


brazing




PIETRO GALLIANI S.p.A.

something precious

PIETRO GALLIANI

THE COMPANY AND ITS SPECIALIZATIONS

Pietro Galliani S.p.A. has operated, since the beginning of this century, in non ferrous metal transformation field.

In 1986 the company passed over to silver rolling and brazing alloys production, becoming in a short time one of the leading companies in this sector.

The company works using advanced production technology and continuosly invests in research in order to guarantee a quality improvement according to its purposes.

Pietro Galliani S.p.A., UNI EN ISO 9001 - VISION 2000, certificated, belongs to a holding operating, also internationally, with other companies all specialized in metallurgical area.

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REG. N. 545
UNI EN ISO 9001-2000

Brazing is a process to join metals through an added alloy that melts at a temperature above 450 °C (strong brazing) or below (soldering), by the phenomenon of capillarity, that is the ability of a liquid to penetrate into the reduced air space of the joint.
The main advantage of this procedure is the capacity to join metals with very different melting temperatures and thicknesses, at the same time keeping the geometrical and physical properties due to the low temperature of the process.

For satisfactory use, a brazing alloy should have the main characteristics here below:

- Good wetting of the base materials to be joined.
- Suitable melting point to permit a uniform distribution into the joint by capillary attraction.
- Homogeneous composition to minimise the separation of constituents under the brazing conditions.
- Ability to form brazed joints with suitable mechanical and physical properties for the operating purposes.
- Ability to avoid the formation of brittle intermetallic compounds with the base metal.

BRAZING WITH FILLER METAL

GENERAL SPECIFICATIONS FOR CORRECT APPLICATION

Properties of the joint

Brazing is characterised by the concept of capillarity that is the ability of the brazing alloy to run into the air space of the joint. For a correct filling of the joint the properties of the base metals and the brazing alloy must be considered. The distance between the surfaces to be joined has to be determined at the brazing temperature.
For an optimal resistance of the brazed joint a good rule to adopt, for flat surfaces, is an overlap equivalent to about 3 to 4 times the smaller thickness of the above mentioned surfaces and, for the circular joints higher than 1", an overlap of 1 diameter.

Choice of the brazing alloy

Is made on the basis of the material to be joined and economic considerations (% of silver) related to the level of difficulty of the application which generally, is directly proportional to the melting range of the alloy.

Preparation of the joint

Before the brazing, the surfaces to be joined should be cleaned by removing grease, using solvents or hot water, and oxides using mechanical brushing.

Application of flux

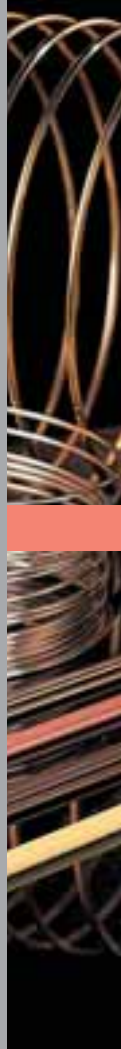
The choice of flux is as important as that of the alloy. The flux applied to the surfaces to be joined should melt and become active at a temperature lower than that of the melting point of the alloy. Its activity should continue for the whole brazing cycle removing the oxides from the two metals or preventing their formation.

Heating of the joint and application of the alloy

The heating can be carried out using a torch fed by fuels such as acetylene, propane or natural gas, or by using induction or resistance electrical systems.
The purpose is to heat uniformly the joint at the right brazing temperature depending on the chosen alloy and its properties, which determine the optimal heating ratio. The alloy should normally be applied only when the temperature required is reached for rapid melting and fast distribution along all the surfaces of the joint by capillary attraction. For the ralisation of a brazing filled an alloy with pasty flow should be used.
The melted alloy always flows towards the hottest part of the joint, this to be obtained possibly by an indirect flame in case of the use of a torch.

Removing of residual flux

Once the solidification of the brazing alloy has taken place, the joint can be cooled down in water to remove the remaining flux being careful not to damage the brazed elements.



GUIDE TO THE CHOICE OF ALLOY

SILVER ALLOYS

Alloys with tin

Are susceptible to rapid cooling especially those with components very different to eachother.

Alloys with silicium

Not recommended on junctions exposed to impacts, vibrations, fatigue stresses because the silicon can make very brittle intemetallic compounds.

Alloys for salty environments

Are those of a high content of silver (>40%) with or without tin. In these alloys, particularly requested for ship and marine construction, the loss of zinc by galvanic process is reduced.

Alloys for step by step brazing

Normally are those with a narrow melting range. They are chosen with melting point progressively lower to avoid phenomena of re-melting of the adjacent joints, previously made.

Nickel and its alloys

Are materials susceptible to cracks during the brazing, caused by intergranular penetration or stress. It is advisable that the alloys have a low quantity of zinc and high brazing temperature.

Alloys with cadmium

Have good flow, good mechanical properties and are more economical than those without cadmium. They show a wide range of brazible materials, from copper to iron, even to stainless steel and tungsten carbides.

Alloys for tungsten carbides

Similar to the alloy with cadmium, there are alloys without cadmium specifically for these materials. The presence of nickel and manganese increases the wetting difficulty of these materials. Preferable the alloys with low melting point in particular for small carbides. Particularly indicated the compound alloys (triple metal sheets), with an interconnected layer of copper able to absorb crashes and vibrations. Carbides present thermal expansion coefficient very low and different than metals of the supports, for this reasons the heating has to be carried out slowly and uniformly to avoid cracks. Rapid cooling after brazing should be avoided.

Alloys for stainless steel

Their choice should consider the operating condition with particular reference to the presence of humidity or water. In fact in these cases failures can occur for interface corrosion alloy-stainless steel.
Particularly susceptible are steels without nickel, with a low content of nickel and from the series 400-410-420-430, on the contrary from austenitic steel of the series 300 more resistant resulting.
Alloys without cadmium, but containing nickel, offer higher resistance particularly on steels, while those with cadmium are more suitable against interface corrosion.

COPPER ALLOYS

Indicated for copper brazing and, with the use of flux, of its alloys (bronze, brass). The best results are obtained by narrow clearances. Due to the high conducibility it is advisable to heat rapidly with the torch. Not suitable on ferrous and stainless materials as they can form brittle intermetallic compounds. With refined copper containing dissolved oxides it is the best to use a neutral or slightly oxidizing flame to avoid the formation of cavities caused by reduction of oxides, as hydrogen embrittlement. Alloys with phosphor should be avoided in presence of gases containing high levels of sulphur. They are successfully used in sanitary and medical piping because not containing zinc, they do not risk of galvanic dezincification.

SILVER ALLOYS CADMIUM FREE

Brazing Alloy	Composition %					Melting Range	Operating Temp.	Density	Tensile Streng.	International Standards Correspondences					Recomm. Flux
	Ag	Cu	Zn	Sn	Others	°C	°C	g/cm³	N/mm²	DIN 8513	AWS A5.8	BS 1845	NFA 81-362	EN 1044	EN 1045
Galflo 1	1	60	39	—	*	890-900	900	8,3	350	—	—	—	—	—	BRONZE
Galflo 5	5	55	40	—	*	820-870	860	8,4	350	L-Ag 5	—	—	05 A1	Ag 208	BRONZE SHT
Galflo 12	12	48	40	—	*	800-830	830	8,5	410	L-Ag 12	—	—	—	Ag 207	SHT
Galflo 16	16	50	34	—	*	790-830	820	8,6	505	—	—	—	—	—	SHT
Galflo 20	20	44	36	—	*	690-810	810	8,7	330	L-Ag 20	—	—	20 A1	Ag 206	SHT
Galflo 25	25	41	34	—	*	700-800	780	8,8	420	L-Ag 25	—	—	25 A1°	Ag 205	S PLUS
Galflo 25 Sn	25	40	33	2	*	680-760	750	8,7	420	L-Ag 25Sn	B Ag 37	—	25 A2	Ag 108	XLT
Galflo 30	30	38	32	—	*	650-750	740	8,8	505	L-Ag 30	B Ag 20	—	—	Ag 204	S PLUS
Galflo 30 Sn	30	36	32	2	*	680-765	750	8,9	460	L-Ag 30 Sn	—	AG21	—	Ag 107	XLT
Galflo 33	33	34	33	—	—	700-740	730	8,9	535	—	—	—	—	—	SLT
Galflo 34 Sn	34	36	27	3	*	630-730	710	9	420	L-Ag 34Sn	—	—	—	Ag 106	
Galflo 35	35	32	33	—	*	680-750	740	9	430	—	B Ag 35	—	—	—	S PLUS SHT
Galflo 38 Sn	38	31	29	2	*	650-720	710	8,8	430	—	B Ag 34	—	—	—	S PLUS UW / UWR
Galflo 40 Sn	40	30	28	2	*	640-700	690	9,1	430	L-Ag 40Sn	B Ag 28	AG20	—	Ag 105	XLT
Galflo 40 Ni	40	30	28	—	Ni 2	670-780	780	8,9	350	—	B Ag 4	—	—	—	XLT UW UWR
Galflo 43	43	37	20	—	—	690-770	760	9,1	400	—	—	AG5	—	—	S PLUS
Galflo 44	44	30	26	—	*	675-735	730	9,1	545	L-Ag 44	—	—	44 A1	Ag 203	XLT
Galflo 45	45	30	25	—	*	660-740	730	9,2	410	—	B Ag 5	—	45 A2°	—	UW / UWR
Galflo 45 Sn	45	27	25	3	*	640-680	670	9,2	350	L-Ag 45Sn	B Ag 36	—	—	Ag 104	S PLUS XLT UW / UWR
Galflo 49 Ni Mn	49	16	23	—	Mn7,5 Ni4,5	685-705	690	8,9	350 T	L-Ag 49	B Ag 22	AG18	—	Ag 502	UW / UWR UB
Galflo 49 Ni Mn L	49	27,5	20,5	—	Mn2,5 Ni0,5	670-690	690	9	350 T	—	B Ag 26	—	—	Ag 502 670-690	UW / UWR UB
Galflo 50 Ni	50	20	28	—	Ni 2	660-750	740	9	450	—	B Ag 24	—	—	—	UW / UWR S PLUS
Galflo 55 Sn	55	21	22	2	*	620-660	650	9,4	390	L-Ag 55Sn°	—	AG14	—	Ag 103	S PLUS
Galflo 56 Sn	56	22	17	5	*	620-650	650	9,5	410	—	B Ag 7	—	56 A1	Ag 102	XLT SLT
Galflo 60 Sn	60	23	14	3	—	620-685	680	9,6	420	L-Ag 60 Sn	—	—	—	Ag 101	UW / UWR
Galflo 60 A Sn	60	30	—	10	—	600-720	710	9,8	420	—	B Ag 18	—	60 A1	Ag 402	XLT S PLUS
Galflo 65	65	20	15	—	—	670-720	710	9,6	400	—	B Ag 9	—	63 A1°	—	SHT UW / UWR
Galflo 72	72	28	—	—	—	779	779	10	350	—	B Ag 8	AG7	72 A1	Ag 401	SHT S PLUS

*** Also available with 0,2% Si**
° Equivalent
T Shearing strength

Main Applications

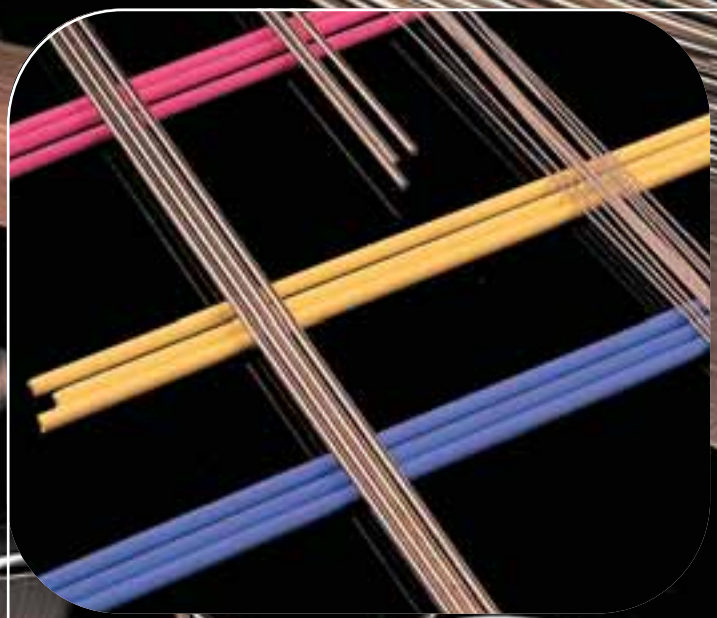
Used in place of brass particularly for automated machinery and for brazing of tungsten carbides tips on tools and saw blades. The reduced content of silver is to improve the fluidity. Yellow colored joint. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
Strong and resistant brazing, indicated for brass fittings, steel or cast iron also if badly prepared or oxidised. Yellow colored joint. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
For torch brazing on carbon and stainless steel, copper, nickel and its alloys. Used in boiler works for drawed components. Yellow colored joint. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
It is a compromise between silver base alloy and copper base alloys (brass and bronze). It allows fillings with much wider joints than the other silver based alloys. Very useful for step by step brazing, recommended clearance: 0,05÷0,13 mm (0,002"÷0,005") yellow colored joint.
Good fluidity and sufficient capillarity. Moderate mechanical characteristics, above all for stretching. Adding tin improves the flow and reduces the operating temperature as well as permitting a light joint colouring. Indicated for all ferrous metals, stainless steel, copper, brass except for aluminium. Used in mechanical and electrical industries, refrigeration, musical instruments and also for heating in furnaces at high frequency. Light yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
Good wetting and flow. The presence of tin as well as improving the fluidity is useful to increase the activity of the flux; used on equipment and containers in the food industry and for the assembly of copper tubes in the refrigeration sector. Light yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
For brazing of dissimilar metals and fittings in the assembly of tubes and for the refrigeration industry. Light yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
Used on ferrous and non-ferrous metals. Good anti-corrosion properties with stainless steel. Ideal for junctions of tungsten carbides. Good mechanical and filling characteristics for a narrow melting range. Tends to yellow-white colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
Intermediate melting range in the group of the ternary alloys with tin; used on ferrous and non-ferrous metals. Less fluid than the GALFLO 50 with cadmium. Light yellow colouring. Recommended clearance: 0,1÷0,25 mm (0,004" ÷ 0,01")
Good mechanical characteristics. Used for brazing of ferrous and non-ferrous metals in furnace. Ideal substitute for corresponding alloys with cadmium. GALFLO 45 cadmium free is used frequently in the electronics industry, food industry, as well as for brass parts in naval tubing, musical instruments and lighting. Ideal for wide joints and thick fillings. White-yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
For general use in particular on dissimilar metals due to of its low melting point. With moderate flow characteristics. Light yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
With low melting point and a higher resistance compared to the GALFLO 50 Ni, ideal for brazing of tungsten carbides tools, and indicated for stainless austenitg steel in salty environments. White colour. Recommended clearance: 0,05÷0,15 mm (0,002"÷0,005").
Low melting range. Good resistance to the cutting. Used for the soldering of tungsten carbides, stainless steels in the tools sector. Furnished also as a triple sheet having a central coating of CU. Low melting range, excellent characteristics (cutting, stess). Available in different ratio thickness brazing alloy : Cu. Used in the brazing of cutting tools.
Good fluidity. Ideal for low carbon stainless steel series 300. (medical and handling food tools) and small tungsten carbides inserts for cutting tools. White colour. Recommended clearance 0,1÷0,25 mm (0,004" ÷ 0,01")
Substitutes of GALFLO 45.The particular composition exalt the low melting characteristics and wettability. Ideal for alimentary applications. Its application minimises the breaking of corrosion under stress of nickel and its alloys and conforms its colour to the metal base. Yellow colour. Recommended clearance: 0,05÷0,13 mm (0,002" ÷ 0,005").
The high content of tin improves the wetting on stainless steel and its alloys and on the carbon steel. Ideal for step by step brazing due to low liquidus temperature and where is important to braze without flux. Good resistance in salty environment and in vacuum. White colour. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
Advisable for brazing of silver alloys (925‰). White colour. The brazing is similar to Sterling Silver. Used also for step by step brazing. Recommended clearance: 0,05÷0,15 mm (0,002"÷0,006")
For brazing into furnace at controlled atmosphere without the use of flux. Used for copper and its alloys, carbon steel, stainless steel and its alloys even if on these last alloys the wetting is short: fluidity and wetting are better with a higher heating.White colour. Recommended clearance: 0,05÷0,10 mm (0,002"÷0,004").

SILVER ALLOYS CADMIUM CONTAINIG

Brazing Alloy	Composition %					Melting Range	Operating Temp.	Density	Tensile Streng.	International Standards Correspondences				
	Ag	Cu	Zn	Cd	Others	°C	°C	g/cm³	N/mm²	DIN 8513	AWS A5.8	NFA 81-362	BS 1845	EN 1044
Galflo 9 Cd	9	52	33	6	*	625-830	830	8,2	350	—	—	—	—	—
Galflo 13 Cd	13	44	33	10	*	605-795	790	8,7	350	L-Ag 12 Cd°	—	—	—	—
Galflo 17 Cd	17	41	26	16	*	610-780	760	8,7	350	—	—	—	—	—
Galflo 19 Cd	19	39	28	14	*	630-730	730	8,8	350	—	—	—	—	—
Galflo 20 Cd	20	40	25	15	*	605-765	750	8,8	380	L-Ag 20 Cd°	—	20A2°	—	Ag 309
Galflo 21 Cd	21	36	27	16	*	605-730	720	8,6	400	—	—	—	—	Ag 308
Galflo 23 Cd	23	35	27	15	*	620-730	720	8,7	505	—	—	—	—	—
Galflo 25 Cd	25	30	27,5	17,5	*	605-720	710	8,8	420	L-Ag 25 Cd	B Ag-33	—	—	Ag 307
Galflo 30 Cd	30	28	21	21	*	600-690	680	9,1	535	L-Ag 30 Cd	B Ag-2a°	30 A1	AG 12	Ag 306
Galflo 34 Cd	34	25	20	21	*	610-670	640	9,1	505	L-Ag 34 Cd°	—	—	AG 11	—
Galflo 35 Cd	35	26	21	18	*	610-700	700	9,1	440	—	B Ag-2	35 A1	—	Ag 305
Galflo 38 Cd	38	20	22	20	*	605-655	640	9,2	505	—	—	—	AG 3	—
Galflo 40 Cd	40	19	21	20	*	595-630	610	9,3	505	L-Ag 40 Cd	—	40 A1	—	Ag 304
Galflo 42 Cd	42	17	16	25	—	610-620	610	9,1	390	—	—	42 A1°	AG 2	Ag 303
Galflo 45 Cd	45	17	18	20	*	620-635	620	9,4	460	L-Ag 45 Cd	—	—	—	—
Galflo 45 Cd	45	15	16	24	*	605-620	620	9,4	460	—	B Ag-1°	45 A1	—	Ag 302
Galflo 50 Cd	50	15	17	18	—	620-640	640	9,4	420	L-Ag 50 Cd	B Ag-1a°	50 A1	AG 1	Ag 301
Galflo 50 Ni Cd	50	15,5	15,5	16	Ni 3	635-685	650	9,5	460	—	B Ag-3	50 A2	AG 9	Ag 351

*** Also available with 0,2% Si**
° Equivalent

Recommended Flux	Main Applications
EN 1045	
S PLUS XLT	Economical alloys with wide melting range. Ideal for uneven junctions and with clearance of 0,1÷0,25 mm (0,004"÷0,01"). They present short capillarity but good fluidity. It is necessary to act with short heating cycles to avoid phenomena of liquations, preventing a perfect filler of the joint. Indicated in the brazing of brasses and particularly the GALFLO 17-20, copper bronze, copper nickel zinc. Yellow colored joint.
S PLUS XLT	They need a high heating rate for the correct filling of the joint. Particularly indicated for sleeve joints for refrigeration applications of copper based metals and its alloys and copper iron, steels, nickel and its alloys. Advisable for clearance of 0,1÷0,25 mm (0,004"÷0,01"). Light yellow colored joint. Not advisable for aluminium.
S PLUS SLT XLT	Alloy with high fluidity and flowability, easy application and reduced risk of annealing of the base metals. Used on tin, bronzes, taps and fittings, lamps. Light yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
S PLUS SLT XLT	Recommended for uneven and not narrow clearance of the joint. Advisable short heating cycle. Ideal for brazing of series with direct heating or by induction on stainless steel components, copper and its alloys for freezing pipes. Light yellow colouring. Recommended clearance: 0,05÷0,13 mm (0,002"÷0,005").
S PLUS SLT XLT UW / UWR	Ideal for a wide range, suitable for any base metal including chrome, cobalt, molybdenum and with some precautions titanium and zirconium. Brazing that normally does not request finishing operations. Advisable a neutral or soft flame care taking not producing dangerous overheatings. Light yellow colouring. Recommended clearance 0,05÷0,20 mm (0,002"÷0,008").
S PLUS XLT SLT	Alloys with high flow rate on closed joints. Ideal for rapidly and slowly heatings. The good mechanical characteristics, most of all of stretching, make them indicated for junctions of all metals also dissimilar from eachother, except aluminium and its alloys. Also used in chemical and pharmaceutical machinery, shipyard and furnace brazing. Recommended clearance 0,05÷0,20 mm (0,002"÷0,008"). Light yellow colouring.
S PLUS XLT	Recommended for brazing of similar metals, with indirect or automatical heating. With high flowability it is resistant in presence of corrosive agents. The joint is very smooth and with a light yellow colouring. Recommended clearance: 0,05÷0,15 mm (0,002"÷0,006").
S PLUS XLT UW / UWR	Resistant to the salty corrosion and to caustic solutions. It forbids the corrosion of the interface of the stainless steel. Because of the high wettability it is ideal for brazing of carbides tools. The low fluidity allows fillets on wider clearances. Light yellow colouring. Recommended clearances 0,1÷0,25 mm (0,004" ÷ 0,01").



COPPER - PHOSPHORUS - SILVER - TIN

Brazing Alloy	Composition %				Melting Range	Operating Temp.	Density	Tensile Streng.	International Standards Correspondences				
	Ag	Cu	P	Others	°C	°C	g/cm³	N/mm²	DIN 8513	AWS A5.8	BS 1845	NFA 81-362	EN 1044
Galflo Cu P 5	—	95	5	—	710-920	790	8,2	250	—	BCuP-1	—	—	—
Galflo Cu P 6	—	94	6	—	710-880	730	8,1	250	L - Cu p 6	—	CP 6	—	CP 203
Galflo Cu P 7	—	93	7	—	710-820	720	8,1	250	L - Cu p 7	BCuP-2	CP 3	07B1	CP 202
Galflo Cu P 7 EXT	—	93	7	*	715-830	750	8,1	250	L - Cu p 7 °	BCuP-2 °	CP 3 °	07B1 °	CP 202 °
Galflo Cu P 8	—	92	8	—	710-750	710	8	250	L - Cu p 8	—	—	08B1	CP 201
Galflo Cu P Ag 0,4	0,4	93,6	6	—	710-740	710	8,1	250	—	—	—	—	—
Galflo Cu P Ag 1	1	92,5	6,5	—	645-810	710	8,1	250	—	—	—	07B2	—
Galflo Cu P Ag 1 EXT	1	92,5	6,5	*	650-820	700	8,1	250	—	—	—	07B2	
Galflo Cu P Ag 2	2	91,8	6,2	—	645-800	710	8,1	250	L - Ag 2 P	BCuP-6	CP 2	06B1	CP 105
Galflo Cu P Ag 2 EXT	2	91,6	6,4	*	650-810	740	8,1	250	L - Ag 2 P °	BCuP-6 °	CP 2 °	06B1 °	CP 105 °
Galflo Cu P Ag 5	5	88,8	6,2	—	645-810	710	8,2	250	L - Ag 5 P	BCuP-3	CP 4	06B2	CP 104
Galflo Cu P Ag 5 EXT	5	88,7	6,3	*	650-820	720	8,2	250	L - Ag 5 P °	BCuP-3 °	CP 4 °	06B2 °	CP 104 °
Galflo Cu P Ag 6	6	86,7	7,3	—	645-690	680	8,2	250	—	BCuP-4	—	—	CP 103
Galflo Cu P Ag 6 Ni	6	86,6	7,3	* Ni0,1	645-725	700	8,2	250	—	—	—	07B3	CP 103
Galflo Cu P Ag 10	10	83,8	6,2	—	650-750	700	8,3	250	—	—	—	—	—
Galflo Cu P Ag 15	15	80,3	4,7	—	645-800	710	8,4	250	L - Ag 15 P	BCuP- 5	CP 1	05B1	CP 102
Galflo Cu P Ag 15 EXT	15	80	5	*	650-810	720	8,4	250	L - Ag 15 P	BCuP- 5	CP 1	05B1	CP 102
Galflo Cu P Ag 18	18	75	7	—	645-670	660	8,6	250	—	—	—	07B4	CP 101
Galflo Cu P 7 Sn 7	—	86	7	Sn 7	645-695	690	8	250	—	—	—	—	—

° Equivalent
* With microchemicals able to improve the mechanical and superficial characteristics of the brazing joint.

BRASSES

Brazing Alloy	Composition %					Melting Range	Operating Temp.	Density	Tensile Streng.	
	Cu	Zn	Ni	Si	Others	°C	°C	g/cm³	N/mm²	DIN 8513
Galflo OT Ni 10	48	41,8	10	0,2	—	920-935	935	8,7	480	L-CuNi10Zn42
Galflo OT Ni 6	53	40,6	6	0,2	Mn0,2	870-910	910	9	420	—
Galflo OT Si	59,5	40,25	—	0,25	—	890-900	900	8,4	370	L-Cu Zn 40
Galflo OT Si Sn	59	39,75	—	0,25	Sn1	870-890	900	8,4	400	—
Galflo OT Si Sn Mn	59	39,25	—	0,15	Mn0,8 Sn0,8	880-900	890	8,4	380	L-Cu Zn 39 Sn

ALLUMINIUM ALLOYS

Brazing Alloy	Composition %		Melting Range	Operating Temp.	Density	Tensile Streng.	International Standards		
	Al	Si	°C	°C	g/cm³	N/mm²	DIN 8513	AWS A5.8	NFA 81-362
Galflo Al Si 5%	95	5	570-620	590	2,7	105	L-Al Si 5	BAlSi-5	—
Galflo Al Si 12%	88	12	576-582	580	2,65	125	L-Al Si 12	BAlSi-12	—

ALLOYS

Recommended Flux	Main Applications
EN 1045	
SHT	Ideal for electrical resistance brazing. Particularly ductile, this alloy is less fluid at brazing temperature. Self pickling on copper-copper brazing.
SHT	Self pickling in the brazing copper-copper, they need the application of flux with the copper alloys: they can not be used on ferrous metals, nickel and aluminium. The fluidity increases with the increasing of the phosphor content. Strong brazing for sanitary industry, refrigeration and air-conditioning. The good capillarity advises clearances of 0,03 ÷ 0,08 mm (0,001" ÷ 0,003").
SHT	It is similar to the above alloys, but with higher fluidity. It is useful for narrower joints with clearances of 0,02 ÷ 0,04 mm (0,001" ÷ 0,002").
SHT	Self pickling on copper they request the flux with the copper alloys. They allow a good filling at the lowest temperatures and a good fluidity at the highest. Particularly recommended for sanitary and refrigerating installations with clearances of 0,06 ÷ 0,13 mm (0,002" ÷ 0,005").
SHT	Self pickling on the copper. Strong brazing of copper components addressed to the assembly of groups operating with vibrations, in the refrigeration and air-conditioning industry. Recommended clearance 0,06÷0,13 mm (0,002"÷ 0,005").
SHT	Self picking on the copper. Excellent wettability and capillarity. Recommended clearances 0,02 ÷ 0,06 mm.
SHT	Self picking on the copper. Excellent wettability, capillarity and resistance to the corrosion and indicated specifically for the combustible gas pipes installation.
SHT	Self picking on the copper. Indicated for the joints brazing copper-copper and copper-brasses.
SHT	Self pickling on copper, they are used for strong brazing of uneven junctions, in the refrigeration industry, on parts as coupling, manifolds, brass distributors, capillary pipes. Presents good mechanical characteristics at low temperature. Clearances of 0,06 ÷ 0,13 mm (0,002" ÷ 0,005").
SHT	Self pickling on copper. Exceptional fluidity. It is suitable for the reparation of the capillary losses of the brazed joints. Useful where the heat feeding is critical because of its low operating temperature. Recommended clearances: 0,02 ÷ 0,06 mm (0,001"÷ 0,003").
SHT	Ideal for furnace brazing. Used for brazing of heat exchanger components. Exceptionally flowing and also with a very high capillarity.

International Standards Correspondences				Recommended Flux	Main Applications
AWS A5.8	NFA 81-362	BS 1845	EN 1044	EN 1045	
RBCuZn D	49 C1	CZ 8	Cu 305	BRONZE	Generally applied on steels, nickel and its alloys. They can be used with all the processes of brazing also with flame but reducing. Not advisable for brazing in furnace with protective atmospheres. The alloy with the 10% of nickel is basically used for brazing of tungsten carbides. Used for reconstruction of teeth gears, supports, shafts, valves seats, steering joints, handlebars and looms of bicycles, metallic furniture, pipelines, etc., where high mechanical characteristics, tenacity and operating temperature until 300° C are requested.
—	—	—	—	BRONZE	
—	60C1	CZ6	Cu 301	BRONZE	Indicated for brazing of spheroidal grafite malleable cast iron because of the presence of silicium that avoid the decarburization.They are commonly used for maintenance applications, for zinc coated steels, tubular looms, special carriages, taps and fittings, small metallic parts, etc.
RBCuZn A	—	—	—	BRONZE	Brazing alloys used on steels, copper, nickel and its alloys, cast iron and stainless steel, where is not important the resistance at the corrosion. Applied to the processes with flame, in furnace, at induction. Generally requested the gasflux or borax and boric acid flux based. Recommended clearances: 0,05÷0,13 mm (0,002"÷0,005").
RBCuZn C	60C2	CZ 7A	—	BRONZE	

Correspondences		Recommended Flux	Main Applications
BS 1845	EN 1044	EN 1045	
B/SB AL95Si	Al 101	AL FLUX	Used for the TIG and MIG soldering, for aluminium brazing and its alloys. Not recommended for the anodized.
B/SB AL88Si	Al 104	AL FLUX	Used for TIG and MIG soldering, for aluminium brazing and its alloys with percentage of silicon higher than 7%. Excellent wettability.

SOFT TIN - LEAD - SILVER - ALLOYS

Brazing Alloy	Composition %			Melting Range	International Standards Correspondences			Recommended Flux	Main Applications
	Ag	Sn	Pb	°C	DIN 1707	NFA 81-362 BS-219	ASTM B321-96at	EN 29454	
Meccanistan 50	—	50	50	183-216	S - Pb 50 Sn 50	50 E1	50A	MECCANISTAN ACID INCLUDED IN THE ALLOY	Used in the fabrication of radiators for cars, gas heaters, cheap jewellery, and hydraulics. Solder of high grade tin 99,9% and electrolytical 99.9% lead. The wire is with 3 cores containing acid-based Meccanistan flux. Ideal for the welding of copper, bronze, brass, tin-plated nickel, cadmium-plated metal surfaces. Flux residuals can be removed with water, and in some cases washing is not even required.
Meccanistan 60	—	60	40	183-238	S - Sn 60 Pb 40	60 E1	60A		
Meccanistan Ag 3,5	3,5	96,5	—	221-223	S - Sn 97 Ag 3*	96 E1 *	—		
Meccanistan Ag 5	5	95	—	221-235	S - Sn 96 Ag 4*	94 E1 *	—		
Elettristan 50	—	50	50	183-216	S - Pb 50 Sn 50	50 E1	50A	ELETTRISTAN WITH COLOPHONY INCLUDED IN THE ALLOY	Used in the electronic industry, radios, Tv, printed circuits, telephony, automation, hobbies. It is composed exclusively with tin high grade 99,9% and electrolytical lead 99,9%. The wire is with 3 cores containing colophony Elettristan flux. This leaves an insulating residual and is deoxidizing, soluble in alcohol/freon and trielyne.
Elettristan 60	—	60	40	183-189	S - Sn 60 Pb 40	60 E1	60A		
Elettristan Ag 3,5	3,5	96,5	—	221-223	S - Sn 97 Ag 3*	96 E1 *	—		
Elettristan Ag 5	5	95	—	221-235	S - Sn 96 Ag 4*	94 E1 *	—		
Nodistan 50	—	50	50	183-216	S - Pb 50 Sn 50	50 E1	50A	FLUIDOSTAN EN 29454.1 3.1.1	Fluxes must be employed. It can substitute elettristan and meccanistan. Solder of high grade 99.9% tin and electrolytic 99.9% lead.
Nodistan 60	—	60	40	183-189	S - Sn 60 Pb 40	60 E1	60A		
Nodistan Ag 3,5	3,5	96,5	—	221-223	S - Sn 97 Ag 3*	96 E1 *	—		
Nodistan Ag 5	5	95	—	221-235	S - Sn 96 Ag 4*	94 E1 *	—		

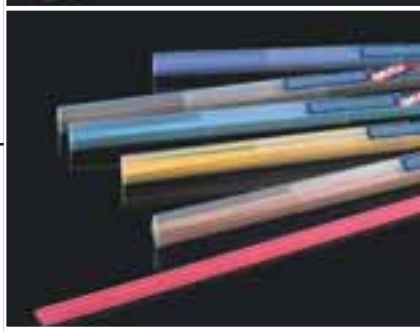
* **Similar**

FLUXES

Products GALFLUX	Activity Temperature Range °C	EN-1045	AWS-FB	Main Applications
UB-PS	550-800	FH 12	FB 3C	Flux in paste for brazing of diamond tools, tungsten carbides, stainless steel, special metals; indicated for applications in which refractory oxide formation is had (oxides of Cr, W), overheatings localizes or long cycles of heating. Typical application industry tools in particular for the induction brazing. The residual are corrosive, soluble in water and easy removable.
UW-PS	550-800	FH 10	FB 3A	Flux in paste for brazing of diamond tools, tungsten carbides, stainless steel, copper and its alloys, generally used in place of UB-PS for the brazing of tools when excessive overheatings are not present and for times of heating not too much long. Typical application industry tools and installation copper tubes. The residual are corrosive, soluble in water and easy removable.
WTP-PS	550-800	FH 10	FB 3A	Flux in paste with fine grinding for brazing of diamond tools, tungsten carbides, stainless steel, copper and its alloys, generally used in place of UB-PS for the brazing of tools when excessive overheatings are not present and for times of heating not too much long. WTP-PS is especially suitable for short brazing time. Typical application industry tools and installation copper tubes. The residual are corrosive, soluble in water and easy removable.
UB-AF	550-800	FH 12	FB 3C	Flux in slurry, dosable to viscosity controlled, it can be applied by a suitable applicator (automatic dispenser). Indicated for the brazing of diamond tools, tungsten carbides, stainless steel, special metals; indicated for applications in which refractory oxide formation is had (oxides of Cr, W), localized overheatings or long cycles of heating. Typical application industry tools in particular for the induction brazing. The residual are corrosive, soluble in water and easy removable.
UW-AF	550-800	FH 10	FB 3A	Flux in slurry, dosable to viscosity controlled, it can be applied by a suitable applicator (automatic dispenser). Indicated for the brazing of diamond tools, tungsten carbides, stainless steel, copper and its alloys, generally used in place of UB-AF for the brazing of tools when excessive overheatings are not had and for times of heating not too much long. Typical application industry tools and installation copper tubes. The residual are corrosive, soluble in water and easy removable.
SLT-PW	500-800	FH 10	FB 3A	Flux in powder with fine grinding and with excellent resistance to the heat, excellent adhesion to rod and optimal wetting action that favours the fluidity and capillarity of the alloy. Easy mixing with water for the paste preparation in situ. Indicated for the brazing of ferrous metals and not, with quaternary and ternary alloys with Ag>30%. Especially indicated for the induction brazing and in the spectacle industry. The residual are corrosive, soluble in water and easy removable.
SLT-PS	500-800	FH 10	FB 3A	Flux in paste with excellent resistance to the heat, excellent adhesion to rod and optimal wetting action that favours the fluidity and capillarity of the alloy. Indicated for the brazing of ferrous metals and not, with quaternary and ternary alloys with Ag>30%. Especially indicated for the automatic induction brazing and in the spectacle industry. The residual are corrosive, soluble in water and easy removable.
UWR-PV	500-800	FH 10	FB 3A	Flux in powder for brazing of diamond tools, tungsten carbides, stainless steel, copper and its alloys, generally used for the brazing of tools when excessive over-heatings are not present and for times of heating not too much long. Typical application in tools and installation copper tubes industries. The residual are corrosive, soluble in water and easy removable.
SHT-PW	550-800	FH 10	FB 3A	Flux in powder for brazing whit alloys to low silver content (< 20%), indicated for the brazing of ferrous metals and not, usually it's employed where the dimensions of the joint demand long times of heat. Used in the brazing of copper and copper-alloys with CuP and CuPAg. In the field of the silverware with ternary alloys to high silver tenor. The residual are corrosive, soluble in water and easy removable.
SHT-PS	550-800	FH 10	FB 3A	Flux in paste for brazing whit alloys to low silver content (< 20%), indicated for the brazing of ferrous metals and not, usually it's employed where the dimensions of the joint demand long times of heat. Used in the brazing of copper and its alloys with CuP and CuPAg. In the field of the silverware with ternary alloys to high silver tenor. The residual are corrosive, soluble in water and easy removable.
S PLUS-PW	500-800	FH 10	FB 3A	Flux in powder for universal applications. The residual are corrosive, soluble in water and easy removable.
S PLUS-PS	500-800	FH 10	FB 3A	Flux in paste for universal applications. The residual are corrosive, soluble in water and easy removable.
XLT-PW	450-800	FH 10	FB 3A	Flux in powder to low interval of activity 450°C 750°C with excellent fluidity, indicated for the small brazing joints with low melting point alloys. The residual are corrosive, soluble in water and easy removable.
XLT-PS	450-800	FH 10	FB 3A	Flux in paste to low interval of activity 450°C 750°C with excellent fluidity, indicated for the small brazing joints with low melting point alloys. The residual are corrosive, soluble in water and easy removable.
BRONZE	800-1000	FH 21	FB 3D	Flux in powder indicated for the brazing with brass alloys also nickel, silicon, tin and manganese containing.
GALFLUX AL-FLUX (PW PS)	400-580	FL 10	—	Powder or paste for low temperature brazing of aluminium and its alloys. The residual are not corrosive.
GALFLUX SN-FLUX	150-300	EN 29454	—	Acid flux used for soldering with soft alloys base SN.
GALFLUX L	> 460	FH 21	FB 3K	Indicated for Cup and Cupag brazing. Used in the flame brazing. It needs the presence of a special dispenser for the liquid passage into the welding blowpipe.

BRAZING DEFECTS

DEFECTS	CAUSES	RIMEDY
Low wetting of both surfaces on braze	Insufficient action of flux	Check grade or amount of flux
	Oxides formation	Ask for help to technical assistance department
	High surface contamination	Adjust pre-cleaning and surface preparation
Low wetting of only one of the surfaces on brazing	No correct joint assembly	Use spring fit for regular joint gap
	Oxides formation	Ask for help to technical assistance department
	High surface contamination	Adjust pre-cleaning and surface preparation
	No correct joint heating	Heat mainly heavier component
Lack of fill or voids	Improper joint clearance	Adjust joint clearance
	No correct heating	Adjust heating rate and time cycle
	Insufficient venting	Increase venting area
	Insufficient action of flux	Check grade and amount of flux
Rounded and shining inner blowholes	Hydrogen pick-up during melting alloy	Adjust flame to neutral slightly oxidising
	Flux entrapment	Check joint design and heating cycle
Shrinkage	No correct local clearance	Adjust joint design
	Localised overheating	Balance heating rate
	General overheating	Reduce heating cycle
	Excessive cooling range alloy	Use an alloy with narrower melting range
Cracks close to centre of fillet	Thermal stresses in cooling	Care for higher thermal expansion material is on outside of the joint
Non continuous fillet	Insufficient heating of the heavier component	Adjust heating cycle for brazing of very different thickness components
Joint components distortion	Uneven heating	Adjust heating rate to slower thermal cycle with a soft and rolling up flame
Discoloration	Overheating	Adjust heating cycle
	Insufficient action of flux	Check grade or amount of flux
	Unsatisfactory precleaning	Adjust precleaning and surface preparation
	Metal base or flux	Ask for help to technical assistance department
Unsatisfactory flow of brazing alloy: rough joint and uneven fillet	No correct components fixing	Check joint clearance and uniformity
	Uneven heating	Raise simultaneously whole joint to brazing temperature
	Insufficient venting	Adjust venting area
	Insufficient action of flux	Check grade or amount of flux
	Overheating	Adjust temperature closer to "liquidus"
	Liquation	Reduce heating cycle or use an alloy with narrower melting range









GOODS SUPPLY FEATURES

DRAWN RODS				
Uncoated silver alloys	Diameters:	0.4 ÷ 4 mm	(1/64″÷ 5/32″)	
	Lengths:	200 ÷ 1000 mm	(8″÷ 36″);	standard 500 mm (18″)
Coated silver alloys	Coating:	flexible – semi-flexible – non flexible in various colours		
	Diameters:	1.5 ÷ 3 mm	(1/16″ ÷ 1/8″)	
	Lengths:	350 ÷ 1000 mm	(13″÷ 36″);	standard 500 mm (18″)
Copper–phosphorus alloys	Diameters:	1.2 ÷ 2.5 mm	(3/64″÷ 3/32″)	
	Lengths:	200 ÷ 1000 mm	(8″ ÷ 36″);	standard 500 mm (18″)
	Spool:	DIN 300	5 ÷ 10 Kg	(10÷20 lb)
DRAWN WIRES				
Silver alloys	Small spools:		100 ÷200 g	(3 ÷5 Toz)
	Spools:	DIN 80	500 g	(1 lb)
		DIN 100	1 Kg	(2 lb)
		DIN 125	2 Kg	(4 lb)
		DIN 300	5 ÷ 10 Kg	(10÷20 lb)
	Small coils:	30 ÷ 150g	(1 ÷ 5 Toz);	wap diameter 80 ÷ 100mm (3″÷4″)
		1500g	(50 Toz);	wap diameter 200 mm (8″)
	Coils:	10 ÷ 20 Kg	(20 ÷ 50 lb)	wap diameter 400-500 mm (16″÷ 20″)
Copper-phosphorus alloys	Coils:	10 ÷ 20 Kg	(20 ÷ 50 lb)	wap diameter 400 mm (16″)
	Spools:	DIN 300	5÷10 Kg	(10 ÷ 20 lb)
EXTRUDED RODS				
Copper alloys	Round:	1.2 ÷ 5 mm	(3/64″÷ 13/64″)	
	Square:	1.2 ÷ 5 mm	(3/64″÷ 13/64″)	
	Rectangle:	1.2 x 1.6 ÷ 1x5	(3/64″ x 1/16 ÷ 0.0394″x13/64″)	
	Lengths:	500 ÷ 1000 mm	(18″÷ 36″); inferior on request	
Packaging	Rods:	1 ÷ 3 Kg	(2 ÷ 5 lb)	in plastic bags
		5 ÷ 20 Kg	(10 ÷ 50 lb)	in carton boxes
		250 ÷ 500 Kg	(500 ÷ 1000 lb)	in wood boxes
	Spools and coils:			in carton boxes
SINGLE SHEET				
Silver alloys	Thickness:	0.05 ÷ 3 mm	(0.002″÷ 1/8″)	
	Width:	1.2 ÷ 150 mm	(3/64″÷ 1.97″)	in spools or coils
Copper–phosphorus alloys	Thickness:	0.05 ÷ 3 mm	(0.002″÷ 1/8″)	
	Width:	1.5 ÷ 80 mm	(1/16″÷ 3.15″)	in spools or coils
Silver alloys	Thickness:	0.02 ÷ 1 mm	(0.008″÷ 0.004″″)	
	Width:	2 ÷ 380 mm	(0.08″÷ 13.7″)	in coils
TRIPLE SHEET				
Silver alloys with copper core	Thickness:	0.20 ÷ 1 mm	(0.079″÷ 0.039″)	
	Width:	1.3 ÷ 80 mm	(1/8″÷ 3.15″)	
		On spool 250 ÷ 1500 g (0.5 ÷ 3 lb) or on coil 1 ÷ 5 Kg (2 ÷ 10 lb)		
POWDERS AND PASTES				
Powder alloys	Granulometries:	0÷80, 80÷200, 200÷500 microns		
	hermetic seal can	100 g ÷ 1 Kg (3 Toz ÷ 2 lb)		
Paste alloys	hermetic seal can	250 g ÷ 1 Kg (8 Toz ÷ 2 lb)		
FORMED PRODUCTS				
Rings	In silver or copper-phosphorus alloys with the wire diameter custom made Overlapped or joined ends Packaged in plastic bags of 1.000÷10.000 pieces.			
FLUXES				
Powder	In pots with hermetic sealing of 100 ÷ 200 ÷ 500 ÷ 1000 g (3 Toz÷1 lb) or in plastic drums of 15 Kg (33 lb)			
Liquids	In plastic sealed drums 500 ÷ 1000 g			

Pietro Galliani S.p.A. can satisfy furter specific customer demands, due to the versatility of their production lines and equipped laboratories for research.

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PIETRO GALLIANI S.p.A.

something precious

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