

A close-up photograph of a brazing process. A bright, glowing orange-yellow flame from a torch is applied to a brass fitting. The fitting is hexagonal and has a smaller circular fitting attached to its side. In the background, another brass fitting is visible, and the overall scene is dimly lit with blue and red ambient light.

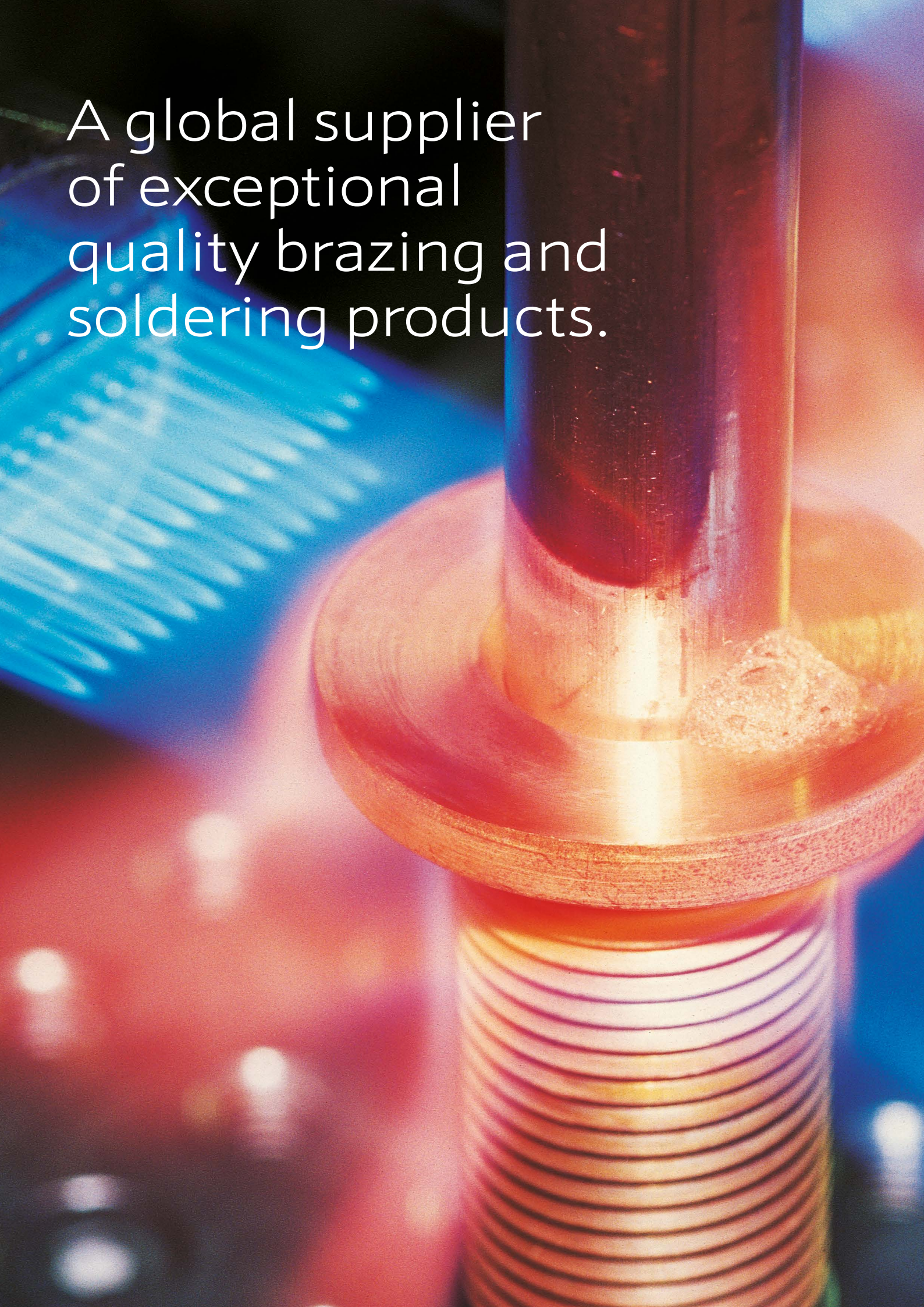
JM

Brazing and soldering products

A photograph of a young child with blonde hair, wearing a blue and white striped shirt, looking out of an airplane window. The child is looking out at a vast, blue sky with white clouds. The window frame is visible, and the child's face is in profile, looking towards the left.

Johnson Matthey
Inspiring science, enhancing life

A global supplier
of exceptional
quality brazing and
soldering products.



Brazing and soldering products

Johnson Matthey can trace its origins back to 1817 as a gold assayer based in London. Today we are a global leader in sustainable technologies, applying our cutting edge science and creating solutions with our customers that make a real difference to the world around us.

We are proud of our products and technologies, how our customers use them and the positive impact they have on our planet. At the same time, we are passionate about how science can enable global solutions for clean air, improved health and make the most efficient use of our planet's natural resources.

Johnson Matthey has a rich history of supplying metal joining products. We have an enviable reputation for excellent quality, customer service and technical support. Our expert team will help find the right solution for all your metal joining needs.

Precious Metal Capability

As an expert in precious metals, Johnson Matthey possesses both metal trading capability and materials knowledge giving it a unique standing in the global brazing market.

Broad Product Range

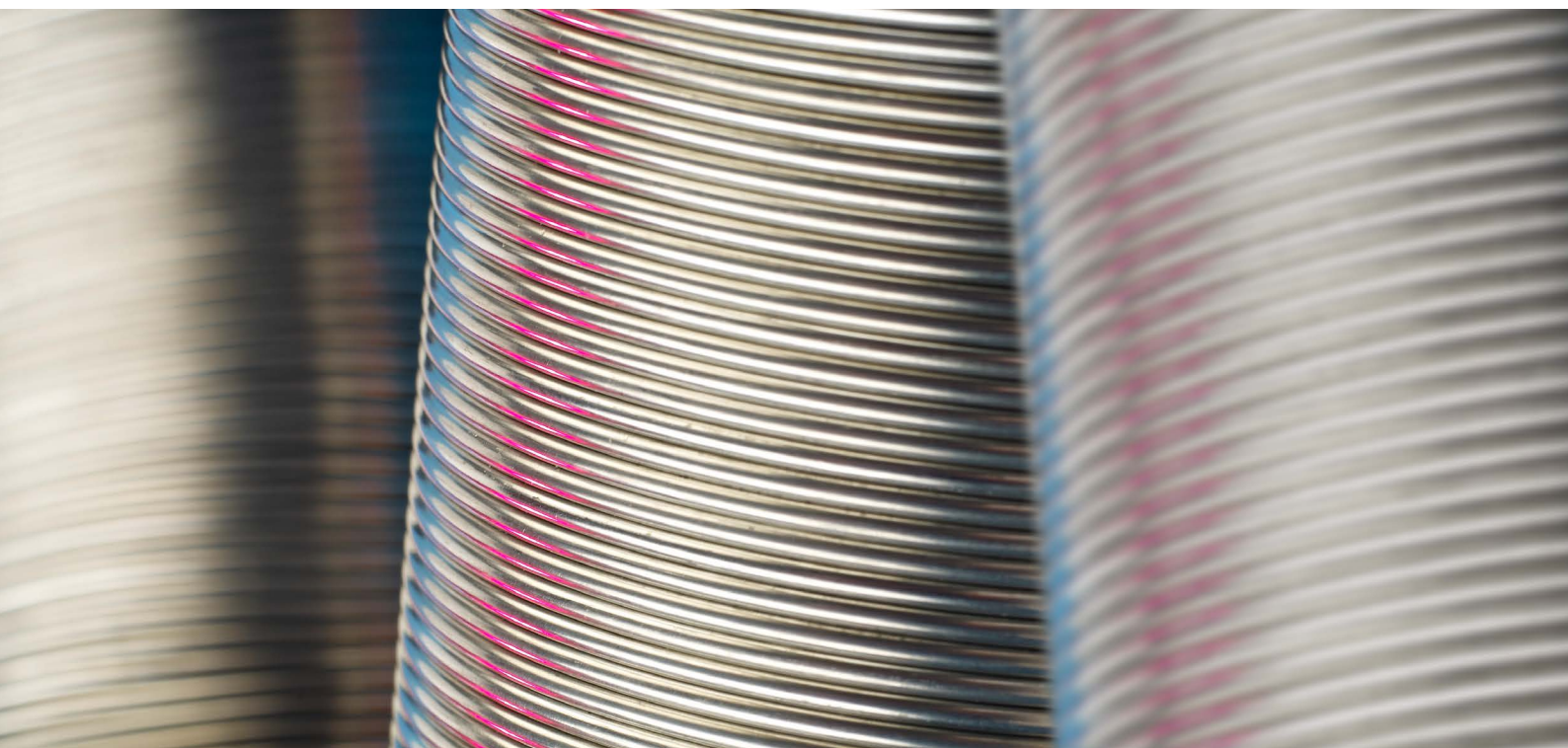
Today Johnson Matthey offers one of the broadest ranges of products of any company in its field meeting the needs of its customers and of emerging technologies.

Technical Expertise

With accumulated knowledge of industrial brazing stretching back for over 100 years and with the experience of our people worldwide, Johnson Matthey provides comprehensive technical support.

Customer Service

Providing good customer service is at the heart of what we do. Our customer service teams are friendly and experienced. We aim to meet customers' requirements.



Quality Systems

Manufacturers of products and components worldwide trust in the quality of Johnson Matthey. The business is approved to ISO 9001 and holds many customer approvals.

Global Supply Capability

We are a global supplier of brazing filler metals, solders and fluxes. We supply over 50 countries worldwide from our bases in the UK, Switzerland, Australia and China.

Technical Support

Our technical people are available to meet customers face to face and aim to understand customers' requirements from a technical, quality and commercial perspective.

Development Advice

The ideal time to offer technical advice is at the beginning of a project. We are able to give practical solutions from design to production stages of a new product or process development.

Optimise the Brazing Process

Where brazing forms an important step in the production of a component Johnson Matthey can help to optimise this process in terms of cost, quality and time.

Product Development

Our product development programme is supported by the JM Technology Centre and links with universities to develop new products and understanding for both emerging technologies and challenging new applications.

Troubleshooting

We offer answers to a wide range of problems including brazing technique, joint design or quality, the need for improved productivity, process reliability and metallurgical issues.

Technical Seminars and Training

Our technical expertise has enabled us to run the successful international seminars 'Brazing Fundamentals' and 'Brazing of Tungsten Carbide and PCD'. We also offer bespoke training for customers.



Brazing and soldering products

Silver brazing filler metals

- Silver-Flo™
- Argo-braze™

Silver/copper-phosphorus brazing filler metals

- Sil-fos™
- Copper-flo™

Brazing fluxes

- Easy-flo™
- Tenacity™
- Alu-flo™

Gold and palladium based brazing filler metals

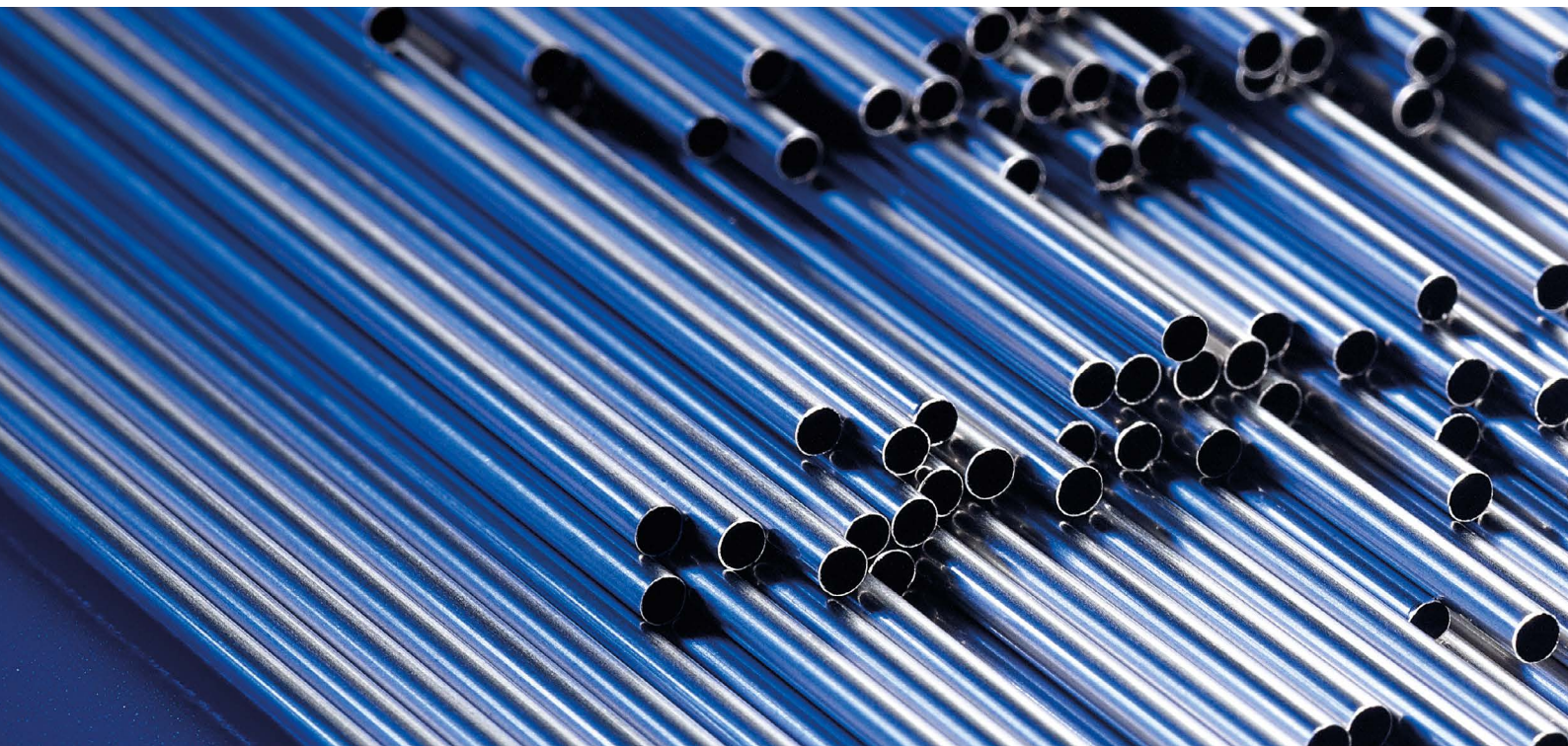
- Orobraze™
- Pallabraze™

Base metal brazing filler metals

- JM Bronze™
- ArgenteI™
- Nickelbraze™
- Alu-flo™

Filler metals and fluxes for soft soldering

- Soft Solder



Silver Brazing Filler Metals

Silver-flo™ Range of Cadmium-Free Silver Brazing Filler Metals

	Ag	Cu	Zn	Sn	Si	Melting Range °C	EN1044:1999	ISO 17672:2016
Silver-flo™ 55	55	21	22	2		630-660	AG103	Ag 155
Silver-flo™ 56	56	22	17	5		618-652	AG102	Ag 156
Silver-flo™ 452	45	27	25.5	2.5		640-680	AG104	Ag 145
Silver-flo™ 40	40	30	28	2		650-710	AG105	Ag 140
Silver-flo™ 38	38	32	28	2		660-720		Ag 138
Silver-flo™ 302	30	36	32	2		665-755	AG107	Ag 130
Silver-flo™ 252	25	40	33	2		680-760	AG108	Ag 125

Silver-flo™ products can be used to join the common engineering metals such as copper, copper alloys (brass, bronze, nickel silver, aluminium bronze, copper nickel), nickel alloys*, steel, stainless steel* and tungsten carbide*.

Silver-flo™ 55 and 56 are general-purpose cadmium-free filler metals combining low brazing temperatures with short melting ranges. Both are free flowing, produce neat joints and are easy to use. They are used as replacements for cadmium-containing filler

metals. In Europe **Silver-flo™ 55** is most common, **Silver-flo™ 56** in the US.

Silver-flo™ 40 is a popular general-purpose product with medium melt and flow characteristics.

Silver-flo™ 302 is a higher- and longer-melting filler metal and a useful gap-filling alloy.

*Special considerations apply, refer to Johnson Matthey for more information.

Silver-flo™ Range - Special Applications

	Ag	Cu	Zn	Sn	Si	Melting Range °C	EN1044:1999	ISO 17672:2016
Silver-flo™ 60	60	26	14			695-730	AG202	
Silver-flo™ 56S	56	22	16.75	5	0.25	618-652		Ag 156Si
Silver-flo™ 453S	45	25	26.8	3	0.2	640-680		Ag 145Si*
Silver-flo™ 44	44	30	26			675-735	AG203	Ag 244
Silver-flo™ 43	43	37	20			690-775		
Silver-flo™ 24	24	43	33			740-800		
Silver-flo™ 20	20	44	35.85		0.15	776-815	AG206	Ag 220

Silver-flo™ 56S and **453S** are proprietary filler metals containing silicon, which in conjunction with tin improves alloy flow and surface appearance.

Silver-flo™ 453S, 452 and **45** contain 45% silver and can provide economic alternatives to **Silver-flo™ 56** and **Silver-flo™ 55**.

Silver-flo™ 44 and **43** are used in marine pipe-work applications being resistant to dezincification.

Silver-flo™ 24 is used in aerospace components and for step brazing.

* Nearest specification for product.

Silver-flo™ Range - Less Common/Reference Filler Metals

	Ag	Cu	Zn	Sn	Si	Melting Range °C	EN1044:1999	ISO 17672:2016
Silver-flo™ 45	45	25	30			680-700		
Silver-flo™ 34	34	36	27.5	2.5		630-730	AG106	Ag 134
Silver-flo™ 33	33	33.5	33.5			700-740		
Silver-flo™ 30	30	38	32			695-770	AG204	Ag 230
Silver-flo™ 25	25	40	35			700-790	AG205	Ag 225
Silver-flo™ 18	18	45.75	36		0.25	784-816		
Silver-flo™ 16	16	50	34			790-830		

These **Silver-flo™** filler metals have niche uses or are included for reference purposes.

Silver-flo™ Range - Silver Solders for Silverware Applications

	Ag	Cu	Zn	Melting Range °C	
Silver-flo™ 67 Extra Easy	67	13.7	19.3	667-709	Johnson Matthey's range of guaranteed hallmarking quality jewellery 'solders' demonstrate excellent flow characteristics and produces neat 'soldered' joints and seams. Varying grades are available, easy, medium and hard which can be used for complex 'step-soldering' operations.
Silver-flo™ 67 Easy	67	23	10	705-723	
Silver-flo™ 67 Hard	67	29	4	745-778	
Silver-flo™ 74 Medium	74	19.2	6.8	720-765	
Silver-flo™ 81 Enamelling	81	14	5	730-800	

Silver/Copper Phosphorus Brazing Filler Metals

Sil-fos™ Range - Silver Copper Phosphorus Brazing Filler Metals

	Ag	Cu	P	Melting Range °C	EN1044:1999	ISO 17672:2016
Sil-fos™ Plus	18	75	7	644	CP101	CuP 286
Sil-fos™	15	80	5	644-800	CP102	CuP 284
Sil-fos™ 5	5	89	6	644-815	CP104	CuP 281
Sil-fos™ 6	6	86.75	7.25	644-718		CuP 283
Silbralloy™	2	91.7	6.3	644-825	CP105	CuP 279

These filler metals are recommended for the flux-less brazing of copper. On brass, bronze and other copper alloys a separate flux (**Easy-flo™/Tenacity™ No. 4A**) is needed. They should not be used on nickel or iron containing metals, including all grades of steel, because a brittle joint will result.

Sil-fos™ is the most ductile of this range of filler metals and is the only one that is available as a foil. It is widely used in electrical components.

Sil-fos™ 6 has the best flow of the group but has less alloy ductility.

Sil-fos™ 5 provides the best combination of ductility and flow of the group making it the filler metal of choice for joining tubes in HVACR components.

Silbralloy™ can be used instead of **Copper-flo™** when a low cost filler metal with improved ductility is required.

Johnson Matthey Metal Joining

Argo-braze™ Range for Brazing of Cemented Carbides (WC) and PCD Diamond Segments

	Ag	Cu	Zn	Ni	Mn	In	Melting Range °C	AMS	AWS A5.8	EN1044:1999	ISO 17672:2016
Argo-braze™ 64	64	26		2	2	6	730-780				
Argo-braze™ 502	50	20	28	2			660-705	4788	BAG-24		Ag 450
Argo-braze™ 49H	49	16	23	4.5	7.5		680-705		BAG-22	AG502	Ag 449
Argo-braze™ 40	40	30	28	2			670-780		BAG-4		Ag 440

These products are most commonly used for brazing cemented tungsten carbide and tungsten carbide faced PCD tips. The manganese and/or nickel in them improve wetting of the filler metal.

Argo-braze™ 64 can be used to braze materials that are subsequently treated with a PVD coating such as titanium nitride. It contains no elements (such as Cd or Zn) that

would be volatile under coating conditions.

Argo-braze™ 49H and Argo-braze™ 502 are widely used for small/medium carbides and as a substitute for Easy-flo™ No.3. Argo-braze™ 502 is also available as a tri-foil.

Argo-braze™ 40 has a long melting range and gap-filling characteristics. It is used on both steel and carbide parts.

Argo-braze™ Range of Tri-foils for Brazing Cemented Carbides (WC) and PCD Diamond Segments

	Ag	Cu	Zn	Ni	Mn	In	Melting Range °C	AMS	AWS A5.8	ISO 17672:2016
Argo-braze™ 502 Tri-foil	50	20	28	2			660-705	4788	BAG-24	Ag 450
Argo-braze™ 49LM Tri-foil	49	27.5	20.5	0.5	2.5		670-710			

Tri-foils are composite materials with the brazing filler metal shown above on either side of a central copper core. They are designed to artificially thicken a joint, relieving stress and reducing the incidence of cracking. Tri-foils are commonly used for brazing of large tungsten carbide segments (>20mm) and in cases where residual stress from cooling is a factor.

Argo-braze™ Range for Brazing of Stainless Steel Joints Exposed to Water or Moisture in Service

	Ag	Cu	Ni	In	Sn	Melting Range °C	AMS	AWS A5.8	EN1044:1999	ISO 17672:2016
Argo-braze™ 632	63	28.5	2.5		6	691-802	4774	BAG-21		Ag 463
Argo-braze™ 56	56	27.25	2.25	14.5		600-711			AG403	Ag 456a

Argo-braze™ 632 and Argo-braze™ 56 are designed to prevent interfacial (crevice) corrosion in stainless steel silver-brazed joints that are exposed to water in, for example, damp or wet service environments. Both filler metals have long melting ranges and are not free-flowing or easy to use.

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.

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.

Argo-braze™ Range for Aerospace and Miscellaneous Applications

	Ag	Cu	Zn	Ni	Mn	Melting Range °C	AMS	AWS A5.8	ISO17672:2016
Argo-braze™ 85	85				15	960-970	4766	BAG-23	Ag 485
Argo-braze™ 562	56	42		2		771-893	4765	BAG-13a	Ag 456
Argo-braze™ 54	54	40	5	1		718-857	4772	BAG-13	Ag 454
Argo-braze™ 25DHE	25	52.5	22.5			675-855			

Argo-braze™ 85 is a copper-free brazing filler metal used for brazing assemblies which will see ammonia in service or temperatures up to 400°C.

Argo-braze™ 562, 54 and 25DHE are brazing filler metals that are used in various aerospace components. Argo-braze™ 562 can be supplied to Vacuum Grade 1 specification.

Copper-flo™ Range - Copper Phosphorus Brazing Filler Metals

	Cu	P	Sn	Sb	Melting Range °C	EN1044:1999	ISO 17672:2016
Copper-flo™	92.2	7.8			714-810	CP201	CuP 182
Copper-flo™ No. 2	92	6		2	690-825	CP301	CuP 389
Copper-flo™ No. 3	93.8	6.2			714-890	CP203	CuP 179
Copper-flo™ No. 5	92.75	7.25			710-793		CuP 181
Stan-fos™	86.2	6.8	7		640-680	CP302	CuP 386

Copper-flo™ filler metals are recommended for the flux-less brazing of copper most commonly for joining tubes and pipes in heating, refrigeration, air-conditioning and heat exchanger components. They have lower ductility than the silver-copper-phos products. Copper-flo™ filler metals should not be used on nickel or iron-containing metals, including all grades of steel, because a brittle joint will result.

Copper-flo™, Copper-flo™ No.3, Copper-flo™ No.5 are widely used in HVACR joints. Copper-flo™ and Copper-flo™ No.2 are used for copper cylinders.

Stan-fos™ is a very free-flowing filler metal that produces a good surface finish on joints. However it has low ductility and requires the use of a flux.

Brazing Product Reference Chart

Brazing Fluxes

Easy-flo™ Silver Brazing Fluxes - General Purpose

	Working Range °C	EN1045	
● Easy-flo™ Flux Powder	550-800	FH10	The leading brand general-purpose flux, good for hot-rodding.
● Easy-flo™ 100 Flux Paste	550-800	FH10	Smooth general-purpose flux with good overheat resistance.

These products are popular general-purpose silver brazing fluxes. They can be used on the common engineering metals including copper, copper alloys (brass, bronze, nickel silver, copper nickel), nickel alloys, steel, stainless steel and tungsten carbide. Specialised fluxes are often required for aluminium bronze, stainless steel and tungsten carbide.

Easy-flo™ Silver Brazing Flux Pastes - Special Purpose

	Working Range °C	EN1045	
● Easy-flo™ Low Temperature Grade Flux Paste	550-800	FH10	Smooth paste good for copper alloys and induction heating.
● Easy-flo™ Medium Temperature Grade Flux Paste	600-800	FH10	A general-purpose flux paste with good overheat resistance.
● Easy-flo™ High Temperature Grade Flux Paste	575-825	FH10	Good overheat resistance but provides less cover when molten.

Easy-flo™ Silver Brazing Fluxes – Special Purpose for Specific Markets

	Working Range °C	EN1045	
● Easy-flo™ K Grade Flux Powder	550-800	FH10	A general-purpose flux powder for Swiss, German and Austrian markets.
● Easy-flo™ A Grade Flux Paste	550-800	FH10	A general-purpose flux paste for Swiss, German and Austrian markets.

Easy-Flo™ Silver Brazing Fluxes For Special Applications

	Working Range °C	EN1045	
● Easy-flo™ Stainless Steel Grade Flux Paste	550-775	FH10	Additional fluoride, good for stainless steel with short heating cycles.
● Easy-flo™ Stainless Steel Grade Flux Powder	550-775	FH10	Additional fluoride, good for stainless steel with short heating cycles.
● Easy-flo™ Aluminium Bronze Grade Flux Paste	550-775	FH11	For brazing on parent metals (aluminium bronze) containing 2-10% Al.

Tenacity™ Brazing Fluxes - Boron Modified

	Working Range °C	EN1045	
● Tenacity™ No. 6 Flux Powder	550-800	FH12	This powder contains boron for improved wetting on tungsten carbide.
● Tenacity™ No. 6 Flux Paste	550-800	FH12	This paste contains boron for improved wetting on tungsten carbide.
● Tenacity™ No. 5A Flux Powder	600-900	FH12	A higher temperature boron-modified flux powder.
● Tenacity™ No. 3A Flux Paste	600-875	FH12	This boron-modified flux conforms to AMS 3411.

The addition of elemental boron to brazing fluxes improves filler metal wetting on refractory metals and difficult to wet materials such as tungsten carbide. It should be noted that boron-modified fluxes are not suitable for use on low or nickel-free stainless steels if interfacial corrosion is likely to be a hazard in service because they can promote the corrosive mechanism.

Tenacity™ Brazing Fluxes - Medium and High Temperature

	Working Range °C	EN1045	
● Tenacity™ No. 4A Flux Powder	600-850	FH10	For brazing larger copper parts and prolonged heating cycles.
● Tenacity™ No. 5 Flux Powder	600-900	FH10	For stainless steel, heavy parts and prolonged heating cycles.
● Tenacity™ No. 20 Flux Powder	750-1000	FH21	For brass brazing/bronze welding with the Argente! ™ range.
● Tenacity™ No. 125 Flux Powder	750-1200	FH21	For brazing with JM Bronze ™ filler metals such as F Bronze ™.
● Tenacity™ No. 125 Flux Paste	750-1200	FH21	For brazing with JM Bronze ™ filler metals such as F Bronze ™.

These products are designed for components requiring extended heating cycles, low silver or copper-based brazing filler metals.

Specialised Tenacity™ Fluxes

	Working Range °C	EN1045	
● Tenacity™ No. 2 Modified Flux Powder	550-800	FH10	Specially modified for use as coating on brazing rods.
● Tenacity™ No. 14 Flux Powder	550-750	FH10	A very fluid flux that prevents red staining on brass.

Alu-Flo™ Fluxes For Brazing Aluminium

	Working Range °C	Flux Residues	
● Alu-flo™ No. 1 Flux Paste	450-650	Corrosive	A chloride based flux suitable for use with Alu-flo ™ HT and MT.
● Alu-flo™ No. 2 Flux Powder	575-650	Non-Corrosive	A fluoride based flux suitable for use with Alu-flo ™ HT and MT.

These products are designed for low temperature aluminum brazing in air.

Braze Stop-Off Compounds

Stop-flo™ Stop-off or Parting Compounds

	Working Range °C	
● Stop-flo™ No. 1 Braze Stop-off	Up to 1600	Standard stop-off compound for use on the general engineering metals
● Stop-flo™ No. 2 Braze Stop-off	Up to 1600	Specially formulated stop-off compound for use on titanium alloys

These products are formulated to prevent the flow and wetting of molten brazing filler metal across the surface of a component during the brazing process. They are suitable for vacuum furnace, controlled atmosphere or air brazing processes.
Stop-flo™ No.1 and **Stop-flo**™ No.2 are available in paint, paste or tape form.
Residues of **Stop-flo**™ No.1 or No.2 before and after brazing are best removed using a water wash.

Precious Metal Brazing Filler Metals

Orobrazе™ Range of Gold-Based Brazing Filler Metals

	Au	Cu	Ni	Ag	Pd	Melting Range °C	AMS/AWS A5.8	EN1044:1999	ISO 17672:2016
Orobrazе™ 890	80	20				890	BAu-2		Au 800
Orobrazе™ 940	62.5	37.5				930-940		AU102	Au 625 V1
Orobrazе™ 950	82		18			950	4787/BAu-4	AU105	Au 827 V1
Orobrazе™ 970	50	50				955-970			Au 503
Orobrazе™ 990	75		25			950-990		AU106	Au 752 V1
Orobrazе™ 998	37.5	62.5				980-998	BAu-1	AU103	Au 375 V1
Orobrazе™ 1005	35	65				970-1005			Au 354
Orobrazе™ 1018	30	70				996-1018		AU104	Au 295 V1
Orobrazе™ 1030	35	62	3			1000-1030	BAu-3		Au 351
Orobrazе™ 1040	70			30		1030-1040			
Orobrazе™ 1045	70		22		8	1005-1045	4786/BAu-6		Au 700

Pallabrazе™ Range of Palladium-Bearing Brazing Filler Metals

	Pd	Ag	Cu	Ni	Mn	Melting Range °C	AMS/AWS A5.8	EN1044:1999	ISO 17672:2016
Pallabrazе™ 810	5	68.5	26.5			807-810	BAG-30	PD106	Pd 287 V1
Pallabrazе™ 840	10	67.5	22.5			834-840		PD104	Pd 388 V1
Pallabrazе™ 850	10	58	32			824-850	BAG-31	PD105	Pd 387 V1
Pallabrazе™ 880	15	65	20			856-880		PD103	Pd 481 V1
Pallabrazе™ 900	20	52	28			876-900		PD102	Pd 484 V1
Pallabrazе™ 950	25	54	21			901-950	BAG-32	PD101	Pd 587 V1
Pallabrazе™ 1010	5	95				970-1010		PD204	Pd 288 V1
Pallabrazе™ 1090	18		82			1080-1090		PD203	Pd 483 V1
Pallabrazе™ 1120	20	75			5	1000-1120			Pd 485
Pallabrazе™ 1225	30	70				1150-1225			
Pallabrazе™ 1237	60			40		1237		PD201	Pd 647 V1

Orobrazе™ and Pallabrazе™ Brazing Filler Metals

Johnson Matthey Metal Joining supply a wide range of precious metal brazing filler metals. The specialised filler metals of the **Orobrazе™** and **Pallabrazе™** product ranges have been extended in recent years. This section of the product reference chart lists both the traditional Johnson Matthey products and the more recent additions shown below.

Gold-copper Orobrazе™ filler metals show good wetting on Fe, Ni, Co, Ta, Nb and W.

Gold-nickel Orobrazе™ filler metals (**Orobrazе™ 950** and **990**) show good high temperature strength (up to 600°C), resistance to oxidation, and resistance to crevice corrosion on stainless steel.

Pallabrazе™ products can be used to braze a variety of materials from stainless steel to metalised ceramics. They exhibit good resistance to oxidation and elevated temperature strength.

Miscellaneous Precious Metal Brazing Filler Metals

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

Melting between 1000-1050°C	Au	Pd	Ni	Cu	In	Other	Melting Range °C
Orobrazе™ 1004	35	10	14	31.5		9.5 Mn	971-1004
Orobrazе™ 1010	73.8		26.2				980-1010
Orobrazе™ 1013	25	15	10	37		13 Mn	970-1013
Orobrazе™ 1025	20			78	2		975-1025
Orobrazе™ 1037	70	8	22				1005-1037
Orobrazе™ 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
Orobrazе™ 1052	25	15		18	31		11	1017-1052		
Pallabrazе™ 1070		10	90					1025-1070		
Orobrazе™ 1121	50	25		25				1102-1121	4784	Au 507
Pallabrazе™ 1169	30	34		36				1135-1169	4785	Au 300
Pallabrazе™ 1197		22.5	48.5	10	19			910-1179		
Pallabrazе™ 1219		65				35		1219	BPd-1	
Orobrazе™ 1270	92	8						1200-1270	BAu-8	

The miscellaneous **Orobrazе™** and **Pallabrazе™** product ranges shown are used for a variety of applications. Consult www.jm-metaljoining.com for more information on an individual product.

Base Metal Brazing Filler Metals

JM Bronze™ and Copper Based Brazing Filler Metals

	Cu	Zn	Ni	Mn	Sn	Co	Others	Melting Range °C	EN1044:1999	ISO 17672:2016
Copper	99.9							1081	CU101	Cu 110
P Bronze™	91.75				8		0.25 P	882-1027		
B Bronze™	97		3				0.03 B	1081-1101	CU105	Cu 186
C Bronze™	86.85		2.15	11				965-995		
D Bronze™	86			10		4		980-1030		
F Bronze™	58	38		2		2		890-930		
H Bronze™	52.5		9.5	38				880-920		
J Bronze™	67.5		9	23.5				925-955		

JM Bronze™ filler metals are a range of special products designed for high temperature brazing of steel and carbide components. The JM Bronze products which contain nickel and or manganese can show improved wetting on tungsten carbide.

Copper can be used as a filler metal. It can be supplied in a variety of forms and is used in reducing atmosphere or vacuum brazing processes.

P Bronze™ is used for furnace brazing of mild steel and offers good gap-filling properties.

B Bronze™ was developed for furnace brazing of stainless steel under reducing atmospheres. The joints produced in both ferritic and austenitic steels exhibit resistance to interfacial corrosion. It will penetrate joint gaps ranging from an interference fit up to 0.5 mm and has consequently been used to braze mild steels where the gaps are too

large for copper (i.e. over 0.025 mm).

C Bronze™ has good gap-bridging properties (0.025 to 0.75 mm) and offers excellent resistance to interfacial corrosion when used on ferritic or austenitic stainless steels. Due to the manganese content the alloy requires a furnace atmosphere with a dew point better than -40°C and if used for vacuum brazing a partial pressure of argon is required.

D Bronze™ and **F Bronze™** are used to braze rock drills. They show good wetting, strength and an ability to allow heat treatment of the drill shank during brazing. Induction brazing is used in air with **Tenacity™ No. 125** flux.

H Bronze™ and **J Bronze™** are manganese-containing filler metals used in road planing tools, and drills.

Argentel™ Copper Based Brazing Filler Metals

	Cu	Zn	Ni	Sn	Si	Mn	Melting Range °C	EN1044:1999	ISO 17672:2016
Argentel™ No. 1	60	Bal			0.3		875-895	CU301	Cu 470a
Argentel™ 302	60	Bal		0.35	0.3		875-895	CU302	
Argentel™ 303	60	Bal		0.2	0.3	0.15	870-900	CU303	Cu 670
Argentel™	48	Bal	10		0.2		890-920	CU305	Cu 773

Argentel™ No. 1 and products of a similar composition (e.g. JM CZ6) are designed for brazing steel or copper components and also for brazing steel to tungsten carbide in tooling applications.

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

Argentel™ 303 and products of similar composition contain controlled additions of tin, silicon and manganese. This gives good fillet formation with reasonable flow and penetration.

Argentel™ is a braze/bronze welding alloy 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**.

Alu-flo™ Range of Aluminium Brazing Filler Metals

	Al	Si	Cu	Zn	Melting Range °C	AMS/AWS A5.8	EN1044:1999	ISO 17672:2016
Alu-flo™ HT	88	12			575-585	BAISi-4	AL104	Al 112
Alu-flo™ MT	86	10	4		520-585	BAISi-3	AL201	Al 210
Alu-flo™ LT	2			98	377-385			

Alu-flo™ filler metals are primarily used for joining aluminium alloys – the 1000 series (e.g. 1100), 3000 series (e.g. 3003, 3004), 5005 and some 6000 alloys (eg.6061, 6031, 6951). They are used in the manufacture of automotive components, cookware and aluminium heat exchangers.

Alu-flo™ HT has a short melting range and exhibits good alloy flow.

Alu-flo™ MT is less free-flowing and should be considered when the joint gaps are larger.

Alu-flo™ No.1 or **Alu-flo™ No.2** Flux Powder or Paste should be used with these filler metals.

Alu-flo™ LT is a high temperature solder for aluminium.

Nickelbrazel™ HTN Nickel Based Brazing Filler Metals

	Ni	Cr	Fe	B	Si	P	C	Melting Range °C	AMS/AWS A5.8	EN1044:1999	ISO 17672:2016
Nickelbrazel™ HTN1	Bal	14	4.5	3.1	4.5		0.7	980-1060	4775/BNi-1	NI101	Ni 600
Nickelbrazel™ HTN1A	Bal	14	4.5	3.1	4.5			980-1070	4776/BNi-1a	NI1A1	Ni 610
Nickelbrazel™ HTN2	Bal	7	3.0	3.1	4.5			970-1000	4777/BNi-2	NI102	Ni 620
Nickelbrazel™ HTN3	Bal		0.5	3.1	4.5			980-1040	4778/BNi-3	NI103	Ni 630
Nickelbrazel™ HTN4	Bal		1.5	1.8	3.5			980-1070	4779/BNi-4	NI104	Ni 631
Nickelbrazel™ HTN5	Bal	19			10.1			1080-1135	4782/BNi-5	NI105	Ni 650
Nickelbrazel™ HTN6	Bal					11		875	BNi-6	NI106	Ni 700
Nickelbrazel™ HTN7	Bal	14				10.1		890	BNi-7	NI107	Ni 710

Nickelbrazel™ HTN brazing filler metals are used to join stainless steel, nickel and cobalt base alloys. They provide exceptional resistance to chemical corrosion and oxidation coupled with high strength at elevated temperatures. These alloys are widely used

particularly within the aerospace, automotive and nuclear industries using vacuum or controlled atmosphere brazing methods. These products are available as pastes, powders or tapes. Several can be supplied in rapidly solidified foil form.

Ti-flo™ Range of Brazing Filler Metals for Titanium

	Ti	Ni	Cu	Ag	Al	Other	Melting Range °C
Ti-flo™ 830				95	5		780-830
Ti-flo™ 950	70	15	15			0.3% max	902-950

Ti-flo™ 950 This filler metal will wet titanium, titanium-based alloys and super alloys. It exhibits good wetting characteristics on ceramic surfaces eliminating the need for metalisation and plating processes. Because of its high titanium content it is very strong and has good corrosion resistance. Typical applications include brazing of vacuum tubes,

wave-guides and titanium-based rocket and engine components in the aerospace industry. **Ti-flo™ 950** should be brazed in a high vacuum environment. Other filler metals suitable for brazing titanium alloys include **Pallabrazel™ 880Ga**, **Active-brazel™ No.1**, **Active-Brazel™ No.2**, silver and standard silver.

Colour indicates Brand Label



Active Brazing Filler Metal Products

Active-braze™ Silver Brazing Filler Metals

	Ag	Cu	Ti	In	Al	Melting Range °C
Active-braze™ No. 1	92.75	5	1.25		1	860-912
Active-braze™ No. 2	68.8	26.7	4.5			830-850
Active-braze™ No. 10	70	28	2			780-800
Active-braze™ No. 15	60	24	2	14		620-720

A number of other compositions of **Active-braze™** products are available in addition to those shown above. **Active-braze™ No.1** and **2** are available as pastes and are suitable for the brazing of diamond, ceramics and titanium alloys. **Active-braze™ No.10** brazing paste is used for the brazing of PCBN tips to tungsten carbide. **Active-braze™ No.10** can also be used for the brazing of natural and CVD single crystal diamonds, graphite, carbon-carbon composites and silicon carbide. **Active-braze™ No.15**, which has a lower brazing temperature than **Active-braze™ No.10** is used for applications involving the brazing of PCD (Polycrystalline Diamond).

Soft Solders

Silver-Tin-Lead and Silver-Lead Soft Solder Alloys

	Ag	Sn	Pb	Melting Range °C	EN29453	ISO 9453:2014
JM6236	2	62	36	178-190	Alloy No. 30	Alloy No. 171
Comsol™	1.5	5	93.5	296	Alloy No. 34	Alloy No. 191
A25™	2.5		97.5	304	Alloy No. 32	Alloy No. 181
A5™	5		95	304-370	Alloy No. 33	Alloy No. 182

Comsol™ has excellent creep resistance when compared to tin-lead solders at room and elevated temperature. It has improved wetting and flow on copper alloys compared with **A25™** / **A5™** and can be used for step soldering. **A25™** and **A5™** offer increased strength and creep resistance at elevated temperatures over tin-lead solders. Silver in these solders improves flow and wetting onto copper and copper based alloys.

Tin-Lead Soft Solder Alloys

	Sn	Pb	Sb	Melting Range °C	EN29453	ISO 9453:2014
JM595	5	95		300-315		Alloy No. 123
JM1090	10	90		268-302	Alloy No. 8	Alloy No. 122
JM1585	15	85		225-290		Alloy No. 121
JM2080	20	80		183-275		Alloy No. 117
JM3070	30	70		185-255	Alloy No. 7	Alloy No. 116
JM3565	35	65		183-245	Alloy No. 6	Alloy No. 115
JM4060	40	60		183-235	Alloy No. 5	Alloy No. 114
JM4552	45	52.5	2.5	185-215		
JM4555	45	55		183-224	Alloy No. 4	Alloy No. 113
JM5050	50	50		183-215	Alloy No. 3	Alloy No. 112
JM5840	40	58	2	185-231	Alloy No. 14	Alloy No. 134
JM5941	59	41		183-190		
JM6040	60	40		183-190	Alloy No. 2	Alloy No. 103
JM6337	63	37		183	Alloy No. 1	Alloy No. 102

This chart shows the range of tin-lead solders currently available and still widely used. Customers are advised to check with current legislation to ensure that the use of lead-containing solder is acceptable for each application.

Please note: Johnson Matthey recommends the use of lead-free products wherever possible. Unless a sound technical reason exists for doing otherwise we do not recommend the use of lead and cadmium-containing materials. The use of lead in products is increasingly recognised as being undesirable both in terms of the long-term environmental impact and recyclability of products. The End of Life Vehicles (ELV) Directive (2000/53/EC), the RoHS Regulations in Directive 2002/95/EC and WEEE Directive on waste electrical and electronic equipment (2002/96/EC) prevent the use of certain hazardous substances including lead-containing materials. The use of lead in potable water systems has also been prohibited in Europe and in many countries worldwide.

Soft Solder Fluxes

Soft Solder Fluxes

	Recommended For Use On		Flux Residues	Working Range °C
Soft Solder Flux No. 15	Liquid Flux	Carbon steel/stainless steel	Corrosive	180-350°C
Soft Solder Flux No. 25	Liquid Flux	Copper/brass	Intermediate	180-350°C
Soft Solder Flux No. 35	Paste Flux	Copper/brass/carbon steel/stainless steel	Corrosive	180-350°C
Soft Solder Flux No. 45	Dispensable Flux	Copper/brass	Intermediate	180-350°C

The Johnson Matthey range of soft solder fluxes includes corrosive and intermediate liquid fluxes as well as corrosive and intermediate paste fluxes.

Lead-Free Soft Solder Alloys

	Sn	Ag	Cu	Sb	Melting Range °C	EN29453	ISO 9453:2014
Plumbsol™	97.5	2.5			221-225		
P35™	96.5	3.5			221		Alloy No. 703
P35Sb™	96.15	3.5		0.35	221		
P40™	96	4			221-228	Alloy No. 28	Alloy No. 701
P5™	95	5			221-235		Alloy No. 704
97C	97		3		230-250	Alloy No. 24	Alloy No. 402
99C	99.3		0.7		230-240	Alloy No. 23	Alloy No. 401
LM10A™	87	10	3		214-275		
95A	95			5	230-240	Alloy No. 18	Alloy No. 201

The products in this range are all lead-free and should be considered before the use of a lead-containing product. They offer greater strength than conventional tin-lead alloys. **Plumbsol™**, **P35™**, **P35Sb™**, **P40™** and **P5™** are silver-tin solders which have excellent soldering characteristics and provide improved strength particularly in service at moderately elevated temperatures. They are a good colour-match with stainless steel and the joints do not suffer from interfacial corrosion. **P35Sb™** is available as a specially formulated industrial grade solder paste only. **97C** and **99C** tin-copper solders are now used in all copper plumbing installations as well as industrial applications where the lead content of solder is banned or undesirable. **LM10A™** produces joints exhibiting relatively high tensile strength and conductivity for a soft solder alloy. It is used in electrical control gear and in steam control equipment where its conductivity, strength and creep properties at higher temperatures are considered important.

LM™ Indium-Bearing Soft Solder Alloys

	In	Sn	Pb	Ag	Melting Range °C	ISO 9453:2014
LM118E™	52	48			118	Alloy No. 601
LM149E™	80		15	5	149	
LM157E™	100				157	
LM195™	58		39	3	165-195	
LM210™	50		50		184-210	

These specialised indium-containing solders are used in electronic applications.

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