



# Brazing and Soldering Alloys and Fluxes



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*The brand name materials originally developed by Handy & Harman and synonymous with brazing experience for over 75 years.*

*Available either in bulk or pre-packaged lots are filler metals for brazing copper-based alloys (Sil-Fos®), steels, stainless, etc. (Braze™ and Easy-Flo® Alloys) as well as low temperature, lead-bearing (Solderite™) and no-lead solders (Clean 'n Brite™).*

## High silver brazing alloys

For joining ferrous (iron-based) and non-ferrous materials.

Brazing is so universally used because it is economical, easy to do and produces strong leak-tight joints. It is also a flexible process that allows you to join both similar and dissimilar metals. In refrigeration applications, much of the brazing involves joining copper tubing. However, there are numerous applications where other materials need to be joined (steel, brass, stainless steel, carbide, etc.). These high silver brazing alloys facilitate the joining of these metals.

Lucas-Milhaupt offers these high silver alloys in a variety of package sizes and wire diameters depending upon your needs and application. For added convenience, several of these alloys are available as flux coated rods or flux cored rods. This eliminates the separate fluxing operation previously required when using this family of alloys.

## High silver brazing alloys (continued)

| Name         | Description   | AWS Spec | Composition % |    |    |    |       | Temperature °F |       |
|--------------|---|----------|---------------|----|----|----|-------|----------------|-------|
|              |   |          | Ag            | Cu | Zn | Sn | Other | Melt           | Flow  |
| Braze™ 560   | Lowest temperature, Cadmium-free filler metal, very fluid alloy flow.   | BAg-7    | 56            | 22 | 17 | 5  |       | 1145°          | 1205° |
| Braze 505    | Best general purpose filler metal available. Recommended for stainless steel as it retards interface corrosion. Nickel content provides superior adhesion to base metal surfaces. | BAg-24   | 50            | 20 | 28 |    | 2 Ni  | 1220°          | 1305° |
| Braze 452    | Low temperature, general-purpose alloy with better flow properties than Braze 450.  | BAg-36   | 45            | 27 | 25 | 3  |       | 1185°          | 1260° |
| Braze 450    | General purpose filler metal for joining ferrous, non-ferrous and dissimilar metals with large joint clearances.  | BAg-5    | 45            | 30 | 25 |    |       | 1225°          | 1370° |
| Braze 401    | A more economical filler metal with a fairly narrow melt range, this alloy has application for both steel and copper-based materials.   |          | 40            | 30 | 30 |    |       | 1245°          | 1340° |
| Braze 380    | Economical general purpose brazing alloy for joining both ferrous and nonferrous base metals. Free flowing.   | Bag-34   | 38            | 32 | 28 | 2  |       | 1200°          | 1330° |
| Easy Flo® 45 | Versatile alloy, used for most ferrous and non-ferrous metals. Contains Cadmium, therefore exercise extreme caution as Cadmium fumes are toxic.                                   | BAG-1    | 45            | 15 | 16 |    | 24 Cd | 1125°          | 1145° |

| Name                              | Description    | 1 Oz. Pkg |           | 3 Oz. Pkg |           | 5 Oz. Pkg |           |
|-----------------------------------|----------------|-----------|-----------|-----------|-----------|-----------|-----------|
|                                   |                | L/M P/N   | Trane P/N | L/M P/N   | Trane P/N | L/M P/N   | Trane P/N |
| Braze 560™ • 56% Ag, Cd-Free      | ½" Dia. x Coil | 98060     | ALY00007  | 98061     | ALY00008  | 98062     | ALY00009  |
| Braze 505 • 50% Ag, Cd-Free       | ½" Dia. x Coil | 98070     | ALY00010  | 98071     | ALY00011  | 98072     | ALY00012  |
| Braze 450 • 45% Ag, Cd-Free       | ½" Dia. x Coil | 98000     | ALY00013  | 98001     | ALY00014  | 98002     | ALY00015  |
| Braze 452 • 45% Ag, Cd-Free       | ½" Dia. x Coil | 98010     | ALY00086  | 98011     | ALY00087  | 98012     | ALY00088  |
| Braze 401 • 40% Ag, Cd-Free       | ½" Dia. x Coil | 98090     | ALY00089  | 98091     | ALY00090  | 98092     | ALY00091  |
| Easy-Flo® 45 • 45% Ag, Cd-Bearing | ½" Dia. x Coil | 98296     | ALY00092  | 98297     | ALY00093  | 98298     | ALY00094  |

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Product Availability: Other filler metals are also available, please call us at 608-787-4885 for a complete list.

## Handy One®

### Flux-cored brazing alloys

Handy One is a brazing alloy in strip form that is rolled around a powdered flux. This simplifies and improves the brazing operation by eliminating the separate fluxing operation, and by delivering the correct amount of flux – right where it's needed.



### Other benefits include:

- Improves joint strength due to a reduction in flux inclusions
- Reduces brazing cycle time - flux insulates, so less flux means parts heat up to brazing temperature quicker
- Minimizes post braze cleaning

| Name       | Description  | L/M P/N | Trane P/N |
|------------|--|---------|-----------|
| Braze™ 560 | 56% Ag, Flux cored, 0.075" Dia × 20" - 8 rods per tube | 99084   | ALY00131  |
| Braze 505  | 50% Ag, Flux cored, 0.075" Dia × 20" - 8 rods per tube | 99076   | ALY00119  |
| Braze 380  | 38% Ag, Flux cored, 0.075" Dia × 20" - 8 rods per tube | 99080   | ALY00120  |
| Braze 300  | 30% Ag, Flux cored, 0.075" Dia × 20" - 8 rods per tube | 99079   |           |



## Flux coated brazing rod

For joining ferrous and non-ferrous materials.

In addition to bare and cored high silver brazing alloys, we also offer rods that are coated with our general purpose Handy Flux. We start with  $\frac{1}{16}$ " diameter wire and coat on the flux for a final diameter of  $\frac{1}{8}$ ". Rods are 18" in length and product is packaged into  $\frac{1}{4}$  pound tubes.

| Name                                 | Description   | L/M P/N | Trane P/N |
|--------------------------------------|---|---------|-----------|
| Braze 560 • 56% Ag, Cd-Free (yellow) | $\frac{1}{8}$ " Dia. x 18" Rods x $\frac{1}{4}$ pound tubes (8) | 98120   | ROD00940  |
| Braze 505 • 50% Ag, Cd-Free (blue)   | $\frac{1}{8}$ " Dia. x 18" Rods x $\frac{1}{4}$ pound tubes (8) | 98110   | ROD00939  |
| Braze 452 • 45% Ag, Cd-Free (orange) | $\frac{1}{8}$ " Dia. x 18" Rods x $\frac{1}{4}$ pound tubes (8) | 98100   | ROD00941  |

Packaging options: 1 case contains 15 tubes

| Name                                 | Description                                       | L/M P/N | Trane P/N |
|--------------------------------------|---|---------|-----------|
| Braze 452 • 45% Ag, Cd-Free (orange) | $\frac{1}{8}$ " Dia. x 18" Rods x 3 rods per tube | 98102   |           |

## Brazing flux – Handy Flux®

Where fluxing is required as part of the brazing operation, Handy Flux is recommended. Handy Flux is an all-purpose flux for use in brazing both ferrous and non-ferrous metals and alloys. Where larger mass assemblies are being joined, Black Flux or Handy B1 is often recommended as it offers higher temperature protection.



- Handy Flux (White)
- Handy Flux Type B-1 (Black-Boron Modified)
- Handy Flux conforms to: AWS Brazing Flux Type # 3A, Society of Automotive Engineers AMS-3410G

| Name              | Description                              | L/M P/N | Trane P/N |
|-------------------|--|---------|-----------|
| Handy Flux®       | 7 oz. Jar w/ brush cap • 24 per case     | 97030   | FLX00003  |
|                   | ¼ lb. Jar • 24 per case                  | 97033   | FLX00007  |
|                   | ½ lb. Jar • 50 per case                  | 97031   | FLX00008  |
|                   | 1 lb. Jar • 25 per case                  | 97032   | FLX00009  |
|                   | 5 lb. Jar • 6 per case                   | 97034   | FLX00010  |
|                   | 25 lb. Pail                              | 97035   | FLX00011  |
|                   | 50 lb. Pail                              | 97036   | FLX00012  |
| Handy B1 Flux     | Boron Modified - 1 lb. Jar • 25 per case | 97041   | FLX00013  |
|                   | Boron Modified - 5 lb. Jar • 6 per case  | 97042   | FLX00014  |
|                   | Boron Modified - 25 lb. Pail             | 97043   | FLX00015  |
|                   | Boron Modified - 50 lb. Pail             | 97044   | FLX00016  |
| Handy Liquid Flux | Liquid Flux-Pint • 12 per case           | 97006   | FLX00017  |
|                   | Liquid Flux-Quart • 12 per case          | 97007   | FLX00018  |
|                   | Liquid Flux-Gallon • 4 per case          | 97008   | FLX00019  |



## Sil-Fos® family of brazing alloys

For joining copper and copper-based alloys.

This group of alloys allows the joining of copper to copper without a flux and copper based alloys (brass and bronze) with a flux.

The family of products includes the original Sil-Fos 15. Developed and patented over 75 years ago, Sil-Fos is the workhorse filler metal used in the refrigeration and air conditioning industry.

Think of the brazing alloy as the glue that holds the refrigeration system together. The thermal cycling (and subsequent expansion and contraction), vibration stresses and higher pressures of the new refrigerants strongly suggest that the ductility of the braze alloy is extremely important—not just for an initial leak tight joint, but to be hermetic for many years down the road.



| Name        | Description   | AWS Spec | Composition % |      |     | Temperature °F |       |
|-------------|---|----------|---------------|------|-----|----------------|-------|
|             |   |          | Ag            | Cu   | P   | Melt           | Flow  |
| Sil-Fos® 15 | Best alloy for general copper-copper brazing in the Sil-Fos family. For copper-to-copper joints the phosphorus in the Sil-Fos product serves as the fluxing agent and no separate flux is necessary. For brass applications however, flux is recommended. For use where close fit-ups cannot be maintained Sil-Fos 15 works well to "bridge" gaps. Highest joint ductility of the entire Sil-Fos family to best withstand the stresses inherent in refrigeration applications. Slow Flow. | BCuP-5   | 15            | 80   | 5   | 1190°          | 1475° |
| Sil-Fos 6M  | Recommended for use where a close fit-up cannot be maintained. Has the ability to fill gaps and form fillets without affecting joint strength. Slow Flow.   |          | 6             | 88   | 6   | 1190°          | 1460° |
| Sil-Fos 6i  | A fluid filler metal that offers "intermediate" flow characteristics. Sil-Fos 15 where vibration and thermal cycling stresses are not severe.   |          | 6             | 87.5 | 6.5 | 1190°          | 1425° |
| Sil-Fos 6   | A very fluid filler metal for close fit-up work. Low melting range makes it ideal where temperature is a factor. Fast Flow.   | BCuP-4   | 6             | 86.8 | 7.2 | 1190°          | 1325° |
| Sil-Fos 5   | Designed primarily for those applications where close fit-ups cannot be maintained. It has the ability to fill gaps and form fillets without adversely affecting joint strength. Slow Flow.   | BCuP-3   | 5             | 89   | 6   | 1190°          | 1495° |
| Sil-Fos 2   | A filler metal with comparable characteristics to Fos-Flo 7. Medium Flow.   | BCuP-6   | 2             | 91   | 7   | 1190°          | 1450° |
| Fos Flo® 7  | An economical, very fluid medium temperature filler metal for use with copper, brass and bronze. Withstands moderate vibration. Fast Flow.  | BCuP-2   |               | 92.8 | 7.2 | 1190°          | 1460° |

Product Availability: Packaging Options: 1 pound plastic tubes (25 pounds per case). Bulk packed in 5, 10 & 25 lb. cartons.

## Sil-Fos® family of brazing alloys (continued)

| Name                  | Description                 | Package Size       | L/M P/N | Trane P/N |
|-----------------------|-----------------------------|--------------------|---------|-----------|
| Sil-Fos® 15<br>15% Ag | 0.125" × 0.050" × 20"       | 1 lb. Plastic Tube | 95150   | ALY00001  |
|                       | 0.125" × 0.050" × 20"       | 25 lb. Carton      | 95161   | ALY00018  |
|                       | 0.125" Sq × 20" × 11 Rods   | Plastic Tube       | 95168   | ALY00017  |
|                       | 0.125" Sq × 20"             | 5 lb. Tube         | 95166   |           |
|                       | 0.125" Sq × 20"             | 25 lb. Carton      | 95162   |           |
|                       | 0.125" Sq × 36"             | 10 lb. Carton      | 95151   | ALY00002  |
|                       | 0.125" Sq × 36"             | 25 lb. Carton      | 95152   | ALY00019  |
|                       | 0.125" Dia × 36"            | 25 lb. Carton      | 95154   | ALY00021  |
| Sil-Fos 6<br>6% Ag    | 0.125" × 0.050" × 20"       | 1 lb. Plastic Tube | 95090   | ALY00028  |
|                       | 0.125" × 0.050" × 20"       | 25 lb. Carton      | 95101   | ALY00029  |
| Sil-Fos 6i<br>6% Ag   | 0.125" × 0.050" × 20" × 1#  | 1 lb. Plastic Tube | 95180   | ALY00003  |
|                       | 0.125" × 0.050" × 20" × 25# | 25 lb. Carton      | 95181   | ALY00040  |

| Name                | Description           | Package Size       | L/M P/N | Trane P/N |
|---------------------|-----------------------|--------------------|---------|-----------|
| Sil-Fos 6M<br>6% Ag | 0.125" × 0.050" × 20" | 1 lb. Plastic Tube | 95120   | ALY00004  |
|                     | 0.125" × 0.050" × 20" | 25 lb. Carton      | 95131   | ALY00041  |
| Sil-Fos 5<br>5% Ag  | 0.125" × 0.050" × 20" | 1 lb. Plastic Tube | 95060   | ALY00005  |
|                     | 0.125" × 0.050" × 20" | 25 lb. Carton      | 95071   | ALY00052  |
|                     | 0.125" Sq × 36"       | 25 lb. Carton      | 95062   | ALY00054  |
| Sil-Fos 2<br>2% Ag  | 0.125" × 0.050" × 20" | 1 lb. Plastic Tube | 95030   | ALY00063  |
|                     | 0.125" × 0.050" × 20" | 25 lb. Carton      | 95041   | ALY00064  |
| Fos Flo® 7<br>0% Ag | 0.125" × 0.050" × 20" | 1 lb. Plastic Tube | 95000   | ALY00006  |
|                     | 0.125" × 0.050" × 20" | 25 lb. Carton      | 95011   | ALY00075  |

## Mini packs

| Name                   | Description                    | Package Size    | L/M P/N | Trane P/N |
|------------------------|--------------------------------|-----------------|---------|-----------|
| Sil-Fos 15 •<br>15% Ag | 0.125" × 0.050" × 20" × 8 rods | 8 rods per tube | 95177   |           |
| Sil-Fos 5 •<br>5% Ag   | 0.125" × 0.050" × 20" × 8 rods | 8 rods per tube | 95082   |           |
| Sil-Fos 6M •<br>6% Ag  | 0.125" × 0.050" × 20" × 8 rods | 8 rods per tube | 95136   |           |

## Lead-bearing solders

Lead-bearing solders.

Low-temperature, tin/lead solders available in solid wire or acid core.



| Name             | Description   | Composition % |    | Temperature °F |      |
|------------------|---|---------------|----|----------------|------|
|                  |   | Sn            | Pb | Melt           | Flow |
| Solderite™ 50/50 | Standard general purpose Tin/Lead solder for moderate joint clearances. Available as Solid, Acid or Rosin core. | 50            | 50 | 361°           | 414° |

Product Availability: 1/8" diameter 1 pound spools standard, however other diameters and sizes (including 1/2 lb., 5 lb., 10 lb., 25 lb., 25# spools and bar) are available upon request.

Packaging Options: 24 pounds per case (1 lb. spool).

| Name                       | Description         | L/M P/N | Trane P/N |
|----------------------------|---------------------|---------|-----------|
| Solderite™ 50/50           | 1/8" Dia x 1# Spool | 96050   | SLD00004  |
| Solderite™ 50/50 Acid Core | 1/8" Dia x 1# Spool | 96060   | SLD00007  |

## Silver-bearing, lead-free soft solders

High strength—general purpose solders. Higher strength than tin/lead solders and safe for potable water systems.

These alloys are widely used in low-stress, low-pressure copper-copper and copper-steel applications (e.g. sight glasses where temperature must be kept low, etc.). For copper-copper, Clean 'n Brite Paste Flux is the flux of choice. For copper-steel applications, TEC Liquid Flux is recommended as it is more aggressive at keeping the metal surfaces to be joined free of oxides. TEC is a more corrosive flux however, and subsequent flux residue removal is recommended.

| Name                   | Description  | Composition % |    |       |       | Temperature °F |      |
|------------------------|--|---------------|----|-------|-------|----------------|------|
|                        |  | Ag            | Cu | Sn    | Other | Melt           | Flow |
| Clean 'n Brite™ 6      | Lead-free, silver-bearing high-strength solder used for applications requiring large joint clearances. Easiest Silver-bearing soft solder to work with as temperature range permits "bridging" loose fit-ups if necessary. | 6             |    | 94    |       | 431°           | 535° |
| Clean 'n Brite         | Lead-free, silver-bearing high-strength solder used for applications requiring close joint clearances.   | 3.6           |    | 96.4  |       | 431°           | 431° |
| Clean 'n Brite No Lead | Silver-bearing solder with good strength used in potable water system applications requiring no lead.  | 0.5           | 4  | 95.5° |       | 428°           | 446° |
| Clean 'n Brite 95/5    | General purpose Tin/Antimony solder. Not for use on brass alloys.  |               |    | 95    | 5 SB  | 450°           | 460° |

| Name                   | Description       | L/M P/N | Trane P/N |
|------------------------|-------------------|---------|-----------|
| Clean 'n Brite 6       | ⅜" Dia × 1# Spool | 96010   | SLD00002  |
| Clean 'n Brite         | ⅜" Dia × 1# Spool | 96000   | SLD00001  |
|                        | ⅜" Dia × 1# Spool | 96001   | SLD00006  |
| Clean 'n Brite-No Lead | ⅜" Dia × 1# Spool | 96150   | SLD00005  |
| Clean 'n Brite 95/5    | ⅜" Dia × 1# Spool | 96040   | SLD00003  |

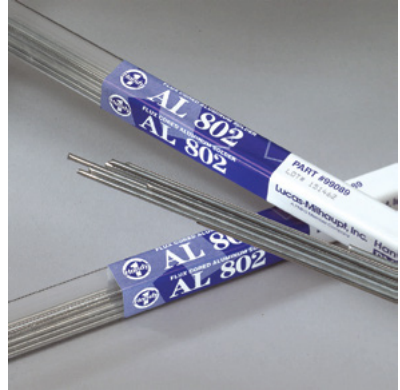
Product Availability: 0.125" diameter × 1 pound spool (1 Per Box) standard. Other sizes available upon request.

Packaging Options: 24 pounds per case.

## Aluminum solder

Flux-cored, low temperature solder for joining aluminum and copper alloys.

Flux cored alloy is ideal for soldering aluminum to aluminum or aluminum to copper. Non corrosive flux does not require removal after soldering.



| Name   | Description       | Composition % |    | Temperature °F |      |
|--------|-------------------|---------------|----|----------------|------|
|        |                   | Zn            | Al | Melt           | Flow |
| Al 802 | Flux cored solder | 98            | 2  | 710°           | 725° |

| Name          | Description                          | L/M P/N | Trane P/N |
|---------------|--------------------------------------|---------|-----------|
| Al 802 Solder | 0.078" Dia x 20" x 4 Sticks per tube | 99087   | ALY00121  |



## Solder fluxes

For soldering applications we offer two different flux products depending on the materials to be joined. They include Clean 'n Brite Flux for general purpose applications and TEC Liquid Flux where more aggressive fluxing is required for the more difficult-to-solder materials (e.g. steel, stainless steel, etc.).

| Name                                | Description                              | L/M P/N | Trane P/N |
|-------------------------------------|--|---------|-----------|
| TEC® Liquid Soldering Flux          | 4 oz. Squeeze Bottle • 24 or 48 per case | 97000   | FLX00001  |
|                                     | 16 oz. Bottle (Pint) • 12 per case       | 97001   | FLX00004  |
|                                     | 128 oz. Bottle (Gallon) • 4 per case     | 97003   | FLX00006  |
| Clean 'n Brite Paste Soldering Flux | 4 oz. Jar w/ Brush Cap • 24 per case     | 97020   | FLX00002  |



## Point-of-purchase display

Also available for merchandising assistance is a two shelf display rack (shown stacked as 4 shelf unit) suitable for counter top display or hanging on pegboard. It includes a helpful laminated alloy selection guide for use by the trade in selecting the proper alloy and flux for a variety of metal joining applications. Display comes preassembled and is included at no charge with your initial minimum order. And while we recommend a specific stocking mix, product assortment can be customized for your requirements.

Part # 99066



## Brazing tips and techniques brochure

An excellent “How To” publication produced by Lucas-Milhaupt that covers a wide variety of topics regarding the nature of brazing. Included is information pertaining to the six brazing fundamentals including proper joint design, clearance, cleaning, brazing techniques and safety information. This book can be ordered individually or in packs of 25.

Pack of 25 - Part # 99093



## Plastic literature stand

A free standing plastic display that holds up to 25 copies of the Tips and Techniques Book; can be ordered individually or together with 25 copies of our “Tips” brochure.

Stand - Part # 99082

Stand with 25 books - Part # 99083



## Counter mat

A laminated, non-slip foamed back counter mat that includes an easy to read selection guide with a competitive cross reference for the Lucas-Milhaupt brazing and soldering product line. Counter mat is available at no charge with minimal brazing material orders.

Counter Mat - Part # 99200

### Size chart

- – 1/32" (0.031")
- – 3/64" (0.047")
- – 1/16" (0.062")
- – 3/32" (0.094")
- – 1/8" (0.125")
- – 0.075" (Handy 1)
- – 0.078" (Aluminum Solder)
- – 0.125" (Square)
- – 0.125" x 0.050" (Flat Rod)

### Atomic symbols

- Ag** = Silver
- P** = Phosphorus
- Ni** = Nickel
- Zn** = Zinc
- Sn** = Tin
- Al** = Aluminum
- Cu** = Copper
- Pb** = Lead
- Cd** = Cadmium
- Sb** = Antimony

**Warning!** *Brazing can generate potentially harmful fumes and gases. Protect yourself and others. Obtain a Material Safety Data Sheet (MSDS) from your supplier or from Lucas-Milhaupt, Inc. Follow the MSDS' instructions for safe brazing practices and appropriate measures.*



Trane – by Trane Technologies (NYSE: TT), a global climate innovator – creates comfortable, energy efficient indoor environments through a broad portfolio of heating, ventilating and air conditioning systems and controls, services, parts and supply. For more information, please visit [trane.com](http://trane.com) or [tranetechnologies.com](http://tranetechnologies.com).

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