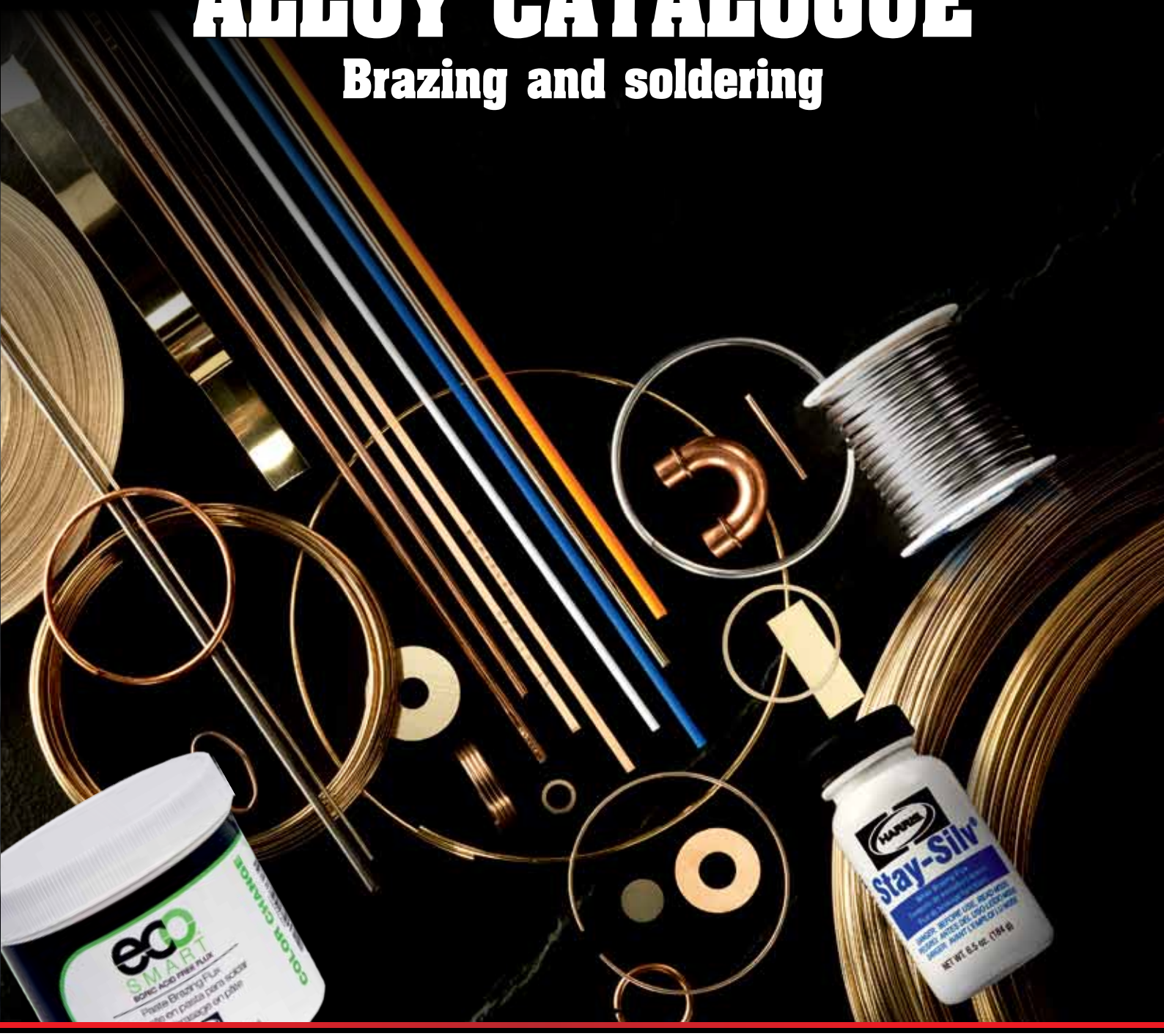
HARRIS

A LINCOLN ELECTRIC COMPANY

INTERNATIONAL
ALLOY CATALOGUE
Brazing and soldering



Mason, Ohio, USA

Gainesville, Georgia, USA

Dzierżoniów, Poland

Harris Products Group

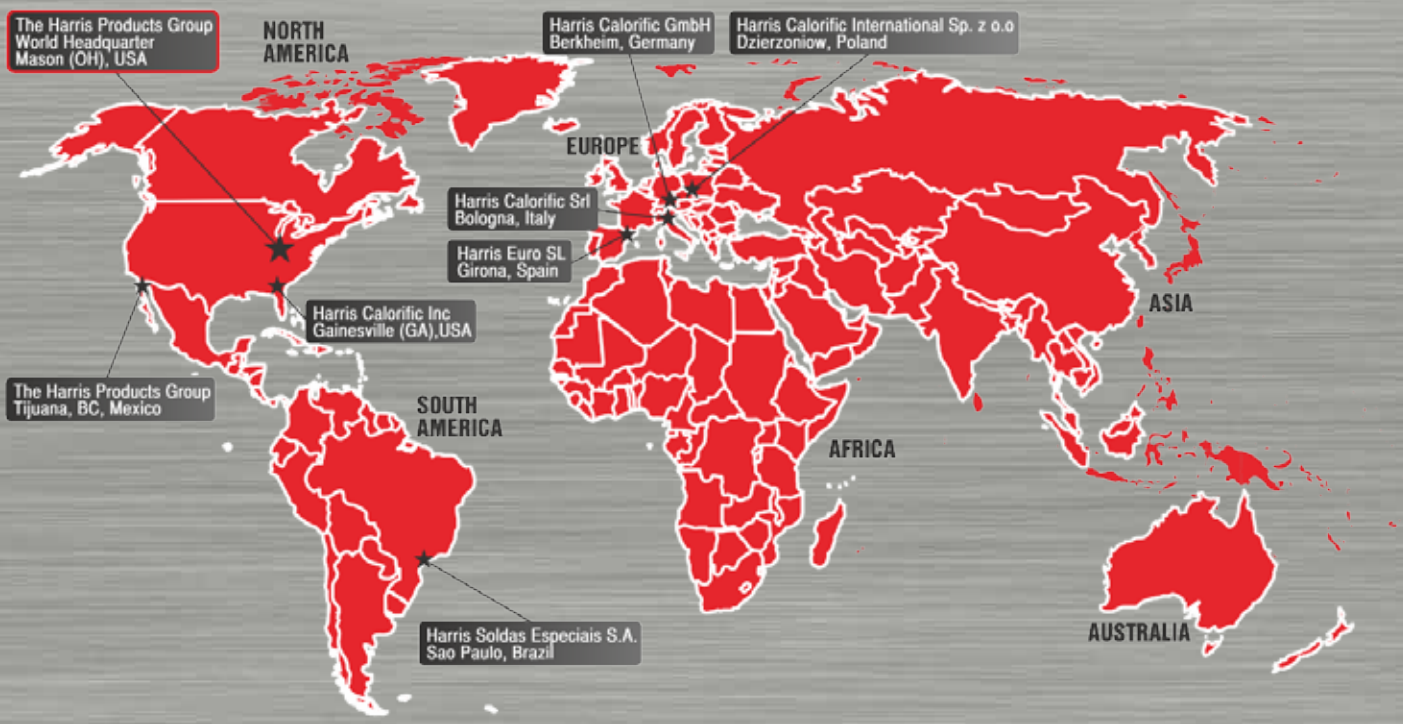
The Harris Products Group was formed by combining two strong names in the brazing and soldering consumables and the gas appararus business: Harris Calorific and J.W. Harris.

The merger resulted from series of acquisitions by The Lincoln Electric Company. Harris Calorific is a manufacturer of gas welding and cutting equipment, industrial and specialty gas regulation equipment and gas distribution systems. J.W. Harris is a major producer of soldering, brazing and welding alloys; it manufactures high quality alloys and specialized in phosphorus/ copper and phosphorus/ copper/ silver brazing alloys for the air-conditioning and refrigeration industries.

The result of this merger is a very powerful combination of customer service teams working together to provide best-in-class service to Harris customers. The Harris products are manufactured by skilled craftsmen using state-of-art technology, with a focus on quality and product testing, to provide customers with the best and most reliable products: 100% tested, 100% of the time, for consistency and precision.

The Harris Products Group includes facilities in the United States, Italy, Poland, Spain, Germany, Mexico and Brazil, giving the Company a broad global footprint.

Today Harris is very proud to supply products and equipment of the highest quality to the global cutting, brazing, soldering and welding markets in over 95 different countries.



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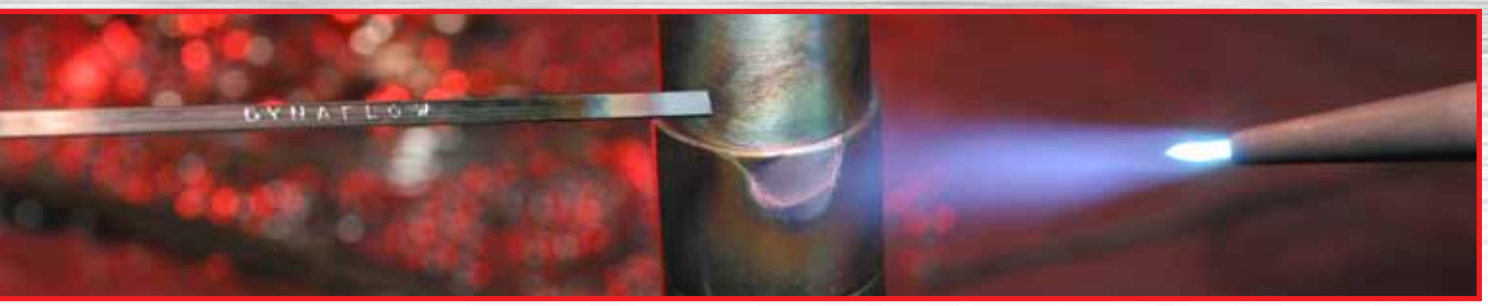


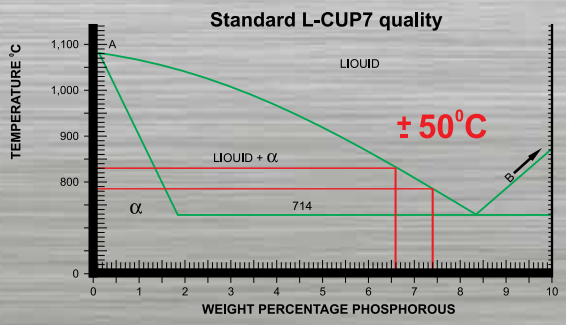
COPPER PHOSPHOROUS ALLOYS

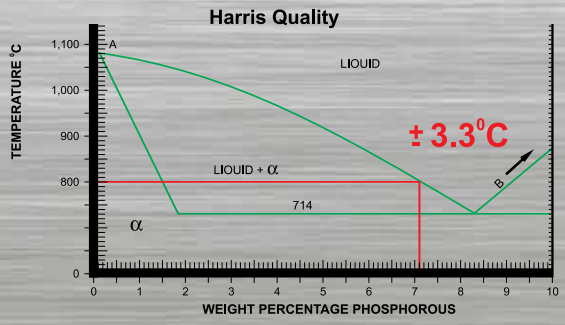
The Harris Products Group is the brazing industries frontrunner in developing the technology to control phosphorous content. The melting range is so precise, that brazing operators no longer need to make temperature adjustments from one batch of filler metals to the next. Operators know that with Harris alloys, the result will be the same with every batch, every time. Its technology is so accurate that The Harris Products Group guarantees users a liquidus temperature variation of no more than ± 3.3 °C - a much tighter standard than industry requires.

Over the decades many things have changed in our industry. But our dedication to making the world's purest and most consistent brazing alloys has not changed; we are committed to giving you the best tool to do your job.

All alloys are available in rods, solid wires and rings in both metric and imperial sizes according to European and American standards.

Save money using Harris phosphorous controlled products.
± 3.3°C liquidus point fluctuation from batch to batch.





BLOCKADE®

Blockade® is a proprietary phosphorus-tin-silicon alloy engineered to provide a low cost alternative to silver bearing filler metals. It is self- fluxing on copper and its lower melting temperature makes it an excellent choice for brass. Blockade® flows rapidly but can be used to “cap” brazed joints.

HARRIS 0®

This low cost alloy is suitable for most copper to copper or brass joints where good fit-up exists, and the assemblies are not subject to excessive vibration nor movement.

DYNAFLOW®

Dynaflow® melts and flows at temperatures very close to L-Ag15P and provides comparable brazed mechanical properties. This makes Dynaflow® an excellent cost effective alternative to the 15% silver alloys. This premium, medium range silver alloy has been meticulously formulated to even tighter specifications than our standard copper-to-copper alloys.

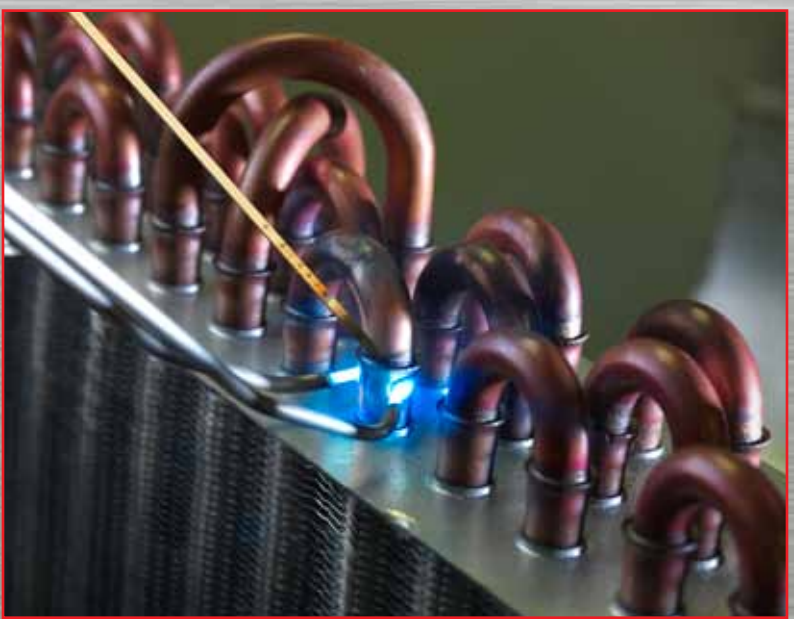
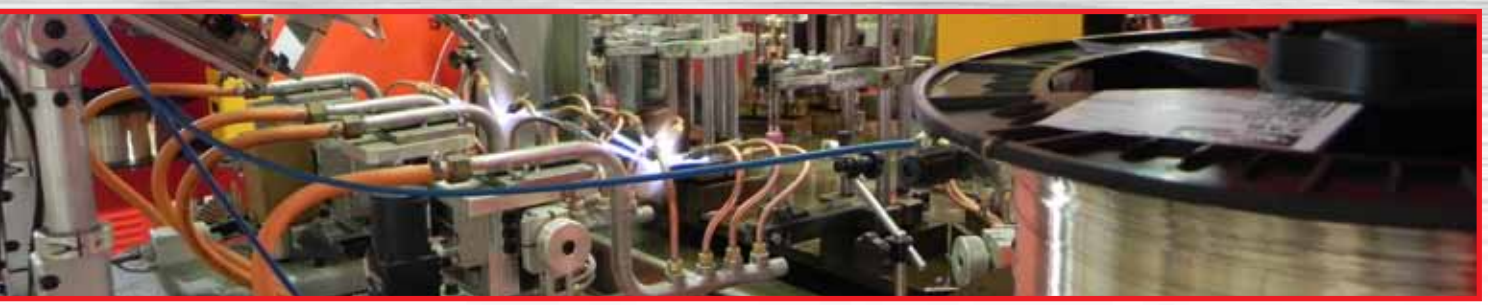


Table for Copper phosphorous alloys

Alloy	ISO17672	EN-1044	AWS A5.8	Cu %	P %	Ag %	Sn %	Other	Melting range °C	Specific Weight gr/cm³	Fluidity Rating*	Typical Application
L-CuP6	CuP 179	CP 203	-	R/B*	6,50	-	-	0,25	710 - 890	8,10	4	For copper. Good choice where joint tolerances cannot be maintained.
Harris 0	-	-	-	R/B*	7,10	-	-	-	710 - 802	8,05	5	For copper. Requires medium fit- up 0,05 – 0,178 mm (.002 – .007") clearance.
L-CuP7	CuP 180	CP 202	BCuP-2	R/B*	7,40	-	-	-	710 - 785	8,05	6	For copper. Fluid alloy, requires good fit- up 0,05 – 0,152 mm (.002 – .006") clearance.
Harris 0HP	CuP 181	CP 202	BCuP-2	R/B*	7,40	-	-	-	710 - 785	8,00	6,5	For copper. Most popular for brazing copper return bends in automated process.
L-CuP8 (Flash®)	CuP 182	CP 201	-	R/B*	8,10	-	-	-	710 - 727	8,00	8	For copper. Very fluid for close joint tolerances 0,50 – 0,102 mm (.002 – 0.004") clearance. Excellent for speeding up the brazing of Return Bends.
Blockade®	-	-	-	R/B*	6,50	-	6,50	Si 0,02	637 - 674	8,00	3	For copper or brass. Lower brazing temperature, excellent replacement for silver bearing phosphorus alloys. Can also be used to replace some high silvers for copper to copper or copper to brass joints. It has good fluidity, yet it has the unique ability to form a cap at the joint.
L-CuPSn7	CuP 386	CP 302	-	R/B*	6,50	-	6,80	-	650 - 700	8,00	6	For copper or brass connections. Low brazing temperature. Good fluidity for close joint tolerances.
Phoson	-	-	-	R/B*	7,3	0,1	-	-	710 - 785	8,00	6	Nominal addition of silver helps to enhance flow and handling properties. Ideally suited for brazing copper, brass and bronze where its high fluidity permits penetration into the close fit ups encountered is most applications.
Stay Silv® 01T	-	-	-	R/B*	6,10	1,10	-	0,05	699 - 846	8,00	3	Economical brazing of copper and brass. Requires medium fit- up 0,05 – 0,127 mm (.002 – .005") clearance.
Stay Silv® 2LP	CuP 279	-	-	R/B*	6,60	2,00	-	-	643 - 816	8,00	3	Sluggish flow, used for copper joints with wider clearance 0,076 – 0,152 mm (.003 – .006")
L-Ag2P	CuP 279	CP 105	-	R/B*	6,40	2,00	-	-	645 - 825	8,00	3,5	Broadens melting range of Harris 0. For copper or brass. Clearance range 0,076 – 0,127 mm (.003 – .005").
Stay Silv® 2	CuP 280	-	BCuP-6	R/B*	7,00	2,00	-	-	643 - 788	8,00	4	Broadens melting range of Harris 0. For copper or brass. Clearance range 0,05 – 0,127 mm (.002 – .005")
Stay Silv® 2HP	-	-	-	R/B*	7,40	2,00	-	-	643 - 763	8,00	5	For copper or brass. More fluid. Clearance range 0,05 – 0,127 mm (.002 – .005")
Stay Silv® 5LP	-	-	-	R/B*	5,70	5,00	-	-	643 - 835	8,10	2	For copper or brass. Use when fit-up cannot be controlled. Clearance range 0,076 – 0,127 mm (.003 – .005")
Stay Silv® 5	CuP 281	-	BCuP-3	R/B*	6,00	5,00	-	-	643 - 816	8,10	3	For copper or brass. Use to bridge gaps where close fit-up cannot be maintained.
L-Ag5P	CuP 281	CP 104	-	R/B*	5,90	5,00	-	-	645 - 815	8,10	3	For copper or brass. Use to bridge gaps where close fit-up cannot be maintained.
Stay Silv® 5HP	-	-	-	R/B*	6,40	5,00	-	-	643 - 785	8,10	4	For copper or brass. Slightly more fluid, use with clearance of 0,076 – 0,127 mm (.003 – .005")
Dynaflow®	-	-	-	R/B*	6,10	6,00	-	-	643 - 796	8,20	3	Premium alloy for copper or brass. Excellent strength and ductility, use as replacement for L-Ag15P.
L-Ag15P (Stay Silv® 15)	CuP 284	CP 102	BCuP-5	R/B*	5,00	15,50	-	-	645 - 800	8,40	3	Copper or brass. Useful for wide clearance of 0,05 – 178 mm (.002 – .007). Good ductility.
L-Ag18P	CuP 286	CP 101	-	R/B*	7,30	18,00	-	-	645 - 645	8,60	8	Copper to copper or copper to brass. Eutectic alloy with low temperature and highly fluidity. Suited for automated brazing operation such as those with rings.

R/B*- Remainder/ balance
Fluidity Rating**- the higher the fluidity rating, the faster the alloy flows within the melting range.


Pure.
Clean.
Consistent.
HARRIS 0
PHOS/COPPER BRAZING ALLOY
Harris 0 is the most recognized brazing alloy in the world.
It is made in the USA from only the purest raw materials.
Joints made with Harris 0 have consistently fewer leaks.
Accept no imitations, ask for genuine Harris 0.
HARRIS
The Harris Products Group- www.harrisproductsgroup.com



HIGH SILVER ALLOYS

The Harris Products Group manufactures a complete line of cadmium-free, high silver brazing alloys. Only pure base metals are used. Precision production procedures ensure consistency in product quality, composition, chemistry, dimensions and performance.

These filler metals are used for joining most ferrous and nonferrous metals, except aluminum and magnesium. Most of the high silver alloys composition are Copper, Zinc, and silver based but other additions as Manganese, Nickel or Tin can be added.

Tin can effectively reduce the brazing temperature, and is used to replace zinc or cadmium in filler metals.

Nickel is added to assist in wetting tungsten carbides and provides greater corrosion resistance. Brazing alloys containing Nickel are especially recommended for joining stainless steels because they reduce susceptibility to interfacial corrosion.

Manganese is sometimes added to improve wetting on stainless steel, other nickel-chromium alloys and cemented carbides.

Flux like Stay Silv® White, Black flux or Ecosmart® acid boric free flux is required when torch brazing, even if vapor flux introduced through a flame is used.

All high silver alloys are available in bare rods, flux coated rods, solid wires and rings, in both metric and imperial sizes according to European and American standards.

NEW! **High silver flux CORED now available!** Please contact our Technical Department for further details.

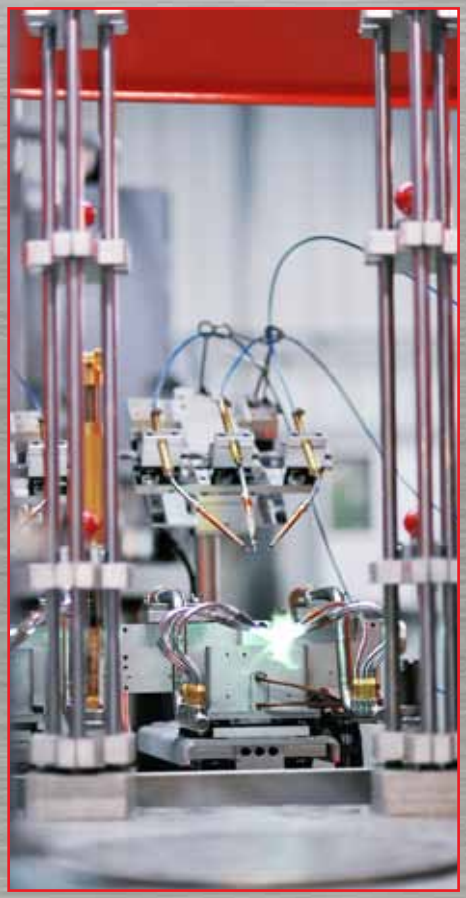


Table for High silver alloys

Alloy	ISO17672	EN-1044	AWS A5.8	Ag %	Cu %	Zn %	Others %	Melting range °C	Specific Weight gr/cm³	Fluidity Rating*	Typical Application
L-AG20	-	AG 206	-	20,0	44,0	35,8	Si 0,2	690 - 810	8,7	5,0	Economical alloy with large melting range. The wetting and flow characteristics make L-Ag20 an appropriate choice to join similar and dissimilar base metals (excluding aluminum). Colour Brass - Yellow.
L-Ag25Sn Safety-Silv 25	AG 125	AG 108	BAg-37	25,0	40,0	33,0	Sn 2,0	680 - 760	8,7	5,0	A low cost, general purpose silver brazing alloy. Exhibits moderate ductility and slightly higher melting temperature than alloys containing higher percentages of silver and or tin.
Safety-Silv 30	AG 230	-	BAg-20	30,0	38,0	32,0	-	677 - 766	8,8	6,0	A moderate temperature filler metal with flow characteristics useful for wider gaps.
L-Ag30Sn	AG 130	AG 107	-	30,0	36,0	32,0	Sn 2,0	665- 755	8,8	5,5	Steel and copper to copper and copper to brass. Good wetting and fluidity. Can be used for equipment and tools in the food industry. Also to be used in the refrigeration industry. Recommended clearance 0.05 to 0,13 mm (.002- .005")
L-Ag34Sn Safety-Silv 34T	AG 134	AG 106	-	34,0	36,0	27,5	Sn 2,5	630 - 730	9,0	6,0	
L-AG35 Safety-Silv 35	AG 235	-	BAg-35	35,0	32,0	33,0	-	685 - 755	9,0	6,0	Mainly used in the refrigeration industry.
L-AG38SN Safety-Silv 38T	AG 138	-	BAg-34	38,0	32,0	28,0	Sn 2,0	660 - 718	8,8	7,0	This tin-bearing alloy combines excellent fillet-forming characteristics with good flow properties. The addition of a small amount of tin provides qualities normally associated with alloys containing greater quantities of silver.
Safety-Silv 40	-	-	-	40,0	30,5	29,5	-	677 - 732	8,9	5,0	Ductile, free – flowing alloy that offers economy, good penetration into tight connections and medium temperature. Silver to light yellow color as in polished brass.
L-Ag40Sn Safety-Silv 40T	AG 140	AG 105	BAg-28	40,0	30,0	28,0	Sn 2,0	650 - 710	9,1	6,5	Good flow properties. Suitable for ferrous and nonferrous base materials. Good results with bigger gaps, even with a narrower melting range.
Safety-Silv 40Ni	AG 440	-	BAg-4	40,0	30,0	28,0	Ni 2,0	660 - 779	8,9	4,5	For stainless steel, nickel alloy for corrosion resistance and strength. Good choice for tungsten carbide.
L-Ag44	AG 244	AG203	-	44,0	30,0	26,0	-	675 - 735	9,1	6,5	Excellent general purpose brazing alloy. Good ductility and capillarity flow.
Safety-Silv 45	AG 245	-	BAg-5	45,0	30,0	25,0	-	663 - 743	9,1	4,5	
L-Ag45Sn Safety-Silv 45T	AG 145	AG 104	BAg- 36	45,0	27,0	25,5	Sn 2,5	646 - 685	9,2	7,0	Performs like a 45% silver cadmium bearing alloy but is cadmium – free. Excellent filler forming qualities produces high strength, ductile joints.
L-Ag49NiMn	AG 449	AG 502	BAg-22	49,0	16,0	23,0	Mn 7,5 Ni 4,5	680 - 705	8,9	7,0	Highly appropriate on tungsten carbides – high alloyed steels applications. These filler metals provide excellent flow characteristics on carbides getting strong / large resistance joints becoming an excellent choice where high stress working conditions are required.
Safety-Silv 50	AG 250	-	BAg-6	50,0	34,0	16,0	-	688 - 774	9,0	5,0	Useful in brazing electrical connections. It has a wide melting range suitable for bridging gaps where poor fit ups are encountered.
Safety-Silv 50N	AG 450	-	BAg-24	50,0	28,0	20,0	Ni 2,0	660 - 707	9,0	7,0	It is especially helpful where low brazing temperature must be maintained. It can be used to braze tungsten carbide, stainless steel, as well as other steel, copper and nickel alloys.
L-Ag55Sn	AG 155	AG 103	-	55,0	21,0	22,0	Sn 2,0	630 - 660	9,4	8,0	High silver content alloy; makes premium-quality brazes. Free- flowing with unsurpassed capillary attraction and deep penetration with high ductility. Suitable for use in the food processing industry. Silver color is excellent match for stainless steel and silverware applications. For ferrous and nonferrous alloys. Often used to braze stainless steel.
L-Ag56Sn Safety-Silv 56	AG 156	AG 102	BAg- 7	56,0	22,0	17,0	Sn 5,0	620 - 655	9,4	8,0	

Fluidity Rating*- the higher the fluidity rating, the faster the alloy flows within the melting range.

FLUXES FOR BRAZING

The purpose of a brazing flux is to protect the formation of a brazed joint by protecting the base metal and filler metal from oxidation. The brazing flux may also serve to remove surface oxides and therefore reduce surface tension to promote freer flow of filler metal.

Fluxes are not designed or intended for the primary removal of oxides, coatings, oil, grease, dirt, or other foreign materials from the parts to be brazed.

NEW! **EcoSmart®**

EcoSMART® is the unique, Boric Acid and Borax free, patent-pending new range of an environmentally friendly fluxes.

Product Features:

- Boric Acid and Borax free - environmentally friendly;
- Homogeneous mix that stays in solution or suspended paste;
- Powder flux has excellent adherence when heated rod is dipped into flux;
- Dissolves surface oxides and protects against oxidation during heating;
- Wide activation range;
- Excellent flux coverage during heating;
- Easy flux residue removal;
- Water soluble.

EcoSMART® COLOR CHANGE is designed with color change technology: a green color that changes to clear when the flux becomes active.

EcoSMART® HIGH HEAT is designed to extend the temperature and life of the flux. This is helpful during longer part heating cycles, or in cases of intense localized heating, such as induction brazing.

Table: fluxes for brazing

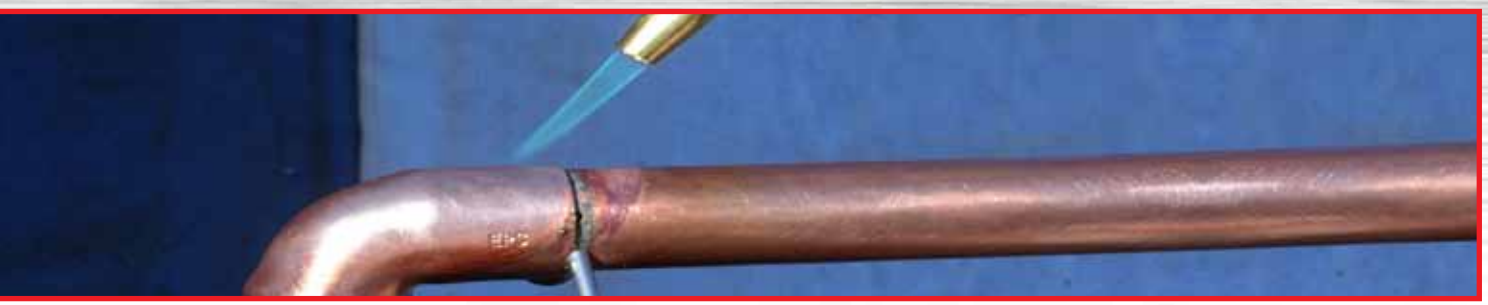
Flux	Active range °C	Application
EcoSMART® PASTE BRAZING FLUX - COLOR CHANGE: Green Paste and Powder	427 - 871	For brazing steel, stainless steel, Monel®, nickel, copper, brass, bronze and other ferrous and non-ferrous metals and alloys. Use with Stay-Silv®, Safety-Silv® and other brazing filler metals. Extremely fluid. Will penetrate the tightest joints. Not subject to recrystallization (lumpiness-hardening). May be water thinned.
Stay-Silv® White Brazing Flux	566 - 871	Common flux to be used with ferrous and nonferrous alloys.
EcoSMART® PASTE BRAZING FLUX - HIGH HEAT: Black Paste and Black Powder	371 - 982	For brazing steel, stainless steel, Monel®, nickel, copper, brass, bronze and other ferrous and non-ferrous metals and alloys. Use with Stay-Silv®, Safety-Silv® and other brazing filler metals. High Heat flux is designed to extend the temperature and life of the flux. This is helpful during longer part heating cycles, or in cases of intense localized heating, such as induction brazing. Extremely fluid. Will penetrate the tightest joints. Not subject to recrystallization (lumpiness-hardening). May be water thinned.
Stay-Silv® Black Brazing Flux	566 - 982	Recommended for stainless steel.
Dynaflow® Brazing Flux	566 - 871	Excellent joint penetration. Recommended for nonferrous alloys.

RINGS, PREFORMS AND RETURN BENDS

Preformed Brazing rings and other preforms have become a staple of many original equipment manufacturers, helping them improve consistency, quality, efficiency and productivity. The Harris Products Group, is an industry leader in producing these custom alloys in a wide variety of shapes and sizes. With more than 30 years of experience in the industry, The Harris Products Group for over 100 years is dedicated to creating innovative products that allow customers to braze more quickly and efficiently, resulting in cost savings and a competitive advantage.

We recognize our customers have a wide variety of applications and requirements. Our engineering team can assist you in developing or designing the shape that fits your needs. Or if you already have specifications, The Harris Products Group can meet your requirements and provide a production and delivery schedule that coincides with your inventory needs.

Since The Harris Products Group brazing rings are designed for specific part, there is no waste from excess filler metals applications. Rings can be located externally or buried inside and drawn out during brazing.



SOLDERING

There is evidence that soldering was used 5000 years ago to make jewelry items, cooking ware and tools. Over the years many thing have changed but soldering alloys are still widely used making possible the 20st and 21st century commercial and digital revolution.

The Harris Products Group offers a wide range of soldering alloys for HVAC&R, plumbing and electronic applications. Each solder product meets the highest standards for consistent performance.

STAY-BRITE® SILVER SOLDER

Silver-bearing solders are often used throughout the refrigeration/ air conditioning industry instead of brazing alloys. Both Stay-Brite® and Stay-Brite® 8 produce an overall component with greater strength than a brazed component whose base metals are weakened by high brazing heat. Stay-Brite solders bond with all of the ferrous and nonferrous alloys. Joints soldered with Stay-Brite® solders exhibit considerably higher than necessary elongation for sound, dissimilar metal joints and vibration applications.

Stay-Brite® 8 is especially effective in filling loosely fitted couplings. Use for all metals with the exception of aluminum. This is a low temperature solder excellent for many HVAC connections.

BRIDGIT®

Lead-free solder widely used in plumbing. Contains nickel, making joints tremendously strong. Wide range makes Bridgit an excellent alloy for large diameter fittings and ill-fitted or non-concentric pipes. Fills gaps and caps off easily and effectively.

NICK®

Nick® has a wide melting range (225°C-387°C) that allows operators to fill small tight fitting pipe connections and also to bridge gaps in large, loose fitting or non-concentric pipe. Its ease of application in all types of copper joints, makes it the preferred solder of experienced operators and is the most forgiving in the hands of the less experienced.

SPEEDY®

Speedy has a faster melting range, which allows operators to fill small, tight-fitting pipe connections quickly. Speedy®'s low temperature, free following nature decreases cycle time while reducing setup time. Speedy can be used with Stay-Clean paste or liquid flux, as well as Bridgit paste flux. Speedy is a lead-free, low temperature alloy formulated for joining copper pipe in potable water systems.

Table for soldering alloys

Alloy	ISO 9453	Sn %	Ag %	Cu %	Ni %	Sb %	Melting range °C	Fluidity Rating	Typical Application
Stay-Brite®	703	96	4	-	-	-	221-221	10	Low temperature solder for all metals except aluminum. Particularly used in refrigeration joints.
Stay-Brite® 8	-	94	6	-	-	-	221- 279	8	Similar to Stay-Brite®. Plastic range useful in bridging wider gaps.
Stay-Brite® ULTRA	703	96,5	3,5	-	-	-	221 - 221	10	Low temperature solder for all metals except aluminum. Particularly used in refrigeration joints.
Bridgit®	-	R/B*	0,15	2,5-3,5	0,05-2	4,5- 5,5	238- 332	6	Lead free, nickel & silver bearing solder of exceptional strength& capping ability
95/5	201	95	-	-	-	5	233-240	9	Lead free solder recommended for small diameter installations. Not recommended for use on brass.
Speedy	402	97	-	3	-	-	232 - 290	8	Lead free low temperature alloy formulated for joining copper pipes in portable water systems
Nick®	-	R/B*	0,05- 0,15	3,5- 4,5	0,05- 0,15	-	225- 387	5	Nickel & copper silver- bearing lead free solder with wide melting range.

R/B*- Remainder/ balance

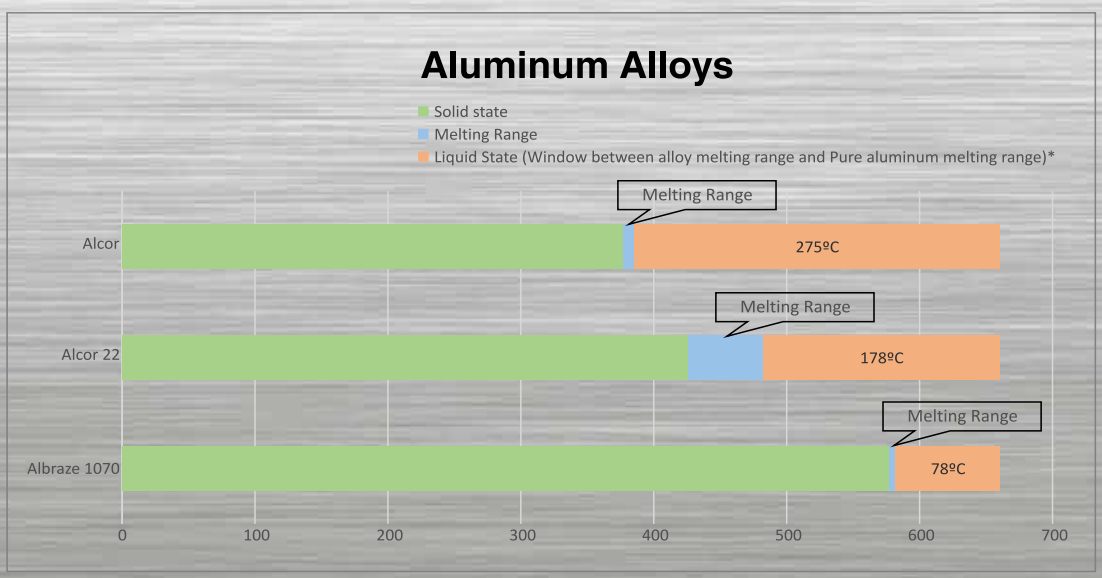
Table: fluxes for soldering

Flux	Active range °C	Application
Stay-Clean® Liquid Soldering Flux and Paste Soldering Flux	Up to 371	For all base materials other than Al, Mg or Ti.
Bridgit® Burn Resistant Flux	93 - 427	Designed to be used in lead free soldering.
Bridgit® Water Soluble Flux	121 - 315	Designed to be used in lead free soldering.

ALUMINUM ALLOYS

Aluminum and aluminum alloys are brazed using similar procedure to those used for brazing other metals except that different fluxes, different filler metals and generally lower brazing temperatures are used.

Not all aluminum alloys can be brazed, the high strength wrought aluminum alloys and certain casting alloys contain high amount of alloying ingredients that often prevent adequate wetting due to their unique oxide film combination.



Alloy	Al %	Si %	Mg %	Zn %	Sn %	Other %	Melting range °C	Typical Application
Al-Braze 1070®	88	12	-	-	-	-	577-582	Superior brazing alloy for joining aluminum to aluminum. Free - flowing with unequaled capillary attraction, ductility and penetration. Not recommended for brazing Aluminum directly to non-aluminum alloys as the joint may become brittle. Excellent corrosion resistance with a tensile strength up to 241N/mm².
Alcor®	2	-	-	98	-	-	377-385	Very easy to use aluminum alloy with non corrosive flux inside the wire; no external flux is required. Designed for the repair of heat exchangers, air conditioners, aluminum alloy condensers and other applications. Very good fluidity with good capillary attraction. Tensile strength up to 241 N/mm².
Alcor® 22	22	-	-	78	-	-	426-492	New approach for joining aluminum. A low temperature flux cored alloy recommended for brazing aluminum. Wider melting range than aluminum silicion alloys. Useful for both wide and close clearances.
Coral®	87	6	6	0,5	-	0,5	568-623	Flux cored aluminum alloys which is able to produce either this flowing of bead formining characteristics. Aluminum to aluminum; Not recommended for brazing directly to non-aluminum alloys. By adjustment of the temperature of the torch flame, it can be applied out of position with absolute control. Tensile strength up to 207 N/mm².
AlSolder 500	-	-	-	15	85	-	199-248	Solder alloy for torch on iron. Used to join all solderable aluminum alloys to each other and to dissimilar metals. Also for zinc die cast. Forms excellent, corrosion resistant joints. Not recommended for magnesium. Tensile strength up to 138N/mm².

NEW! **Aluminum Flux Cored Alloys**

For Aluminum- Aluminum and Aluminum-Copper connections.

- 2 in 1 product (Non Corrosive Flux inside);
- Simplification of the brazing process;
- Excellent capillarity;
- High mechanical features on Aluminum.

Applications:

- Brazing of automotive parts: Al heat exchangers (condensers, evaporators), connections and others tubes of components for air-conditioning system;
- Brazing of Aluminum Flat Roll Bond Evaporator;
- Brazing of refrigeration and heating components.

Advantages:

- SAFETY No direct contact with the flux and flux is Non Corrosive;
- ENVIRONMENT Less residues after brazing.

Fluxes for aluminum joining

Flux	Active range °C	Application
Al Braze® flux	500 - 700	Flux designed to be used in aluminum joints 4043 / 4047
Stay Clean Aluminum Flux	177- 288	To be used with Alsolder 500 alloys (Sn Zn). Forms excellent corrosion resistant joints on the tough-to-solder aluminum alloys.

COPPER WELDING ALLOYS

The copper welding alloys differs from brazing alloys in that the filler metal are distributed by deposition rather than by capillarity action (braze welding procedure).

The copper welding alloys are normally used for joining steel and gray cast iron, however it can also join copper, nickel and nickel alloys, providing a convenient way to join similar and dissimilar metals.

Braze welding procedure requires less heat than arc welding procedures to accomplish the bonding, producing less distortion from thermal expansion and contractions and reducing the potential for cracking.

Table for copper welding alloys

Alloy	AWS A5.8	AWS A5.7	Cu %	Zn %	Sn %	Fe %	Mn %	Ni %	P %	Si %	Al %	Melting range ºC	Typical Application
HA Low Fuming Bronze	-	-	60	BAL	0,4	-	0,1	-	-	0,1	-	865 - 887	Developed for braze welding, steel, cast iron, nickel, and copper alloys. HA LFB flows faster with less build up compared to LFB. Deposits can be machined and have excellent ductility. Harris bronze can be deposited using standard oxy-fuel torches.
Low Fuming Bronze	RBCuZn-C	-	60	BAL	1,0	0,7	0,3	-	-	0,1	-	910 - 954	Designed for repair and fabrication applications on steel, copper, copper alloys nickel and nickel alloys. Good machinability. Tensile strength up to 448N/mm^2
Silicon Bronze	-	ERCuSi-A	BAL	1,0	1,0	0,5	1,5	-	-	2,8 - 4,0	-	971 - 1027	Alloy used to weld similar composition base metals, brass and to weld copper alloys to steel. Frequenly used in GMAW “braze welding” of coated sheet steels. Use with Argon shelding Gas.
Aluminum Bronze A2	-	ERCuAl-A2	BAL	0,2	-	-	0,5	-	-	0,1	6,0 - 8,5	1046	Wire designed for joining aluminum bronze base metals, welding brass., steel and a variety of dissimilar metals applications.
Aluminum Bronze A1	-	ERCuAl-A1	BAL	0,2	-	-	0,5	-	-	0,1	‘8,5 - 11	1046	Wire designed for weld overlays for bearing and wear resistant surfaces. It is iron-free and is often used to protect parts exposed to salt water and certain acid conditions. Not recommended for joining.
Deox Copper	-	ERCu	BAL	-	1,0	-	0,5	-	0,2	0,5	0,01	1075	Developed for welding applications on high copper content base metals. This alloy produces trouble free welds that are a good color match to copper and have high electrical conductivity. Can also be used for welding copper to steel.
Phos Bronze	-	ERCuSN-C	BAL	0,2	8,0	-	-	-	0,2	-	0,01	882 - 1027	Used to weld base metals of steel, cast iron, cooper, brass and bronze. It is the ideal overlay on shafts, propellers, housings, couplings, bushings, valve seats, pumps and other surfaces needing a bronze wearing surface.
Alloy 170	RBCuzn-D	-	46,0 - 50,0	BAL	< 3,0	< 1,5	< 1,5	10,0	-	< 3,5	-	938 - 982	Developed for braze welding steel and cast iron. It can also be used for brazing tungsten carbide to steel where hiher joining temperature is not objectionable. The nickel addition provides hardness and strength compared to the standard bronze alloys.

THE PERFECT FLAME

With a history that includes the invention of flame-cutting torches and more than 100 years of manufacturing excellence, Harris Products Group continues to design and develop new products and processes to improve the quality of the products it manufactures. The Perfect Flame is one of the latest products that Harris developed to assist customers with the most effective and efficient method of creating and controlling the perfect oxy-fuel flame*, every time.

DEFINE exactly what type of flame you are currently using

MEASURE what the BTU/Kcal and temperature are

ANALYZE which type of flame is best for each process

IMPROVE flame

CONTROL flame by locking the box so the operators cannot change the setting

THE PERFECT FLAME ™

- Increased production speed by adjusting the flame BTU's;
- Lower leak and failure rates by adjusting a neutral flame and having a consistent flame for multiple operators;
- Decreased training time by eliminating the adjustment valves on the torch;
- Decreased gas usage by controlling the flow and temperature of the flame with the software;
- Lowering factory noise to schedule acceptable decibel levels;
- Extremely helpful on aluminum brazing where temperature is more critical.

*Kcal, flame temperature, flame mixing ratio.

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for cutting, brazing, soldering,
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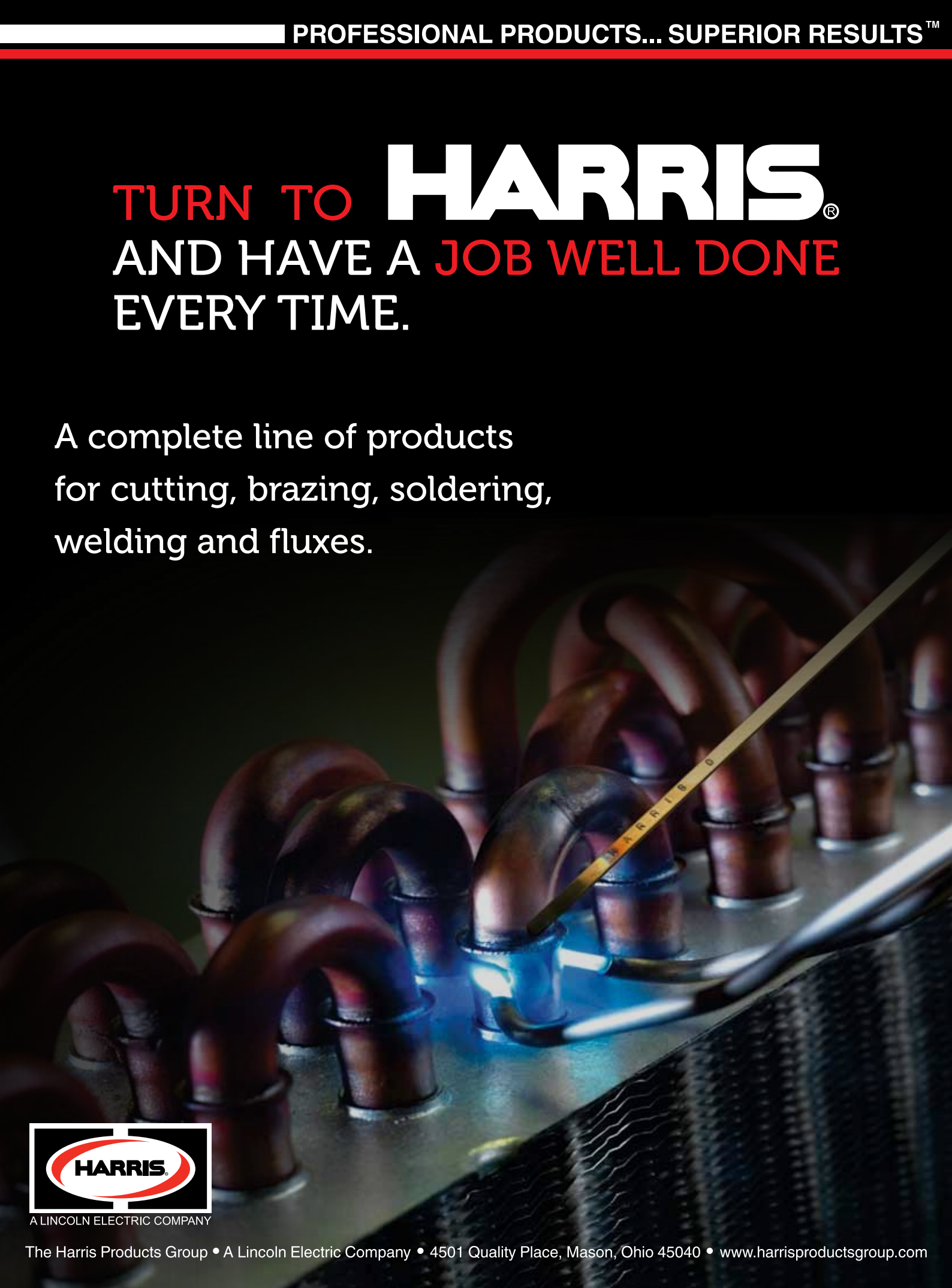

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The Harris Products Group • A Lincoln Electric Company • 4501 Quality Place, Mason, Ohio 45040 • www.harrisproductsgroup.com

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A LINCOLN ELECTRIC COMPANY

Harris Calorific International Sp. z o.o.
ul. Strefowa 8, 58-200 Dzierzoniow, Poland
Phone: +48 74 646 23 01
marketingharris@lincolnelectric.eu
www.harrisproductsgroup.com

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