SUPERFLOW

SILVER BRAZING ALLOYS
SOLDERS and FLUXES

U.S. ALLOY CO.

U.S. ALLOY CO.

"U.S. Alloy Company is dedicated to providing our customers with the service and quality they expect. This will be accomplished through employee involvement, systematic problem solving and a commitment to comply with requirements to continually improve the effectiveness of our Quality Management System."

ISO 9001:2000
REGISTERED QUALITY MANAGEMENT SYSTEMS

...Twenty two years ago, we made the decision to provide our customers with high quality, great packaging, excellent pricing and superior customer service.... U.S. Alloy Co was born.

These concepts and the wonderful support of our customers over the years, have brought us to 2005, where we still provide high quality, great packaging, excellent pricing and superior customer service, as we continue into the future.

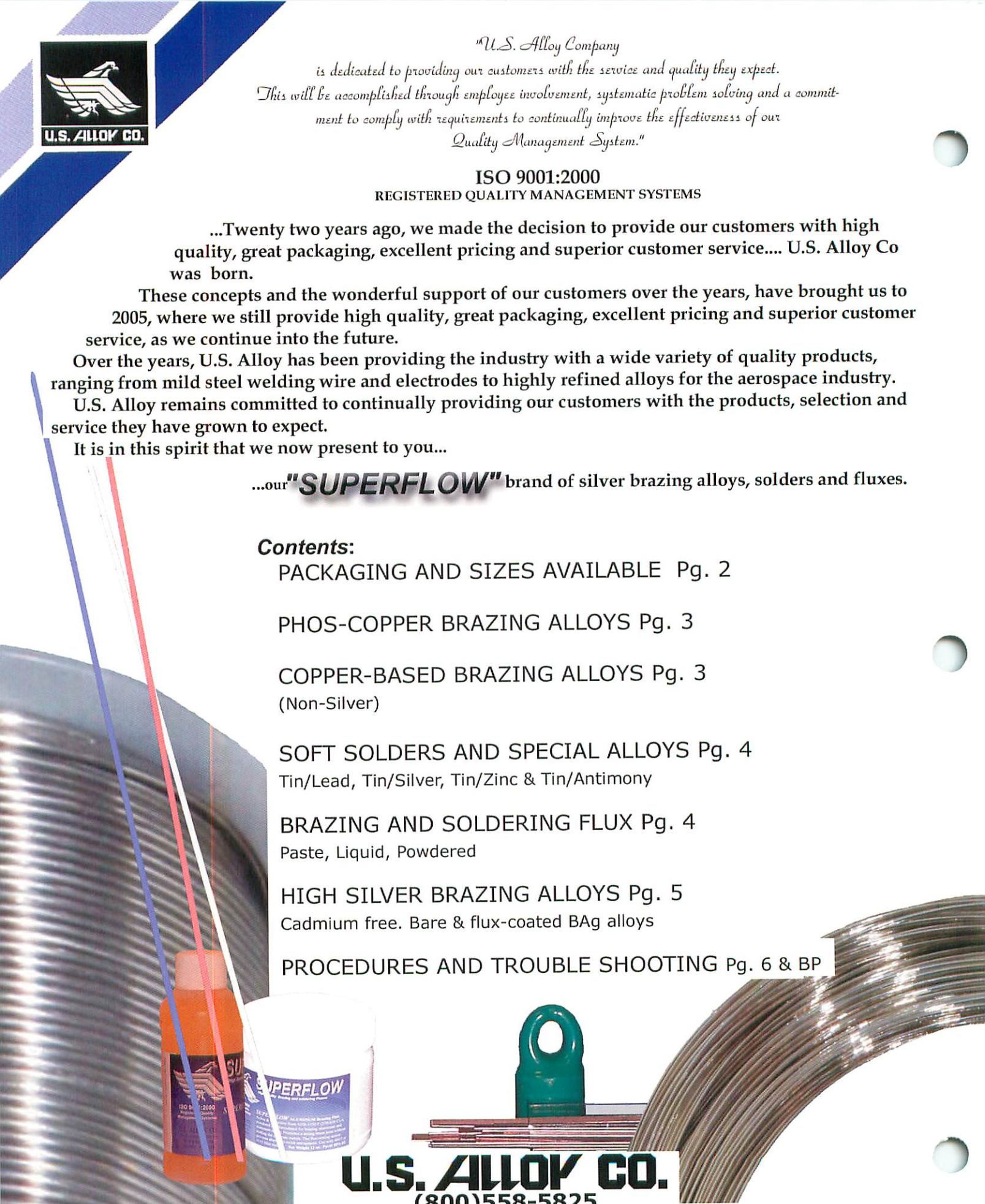
Over the years, U.S. Alloy has been providing the industry with a wide variety of quality products, ranging from mild steel welding wire and electrodes to highly refined alloys for the aerospace industry.

U.S. Alloy remains committed to continually providing our customers with the products, selection and service they have grown to expect.

It is in this spirit that we now present to you...

...our "SUPERFLOW" brand of silver brazing alloys, solders and fluxes.

***Contents*:**



U.S. ALLOY CO.
(800)558-5825

East: 7010-G Reames Rd
Charlotte, NC 28216
(888) 522-8296 T / (704) 598-6673 F

West: 8535 Utica Ave.
Rancho Cucamonga, CA 91730
(800) 830-9033 T / (909) 291-4586 F

SUPERFLOW®

Packaging and Size Availability

1 LB and 5 LB Coil Solder Boxes

1,3 & 5 T.O. silver re-sealable clamshell

20" Hanger Tube up to 2 LB/30 T.O.

36" Hanger Tube up to 2 LB/30T.O.

36" 10 LB pack (5 LB Aluminum)

50 T.O. bulk silver coil

1 LB Hard Pack and 1 LB Cello-bag

RETAIL PACKS

SILVER COIL & 20" and 36" Rods		20" Flux-Coated SILVER Rods	
Available Packaging	Dia. Inch	Available Pkg	Dia. Inch
1 T.O. Clamshell	.031 (1/32)		
3 T.O. Clamshell	.045		
5 T.O. Clamshell	.062 (1/16)		.062 (1/16)
50 T.O. Bulk Box	.093 (3/32)		.093 (3/32)
20" Cello-bag	.125 (1/8)	20" Cello-Bag	.125 (1/8)
20" Hanger Tube		20" Hanger Tube	
36" Hanger Tube			

COPPER - Bare & Flux-coated	
Available Packing	Dia. Inch
20" Cello-bag	1/16 (.062)
20" Hanger Tube	3/32 (.093)
36" Hanger Tube	1/8 (.125)
36" 10 LB Pack	5/32 (.156)
	3/16 (.187)
	1 / 4 (.250)
	5/16 (.312)
	3/8 (.375)

PHOS-COPPER – 36", 20" and Flat Rods	
Available Pkg	Diameter (inches)
20" Hanger Tube	1/16" (.062)
36" Hanger Tube	3/32" (.093)
1 LB Hard-pack	1/8" (.125)
	3/16" (.187)
	1 / 4" (.250)
	1/8 x .050 x 20"

SOLDERS – Solid, Rosin or Acid Core	
Available Pkg	Dia. (inches)
1 LB Coil	1/32" (.031)
5 LB Coil	1/16" (.062)
25 LB Coil	3/32" (.093)
	1/8" (.125)
Loose pack	¾ x ½ x 13.5"
Bar solder	1 x 1.5 x 10.5"

FLUX	AVAILABLE PACKAGING
Paste Flux	6 oz Brush Cap, 8 & 16 oz Cans/Tubs, Pails
Powdered Flux	12 & 16 oz Cans/Tubs, Pails
Liquid Flux	4 oz, Pint & Quart bottles, Gallon Jugs

WARNING! PROTECT yourself and others. Read and understand this information. FLUXES MAY CONTAIN FLUORIDES. FUMES and GASES can be DANGEROUS TO YOUR HEALTH. Fluxes may BURN EYES and SKIN ON CONTACT AND CAN BE FATAL IF SWALLOWED! Before use, read, understand and follow manufacturer's instructions, Material Safety Data Sheets (MSDS) and your employer's safety practices. *Keep head out of fumes. Use enough ventilation and exhaust to keep fumes and gases away from your breathing zone and the general area. *Avoid flux contact with eyes and skin. *Do not take flux internally. *Keep out of reach of children and those unfamiliar with, or unwilling to use safe handling practices. *See American National Standard Z49.1, *Safety in Welding and Cutting* published by the American Welding Society (AWS), 550 NW LeJeune Rd, P.O. Box 351040, Miami, FL 33135: OSHA *Safety and Health Standards 29 CFR 1910*, available from the US Government Printing Office, Superintendant of Documents, P.O. Box 37194 Pittsburg, PA 15250-7954. MSDS sheets are available from U.S. Alloy co. Charlotte, NC 28216, on our website at www.weldingwire.com, from your employer or by contacting your supplier.

U.S. ALLOY CO.

SUPERFLOW®

Phos-Copper Brazing Alloys

U.S. Alloy Co's family of **Phos-coppers,** commonly referred to the ***B-CuP*** alloys**,** are a group of alloys (some containing silver) that are designed to join copper and copper alloys in tight fitting joints with clearances ranging from .001 in. to .005 in. With silver content ranging from 0 to 15%, our ***SUPERFLOW*** phos-coppers are both economical and reliable. The integrity of joints brazed with ***SUPERFLOW*** phos-coppers is unsurpassed, as all of our BCuP alloys are manufactured to consistantly high quality standards. ***SUPERFLOW*** phos-coppers are ***SELF-FLUXING*** when used on copper, making them a superb choice on closed copper tubing systems in the refrigeration and air conditioning industries, where flux may contaminate the system. When brazing copper alloys, including brass, we recommend the use of ***SUPERFLOW*** white brazing paste flux. **Remember,** phos-copper alloys are **NOT to be used on iron, steel or nickel based alloys.** The phosphorus, while useful on copper, will react to iron or nickel with a 10% or more content, forming an intermetalic brittle phosphide compound which could weaken the joint. These alloys are also not intended for use in sulphurous atmospheres, where their corrosion restant properties are compromised. ***SUPERFLOW*** phos-coppers are commonly used in the plumbing, refrigeration and HVAC industries.

SUPERFLOW PHOS-COPPER BRAZING ALLOYS

SUPERFLOW ALLOYS	Spec. AWS A5.8	CHEMISTRY Ag	Cu	P	Solidus °F - °C	Liquidus °F - °C	Basic Alloy Application Information
USA 0	BCuP-2	-	92.8	7.2	1310-710	1460-793	Very fluid. Joint clearance .001 to .003. plumbing, heating, HVAC
USA 2	BCuP-6	2	91	7	1190-643	1450-788	Broad fluidity, low temp. range for wide joints, high temp range more fluid.
USA 5	BCuP-3	5	89	6	1190-643	1495-813	Use where joint clearance cannot be held, moderate gap bridging.
USA 6	BCuP-4	6	86.8	7.2	1190-643	1325-718	Very fluid for tight joints. Higher corrosion resistance than BCuP-3
USA 15	BCuP-5	15	80	5	1190-643	1475-802	Good for wider joints up to .005 in. Highest corrosion resistant BCuP alloy

COPPER BASED BRAZING ALLOYS FROM U.S. ALLOY

In addition to supplying a broad range of silver bearing alloys, U.S. Alloy Co. also offers a wide selection of copper based alloys to meet the various demands of the welding and brazing markets. Among these alloys, there are a few that should be mentioned here, due to their similarity in usage, but which cover areas of application not met by the silver and phos-copper alloy groups.

NICKEL SILVER (RBCuZn-D) Despite it's name (because of it's color), this alloy contains no silver. Nickel silver is a tough alloy with a 10% nickel content. Sometimes used as an overlay on bearing surfaces, it is known for it's ability to brazeTungsten-carbide and is commonly used as a matrix to bind carbide particles to drilling tools in hardfacing applications. Used heavily in oil and gas drilling and exploration. Good for brazing steel, nickel and nickel alloys**.** Use with a borax-boric acid flux, or choose our flux-coated version.

LOW FUMING BRONZE (RBCuZn-C) is the most popular general purpose brazing rod. Low fuming bronze has great mechanical properties, featuring joint soundness, ductility and strength. Used on steels, copper, copper alloys, nickel, nickel alloys and stainless steel, and for repair of cracks in cast iron. Use with a borax-boric acid flux. A flux-coated version is also available.

NICKEL BRONZE (RBCuZn-B) is the same as low fuming bronze with the exception that nickel is added to create a more uniform distribution of the iron in the deposit. Nickel bronze is frequently used to surface steel. Used on steels, copper, copper alloys, nickel, nickel alloys and stainless steel. Use a borax-boric acid flux

ALLOYS	AWS A5.8	CHEMICAL COMPOSITION Cu	Zn	Fe	Si	Al	Pb	Mn	P	Ni	Sn	Solidus °F - °C	Liquidus °F - °C	MINIMUM TENSILE
Nickel Silver	RBCuZn-D	48	41	---	.13	.01	.05	---	.25	10	---	1690-921	1715-935	60,000 psi
Nickel Bronze	RBCuZn-B	58	38	.75	.7	.01	.05	.25	---	.6	1	1590-866	1620-882	56,000 psi
Low Fum. Brze	RBCuZn-C	58	39	.75	.7	.01	.05	.25	---	---	1	1590-866	1630-888	56,000 psi

WARNING! PROTECT yourself and others. Read and understand this information. BRAZING AND SOLDERING ALLOYS AND FLUXES MAY PRODUCE FUMES AND GASES DANGEROUS TO YOUR HEALTH. FLUXES MAY CONTAIN FLUORIDES. FLUXES MAY BURN EYES and SKIN ON CONTACT AND CAN BE FATAL IF SWALLOWED! Before use, read, understand and follow manufacturer's instructions, Material Safety Data Sheets (MSDS) and your employer's safety practices. *Keep head out of fumes. Use enough ventilation and exhaust to keep fumes and gases away from your breathing zone and the general area. *Avoid flux contact with eyes and skin. *Do not take flux internally. *Keep out of reach of children and those unfamiliar with, or unwilling to use safe handling practices. *See American National Standard Z49.1, *Safety in Welding and Cutting* published by the American Welding Society (AWS), 550 NW LeJeune Rd, P.O. Box 351040, Miami, FL 33135: OSHA *Safety and Health Standards 29 CFR 1910*, available from the US Government Printing Office, Superintendant of Documents, P.O. Box 37194 Pittsburg, PA 15250-7954. MSDS sheets are available from U.S. Alloy co. Charlotte,NC 28216, on our website at www.weldingwire.com, from your employer or by contacting your supplier.

SUPERFLOW®

Solders and Fluxes

U.S. ALLOY CO.

The *SUPERFLOW* line of soft solders, from **U.S.ALLOY CO,** are made from only the purest virgin materials, ensuring smooth, consistant flow and superior bonding charactoristics. Whether you choose Tin/Lead, Tin/Silver or Tin/Zinc, you can be assured of the highest performance, strength and elongation possible for each specific alloy and application. Available in bar, 1 LB and 5 LB spools in diameters ranging from 1/32 to 3/16". Tin-Lead solders are available in Solid, Rosin-core or Acid-core.

SUPERFLOW SOFT SOLDERS AND SPECIAL PURPOSE ALLOYS

SUPERFLOW ITEM	CHEMICAL COMPOSITION Sn	Zn	Pb	Ag	Sb	ASTM B32	SOLIDUS °F - °C	LIQUIDUS °F - °C	BASIC PROPERTIES AND APPLICATIONS
USA 35 / 65	35		65			35A	361 - 183	477 - 247	The Tin / Lead solder group sees the majority of use in electrical industry and limited use in other fields. As a rule, the higher the lead content the higher the working temperature and lower fluidity. Using lead –bearing solders in potable water systems is ILLEGAL!
USA 40 / 60	40		60			40A,Sn40A	361 - 183	460 - 238	
USA 50 / 50	50		50			50A	360 - 182	420 - 216	
USA 60 / 40	60		40			60A	361 - 183	370 - 191	
USA 95 / 5	95				5	95TA,Sb5	452 - 233	464 - 240	Lead free. High fluidity and high electrical conductivity
USA 94 / 6	94			6			430 - 221	535 - 279	The Tin / Silver group yield high joint ductility, high vibration tolerance, higher tensile strength and High electrical conductivity
USA 96 / 4	96			4			430 - 221	430 - 221	
USA 96.5 / 3.5	96.5			3.5		96.5 TS	430 - 221	430 - 221	The silver content is to user's preference, unless spec. is required
ALUMINUM	**Sn**	**Zn**	**Pb**	**Ag**	**Sb**	**AWS**	**WORKING TEMPERATURE**		**Special purpose alloys**
USA 80 / 20	80	20					391 - 199	482 - 250	For joining aluminum to itself or copper
FLUX-CORE ALUMNIUM	4043 sheath with a proprietary Flux formula for brazing aluminum						1,100 °F	598 °C	For repairing broken or cracked aluminum castings and extrusions. Tensile strength approx. 32,000 psi
ALU-ZINC	Aluminum repair-Proprietary formula						715 - 379	735 - 391	Production and repair of aluminum and zinc based alloys.
R4047	Si 11.0 – 13.0, Fe .80, Cu .30, Mn .15, Mg .10, Zn .20, Al Balance					A5.10 BAlSi-4	1080-1120	582 - 604	The designated filler rod for use with USA ABP aluminum brazing Flux. For general repair of aluminum castings and parts.
CAST IRON	**NOMINAL CHEMICAL COMPOSITION**								**BASIC APPLICATIONS**
Oxy-Fuel Rod	**C**	**Mn**	**Si**	**P**	**S**	**Fe**	1,600° F	870° C	For maintenance, repair, filling in and building up of new or worn Cast iron. Use *SUPERFLOW* cast iron welding flux *A-B Red.*
USA RCI	3.3	.70	2.9	.60	.10	95			

BRAZING AND SOLDERING FLUXES

SUPERFLOW FLUX	AWS A5.31-91 or Commercial	AMS	U.S. MILITARY	ACTIVE TEMPERATURE °F RANGE	°C	PRODUCT APPLICATION
USA SBPW White Brazing Paste	TYPE FB3A	AMS 3410		1000-1700	540 - 870	General purpose silver brazing on Steel, copper, nickel, stainless, etc.
USA SBPB Black Brazing Paste	TYPE FB3C	AMS 3411		1000-1800	540 - 980	High or prolonged temperature on Steel, copper, nickel, stainless, etc.
USA ABP Alum. Braze Flux	TYPE FB1A	AMS 3412		1030-1280	550 - 690	For torch or furnace brazing on aluminum, **Use 4047 filler metal**
USA RMA Rosin - Liquid Flux			MIL-F-14256 Type RMA	390 - 500	200 - 260	PCB's, wire, cable, electronics, copper, nickel, tin, steel, silver/gold
USA SGP Acid – Liquid Flux	A-A-51145C Form B			220 - 650	105 - 345	General Purpose soldering flux, Not for electrical connections
USA SAF Alum. Solder Flux				350 - 550	177 - 288	Chloride-free. Aluminum to copper aluminum, steel, brass, plating etc.
USA A-B-RED Cast Iron Flux				1540-2900	815 - 1500	Use on cast iron, with cast iron rod. High bond strength, deep joint pen.
USA A-B-WHITE G.P. Brazing Flux	TYPE FB3J		MIL-F-16136B Types A and B	1400-2200	760 - 1400	General purpose high-temp braze On most alloys, non-silver filler rod

WARNING! PROTECT yourself and others. Read and understand this information. FLUXES MAY CONTAIN FLUORIDES. FUMES and GASES can be DANGEROUS TO YOUR HEALTH. Fluxes may BURN EYES and SKIN ON CONTACT AND CAN BE FATAL IF SWALLOWED! Before use, read, understand and follow manufacturer's instructions, Material Safety Data Sheets (MSDS) and your employer's safety practices. *Keep head out of fumes. Use enough ventilation and exhaust to keep fumes and gases away from your breathing zone and the general area. *Avoid flux contact with eyes and skin. *Do not take flux internally. *Keep out of reach of children and those unfamiliar with, or unwilling to use safe handling practices. *See American National Standard Z49.1, *Safety in Welding and Cutting* published by the American Welding Society (AWS), 550 NW LeJeune Rd, P.O. Box 351040, Miami, FL 33135: OSHA *Safety and Health Standards 29 CFR 1910*, available from the US Government Printing Office, Superintendant of Documents, P.O. Box 37194 Pittsburg, PA 15250-7954. MSDS sheets are available from U.S. Alloy co. Charlotte, NC 28216, on our website at www.weldingwire.com, from your employer or by contacting your supplier.

U.S. ALLOY CO.

SUPERFLOW®

High Silver Brazing Alloys

U.S.ALLOY CO offers a wide selection of ***SUPERFLOW*** High Silver brazing alloys to meet virtually any brazing application that may arise on ferrous or non-ferrous metals (except aluminum, magnesium and titanium). *SUPERFLOW* silver alloys are manufactured only from the purest raw materials, thereby eliminating undesirable trace elements and inclusions that might otherwise interfere with the performance of these superb alloys. *SUPERFLOW* silver alloys are carefully formulated to provide the utmost in strength, wetting action and corrosion resistance. Our Cadmium-free alloys are suitable for the vast majority of brazing operations in the food industry, electronics, petrochemical, refrigeration, automotive, marine applications, etc.

CAD-BEARING ALLOYS. While we stock several cad-bearing silver alloys, They are not recommended to the general public due to their fume toxicity and risk of respiratory damage to anyone breathing cadmium fumes. These alloys are supplied only under strict control to meet certain federal, military and aerospace specifications, as well as some specialized domestic applications. See notation below

SUPERFLOW CADMIUM-FREE SILVER PRODUCTS

Alloy Selector	Applicable Specifications			Chemical Composition					Melting Range		
Superflow Part No.	AWS A5.8	Federal QQ-B-654A	AMS	Ag	Cu	Zn	Ni	Sn	Solidus °F - °C	Liquidus °F - °C	Basic Alloy Information and Application Data
USA 25T CF	BAg-37			25	40	33		2	1270-688	1435-799	Most economical, good for low ductility requirements
USA 30 CF	BAg-20	BAg-20		30	38	32			1250-677	1410-766	Economical yet good wetting / flowing. High temp service
USA 35 CF	BAg-35			35	32	33			1265-685	1390754	Production on dissimilars. Moderate joint gap bridging
USA 38T CF	BAg-34			38	32	28		2	1200-649	1330-721	Low melting temp, free-flowing. Excellent fillet results
USA 40T CF	BAg-28			40	30	28		2	1200-649	1310-710	Good gen. purpose, free flowing similar to BAg-2, BAg- 2a
USA 40N CF	BAg-4	BAg-4		40	30	28	2		1240-671	1435-779	Corrosion resistant. Improved wetting for Carbide tool tips
USA 45 CF	BAg-5	BAg-5		45	30	25			1225-663	1370-743	Excellent gen. purpose. Ductile. Good fillets. Brass parts
USA 50 CF	BAg-6			50	34	16			1270-688	1425-774	Wide melt range. Good for wide fillets and joint gaps
USA 50N CF	BAg-24		4788	50	20	28	2		1220-660	1305-707	Good for crevice corrosion prevention on stainless
USA 54N CF	BAg-13		4772	54	40	5	1		1325-718	1575-857	High temp service up to 700°. Aerospace usage
USA 56T CF	BAg-7	BAg-7	4763	56	22	17		5	1145-618	1205-652	Lowest melt range, deep penetrating capillary action
USA 56N CF	BAg-13a	BAg-13a	4765	56	42		2		1420-771	1640-893	No zinc. Furnace brazing. Aerospace usage
USA 65 CF	BAg-9	BAg-9		65	20	15			1240-671	1325-718	Specifically for joining sterling silver. Excellent color match
USA 72 CF	BAg-8			72	28				1435-779	1435-779	Atmosphere or vacuum brazing of copper and steel alloys

FLUX-COATED HIGH SILVER BRAZING ALLOYS

Superflow Part No.	AWS A5.8	Federal QQ-B-654A		Ag	Cu	Zn	Ni	Sn	Solidus °F - °C	Liquidus °F - °C	Application Information
USA 35GFC	BAg-35			35	32	33			1265-685	1390-754	Good economical production alloy. Moderate gap bridging
USA 45GFC	BAg-5	BAg-5		45	30	25			1225-663	1370-743	Excellent general purpose. Good fillets, ductile.
USA 56GFC	BAg-7	BAg-7		56	22	17		5	1145-618	1205-652	Low melting temp. Deep penetrating capillary action

SOME OF THE MORE POPULAR SILVER BRAZING ALLOYS

SUPERFLOW* - USA 25 CF (BAg-37)** Is an economical option to some of the higher silver alloys and is a good choice where lower ductility is acceptable. ***USA 25 CF simulates the performance of some of the higher silver alloys to create tough, resistant joints on steel, copper and brass. Melting at a slightly higher temperature than some of the higher silver alloys, ***USA 25 CF*** is a reliable, low cost alloy.

SUPERFLOW* – USA 38 CF (BAg-34)** is a free-flowing alloy. The characteristics of this alloy are similar in performance and brazing temperature to BAg-2 and BAg-2a, making it an excellent *Cadmium-Free* substitute for these alloys. ***USA 38 CF forms excellent fillet joints, making it a very versatile alloy in a variety of applications.

***SUPERFLOW* – USA 45 CF (BAg-5)** is one of the most widely used and accepted silver brazing alloy on the market today. The good capillary flow and tough, ductile properties of this alloy make it a great all-around choice in the electrical industry, dairy and food processing, brass components in ship piping, government spec., band instruments, etc.

***SUPERFLOW* – USA 56 CF (BAg-7)** exhibits low melting range, good flow and wetting properties, low stress corrosion cracking, deep penetrating capillary action and high elongation and ductility, making it the best choice in a wide range of applications, especially food processing.

A WORD ABOUT CADMIUM...Why is it used?

Cadmium is commonly used in various industries, primarily, marine, electrical and military. Cadmium has high electrical conductance, low friction properties and high corrosion resistance, particularly in salt and alkali media. because of these characteristics, cadmium is widely used as a coating on steel, aluminum and other non-ferrous moving parts or electrical parts that are subject to abrasion or corrosion. It is also used for some galvanizing applications where aluminum galvanizing does not offer sufficient protection. ***IN BRAZING ALLOYS,*** such as BAg-1, 1a, 2, 2a and 3, Cadmium lowers the alloy's melting temperature, as well as creating a more fluid alloy puddle and enhanced mating with cad-bearing surfaces. ***WRITTEN PROCEDURE*** sometimes dictates the use of cad-bearing alloys, such as military, aerospace and other specialized applications. However, due to The ***DANGER*** of inhaling cadmium fumes, U.S. Alloy strongly recommends the use of ***CAD-FREE*** brazing alloys whenever possible. If the user has the option, we recommend our ***USA 56% CF, BAg-7*** due to it's similar melt and flow characteristics with BAg-1 and 1a.

WARNING!! ANYONE brazing or soldering on coated metals should determine if the coating contains cadmium. If so, using a cad-free brazing alloy WILL NOT eliminate CADMIUM FUME EMISSIONS. DO NOT INHALE FUMES! Understand and follow proper safety procedures for ventilation and fume extraction from your breathing zone and general area. If it cannot be determined if cadmium is present, view the fumes. Cadmium emits a distinct brownish fume color. If you suspect cadmium is present, notify your supervisor at once. ALL FUMES, *Cadmium or not*, should be extracted from your breathing zone and general work area. See warning on previous page.

SUPERFLOW®

Procedures and Trouble shooting

U.S. ALLOY CO.

Brazing and soldering are not the same as welding. In the welding process, metals are joined by litterally melting them together along with a filler metal, This action forms a weldment that is an alloy of the base metal(s) and the filler metal. In **Brazing** and **soldering**, the metals are joined by the filler metal forming a surface bond that does not alloy with the base metals. The bond occurs at brazing/soldering temperature as the surface molecules of the base metal interact with the smaller molecules of the filler metal and form an adhesion as the joint cools. A phenomenon known as "*capillary action*" occurs in the joint that draws the molten filler metal into the joint and fills it. **Flux** is the key to making a braze joint work. Flux removes or absorbs oxides which, if left alone, would not only prevent the molecular interaction of the base and filler metal, but would also prevent the capillary flow of the filler metal into the joint. ***Soldering*** is similar to brazing, but at a much lower temperature, and where the overall stregth of the joint is less demanding. *For a more technical and detailed explanation, please consult the "Brazing Handbook" by the American Welding Society 550 N.W. LeJeune Rd, P.O. Box 351040, Miami, FL 33135.*

TUBING AND PIPE BRAZING PROCEDURES

Square-up tube ends using a good sharp hacksaw or tube cutter to cut the ends of your tubing square and to proper length. it is important that your cutting blades are sharp, especially on thin-walled tubing, to prevent distortion and reduce burrs. Once ends are square, use a file, emerycloth or scraper to remove burrs. if the tube has become distorted, use a sizing tool or similar tool to bring it back to shape. **Test the fit** to ensure that your joint tolerances are acceptable and the mating surfaces alight properly. *(the purpose of squaring the ends is to ensure the joint has uniform strength to withstand pressures and stresses or vibrations that it may be subject to in service. An uneven tube end may result in a weak point that could cause the joint to fail after a period of service)*

Clean mating surfaces with a stainless steel brush or emerycloth. Remove all surface contaminates as well as oxides from the areas to be joined. if oil or grease is present, a commercial grade solvent should be used to remove them. always wipe the area clean with a dry cloth before proceeding. *Note: Be certain that the inside of the recieving tube is clean, as it is more difficult to access than the outside of the tube end.)*

Flux and brazing alloy selection will vary with the base metal you are brazing. In most cases the *SUPERFLOW* white flux will be the proper choice. Black flux would be used if you are heating above 1,700 **F** or you are holding the brazing temperature for an extended period of time. Apply a thin layer of flux with a brush. Avoid "globbing-on" too much flux. Excess flux does not aid the brazing process, and could conaminate the inside of the lines you are connecting, especially refrigeration lines. **Alloy selection** is largely dependant on the type of service the joined line will be used in, as well as the type of base metals being joined.

Copper to copper - Use the BCuP series which contains phosphorus and are ***self-fluxing.*** The choice of silver content, ranging from 0 - 15% would be determined by the level of corrosion resistance the joint requires, joint tolerances or the flow characteristics desired.

Copper to brass, bronze or other copper-based alloys would require the use of our white flux. The BCuP series are still a good choice, as well as any of the higher silver content alloys. Again, service requirements will dictate the alloy content of your brazing filler metal.

Copper to nickel alloys, steel, stainless steel or other ferrous alloys should be joined with the higher silver contents such as 40% ,45% or 56% and in some cases, 65% and 72% (65% for sterling silver, 72% for highest possible corrosion resistance and color match for stainless and nickel alloys.)
Caution: BCuP alloys should never be used on iron based alloys or those containing 10% nickel or higher. due to the possible formation of intermetalic phosphide compounds, which could embrittle the joint and cause cracking and joint failure.

Soldering should be done on the above alloy combinations with USA 94/6 or USA 96/4, using a General purpose soldering flux, such as **USA GPS**. *Note: This is an acid-flux and is not recommended in electrical soldering applications. Electrical applications should be perforemed with a rosin flux, such as,* ***USA RMA.***
Air-Fuel torch equipment is recommended.

Aluminum Alloys require a completely different alloy/flux combination, Our **USA ABP** is a powdered aluminum flux designed for use with 4047 aluminum filler metal, and is suitable to braze many common aluminum alloys. *Note: Some aluminums are easier to braze than others. The more common alloys such as 6061 or 1100 are easiest.*
Soldering is accomplished with an aluminum soldering flux, such as, USA SAF, along with USA 80/20 solder.
Air-Fuel torch equipment is recommended.

-continued on back cover-

WARNING! PROTECT yourself and others. Read and understand this information. FLUXES MAY CONTAIN FLUORIDES. FUMES and GASES can be DANGEROUS TO YOUR HEALTH. Fluxes may BURN EYES and SKIN ON CONTACT AND CAN BE FATAL IF SWALLOWED! Before use, read, understand and follow manufacturer's instructions, Material Safety Data Sheets (MSDS) and your employer's safety practices. *Keep head out of fumes. Use enough ventilation and exhaust to keep fumes and gases away from your breathing zone and the general area. *Avoid flux contact with eyes and skin. *Do not take flux internally. *Keep out of reach of children and those unfamiliar with, or unwilling to use safe handling practices. *See American National Standard Z49.1, *Safety in Welding and Cutting* published by the American Welding Society (AWS), 550 NW LeJeune Rd, P.O. Box 351040, Miami, FL 33135: OSHA *Safety and Health Standards 29 CFR 1910*, available from the US Government Printing Office, Superintendant of Documents, P.O. Box 37194 Pittsburg, PA 15250-7954. MSDS sheets are available from U.S. Alloy co. Charlotte, NC 28216, on our website at www.weldingwire.com, from your employer or by contacting your supplier.

SUPERFLOW®

Procedures and Trouble shooting (cont.)

Properly align tubing and fitting by sliding the fluxed end of the tube into the fitting. It is advisable to do this a couple of times and rotate either the tube or fitting, if possible, to ensure the even distribution of the flux within the joint. This is critical because a void spot in the flux distribution can become a void spot in the brazement. Also make sure elbows and T-fittings are properly aligned in the intended directions. Use support jigs or clamps as necessary to hold the joint firmly during the brazing process and until the joint cools and solidi fies. Be sure tubing is inserted completely before brazing.

Set the torch flame to a "neutral" flame, using an oxygen/acetylene gas combination (see illustration below). A neutral flame has a blu-ish white inner cone at the tip oriface, and the body of the flame should be blue with a slight orange tint at the edges. This is normally the ideal flame setting, however, a slightly carburizing flame is preferred by some and will usually perform as well as a neutral flame. An oxidizing flame should be avoided in all brazing applications. Air-fuel equipment, normally recommended for soldering, may also be used with good results in typical brazing applications.

Heat up the joint area by applying the flame to the tube side of the connection, next to the joint area, first, then move to the fitting side of the joint. Alternate back and forth, moving the torch around the circumferance of the connection, heating the entire joint area uniformly, bringing the joint up to brazing temperature. *The flux is a great indicator of brazing temperature. As you continue to heat up the area, the flux will begin to bubble or boil. Continue applying heat to both sides of the joint until the flux turns clear and watery in appearance.* If you have maintained an even heat distribution, the flux inside the connection should also have liquified. You may want to pass over the area a couple more times to be sure. Maintain brazing temperature while alloy is being applied.

Add the brazing alloy by placing the end of your *SUPERFLOW* silver alloy into the flame briefly, while in contact with the base metal, to begin the melting process. Then direct the silver alloy into the joint itself (Remember, the brazing temperature of the connection area is melting the alloy, not the flame. The flame should only be maintaining brazing temperature). The alloy will melt and the capillary action will draw the molten alloy into the joint until it fills. Once you see the joint is filled, your braze is complete. You need not add any more brazing alloy at this point (Doing so, will only waste your brazing alloy). Remove torch and allow the joint to cool until it sets or solidifies. You may then quench the area as desired and clean away the flux residue from joint area with a swab, wire brush or emery cloth as necessary.

TROUBLE SHOOTING: *"I have followed all the directions, but my brazing alloy balls up instead of flowing."*

First things first: Have you cleaned your joint area properly? Oddly enough, some people think they can skip this procedure or take short-cuts and not clean the joint properly. Remember the flux has it's job to do, but it needs a clean surface to do it. Your option, at this point, is to disassemble the connection and thoroughly clean the area properly, then repeat procedure from step 3.

If you are sure you cleaned the joint area properly, Study the heating procedure, Your connection is either too cold, in which case, you have melted the alloy with your torch, not the base metal, or, you have overheated the joint area and the flux is no longer doing it's job. In this case, allow the joint to cool, disassemble connection, re-clean the mating surfaces, properly re-apply the flux and repeat procedure from step 4.

"The joint is hot, but my brazing alloy flows away from the joint, not into it."

You have not brought the fitting to brazing temperature. Re-heat the entire area as described in step 6 after applying new flux, as necessary. Be sure you bring both the tubing and fitting to proper temperature at the same time.

"My brazing alloy melts, flows and forms a fillet, but it is not drawn into the connection."

This is another heat problem, only this time, your fitting is hot, your tubing is hot, but you have not heated the tubing enough to bring the tubing inside the connection to brazing temperature. Repeat procedure applying heat to the tube first and then the fitting to ensure you have proper capillary brazing temperature.. ***If you feel you have heated the connection properly,*** you may have overheated the fitting and caused the flux inside the connection to loose it's fluxing ability. Disassemble, re-flux and try again, paying close attention to proper temperature uniformity.

"I am sure I have followed procedure, but my brazing alloy cracked after it cooled."

Did you quench too soon? You should always wait until the joint cools and sets or solidifies before quenching.

Did you use a BCuP alloy on steel, nickel or other ferrous metal? The phosphorous in BCuP filler metals can cause a brittle joint when used on these base metals. **Did you check your joint clearances?** A loose fit-up or an out-of-round part can create a gap that your choice of silver alloy is incapable of bridging. Consult the alloy chart to determine which alloy is best in your case. **Are you joining dissimilar metals?** Different types of metals expand and contract at different rates under heat, placing abnormal stress on the brazing alloy. A different fitting may be required. consult your supplier or a U.S. Alloy representative for suggestions on solving the problem.

"My joint leaks."

Most leaks are attributed to improper heating procedures. review carefully your entire procedure. You may realize your joint was over-heated, not heated uniformly, or you used an improper torch setting as warned against in step 5. Consult color tables of torch settings and compare with your own settings, adjust as needed.

Repairing a leak may be as simple as using a brazing alloy of a lower temperature or a silver solder to cap your joint. However, a large leak repair may not be that easy and the joint may need to be disassembled and re-brazed. Brazing over a joint that has been soldered previously with a solder containing lead is not recommended.

WARNING! PROTECT yourself and others. Read and understand this information. BRAZING AND SOLDERING ALLOYS AND FLUXES MAY PRODUCE FUMES AND GASES DANGEROUS TO YOUR HEALTH. FLUXES MAY CONTAIN FLUORIDES. FLUXES MAY BURN EYES and SKIN ON CONTACT AND CAN BE FATAL IF SWALLOWED! Before use, read, understand and follow manufacturer's instructions, Material Safety Data Sheets (MSDS) and your employer's safety practices. *Keep head out of fumes. Use enough ventilation and exhaust to keep fumes and gases away from your breathing zone and the general area. *Avoid flux contact with eyes and skin. *Do not take flux internally. *Keep out of reach of children and those unfamiliar with, or unwilling to use safe handling practices. *See American National Standard Z49.1, *Safety in Welding and Cutting* published by the American Welding Society (AWS), 550 NW LeJeune Rd, P.O. Box 351040, Miami, FL 33135: OSHA *Safety and Health Standards 29 CFR 1910*, available from the US Government Printing Office, Superintendant of Documents, P.O. Box 37194 Pittsburg, PA 15250-7954. MSDS sheets are available from U.S. ALLOY CO. Charlotte,NC 28216, on our website at www.weldingwire.com, from your employer or by contacting your supplier.