LucasMilhaupt®
A Handy & Harman Company
Global Brazing Solutions®

Technical Data Sheet

SIL-FOS® 5
(SILVALOY® 5, SILVALOY® 5 EXCEL)

NOMINAL COMPOSITION

Silver	5.0% ± 0.2%
Copper	89.0% ± 1.0%
Phosphorus	6.0% ± 0.2%
Other Elements (Total)	0.15% Max

PHYSICAL PROPERTIES

Color	Gray
Melting Point (Solidus)	1190ºF (643ºC)
Flow Point [(1)]	1325ºF (718ºC)
Brazing Temperature Range	1325ºF-1500ºF (718°F-815°F)
Specific Gravity	8.13
Density (lbs/in^3)	0.294
Electrical Conductivity (%IACS) [(2)]	9.60
Electrical Resistivity (Microhm-cm)	18.1

[(1)] The true liquidus for Sil-Fos 5 is 1495°F (813°C). The alloy will flow freely and make strong joints at 1300°F (705°C).
[(2)] IACS = International Annealed Copper Standard

PRODUCT USES

Sil-Fos 5 and was developed primarily for use on copper, but its use has extended to other nonferrous copper base alloys. It is used extensively on refrigeration units, air conditioning apparatus, electrical conductors, copper and brass pipe fittings, and other copper and brass equipment.

BRAZING CHARACTERISTICS

Sil-Fos 5 is a copper rich, filler metal that is self-fluxing on copper by virtue of its phosphorus content. The self-fluxing property of this filler metals is effective on copper only. With copper-base alloys, such as brass or bronze, the joints should be fluxed with Handy Flux®. Sil-Fos 5 should not be used on nickel-base and iron-base alloys, as the phosphorus reacts with the nickel or iron to form brittle compounds at the interface of the joints. Sil-Fos 5, because of its higher phosphorus content, is more fluid than Sil-Fos 15 when heated rapidly to its flow point. Sil-Fos 5 has less tendency to form large fillets or to fill poorly fitted joints compared to Sil-Fos 15.

Sil-Fos 5 has a strong tendency to liquate (i.e. to separate into low and high melting constituents) if heated slowly through its melting range, as normally occurs in furnace brazing. The results in leaving a “skull” of un-melted alloy behind may objectionable from the standpoint of appearance. In furnace brazing it is preferable to pre-place the alloys inside the joint where the skull is not visible.

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PROPERTIES OF BRAZED JOINTS

The properties of a brazed joint are dependent upon numerous factors including base metal properties, joint design, metallurgical interaction between the base metal and the filler metal. The following information, however, should serve as a guide for estimating the results that can be achieved with either Sil-Fos 15 or Sil-Fos 5 on copper and copper base alloys.

Table 1. Brazed butt joints tested at room temperature

	Tensile Strength (lbs/in^2)	Elongation % in 2 in.
Copper	30,000 - 35,000	15.0 - 20.0
Brass	35,000 - 40,000	20.0 - 25.0
Nickel-Silver	35,000 - 40,000	2.00 - 5.00

Table 2. Brazed butt joints tested at elevated temperatures gave the following average values (short time tests)

	Test Temperature °F	Test Temperature °C	Tensile Strength (lbs/in^2)	Elongation % in 2 in.
Copper	200	95	32,050	32.8
	300	150	29,500	31.2
	400	205	28,100	28.1
	500	260	23,600	24.5
	600	315	22,700	24.2
	700	370	17,700	12.5
	800	425	15,800	9.40
Brass	200	95	34,000	19.2
	300	150	34,700	28.1
	400	205	30,700	28.1
	500	260	28,500	19.2
	600	315	22,500	13.0
	700	370	16,700	6.80
	800	425	11,600	2.90

CORROSION RESISTANCE

Normally the corrosion resistance of Sil-Fos 5 is of the same order as copper, but under certain conditions it may corrode more rapidly. Sil-Fos 5 should not be used where the joints are exposed to sulfur compounds, especially in gasses or oils at temperatures above normal room temperature. As the corrosion by sulfur is cumulative, even very small percentages will eventually cause failure of the joint by disintegration. Exposure to pressured steam can also result in accelerated corrosion.

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The following table lists the results of corrosion tests on brazed copper joints in several media:

Solution	Test Temp.	Conditions	Loss in Weight Mgs./Day
10% Acetic Acid	Room	Constant Immersion	33.3
10% Acetic Acid	212°F (100°C)	Constant Immersion	243.0
5% Hydrochloric Acid	Room	Constant Immersion	50.6
5% Hydrochloric Acid	212°F (100°C)	Constant Immersion	395.0
5% Lactic Acid	Room	Alternate Immersion 22 times per minute	48.4
5% Lactic Acid	130°F (55°C)	Alternate Immersion 22 times per minute	381.0
Sodium Chloride (N/10)	Room	Constant Immersion	9.1
Sodium Chloride (N/10)	212°F (100°C)	Constant Immersion	143.0
5% Sulphuric Acid	Room	Constant Immersion	36.3
5% Sulphuric Acid	212°F (100°C)	Constant Immersion	178.0

AVAILABLE FORMS

Wire, engineered preforms, specialty preforms per customer specification, powder and paste.

SPECIFICATIONS

Sil-Fos 5 alloy conforms to the following specifications:

- American Welding Society (AWS) A5.8/A5.8M BCuP-3
- ASME Boiler & Pressure Vessel Code, Sec II-C, SFA-5.8 BCuP-3

APPLICABLE PRODUCT CODE(S)

The applicable Lucas-Milhaupt product code(s) for this technical data sheet: 71-050, 7054, 35503.

Distribution P/N: 95060 , 95062, 95071, 95082.

SAFETY INFORMATION

The operation and maintenance of brazing equipment or facility should conform to the provisions of American National Standard (ANSI) Z49.1, "Safety in Welding and Cutting". For more complete information refer to the Material Safety Data Sheet for Sil-Fos 5.

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