the brazing process.

Product Characteristics

Available as a paste or paint.

Also supplied as a tape with adhesive backing.

Residue removal by brushing, air blasting or water washing.

Braze Binders

Cement and Gel Binders

Recommended for

- Incorporating brazing filler metal powder into a hand-mixed paste prior to brazing operations
- Creating dense paste deposits with low binder content
- Vacuum furnace or reducing atmosphere furnace brazing processes

Description

Cement and Gel Binder are available that can be used to act as a carrier for a brazing filler metal powder. They form a smooth uniform paste or slurry and typically contain non-hazardous polymers and water.

Product Characteristics

Viscous liquid cement or gel

Burns off during heating cycle

Leaves little or no residue

Packaging varies with product

Key

Elements

Al	Aluminium
B	Boron
C	Carbon
Cr	Chromium
Co	Cobalt
Cu	Copper
Fe	Iron
Mn	Manganese
Ni	Nickel
P	Phosphorus
Si	Silicon
Sn	Tin
Zn	Zinc

Standards

ISO 17672	Products will be supplied according to the current version at time of supply i.e. 2010/2016
EN 1044	Refers to EN 1044:1999 which was superceded by ISO17672:2010
Al Based Cu Based	Available specifications and compositions may vary from those shown. Products will be supplied to the prevailing and commercially available specification at the time of order as agreed with the customer.

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