Johnson Matthey

OROBRAZE™
PALLABRAZE™

GOLD AND PALLADIUM BASED BRAZING FILLER METALS

OROBRAZE™ & PALLABRAZE™

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Products at a glance

Compositions

	OROBRAZE™	PALLABRAZE™
Alloy System	Au Containing	Pd Containing
Additional Elements	Cu Ni Ag Pd In	Ag Cu Ni Mn Si In Ga Ge

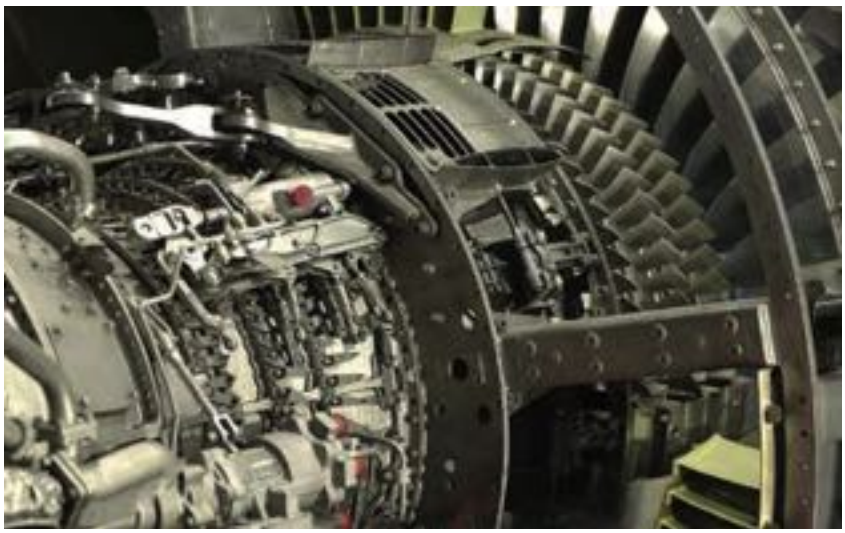
Uses for the products

Orobraze™ filler metals are suitable for brazing a variety of materials including stainless steel, nickel-based high-temperature alloys, super alloys and metallised ceramics. The gold-copper Orobraze™ filler metals exhibit good wetting on copper, nickel, iron, cobalt, molybdenum, tungsten and alloys thereof.

Pallabraze™ filler metals are also suitable for brazing a wide range of materials such as copper and stainless steel to metallised alumina ceramics and iron-nickel-cobalt alloys.

Applications

- Brazing of ceramic components in vacuum tube / thermionic valve devices High
- integrity joints in aero engine components
- Specialised temperature and pressure sensors
- Joining components operating in corrosive conditions
- Joining of hard materials such as PCD / WC for use in drilling applications



PROPERTIES OF OROBRAZE™ AND PALLABRAZE™ FILLER METALS

Properties of the products

Within the Orobraze™ and Pallabraze™ product ranges there are some key properties which lead to special uses and applications for these filler metals.

- Joints made with Orobraze™ and Pallabraze™ can exhibit strength at elevated temperatures making them ideal for components that will see these conditions in service.
- Gold and palladium in the filler metals can impart improved resistance to oxidation at elevated temperatures.
- Orobraze™ and Pallabraze™ products can also offer improved resistance to chemical attack in certain corrosive conditions.
- Some of the products have low volatile elements which makes them ideal for use in vacuum tube / thermionic valve devices that operate in vacuum at elevated temperatures.
- Selected products have no readily-oxidising elements making them suitable for reducing atmosphere brazing conditions.
- Within the range there are ductile filler metals which are suitable for use on ceramic to metal joints where there is a need to balance differences in coefficients of thermal expansion.

Brazing Characteristics

- Both Orobraze™ and Pallabraze™ filler metals have short melting ranges and free-flowing characteristics making them ideal for furnace brazing applications without the problem of liquation.
- Both ranges exhibit well-defined melting ranges, which make them suitable for step brazing operations.
- Orobraze™ and Pallabraze™ filler metals produce small exceptionally smooth fillets at the joint edges.
- Gold-nickel Orobraze™ filler metals exhibit flow characteristics superior to the gold-copper filler metals on nimonics, super-alloys and stainless steel.
- Gold-copper Orobraze™ filler metals produce ductile joints without excessive inter-alloying / erosion of the parent metals.
- Pallabraze™ filler metals have excellent flow and penetration qualities but some are also capable of filling joint gaps up to 0.5mm.
- Pallabraze™ filler metals also exhibit minimal erosion on ferrous and nickel bearing alloys during brazing.
- These filler metals do not cause liquid metal induced stress cracking and are recommended on iron-nickel-cobalt alloys.

High Purity Vacuum Grade

Most Orobraze™ and Pallabraze™ filler metals are manufactured to contain only minimum levels of volatile elements. As a result they have low vapour pressures under elevated temperature and ultra-high vacuum conditions. This makes them suitable for brazing components that operate under these conditions such as vacuum tube devices. In particular Pallabraze™ filler metals are widely used in this application. Products are in general supplied to conform to the impurity limits specified in ISO17672 for vacuum grade 1 (V1 Grade) materials.

Elevated Temperature Properties

In general Orobraze™ filler metals exhibit excellent high temperature strength up to 500˚C and oxidation resistance up to 800˚C. And the nickel-bearing Orobraze™ filler metals exhibit improved high temperature strength and resistance to oxidation at elevated temperatures compared to gold-copper alloys.
Pallabraze™ filler metals can be used to produce joints for elevated-temperature service conditions between 300˚C and 400˚C. Under these conditions they exhibit good oxidation resistance and mechanical properties. Pallabraze™ 810 shows oxidation resistance up to 500˚C and Pallabraze™ 1237 up to 700˚C.

Corrosion Resistance

Orobraze™ and Pallabraze™ filler metals also offer good corrosion resistance in many chemical environments and joints are resistant to interfacial corrosion on stainless steels in aqueous service environments. It is recommended that joints that will be subjected to chemical environments in service be tested prior to adoption of a particular brazing filler metal.

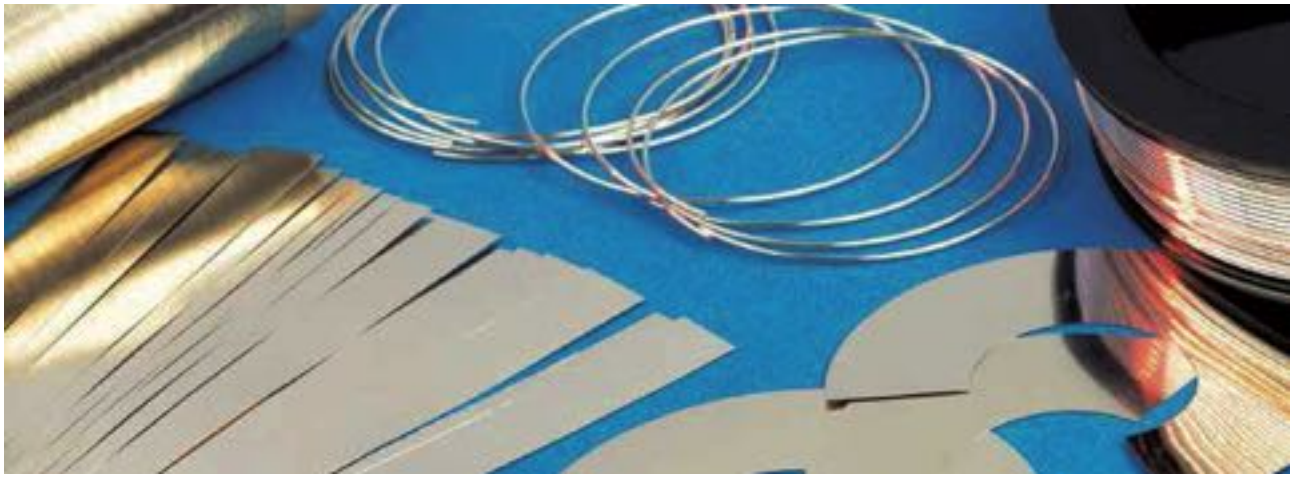
OROBRAZE™

PRODUCTS

GOLD-BASED BRAZING FILLER METALS

These products are gold-based filler metals manufactured to the highest purity 'vacuum grade' to meet the needs of aerospace and electronics applications.

	Composition			Specification		
Orobraze™ 910	**Au**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	80	20		890		Au 800
Orobraze™ 940	**Au**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	62.5	37.5		930-940	AU102	Au 625 V1
Orobraze™ 950	**Au**	**Ni**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	82	18		950	AU105	Au 827 V1
Orobraze™ 970	**Au**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	50	50		955-970		Au 503
Orobraze™ 990	**Au**	**Ni**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	75	25		950-990	AU106	Au 752 V1
Orobraze™ 998	**Au**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	37.5	62.5		980-998	AU103	Au 375 V1
Orobraze™ 1005	**Au**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	35	65		970-1005		Au 354
Orobraze™ 1018	**Au**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	30	70		996-1018	AU104	Au 295 V1
Orobraze™ 1030	**Au**	**Cu**	**Ni**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	35	62	3	1000-1030	AU101	Au 351
Orobraze™ 1040	**Au**	**Ag**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	70	30		1030-1040		
Orobraze™ 1045	**Au**	**Ni**	**Pd**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	70	22	8	1005-1045		Au 700



PALLABRAZE™

PRODUCTS

PALLADIUM-BEARING BRAZING FILLER METALS

These palladium-bearing filler metals are manufactured to the highest purity 'vacuum grade' to meet the needs of aerospace and electronics applications.

	Composition			Specification		
Pallabraze™ 810	**Pd**	**Ag**	**Cu**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	5	68.5	26.5	807-810	PD106	Pd 287 V1
Pallabraze™ 840	**Pd**	**Ag**	**Cu**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	10	67.5	22.5	834-840	PD104	Pd 388 V1
Pallabraze™ 850	**Pd**	**Ag**	**Cu**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	10	58	32	825-850	PD105	Pd 387 V1
Pallabraze™ 880	**Pd**	**Ag**	**Cu**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	15	65	20	856-880	PD103	Pd 481 V1
Pallabraze™ 900	**Pd**	**Ag**	**Cu**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	20	52	28	876-900	PD102	Pd 484 V1
Pallabraze™ 950	**Pd**	**Ag**	**Cu**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	25	54	21	901-950	PD101	Pd 587 V1
Pallabraze™ 1010	**Pd**	**Ag**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	5	95		970-1010	PD204	Pd 288 V1
Pallabraze™ 1090	**Pd**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	18	82		1080-1090	PD203	Pd 483 V1
Pallabraze™ 1120	**Pd**	**Ag**	**Mn**	**Melting Range °C**	**EN 1044**	**ISO 17672**
	20	75	5	1000-1120	-	Pd 485 V1
Pallabraze™ 1225	**Pd**	**Cu**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	30	70		1150-1225		
Pallabraze™ 1237	**Pd**	**Ni**		**Melting Range °C**	**EN 1044**	**ISO 17672**
	60	40		1237	PD201	Pd 647 V1

OROBRAZE™ & PALLABRAZE™

PRODUCTS

MISCELLANEOUS PRECIOUS METAL BRAZING FILLER METALS

These products are less commonly specified and are included for reference purposes. Availability may vary and it is recommended to consult Johnson Matthey.

MELTING UP TO 1000˚C

	Au	Pd	Ag	Ni	Cu	Si	In	Cr	Other	Melting Range ˚C
Pallabraze™ 851		46.7		47.2		6.1				810-851
Pallabraze™ 880Ga		9	82						9 Ga	845-880
Orobraze™ 895	75		5		20					885-895
Orobraze™ 900	60				37		3			860-900
Pallabraze™ 960		36		50		0.5		10.5	3 B	820-960
Pallabraze™ 977		30		57.1				10.5	2.4 B	941-977
Orobraze™ 1000Cr	72			22				6		975-1000
Orobraze™ 1000	40				60					980-1000

MELTING BETWEEN 1000-1050˚C

	Au	Pd	Ni	Cu	In	Mn	Melting Range ˚C
Orobraze™ 1004	35	10	14	31.5		9.5	971-1004
Orobraze™ 1010	73.8		26.2				980-1010
Orobraze™ 1013	25	15	10	37		13	970-1013
Orobraze™ 1025	20			78	2		975-1025
Orobraze™ 1037	70	8	22				1005-1037
Orobraze™ 1050	70		30				960-1050

MELTING ABOVE 1050˚C

	Au	Pd	Ag	Ni	Cu	Co	Mn	Melting Range ˚C	AMS/AWS A5.8	ISO 17672:2016
Orobraze™ 1052	25	15		18	31		11	1017-1052		
Pallabraze™ 1070		10	90					1025-1070		
Orobraze™ 1121	50	25		25				1102-1121	4784	Au 507
Pallabraze™ 1169	30	34		36				1135-1169	4785	Au 300
Pallabraze™ 1197		22.5	48.5	10	19			910-1179		
Pallabraze™ 1219		65				35		1219	BPd-1	
Orobraze™ 1270	92	8						1200-1270	BAu-8	

ASSOCIATED PRODUCTS

ARGO-BRAZE™ RANGE FOR VACUUM TUBES, VACUUM BRAZING AND ELECTRONIC COMPONENTS

	Ag	Cu	In	Sn	Ni	Melting Range ˚C	AMS	AWS A5.8	EN1044:1999	ISO 17672:2016
Argo-braze™ 72NiV	71.5	28			0.5	780-795		BAg-8b		
Argo-braze™ 72V	72	28				778		BAg-8	AG401	Ag 272 V1
Argo-braze™ 63V	63	27	10			685-730				
Argo-braze™ 61V	61.5	24	14.5			630-705		BAg-29		
Argo-braze™ 60V	60	30		10		602-718	4773	BAg-18	AG402	Ag 160

This range of products can be supplied to a vacuum-grade specification, with lower impurity limits, which can be required for brazing in vacuum or service in vacuum (e.g. Thermionic Valves).
A 'V' added as a suffix after the product name shows that a vacuum-grade product, according to ISO17672: 2016 Vacuum Grade 1, will be supplied. This range of products can also be supplied in a non-vacuum grade where ultra-high purity of the alloy is not required but freedom from Zinc is. **Argo-braze™ 72NiV** is a modified version of **Argo-braze™ 72V** that contains nickel for improved wetting on ferrous and nickel-based parent materials. **Argo-braze™ 72V** (formerly Silver-Copper Eutectic™) is ideal for flux-less brazing of copper, nickel and metalised ceramics.
Argo-braze™ 63V and 61V are low temperature, indium-bearing filler metals often used in step brazing operations.
Argo-braze™ 60V (formerly RTSN™) can meet a variety of niche requirements. It is also used in air brazing operations (flame/induction) in its non-vacuum specification.

Key

Elements

Ag	Silver
Cu	Copper
In	Indium
Mn	Manganese
Ni	Nickel
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 superseded by ISO 17672:2010

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