

# EQUIPMENT CATALOG FOR HVAC/R AND PLUMBING



THE HARRIS PRODUCTS GROUP  
JW Harris • Harris Calorific



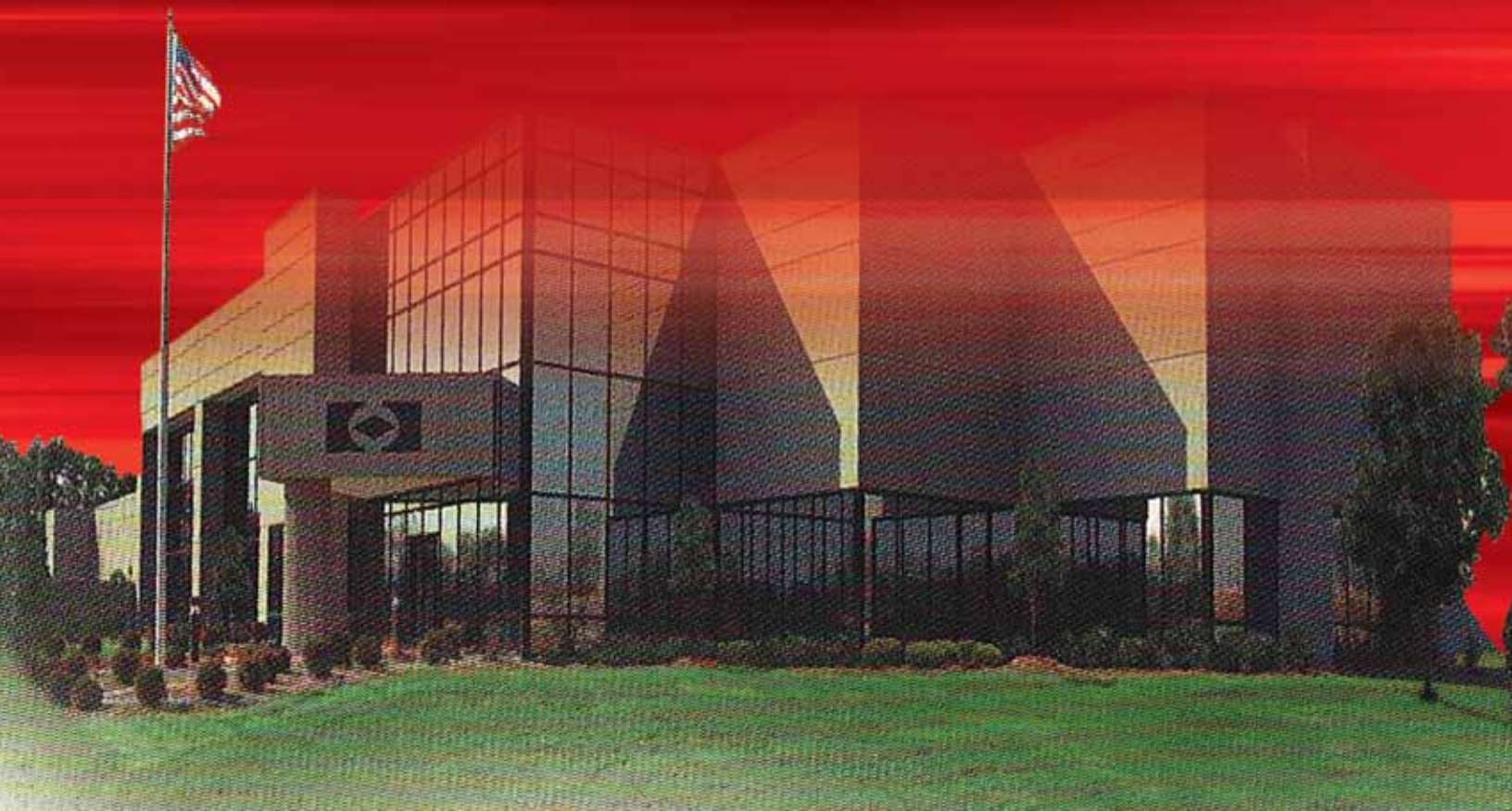
The J.W. Harris Company was founded in 1914 by Joseph W. Harris, Sr., who was involved primarily in the distribution and repair of specialized parts for automotive and farm implement vehicles. In 1937, Mr. Harris formulated Stay-Clean soldering flux, followed by the development of Stay-Brite, a tin-silver solder, in 1956.

In late 1976, the Company entered the welding supply industry by adding a completely new product line of filler metals including stainless steel, aluminum, and copper-based alloys for most welding applications.

Autobrazo Inc., a division of J.W. Harris, was established in early 1993 and operates in Cranston, Rhode Island. Autobrazo specializes in the manufacture of precision brazing rings for automated brazing systems.

In 2000, the Company built new world headquarters in Mason, Ohio. The facility incorporates leading edge manufacturing technologies, increased production capabilities and expanded warehouse space.

In 2005, J.W. Harris was acquired by The Lincoln Electric Company of Cleveland, Ohio.





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# AIR FUEL KITS



## FEATURES:

- Available in "B" or "MC" tank configurations
- Quick Disconnect Handle & Tip(s)
- 12ft. Hose (A x A Fittings)
- Instruction manual

**USA  
MADE IN**

<b>SOFT SOLDERS up to 3"</b>	<b>SILVER BRAZING 1-5/8"</b>	<b>MODEL NO.</b> HQA4520A311 HQA4200A311	<b>TANK CONNECTION</b> "B" Acetylene "MC" Acetylene
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**USA  
MADE IN**

<b>SOFT SOLDERS 1-1/2"</b>	<b>SILVER BRAZING 3/4"</b>	<b>MODEL NO.</b> HQA4520A5 HQA4200A5	<b>TANK CONNECTION</b> "B" Acetylene "MC" Acetylene
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**USA  
MADE IN**

<b>SOFT SOLDERS UP TO 3-1/2"</b>	<b>SILVER BRAZING UP TO 2"</b>	<b>MODEL NO.</b> HQA4520A514	<b>TANK CONNECTION</b> "B" Acetylene
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**USA  
MADE IN**

<b>SOFT SOLDERS UP TO 2"</b>	<b>SILVER BRAZING UP TO 1"</b>	<b>MODEL NO.</b> HQA4520A8	<b>TANK CONNECTION</b> "B" Acetylene
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## ACETYLENE OUTFIT WITH SWIRL TIPS

PART NO.	MODEL NO.	TANK CONNECTION	TORCH HANDLE	ACETYLENE TIPS	REGULATOR	ACCESSORIES
4400052	HQA4520A311	B (CGA 520)	HQA-4	A3, A11	601-15-B (520)	12ft. Hose
4400053	HQA4200A311	MC (CGA 200)	HQA-4	A3, A11	601-15-MC (200)	12ft. Hose
4400054	HQA4520A5	B (CGA 520)	HQA-4	A5	601-15-B (520)	12ft. Hose
4400055	HQA4200A5	MC (CGA 200)	HQA-4	A5	601-15-MC (200)	12ft. Hose
4400056	HQA4520A514	B (CGA 520)	HQA-4	A5, A14	601-15-B (520)	12ft. Hose
4400057	HQA4520A8	B (CGA 520)	HQA-4	A8	601-15-B (520)	12ft. Hose

# AIR FUEL KITS



## FEATURES:

- Available in "B" or "MC" tank configurations
- Screw connect Handle & Tip
- 12ft. Hose (A x A Fittings)
- Instruction manual

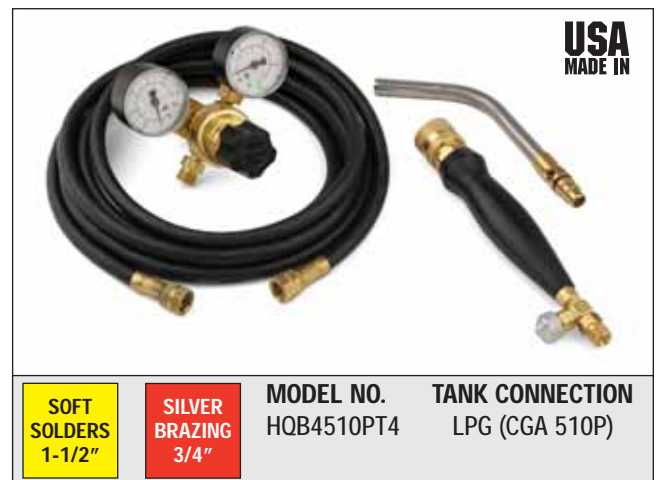


## ACETYLENE OUTFIT WITH SOFT FLAME TIP

PART NO.	MODEL NO.	TANK CONNECTION	TORCH HANDLE	ACETYLENE TIPS	REGULATOR	ACCESSORIES
4400058	HAS4520S3	B (520)	HSA-400	S3	601-15-B (520)	12ft. Hose
4400059	HAS4200S3	MC (CGA 200)	HSA-400	S3	601-15-MC (200)	12ft. Hose

## FEATURES:

- Available in LPG (CGA 510P) tank configuration
- Quick Disconnect Handle & Tip
- 12ft. Hose (B x B Fittings)
- Instruction manual



## PROPANE OUTFIT WITH SWIRL TIP

PART NO.	MODEL NO.	TANK CONNECTION	TORCH HANDLE	PROPANE TIPS	REGULATOR	ACCESSORIES
4400051	HQB4510PT4	LP (CGA 510P)	HQB-4	HT-4	601-50-510P	12ft. Hose



# OXY/ACETYLENE KITS



Industrial duty kits for cutting welding and brazing with acetylene. Torch Handles are equipped with FlashGuard® checkvalves

## WELDING & BRAZING - Weld or Braze 3/32" with tips supplied

PART NUMBER	MODEL NUMBER	TORCH HANDLE	MIXER	WELDING TIP	SINGLE STAGE OXYGEN REG. 0-125 PSIG	SINGLE STAGE FUEL GAS REG. 0-15 PSIG	ACCESSORIES
4400061	16601-200 L/CA	16	H-16-2E	23A90-1,4	601-80-540	601-15-200	Goggles, Striker 12'x 3/16" Hose (B x B)
4400065	19601-200 L/CA	19-6A	H-16-2E	23A90-1,4	601-80-540	601-15-200	Goggles, Striker 12'x 3/16" Hose (A x A)
4400063	16601-520 L/CA	16	H-16-2E	23A90-1,4	601-80-540	601-15-520	Goggles, Striker 12'x 3/16" Hose (B x B)
4400067	19601-520 L/CA	19-6A	H-16-2E	23A90-1,4	601-80-540	601-15-520	Goggles, Striker 12'x 3/16" Hose (A x A)



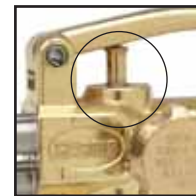
## Cutting Attachments Feature:



Solid Forged Head



Brazed Triangular Tube Design



Ease-On Cutting Valve



Protected Torch Union

## CUTTING, WELDING & BRAZING - Cuts 5/8", Welds 3/32" with tips supplied

PART NUMBER	MODEL NUMBER	TORCH HANDLE	MIXER	CUTTING ATTACH.	CUTTING TIP	WELDING TIP	SINGLE STAGE OXYGEN REG. 0-125 PSIG	SINGLE STAGE FUEL GAS REG. 0-15 PSIG	ACCESSORIES
4401138	16601-200	16	H-16-2E	71-3	6290-0	23A90-1,3,4	601-80-540	601-15-200	Goggles, Striker 12'x 3/16" Hose (B x B)
4400064	19601-200	19-6A	H-16-2E	71-3	6290-0	23A90-1,3,4	601-80-540	601-15-200	Goggles, Striker 12'x 3/16" Hose (B x A)
4400062	16601-520	16	H-16-2E	71-3	6290-0	23A90-1,3,4	601-80-540	601-15-520	Goggles, Striker 12'x 3/16" Hose (B x B)
4400066	19601-520	19-6A	H-16-2E	71-3	6290-0	23A90-1,3,4	601-80-540	601-15-520	Goggles, Striker 12'x 3/16" Hose (A x A)

# OXY/ACETYLENE KITS



## Port-A-Torch®

Contains all the quality equipment needed for cutting, welding and brazing in a rugged molded plastic carrying case. The outfit is designed to carry one MC acetylene cylinder and one 20 cu.ft. oxygen cylinder. As supplied, the outfit is capable of cutting to 1" and welding to 1/16". Can cut to 4" and weld to 1/2" with larger tips and acetylene cylinder.

PART NUMBER	MODEL NUMBER	TORCH HANDLE	MIXER	CUTTING ATTACH.	CUTTING TIP	WELDING TIP	SINGLE STAGE OXYGEN REG. 0-125 PSIG	SINGLE STAGE FUEL GAS REG. 0-15 PSIG	ACCESSORIES
4400060	16601-200-PAT-L/CA	16	H-16-2E	-	-	23A90-1,4	601-80-540	601-15-200	Goggles, Striker 12'x3/16" Hose (B x B) 20 CU. FT. OXY CYL., 10 CU.FT. "MC" ACET. CYL. (cylinders shipped empty)
4401141	19601-200-PAT-L/CA	19-6A	H-16-2E	-	-	23A90-1,4	601-80-540	601-15-200	Goggles, Striker 12'x3/16" Hose (A x A) 20 CU. FT. OXY CYL., 10 CU.FT. "MC" ACET. CYL. (cylinders shipped empty)
4401137	16601-200-PAT-DLX	16	H-16-2E	71-3	6290-0	23A90-1,4	601-80-540	601-15-200	Goggles, Striker 12'x3/16" Hose (B x B) 20 CU. FT. OXY CYL., 10 CU.FT. "MC" ACET. CYL. (cylinders shipped empty)
4401140	19601-200-PAT-DLX	19-6A	H-16-2E	71-3	6290-0	23A90-1,4	601-80-540	601-15-200	Goggles, Striker 12'x3/16" Hose (A x A) 20 CU. FT. OXY CYL., 10 CU.FT. "MC" ACET. CYL. (cylinders shipped empty)
<b>PORT-A-TORCH W/GAS AIR ADAPTOR</b>									
4401668	16601-200-PAT-W/AD	16	H-16-2E	71-3	6290-0	23A90-3	601-80-540	601-15-200	Goggles, Striker 12'x3/16" Hose (B x B) 20 CU. FT. OXY CYL., 10 CU.FT. "MC" ACET. CYL. (cylinders shipped empty)
4401142	19601-200-PAT-W/AD	19-6A	H-16-2E	71-3	6290-0	23A90-3	601-80-540	601-15-200	Goggles, Striker 12'x3/16" Hose (A x A) 20 CU. FT. OXY CYL., 10 CU.FT. "MC" ACET. CYL. (cylinders shipped empty)



# AIR FUEL TORCHES



## SELF LIGHTING TORCH HSLT-604

- Operates on MAPP, Propane and Propylene
- Durable cast aluminum construction
- Precise flame control
- Swirl combustion tip
- Operates in any position
- Trigger lock
- For Brazing and Soldering
- Torches work with non-refillable cylinders

P/N: 1400080

## REGULATED HAND TORCHES



**HTR-HT2**  
Hand torch with  
Double Twister tip

- Swivels 360°
- Built in regulator

**USA  
MADE IN**

P/N: 1400083



**HTR-HT6**  
A Self-Lighting torch which  
eliminates the need for a  
flint striker. Just pull down  
to ignite.

- Swivels 360°
- Built in regulator

**USA  
MADE IN**

P/N: 1400082



**HTR-HT5**  
Hand torch with Single  
Swirl tip

- Swivels 360°
- Built in Regulator

**USA  
MADE IN**

P/N: 1400081



# AIR FUEL TORCH HANDLES



Air/Fuel torch handles are ergonomically designed with a super tough grip for balance and comfort. Handle options include screw connect or quick connect tips, and "A" or "B" inlet connections.

## Quick Connect Handles HQA, HQB-4

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Model HQA-4 shown

### HQB-4

■ "B" Hose Connection  
P/N: 1400085

### HQA-4

■ "A" Hose Connection  
P/N: 1400084



## Screw Connect Handle HAS-400

**USA  
MADE IN**



### HAS-400

■ "A" Hose Connection  
P/N: 1400086



### HTA

#### Quick Connect Adaptor

Converts HAS-400 handle to quick connect HA, HT Series tips  
P/N: 4300676



### 16GA

Converts Oxy/Acetylene Model 16 torch handle to HS Screw connect tips  
P/N: 4300419



# AIR FUEL TIPS



A swirl tip is designed to maximize heat output through a stationary tip insert, which swirls the flame and provides greatly improved performance.

## ACETYLENE QUICK CONNECT SWIRL TIPS HA Series Tips

- For Acetylene gas
- Swirl tip design
- Quick connect
- Stainless steel and brass construction

**USA**  
MADE IN



## ACETYLENE QUICK CONNECT SWIRL TIPS

PART NO.	MODEL NO.	TIP SIZE	GAS FLOW @ 15 PSI	COPPER TUBING CAPACITY	
				SOFT SOLDER	BRAZING
1601010	HA-3	1/4"	2.7 SCFH	UP TO 1"	UP TO 1/2"
1601011	HA-5	5/16"	4.8 SCFH	3/4" - 1 1/2"	1/4" - 3/4"
1601012	HA-8	3/8"	7.7 SCFH	1" - 2"	1/2" - 1"
1601013	HA-11	7/16"	11.8 SCFH	1 1/4" - 3"	7/8" - 1 5/8"
1601014	HA-14	1/2"	14.3 SCFH	2 - 3 1/2"	1" - 2"
1601015	HA-32	3/4"	35.3 SCFH	4" - 6"	1 1/2" - 4"

# AIR FUEL TIPS



## PROPANE/MAPP QUICK CONNECT SWIRL TIPS HT Series Tips

- For Propane/MAPP®/Propylene gas
- Swirl tip design
- Quick connect
- Stainless steel and brass construction

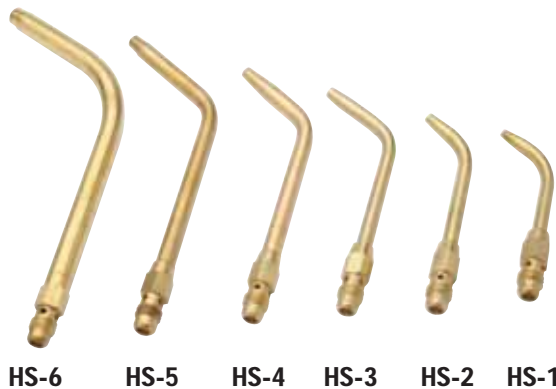
**USA**  
MADE IN



## PROPANE/MAPP QUICK CONNECT SWIRL TIPS

### COPPER TUBING CAPACITY

PART NO.	MODEL NO.	TIP SIZE	GAS FLOW @ 24 PSI	PROPANE GAS		MAPP/PROPYLENE GAS	
				SOFT SOLDER	BRAZING	SOFT SOLDER	BRAZING
1601030	HT-2	5/16"	1.3 SCFH	1/8" - 1/4"	1/16" - 1/4"	1/8" - 1/2"	1/8" - 1/4"
1601031	HT-3	7/16"	3.6 SCFH	1/4" - 1"	1/8" - 1/2"	1/4" - 1-1/2"	1/4" - 1/2"
1601032	HT-4	1/2"	4.1 SCFH	1/4" - 1-1/2"	1/4" - 3/4"	1/4" - 2-1/2"	1/2" - 1-1/4"
1601033	HT-5	3/4"	9.6 SCFH	1-1/2" - 2-1/2"	1/2" - 1-1/4"	1" - 4"	1/2" - 2"



## ACETYLENE SCREW CONNECT SOFT FLAME TIPS HS Series Tips

- For Acetylene gas
- Soft flame design
- Screw connect
- All brass construction

**USA**  
MADE IN

## ACETYLENE SCREW CONNECT SOFT FLAME TIPS

### COPPER TUBING CAPACITY

PART NO.	MODEL NO.	GAS FLOW@8-10 PSI	COPPER TUBING CAPACITY	
			SOFT SOLDER	BRAZING
1601020	HS-1	.31 SCFH	1/16" - 1/8"	UP TO 1/16"
1601021	HS-2	.92 SCFH	1/8" - 3/8"	UP TO 1/8"
1601022	HS-3	3.3 SCFH	3/8" - 1/2"	UP TO 3/8"
1601023	HS-4	4.6 SCFH	1/2" - 1"	UP TO 1/2"
1601024	HS-5	6.6 SCFH	1/2" - 1 1/2"	1/2" - 3/4"
1601025	HS-6	12.7 SCFH	3/4" - 4"	3/4" - 1 1/2"



# ACCESSORIES

## FLAME BARRIER

### HTS12 - 12" x 12"

P/N: 4300679

Protects adjacent surfaces from damage when soldering and brazing.



## HOSES

Kink proof, double and single line hoses for safety and service. 100 PSI rating



### Single Hose

PART NO.	DESCRIPTION
4300775	12' Acetylene hose (A & A Fittings)
4300777	24' Acetylene hose (A & A Fittings)
4300774	12' Propane hose (B & B Fittings)
4300779	24' Propane hose (B & B Fittings)



HMCTS

HBTS

## TANK STANDS

### HMCTS

P/N: 4300678

Use with 2 1lb. NRC or with "MC" Acetylene cylinder. Easy storage of tips, handle, hose and striker.

### HBTS

P/N: 4300677

Fits "B" size acetylene tanks. Easy storage of tips, handle, hose and striker.

### Twin Hose

PART NO.	DESCRIPTION
4300556	3/16" X 12' twin hose (B & B Fittings)
4300557	3/16" X 20' twin hose (B & B Fittings)
4300005	3/16" X 12' twin hose (A & B Fittings)
4300155	3/16" X 12' twin hose (A & A Fittings)



## CYLINDERS

### Propane Replacement Tank

P/N: 4300675

- 14.1 oz. Propane
- CGA 600 Connection
- Disposable (non-refillable)
- Sold by the case (12)

### MAPP® Replacement Tank

P/N: 4300674

- 16 oz. MAPP®
- CGA 600 Connection
- Disposable (non-refillable)
- Sold by the case (12)



## TIP CLEANER

P/N: 4300833

For cleaning of Oxy/Fuel cutting and welding tips. Fits all tip sizes.



## STRIKER

P/N: 4300834

Economical and dependable. Most popular striker in the industry. Single flint striker with replaceable flint.



### STRIKER REFILLS

P/N: 4300418

Fits single flint striker.

\*NO AIR SHIPMENTS ON FILLED CYLINDERS

# PRESSURE REGULATORS



## Model 601 Single Stage Regulator

- One-piece encapsulated seat design with an internal filter and a PTFE teflon seat
- Forged brass bonnet and body
- 50mm dual scale gauges
- Featured in the POWERTORCH® kits



**USA  
MADE IN**

PART NO.	MODEL NO.	GAS	MAXIMUM INLET PSIG	DELIVERY PRESSURE RANGE PSIG	DELIVERY PRESSURE GAUGE PSIG	SUPPLY PRESSURE GAUGE PSIG	INLET CONNECTION	OUTLET CONNECTION
3000407	601-15-200	Acetylene	500	0-15	30	400	CGA 200 (MC)	A
3000295	601-15-200	Acetylene	500	0-15	30	400	CGA 200 (MC)	B
3000409	601-50-510P	Propane	500	0-50	60	400	CGA 510P (LPG)	B
3000408	601-15-520	Acetylene	500	0-15	30	400	CGA 520 (B)	A
3000411	601-15-520	Acetylene	500	0-15	30	400	CGA 520 (B)	B
3000296	601-80-540	Oxygen	3000	0-80	100	4000	CGA 540	B
3000412	601-80-540A	Oxygen	3000	0-80	100	4000	CGA 540	A

## Model 25 Single Stage Nitrogen Regulator

This regulator is recommended for joint testing and purging on job sites.

- For line purging up to 600 psig.
- One-piece encapsulated seat design with an internal filter and a PTFE teflon seat
- Chrome-plated bonnet with forged brass body
- 2" dual scale gauges
- 1/4" SAE outlet



**UL USA MADE IN 3 YEAR WARRANTY**

PART NO.	MODEL NO.	GAS	MAXIMUM INLET PSIG	DELIVERY PRESSURE RANGE PSIG	DELIVERY PRESSURE GAUGE PSIG	SUPPLY PRESSURE GAUGE PSIG	INLET CONNECTION	OUTLET CONNECTION
<b>MODEL 25 HVAC REGULATOR</b>								
3000615	25-500C-580	Ar,N <sub>2</sub> ,He	3000	0-500	1000	4000	CGA 580	1/4 FLARE



# TORCH HANDLES

## Torch Handle Ordering Information

PART NO.	MODEL NO.	DESCRIPTION
<b>ACETYLENE</b>		
1401016	16	HANDLE
1401143	19-6A	HANDLE
1401585	50-9	HANDLE
<b>PROPANE, MAPP®, PROPYLENE</b>		
1401590	50-10	HANDLE

## Model 16 Torch Handle

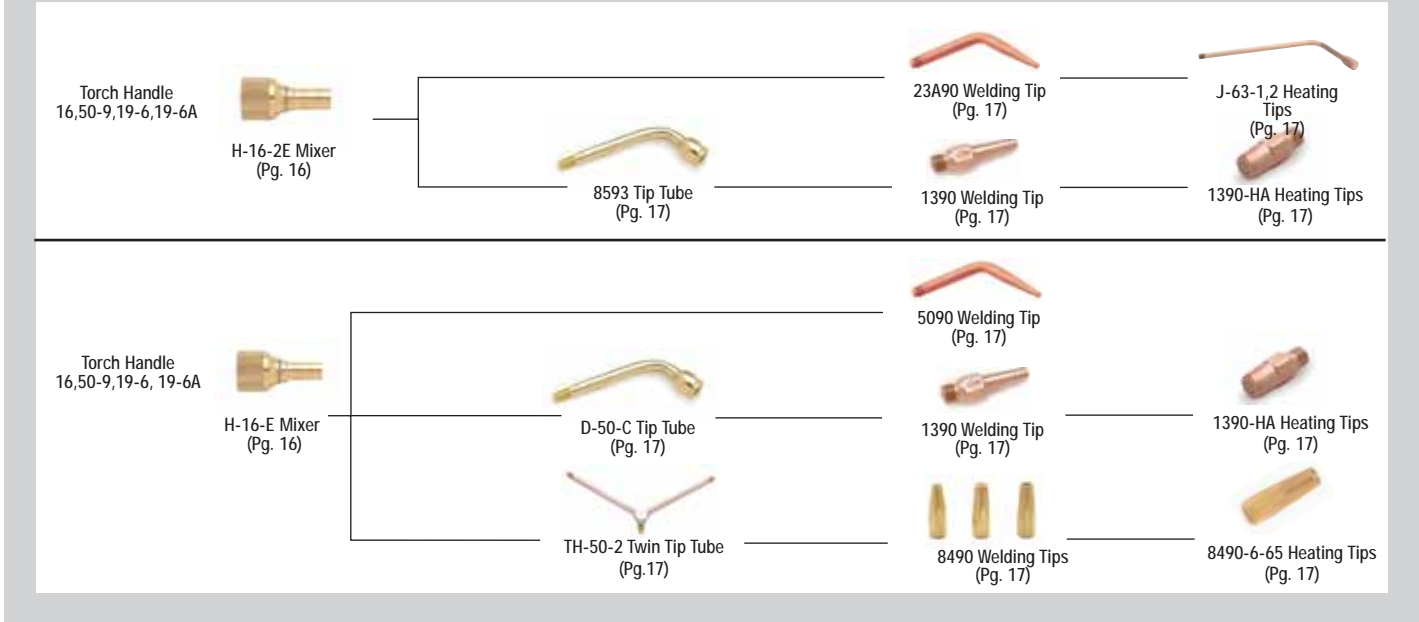
The Harris 16 combination torch handle for cutting, welding, brazing and heating. It can be used with oxy-acetylene or other fuel gases. The Model 16 features silver brazed twin tube construction.



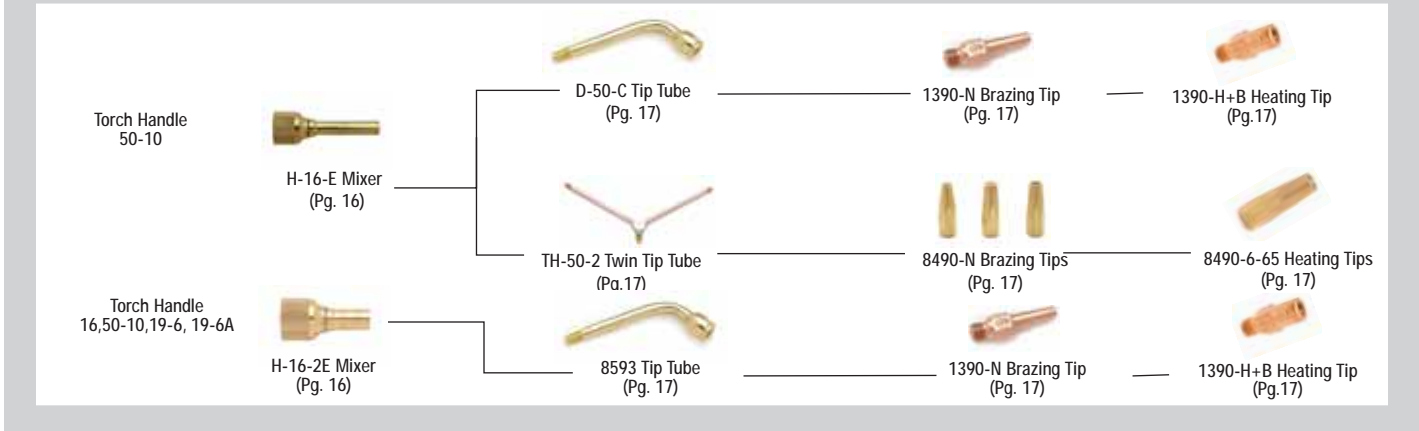
- Equipped with FlashGuard® check valves
- Capacity: cuts 4", welds to 1/2"
- Length: 7 3/4", Weight: 0.9 lbs



### RECOMMENDED POSITIVE PRESSURE "E" EQUIPMENT\* FOR ACETYLENE/MAPP®



### RECOMMENDED POSITIVE PRESSURE "E" EQUIPMENT FOR PROPANE/PROPYLENE



# TORCH HANDLES



## Model 50 Automatic Torch Handle

The Harris 50-9 and 50-10 automatic torch handles feature a unique gas control system to reduce operating cost and improve safety and convenience. The thumb operated on/off gas control and adjustable pilot light eliminate relighting and flame readjustment each time the torch is used. The on/off feature can be used for cutting, brazing, and welding with all oxy-fuel gases. The pilot light feature is not recommended when using cutting attachments or heating tips. Select the Model 50-9 for acetylene and the 50-10 for other fuels.



- Automatic on/off gas control
- Adjustable pilot light
- Equipped with Flash Guard® check valves
- Capacity: cuts 3", welds to 1/2"
- Length: 8", Weight: 0.8 lbs



## Model 19-6A Torch Handle

The Harris 19-6 combination torch handle for cutting, welding, brazing and heating. It can be used with oxy-acetylene or other fuel gases. The Model 19-6 features silver brazed twin tube construction. Valves are located at the front of torch handle for more precise control while brazing.



- Equipped with check valves
- Capacity: cuts 2", welds to 5/16"
- Length: 7 1/2", Weight: 0.7lbs
- "A" 3/8" - 24 Hose Connections



## Hose Adaptors - B x A



## Classic Cutting Attachments



- Solid forged head resists abuse and distortion
- Triangular tube design is compact and lightweight with exceptional strength and rigidity
- Brazed connections prevent leaks
- Protected torch union nut protects seats and O-rings from abuse
- Solid forged lever for exceptional strength
- Ease-on cutting oxygen control for smoother starts



71 - 3

Capacity: 4", Length: 8 1/4"; Weight: 1.4lbs.

### Classic or Positive Pressure "E" Cutting Attachments

PART NUMBER	MODEL NUMBER	TORCH HEAD ANGLE	COMPATIBLE HANDLES
1300400	71-3	90°	16, 50, 19-6

## Flash-Guard® Check Valves

Check valves fully open with only ounces of pressure. If reverse flow starts, the valve closes immediately for total shutoff.

- High Capacity- adequate for cutting steel and for operating the largest heating tips
- Quality Manufacture- valve spring made of stainless steel for long life
- 100% Production Tested- individually tested and packaged immediately to assure cleanliness
- Conforms to OSHA regulations



Regulator Type  
Model 88-6CVR (R&L)  
9/16-18 Connections  
(P/N 4300389)



Torch Type  
Model 88-6CVT (R&L)  
9/16-18 Connections  
(P/N 4300390)



Torch Type  
Model 88-6CVTA (R&L)  
"A" Connections  
(P/N 4300835)



# OXY/FUEL TIPS

## Oxy-Acetylene 6290 General Preheat Cutting Tips



6290 GENERAL PREHEAT PART NO.	PLATE THICKNESS INCHES	TIP SIZE	OXYGEN PSIG	CUTTING ACETYLENE PSIG	ORIFICE DRILL SIZE
1500820	3/16-3/8	00	20-25	5-15	#64
1500830	3/8-5/8	0	35-40	5-15	#60
1500840	5/8-1	1	35-40	5-15	#56
1500850	1-2	2	40-45	5-15	#52*

Larger tips available upon request

## "J" Series Heating Tip Information

Tube and Tip Assembly



PART NO>	TIP SIZE	ORIFICE SIZE	OXYGEN & ACETYLENE "EQUAL PRESSURE"		ACETYLENE FLOWS		APPROXIMATE GROSS HEATING OUTPUT BTU/HR.	
			MAX. PSI	MIN. PSI	MAX. FLOW CFH	MIN. FLOW CFH	MAX.	MIN.
1800710	1	(6) #60 (.040)	6	2	35	20	51,500	29,500
1800720	2	(8) #60 (.040)	7	3	50*	30	74,000	44,000

1. Maximum Pressure - Neutral flame with no flame blow-off (highest stable flame). 2. Minimum Pressure - Neutral flame with no flame pop-out lowest stable flame). 3. Acetylene flows shown - Oxygen flow theoretically 1.1 of acetylene flow for neutral flame. 4. Minimum Acetylene cylinder size for #1 tip is 140 SCF and 210 SCF for #2 tip. \*Exceeds the capacity of one standard 320 CF acetylene cylinder (1/7 rule).



23/64" - 26

H-16-2E



5/16" - 27

H-16-E

## Positive Pressure "E" Type Mixers

PART NUMBER	MIXER	FITS HANDLE	TIP TUBES	ACETYLENE WELDING/BRAZING TIPS	ACETYLENE HEATING TIPS	PROPANE/PROPYLENE BRAZING TIPS	PROPANE/PROPYLENE HEATING TIPS
9100787	H-16-2E	16, 19, 50-9 & 10	-	23A90-0 thru 10	J-63-1 & 2	-	-
			8593	1390-0 thru 10	1390-HA	1390-N	1390 H & B
9100096	H-16-E	16, 19, 50-9 & 10	-	5090	J-16-1 & 2	-	-
			D-50-C	1390	1390 HA	1390-N	1390 H & B
			D-50-CXL	1390	1390 HA	1390-N	1390 H & B
			TH-50-2	8490	8490-6-65	8490-N	8490-6-65
			TH-50-2XL	8490	8490-6-65	8490-N	8490-6-65

## Tip Tubes for Separable Welding, Brazing and Heating Tips

TORCH HANDLE	MIXER	TIP TUBE	TIP
16,19,50-9 & 10	H-16-2E	8593	1390-0 THRU 10,HA
	H-16-E	TH-50-2	8490-2 THRU 6,6-65
	H-16-E	D-50-C	1390-0 THRU 10,HA

D-50-CXL  
P/N 9100872  
LENGTH: 7"



5/16" - 27

D-50-C  
P/N 9100379  
LENGTH: 4"

3/8" - 24



23/64" - 26

8593  
P/N 9003678  
LENGTH: 4"

3/8" - 24

TH-50-2  
P/N 1601590  
Tube Length: 5-1/2"

TH-50-2XL  
P/N 1601596  
Tube Length: 7-1/4"

1/4" - 27



1/4" - 27

5/16" - 27



# OXY/FUEL TIPS



## Acetylene & MAPP® Welding, Brazing and Heating Tips

23A90 PART NO.	1390 PART NO.	5090 PART NO.	8490 PART NO.	TIP SIZE	METAL THICKNESS INCHES	OXYGEN PSIG	ACETYLENE PSIG
1600840	1600020	1601690	-	0	1/64	1	1
1600850	1600030	1601700	-	1	1/32	1	1
1600860	1600040	1601710	1601990	2	3/64	2	2
1600870	1600050	1601730	-	3	1/16	3	3
1600880	1600060	1601740	1602010	4	3/32	4	4
1600890	1600070	1601760	-	5	1/8	5	5
1600900	1600080	1601780	1602030	6	3/16	6	6
1600910	1600090	1601800	-	7	1/4	7	7
-	1800025	-	-	HA	HEATING	5	5
-	-	-	1602040	6-65	HEATING	8	8



## Alternate Fuel Tips Brazing and Light Heating Tips for Propane and Propylene

### Brazing Tips

### Heating Tips



### 1390-N/8490-N Tip Chart for "E" Type Mixers: H-16 & H-16-2E

1390-N PART NO.	8490-N PART NO.	TIP SIZE	OXYGEN PSIG	FUEL GAS PSIG
1600180	-	2N	2	1
1600190	-	3N	2	1
1600200	1602090	4N	2	1
1600210	1602100	5N	2	1
1600220	1602110	6N	2	2
1600230	1602120	7N	3	2
1600240	1602130	8N	3	2
1600250	-	9N	4	3
1600260	-	10N	4	3
1800020	-	1390-H*	5-25	2-12
1800015	-	1390-B*	5-25	2-12
-	1602040	8490-6-65	8	8

\* BTU/Hr 30-100,000 with Propane

NOTE: All tips on this page require separate tip tubes and mixers, page 16.

See page 16 for appropriate mixer usage.



# BRAZING ALLOYS

## Stay-Silv® Brazing Alloys

Phos/copper and silver/phos/copper alloys are used to braze copper to copper and copper to brass. The phosphorus content in these alloys makes them self-fluxing on copper. When brazing brass or copper to brass, use Stay-Silv white brazing flux. These alloys are not recommended for brazing steel or other ferrous metals.

**Harris 0:** Low-cost alloy for many copper-to-copper applications where good fit-up can be maintained and brazing temperature is not critical.

**Stay-Silv 5 and Stay-Silv 6:** Medium-range alloys; Stay-Silv 5 is useful primarily where fit-up can not be tightly controlled. Stay-Silv 6 is slightly more fluid and can be used where closer tolerances are available. Both alloys are somewhat more ductile than Harris 0.

**Dynaflow:** Premium, medium-range silver alloy, formulated to even tighter specifications than the Stay-Silv alloys to mirror the performance characteristics of the 15% silver brazing filler metals. Excellent for brazing both tight and poorly-fitted connections, Dynaflow's proven reliability and acceptance by field service engineers has made it the leading choice of brazing operators.

**Stay-Silv 15:** For many years, the industry standard for air conditioning/refrigeration applications. Still widely used but now often replaced by Dynaflow in many AC/R applications.

Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
0620F1 (21035)	Harris 0 .050 x 1/8 x 28 Stick Tube	92.9% Cu 7.1% P	AWS A5.8 BCuP-2	1310° F 710° C	1475° F 802° C	Requires medium fit up
2620F1 (31035)	Stay-Silv 2 .050 x 1/8 x 28 Stick Tube	2% Ag 91% Cu, 7% P	AWS A5.8 BCuP-6	1190° F 643° C	1450° F 788° C	Broader melting range than 0
5620F1 (41035)	Stay-Silv 5 .050 x 1/8 x 28 Stick Tube	5% Ag 89% Cu, 6% P	AWS A5.8 BCuP-3	1190° F 643° C	1500° F 816° C	Used to bridge gaps where close fit-up can't be maintained.
6620F1 (51035)	Stay-Silv 6 .050 x 1/8 x 28 Stick Tube	6% Ag 87.5% Cu, 6.5% P		1190° F 643° C	1455° F 791° C	Used to bridge gaps where more ductile filler metal is required
15620F1 (61035)	Stay-Silv 15 .050 x 1/8 x 28 Stick Tube	15% Ag 80% Cu 5% P	AWS A5.8 BCuP-5 QQ-B-654A	1190° F 643° C	1480° F 846° C	Good ductility
D620F1 (66000)	Dynaflow .050 x 1/8 x 28 Stick Tube	6% Ag 87.9% Cu, 6.1% P		1190° F 643° C	1465° F 796° C	Premium alloy Excellent strength and ductility

## Blockade® Brazing Alloys

Silicon brazing alloys offer significant advantages over phos/copper and silver/phos/copper (BCuP) brazing alloys and present important differences in the brazing of copper and its alloys. The addition of silicon effects such noticeable changes as:

- Outstanding ability to form a large shoulder, or cap, at the braze connection
- Distinct, favorable color changes in the finished braze alloy
- Improved ductility over non-silver-bearing BCuP-2 braze alloys
- Easily brazes brass and brass alloys without the addition of silver
- Significantly reduces brazing temperatures compared to BCuP braze alloys
- The addition of silver further enhances the favorable color change



Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
BK220R1 (45535)	Blockade Bare Rod 2 mm x 20 stk tube	86.9 % Cu 6.5 % Sn	AWS A5.8 BCuP-9	1187° F 637° C	1297° F 674° C	For copper or brass. Reduced brazing temperature, visible braze allows easy joint inspection. Excellent for HVAC applications.
BKFC2500R1 (45235)	Blockade Flux-Coated 2 mm x 20 stk tube	6.5 % P .1 % Si				

# BRAZING ALLOYS



## Stay-Silv® Brazing Alloys

Harris manufactures their complete line of cadmium-free, high silver brazing alloys with the same attention to quality found in their phos/copper products. Only the purest base metals are used, and precision production procedures ensure consistency in product quality and performance.



**SAFETY-SILV® 56** - This high silver (56%) content alloy makes first quality brazes. It is free-flowing with unequaled capillary attraction and deep penetration. Ductility is high, corrosion resistance suitable for all but strong chemical applications. Offers highest elongation of silver brazing alloys. Suitable for use in the food processing industry. The silver color is an excellent match for stainless steel and silverware applications.

**SAFETY-SILV® 40** - Ductile, free-flowing alloy offers economy, good penetration into tight connections, and medium temperature. Silver to light yellow color as in polished brass.

**SAFETY-SILV® 45** - Excellent general purpose non-toxic brazing alloy. Often specified in governmental use. Good ductility and capillary flow. Color is silver to light yellow as in polished brass.

**SAFETY-SILV® 45T** - Performs like a 45% silver, cadmium-bearing alloy. Lower melting temperature than Safety-Silv 45. Excellent fillet-forming qualities. Produces high-strength, ductile joints.

Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
4531 (76310)	Safety-Silv 45 1/16 x 1	45% Ag 30% Cu 25% Zn	AWS A5.8 BAg-5	1225° F 663° C	1370° F 743° C	General purpose filler for steel and copper alloys. Melting range useful for wide clearances.
4533 (76313)	Safety-Silv 45 1/16 x 3					
4535 (76315)	Safety-Silv 45 1/16 x 5					
45K (76012)	Safety-Silv 45 Kit					
45F3184 (76324)	Safety-Silv 45 Flux Coated 1/16 x 18 x 4 oz tube					
45F318M (76339)	Safety-Silv 45 Flux Coated Minnipak					
<b>SAFETY SILV 56</b>						
5631 (75310)	Safety-Silv 56 1/16 x 1	56% Ag 22% Cu 17% Zn 5% Sn	AWS A5.8 BAg-7 NSF 51	1145° F 618° C	1205° F 652° C	For ferrous and nonferrous alloys. Often used to braze stainless steel for food service.
5633 (75313)	Safety-Silv 56 1/16 x 3					
5635 (75315)	Safety-Silv 56 1/16 x 5					
56K (75012)	Safety-Silv 56 Kit					
56F3184 (75324)	Safety-Silv 56 Flux Coated 1/16 x 18 x 4 oz tube					
56F5184 (75224)	Safety-Silv 56 Flux Coated 3/32 x 18 x 4 oz tube					
<b>SAFETY SILV 45T</b>						
45T31 (81001)	Safety-Silv 45T 1/16 x 1	45% Ag 27% Cu 23% Sn 5% Zn	AWS A5.8 BAg-36 NSF-51	1195° F 646° C	1265° F 685° C	For copper, brass, and steel. Good flow properties with lower brazing temperature
45T33 (81003)	Safety-Silv 45T 1/16 x 3					
45T35 (81005)	Safety-Silv 45T 1/16 x 5					
<b>SAFETY SILV 40</b>						
4031 (77310)	Safety-Silv 40 1/16 x 1	40% Ag 30.5% Cu 29.5% Zn		1250° F 677° C	1350° F 732° C	For copper, nickel, and steel. Suitable for wider clearance yet provides good ductility.
4033 (77313)	Safety-Silv 40 1/16 x 3					
4035 (77315)	Safety-Silv 40 1/16 x 5					
40F3184 (77324)	Safety-Silv 40 Flux Coated 1/16 x 18 x 4 oz Tube					



# SOLDERS

## Stay-Brite® Silver Solders

Stay-Brite® and Stay-Brite® 8 silver bearing solders are often used instead of brazing alloys throughout the refrigeration/air conditioning industry. Both Stay-Brite and Stay-Brite 8 produce a component with greater overall strength than a brazed component whose base metals are weakened by annealment from high brazing heat.

Stay-Brite solders bond with most 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



Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
SB61 (10001)	Stay-Brite 1/8 x 1# Spool	4% Ag 96% Sn	ASTM B32 Sn 96 NSF 51 J-STD-006 Sn96Ag04A	430° F 221° C	430° F 221° C	Use for all metals with the exception of aluminum. Low temperature solder used in HVAC joints.
SB31 (10004)	Stay-Brite 1/16 x 1# Spool					
SBSK (11000)	Stay-Brite Kit with Flux					
SB861 (10009)	Stay-Brite #8 1/8 x 1# Spool	6% Ag 94% Sn	NSF 51	430° F 221° C	535° F 279° C	Similar to Stay-Brite with a plastic range that is useful in bridging wider gaps.
SB831 (10010)	Stay-Brite #8 1/16 x 1# Spool					

## Aluminum Alloys

Alsolder 500 forms excellent corrosion-resistant joints on the tough-to-solder aluminum alloys. Joins all solderable aluminum alloys to each other and to dissimilar metals, both ferrous and non-ferrous. Also beneficial as a high-temperature solder on most other metals.

Al-braze is a superior brazing alloy for the joining of aluminum to aluminum. Not recommended for brazing aluminum directly to non-aluminum alloys, as the joint may be brittle. Al-Braze is free flowing with unequaled capillary attraction, ductility and penetration. Excellent corrosion resistance.

ALCoR aluminum alloy with non-corrosive flux inside the wire; no external flux required. Very good fluidity with good capillary attraction. Post-braze cleaning unnecessary. Better than tin-zinc and aluminum silicon alloys for aluminum coil repair



Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
AL200RC (10015)	ALCoR Flux-Cored Aluminum Alloy	Zn Al		824° F 440° C	824° F 440° C	A new approach to joining aluminum. A low temperature, free flowing, flux-cored solder for aluminum joining or repair.
500K (10022)	Alsolder 500 Aluminum Solder Kit	15% Zn 85% Sn		391° F 199° C	482° F 250° C	Forms excellent corrosion-resistant joints on the tough-to-solder aluminum alloys. Useful for copper to aluminum connections.
1070K (10023)	Al-Braze 1070 Aluminum Brazing Kit	88% Al 12% Si	QQB-655 BAISi4 AWS A5.8 BAISi4	1070° F 577° C	1080° F 582° C	Superior brazing alloy for joining aluminum to aluminum. Excellent capillary attraction.

# SOLDERS



## Lead Free Solders

Federal Law 99-339 bans the use of solders containing over .2% lead in potable water systems, Harris metallurgists conducted research, developed and ultimately patented Bridgit, a non-toxic solder alloy that exceeds the physical advantages of lead-tin solders. The addition of nickel to Bridgit was responsible for a patent being granted. Nickel is used to strengthen and toughen stainless steel, tool steels and various coppers. Nickel is also used to greatly enhance impact strength in silver brazing alloys when joining tungsten carbide cutting tips to tool ends. Nickel is the key element in Bridgit's unique high strength



Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
BRGT61 (16000)	BRIDGIT® 1/8 x 1# Spool Lead Free Solder		ASTM B32 HB NSF 61 Conforms to 1986 Safe Drinking Act	460° F 238° C	630° F 332° C	Contains nickel, making joints tremendously strong. Wide plastic 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.
NICK61 (17000)	NICK™ 1/8 X 1# Spool Lead Free Solder		NSF 61 Conforms to 1986 Safe Drinking Act	438° F 225° C	729° F 387° C	For joining copper pipe in potable water systems. Has excellent wetting and capping characteristics and produces an extremely strong joint.
SPDY61 (18000)	SPEEDY™ 1/8 X 1# Spool Lead Free Solder		Conforms to 1986 Safe Drinking Act	450° F 230° C	555° F 250° C	Low temperature alloy formulated to join copper pipe in potable water systems. Designed for use on applications of 1" diameter or less.

## Common Solders

With some exceptions, the tin/lead solders can be used to solder copper and most copper alloys, lead, nickel alloys and steel. Tin-lead solders are not recommended in high stress or vibration joints in the cooling industry due to lack of sufficient elongation properties. It is illegal to use lead alloys in connection with potable water systems. (See Bridgit lead free solder information).

Part No.	Description	Chemical Composition	Specifications	Solidus	Liquidus	Typical Application
95561 (10030)	95/5 1/8 X 1# Spool	95% Sn 5% Sb	ASTM B32 Sb5 J-STD-006 Sn95Sb05A	452° F 233° C	464° F 240° C	Well suited for applications where moderately-elevated temperature is a factor. Recommended for lead-free installations of small-diameter.
505061 (10028)	50/50 1/8 X 1# Spool	50% Sn 50% Pb	ASTM B32 Sn50 J-STD-006 Sn50Pb50A	360° F 182° C	420° F 216° C	Can be used, with some exceptions, to join copper to most copper, lead, nickel, and steel. Note: Illegal for potable water systems.
50501B (10051)	50/50 1# Solder Bars					
5050TB (10050)	50/50 7/16" Tri- Bars					
604061 (10036)	60/40 1/8 X 1# Spool	60% Sn 40% Pb	ASTM B32 Sn60	360° F 182° C	375° F 191° C	Similar to 50/50 but flows faster due to narrow melting range. Note: Illegal for potable water systems.
406061 (10035)	40/60 1/8 X 1# Spool	40% Sn 60% Pb	ASTM B32 Sn40	360° F 182° C	460° F 238° C	A general purpose solder with a wider melting range. This allows it to be worked easier than other tin/lead alloys. Often used to solder sheet metal and radiator coils. Note: Illegal for potable water systems.



# FLUXES

Harris offers a broad range of quality fluxes for many applications including brazing or welding aluminum, nickel-silver, bronze, zinc die cast, soft solders, cast iron, magnesium, stainless steel, and low fuming bronze and other copper-base alloys



## Stay-Clean® Soldering Flux (Liquid)

For virtually all metals other than aluminum, magnesium or titanium. Use with Stay-Brite solders or practically any other solder with a liquidus below 700° F. Not recommended for electrical or electronic applications. Meets Commercial Spec. A-A-51145C, Form B

PART NO.	DESCRIPTION	SIZE
SCLF4 (40002)	Stay-Clean® Liquid Flux	4 oz.
SCLF16 (40003)	Stay-Clean® Liquid Flux	16 oz.
SCLF32 (40004)	Stay-Clean® Liquid Flux	32 oz.
SCLF1G (40005)	Stay-Clean® Liquid Flux	1 gal.

## Stay-Clean® Soldering Flux (Paste)

Excellent flux for joining copper to copper and copper to brass. Not recommended for electrical or electronic applications. Effective to 700° F. Meets Commercial Spec. A-A-51145C, Form A

PART NO.	DESCRIPTION	SIZE
SCPF4 (40027)	Stay-Clean® Paste Flux	4 oz.
SCPF1 (40028)	Stay-Clean® Paste Flux	1 lb.

## Stay-Clean® Aluminum Flux

Use with Stay-Brite solders or Alsolder 500 to join aluminum to aluminum and most other metals. Effective to 500° F

PART NO.	DESCRIPTION	SIZE
SCAF4 (40006)	Stay-Clean® Aluminum Flux	4 oz.

## Stay-Silv® Brazing Flux (white)

For use with silver brazing alloys on all metals other than aluminum, magnesium or titanium. Effective to 1600°F. Meets Fed Spec. OF499, Type B; AWS FB3A, AMS 3410.

PART NO.	DESCRIPTION	SIZE
SSWF1/4 (40020)	Stay-Silv® Brazing Flux	1/4 lb.
SSWF1/2 (40021)	Stay-Silv® Brazing Flux	1/2 lb.
SSWF7 (40022)	Stay-Silv® Brazing Flux	6.5 oz.
SSWF1 (40023)	Stay-Silv® Brazing Flux	1 lb.

## Stay-Silv® Brazing Flux (black) High Temperature

Use with silver or other brazing alloys liquidus below 1800°F. Recommended for stainless, heavy parts, and whenever heating cycle is prolonged. For all metals other than aluminum, magnesium, titanium. Meets AMS 3411, AWS 5.31, Class FB3C; Fed Spec. O-F-499D, Type B

PART NO.	DESCRIPTION	SIZE
SSBF1/2 (40050)	Stay-Silv® HT Brazing Flux	1/2 lb.
SSBF1 (40051)	Stay-Silv® HT Brazing Flux	1 lb.

## Bridgit® Paste Flux

Stays active to 800°F. Bridgit flux will not burn at soldering temperatures, reducing black carbon formations that can result in voids and leaks. This flux works extremely well with Bridgit lead-free solder in potable water systems. However, this flux should work equally well with other solders. Bridgit paste flux meets all requirements of the Safe Drinking Water Act. Bridgit flux is designed primarily for copper tube applications..

PART NO.	DESCRIPTION	SIZE
BRPF4 (40057)	BRIDGIT® HT Solder Flux	4 oz.
BRPF1 (40058)	BRIDGIT® HT Solder Flux	1 lb.



# HARRIS FILLER METAL SELECTION CHART



METALS TO BE JOINED	FILLER METALS				MELTING RANGE		FLUIDITY RATING*	FLUXES	TORCHES & FLAMES**
	SOLDERS	BRAZING FILLER METALS	SOLIDUS °F / °C	LIQUIDUS °F / °C					
Copper or Brass To Copper or Brass	Stay-Brite® Stay-Brite® 8 Bright®		430 / 221 430 / 221 460 / 238	430 / 221 535 / 279 530 / 332	430 / 221 535 / 279 530 / 332	10 8 7	Stay-Clean® Soldering Fluxes Bright® Water Soluble Paste Flux	Harris Powertorch® Air - Fuel Equipment Harris Powertorch® Air - Fuel Equipment	
		Blackabe®	1178 / 637	1247 / 674	1247 / 674	6	No flux required for copper-copper joints with the phosphorus-bearing filler metals	Harris Powertorch® or Classic Oxy-Acetylene Equipment (neutral flame)	
		Harris 0 Stay-Silv® 5	1510 / 710	1475 / 802	1475 / 802	5			
		Stay-Silv® 6 Stay-Silv® 15	1190 / 643 1190 / 643	1429 / 774 1429 / 774	1429 / 774 1429 / 774	3 3	For brass and other alloys of copper, use Stay-Silv® White Brazing Flux		
		Stay-Brite® Stay-Brite® 8	430 / 221 430 / 221	430 / 221 535 / 279	430 / 221 535 / 279	10 8	Stay-Clean® Soldering Flux	Harris Powertorch® Air - Fuel Equipment	
Copper or Brass To Steel or Stainless		Safety-Silv® 56 Safety-Silv® 40 Safety-Silv® 45 Safety-Silv® 451	1145 / 618 1250 / 677 1225 / 663 1195 / 646	1205 / 632 1350 / 732 1370 / 743 1285 / 685	1205 / 632 1350 / 732 1370 / 743 1285 / 685	8 5 6.5 7	Stay-Silv® White Brazing Flux Stay-Silv® Black Flux for Stainless	Harris Powertorch® or Classic Oxy-Acetylene Equipment (slightly reducing flame)	
		Stay-Brite® Stay-Brite® 8	430 / 221 430 / 221	430 / 221 535 / 279	430 / 221 535 / 279	10 8	Stay-Clean® Soldering Flux	Harris Powertorch® Air - Fuel Equipment	
			1145 / 618 1250 / 677	1205 / 632 1350 / 732	1205 / 632 1350 / 732	8 5			
			1220 / 660 1225 / 663 1195 / 646	1435 / 779 1370 / 743 1285 / 685	1435 / 779 1370 / 743 1285 / 685	4.5 6.5 7	Stay-Silv® White Brazing Flux Stay-Silv® Black Flux for Stainless	Harris Powertorch® or Classic Oxy-Acetylene Equipment (slightly reducing flame)	
		NOT RECOMMENDED	1220 / 660 1220 / 660	1435 / 779 1305 / 707	1435 / 779 1305 / 707	4.5 7	Stay-Silv® White Brazing Flux	Harris Powertorch® or Classic Oxy-Acetylene Equipment (reducing flame)	
Aluminum To Aluminum (1) Aluminum To Copper or Brass (2)* Aluminum To Steel or Stainless (3)* * Aluminum dissimilar metal joints may be subject to galvanic corrosion.	Alcol® Alcol® 500		381 / 199 1070 / 577	482 / 250 924 / 440	482 / 250 924 / 440	NOT RATED NOT RATED NOT RATED	Stay-Clean® Aluminum Soldering Flux No Flux Required Altrace® 1070 Flux	Harris Powertorch® Air - Fuel Equipment Harris Powertorch® Air - Fuel Equipment Harris Powertorch® Air - Fuel Equipment or Classic Oxy-Acetylene Equipment (reducing flame)	

\* The higher the fluidity rating, the faster the alloy flows within the melting range.  
 \*\* For best results and strong leak proof bonds, filler metals should be applied to the joint area only after the parts are heated to the proper brazing or soldering temperature. Oxy-Acetylene torches may be substituted for air-fuel but may require care to prevent overheating of the base metal/flux with the higher temperature flame.  
 (1) Can be directly brazed or soldered.  
 (2) Solder directly with Alcol® 300 or coat steel with Alcol® aluminum and solder with Alcol® 600. Brass with Altrace® 1070.

Safety Information: **WARNING: PROTECT YOURSELF AND OTHERS.** Read and understand this information. FUMES AND GASES can be hazardous to your health. **HEAT RAYS (INFRARED RADIATION)** from flame or hot metal can injure eyes. Before use, read and understand the manufacturer's instructions. Material Safety Data Sheet (MSDS) and your employer's safety practices. Keep your head out of fumes. Use enough ventilation, exhaust at the flame, or both, to keep fumes and gases from your breathing zone and the general area. Wear correct eye, ear and body protection. See American National Standard Z46.1, Safety in Welding, Cutting, and Allied Processes, published by the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126; OSHA Safety Standards, available from the U.S. Government Office, Washington, DC 20402. **STATEMENT OF LIABILITY - DISCLAIMER:** Any suggestion of product applications or results is given without representation or warranty, either expressed or implied. Without exception or limitation, there are no warranties or merchantability or of fitness for particular purpose or application. The user must fully evaluate every process and application in all aspects, including suitability, compliance with applicable law and non-infringement of the rights of others. The Harris Products Group and its affiliates shall have no liability in respect thereof.

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