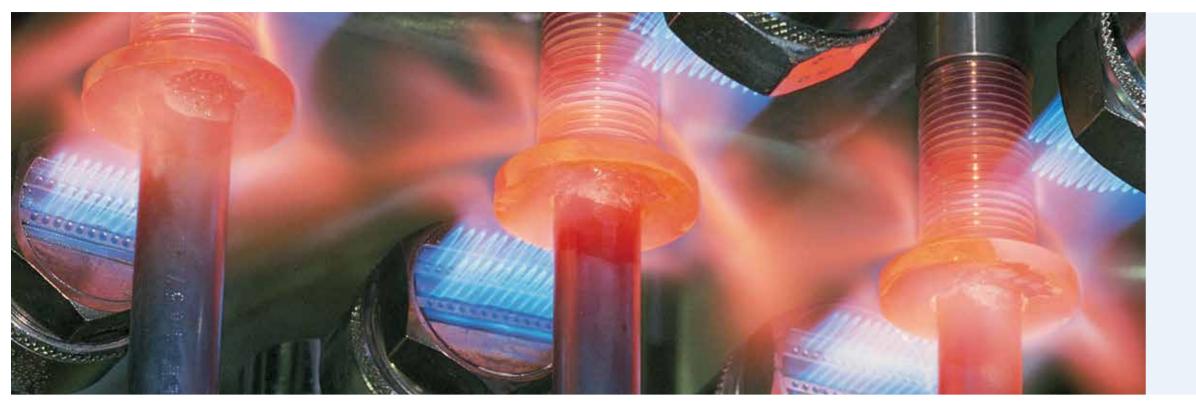


JM Johnson Matthey Metal Joining



STSIJAID392 BRAZING SPECIALISTS A broad range of quality products, supported by excellent customer service

JOHNSON MATTHEY METAL JOINING

and a global supplier of brazing filler metals, solders and fluxes. Is part of the Precious Metal Products Division of Johnson Matthey plc,

WWW.JM-METALJOINING.COM Johnson Matthey Metal Joining

Johnson Matthey Metal Joining | York Way Royston Hertfordshire SG8 5HJ UK | Tel: +44 (0)1763 253200 | Fax: +44 (0)1763 253168 | Email: mj@matthey.com

Johnson Matthey PIc cannot anticipate all conditions under which this information and our products or the products of other manufacturers in combination with our products will be used. This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is given in good faith, being based on the latest information available to Johnson Matthey PIc and is, to the best of Johnson Matthey PIC's knowledge and belief, accurate and reliable at the time of preparation. However, no representation, warranty or guarantee is made as to the accuracy or completeness of the information and Johnson Matthey PIc assumes no responsibility therefore and disclaims any liability for any loss, damage or injury howsoever arising lincluding in respect of any claim brought by any third party lincured using this information. The product is supplied on the condition that the user accepts responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. Freedom from patent or any other proprietary rights of any third party must not be assumed. This datasheet may only be reproduced as information, for use with or for reside of Johnson Matthey PIc, Royston, United Kingdom 2012.

JM 🐼

emetev2 tnemegeneM

Product Quality and

METAL JOINING WALL CHART

PRODUCTS



JOHNSON MATTHEY

METAL JOINING

JMMJ-WCE-v10



JOHNSON MATTHEY METAL JOINING PRODUCT REFERENCE CHART

SILVER AND COPPER PHOSPHORUS 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: 2010					
Silver-flo™ 60	60	26	14			695-730	AG202						
Silver-flo™ 56	56	22	17	5		618-652	AG102	Ag 156					
Silver-flo™ 55	55	21	22	2		630-660	AG103	Ag 155					
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™ 20	20	44	35.85		0.15	776-815	AG206						
						· · · · · · · · · · · · · · · · · · ·	_						

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*. *Special considerations apply refer to Johnson Matthey for more info. Silver-flo™ 55 and 56 are general-purpose cadmium-free filler metals. They combine 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 such as Easy-flo™ and Easy-flo™ No. 2. 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.

Silver-flo™ Range - Special Applications

				- F F		-		
Silver-flo™ 56S	56	22	16.75	5	0.25	618-652		
Silver-flo™ 453S	45	25	26.8	3	0.2	640-680		
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™ 18	18	45.75	36		0.25	784-816		

Silver-flo™ 56S and 453S are proprietary filler metals containing silicon, which in conjunction with tin improves alloy flow and surface appearance. Silver-flo™ 4535 like 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 by model engineers.

Silver-flo™ F	lange	- Les	s Cor	nmon	/ Ref	ference Filler M	Netals					
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 33.5 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™ 16 16 50 34 790-830												
These Silver-flo™ fil	ler meta	ls have r	niche use	es or are	include	d for reference purpos	es.					

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

	Ag	Cu	Р	Melting Range °C	EN1044:1999	ISO 17672:2010							
Sil-fos™ Plus	18	75	7	644	CP101	CuP 286							
Sil-fos™	15	80	5	644-800 CP102 CuP 2									
Sil-fos™ 5	5	89	6	644-815	CP104	CuP 281							
Sil-fos™ 6													
Silbralloy™	2	91.7	6.3	644-825	CP105	CuP 279							
These filler metals a	re recomm	ended for t	the flux-les	s brazing of copper.	On brass, bronze	e and other copper							
alloys a separate flu containing metals, in						on nickel or iron							

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^m 5 provides the best combination of ductility and flow of the group making it the filler metal of choice for joining tubes in heating, refrigeration, air-conditioning and heat exchanger component

SilbralloyTM can be used instead of Copper-floTM when low cost filler metal with higher ductility is required.

Copper-flo™ Range - Copper Phosphorus Brazing Filler Metals

Cadmium-Containing

Product

Easy-flo™

Argo-flo™

Easy-flo™No.2

DIN Argo-flo™

Mattibraze™35

Easv-flo™No.3

Argo-Swift™

Argo-bond™

	Cu	Р	Sn	Other	Melting Range °C	EN1044:1999	ISO 17672:2010						
Copper-flo™	92.2	7.8			714-810	CP201	CuP 182						
Copper-flo™ 2 92 6 2 Sb 690-825 CP301 CuP 389 Copper-flo™ 3 93.8 6.2 714-890 CP203 CuP 179													
Copper-flo™ 3	93.8	6.2			714-890	CP203	CuP 179						
Stan-fos™ 86.2 6.8 7 640-680 CP302 CuP 386													
The Copper-flo™ fill joining tubes and pi have lower ductility nickel or iron contai Copper-flo™ and Co Stan-fos™ is a very f ductility and requires t	pes in he than the ning met pper-flo ¹ ree flowir	eating, re silver-c tals, inclu Mo.3 a ng filler m	efrigerat opper-pl uding all re widely	ion, air- hos proc grades used in	conditioning and he lucts. Copper-flo™ f of steel, because a refrigeration pipe wor	at exchanger con filler metals shou brittle joint will r k and for copper c	nponents. They Id not be used on result. ylinders.						

Cd

Cd

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 1767 2010
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™ 49LM Tri-foil	49	27.5	20.5	0.5	2.5		670-710				
Argo-braze™ 40	40	30	28	2			670-780		BAg-4		Ag 440
								_		<u> </u>	

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[™] 49LMT is the universal brazing tri-foil used for larger carbide tips and circular saw blades. Argo-braze™ 40 has a long melting range and gap filling characteristics. It is used on both steel and carbide parts.

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: 2010				
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					
Argo-braze™ 632 and Argo	-braze	™ 56 a	re desi	igned t	o preve	ent interfacial	(crevice	e) corrosio	n, which m	ay result in				

Cadmium-Free Product Ag Cu Zn Sn Ni

lt in rapid failure of joints made in stainless steel when exposed to water. Both filler metals have long melting ranges and are not free flowing or easy to use.

55 21 22 2

55 21 22 2

55 21 22 2

40 30 28 2

40 30 28 2

40 30 28 2

30 36 32 2

50 20 28

2 660-705

Argo-braze[™] Range for Vacuum Tube Devices, Vacuum Brazing and **Electronic Components**

	Ag	Cu	In	Sn	Ni	Melting Range °C	AMS	AWS A5.8	EN1044: 1999	ISO 17672: 2010
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
Argo brazoTM Z2NiV is	modi	finds	orcior	a of A	rao hi		at cont	ning nickol f	or improvo	d watting on

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 was formerly called Silver-Copper Eutectic™ by Johnson Matthey. It is ideal for flux-less brazing of copper, nickel and metalised ceramics. Argo-braze™ 72 is supplied in two grades: 'Vacuum' Grade 1, as indicated by the letter 'V', which is suitable for components that will operate in a vacuum; and Grade 3 for applications where ultra high purity of the alloy is not required

Argo-braze™ 63V and Argo-braze™ 61V are indium bearing filler metals suitable for similar applications to Argo-braze[™] 72V and can be used in conjunction with it in step brazing operations. Argo-braze[™] 60V was formerly known as RTSN[™] and can meet a variety of niche requirements. V1 indicates that the filler metal is supplied to a tightly controlled volatile impurity specification, Grade 1 of the vant standard, making the filler metal suitable for vacuum service e.g. in thermionic vacuum tube type devices.

Argo-braze™ Range for Aerospace and Miscellaneous Applications

	Ag	Cu	Zn	Ni	Mn	Melting Range °C	AMS	AWS A5.8	ISO 17672: 2010					
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														
Argo-braze™ 85 is a coppe	er-free	brazing	filler m	netal u	sed for	brazing assembli	es which	will see ammon	ia in service					

or temperatures up to 400°C.

Argo-braze.	" 502, 54 and 25	DHE are brazing	, mei metais t	nat are used in v	anous aerospace con	iponents.

Melting Range °C	EN1044: 1999	ISO 17672: 2010	Active-braze™	Silver Br	azing Fill	er Metals								
630-660	AG103	Ag 155												
630-660	AG103	Ag 155			Ag	Cu	Ti	Al	Melting Range °C					
630-660	AG103	Ag 155	Active-braze™ No.	1	92.75	5	1.25	1	860-912					
650-710	AG105	Ag 140				-		-						
650-710	AG105	Ag 140	Active-braze™ No. 2	2	68.8	26.7	4.5		830-850					
650-710	AG105	Ag 140	Active-braze™ No.	10	70	28	2		780-800					
665-755	AG107	Ag 130	These products are repr	These products are representative of the Active-braze™ brazing filler metals – other compositions are available.										
660-705		Ag 450	They are suitable for brazing of diamond, ceramics and titanium alloys.											

BRAZING FLUXES

Silver-flo™ and Argo-braze™ Products as Alternatives for Discontinued Cadmium Bearing Filler Metals

1999

AG301

AG303

AG304

AG305

AG306

AG351

FN1044: Recommended

Alternative*

 \longrightarrow

 \rightarrow

 \rightarrow

 \rightarrow

->

 \rightarrow

Silver-flo™55

Silver-flo™55

Silver-flo™55

Silver-flo™40

Silver-flo™40

Silver-flo™40

Silver-flo™302

Argo-braze™502

Melting

Range °C

620-630

608-617

595-630

608-655

610-700

607-685

616-735

Ag Cu Zn Cd Ni

50 15 16 19

38 20 22 20

634-656 634-656

 Call
 42
 17
 16
 25

 Call
 40
 19
 21
 20

 Cd!
 35
 26
 21
 18

 Cd!
 30
 28
 21
 21

 Cd!
 23
 35
 27
 15

General Purpose Silver Bra	ral Purpose Silver Brazing Fluxes Working Range °C EN1045			Silver Brazing Fluxes for Special Application	ons		Fluxes for Aluminium		Fluxes for Jewellery			
	Working Range °C	EN1045			Working Range °C	EN1045		Applications			Applicatio	ins
Easy-flo™ Flux Powder	550-800	FH10	The leading brand general-purpose flux, good for hot-rodding.	Easy-flo™ Aluminium Bronze Grade Flux Paste	550-775	FH11	For brazing on parent metals (aluminium bronze) containing 2-10% aluminium.		Working			Working
Easy-flo™ Flux Paste	575-825	FH10	Good overheat resistance but provides less cover when molten.	Easy-flo™ Medium Temperature Grade Flux Powder	600-800	FH10	A general-purpose flux powder with good overheat resistance.		Range °C	Flux Residues		Range °C
Mattiflux™ 100 Flux Paste	550-800	FH10	Smooth general-purpose flux with good overheat resistance.	Easy-flo™ Stainless Steel Grade Flux Paste	550-775	FH10	Contains more fluoride, good for stainless steel with short heating cycles.				Palla-flo™	700-1100
				Easy-flo™ Stainless Steel Grade Flux Powder	550-775	FH10	Contains more fluoride, good for stainless steel with short heating cycles.	Alu-flo™ No. 1 Flux Paste	450-650	Corrosive	Oro-flo™	550-800
Medium and High Tempera	turo Brazing Eluvos			Easy-flo™ Dipping Grade Flux Paste	550-750	FH10	Active at low temperatures, good for 'dipping' and induction brazing applications.	Alu-flo™ No. 2 Flux Paste	575-650	Non-Corrosive	010-110	550-800
Medium and right tempera	ture brazing riuxes			Liquid Flux No. 25	600-850	FH10	A liquid flux for use where limited fluxing is needed.				Palla-flo™ is a	
Tenacity™ No. 4A Flux Powder	600-850	FH10	For brazing larger copper parts and prolonged heating cycles.	Tenacity™ No. 6 Flux Powder	550-800	FH12	Contains boron for improved wetting on tungsten carbide.	Alu-flo™ No.1 Flux Paste is a chl			jelly based flux	
Tenacity™ No. 5 Flux Powder	600-900	FH10	For stainless steel, heavy parts and prolonged heating cycles.	Tenacity™ No. 6 Flux Paste	550-800	FH12	Contains boron for improved wetting on tungsten carbide.	Alu-flo™ HT and MT. Residues are warm water washing after brazing		ld be removed with	brazing cobalt palladium alloy	-
Tenacity™ No. 5A Flux Powder	600-900	FH12	Contains boron for improved wetting on tungsten carbide.	Tenacity™ No. 2 Modified Flux Powder	550-800	FH10	Specially modified for use as coating on brazing rods.	Alu-flo™ No.2 Flux and Paste is		x suitable for use	Oro-flo™ is a	
Tenacity™ No. 20 Flux Powder	750-1000	FH21	For brass brazing / bronze welding with the Argentel [™] range.	Tenacity™ No. 14 Flux Powder	550-750	FH10	A very fluid flux that prevents red staining on brass.	with Alu-flo™ HT and MT. Residue	s are insoluble and	inert and cannot be	yellow liquid ba	
Tenacity™ No. 125 Flux Powder	750-1200	FH21	For brazing with JM Bronze™ filler metals such as F Bronze™.	Silver-flo™ Flux Powder	550-775	FH10	A basic grade economic flux.	removed after brazing.			suitable for bra	Jzing gold
Tenacity™ No. 125 Flux Paste	750-1200	FH21	For brazing with JM Bronze [™] filler metals such as F Bronze [™] .	Silver-flo™ Flux Paste	550-775	FH10	A paste equivalent to Easy-flo™ Flux Powder.				jewellery.	

PRECIOUS METAL BRAZING FILLER METALS

SO 17672:

2010

Ni 600

Ni 610

Concerns over user safety

cadmium within the environr mean that the Easy-flo™

ontinued.

range of products has been

The conversion chart to the

right shows the cadmium-free

selected as an alternative.

*Please note that it is advisable

o consult Johnson Matthey before

changing to a cadmium-free product.

rnative that is most often

and the long-term impact of

Orobraze ^{IM} Ra	inge	of Go	DIG B	ased	Bra	zing Filler I	Metals		
	Au	Cu	Ni	Ag	Pd	Melting Range °C	AMS/ AWS A5.8	EN1044: 1999	ISO 17672 2010
Orobraze™ 845	60	20		20		835-845			
Orobraze™ 890	80	20				890			Au 800
Orobraze™ 940	62.5	37.5				930-940		AU102	Au 625 VI
Orobraze™ 950	82		18			950	4787/BAu-4	AU105	Au 827 VI
Orobraze™ 970	50	50				955-970			Au 503
Orobraze™ 990	75		25			950-990		AU106	Au 752 VI
Orobraze™ 998	37.5	62.5				980-998	BAu-1	AU103	Au 375 VI
Orobraze™ 1005	35	65				970-1005			Au 354
Orobraze™ 1018	30	70				996-1018		AU104	Au 295 VI
Orobraze™ 1030	35	62	3			1000-1030	BAu-3		Au 351
Orobraze™ 1040	70			30		1030-1040			
Orobraze™ 1045	70		22		8	1005-1045	4786/BAu-6		Au 700

Miscellaneous	Precious	Metal	Brazing	Filler	Metals
(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[™] and Pallabraze[™] Brazing Filler Metals

Johnson Matthey Metal Joining supply a wide range of precious metal brazing filler metals. The specialised filler metals of the Orobraze™ and Pallabraze™ product ranges have been added to in recent years. This section of the product reference chart lists both the traditional Johnson Matthey products shown to the right and left and the more recent additions shown below

OrobrazeTM and **Pallabraze**TM product ranges are supplied to 'vacuum grade' purity standards. **V1** indicates that the filler metal is supplied to a tightly controlled volatile impurity specification, Grade 1 of the relevant standard, making the filler metal suitable for vacuum service e.g. in thermionic vacuum tube type devices. In addition to traditional aerospace and electronics applications they have been used in the glass and chemical industries where increased resistance to corrosion and chemical attack makes them a good choice.

Gold-copper Orobraze™ filler metals show good wetting on Fe. Ni, Co. Ta. Nb and W. Gold-nickel Orobraze™ filler metals (Orobraze™ 950 and 990) show good high temperature strength (up to

600°C), resistance to oxidation, and resistance to crevice corrosion on stainless steel Pallabraze™ products can be used to braze a variety of materials from stainless steel to metalised ceramics.

They generally have good resistance to oxidation as well as high temperature strength The miscellaneous Orobraze™ and Pallabraze™ product ranges shown are used for a variety of applications.

Consult www.jm-metaljoining.com for more information on an individual product.

Miscellaneous (melting betwe			-	Filler M	letals								
	Au	Pd	Ni	Cu	In	Other	Melting Range °C						
Orobraze™ 1000	40			60			980-1000						
Orobraze™ 1004	35	10	14	31.5		9.5 Mn	971-1004						
Orobraze™ 1010	73.8		26.2				980-1010						
Orobraze™ 1013	25	15	10	37		13 Mn	970-1013						
Orobraze™ 1025	20			78	2		975-1025						
Orobraze™ 1050	70		30				960-1050						

Pallabraze™ Range of Palladium Bearing Brazing Filler Metals

	Pd	Ag	Cu	Ni	Melting Range °C	AMS/AWS A5.8	EN1044:1999	ISO 17672:2010
Pallabraze™ 810	5	68.5	26.5		807-810	BAg-30	PD106	Pd 287 V1
Pallabraze™ 840	10	67.5	22.5		834-840		PD104	Pd 388 V1
Pallabraze™ 850	10	58.5	31.5		824-850	BAg-31	PD105	Pd 387 V1
Pallabraze™ 880	15	65	20		856-880		PD103	Pd 481 V1
Pallabraze™ 900	20	52	28		876-900		PD102	Pd 484 V1
Pallabraze™ 950	25	54	21		901-950	BAg-32	PD101	Pd 587 V1
Pallabraze™ 1010	5	95			970-1010		PD204	Pd 288 V1
Pallabraze™ 1090	18		82		1080-1090		PD203	Pd 483 V1
Pallabraze™ 1225	30	70			1150-1225			
Pallabraze™ 1237	60			40	1237		PD201	Pd 647 V1

Miscellaneous Precious Metal Brazing Filler Metals (melting above 1050°C)

	Au	Pd	Ag	Ni	Cu	Со	Other	Melting Range °C	AMS/AWS A5.8	ISO	Pt Extra E
	Au	Fu	~5	INI	cu	co	Other	Menting Range C		17672:2010	Pt Easy
Orobraze™ 1052	25	15		18	31		11 Mn	1017-1052			Pt Mediun
Pallabraze™ 1070		10	90					1025-1070			Pt Hard
Pallabraze™ 1120		20	75				5 Mn	1000-1120		Pd 485 V1	Pt 1200
Orobraze™ 1121	50	25		25				1102-1121	4784	Au 507	Pt 1700
Pallabraze™ 1169	30	34		36				1135-1169	4785	Au 300	These platir
Pallabraze™ 1179		22.5	48.5	10	19			910-1179			available in
Pallabraze™ 1219		65				35		1219	BPd-1		paste or as
Orobraze™ 1270	92	8						1200-1270	BAu-8		

Carat Gold Jewellery Solders

	Melting Range °C		Melting Range °C							
3.6ct Yellow Extra Easy	645-705	9ct Red Medium	685-790							
9ct Yellow Extra Easy	620-690	14ct Yellow Easy	710-730							
9ct Yellow Easy	650-720	18ct Yellow Easy	700-715							
9ct Yellow Medium	735-755	18ct Yellow Medium	730-765							
9ct Yellow Hard	755-795	18ct Yellow Hard	790-830							
9ct White Medium	735-755	18ct Red Medium	805-810							
These carat gold solders are available in 2g panels, as a paste or as a powder.										

Platinum lewellerv Silver Solders for Silverware Solders Applications Melting Melting Range °C Range °C Silver-flo™ 67X - Extra Easy t Extra Easy 935-955 667-709 Silver-flo™ 67E - Easv 1010-1029 705-723 t Medium 1179-1217 Silver-flo™ 67H - Hard 745-778 1422-1445 Silver-flo™ 74M - Medium 720-765 1179-1217 Silver-flo™ 81F -730-800 1700 **Enamelling Solder** se platinum solders are The original 'Silver Solders' used by silversmiths, ailable in 2g panels, as a iewellers and the allied trades. Available in strip form and suitable for use with Easy-flo™ Flux Powder, ste or as a powder. Oro-flo™ Liquid Flux or Tenacity™ No.125.

BASE METAL BRAZING FILLER METALS

Argentel[™], Bronze[™] and Other Copper Based Brazing Filler Metals

	Cu	Zn	Ni	Mn	Sn	Со	Other	Melting Range °C	EN1044: 1999	ISO 17672: 2010
Copper	99.9							1081	CU101	Cu 110
92/8 Copper-Tin	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		
Argentel™ No. 1	60	39.7					0.3 Si	875-895	CU301	Cu 470a
Argentel™	48	41.8	10				0.2 Si	890-920	CU305	Cu 773

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

Copper can be supplied in a variety of forms to EN1044 CU101 and is used in reducing atmosphere or vacuum brazing processes

92/8 Copper-Tin 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™ filler metals are brass type alloys. They are used in 'braze' or 'bronze welding' processes for which the main application is joining of steel and / or tungsten carbide.

Alu-flo™ Range of Aluminium Brazing Filler Metals

	AI	Si	Cu	Melting Range °C	AMS/AWS A5.8	EN1044:1999	ISO 17672:2010
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[™] MI 86 10 4 520-585 BAISI-3 AL201 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.

Nickelbraze™ H	TN I	Nick	el B	ase	d B	razi	ng F	iller Met	als		
	Ni	Cr	Fe	в	Si	Ρ	с	Melting Range °C	AMS/ AWS A5.8	EN1044: 1999	19
Nickelbraze™ HTN1	Bal	14	4.5	3.1	4.5		0.7	980-1060	4775/BNi-1	NI101	
Nickelbraze™ HTN1A	Bal	14	4.5	3.1	4.5			980-1070	4776/BNi-1a	NI1A1	
Nickelbraze™ HTN2	Bal	7	3.0	3.1	4.5			970-1000	4777/BNi-2	NI102	

Nickelbraze™ HTN2	Bal	7	3.0	3.1	4.5		970-1000	4777/BNi-2	NI102	Ni 620
Nickelbraze™ HTN3	Bal		0.5	3.1	4.5		980-1040	4778/BNi-3	NI103	Ni 630
Nickelbraze™ HTN4	Bal		1.5	1.8	3.5		980-1070	4779/BNi-4	NI104	Ni 631
Nickelbraze™ HTN5	Bal	19			10.1		1080-1135	4782/BNi-5	NI105	Ni 650
Nickelbraze™ HTN6	Bal					11	875	BNi-6	NI106	Ni 700
Nickelbraze™ HTN7	Bal	14				10.1	890	BNi-7	NI107	Ni 710

Nickelbraze™ 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	Zr	Ni	Cu	Ag	AI	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 Pallabraze™ 880Ga, Active-braze™ No.1, Active-Braze™ No.2, silver and standard silver.

Alu-floth ChannelFluxth Range of Aluminium Brazing Filler Metals

······································									
	AI	Si	Zn	Melting Range °C	AMS/AWS A5.8	EN1044: 1999	ISO 17672: 2010		
Alu-flo™ HT ChannelFlux™	88	12		575-585	BAISi-4	AL104	Al 112		
Alu-flo™ ZA-1 ChannelFlux™	22		78	441-471	Patent pending product				
Alu-flo™ ChannelFlux™ Products are aluminium brazing filler materials in which a flux is encapsulated into a									

central channel running through the product. Alu-flo™ HT ChannelFlux™ is based upon the industry standard aluminium-silicon brazing filler metal and can be supplied with various flux compositions to suit the application. It is suitable for brazing automotive or mobile air conditioning components. Alu-flo ZA-1 ChannelFlux™ can be useful as a product for repair of brazed aluminium components. Special considerations should be followed for any other use.

Lead-Free Soft Solder Alloys Melting BS.EN.29453 EN ISO 9453:2006 Sn Ag Cu Other Range °C P40™ 96 4 221 Alloy No. 28 Alloy No. 701 Plumbsol™ 97.5 2.5 221-225 P5™ 95 5 221-235 Alloy No. 704 97C 97 230-250 Alloy No. 402 Allov No. 24 99C 99 230-240 Alloy No. 401 1 Allov No. 23 87 LM10A™ 10 3 214-275 95A 95 5 Sb 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™, P40™ and P5™ silver-tin solders 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.

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

	In	Sn	Pb	Ag	Melting Range °C	EN ISO 9453:2006
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	

Soft Solder Fluxes

	Recommended For Use On	Flux Residues	Working Range °C
Soft Solder Flux No.1S	Carbon steel / stainless steel	Corrosive	180-350°C
Soft Solder Flux No.2S	Copper / brass	Intermediate	180-350°C
Soft Solder Flux No.3S	Copper / brass / carbon steel / stainless steel	Corrosive	180-350°C

Soft Solder Flux No.1S is a liquid flux with corrosive residues used for stainless, carbon steel and copper alloys Soft Solder Flux No.2S is a liquid flux for copper and copper alloys with residues classified as intermediate. Soft Solder Flux No.35 is a flux paste with corrosive residues used for stainless, carbon steel, and copper alloys.

SOFT SOLDERS

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

6		Ag	Sn	Pb	Melting Range °C	BS.EN.29453	EN ISO 9453:2006		
	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 improves wetting of A25™ / A5™ onto copper and copper-based alloys.								

Tin-Lead Soft Solder Alloys

	Sn	Pb	Other	Melting Range °C	BS.EN.29453	EN ISO 9453:2006
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 Sb	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 Sb	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

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

