

Evaporation Sources

9

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► Evaporation Sources & Heating Methods

Introduction to Evaporation Sources

Evaporation occurs when the atoms/molecules of the evaporant (the material being evaporated) achieve sufficient energy to overcome the solid/liquid binding forces and enter the gas phase. To increase the evaporation rate, the average energy is increased by raising the evaporant's temperature. Expressed another way, raising its temperature increases an evaporant's vapor pressure (VP).

It's a common misconception that a solid has no VP, but as it melts, vapor suddenly appears. Melting has nothing to do with vapor pressure! For all materials (that do not decompose) VP versus temperature is a smooth curve—with the material's melting point being at just one point on that curve. Honig and Kramer's *Vapor Pressure Data for the Liquid and Solid Elements* (RCA 1969) clearly shows the non-relationship between VP and melting point.

The most striking examples are two pairs of metals: gallium/gadolinium and magnesium/aluminum. The first pair have melting points of 29.76° C (Ga) and 1312° C (Gd). Yet their VPs are within a factor of 10 from 10⁻¹¹ Torr to 760 Torr. The second pair's melting points are 650° C (Mg) and 660.32° C (Al). However, Mg's VP is 10⁷ higher than Al's VP at any temperature.

The strict relationship between VP and temperature for each evaporant has at least one important consequence when evaporating alloys or mixtures. Except in rare circumstances, it's impossible to evaporate an alloy and make a film of identical stoichiometry. For example, evaporating 20/80 Sn/Pb solder gives, initially, a film of almost pure Pb since its VP is 10⁶ times higher than Sn's. (*Dilution and activity coefficient affect the vapor composition too, but these issues are beyond this simple introduction.*)

When evaporating compounds, there are few general rules. Some compounds (e.g., MgF₂ and KI) evaporate as molecules and the film's stoichiometry is identical to the compound's. Oxides may: dissociate completely, evaporate as lower oxides, evaporate as non-stoichiometric oxides, or give films with compositions identical to the evaporant. Compound semiconductor materials, the so-called III-V, II-VI materials, present a complex mix of results. Individual components may evaporate as dimers or tetramers, depending on the temperature (again, concepts beyond this simple introduction).

Heating Methods

Four heating techniques are commonly used to evaporate materials for thin film deposition. Different names may be applied but generally they are known as:

- Direct resistive heating
- Indirect resistive heating
- E-beam evaporation
- Pulse laser deposition (or ablation)

Direct Resistive Heating Thermal Sources

The evaporant is placed on/in a refractory metal source through which a high electrical current flows. The method's low equipment costs are balanced by the difficulty of maintaining a constant evaporation rate (when compared with other techniques) and possible reactions between evaporant and boat material. These devices are often called *thermal sources* and are essentially open heaters frequently without thermal radiation shielding, insulation, or any tricks to reduce thermal gradients.

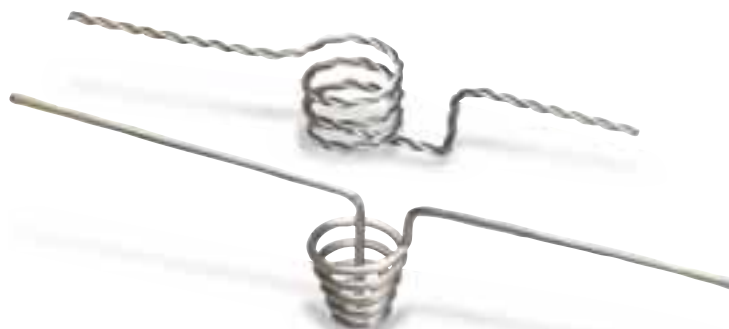
Filaments

Single- or multiple-strand tungsten wire is bent into a shape (loop, point, coil) that suits a particular mounting or the required evaporation pattern. Evaporant is deposited on the wire by dipping into a melt, into a solution of a thermally degradable salt, or physically capturing pieces. The material's evaporation rate is varied by changing the current. If the material wets or alloys with the heater, non-reproducible or continuously changing evaporation rates may occur. Since this source is inexpensive, it is often used once and discarded.



Basket Heaters

If a refractory metal wire is shaped into an inverted conical basket, larger "pieces" of material can be inserted into the cone. These are also used to heat small crucibles.



Boats and Boxes

Thin, flat tungsten, tantalum, or molybdenum sheets are formed into shapes with creases, dimples, folds, bends, etc., to hold evaporant. The complexity ranges from a dimple in a strip to multichamber baffled boxes with sideways-pointing vapor chimneys. The "baffle" in a baffle box prevents a line-of-sight between evaporant and substrate. This type of source is used where the evaporant is known to "spit" (crepitate).



Coated Boats

A variant of the normal boat, a coated boat has a thin coherent layer of aluminum oxide covering the dimple. These boats are sometimes recommended for applications where the hot evaporant reacts with refractory metals.

Rods & Screens

For very specific applications, thick tungsten rods and fine meshes/screens are recommended. Chromium evaporation is one common example. The thick rod has lower resistance than a filament, making it easier to control lower evaporating temperatures. Meshes are sometimes used to extend the coverage area without moving the substrate.



Indirect Resistive Heating Thermal Sources

With indirect resistive heating, a crucible holds the evaporant in isolation from the heater filament. The increased thermal mass and the evaporant/heater separation stabilizes the evaporation rate. Various iterations of these indirectly heated devices are called Knudsen cells, K-cells, effusion sources, diffusion cells, evaporation cells, etc. But distinctions between these names are blurring as manufacturers explore designs that use features from several devices.

Knudsen Cells

Where repeatable, constant evaporation rates are required, Knudsen cells are chosen. The classic Knudsen cell is a large-mass, small-volume tungsten container with a close-fitting thick lid where an inverted conical-shaped aperture is bored. The container is mounted on tungsten needle points to reduce thermal losses and surrounded by tungsten heater filaments and diffusers to ensure a uniform temperature. Outside the heaters, several layers of reflective radiation shielding further reduce thermal gradients in the cell.

With the cell maintained at a uniform, constant, and known temperature, the evaporant's equilibrium vapor pressure is known. The aperture is small so the vapor lost through it does not significantly affect the cell's internal pressure, and the evaporant's effusion rate is constant. In addition, the small aperture means the vapor emerges in a cosine distribution (the flux issuing at any given angle to the cell lid's normal is proportional to the cosine of that angle). The maximum temperature for the classic Knudsen cell is around 2000K to 2100K.

Evaporation Cells

Evaporation cells are based on the Knudsen cell design but are/have:

- Less mechanically complex
- Easier to fill
- Larger capacities
- Larger orifice diameters to increase material flux
- Lids or vapor shutters
- Less stringent thermal gradient specifications
- Higher deposition rates

These devices are known as K-cells, effusion cells, evaporation sources, or thermal sources. Although the vapor plume does not have a cosine distribution, these source have many thin film applications, including molecular-beam epitaxy, low temperature evaporation (100–500° C) for organic compounds, and high temperature evaporation (1500° C) for metals and inorganic compounds.

Some heaters are flat ribbons arranged parallel to the crucible's long axis. This helps reduce temperature gradients in the important central zone. In other designs, the heater wires are more closely spaced at the crucible's ends to combat thermal end-effects.

The crucible is typically a pure alumina cylinder closed at one end with a wide bore to increase the vapor flux. This source is well-suited to conventional evaporation but some low thermal mass versions are used as flash evaporators.

Thermal Sources

Some thermal sources described in *Direct Resistance Heating* can be constructed to accommodate crucibles and, therefore, fit in this section. In particular, refractory metal wire baskets or refractory metal boxes can be shaped into truncated cones of appropriate depth and slope to suit a given crucible. While such heaters lack the refinements and end-effect correction found in the evaporation cells, they provide inexpensive approaches to film deposition of materials that can't be in direct contact with a refractory metal.

E-Beam Sources

The electron-beam (e-beam) source's high deposition rates and large evaporant capacity make it convenient for production-scale coating machines. Solid evaporant such as powder, granules, lumps, or shaped starter sources, is placed in the source's copper hearth or in a crucible liner. A high electron flux generated by a hot filament placed below the source is electrostatically and magnetically focused on the top of the evaporant. The electron beam's energy raises the evaporant's surface temperature. Often the beam is rastered to increase the evaporation area. Since the evaporation area is surrounded by cooler (often solid) evaporant, unlike other thermal sources, the e-beam source's vapor plume is largely uncontaminated by crucible liner material.

Production scale e-beam sources are usually single pocket (one hearth). Multipocket sources (4 or 6 hearths) are available for R&D applications. A cover plate obscures the pockets "not-in-use" to prevent vapor *cross-contamination*. Multipocket sources are particularly convenient when depositing multilayer films on a single substrate.

The drawbacks of e-beam evaporation are similar to those of thermal evaporation, but they are more apparent in the e-beam source—the source must be mounted upright (to prevent the evaporant spilling), evaporants often "spit" and must be heated in a series of *ramp/soak* steps to evaporation temperature, and the melt presents a high-temperature source that thermally radiates the substrate.

Pulse Laser Deposition (PLD) Sources

PLD uses repetitive pulses from a laser of appropriate power density, angle of incidence, and wavelength to ablate a localized area of evaporant into a vapor plume. The wavelength is important to maximize photon absorption rather than reflection. The *flash* evaporation nature of this technique, at least in the small volume in which the laser pulse's energy is dumped, is advantageous when evaporating alloys or mixtures. The vapor plume tends to be stoichiometrically similar to the bulk; however, the PLD vapor plume is not particularly convenient because its flux distribution is closer to \cos^6 to the evaporant's surface normal.

Crucible and Liners

The crucible and liners are used to (A) keep the e-beam hearth free of evaporants or (B) to act as the evaporant container for basket or foil thermal sources. For an e-beam source, a liner provides an often unrecognized benefit—an efficient thermal barrier. The same deposition rate requires only $1/4$ the power needed if a liner is not used. This reduces operating costs and lowers the system's thermal burden; however, any liner must be electrically conductive to dissipate the electron charge. For a thermal source, the crucible thermal resistance is a serious but unavoidable disadvantage. The heater is usually much hotter than the evaporant's average temperature.



► Point & Loop Heaters

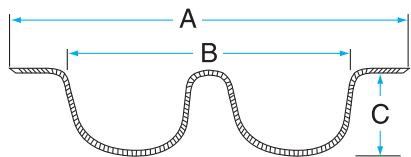
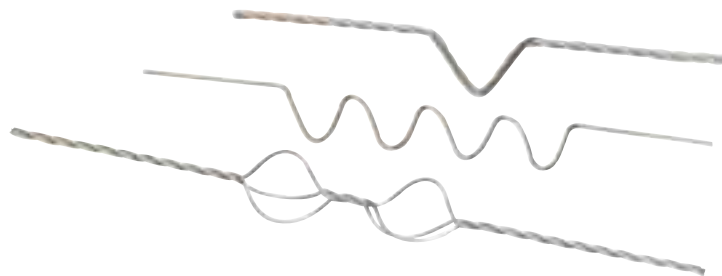


Figure 1 (EVSP1)

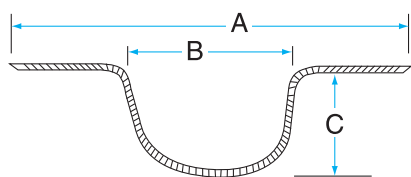


Figure 2 (EVSP2)

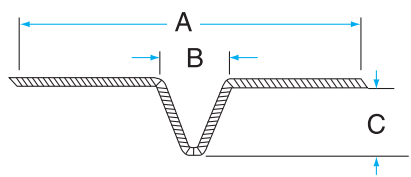


Figure 3 (EVSP3)

■ Points & Loops—Tungsten

Match the form and size of sample to heat.

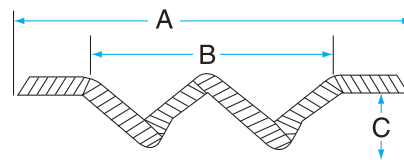


Figure 4 (EVSP4)

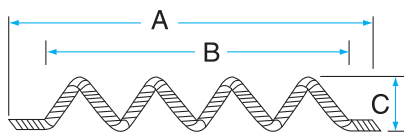


Figure 5 (EVSP5)

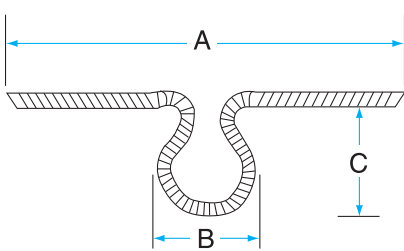


Figure 6 (EVSP6)

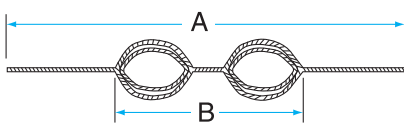


Figure 7 (EVSP7)

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Evaporation Sources

Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Tungsten Double Loop Source											
3 Wires x 0.025" Diameter	1	5	5	3	1/2	2.95	50	148	1800° C	EVSP13025W	Call
3 Wires x 0.030" Diameter	1	5	5	3	1/2	2.36	65	153	1800° C	EVSP13030W	Call
4 Wires x 0.030" Diameter	1	5	5	3	1/2	2.76	80	221	1800° C	EVSP14030W	Call
1 Wire x 0.060" Diameter	1	5	5	3	1/2	2.08	73	152	1800° C	EVSP1060W	Call
Tungsten Single Loop Source											
3 Wires x 0.025" Diameter	2	5	4 1/2	2	1/2	2.83	48	136	1800° C	EVSP23025W	Call
3 Wires x 0.030" Diameter	2	5	4 1/2	2	1/2	3.56	78	278	1800° C	EVSP23030W	Call
4 Wires x 0.030" Diameter	2	5	4 1/2	2	1/2	2.04	82	167	1800° C	EVSP24030W	Call
1 Wire x 0.060" Diameter	2	5	4 1/2	2	1/2	1.84	75	138	1800° C	EVSP2060W	Call
Tungsten Point Source											
3 Wires x 0.025" Diameter	3	5	3 1/2	5/8	1/2	2.25	50	113	1800° C	EVSP33025W	Call
3 Wires x 0.030" Diameter	3	5	3 1/2	5/8	1/2	1.94	64	124	1800° C	EVSP33030W	Call
4 Wires x 0.030" Diameter	3	5	3 1/2	5/8	1/2	1.59	84	134	1800° C	EVSP34030W	Call
1 Wires x 0.060" Diameter	3	5	3 1/2	5/8	1/2	1.39	79	110	1800° C	EVSP3060W	Call
3 Wires x 0.025" Diameter	4	5	5	2	1/2	3.20	51	163	1800° C	EVSP43025W	Call
3 Wires x 0.030" Diameter	4	5	5	2	1/2	2.04	64	131	1800° C	EVSP43030W	Call
4 Wires x 0.030" Diameter	4	5	5	2	1/2	2.69	80	215	1800° C	EVSP44030W	Call
1 Wire x 0.060" Diameter	4	5	5	2	1/2	2.04	74	151	1800° C	EVSP4060W	Call
3 Wires x 0.025" Diameter	5	5	5	2	1/2	3.80	51	194	1800° C	EVSP53025W	Call
3 Wires x 0.030" Diameter	5	5	4	2	1/2	3.50	66	231	1800° C	EVSP53030W	Call
4 Wires x 0.030" Diameter	5	5	4	2	1/2	3.13	79	247	1800° C	EVSP54030W	Call
1 Wire x 0.040" Diameter	5	5	4	2	1/2	3.44	40	138	1800° C	EVSP5040W	Call
1 Wire x 0.060" Diameter	5	5	4	2	1/2	3.09	71	219	1800° C	EVSP5060W	Call
Tungsten Single Loop Source											
3 Wires x 0.025" Diameter	6	5	3 1/2	3/8	3/8	2.08	51	106	1800° C	EVSP63025W	Call
1 Wire x 0.040" Diameter	6	5	3 1/2	3/8	3/8	1.94	42	81	1800° C	EVSP6040W	Call
1 Wire x 0.060" Diameter	6	5	3 1/2	3/8	3/8	1.46	75	109	1800° C	EVSP6060W	Call
Tungsten Double Loop Source											
3 Wires x 0.030" Diameter	7	5	5	1 1/2	N/A	2.78	69	192	1800° C	EVSP73030W	Call
1 Wires x 0.030" Diameter	7	1	5	1 1/2	N/A	2.42	87	211	1800° C	EVSP74030W	Call

► Point & Loop Heaters

■ Points & Loops—Microelectronics

Made from tungsten wire.

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.

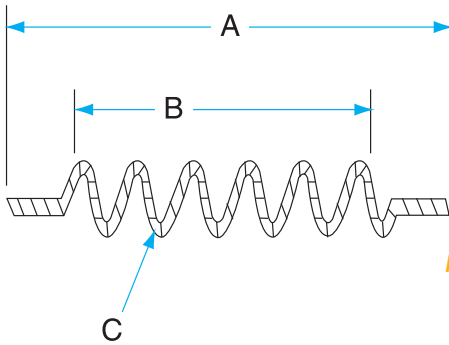


Figure 1 (EVSME11)

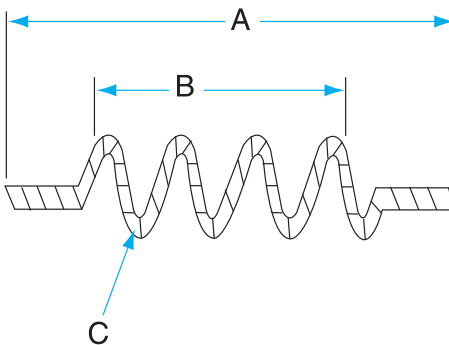


Figure 2 (EVSME12)

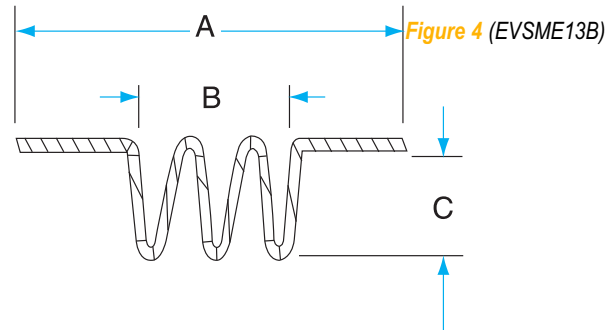


Figure 4 (EVSME13B)

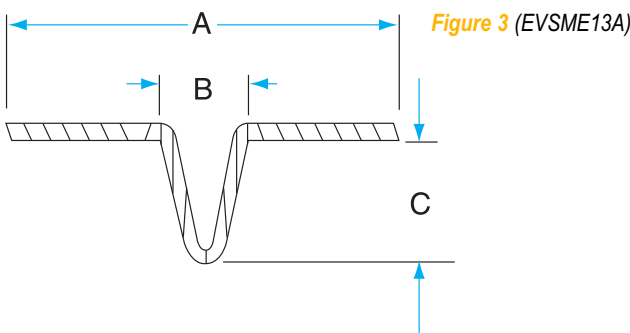


Figure 3 (EVSME13A)

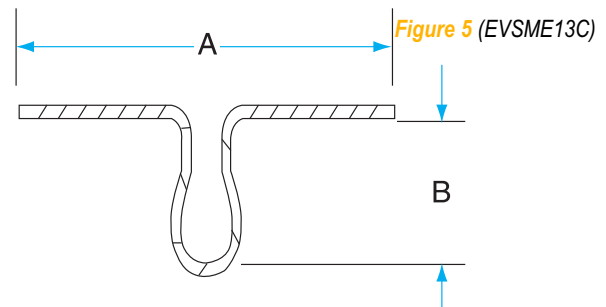
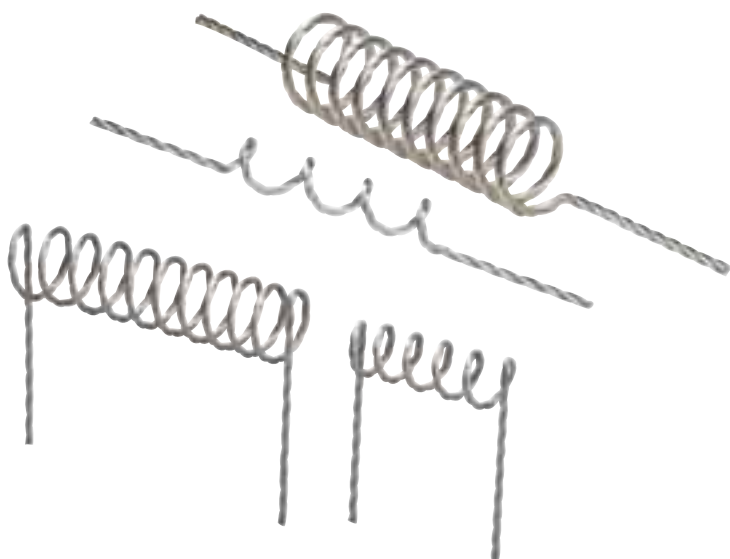


Figure 5 (EVSME13C)

Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Tungsten 6 Coils											
1 Wire 0.030" Diameter	1	5	1 ⁷ / ₈	1	3 ³ / ₁₆	3.59	25	90	1800°C	EVSME11030W	Call
3 Wires 0.025" Diameter	1	5	1 ⁷ / ₈	1	3 ³ / ₁₆	3.13	44	138	1800°C	EVSME113025W	Call
Tungsten 4 Coils											
1 Wire 0.030" Diameter	2	5	1 ⁷ / ₈	1	3 ³ / ₁₆	2.47	27	67	1800°C	EVSME12030W	Call
3 Wires 0.025" Diameter	2	5	1 ⁷ / ₈	1	3 ³ / ₁₆	2.30	47	108	1800°C	EVSME123025W	Call
Tungsten 1 Point											
1 Wire 0.030" Diameter	3	5	1 ⁷ / ₈	1/4	1/4	1.25	33	41	1800°C	EVSME13A030W	Call
3 Wires 0.025" Diameter	3	5	1 ⁷ / ₈	1/4	1/4	1.08	61	66	1800°C	EVSME13A302W	Call
Tungsten 3 Point											
1 Wire 0.030" Diameter	4	5	1 ⁷ / ₈	1	1/4	1.95	27	53	1800°C	EVSME13B030W	Call
3 Wires 0.025" Diameter	4	5	1 ⁷ / ₈	1	1/4	1.68	52	87	1800°C	EVSME13B302W	Call
Tungsten 1 Loop											
1 Wire 0.030" Diameter	5	5	1 ⁷ / ₈	3/8	N/A	1.95	26	51	1800°C	EVSME13C030W	Call
3 Wires 0.025" Diameter	5	5	1 ⁷ / ₈	3/8	N/A	1.56	53	83	1800°C	EVSME13C302W	Call

► Coil Heaters



■ Coils (EVF 1–4)

Made from tungsten wire.

Evaporation Sources covers products as diverse as resistance heated boats, laser ablation target carousels, crucibles for electron beam sources, indirectly heated effusion cells, and low temperature evaporation sources specifically design for OLED/PLED coating applications in flat panel display manufacture.

- Applications include: discharging insulating surfaces, melting refractory metals, and increasing plasma density over normal magnetron sputter sources
- Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.

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Evaporation Sources

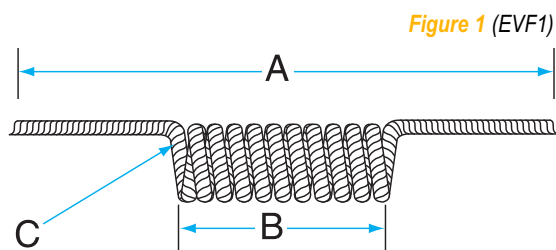


Figure 1 (EVF1)

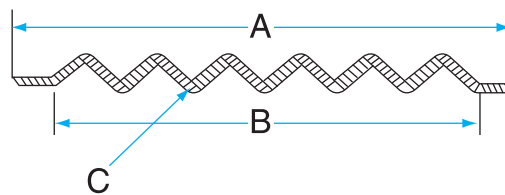


Figure 3 (EVF3)

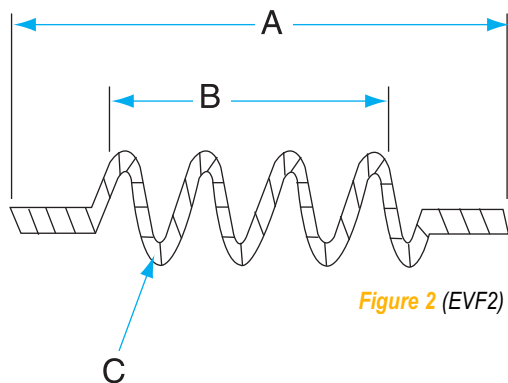


Figure 2 (EVF2)

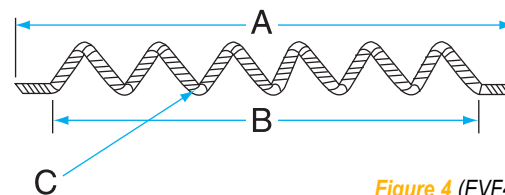


Figure 4 (EVF4)

Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten Coil											
3 Wires x 0.025" Diameter	1	5	4	1	1/16	3.00	42	126	1800° C	EVF13025W	Call
3 Wires x 0.030" Diameter	1	5	4	1	1/16	2.94	54	159	1800° C	EVF13030W	Call
1 Wire x 0.040" Diameter	1	5	4	1	1/16	3.07	36	111	1800° C	EVF1040W	Call
3 Wires x 0.025" Diameter	2	5	4	1 3/4	3/16	3.43	49	168	1800° C	EVF23025W	Call
3 Wires x 0.030" Diameter	2	5	4	1 3/4	3/16	3.08	63	194	1800° C	EVF23030W	Call
4 Wires x 0.030" Diameter	2	5	4	1 3/4	3/16	2.70	77	208	1800° C	EVF24030W	Call
3 Wires x 0.025" Diameter	3	5	5	2	3/16	4.61	48	221	1800° C	EVF33025W	Call
3 Wires x 0.030" Diameter	3	5	5	2	3/16	4.15	60	249	1800° C	EVF33030W	Call
2 Wires x 0.040" Diameter	3	5	5	2	3/16	4.00	68	272	1800° C	EVF32040W	Call
4 Wires x 0.030" Diameter	3	5	5	2	3/16	4.00	77	308	1800° C	EVF34030W	Call
1 Wire x 0.040" Diameter	3	5	5	2	3/16	3.91	39	152	1800° C	EVF3040W	Call
3 Wires x 0.025" Diameter	4	5	4	1 3/4	1/4	5.29	48	254	1800° C	EVF43025W	Call
3 Wires x 0.030" Diameter	4	5	4	1 3/4	1/4	4.28	62	265	1800° C	EVF43030W	Call
4 Wires x 0.030" Diameter	4	5	4	1 3/4	1/4	3.63	73	265	1800° C	EVF44030W	Call
2 Wires x 0.040" Diameter	4	5	4	1 3/4	1/4	3.97	66	262	1800° C	EVF42040W	Call
4 Wires x 0.040" Diameter	4	5	4	1 3/4	1/4	3.70	38	141	1800° C	EVF4040W	Call

► Coil Heaters

■ Coils (EVF 5–8)

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.

Figure 1 (EVF5)

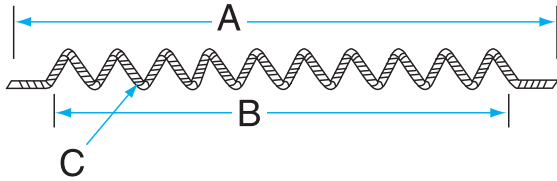


Figure 3 (EVF7)

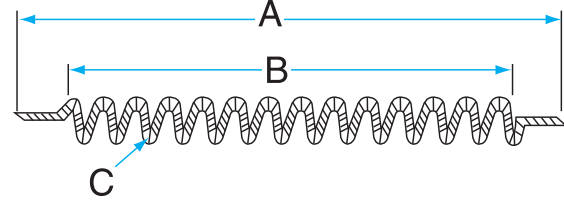


Figure 2 (EVF6)

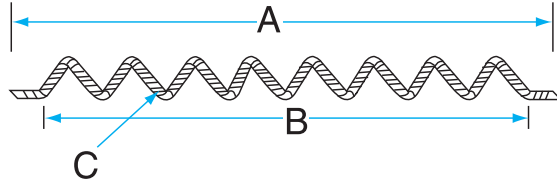
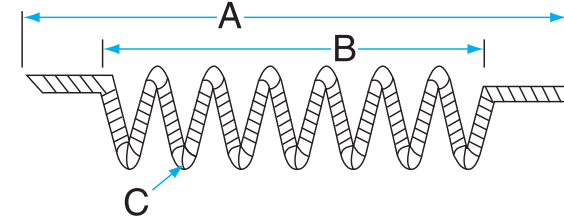


Figure 4 (EVF8)



Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten Coil											
3 Wires x 0.025" Diameter	1	5	5	2	1/4	8.05	45	362	1800° C	EVF53025W	Call
3 Wires x 0.030" Diameter	1	5	5	2	1/4	6.58	57	375	1800° C	EVF53030W	Call
4 Wires x 0.030" Diameter	1	5	5	2	1/4	6.10	69	421	1800° C	EVF54030W	Call
2 Wires x 0.040" Diameter	1	5	5	2	1/4	6.82	64	436	1800° C	EVF52040W	Call
3 Wires x 0.040" Diameter	1	5	5	2	1/4	5.60	83	465	1800° C	EVF53040W	Call
1 Wire x 0.040" Diameter	1	5	5	2	1/4	6.90	37	255	1800° C	EVF5040W	Call
3 Wires x 0.025" Diameter	2	5	5	2	3/8	8.72	44	384	1800° C	EVF63025W	Call
3 Wires x 0.030" Diameter	2	5	5	2	3/8	8.25	58	478	1800° C	EVF63030W	Call
4 Wires x 0.030" Diameter	2	5	5	2	3/8	7.29	71	518	1800° C	EVF64030W	Call
2 Wires x 0.040" Diameter	2	5	5	2	3/8	7.20	64	461	1800° C	EVF62040W	Call
3 Wires x 0.040" Diameter	2	5	5	2	3/8	6.42	84	539	1800° C	EVF63040W	Call
3 Wires x 0.030" Diameter	3	5	5	2	3/8	11.65	52	606	1800° C	EVF73030W	Call
4 Wires x 0.030" Diameter	3	5	5	2	3/8	10.31	65	670	1800° C	EVF74030W	Call
2 Wires x 0.040" Diameter	3	5	5	2	3/8	10.97	55	603	1800° C	EVF72040W	Call
3 Wires x 0.040" Diameter	3	1	5	2	3/8	9.40	78	733	1800° C	EVF73040W	Call
3 Wires x 0.030" Diameter	4	5	5	2	5/16	5.39	62	334	1800° C	EVF83030W	Call
4 Wires x 0.030" Diameter	4	5	5	2	5/16	5.09	74	377	1800° C	EVF84030W	Call
2 Wires x 0.040" Diameter	4	5	5	2	5/16	5.00	66	330	1800° C	EVF82040W	Call
3 Wires x 0.040" Diameter	4	5	5	2	5/16	4.61	87	401	1800° C	EVF83040W	Call

► Coil Heaters

■ Coils (EVF 9–12)

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.

Figure 1 (EVF9)

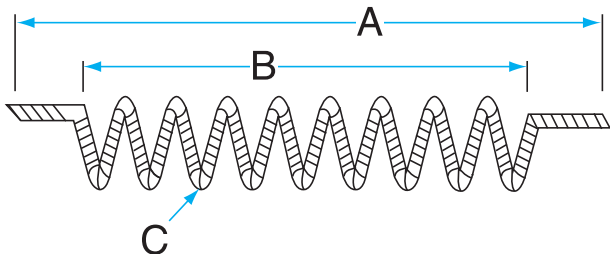


Figure 3 (EVF11)

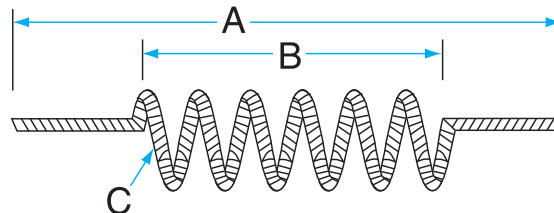


Figure 2 (EVF10)

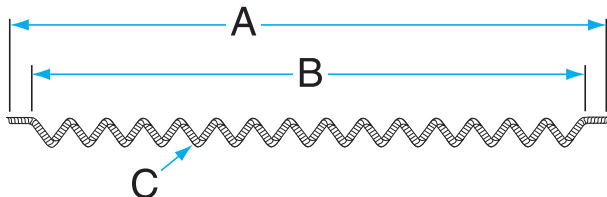
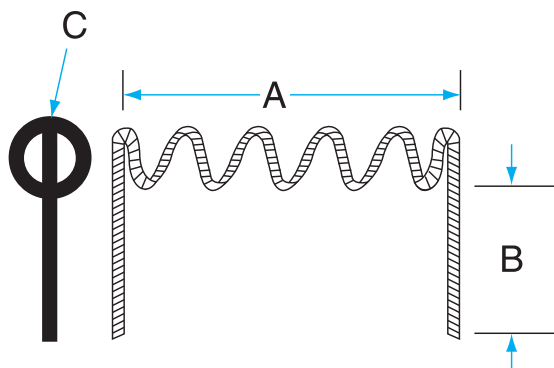


Figure 4 (EVF12)



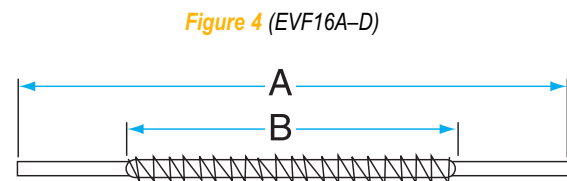
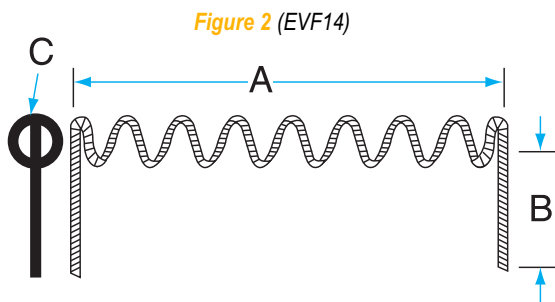
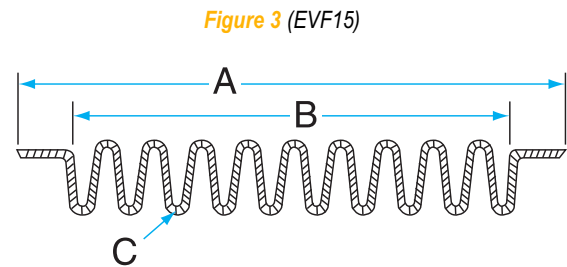
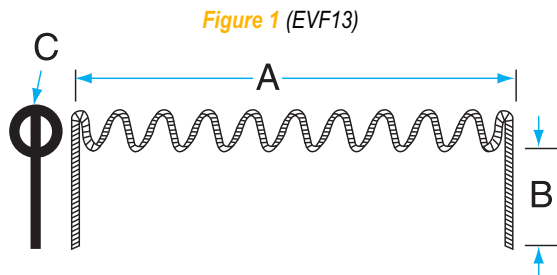
9

Evaporation Sources

Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten Coil											
3 Wires x 0.030" Diameter	1	5	5	2	5/16	6.50	57	370	1800° C	EVF93030W	Call
4 Wires x 0.030" Diameter	1	5	5	2	5/16	6.07	71	431	1800° C	EVF94030W	Call
2 Wires x 0.040" Diameter	1	5	5	2	5/16	6.66	65	433	1800° C	EVF92040W	Call
3 Wires x 0.040" Diameter	1	5	5	2	5/16	5.43	86	467	1800° C	EVF93040W	Call
3 Wires x 0.030" Diameter	2	5	6	2 1/2	5/16	10.90	55	600	1800° C	EVF103030W	Call
4 Wires x 0.030" Diameter	2	5	6	2 1/2	5/16	10.00	68	680	1800° C	EVF104030W	Call
2 Wires x 0.040" Diameter	2	5	6	2 1/2	5/16	10.62	61	648	1800° C	EVF102040W	Call
3 Wires x 0.040" Diameter	2	1	6	2 1/2	5/16	9.02	83	749	1800° C	EVF103040W	Call
3 Wires x 0.030" Diameter	3	5	5	2	1/2	7.07	58	410	1800° C	EVF113030W	Call
4 Wires x 0.030" Diameter	3	5	5	2	1/2	6.40	70	448	1800° C	EVF114030W	Call
2 Wires x 0.040" Diameter	3	5	5	2	1/2	6.74	65	438	1800° C	EVF112040W	Call
3 Wires x 0.040" Diameter	3	5	5	2	1/2	5.70	87	496	1800° C	EVF113040W	Call
3 Wires x 0.025" Diameter	4	5	1	1	1/4	4.44	46	204	1800° C	EVF123025W	Call
3 Wires x 0.030" Diameter	4	5	1	1	1/4	3.82	57	218	1800° C	EVF123030W	Call

► **Coil Heaters**

■ **Coils (EVF 13–17)**



Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten Coil											
3 Wires x 0.025" Diameter	1	5	2	1	3/8	11.00	44	484	1800° C	EVF133025W	Call
3 Wires x 0.030" Diameter	1	5	2	1	3/8	9.06	57	516	1800° C	EVF133030W	Call
4 Wires x 0.030" Diameter	1	5	2	1	3/8	8.59	71	610	1800° C	EVF134030W	Call
3 Wires x 0.030" Diameter	2	5	2	1	1/2	9.44	56	529	1800° C	EVF143030W	Call
4 Wires x 0.030" Diameter	2	5	2	1	1/2	8.80	68	598	1800° C	EVF144030W	Call
3 Wires x 0.040" Diameter	2	5	2	1	1/2	8.20	88	722	1800° C	EVF143040W	Call
3 Wires x 0.030" Diameter	3	5	5	2 1/4	1/2	11.53	57	657	1800° C	EVF153030W	Call
4 Wires x 0.030" Diameter	3	5	5	2 1/4	1/2	10.63	70	744	1800° C	EVF154030W	Call
3 Wires x 0.040" Diameter	3	1	5	2 1/4	1/2	9.66	85	821	1800° C	EVF153040W	Call
Tungsten Rod											
0.100" Diameter, Wrapped with 8 Layers of 0.020" Diameter W Wire	4	5	4	2	N/A	1.12	148	166	1500° C	EVF16A	Call
0.100" Diameter, Wrapped with 8 Layers of 0.020" Diameter W Wire	4	1	5	3	N/A	1.19	149	177	1500° C	EVF16B	Call
0.100" Diameter, Wrapped with 12 Layers of 0.020" Diameter W Wire	4	1	5	3	N/A	1.30	172	224	1500° C	EVF16C	Call
0.100" Diameter, Wrapped with 12 Layers of 0.020" Diameter W Wire	4	1	8	6	N/A	3.62	223	807	1500° C	EVF16D	Call

► Basket Heaters

■ Baskets—Tungsten (EVB 1–6)

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.

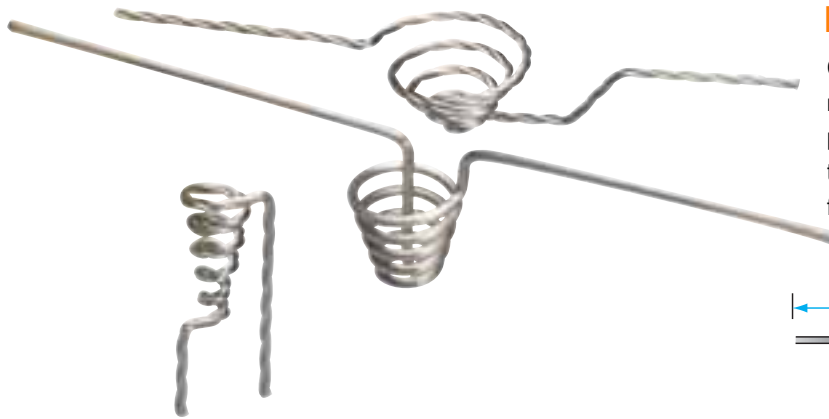


Figure 1 (EVB1)

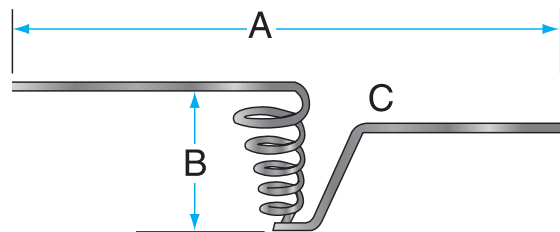


Figure 2 (EVB2)

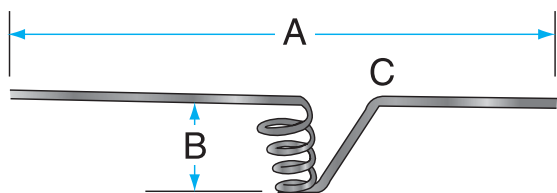


Figure 3 (EVB3)

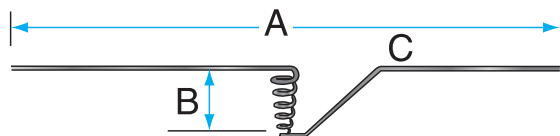


Figure 4 (EVB4)

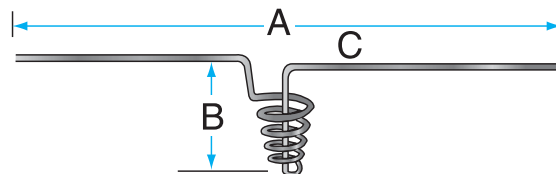


Figure 5 (EVB5)

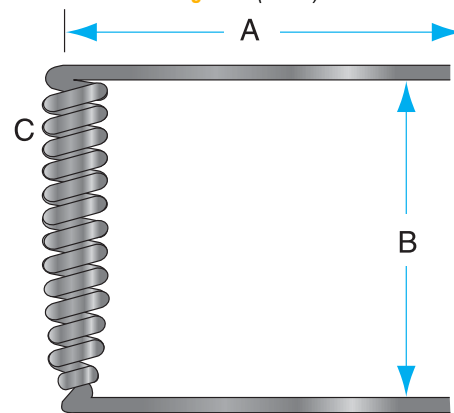
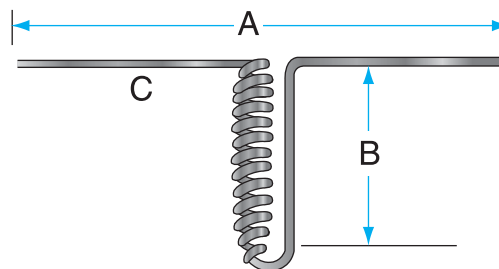


Figure 6 (EVB6)



9

Evaporation Sources

Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten Basket Heater											
3 Wires x 0.025" Diameter	1	5	3 1/2	3/4	5/16	4.22	43	181	1800° C	EVB13025W	Call
3 Wires x 0.030" Diameter	1	5	3 1/2	3/4	5/16	3.69	53	196	1800° C	EVB13030W	Call
1 Wire x 0.040" Diameter	1	5	3 1/2	3/4	5/16	3.47	34	118	1800° C	EVB1040W	Call
3 Wires x 0.025" Diameter	2	5	3 1/2	5/8	5/16	3.50	44	154	1800° C	EVB23025W	Call
3 Wires x 0.030" Diameter	2	5	3 1/2	5/8	5/16	3.00	54	162	1800° C	EVB23030W	Call
1 Wire x 0.040" Diameter	2	5	3 1/2	5/8	5/16	3.04	36	109	1800° C	EVB2040W	Call
3 Wires x 0.025" Diameter	3	5	3 1/2	5/8	3/16	3.51	42	147	1800° C	EVB33025W	Call
1 Wire x 0.040" Diameter	3	5	3 1/2	5/8	3/16	5.40	33	178	1800° C	EVB3040W	Call
3 Wires x 0.030" Diameter	4	5	4 1/2	7/8	1/2	5.24	52	272	1800° C	EVB43030W	Call
1 Wire x 0.060" Diameter	4	5	4 1/2	7/8	1/2	4.02	59	237	1800° C	EVB4060W	Call
3 Wires x 0.025" Diameter	5	5	1 1/4	1 1/4	3/16	5.83	37	216	1800° C	EVB53025W	Call
1 Wire x 0.060" Diameter	5	5	1 1/4	1 1/4	3/16	—	—	—	—	EVB5060W	Call
3 Wires x 0.025" Diameter	6	5	3	1 1/4	3/16	7.04	39	275	1800° C	EVB63025W	Call
1 Wire x 0.040" Diameter	6	5	3	1 1/4	3/16	6.62	32	212	1800° C	EVB6040W	Call

► **Basket Heaters**

■ **Baskets—Tungsten (EVB 7–14)**

Figure 1 (EVB7)

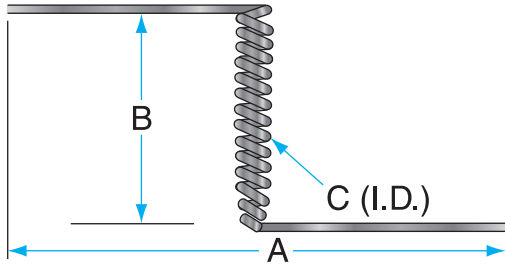


Figure 4 (EVB13)

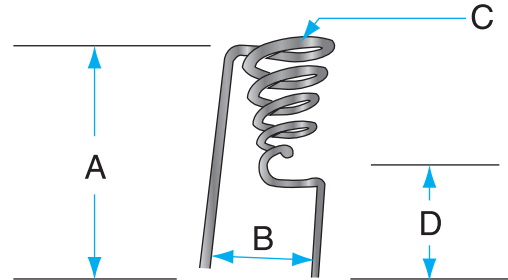


Figure 2 (EVB12A)

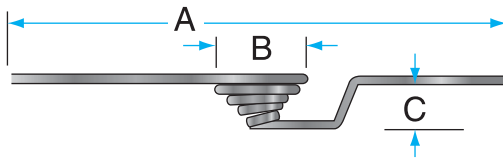


Figure 3 (EVB12B)

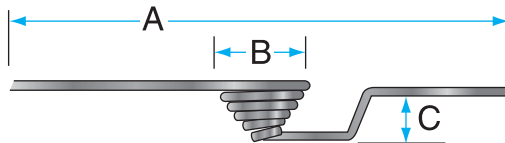
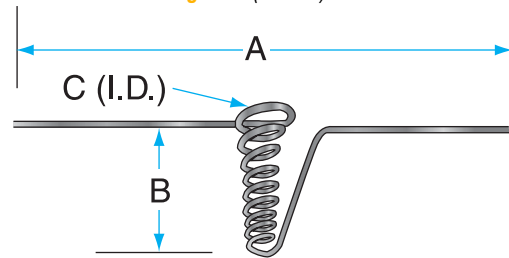


Figure 5 (EVB14)



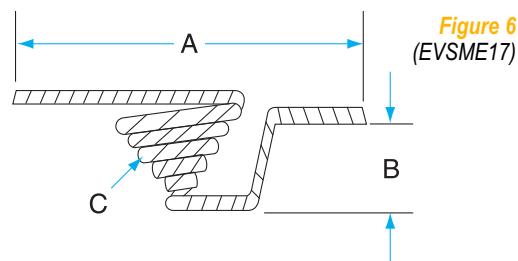
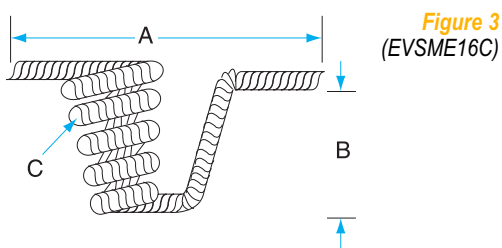
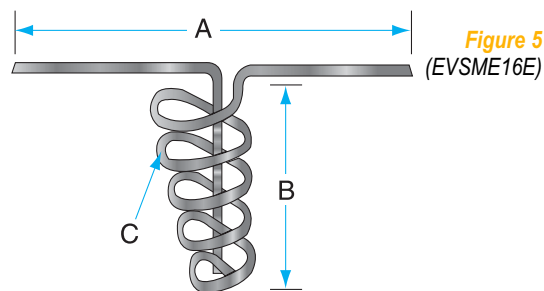
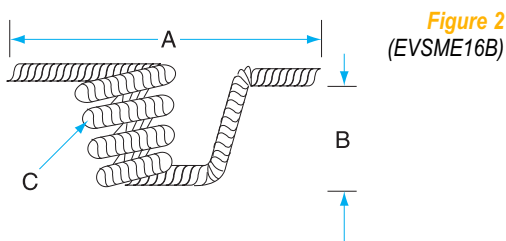
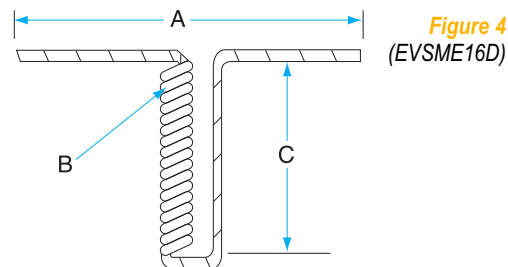
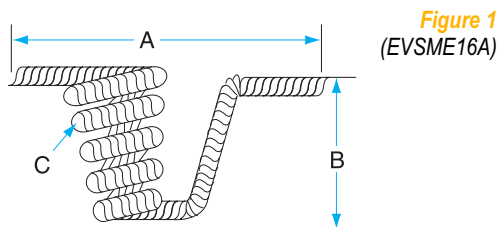
Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Tungsten Basket Heater												
3 Wires x 0.025" Diameter	1	5	3	1 1/4	3/16	N/A	6.84	38	260	1800°C	EVB73025W	Call
1 Wire x 0.040" Diameter	1	5	3	1 1/4	3/16	N/A	6.22	32	199	1800°C	EVB7040W	Call
3 Wires x 0.025" Diameter	2	5	3 1/2	3/4	1/2	N/A	5.31	44	234	1800°C	EVB12A3025W	Call
3 Wires x 0.030" Diameter	2	5	3 1/2	3/4	1/2	N/A	4.80	55	264	1800°C	EVB12A3030W	Call
1 Wire x 0.040" Diameter	2	5	3 1/2	3/4	1/2	N/A	5.00	37	185	1800°C	EVB12A040W	Call
3 Wires x 0.025" Diameter	3	5	3 1/2	1/2	3/8	N/A	4.56	41	187	1800°C	EVB12B3025W	Call
3 Wires x 0.030" Diameter	3	5	3 1/2	1/2	3/8	N/A	3.17	57	181	1800°C	EVB12B3030W	Call
1 Wire x 0.040" Diameter	3	5	3 1/2	1/2	3/8	N/A	3.96	33	131	1800°C	EVB12B040W	Call
1 Wire x 0.060" Diameter	3	5	3 1/2	1/2	3/8	N/A	2.54	99	251	1800°C	EVB12B060W	Call
3 Wires x 0.025" Diameter	4	5	1 1/4	3/8	1/4	1/2	4.04	45	182	1800°C	EVB133025W	Call
3 Wires x 0.030" Diameter	4	5	1 1/4	3/8	1/4	1/2	3.36	57	192	1800°C	EVB133030W	Call
1 Wire x 0.040" Diameter	4	5	1 1/4	3/8	1/4	1/2	3.22	37	119	1800°C	EVB13040W	Call
3 Wires x 0.030" Diameter	5	5	3 1/2	1	1/2	N/A	6.25	50	312	1800°C	EVB143030W	Call
4 Wires x 0.030" Diameter	5	5	3 1/2	1	1/2	N/A	5.82	62	361	1800°C	EVB144030W	Call
1 Wire x 0.060" Diameter	5	5	3 1/2	1	1/2	N/A	4.83	54	261	1800°C	EVB14060W	Call

6 Evaporation Sources

► Basket Heaters

■ Baskets for Microelectronics

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.

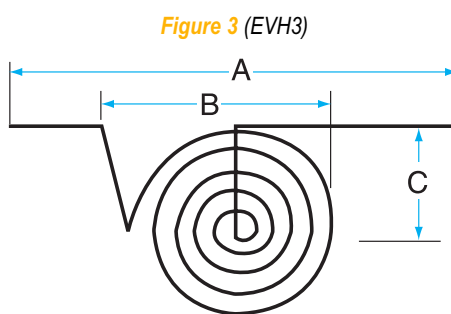
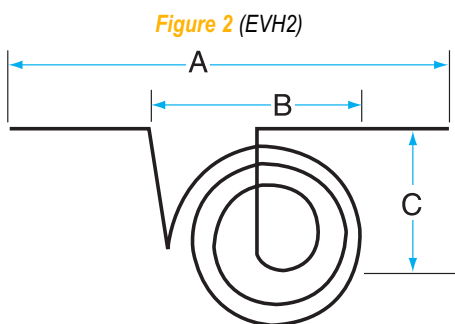
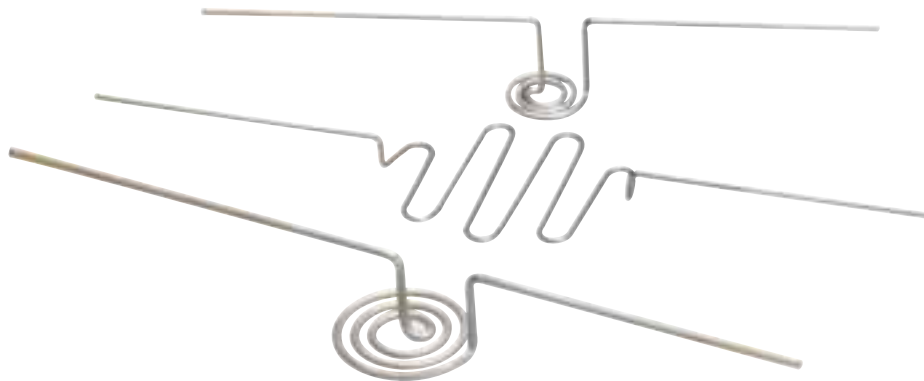
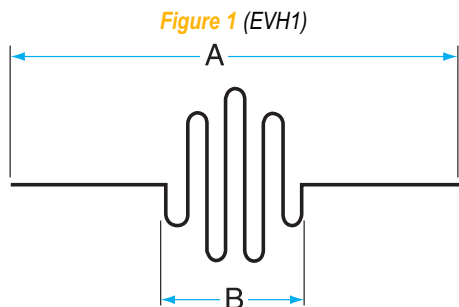


Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Tungsten Tapered Helix Tight, 5 Coils											
1 Wire x 0.030" Diameter	1	5	1 ⁷ / ₈	1/2	3/16	2.48	23	57	1800° C	EVSME16A030W	Call
3 Wires x 0.025" Diameter	1	5	1 ⁷ / ₈	1/2	3/16	2.30	39	90	1800° C	EVSME16A302W	Call
Tungsten Tapered Helix											
4 Coils, 1 Wire x 0.030" Diameter	2	5	1 ⁷ / ₈	5/8	1/4	2.9	23	67	1800° C	EVSME16B030W	Call
3 Wires x 0.025" Diameter	2	5	1 ⁷ / ₈	3/8	1/4	2.66	42	112	1800° C	EVSME16B302W	Call
5 Coils, 1 Wire x 0.030" Diameter	3	5	1 ⁷ / ₈	3/4	1/4	3.77	23	87	1800° C	EVSME16C030W	Call
3-Wires x 0.025" Diameter	3	5	1 ⁷ / ₈	3/4	1/4	3.54	43	152	1800° C	EVSME16C302W	Call
Tungsten Tapered Helix Tight, 12 Coils											
1 Wire x 0.030" Diameter	4	5	1 ⁷ / ₈	3/16	1	5.95	21	125	1800° C	EVSME16D030W	Call
3-Wires x 0.025" Diameter	4	5	1 ⁷ / ₈	3/16	1	5.51	40	220	1800° C	EVSME16D302W	Call
Tungsten Tapered Helix, 5 Coils											
1 Wire x 0.040" Diameter	5	5	1 ⁷ / ₈	7/8	1/2	4.25	32	136	1800° C	EVSME16E040W	Call
Tungsten Tapered Helix, 5 Coils											
3 Wires x 0.025" Diameter	5	5	1 ⁷ / ₈	7/8	1/2	5	44	220	1800° C	EVSME16E302W	Call
Tungsten Basket, 6 Coils											
1 Wire x 0.030" Diameter	6	5	1 ⁷ / ₈	1/2	1/2	4.93	22	108	1800° C	EVSME17030W	Call
3 Wires x 0.025" Diameter	6	5	1 ⁷ / ₈	1/2	1/2	4.57	40	183	1800° C	EVSME173025W	Call

► Spiral Heaters

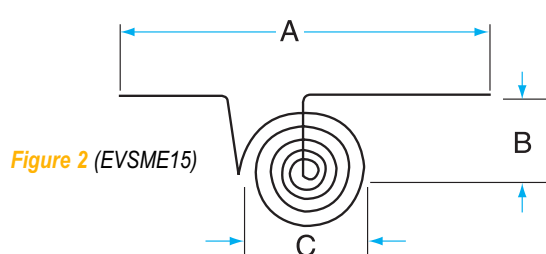
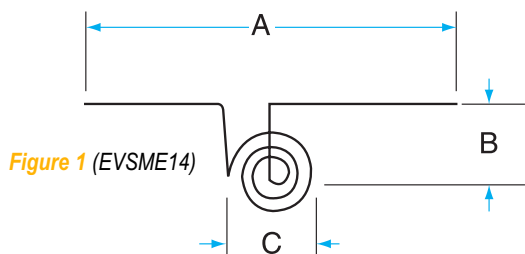
■ Spiral & Serpentine Area Heaters

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these heaters are sometimes satisfactory for more than a single-time use.



Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten Heater Filament											
1 Wire x 0.040" Diameter	1	1	5	1½	N/A	7.9	31	245	1800° C	EVH1040W	Call
1 Wire x 0.060" Diameter	1	1	5	1½	N/A	6.1	71	433	1800° C	EVH1060W	Call
1 Wire x 0.040" Diameter	2	5	4	½	½	4.18	36	150	1800° C	EVH2040W	Call
1 Wire x 0.060" Diameter (Has 1 Less Turn than Shown)	2	5	4	½	½	2.83	69	195	1800° C	EVH2060W	Call
1 Wire x 0.040" Diameter	3	5	5	7/8	½	7.39	34	251	1800° C	EVH3040W	Call
1 Wire x 0.060" Diameter (Has 2 Less Turns than Shown)	3	1	5	7/8	½	5.22	63	329	1800° C	EVH3060W	Call

■ Spirals—Microelectronics



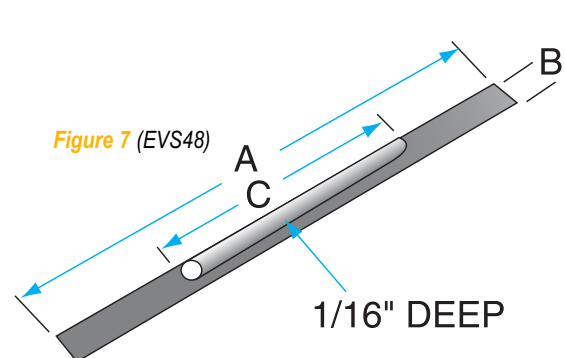
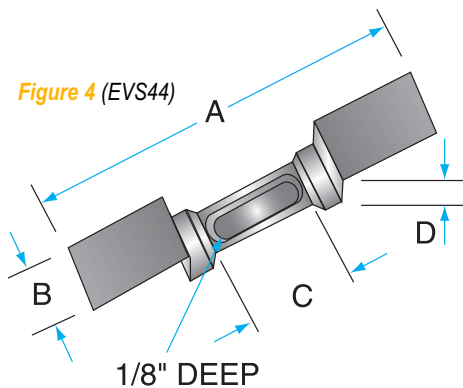
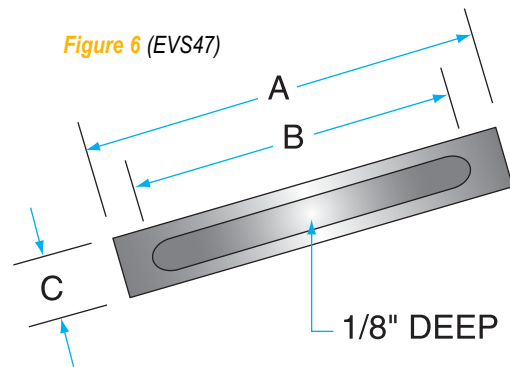
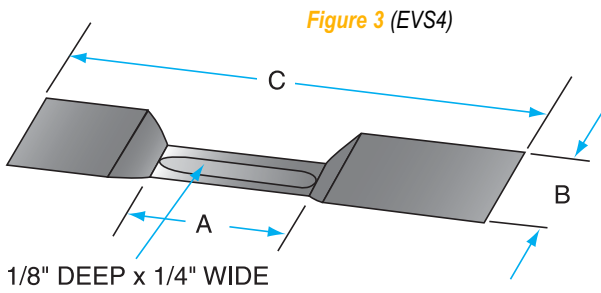
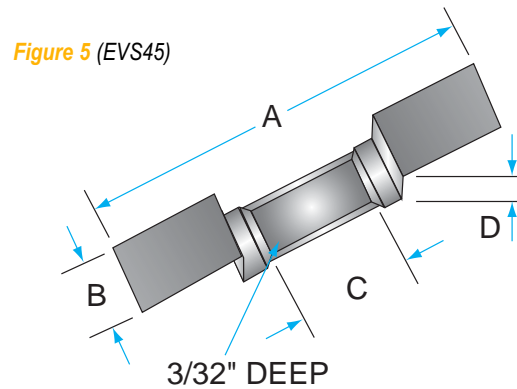
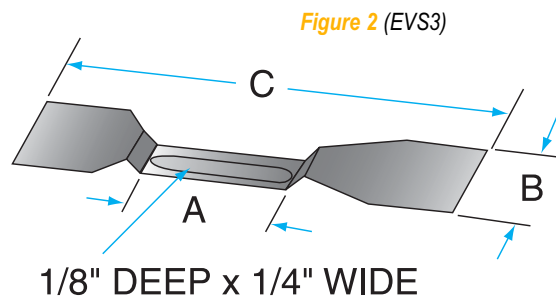
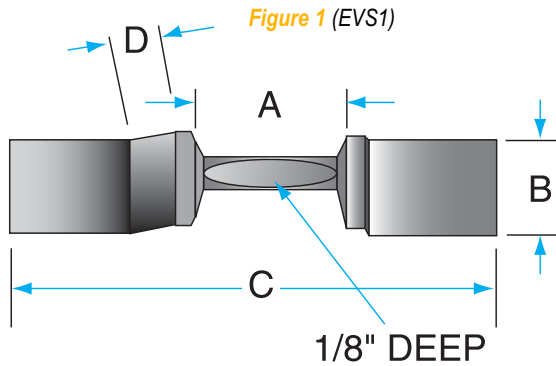
Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C (I.D.)	Volts	Amps	Watts	Temp.		
Tungsten 2.5 Turn Spiral											
1 Wire x 0.030" Diameter	1	5	17/8	3/8	½	3.21	24	77	1800° C	EVSME14030W	Call
1 Wire x 0.040" Diameter	1	5	17/8	3/8	½	2.90	36	104	1800° C	EVSME14040W	Call
Tungsten 3.5 Turn Spiral											
1 Wire x 0.030" Diameter	2	5	17/8	3/8	3/4	4.18	23	96	1800° C	EVSME15030W	Call
1 Wire x 0.040" Diameter	2	5	17/8	3/8	3/4	3.63	34	123	1800° C	EVSME15040W	Call

► Boat Heaters

■ Trough Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.



Boat Heaters

Description	Figure	Thickness	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
				A	B	C (I.D.)	D	Volts	Amps	Watts	Temp.		
Narrow Flat Trough													
Tungsten	1	0.005"	5	1 1/8	3/4	4	5/8	2.25	101	227	1800° C	EVS1005W	Call
Tungsten	1	0.010"	5	1 1/8	3/4	4	5/8	1.79	144	258	1800° C	EVS1010W	Call
Tantalum	1	0.005"	1	1 1/8	3/4	4	5/8	2.72	64	174	1600° C	EVS1005TA	Call
Tantalum	1	0.010"	1	1 1/8	3/4	4	5/8	1.91	96	183	1600° C	EVS1010TA	Call
Molybdenum	1	0.005"	5	1 1/8	3/4	4	5/8	1.29	63	81	1400° C	EVS1005MO	Call
Molybdenum	1	0.010"	5	1 1/8	3/4	4	5/8	0.96	96	92	1400° C	EVS1010MO	Call
Flat Trough													
Tungsten	2	0.005"	5	3/4	3/4	3 1/2	N/A	1.95	100	195	1800° C	EVS3005W	Call
Tungsten	2	0.010"	5	3/4	3/4	3 1/2	N/A	1.47	158	232	1800° C	EVS3010W	Call
Tungsten	2	0.015"	5	3/4	3/4	3 1/2	N/A	1.96	130	255	1800° C	EVS3015W	Call
Tantalum	2	0.005"	5	3/4	3/4	3 1/2	N/A	2.04	64	131	1600° C	EVS3005TA	Call
Tantalum	2	0.010"	5	3/4	3/4	3 1/2	N/A	1.44	92	132	1600° C	EVS3010TA	Call
Molybdenum	2	0.005"	5	3/4	3/4	3 1/2	N/A	0.98	64	63	1400° C	EVS3005MO	Call
Molybdenum	2	0.010"	5	3/4	3/4	3 1/2	N/A	0.77	103	79	1400° C	EVS3010MO	Call
Long Trough													
Tungsten	3	0.005"	5	1 1/2	3/4	4	N/A	2.76	96	265	1800° C	EVS4005W	Call
Tungsten	3	0.010"	5	1 1/2	3/4	4	N/A	2.03	138	280	1800° C	EVS4010W	Call
Tungsten	3	0.015"	1	1 1/2	3/4	4	N/A	1.51	191	288	1800° C	EVS4015W	Call
Tantalum	3	0.005"	5	1 1/2	3/4	4	N/A	2.62	64	168	1600° C	EVS4005TA	Call
Tantalum	3	0.010"	1	1 1/2	3/4	4	N/A	1.83	93	170	1600° C	EVS4010TA	Call
Molybdenum	3	0.005"	5	1 1/2	3/4	4	N/A	1.31	63	83	1400° C	EVS4005MO	Call
Molybdenum	3	0.010"	5	1 1/2	3/4	4	N/A	0.97	93	90	1400° C	EVS4010MO	Call
Inverted Top-Hat Trough Boat													
Tungsten	4	0.005"	5	4	3/4	1 1/2	1/4	3.73	182	679	1800° C	EVS44005W	Call
Tungsten	4	0.010"	1	4	3/4	1 1/2	1/4	2.87	260	746	1800° C	EVS44010W	Call
Tungsten	4	0.015"	1	4	3/4	1 1/2	1/4	2.31	327	755	1800° C	EVS44015W	Call
Tantalum	4	0.005"	1	4	3/4	1 1/2	1/4	3.80	115	437	1600° C	EVS44005TA	Call
Tantalum	4	0.010"	1	4	3/4	1 1/2	1/4	2.90	178	516	1600° C	EVS44010TA	Call
Tantalum	4	0.015"	1	4	3/4	1 1/2	1/4	2.38	220	524	1600° C	EVS44015TA	Call
Molybdenum	4	0.005"	5	4	3/4	1 1/2	1/4	2.05	117	240	1400° C	EVS44005MO	Call
Molybdenum	4	0.010"	5	4	3/4	1 1/2	1/4	1.33	170	226	1400° C	EVS44010MO	Call
Molybdenum	4	0.015"	5	4	3/4	1 1/2	1/4	1.06	207	219	1400° C	EVS44015MO	Call
Inverted Top-Hat Long Trough Boat													
Tungsten	5	0.005"	5	4	1	2 1/8	1/4	4.41	276	1217	1800° C	EVS45005W	Call
Tungsten	5	0.010"	1	4	1	2 1/8	1/4	3.39	394	1336	1800° C	EVS45010W	Call
Tungsten	5	0.015"	1	4	1	2 1/8	1/4	2.72	503	1368	1800° C	EVS45015W	Call
Tantalum	5	0.005"	1	4	1	2 1/8	1/4	4.60	189	869	1600° C	EVS45005TA	Call
Tantalum	5	0.010"	1	4	1	2 1/8	1/4	3.16	257	812	1600° C	EVS45010TA	Call
Tantalum	5	0.015"	1	4	1	2 1/8	1/4	2.55	320	816	1600° C	EVS45015TA	Call
Molybdenum	5	0.005"	5	4	1	2 1/8	1/4	2.11	176	371	1400° C	EVS45005MO	Call
Molybdenum	5	0.010"	5	4	1	2 1/8	1/4	1.45	249	361	1400° C	EVS45010MO	Call
Molybdenum	5	0.015"	5	4	1	2 1/8	1/4	1.29	310	400	1400° C	EVS45015MO	Call
Thin Long Trough Boat													
Tungsten	6	0.010"	5	4	2 3/8	9/16	N/A	2.87	212	608	1800° C	EVS47010W	Call
Tungsten	6	0.015"	5	4	2 3/8	9/16	N/A	2.18	287	626	1800° C	EVS47015W	Call
Tungsten	6	0.020"	5	4	2 3/8	9/16	N/A	2.00	333	666	1800° C	EVS47020W	Call
Tantalum	6	0.010"	5	4	2 3/8	9/16	N/A	2.59	144	373	1600° C	EVS47010TA	Call
Tantalum	6	0.015"	1	4	2 3/8	9/16	N/A	2.06	190	391	1600° C	EVS47015TA	Call
Tantalum	6	0.020"	1	4	2 3/8	9/16	N/A	1.91	210	401	1600° C	EVS47020TA	Call
Molybdenum	6	0.010"	5	4	2 3/8	9/16	N/A	1.18	142	168	1400° C	EVS47010MO	Call
Molybdenum	6	0.015"	5	4	2 3/8	9/16	N/A	1.00	179	179	1400° C	EVS47015MO	Call

Description	Figure	Thickness	No. per Pack	Dimensions (in.)						Power Requirements				Part No.	Price
				A	B	C	D	E	F	Volts	Amps	Watts	Temp.		
Thin Trough Boat															
Tungsten	7	0.005"	5	3 7/8	5/16	2	N/A	N/A	N/A	3.67	81	297	1800° C	EVS48005W	Call
Tungsten	7	0.010"	5	3 7/8	5/16	2	N/A	N/A	N/A	2.82	115	324	1800° C	EVS48010W	Call
Tantalum	7	0.010"	5	3 7/8	5/16	2	N/A	N/A	N/A	2.41	81	195	1600° C	EVS48010TA	Call
Molybdenum	7	0.010"	5	3 7/8	5/16	2	N/A	N/A	N/A	1.24	75	93	1400° C	EVS48010MO	Call



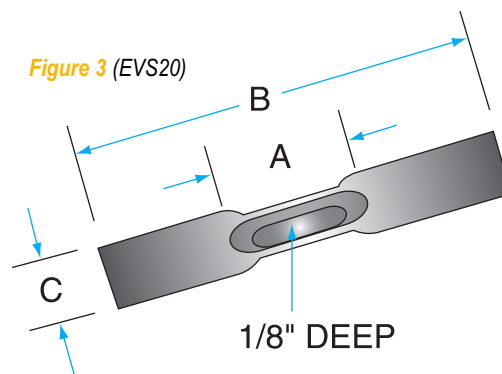
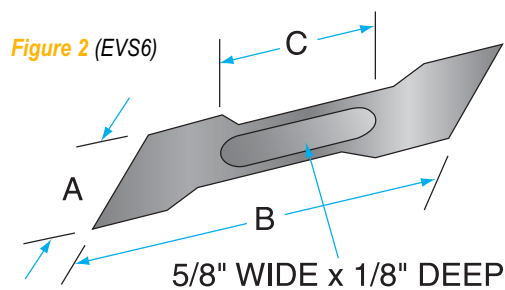
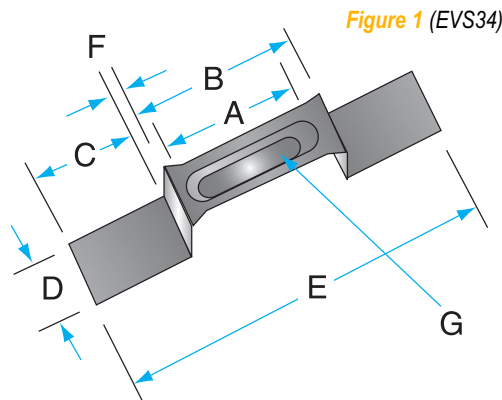
Evaporation Sources

► Boat Heaters

■ Trough Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.



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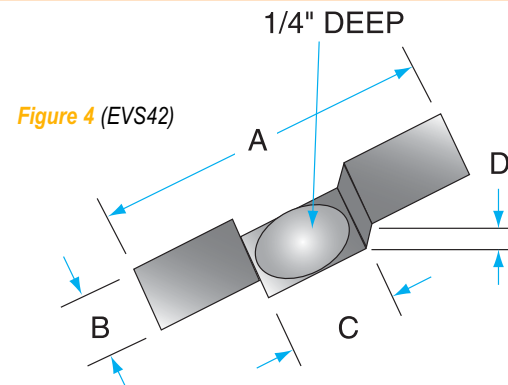
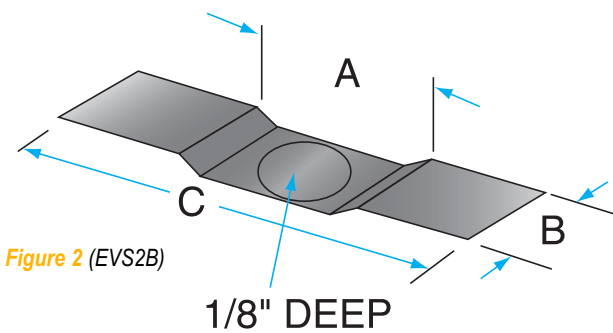
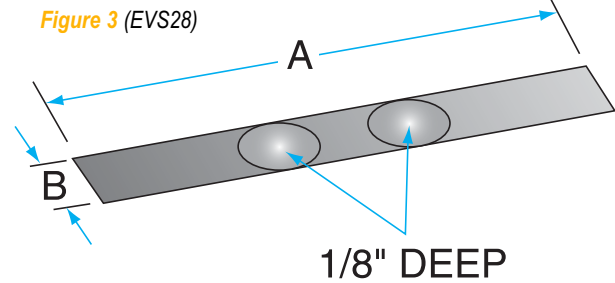
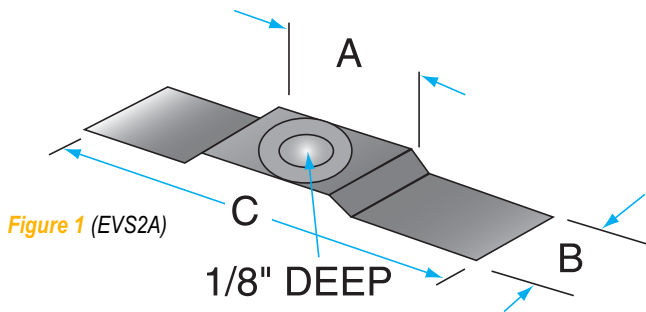
Evaporation Sources

Description	Figure	Thickness	No. per Pack	Dimensions (in.)							Power Requirements				Part No.	Price
				A	B	C	D	E	F	G	Volts	Amps	Watts	Temp.		
Top-Hat Trough Boat																
Tungsten	1	0.005"	5	1	2	1	1	4	3/4	1/8	3.46	181	626	1800° C	EVS34005W	Call
Tungsten	1	0.010"	1	1	2	1	1	4	3/4	1/8	2.66	259	689	1800° C	EVS34010W	Call
Tantalum	1	0.005"	1	1	2	1	1	4	3/4	1/8	3.82	135	516	1600° C	EVS34005TA	Call
Tantalum	1	0.010"	1	1	2	1	1	4	3/4	1/8	2.75	177	487	1600° C	EVS34010TA	Call
Molybdenum	1	0.005"	5	1	2	1	1	4	3/4	1/8	1.70	123	209	1400° C	EVS34005MO	Call
Molybdenum	1	0.010"	5	1	2	1	1	4	3/4	1/8	1.25	169	211	1400° C	EVS34010MO	Call

Description	Figure	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
				A	B	C	Volts	Amps	Watts	Temp.		
Pan Boat												
Tungsten	2	0.005"	5	3/4	3	1	3.04	199	605	1800° C	EVS6005W	Call
Tungsten	2	0.010"	5	3/4	3	1	2.14	263	563	1800° C	EVS6010W	Call
Tungsten	2	0.005"	5	3/4	3	1	2.77	133	368	1600° C	EVS6005TA	Call
Tungsten	2	0.010"	5	3/4	3	1	2.00	186	372	1600° C	EVS6010TA	Call
Molybdenum	2	0.005"	5	3/4	3	1	1.46	123	180	1400° C	EVS6005MO	Call
Molybdenum	2	0.010"	5	3/4	3	1	0.99	181	179	1400° C	EVS6010MO	Call
Narrowed Boat Heater												
Tungsten	3	0.005"	5	1 1/2	4	1/2	3.95	140	533	1800° C	EVS20A005W	Call
Tungsten	3	0.010"	5	1 1/2	4	1/2	2.90	196	568	1800° C	EVS20A010W	Call
Tungsten	3	0.015"	5	1 1/2	4	1/2	2.10	250	525	1800° C	EVS20A015W	Call
Tantalum	3	0.005"	5	1 1/2	4	1/2	3.40	94	320	1600° C	EVS20A005TA	Call
Tantalum	3	0.010"	5	1 1/2	4	1/2	2.61	129	337	1600° C	EVS20A010TA	Call
Molybdenum	3	0.005"	5	1 1/2	4	1/2	1.84	81	149	1400° C	EVS20A005MO	Call
Molybdenum	3	0.010"	5	1 1/2	4	1/2	1.27	129	164	1400° C	EVS20A010MO	Call

► **Boat Heaters**

■ **Dimple Boat Sources**



Description	Figure	Thickness	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
				A	B	C (I.D.)	D	Volts	Amps	Watts	Temp.		
Top-Hat Dimple													
Tungsten	1	0.005"	5	1	1/2	3 1/2	N/A	3.85	140	539	1800° C	EVS2A005W	Call
Tungsten	1	0.010"	5	1	1/2	3 1/2	N/A	2.57	185	475	1800° C	EVS2A010W	Call
Tungsten	1	0.015"	5	1	1/2	3 1/2	N/A	2.20	242	532	1800° C	EVS2A015W	Call
Tantalum	1	0.005"	5	1	1/2	3 1/2	N/A	3.37	100	337	1600° C	EVS2A005TA	Call
Tantalum	1	0.010"	5	1	1/2	3 1/2	N/A	2.27	133	302	1600° C	EVS2A010TA	Call
Molybdenum	1	0.005"	5	1	1/2	3 1/2	N/A	1.72	86	148	1400° C	EVS2A005MO	Call
Molybdenum	1	0.010"	5	1	1/2	3 1/2	N/A	1.13	130	147	1400° C	EVS2A010MO	Call
Inverted Top-Hat Dimple													
Tungsten	2	0.005"	5	1	1/2	3 1/2	N/A	3.87	140	542	1800° C	EVS2B005W	Call
Tungsten	2	0.010"	5	1	1/2	3 1/2	N/A	2.58	187	482	1800° C	EVS2B010W	Call
Tungsten	2	0.015"	5	1	1/2	3 1/2	N/A	2.06	245	505	1800° C	EVS2B015W	Call
Tantalum	2	0.005"	5	1	1/2	3 1/2	N/A	3.42	97	332	1600° C	EVS2B005TA	Call
Tantalum	2	0.010"	5	1	1/2	3 1/2	N/A	2.33	130	303	1600° C	EVS2B010TA	Call
Molybdenum	2	0.005"	5	1	1/2	3 1/2	N/A	1.15	119	137	1400° C	EVS2B005MO	Call
Molybdenum	2	0.010"	5	1	1/2	3 1/2	N/A	1.10	131	144	1400° C	EVS2B010MO	Call
Double Dimple Boat													
Molybdenum	3	0.005"	5	4	1/2	N/A	—	1.92	86	165	1400° C	EVS28005MO	Call
Molybdenum	3	.0010"	5	4	1/2	N/A	—	1.27	127	161	1400° C	EVS28010MO	Call
Tantalum	3	0.005"	5	4	1/2	N/A	—	3.74	92	344	1600° C	EVS28005TA	Call
Tantalum	3	0.010"	5	4	1/2	N/A	—	2.69	132	355	1600° C	EVS28010TA	Call
Tungsten	3	0.005"	5	4	1/2	N/A	—	3.81	131	499	1800° C	EVS28005W	Call
Tungsten	3	0.010"	1	4	1/2	N/A	—	2.93	187	548	1800° C	EVS28010W	Call

Description	Figure	Thickness	No. per Pack	Dimensions (in.)						Power Requirements				Part No.	Price
				A	B	C	D	E	F	Volts	Amps	Watts	Temp.		
Inverted Top-Hat Dimple Boat															
Tungsten	4	0.005"	5	4	1	3/4	1/4	N/A	N/A	3.67	188	690	1800° C	EVS42005W	Call
Tungsten	4	0.010"	1	4	1	3/4	1/4	N/A	N/A	2.82	269	759	1800° C	EVS42010W	Call
Tungsten	4	0.015"	1	4	1	3/4	1/4	N/A	N/A	2.57	508	1306	1800° C	EVS42015W	Call
Tantalum	4	0.010"	1	4	1	3/4	1/4	N/A	N/A	3.35	281	941	1600° C	EVS42010TA	Call
Tantalum	4	0.015"	1	4	1	3/4	1/4	N/A	N/A	2.61	328	856	1600° C	EVS42015TA	Call
Molybdenum	4	0.010"	5	4	1	3/4	1/4	N/A	N/A	1.58	249	393	1400° C	EVS42010MO	Call
Molybdenum	4	0.015"	5	4	1	3/4	1/4	N/A	N/A	1.27	310	394	1400° C	EVS42015MO	Call

► Boat Heaters

■ Dimple Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.

Figure 1 (EVS7)

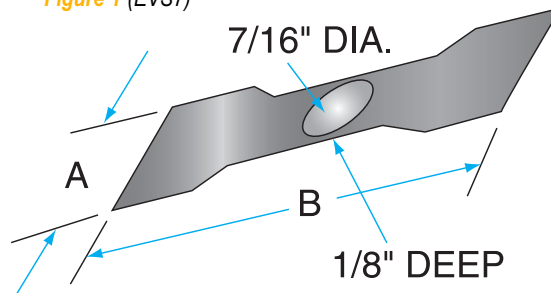


Figure 2 (EVS9A)

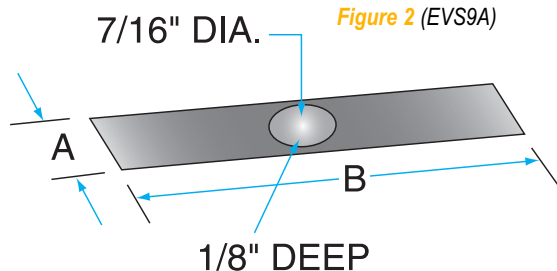


Figure 5 (EVS9D)

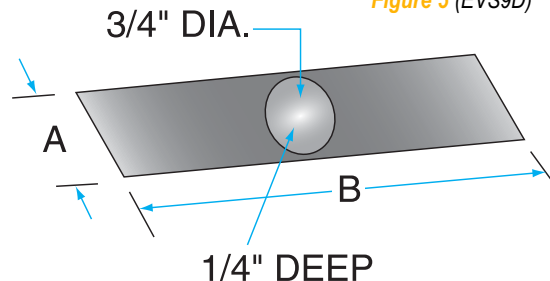


Figure 3 (EVS9B)

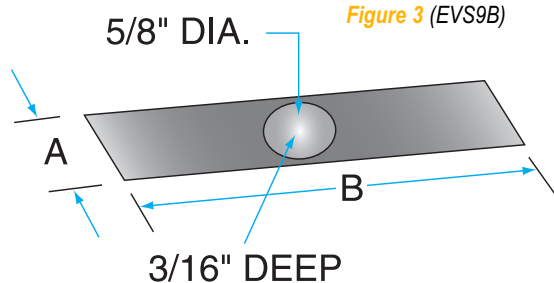


Figure 6 (EVS9E)

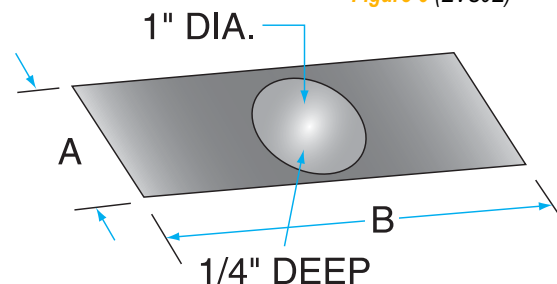


Figure 4 (EVS9C)

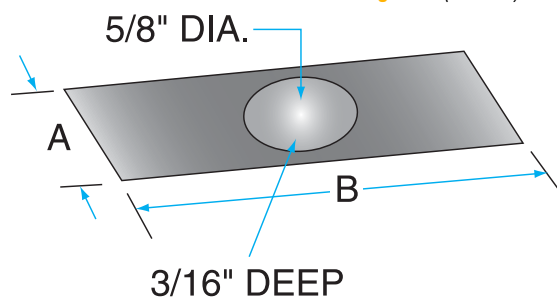
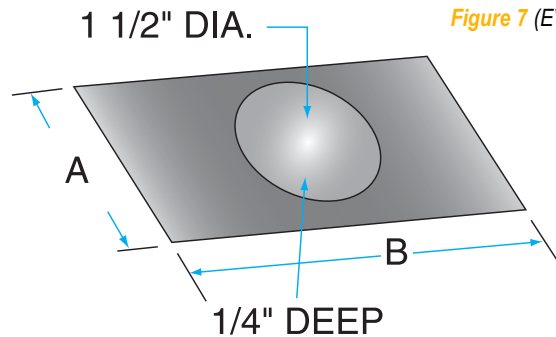


Figure 7 (EVS9F)



Dimple Boat Sources

Description	Figure	Thickness	No. per Pack	Dimensions (in.)		Power Requirements				Part No.	Price
				A	B	Volts	Amps	Watts	Temp.		
Dimple Boat											
Tungsten	1	0.005"	5	3/4	3	2.49	181	451	1800° C	EVS7005W	Call
Tungsten	1	0.010"	5	3/4	3	1.92	258	495	1800° C	EVS7010W	Call
Tantalum	1	0.005"	5	3/4	3	2.48	138	342	1600° C	EVS7005TA	Call
Tantalum	1	0.010"	5	3/4	3	1.80	155	279	1600° C	EVS7010TA	Call
Molybdenum	1	0.005"	5	3/4	3	1.21	108	131	1400° C	EVS7005MO	Call
Molybdenum	1	0.010"	5	3/4	3	0.96	180	173	1400° C	EVS7010MO	Call
Tungsten	2	0.005"	5	1/2	4	3.95	185	731	1800° C	EVS9A005W	Call
Tungsten	2	0.010"	5	1/2	4	2.84	194	551	1800° C	EVS9A010W	Call
Tungsten	2	0.015"	5	1/2	4	2.29	253	579	1800° C	EVS9A015W	Call
Tantalum	2	0.005"	5	1/2	4	3.80	93	353	1600° C	EVS9A005TA	Call
Tantalum	2	0.010"	5	1/2	4	2.69	135	363	1600° C	EVS9A010TA	Call
Molybdenum	2	0.005"	5	1/2	4	1.70	87	148	1400° C	EVS9A005MO	Call
Molybdenum	2	0.010"	5	1/2	4	1.25	121	151	1400° C	EVS9A010MO	Call
Tungsten	3	0.005"	5	3/4	4	3.5	280	980	1800° C	EVS9B005W	Call
Tungsten	3	0.010"	5	3/4	4	3.10	325	1008	1800° C	EVS9B010W	Call
Tungsten	3	0.015"	5	3/4	4	2.76	386	1065	1800° C	EVS9B015W	Call
Tantalum	3	0.005"	5	3/4	4	4.43	146	647	1600° C	EVS9B005TA	Call
Tantalum	3	0.010"	1	3/4	4	2.98	207	617	1600° C	EVS9B010TA	Call
Molybdenum	3	0.005"	5	3/4	4	2.01	132	265	1400° C	EVS9B005MO	Call
Molybdenum	3	0.010"	5	3/4	4	1.30	186	242	1400° C	EVS9B010MO	Call
Tungsten	4	0.010"	5	1	4	3.08	407	1254	1800° C	EVS9C010W	Call
Tantalum	4	0.010"	1	1	4	3.27	281	919	1600° C	EVS9C010TA	Call
Tantalum	4	0.015"	1	1	4	2.31	333	769	1600° C	EVS9C015TA	Call
Molybdenum	4	0.010"	5	1	4	1.36	257	350	1400° C	EVS9C010MO	Call
Molybdenum	4	0.015"	5	1	4	1.09	315	343	1400° C	EVS9C015MO	Call
Tungsten	5	0.010"	5	1	4	3.06	411	1258	1800° C	EVS9D010W	Call
Tantalum	5	0.010"	1	1	4	2.89	262	757	1600° C	EVS9D010TA	Call
Tantalum	5	0.015"	1	1	4	2.35	333	783	1600° C	EVS9D015TA	Call
Tantalum	5	0.025"	1	1	4	1.86	431	802	1600° C	EVS9D025TA	Call
Molybdenum	5	0.010"	5	1	4	1.34	260	348	1400° C	EVS9D010MO	Call
Molybdenum	5	0.015"	5	1	4	1.12	318	356	1400° C	EVS9D015MO	Call
Tungsten	6	0.010"	1	1 1/4	4	3.21	525	1685	1800° C	EVS9E010W	Call
Tantalum	6	0.010"	1	1 1/4	4	2.97	340	1010	1600° C	EVS9E010TA	Call
Tantalum	6	0.015"	1	1 1/4	4	2.00	366	732	1600° C	EVS9E015TA	Call
Tantalum	6	0.025"	1	1 1/4	4	1.93	539	1040	1600° C	EVS9E025TA	Call
Molybdenum	6	0.010"	5	1 1/4	4	1.36	316	430	1400° C	EVS9E010MO	Call
Molybdenum	6	0.015"	5	1 1/4	4	1.12	417	467	1400° C	EVS9E015MO	Call
Tungsten	7	0.010"	1	2 1/8	4	3.31	811	2684	1800° C	EVS9F010W	Call
Tantalum	7	0.010"	1	2 1/8	4	3.12	601	1875	1600° C	EVS9F010TA	Call
Tantalum	7	0.015"	1	2 1/8	4	2.70	721	1947	1600° C	EVS9F015TA	Call
Tantalum	7	0.025"	1	2 1/8	4	2.50	948	2370	1600° C	EVS9F025TA	Call
Molybdenum	7	0.010"	5	2 1/8	4	1.61	559	900	1400° C	EVS9F010MO	Call
Molybdenum	7	0.015"	5	2 1/8	4	1.44	682	982	1400° C	EVS9F015MO	Call

NOTE: Refer to our Material Deposition Table starting on page 17-12 for technical help and thermal evaporation source recommendations.

Evaporation Sources

► Boat Heaters

■ Notched Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.

Notched boats isolate the "hot zone" to the area between the notches.

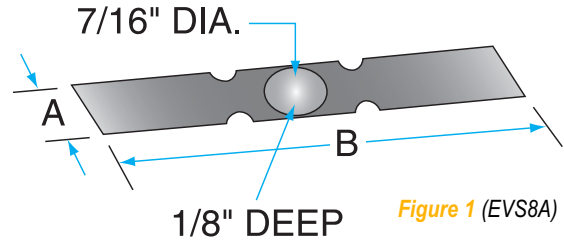


Figure 1 (EVS8A)

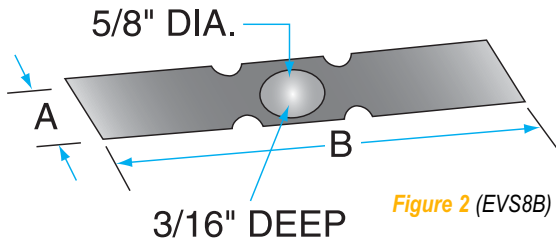
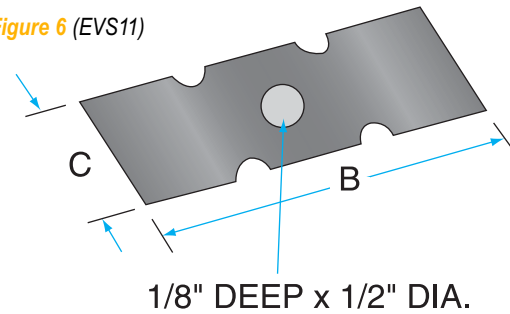


Figure 2 (EVS8B)

Figure 6 (EVS11)



1/8" DEEP x 1/2" DIA.

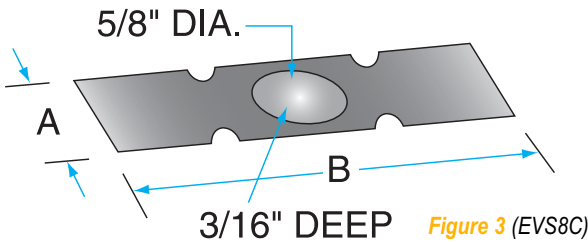
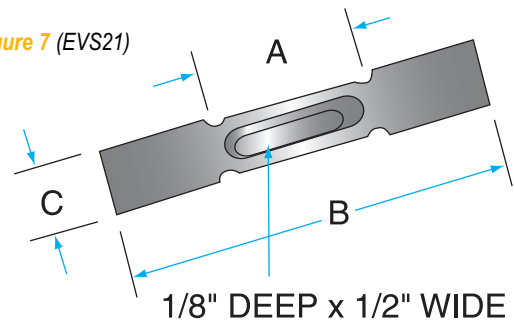


Figure 3 (EVS8C)

Figure 7 (EVS21)



1/8" DEEP x 1/2" WIDE

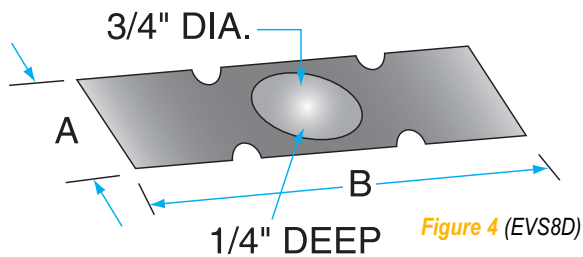
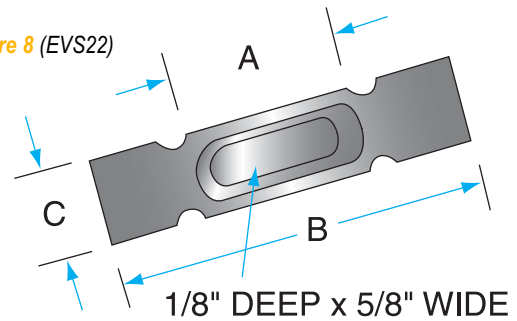


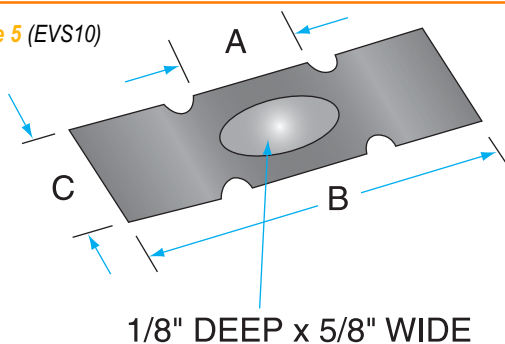
Figure 4 (EVS8D)

Figure 8 (EVS22)



1/8" DEEP x 5/8" WIDE

Figure 5 (EVS10)



1/8" DEEP x 5/8" WIDE

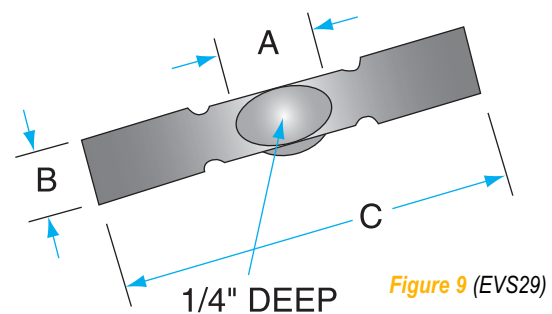


Figure 9 (EVS29)

➤ **Boat Heaters**

Description	Figure	Thickness	No. per Pack	Dimensions (in.)		Power Requirements				Part No.	Price
				A	B	Volts	Amps	Watts	Temp.		
Notched Dimple											
Tungsten	1	0.005"	5	1/2	4	4.96	136	675	1800° C	EVS8A005W	Call
Tungsten	1	0.010"	5	1/2	4	3.11	185	575	1800° C	EVS8A010W	Call
Tungsten	1	0.015"	5	1/2	4	2.37	234	555	1800° C	EVS8A015W	Call
Tantalum	1	0.005"	5	1/2	4	4.44	92	408	1600° C	EVS8A005TA	Call
Tantalum	1	0.010"	5	1/2	4	2.92	129	377	1600° C	EVS8A010TA	Call
Molybdenum	1	0.005"	5	1/2	4	1.95	78	152	1400° C	EVS8A005MO	Call
Molybdenum	1	0.010"	5	1/2	4	1.33	112	149	1400° C	EVS8A010MO	Call
Notched Dimple Boat											
Tungsten	2	0.005"	5	3/4	4	3.71	204	757	1800° C	EVS8B005W	Call
Tungsten	2	0.010"	5	3/4	4	2.85	292	832	1800° C	EVS8B010W	Call
Tungsten	2	0.015"	5	3/4	4	2.24	374	838	1800° C	EVS8B015W	Call
Tantalum	2	0.005"	1	3/4	4	4.44	139	617	1600° C	EVS8B005TA	Call
Tantalum	2	0.010"	1	3/4	4	2.86	190	543	1600° C	EVS8B010TA	Call
Molybdenum	2	0.005"	5	3/4	4	1.92	123	236	1400° C	EVS8B005MO	Call
Molybdenum	2	0.010"	5	3/4	4	1.40	170	238	1400° C	EVS8B010MO	Call
Notched Dimple Boat											
Tungsten	3	0.010"	1	1	4	2.99	387	1157	1800° C	EVS8C010W	Call
Tungsten	3	0.010"	1	1	4	2.97	276	820	1600° C	EVS8C010TA	Call
Tantalum	3	0.015"	1	1	4	2.37	337	799	1600° C	EVS8C015TA	Call
Tantalum	3	0.015"	5	1	4	1.07	300	321	1400° C	EVS8C015MO	Call
Molybdenum	3	0.010"	5	1	4	1.27	241	306	1400° C	EVS8C010MO	Call
Notched Dimple Boat											
Tungsten	4	0.010"	1	1	4	2.94	378	1111	1800° C	EVS8D010W	Call
Tantalum	4	0.010"	1	1	4	2.97	262	778	1600° C	EVS8D010TA	Call
Tantalum	4	0.015"	1	1	4	2.37	325	770	1600° C	EVS8D015TA	Call
Molybdenum	4	0.010"	5	1	4	1.27	241	306	1400° C	EVS8D010MO	Call
Molybdenum	4	0.015"	5	1	4	1.11	300	333	1400° C	EVS8D015MO	Call

Description	Figure	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
				A	B	C	Volts	Amps	Watts	Temp.		
Notched Pan Dimple Boat												
Tungsten	5	0.005"	5	1	4	1	4.4	267	1175	1800° C	EVS10005W	Call
Tungsten	5	0.010"	1	1	4	1	3.35	381	1276	1800° C	EVS10010W	Call
Tantalum	5	0.005"	5	1	4	1	4.26	193	822	1600° C	EVS10005TA	Call
Tantalum	5	0.010"	1	1	4	1	4.24	194	823	1600° C	EVS10010TA	Call
Molybdenum	5	0.005"	5	1	4	1	2.03	170	345	1400° C	EVS10005MO	Call
Molybdenum	5	0.010"	5	1	4	1	1.34	247	331	1400° C	EVS10010MO	Call
Notched Dimple Boat												
Tungsten	6	0.005"	5	N/A	4	1	3.94	261	1028	1800° C	EVS11005W	Call
Tungsten	6	0.010"	1	N/A	4	1	3.03	372	1127	1800° C	EVS11010W	Call
Tantalum	6	0.005"	5	N/A	4	1	4.10	180	738	1600° C	EVS11005TA	Call
Tantalum	6	0.010"	1	N/A	4	1	2.86	262	749	1800° C	EVS11010TA	Call
Molybdenum	6	0.005"	5	N/A	4	1	1.95	165	322	1400° C	EVS11005MO	Call
Molybdenum	6	0.010"	5	N/A	4	1	1.29	236	304	1400° C	EVS11010MO	Call
Notched Boat												
Tungsten	7	0.005"	5	1 1/2	4	3/4	3.26	144	469	1800° C	EVS21005W	Call
Tungsten	7	0.010"	1	1 1/2	4	3/4	3.28	300	984	1800° C	EVS21010W	Call
Tantalum	7	0.005"	1	1 1/2	4	3/4	4.50	138	621	1600° C	EVS21005TA	Call
Tantalum	7	0.010"	1	1 1/2	4	3/4	2.87	198	568	1600° C	EVS21010TA	Call
Molybdenum	7	0.005"	5	1 1/2	4	3/4	2.11	123	260	1400° C	EVS21005MO	Call
Molybdenum	7	0.010"	5	1 1/2	4	3/4	1.47	184	270	1400° C	EVS21010MO	Call
Tungsten	8	0.005"	5	1	3	3/4	3.32	198	657	1800° C	EVS22005W	Call
Tungsten	8	0.010"	5	1	3	3/4	2.55	283	722	1800° C	EVS22010W	Call
Tantalum	8	0.005"	5	1	3	3/4	2.94	150	441	1600° C	EVS22005TA	Call
Tantalum	8	0.010"	1	1	3	3/4	2.28	209	477	1600° C	EVS22010TA	Call
Molybdenum	8	0.005"	5	1	3	3/4	1.54	122	188	1400° C	EVS22005MO	Call
Molybdenum	8	0.010"	5	1	3	3/4	1.09	190	207	1400° C	EVS22010MO	Call
Deep Cup Notched Boat												
Tungsten	9	0.005"	5	1	1 3/16	4	4.29	316	1356	1800° C	EVS29005W	Call
Tungsten	9	0.010"	1	1	1 3/16	4	3.30	451	1488	1800° C	EVS29010W	Call
Tantalum	9	0.005"	1	1	1 3/16	4	4.50	221	994	1600° C	EVS29005TA	Call
Tantalum	9	0.010"	1	1	1 3/16	4	3.36	322	1082	1600° C	EVS29010TA	Call
Tantalum	9	0.015"	1	1	1 3/16	4	2.56	406	1039	1600° C	EVS29015TA	Call
Molybdenum	9	0.005"	5	1	1 3/16	4	2.10	198	416	1400° C	EVS29005MO	Call
Molybdenum	9	0.010"	5	1	1 3/16	4	1.43	281	402	1400° C	EVS29005MO	Call

► Boat Heaters

■ Canoe Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.

Figure 1 (EVS5)

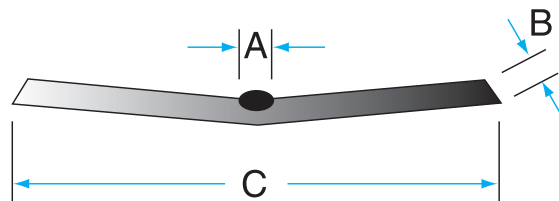


Figure 2 (EVS12)

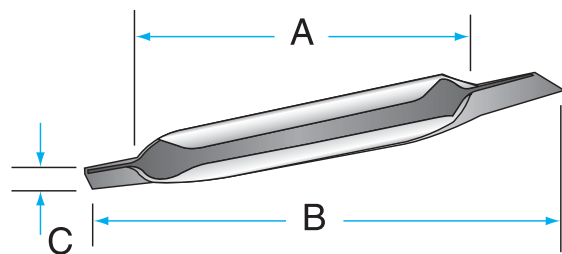


Figure 5 (EVS15)

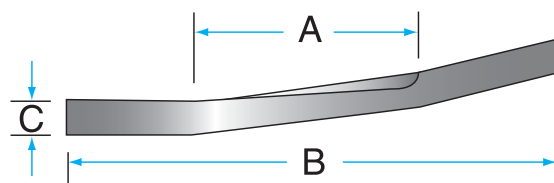


Figure 3 (EVS13)

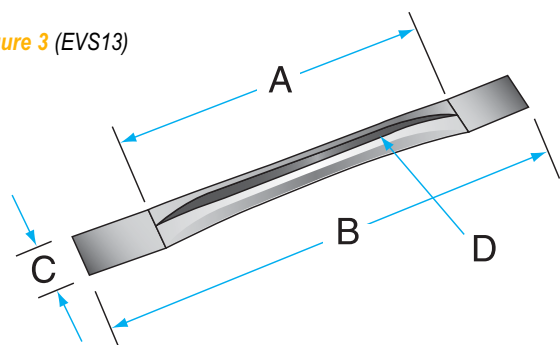


Figure 6 (EVS16)

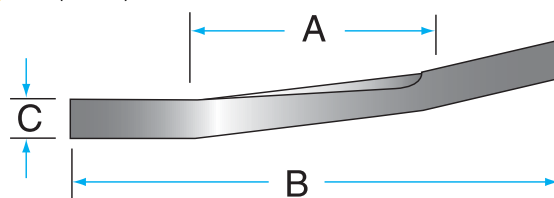


Figure 4 (EVS14)

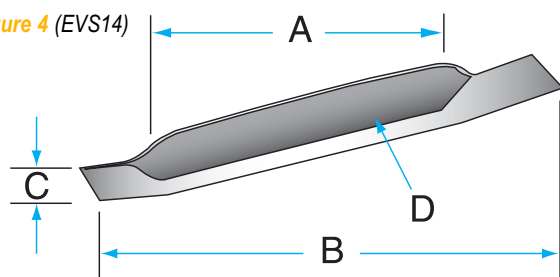
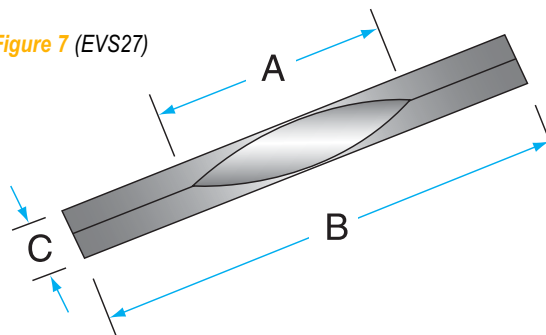


Figure 7 (EVS27)



► **Boat Heaters**

■ **Canoe Boat Sources**

Description	Figure	Thickness	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
				A	B	C	D	Volts	Amps	Watts	Temp.		
Canoe Boat													
Tungsten	1	0.005"	5	3/8	1/2	4	N/A	3.18	199	633	1800° C	EVS5005W	Call
Tantalum	1	0.005"	5	3/8	1/2	4	N/A	3.29	149	490	1600° C	EVS5005TA	Call
Tantalum	1	0.010"	1	3/8	1/2	4	N/A	2.09	220	460	1600° C	EVS5010TA	Call
Molybdenum	1	0.005"	5	3/8	1/2	4	N/A	1.59	133	211	1400° C	EVS5005MO	Call
Molybdenum	1	0.010"	5	3/8	1/2	4	N/A	1.02	208	212	1400° C	EVS5010MO	Call
Tantalum	2	0.005"	1	3	4	3/8	N/A	2.97	197	585	1600° C	EVS12A005TA	Call
Tantalum	2	0.010"	1	3	4	3/8	N/A	2.22	273	606	1600° C	EVS12A010TA	Call
Molybdenum	2	0.005"	5	3	4	3/8	N/A	1.46	181	264	1400° C	EVS12A005MO	Call
Molybdenum	2	0.010"	5	3	4	3/8	N/A	1.11	267	296	1400° C	EVS12A010MO	Call
Tantalum	2	0.005"	1	1 1/2	2 1/2	3/8	N/A	1.82	203	369	1600° C	EVS12B005TA	Call
Tantalum	2	0.010"	1	1 1/2	2 1/2	3/8	N/A	1.48	298	441	1600° C	EVS12B010TA	Call
Molybdenum	2	0.005"	5	1 1/2	2 1/2	3/8	N/A	0.96	196	188	1400° C	EVS12B005MO	Call
Molybdenum	2	0.010"	5	1 1/2	2 1/2	3/8	N/A	0.78	320	250	1400° C	EVS12B010MO	Call
Tungsten	3	0.005"	5	2 1/2	4	3/8	N/A	3.04	149	453	1800° C	EVS13005W	Call
Tantalum	3	0.005"	1	2 1/2	4	3/8	N/A	2.87	110	316	1600° C	EVS13005TA	Call
Tantalum	3	0.010"	1	2 1/2	4	3/8	N/A	1.92	158	303	1600° C	EVS13010TA	Call
Molybdenum	3	0.005"	5	2 1/2	4	3/8	N/A	1.32	106	140	1400° C	EVS13005MO	Call
Molybdenum	3	0.010"	5	2 1/2	4	3/8	N/A	0.97	155	151	1400° C	EVS13010MO	Call
Tungsten	4	0.005"	5	2 1/2	4	1/2	1/2	4.21	283	1191	1800° C	EVS14005W	Call
Tungsten	4	0.010"	1	2 1/2	4	1/2	1/2	2.52	402	1013	1800° C	EVS14010W	Call
Tungsten	4	0.015"	1	2 1/2	4	1/2	1/2	2.40	459	1102	1800° C	EVS14015W	Call
Tantalum	4	0.005"	5	2 1/2	4	1/2	1/2	3.92	179	702	1600° C	EVS14005TA	Call
Tantalum	4	0.010"	1	2 1/2	4	1/2	1/2	2.53	259	655	1600° C	EVS14010TA	Call
Molybdenum	4	0.005"	5	2 1/2	4	1/2	1/2	1.71	170	291	1400° C	EVS14005MO	Call
Molybdenum	4	0.010"	5	2 1/2	4	1/2	1/2	1.19	240	286	1400° C	EVS14010MO	Call
Tungsten	5	0.005"	5	2	4	1/4	N/A	4.08	144	588	1800° C	EVS15005W	Call
Tungsten	5	0.010"	5	2	4	1/4	N/A	3.04	200	608	1800° C	EVS15010W	Call
Tungsten	5	0.015"	5	2	4	1/4	N/A	2.23	249	555	1800° C	EVS15015W	Call
Tantalum	5	0.005"	5	2	4	1/4	N/A	3.80	90	342	1600° C	EVS15005TA	Call
Tantalum	5	0.010"	1	2	4	1/4	N/A	2.86	133	380	1600° C	EVS15010TA	Call
Molybdenum	5	0.005"	5	2	4	1/4	N/A	1.76	86	151	1400° C	EVS15005MO	Call
Molybdenum	5	0.010"	5	2	4	1/4	N/A	1.23	129	159	1400° C	EVS15010MO	Call
Tungsten	6	0.005"	5	1 1/8	1 7/8	3/16	N/A	1.58	110	174	1800° C	EVS16005W	Call
Tungsten	6	0.010"	5	1 1/8	1 7/8	3/16	N/A	1.11	143	159	1800° C	EVS16010W	Call
Tantalum	6	0.005"	5	1 1/8	1 7/8	3/16	N/A	1.49	65	97	1600° C	EVS16005TA	Call
Tantalum	6	0.010"	5	1 1/8	1 7/8	3/16	N/A	1.17	115	135	1600° C	EVS16010TA	Call
Molybdenum	6	0.005"	5	1 1/8	1 7/8	3/16	N/A	0.87	73	64	1400° C	EVS16005MO	Call
Molybdenum	6	0.010"	5	1 1/8	1 7/8	3/16	N/A	0.72	131	94	1400° C	EVS16010MO	Call
Molybdenum	7	0.005"	5	1 1/4	3	3/8	N/A	0.94	94	88	1600° C	EVS27005MO	Call
Molybdenum	7	0.010"	5	1 1/4	3	3/8	N/A	0.75	148	111	1600° C	EVS27010MO	Call
Tantalum	7	0.005"	1	1 1/4	3	3/8	N/A	2.09	99	207	1600° C	EVS27005TA	Call
Tantalum	7	0.010"	1	1 1/4	3	3/8	N/A	1.48	137	203	1600° C	EVS27010TA	Call
Tungsten	7	0.005"	5	1 1/4	3	3/8	N/A	2.22	134	297	1800° C	EVS27005W	Call
Tungsten	7	0.010"	5	1 1/4	3	3/8	N/A	1.57	185	290	1800° C	EVS27010W	Call

NOTE: Refer to our Material Deposition Table starting on page 17-12 for technical help and thermal evaporation source recommendations.

► Boat Heaters

■ Holed/Covered Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.

Figure 1 (EVS17A)

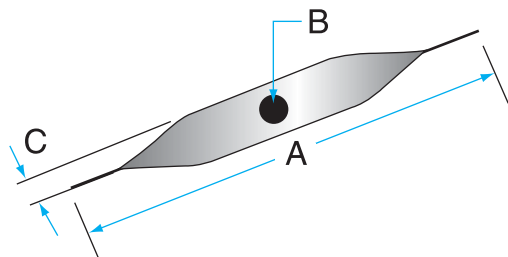
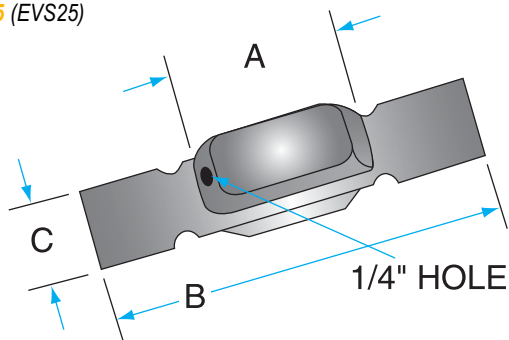


Figure 5 (EVS25)



9

Figure 2 (EVS17B)

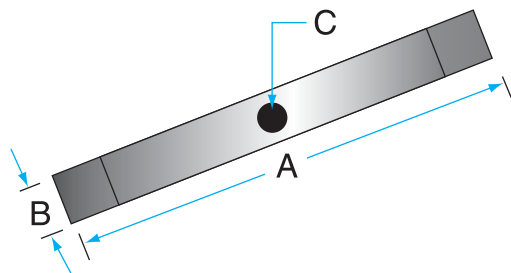
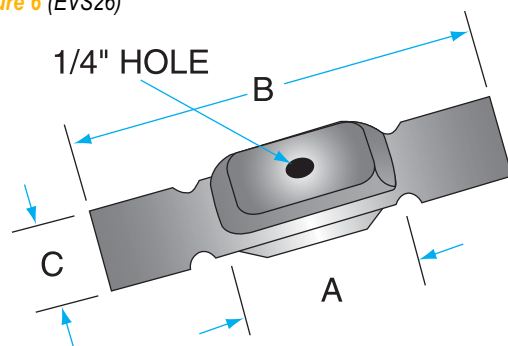


Figure 6 (EVS26)



Evaporation Sources

Figure 3 (EVS23)

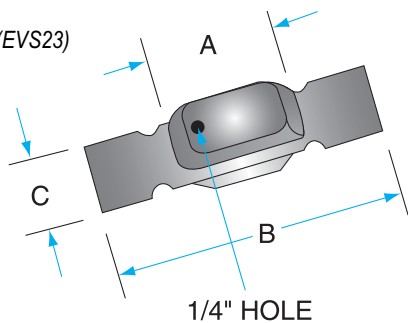


Figure 7 (EVS30)

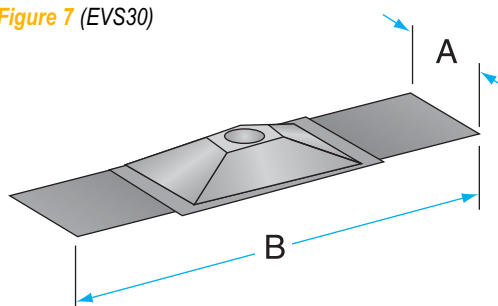


Figure 4 (EVS24)

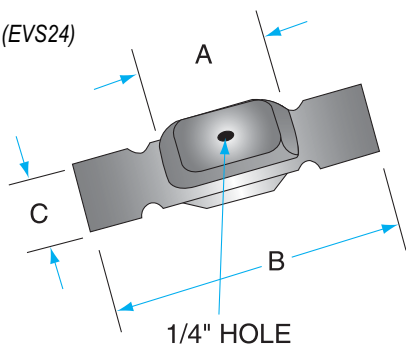
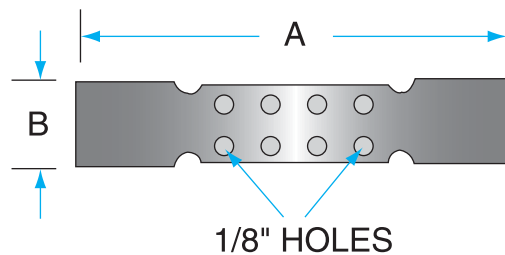


Figure 8 (EVS33)



► **Boat Heaters**

■ **Holed/Covered Boat Sources**

Description	Figure	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
				A	B	C	Volts	Amps	Watts	Temp.		
Holed Boat Heater												
Tantalum	1	0.005"	1	3	1/8	1/4	2.15	158	340	1600° C	EVS17A005TA	Call
Tantalum	1	0.010"	1	3	1/8	1/4	1.40	183	256	1600° C	EVS17A010TA	Call
Tantalum	2	0.005"	1	3	1/4	1/8	1.93	125	241	1600° C	EVS17B005TA	Call
Tantalum	2	0.010"	1	3	1/4	1/8	1.43	187	267	1600° C	EVS17B010TA	Call

Description	Figure	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
				A	B	C	Volts	Amps	Watts	Temp.		
Covered Boat												
Tungsten	3	0.010"	1	1	3	3/4	1.50	375	562	1800° C	EVS23010W	Call
Tantalum	3	0.010"	1	1	3	3/4	1.68	295	496	1600° C	EVS23010TA	Call
Molybdenum	3	0.010"	1	1	3	3/4	0.88	301	265	1400° C	EVS23010MO	Call
Covered Boat (2 Pieces)												
Molybdenum with Center Hole	4	0.005"	5	1	3	3/4	1.24	202	250	1400° C	EVS24005MO	Call
Molybdenum with Center Hole	4	0.010"	1	1	3	3/4	0.83	297	247	1400° C	EVS24010MO	Call
Tantalum with Center Hole	4	0.005"	5	1	3	3/4	2.28	190	433	1600° C	EVS24005TA	Call
Tantalum with Center Hole	4	0.010"	1	1	3	3/4	1.77	329	582	1600° C	EVS24010TA	Call
Tungsten with Center Hole	4	0.005"	1	1	3	3/4	2.21	256	566	1800° C	EVS24005W	Call
Tungsten with Center Hole	4	0.010"	1	1	3	3/4	1.70	386	656	1800° C	EVS24010W	Call
Molybdenum with End Hole	5	0.010"	1	1 1/2	4	3/4	1.14	300	342	1400° C	EVS25010MO	Call
Tantalum with End Hole	5	0.010"	1	1 1/2	4	3/4	2.16	272	588	1600° C	EVS25010TA	Call
Tungsten with End Hole	5	0.010"	1	1 1/2	4	3/4	2.30	375	862	1800° C	EVS25010W	Call
Molybdenum with Center Hole	6	0.010"	1	1 1/2	4	3/4	1.10	278	306	1400° C	EVS26010MO	Call
Tantalum with Center Hole	6	0.010"	1	1 1/2	4	3/4	2.40	293	703	1600° C	EVS26010TA	Call
Tungsten with Center Hole	6	0.010"	1	1 1/2	4	3/4	2.14	383	820	1800° C	EVS26010W	Call
Wrapped/Covered Boat (EVS24 with 0.005" Ta Overwrap to Seal)												
Tungsten	7	0.010"	1	3/4	3	N/A	1.50	444	666	1800° C	EVS30A010W	Call
Tantalum	7	0.010"	1	3/4	3	N/A	—	—	—	—	EVS30A010TA	Call
Molybdenum	7	0.010"	1	3/4	3	N/A	1.05	286	300	1400° C	EVS30010MO	Call
Baffle Insert for EVS25 and EVS26 Boats												
Molybdenum	8	0.005"	1	4	3/4	N/A	1.46	94	137	1400° C	EVS33005MO	Call
Tantalum	8	0.005"	1	4	3/4	N/A	3.27	94	307	1600° C	EVS33005TA	Call
Tungsten	8	0.005"	1	4	3/4	N/A	3.26	144	469	1800° C	EVS33005W	Call

NOTE: Refer to our Material Deposition Table starting on page 17-12 for technical help and thermal evaporation source recommendations.

Related products: Browse our deposition materials offering in Section 10. Custom materials available, contact sales@lesker.com.

2001

iPod®

On October 23, 2001 Apple Computers publicly announced their portable music digital player — the iPod, created under project codename Dulcimer.

Kurt J. Lesker Company moved into their new 60,000 square foot factory in Southwestern Pennsylvania. This facility would accommodate manufacturing expansion, as well as sales and marketing.

► Boat Heaters

■ Well Boat Sources

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.

Figure 1 (EVS37)

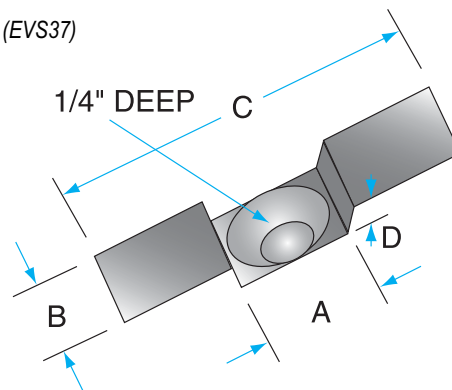


Figure 2 (EVS39)

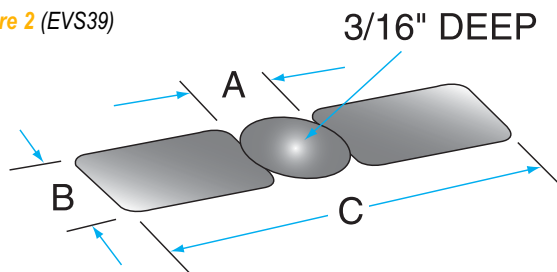
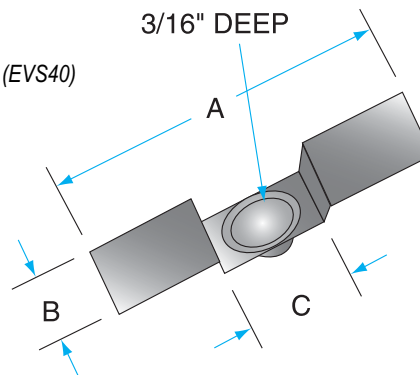


Figure 3 (EVS40)



9

Evaporation Sources

Description	Figure	Thickness	No. per Pack	Dimensions (in.)							Power Requirements				Part No.	Price
				A	B	C	D	E	F	Volts	Amps	Watts	Temp.			
Inverted Top-Hat Deep Well Boat																
Tantalum	1	0.005"	1	1	1 ³ / ₁₆	3 ¹ / ₂	3 ³ / ₁₆	N/A	N/A	4.26	222	946	1600° C	EVS37005TA	Call	
Tantalum	1	0.010"	1	1	1 ³ / ₁₆	3 ¹ / ₂	3 ³ / ₁₆	N/A	N/A	3.21	319	1024	1600° C	EVS37010TA	Call	
Molybdenum	1	0.005"	5	1	1 ³ / ₁₆	3 ¹ / ₂	3 ³ / ₁₆	N/A	N/A	1.84	201	370	1400° C	EVS37005MO	Call	
Molybdenum	1	0.010"	5	1	1 ³ / ₁₆	3 ¹ / ₂	3 ³ / ₁₆	N/A	N/A	1.30	289	376	1400° C	EVS37010MO	Call	
Well Boat																
Tantalum	2	0.005"	5	3/8	9/16	3	N/A	N/A	N/A	2.72	106	288	1600° C	EVS39005TA	Call	
Tantalum	2	0.010"	5	3/8	9/16	3	N/A	N/A	N/A	1.95	165	322	1600° C	EVS39010TA	Call	
Molybdenum	2	0.005"	5	3/8	9/16	3	N/A	N/A	N/A	1.32	100	132	1400° C	EVS39005MO	Call	
Molybdenum	2	0.010"	5	3/8	9/16	3	N/A	N/A	N/A	—	—	—	—	EVS39010MO	Call	
Inverted Top-Hat Well Boat																
Tungsten	3	0.005"	5	3 ¹ / ₂	3/4	1/2	N/A	N/A	N/A	2.71	155	420	1800° C	EVS40005W	Call	
Tantalum	3	0.005"	5	3 ¹ / ₂	3/4	1/2	N/A	N/A	N/A	2.61	120	313	1600° C	EVS40005TA	Call	
Tantalum	3	0.010"	1	3 ¹ / ₂	3/4	1/2	N/A	N/A	N/A	2.01	156	314	1600° C	EVS40010TA	Call	
Molybdenum	3	0.005"	5	3 ¹ / ₂	3/4	1/2	N/A	N/A	N/A	1.39	105	146	1400° C	EVS40005MO	Call	
Molybdenum	3	0.010"	5	3 ¹ / ₂	3/4	1/2	N/A	N/A	N/A	—	—	—	—	EVS40010MO	Call	

► **Boat Heaters**

■ **Wide Dish Boat Sources**

Figure 1 (EVS36)

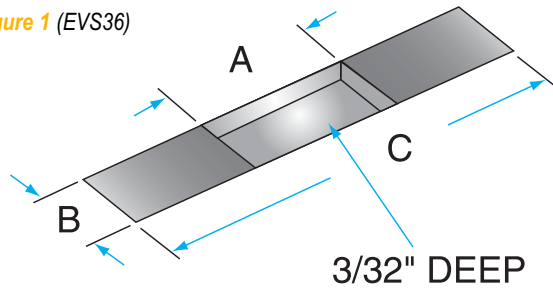


Figure 2 (EVS38)

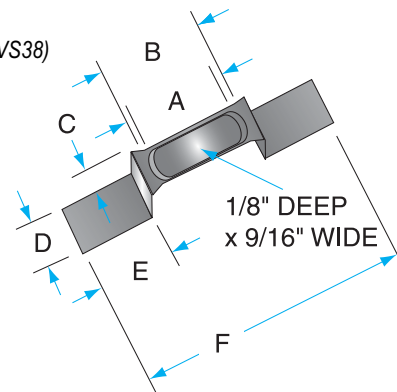
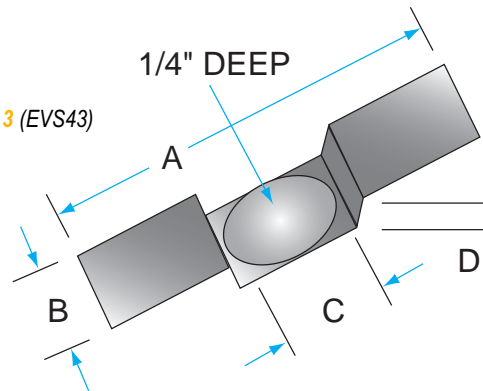


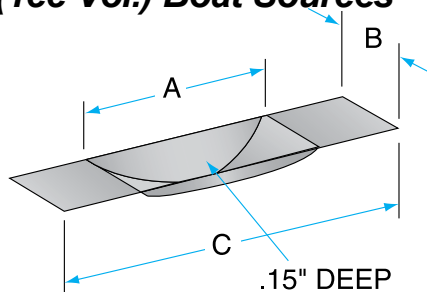
Figure 3 (EVS43)



Description	Figure	Thickness	No. per Pack	Dimensions (in.)						Power Requirements				Part No.	Price
				A	B	C	D	E	F	Volts	Amps	Watts	Temp.		
Wide Dish Boat															
Tungsten	1	0.010"	1	2 1/8	1	4	N/A	N/A	N/A	3.01	391	1177	1800° C	EVS36010W	Call
Tantalum	1	0.010"	1	2 1/8	1	4	N/A	N/A	N/A	2.98	250	745	1600° C	EVS36010TA	Call
Tantalum	1	0.015"	1	2 1/8	1	4	N/A	N/A	N/A	2.27	322	731	1600° C	EVS36015TA	Call
Molybdenum	1	0.005"	5	2 1/8	1	4	N/A	N/A	N/A	—	—	—	—	EVS36005MO	Call
Top-Hat Wide Dish Boat															
Tungsten	2	0.005"	5	1 1/2	2	3/8	3/4	3/4	3 1/2	3.98	169	673	1800° C	EVS38005W	Call
Tungsten	2	0.010"	1	1 1/2	2	3/8	3/4	3/4	3 1/2	2.77	254	704	1800° C	EVS38010W	Call
Tantalum	2	0.005"	1	1 1/2	2	3/8	3/4	3/4	3 1/2	4.01	114	457	1600° C	EVS38005TA	Call
Tantalum	2	0.010"	1	1 1/2	2	3/8	3/4	3/4	3 1/2	2.70	197	532	1600° C	EVS38010TA	Call
Molybdenum	2	0.005"	5	1 1/2	2	3/8	3/4	3/4	3 1/2	1.77	114	202	1400° C	EVS38005MO	Call
Molybdenum	2	0.010"	5	1 1/2	2	3/8	3/4	3/4	3 1/2	1.26	164	207	1400° C	EVS38010MO	Call
Inverted Top-Hat Wide Dish Boat															
Tungsten	3	0.005"	1	4	1 1/4	1	1/4	N/A	N/A	4.59	372	1707	1800° C	EVS43005W	Call
Tungsten	3	0.010"	1	4	1 1/4	1	1/4	N/A	N/A	3.53	531	1874	1800° C	EVS43010W	Call
Tungsten	3	0.015"	1	4	1 1/4	1	1/4	N/A	N/A	2.91	654	1903	1800° C	EVS43015W	Call
Tantalum	3	0.010"	1	4	1 1/4	1	1/4	N/A	N/A	3.48	338	1176	1600° C	EVS43010TA	Call
Tantalum	3	0.015"	1	4	1 1/4	1	1/4	N/A	N/A	2.83	416	1177	1600° C	EVS43015TA	Call
Molybdenum	3	0.010"	5	4	1 1/4	1	1/4	N/A	N/A	1.52	317	482	1400° C	EVS43010MO	Call
Molybdenum	3	0.015"	5	4	1 1/4	1	1/4	N/A	N/A	1.22	389	475	1400° C	EVS43015MO	Call

Boat Heaters

Elongated Dimple Boat (1cc Vol.) Boat Sources



Description	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Elongated Dimple Evaporation Boat (1cc Vol.)											
Tungsten	0.010"	5	1	1/2	2	1.63	214	349	1800° C	EVS31A010W	Call
Tantalum	0.010"	5	1	1/2	2	0.98	119	117	1600° C	EVS31A010TA	Call
Molybdenum	0.010"	5	1	1/2	2	0.53	129	68	1400° C	EVS31A010MO	Call

Flat Boat Sources

Figure 1 (EVS35)

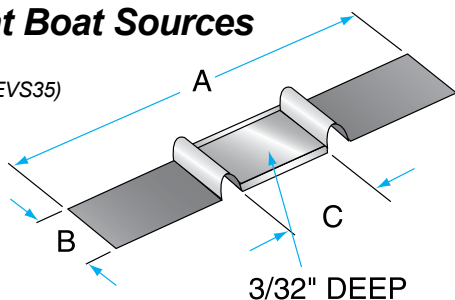
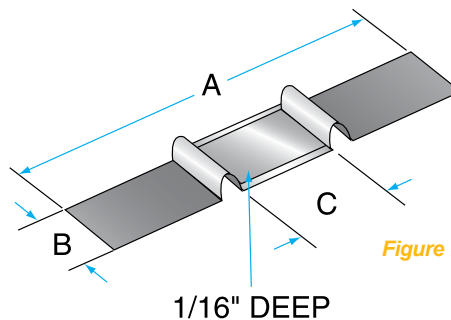
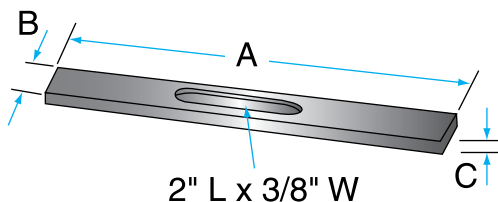


Figure 2 (EVS46)



Description	Figure	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
				A	B	C	Volts	Amps	Watts	Temp.		
Flat Boat												
Tungsten	1	0.005"	5	3/4	1/2	1	3.37	140	472	1800° C	EVS35005W	Call
Tungsten	1	0.010"	5	3/4	1/2	1	2.26	207	468	1800° C	EVS35010W	Call
Tantalum	1	0.005"	5	3/4	1/2	1	3.10	91	282	1600° C	EVS35005TA	Call
Tantalum	1	0.010"	5	3/4	1/2	1	2.13	134	285	1600° C	EVS35010TA	Call
Molybdenum	1	0.005"	5	3/4	1/2	1	1.44	87	125	1400° C	EVS35005MO	Call
Molybdenum	1	0.010"	5	3/4	1/2	1	1.05	124	130	1400° C	EVS35010MO	Call
Flat Boat												
Tungsten	2	0.005"	5	4	1 3/16	1 1/8	4.34	340	1476	1800° C	EVS46005W	Call
Tungsten	2	0.010"	1	4	1 3/16	1 1/8	3.34	485	1620	1800° C	EVS46010W	Call
Tantalum	2	0.005"	1	4	1 3/16	1 1/8	4.87	221	1076	1600° C	EVS46005TA	Call
Tantalum	2	0.010"	1	4	1 3/16	1 1/8	3.20	306	979	1600° C	EVS46010TA	Call
Molybdenum	2	0.005"	5	4	1 3/16	1 1/8	2.10	207	435	1400° C	EVS46005MO	Call
Molybdenum	2	0.010"	5	4	1 3/16	1 1/8	1.49	293	437	1400° C	EVS46010MO	Call

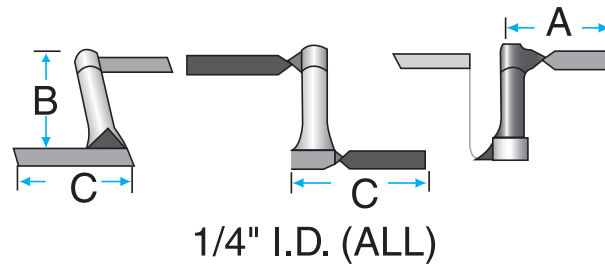
Slab Boat Sources



Description	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Slab Heater											
Carbon	0.25"	1	4	1/2	1/4	11.35	317	3598	2000° C	EVS18C	Call
Boron Nitride	0.25"	1	4	1/2	1/4	—	—	—	—	EVS18BN	Call

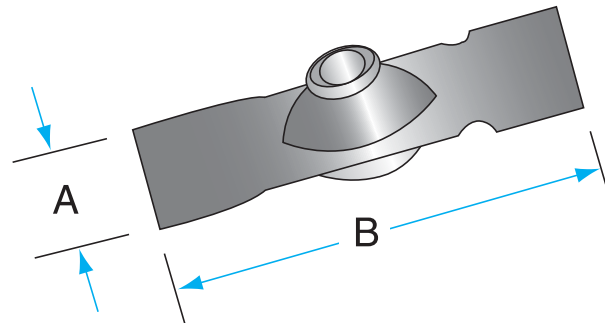
➤ **Boat Heaters**

■ **Closed End Tube Boat Sources**



Description	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Closed End Tube Heater (1/4" I.D.)											
Tantalum	0.25"	1	N/A	1/4	1 1/2	1.71	130	222	1600° C	EVS19ATA	Call
Tantalum	0.25"	1	N/A	N/A	1 1/2	1.83	134	245	1600° C	EVS19BTA	Call
Tantalum	0.25"	1	1 1/2	N/A	N/A	2.64	132	348	1600° C	EVS19CTA	Call

■ **Crucible Boat Sources**



Description	Thickness	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Crucible Heater Bowl (for EVC1 and EVC9 Crucibles)											
Tungsten	0.010"	1	1 3/16	4	N/A	2.38	738	1756	2000° C	EVS32010W	Call

NOTE: Related products, crucibles can be found on pages 9-44 to 9-45.

NOTE: Refer to our Material Deposition Table starting on page 17-12 for technical help and thermal evaporation source recommendations.

9
Evaporation Sources

► Alumina-Coated Boat Heaters

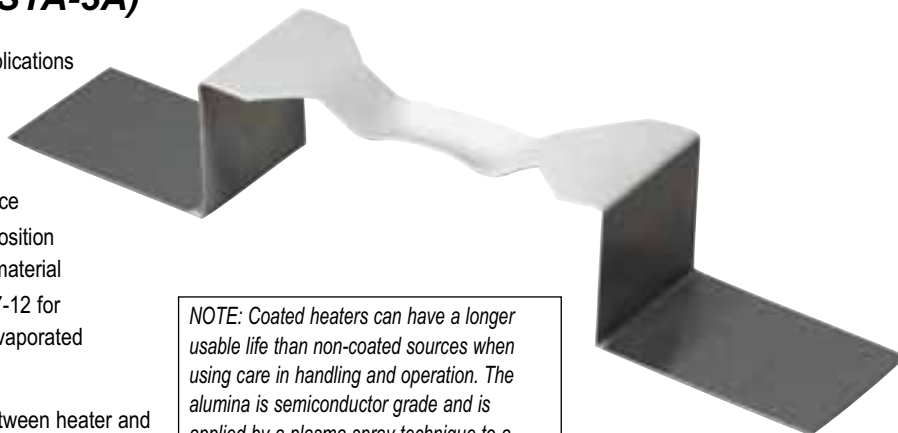
■ Boats—Al₂O₃ Coated (EVS1A-3A)

- Developed to replace alumina crucibles for specific applications
- Offer good heat transfer
- Mostly inert in contact with hot metals
- Evaporant metals do not wet alumina, resulting in the melt forming a “sphere” that acts as a point source
- Heater resistance does not change throughout the deposition since evaporant does not touch the underlying heater material

Refer to our Material Deposition Table starting on page 17-12 for recommendations on specific thermal sources for given evaporated materials.

Because the alumina increases the thermal resistance between heater and evaporant, coated sources require 30–50% more power to achieve the same evaporation rate as an identical but uncoated boat. Another important difference is the thermal lag created by the alumina coating.

Any measurement of temperature in the region of the melt will not be the “equilibrium” temperature unless the power is raised very slowly. Typically, users do not have time for this slow rise and put excess power into the heater until the right evaporation rate is reached. Unfortunately, unless this excess power is then quickly reduced, the melt temperature will quickly rise above the optimum rate value.



NOTE: Coated heaters can have a longer usable life than non-coated sources when using care in handling and operation. The alumina is semiconductor grade and is applied by a plasma spray technique to a thickness of 0.005". The ends of the boat are unsprayed to allow successful connection to the power supply clamps. Coated boats should not be used where the heater temperature must exceed 1850° C to achieve the required evaporation rate.

Evaporation Sources 9

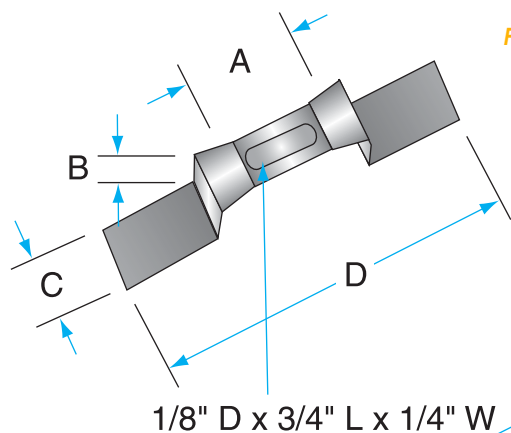


Figure 1 (EVS1)

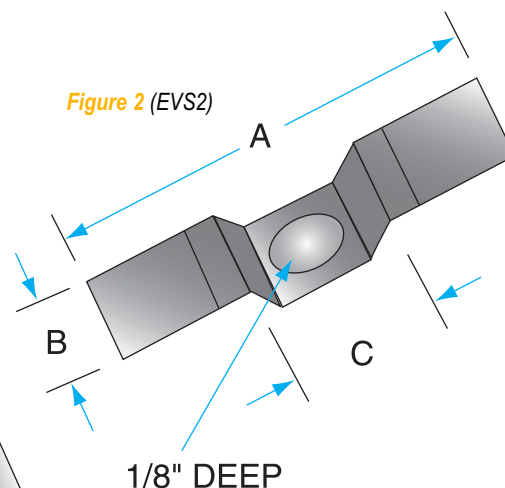


Figure 2 (EVS2)

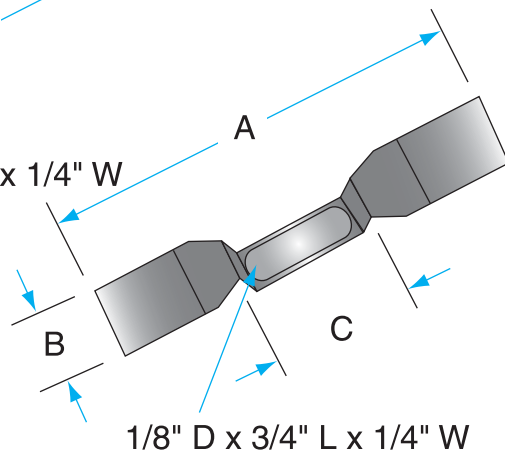


Figure 3 (EVS3)

Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Alumina-Coated Narrow Trough Top-Hat Heater												
Molybdenum	1	5	1 1/8	5/8	3/4	4	0.96	105	100	1200° C	EVS1AOMO	Call
Tungsten	1	1	1 1/8	5/8	3/4	4	1.00	106	106	1200° C	EVS1AOW	Call
Alumina-Coated Inverted Top-Hat Dimpled Boat Heater												
Molybdenum	2	5	3 1/2	1/2	1	N/A	1.12	141	158	1200° C	EVS2BAOMO	Call
Tungsten	2	1	3 1/2	1/2	1	N/A	1.13	141	159	1200° C	EVS2BAOW	Call
Alumina-Coated Inverted Top-Hat Trough Heater												
Molybdenum	3	5	3 1/2	3/4	1	N/A	0.79	114	90	1200° C	EVS3AOMO	Call
Tungsten	3	5	3 1/2	3/4	1	N/A	0.83	117	97	1200° C	EVS3AOW	Call

► Alumina-Coated Boat Heaters

■ Boats—Al₂O₃ Coated

Figure 1 (EVS8)

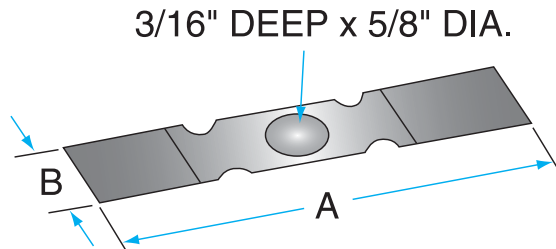


Figure 4 (EVS9C)

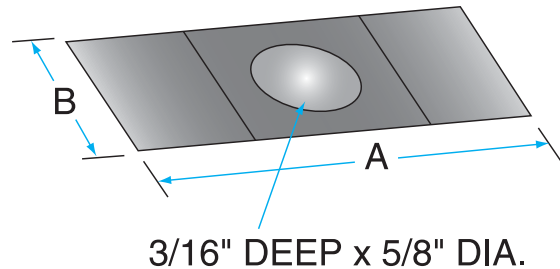


Figure 2 (EVS9A)

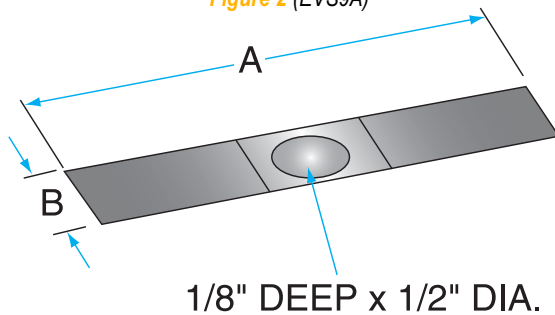


Figure 5 (EVS9F)

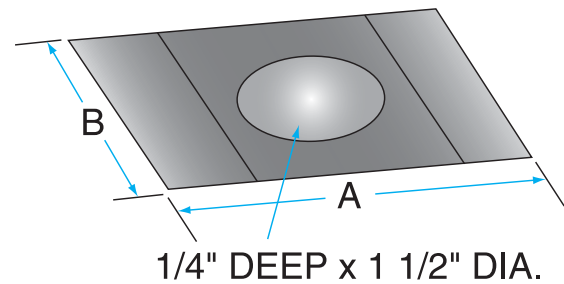


Figure 3 (EVS9B)

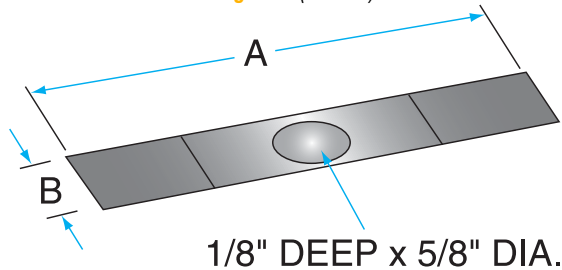
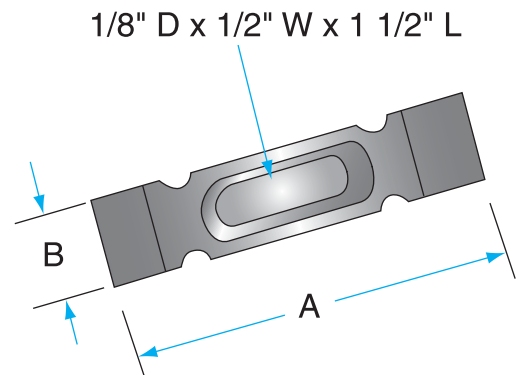


Figure 6 (EVS21)



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Alumina-Coated Notched Dimple Boat Heater												
Molybdenum	1	5	4	1	N/A	N/A	1.31	253	331	1200° C	EVS8CAOMO	Call
Tungsten	1	1	4	1	N/A	N/A	1.27	257	326	1200° C	EVS8CAOW	Call
Alumina-Coated Dimple Boat												
Molybdenum	2	5	4	1/2	N/A	N/A	1.21	130	157	1200° C	EVS9AAOMO	Call
Tungsten	2	5	4	1/2	N/A	N/A	1.17	125	146	1200° C	EVS9AAOW	Call
Molybdenum	3	5	4	3/4	N/A	N/A	1.34	201	269	1200° C	EVS9BAOMO	Call
Tungsten	3	1	4	3/4	N/A	N/A	1.29	190	245	1200° C	EVS9BAOW	Call
Molybdenum	4	5	4	1	N/A	N/A	1.14	248	283	1200° C	EVS9CAOMO	Call
Tungsten	4	1	4	1	N/A	N/A	1.35	268	362	1200° C	EVS9CAOW	Call
Alumina-Coated Dimple Wide Boat												
Molybdenum	5	1	4	2 1/4	N/A	N/A	1.50	586	879	1200° C	EVS9FAOMO	Call
Tungsten	5	1	4	2 1/4	N/A	N/A	1.40	635	889	1200° C	EVS9FAOW	Call
Alumina-Coated Notched Long Trough Boat												
Molybdenum	6	5	4	3/4	N/A	N/A	1.34	207	277	1200° C	EVS21AOMO	Call
Tungsten	6	1	4	3/4	N/A	N/A	1.47	204	300	1200° C	EVS21AOW	Call

► Alumina-Coated Boat Heaters

■ Boats—Al₂O₃ Coated

- Developed to replace alumina crucibles for specific applications
- Mostly inert in contact with hot metals
- Evaporant metals do not wet alumina, resulting in the melt forming a “sphere” that acts as a point source

Figure 1 (EVS29)

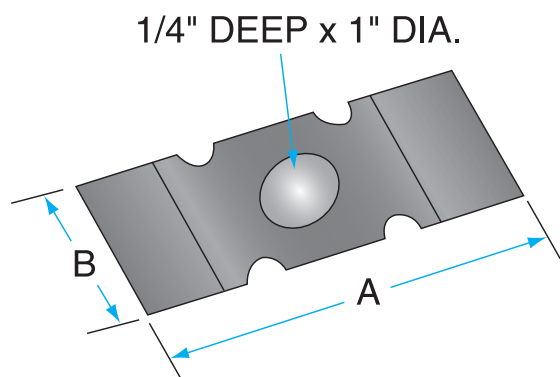


Figure 3 (EVS36A)

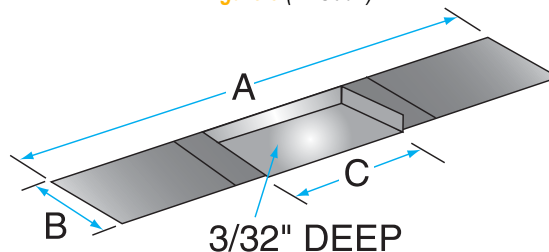


Figure 4 (EVS37)

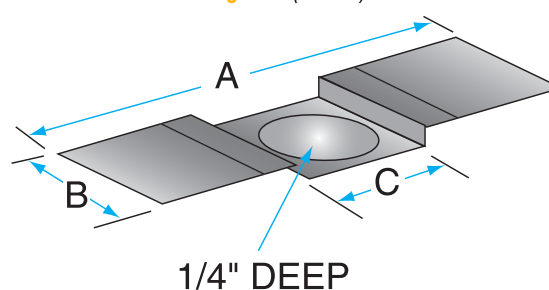


Figure 2 (EVS35A)

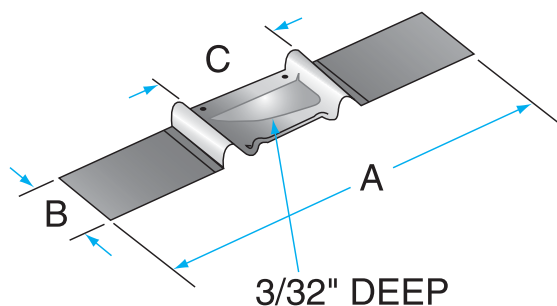
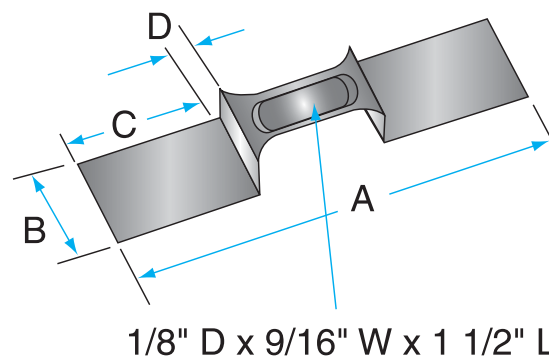


Figure 5 (EVS38A)



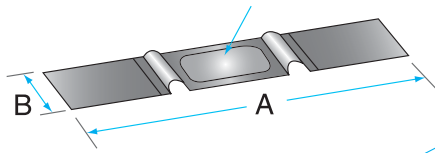
Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price	
			A	B	C	D	Volts	Amps	Watts	Temp.			
Alumina-Coated Notched Dimple Boat													
Molybdenum	1	1	4	1 ³ / ₁₆	N/A	N/A	1.41	220	310	1200° C	EVS29AOMO	Call	
Tungsten	1	1	4	1 ³ / ₁₆	N/A	N/A	1.34	294	394	1200° C	EVS29AOW	Call	
Alumina-Coated Flat Boat													
Molybdenum	2	5	3 ³ / ₄	1/2	1	N/A	1.05	144	151	1200° C	EVS35AAOMO	Call	
Tungsten	2	5	3 ³ / ₄	1/2	1	N/A	0.95	135	129	1200° C	EVS35AAOW	Call	
Alumina-Coated Long Trough Boat													
Molybdenum	3	5	4	1	2 ¹ / ₈	N/A	1.34	289	387	1200° C	EVS36AOMO	Call	
Tungsten	3	1	4	1	2 ¹ / ₈	N/A	1.25	268	336	1200° C	EVS36AOW	Call	
Deep-Dimple Boat Heater-Molybdenum	4	5	3 ¹ / ₂	1 ³ / ₁₆	1	N/A	1.23	326	401	1200° C	EVS37AOMO	Call	
Alumina-Coated Top-Hat Trough Boat													
Molybdenum	5	1	3 ¹ / ₂	3/4	3/4	3/8	1.22	181	221	1200° C	EVS38AAOMO	Call	
Tungsten	5	1	3 ¹ / ₂	3/4	3/4	3/8	1.20	169	203	1200° C	EVS38AAOW	Call	

► Alumina-Coated Boat Heaters

■ Boats—Al₂O₃ Coated (EVS35B–45B)

Figure 1 (EVS35B)

3/32" D x 1/4" W x 3/4" L



1/8" D x 9/16" W x 1 1/2" L

Figure 2 (EVS38B)

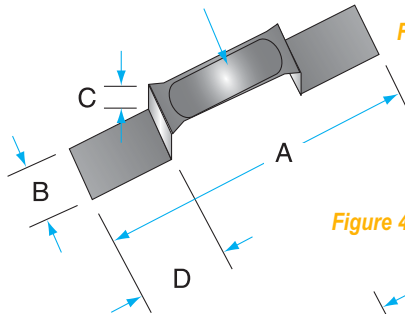


Figure 3 (EVS42)

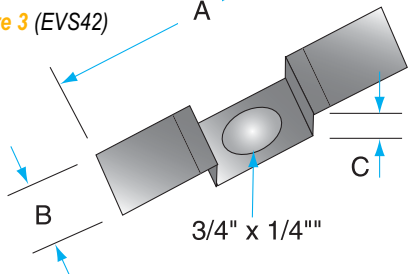
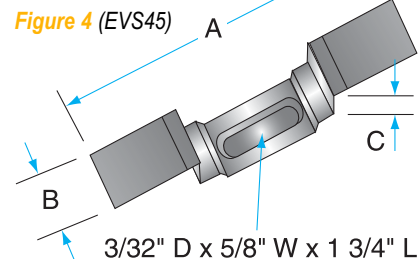


Figure 4 (EVS45)



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price	
			A	B	C	D	Volts	Amps	Watts	Temp.			
Alumina-Coated Flat Trough Boat													
Molybdenum	1	5	1/2	3/4	N/A	N/A	0.90	137	123	1200° C	EVS35BAOMO	Call	
Tungsten	1	5	1/2	3/4	N/A	N/A	0.89	130	116	1200° C	EVS35BAOW	Call	
Alumina-Coated Top-Hat Trough Boat													
Molybdenum	2	1	3 1/2	3/4	3/8	3/4	1.04	167	174	1200° C	EVS38BAOMO	Call	
Tungsten	2	1	3 1/2	3/4	3/8	3/4	1.04	156	162	1200° C	EVS38BAOW	Call	
Alumina-Coated Inverted Top-Hat Dimple													
Molybdenum	3	5	4	1	1/4	N/A	1.35	262	354	1200° C	EVS42BAOMO	Call	
Tungsten	3	1	4	1	1/4	N/A	1.41	245	345	1200° C	EVS42BAOW	Call	
Alumina-Coated Double-Step Top-Hat Trough Boat													
Molybdenum	4	1	1	4	1/4	N/A	1.27	264	336	1200° C	EVS45BAOMO	Call	
Tungsten	4	1	1	4	1/4	N/A	1.43	264	378	1200° C	EVS45BAOW	Call	

■ Boats—Microelectronics (EVSME3A–9A)

Figure 1 (EVSME3)

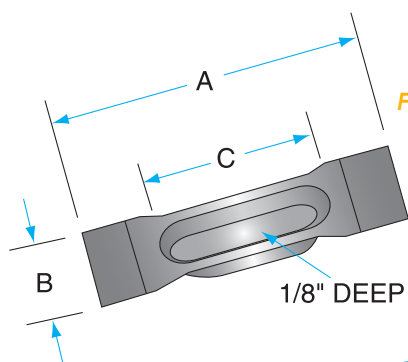


Figure 3 (EVSME6)

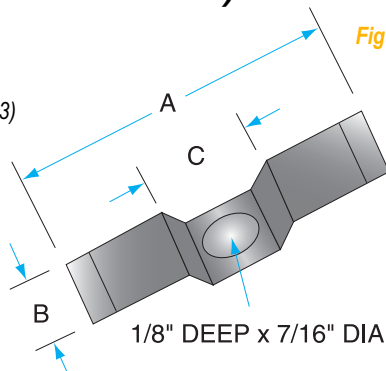


Figure 2 (EVSME4)

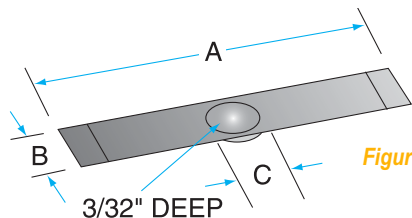
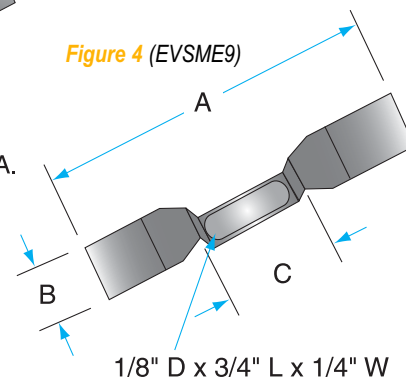


Figure 4 (EVSME9)



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Alumina-Coated												
Molybdenum Narrowed Trough Heater	1	5	1 7/8	3/4	1	N/A	0.86	151	130	1200° C	EVSME3AOMO	Call
Molybdenum Dimple Boat Heater	2	5	1 7/8	1/2	3/8	N/A	0.83	116	96	1200° C	EVSME4AOMO	Call
Molybdenum Inverted Top-Hat Dimple Boat Heater	3	5	1 7/8	1/2	1	N/A	0.84	106	89	1200° C	EVSME6BAOMO	Call
Molybdenum Inverted Top-Hat Trough Heater	4	5	1 7/8	3/4	1	N/A	0.80	83	66	1200° C	EVSME9AOMO	Call

► Boat Heaters for Microelectronics

■ Boats—Microelectronics (EVSME 3–6B)

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

The Part No. listed in the ordering table carries the boat material code. "MO" indicates molybdenum, "TA" indicates tantalum, and "W" indicates tungsten.

Figure 1 (EVSME3)

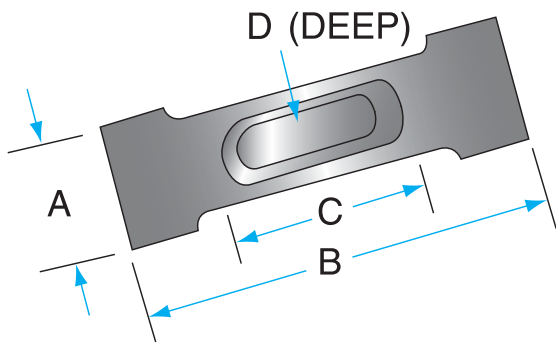


Figure 2 (EVSME4)

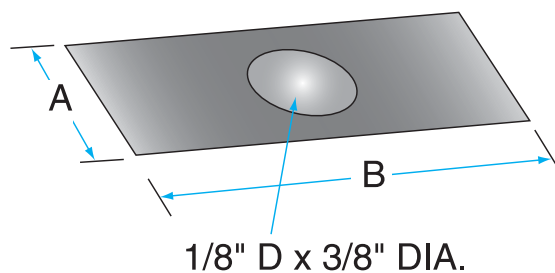


Figure 3 (EVSME5)

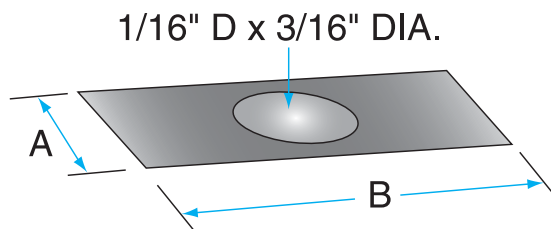


Figure 4 (EVSME6A)

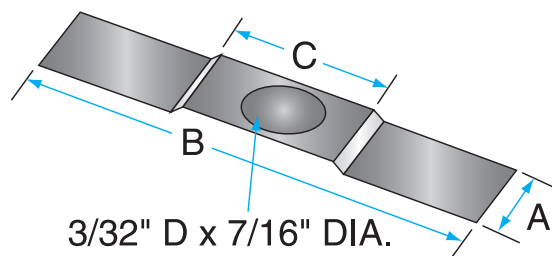
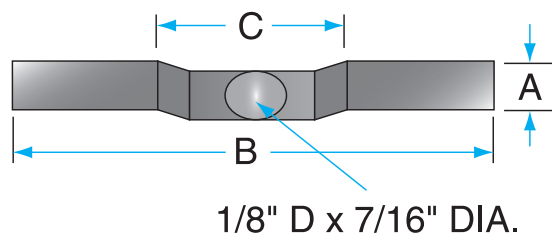


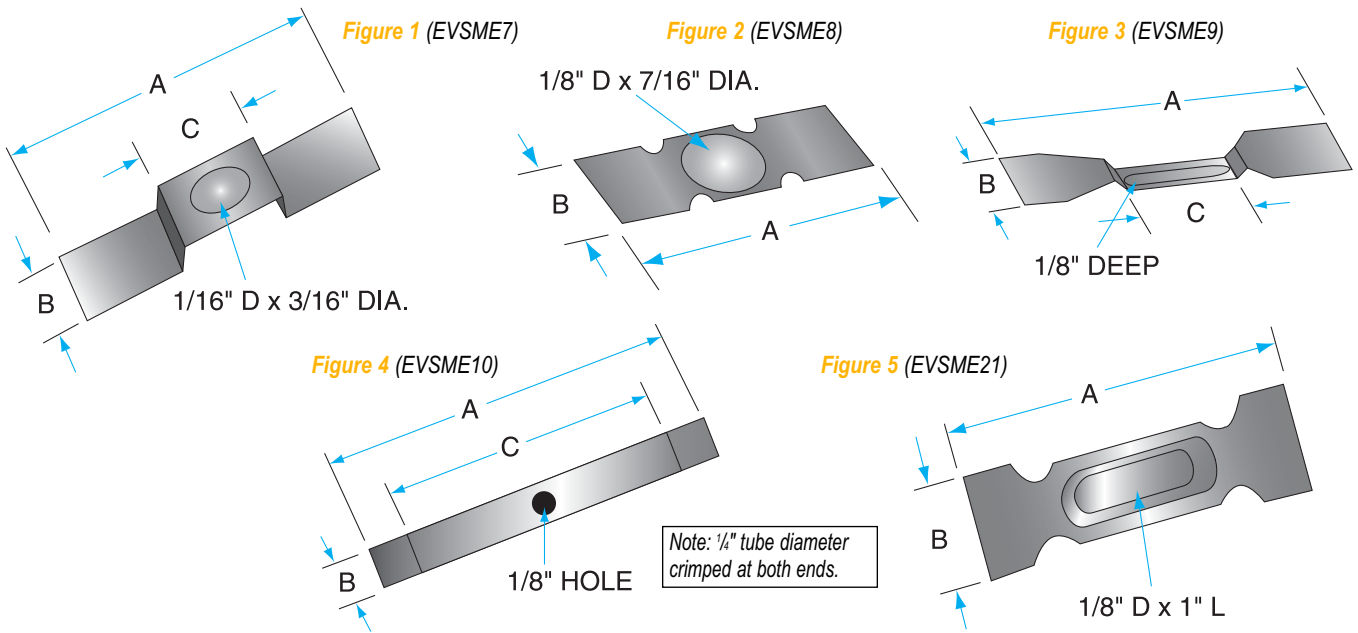
Figure 5 (EVSME6B)



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Trough Boat for Microelectronics												
Tungsten	1	5	3/4	1 7/8	1	1/8	2.00	202	404	1800° C	EVSME3005W	Call
Tantalum	1	5	3/4	1 7/8	1	1/8	1.77	138	244	1600° C	EVSME3005TA	Call
Molybdenum	1	5	3/4	1 7/8	1	1/8	0.94	150	141	1400° C	EVSME3005MO	Call
Dimple Boat for Microelectronics												
Tungsten	2	5	1/2	1 7/8	N/A	N/A	1.83	143	262	1800° C	EVSME4005W	Call
Tantalum	2	5	1/2	1 7/8	N/A	N/A	1.50	98	147	1600° C	EVSME4005TA	Call
Molybdenum	2	5	1/2	1 7/8	N/A	N/A	0.94	93	87	1400° C	EVSME4005MO	Call
Tungsten	3	5	9/32	1 7/8	N/A	N/A	1.69	80	136	1800° C	EVSME5005W	Call
Tantalum	3	5	9/32	1 7/8	N/A	N/A	1.40	55	77	1600° C	EVSME5005TA	Call
Molybdenum	3	5	9/32	1 7/8	N/A	N/A	0.85	58	49	1400° C	EVSME5005MO	Call
Dimple Top-Hat for Microelectronics												
Tungsten	4	5	1/2	1 7/8	1	N/A	1.83	145	265	1800° C	EVSME6A005W	Call
Tantalum	4	5	1/2	1 7/8	1	N/A	1.85	95	176	1600° C	EVSME6A005TA	Call
Molybdenum	4	5	1/2	1 7/8	1	N/A	0.85	102	87	1400° C	EVSME6A005MO	Call
Dimple Inverted Top-Hat for Microelectronics												
Tungsten	5	5	1/2	1 7/8	1	N/A	1.88	144	271	1800° C	EVSME6B005W	Call
Tantalum	5	5	1/2	1 7/8	1	N/A	1.73	96	166	1600° C	EVSME6B005TA	Call
Molybdenum	5	5	1/2	1 7/8	1	N/A	0.90	97	87	1400° C	EVSME6B005MO	Call

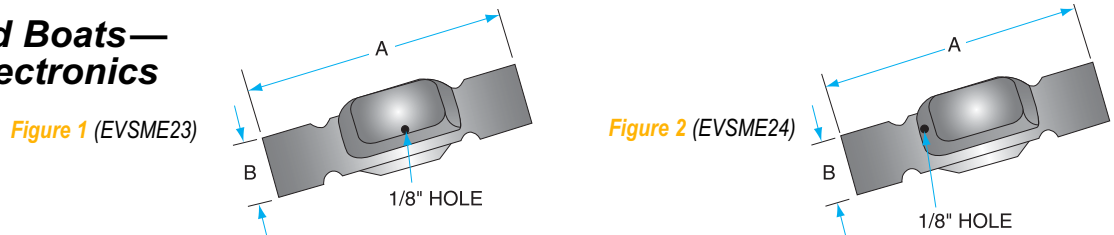
► Boat Heaters for Microelectronics

■ Boats—Microelectronics (EVSME 7–21)



Description	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
			A	B	C	Volts	Amps	Watts	Temp.		
Dimple Top-Hat for Microelectronics											
Tungsten	1	5	17/8	9/32	1	2.03	76	154	1800° C	EVSME7005W	Call
Tantalum	1	5	17/8	9/32	1	1.72	49	84	1600° C	EVSME7005TA	Call
Molybdenum	1	5	17/8	9/32	1	1.12	53	59	1400° C	EVSME7005MO	Call
Notched Dimple Boat for Microelectronics											
Tungsten	2	5	17/8	1/2	N/A	2.57	129	332	1800° C	EVSME8005W	Call
Tantalum	2	5	17/8	1/2	N/A	2.16	93	201	1600° C	EVSME8005TA	Call
Molybdenum	2	5	17/8	1/2	N/A	1.04	79	82	1400° C	EVSME8005MO	Call
Thin Trough for Microelectronics											
Tungsten	3	5	17/8	3/4	1	1.55	97	150	1800° C	EVSME9005W	Call
Tantalum	3	5	17/8	3/4	1	1.48	67	99	1600° C	EVSME9005TA	Call
Molybdenum	3	5	17/8	3/4	1	0.80	72	58	1400° C	EVSME9005MO	Call
Canoe for Microelectronics											
Tantalum	4	1	17/8	~3/5	1	1.07	131	140	1600° C	EVSME10005TA	Call
Notched Trough for Microelectronics											
Tungsten	5	5	17/8	3/4	N/A	1.96	213	417	1800° C	EVSME21005W	Call
Tantalum	5	5	17/8	3/4	N/A	1.75	141	247	1600° C	EVSME21005TA	Call
Molybdenum	5	5	17/8	3/4	N/A	0.94	147	138	1400° C	EVSME21005MO	Call

■ Covered Boats—Microelectronics



Description	Figure	No. per Pack	Dimensions (in.)		Power Requirements				Part No.	Price
			A	B	Volts	Amps	Watts	Temp.		
Covered Boat with Side Hole for Microelectronics										
Tungsten	1	5	17/8	3/4	1.40	327	458	1800° C	EVSME23005W	Call
Tantalum	1	1	17/8	3/4	1.51	215	325	1600° C	EVSME23005TA	Call
Molybdenum	1	5	17/8	3/4	0.79	251	198	1400° C	EVSME23005MO	Call
Covered Boat with End Hole for Microelectronics										
Tungsten	2	5	17/8	3/4	1.66	322	535	1800° C	EVSME24005W	Call
Tantalum	2	1	17/8	3/4	1.47	230	338	1600° C	EVSME24005TA	Call
Molybdenum	2	5	17/8	3/4	0.83	248	206	1400° C	EVSME24005MO	Call

► Tantalum Box Heaters

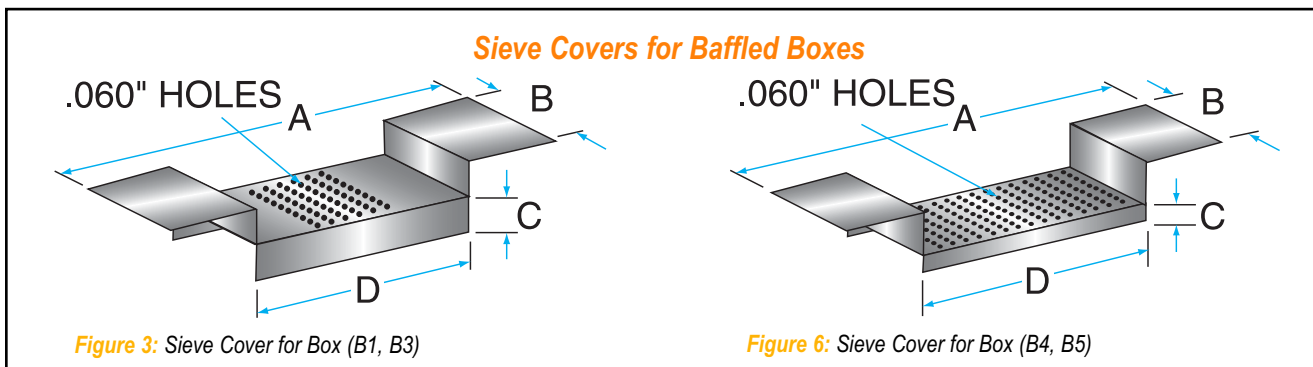
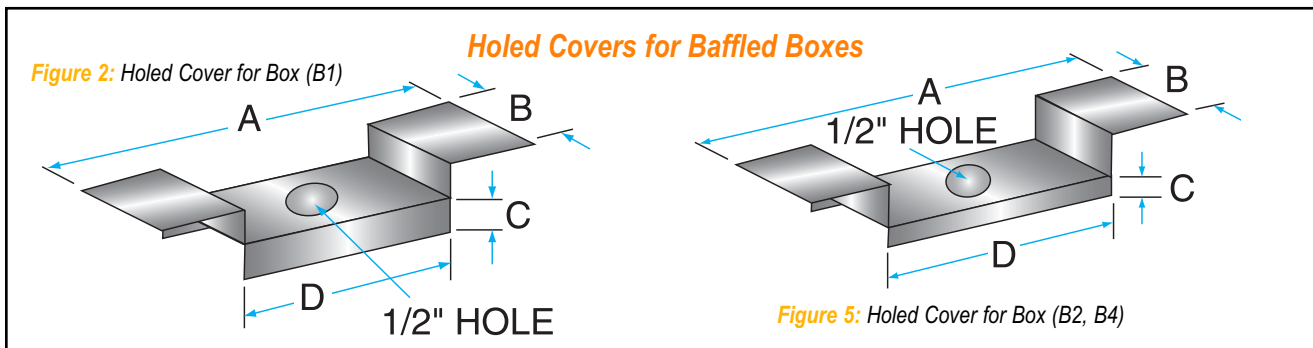
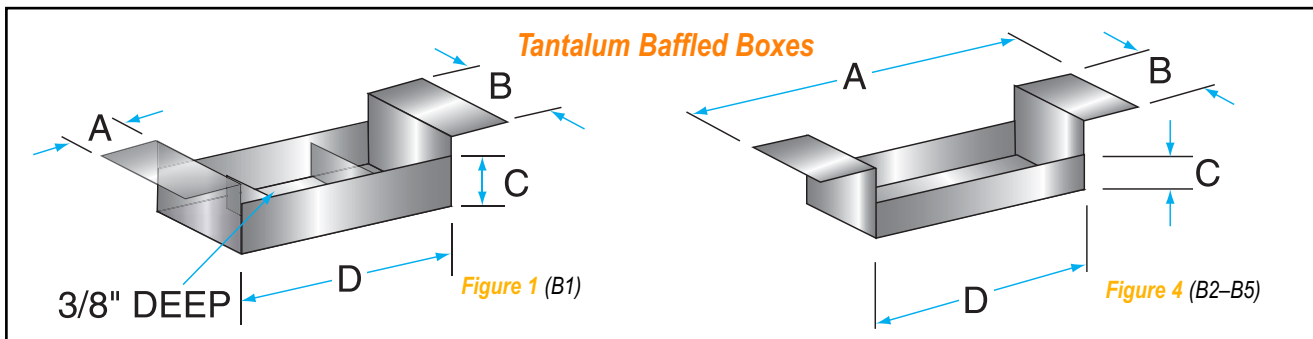


■ Baffled Boxes — Tantalum

Choose a heater shape that best matches the substrate's area requirements and the characteristics or form of material you plan to heat. When heating the same material multiple times, these boat heaters are sometimes satisfactory for more than a single-time use.

Select tantalum baffle box and the appropriate baffle cover per application.

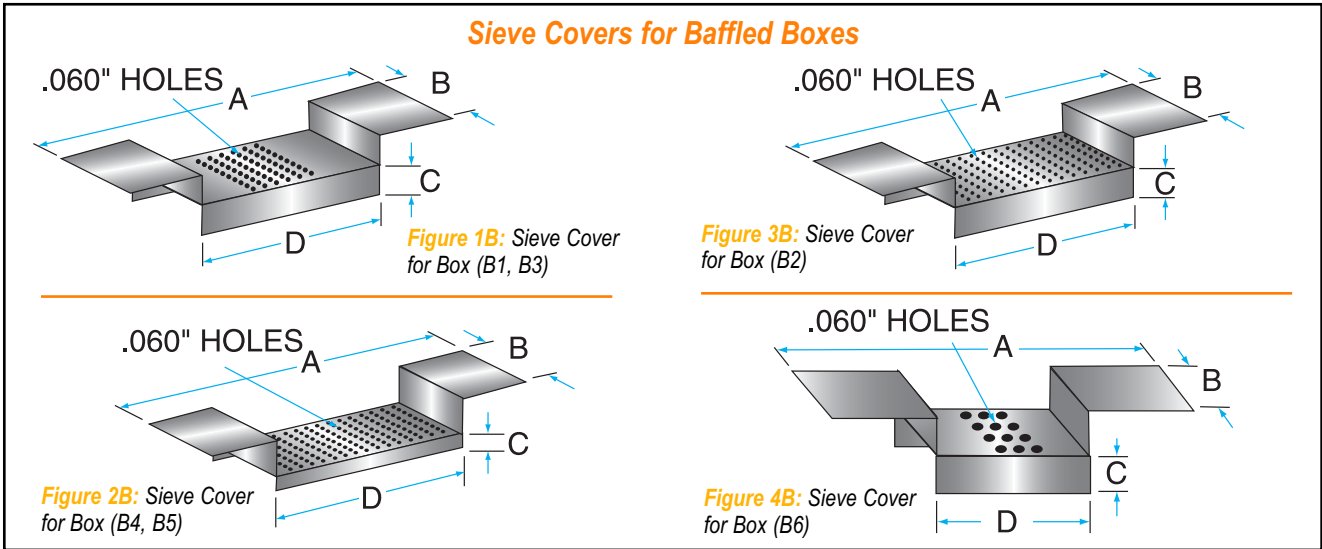
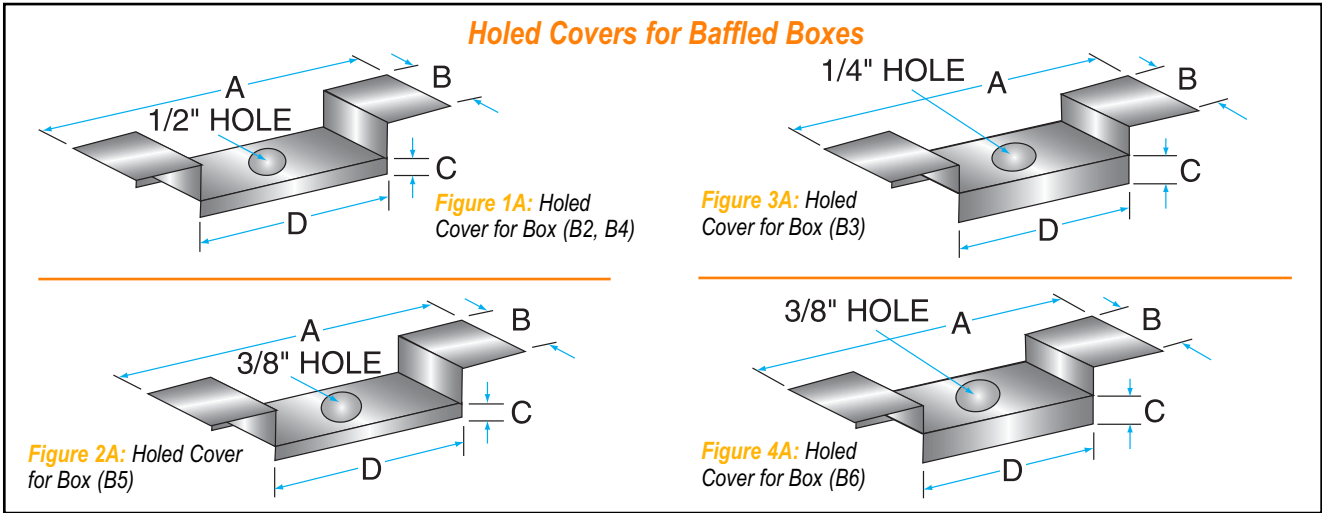
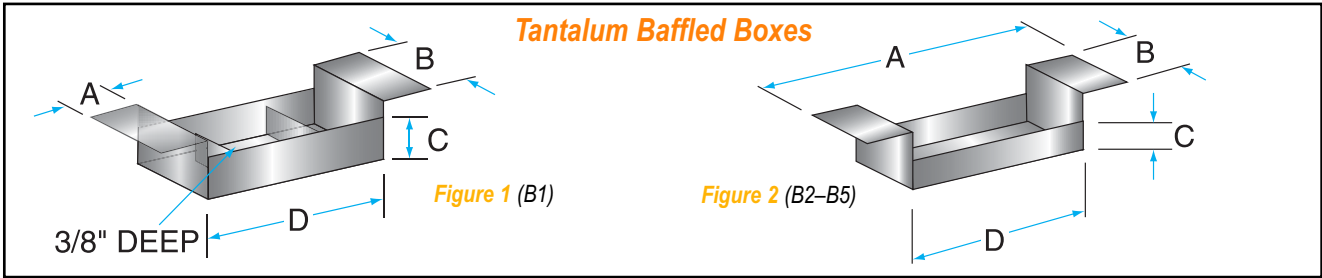
9 Evaporation Sources



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Tantalum Baffle Box (B1)	1	1	1/2	2	3/8	3 1/2	4.14	707	2927	1600°C	EVSSB1	Call
Holed Cover	2	1	4 1/2	2	N/A	N/A	3.20	749	2397	1600°C	EVSSB1A	Call
Sieve Cover	3	1	4 1/2	2	N/A	N/A	3.20	749	2397	1600°C	EVSSB1B	Call
Tantalum Baffle Box (B2)	4	1	4 1/16	3/4	3/8	3	3.70	388	1436	1600°C	EVSSB2	Call
Holed Cover	5	1	4 1/16	3/4	N/A	N/A	2.91	398	1158	1600°C	EVSSB2A	Call
Sieve Cover	6	1	4 1/16	3/4	N/A	N/A	2.91	398	1158	1600°C	EVSSB2B	Call

► Tantalum Box Heaters

■ Baffled Boxes — Tantalum



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price
			A	B	C	D	Volts	Amps	Watts	Temp.		
Tantalum Baffle Box (B3)	2	1	2 ¹ / ₁₆	3/4	3/8	1	2.08	366	761	1600° C	EVSSB3	Call
With Holed Cover	3A	1	2 ¹ / ₁₆	3/4	N/A	N/A	1.63	380	619	1600° C	EVSSB3A	Call
With Sieve Cover	1B	1	2 ¹ / ₁₆	3/4	N/A	N/A	1.49	345	514	1200° C	EVSSB3B	Call
Tantalum Baffle Box (B4)	2	1	4	1	3/8	3	1.54	295	454	1200° C	EVSSB4	Call
With Holed Cover	1A	1	4	1	N/A	N/A	3.57	438	1564	1600° C	EVSSB4A	Call
With Sieve Cover	2B	1	4	1	N/A	N/A	2.83	479	1356	1600° C	EVSSB4B	Call
Tantalum Baffle Box (B5)	2	1	3	3/4	3/8	2	2.96	371	1098	1600° C	EVSSB5	Call
With Holed Cover	2A	1	3	3/4	N/A	N/A	2.12	380	806	1600° C	EVSSB5A	Call
With Sieve Cover	3B	1	3	3/4	N/A	N/A	1.63	334	544	1200° C	EVSSB5B	Call
Tantalum Baffle Box (B6)	1	1	3 ¹ / ₂	3/4	3/8	2 ¹ / ₂	2.2	314	691	1200° C	EVSSB6	Call
With Holed Cover	4A	1	3 ¹ / ₂	3/4	N/A	N/A	3.58	280	1002	1600° C	EVSSB6A	Call
With Sieve Cover	4B	1	3 ¹ / ₂	3/4	N/A	N/A	2.69	310	834	1600° C	EVSSB6B	Call

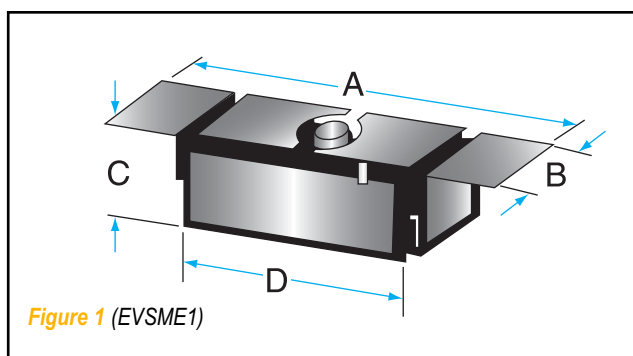
► Tantalum Box Heaters for Microelectronics

■ Baffled Boxes—Microelectronics

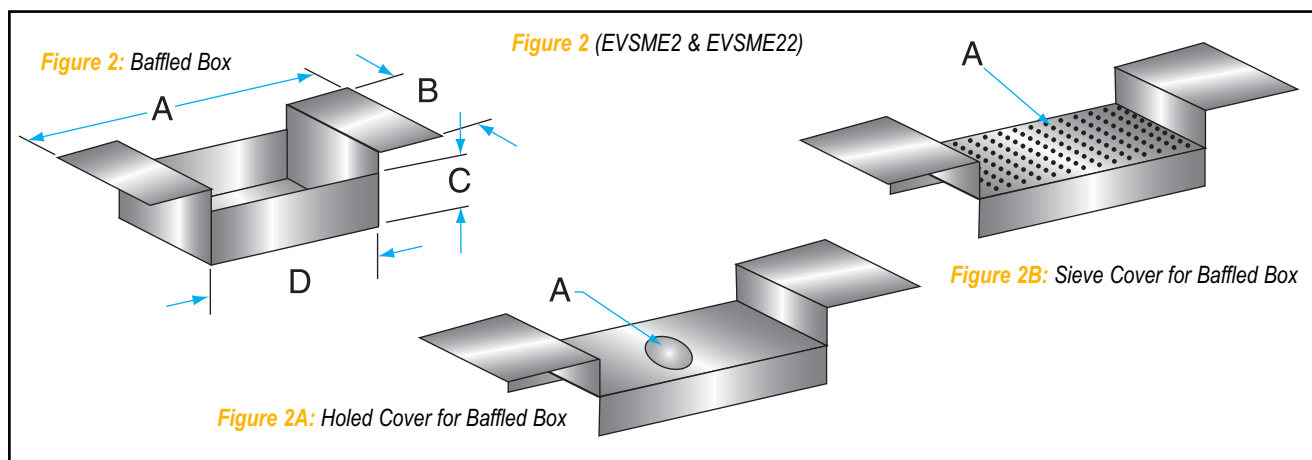
- Used for relatively high vapor pressure materials that may “spit” during evaporation
- Figure 1 is a single structure combining box, lid with hole, and thermal radiation shields made from tantalum
- Figures 2A, 2B, and 2C are, respectively, the wide box body, holed lid, and sieve lid of a two-part baffle box structure

Choose a heater shape that best matches the substrate’s area requirements and the characteristics or form of material you plan to heat.

Heaters can sometimes be used more than once when heating the same material, but often the evaporant “seals” the lid to the body, making separation impossible and, therefore, preventing fresh material from being placed in the correct location.



9 Evaporation Sources



Description	Figure	No. per Pack	Dimensions (in.)				Power Requirements				Part No.	Price	
			A	B	C	D	Volts	Amps	Watts	Temp.			
Tantalum Baffled Box													
For SiO & CdS—Capacity 2g	1	1	17/8	5/8	1/2	1	1.45	266	386	1600° C	EVSME1	Call	
Tantalum Box	2	1	17/8	3/8	1/4	3/4	2.52	141	355	1600° C	EVSME2	Call	
Holed Cover for EVSME2	2A	1	1/8	N/A	N/A	N/A	—	—	—	—	EVSME2A	Call	
Sieve Cover for EVSME2	2B	1	.060	N/A	N/A	N/A	—	—	—	—	EVSME2B	Call	
Tantalum Box	2	1	17/8	5/8	1/4	1	1.87	196	367	1600° C	EVSME22	Call	
Holed Cover for EVSME22	2A	1	1/4	N/A	N/A	N/A	—	—	—	—	EVSME22A	Call	
Sieve Cover for EVSME22	2B	1	.060	N/A	N/A	N/A	—	—	—	—	EVSME22B	Call	

► SiO Box Heaters

■ Baffled Boxes—SiO

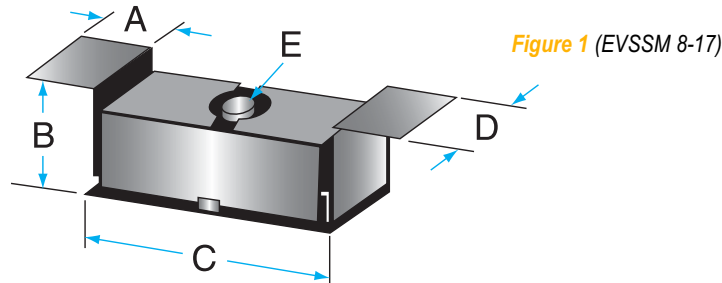
Excellent thermal sources for depositing thin film of silicon monoxide.

How they work:

- The box is loaded with SiO before use (not exceeding the weight indicated for that box)
- Bulk SiO is held in compartment(s) indirectly connected to the chimney
- As the box is heated, the SiO vapor is forced to flow through a series of baffles before exiting at the chimney
- Since there is no line of sight between the bulk material and the substrate surface, the deleterious effects of spitting or streaming on the depositing film are eliminated
- Construction from Tantalum

Additional information:

- Available in non-rechargeable and rechargeable—named to reflect the location of the initial charging or recharging
- A rechargeable box can be filled through one or two lids while still mounted on its electrical feedthroughs in the vacuum chamber
- A non-rechargeable box must be dismantled from its electrical feedthroughs and disassembled before charging or re-charging
- Both styles offer long life and can be recharged many times
- Designed with two evaporation plume directions—upward “vertical” or downward “inverted” (by turning either source on its side, a “horizontal” plume can be arranged)



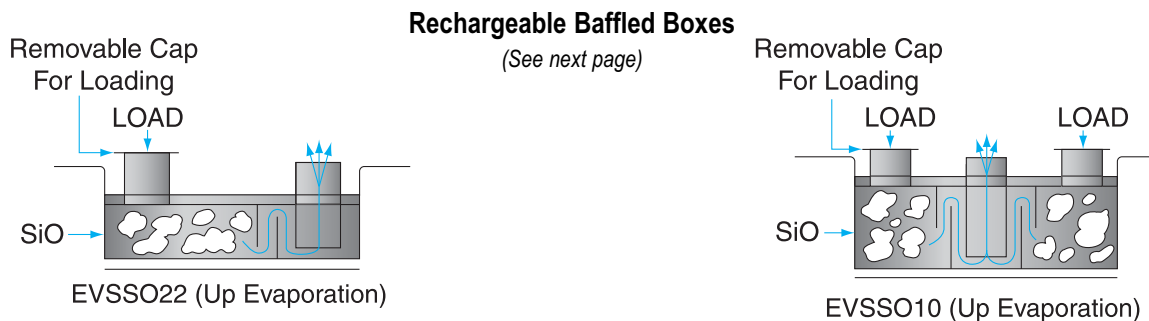
Vertical Non-Rechargeable Boxes for “Up” Evaporation

Description	Figure	Weight SiO	No. per Pack	Dimensions (in.)					Power Requirements				Part No.	Price
				A	B	C	D	E (I.D.)	Volts	Amps	Watts	Temp.		
Vertical	1	3.5 g	1	1/2	7/8	1 3/4	3/4	3/8	1.08	255	275	1200° C	EVSSM8	Call
Vertical	1	5 g	1	1/2	7/8	2 1/2	3/4	3/8	1.25	225	282	1200° C	EVSSM10	Call
Vertical	1	10 g	1	3/8	1 1/8	3 1/4	1 1/8	3/8	1.36	283	385	1200° C	EVSSM12	Call
Vertical	1	20 g	1	3/4	1 1/4	3 1/4	1 1/4	1/2	1.66	340	564	1200° C	EVSSM14	Call
Vertical	1	40 g	1	3/4	1 3/8	4 1/2	1 1/4	1/2	2.06	357	735	1200° C	EVSSM16	Call

Inverted Non-Rechargeable Baffled Boxes for “Down” Evaporation

Description	Figure	Weight SiO	No. per Pack	Dimensions (in.)					Power Requirements				Part No.	Price
				A	B	C	D	E (I.D.)	Volts	Amps	Watts	Temp.		
Inverted	1	3.5 g	1	1/2	7/8	1 3/4	3/4	3/8	1.00	242	242	1200° C	EVSSM9	Call
Inverted	1	5 g	1	1/2	7/8	2 1/2	3/4	3/8	1.26	236	297	1200° C	EVSSM11	Call
Inverted	1	10 g	1	3/8	1 1/8	3 1/4	1 1/8	1/2	1.60	318	509	1200° C	EVSSM13	Call
Inverted	1	20 g	1	3/4	1 1/4	3 1/4	1 1/4	1/2	1.70	349	593	1200° C	EVSSM15	Call
Inverted	1	40 g	1	3/4	1 3/8	4 1/2	1 1/4	1/2	1.86	327	608	1200° C	EVSSM17	Call

NOTE: The “inverted” style have the same dimensions as the “vertical” style shown above. However, the internal baffles are reversed which allows the box to be mounted in an inverted position where the exhaust port points down.



Rechargeable Baffled Boxes

(See next page)

► SiO Box Heaters

■ Baffled Boxes—SiO

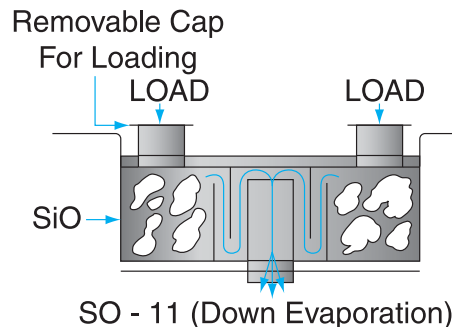
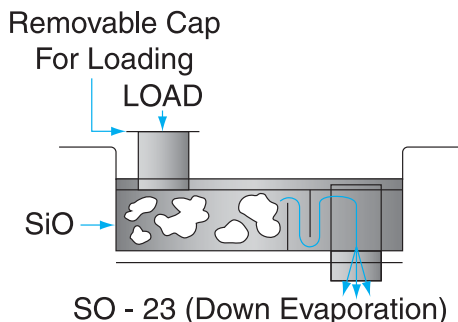


Figure 1 (EVSS020)

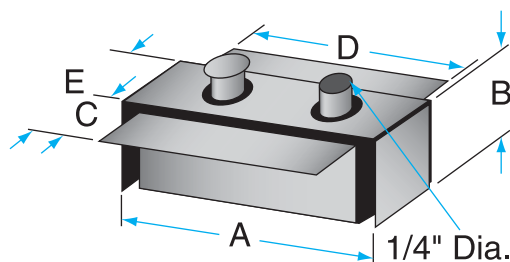


Figure 3 (EVSS010)

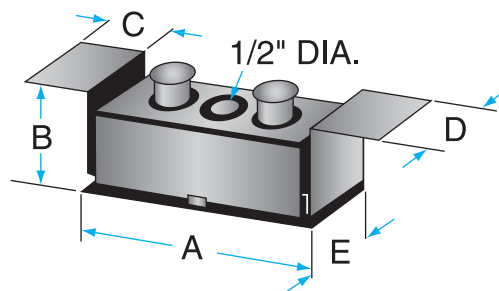


Figure 2 (EVSS022)

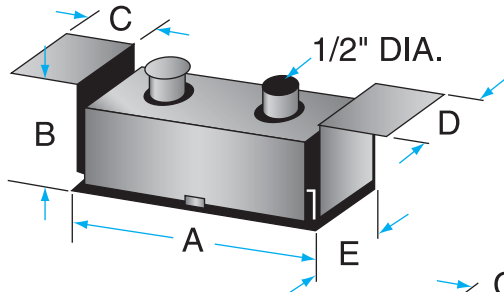


Figure 4 (EVSS029)

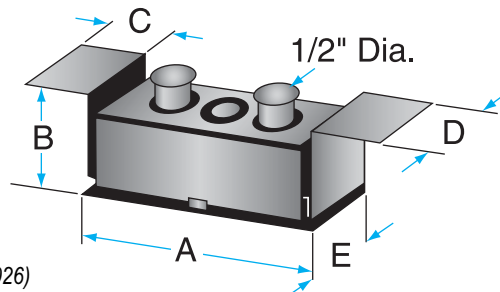
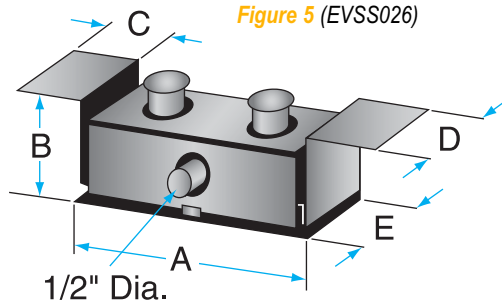


Figure 5 (EVSS026)



Rechargeable Baffled Boxes

Description	Figure	Weight SiO	No. per Pack	Dimensions (in.)					Power Requirements				Part No.	Price
				A	B	C	D	E	Volts	Amps	Watts	Temp.		
Vertical with 1 Loading Cap	1	1.5 g	1	1 1/4	5/8	N/A	1	1 1/2	0.86	333	286	1200° C	EVSS020	Call
Inverted with 1 Loading Cap	1	1.5 g	1	1 1/4	5/8	N/A	1	1 1/2	0.91	328	298	1200° C	EVSS021	Call
Vertical with 1 Loading Cap	2	6.5 g	1	2 1/2	7/8	1/2	3/4	1	1.34	246	330	1200° C	EVSS022	Call
Inverted with 1 Loading Cap	2	6.5 g	1	2 1/2	7/8	1/2	3/4	1	1.31	236	309	1200° C	EVSS023	Call
Vertical with 2 Loading Caps	3	6.5 g	1	2 1/2	7/8	1/2	3/4	1 1/4	1.40	257	360	1200° C	EVSS010	Call
Inverted with 2 Loading Caps	3	6.5 g	1	2 1/2	7/8	1/2	3/4	1 1/4	1.40	256	358	1200° C	EVSS011	Call
Vertical with 2 Loading Caps	4	13 g	1	3 1/4	1 1/8	5/8	3/4	1 1/4	1.67	264	441	1200° C	EVSS024	Call
Inverted with 2 Loading Caps	4	13 g	1	3 1/4	1 1/8	5/8	3/4	1 1/4	1.58	272	430	1200° C	EVSS025	Call
Side (Horizontal) with 2 Loading Caps	5	13 g	1	3 1/4	1 1/8	5/8	3/4	1 1/4	1.62	271	439	1200° C	EVSS026	Call

► Baffled Al₂O₃ Box Heaters

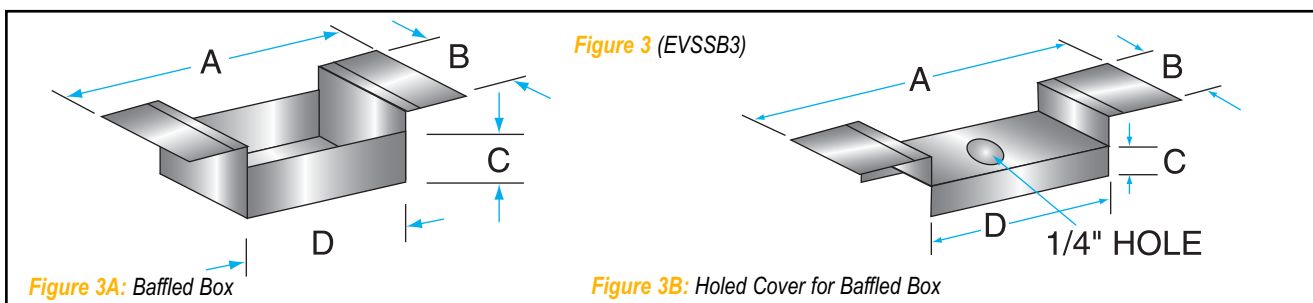
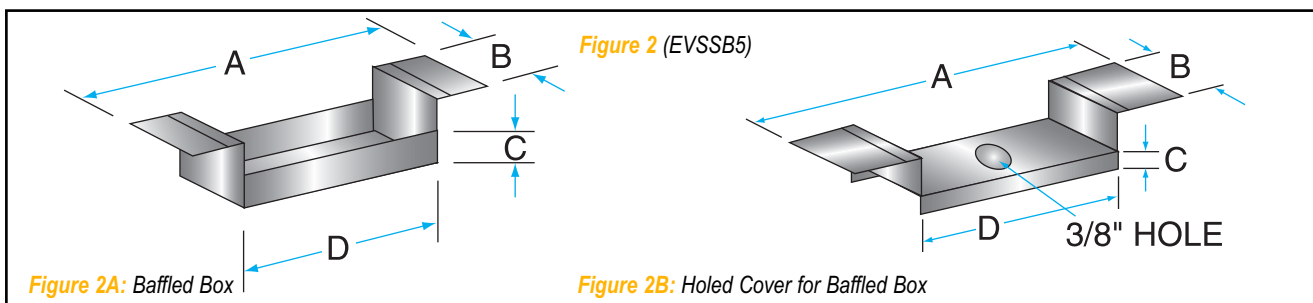
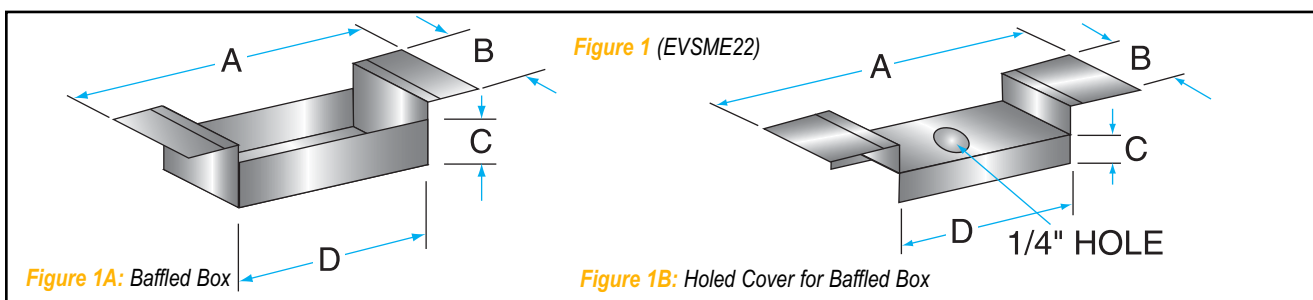
■ Baffled Boxes—Al₂O₃ Coated

These boxes offer good heat transfer and are mostly inert in contact with hot metals.

- Developed to replace alumina crucibles for specific applications
- Evaporant metals don't wet alumina, resulting in the melt forming a "sphere" that acts as a point source
- Heater resistance doesn't change throughout the deposition since evaporant won't touch the underlying heater material
- With care, heaters can have a longer useable life than non-coated sources
- The alumina is a semiconductor grade and is applied by a plasma spray technique to a thickness of 0.005"
- The ends of the boat are unsprayed to enable successful connection to the power supply clamps
- Coated boats should not be used where the heater temperature must exceed 1850° C to achieve the required evaporation rate

Because the alumina increases the thermal resistance between heater and evaporant, coated sources require 30–50% more power to achieve the same evaporation rate as an identical but uncoated boat.

Another important difference is the thermal lag created by the alumina coating. Any measurement of temperature in the region of the melt will not be the "equilibrium" temperature unless the power is raised slowly. Typically, users do not have time for this slow rise, putting excess power into the heater until the right evaporation rate is reached. Unless this excess power is quickly reduced, the melt temperature will rapidly rise above the optimum rate value.



Description	Figure	No. per Pack	Dimensions (in.)				Part No.	Price
			A	B	C	D		
Alumina-Coated Tantalum Box Heater	1A	1	1 7/8	5/8	1/4	1	EVSM22BAO	Call
Cover for Box Heater (EVSM22BAOTA)	1B	1	1 7/8	5/8	N/A	N/A	EVSM22AAO	Call
Alumina-Coated Tantalum Box Heater	2A	1	3	3/4	3/8	2	EVSSB5AO	Call
Cover for Box Heater (EVSSB5AOTA)	2B	1	3	3/4	N/A	N/A	EVSSB5AAOTA	Call
Alumina-Coated Tantalum Box Heater	3A	1	2 1/16	3/4	3/8	1	EVSSB3AOTA	Call
Cover for Box Heater (EVSSB3AOTA)	3B	1	2 1/16	3/4	N/A	N/A	EVSSB3AAOTA	Call

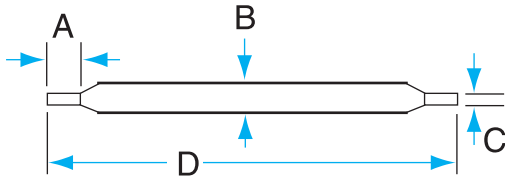
► Chrome-Plated Tungsten Rods

■ Chrome-Plated Tungsten Rods

Used to produce thin films of chromium by evaporation in the electronics and optics industries.

Advantages over chromium chips:

- Good thermal efficiency
- Better regulation of film thickness
- Elimination of spalling
- 99.9% pure Cr



NOTE: Custom-built dimensions may be available.

9

Description	No. per Pack	Dimensions (in.)				Power Requirements			Temp.	Part No.	Price
		A	B	C	D	Volts	Amps	Watts			
Chrome-Plated Tungsten Rods	5	0.50"	0.070"	0.050"	2"	1.05	78	82	1800° C	EVSCRW1	Call
	5	0.50"	0.070"	0.050"	4"	2.02	78	158	1800° C	EVSCRW2	Call
	5	0.50"	0.070"	0.050"	6"	2.40	77	185	1800° C	EVSCRW3	Call

Evaporation Sources



Don't let your supplies evaporate!

Whether you're working on research or production, Kurt J. Lesker Company® offers a wide variety of inorganic evaporation materials to serve your needs.

Our evaporation materials are ideal for use in these industries: vacuum metallizing, optical coating, electronic device manufacture, university and research institutions, and more.

- Choose from a vast assortment of metals in pellet form
- Popular sizes include 1/8" diameter x 1/8" long; and 1/4" diameter x 1/4" long
- Sold in 25–250g bottles (production customers can also purchase larger pound and kilogram quantities)
- Additional products are available in irregular forms, sizes, and packaging — contact sales@lesker.com for more information



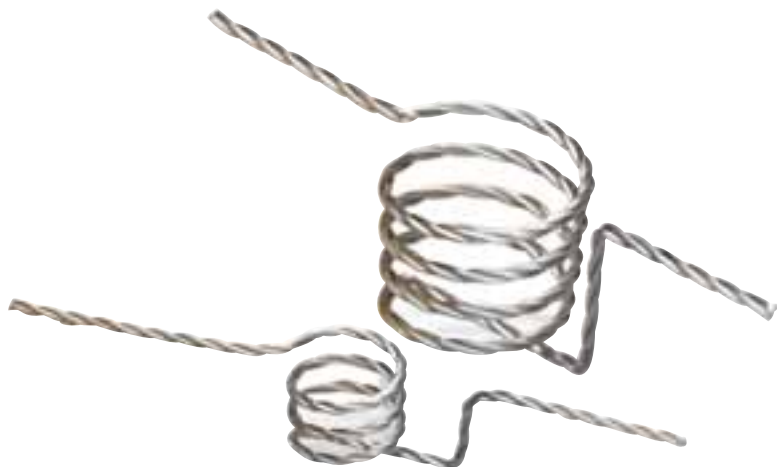
Kurt J. Lesker
Company

To view our selection of evaporation materials in various forms and purities, see pages 10-4 through 10-21 or email us at materials@lesker.com

► Crucible Basket Heaters

■ Crucible Basket Heaters

Choose a basket heater that matches the crucible you plan to heat.



NOTE: These heaters can frequently be re-used, providing they are not affected by the vapor of the material being evaporated or by the melt, should the crucible spill. Heater does not include crucible.

Figure 1 (EVB8A)

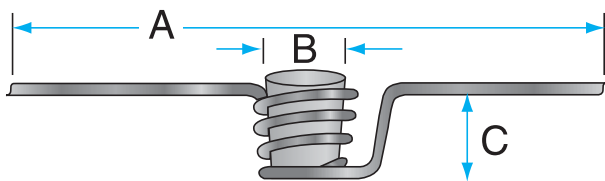


Figure 2 (EVB8B)

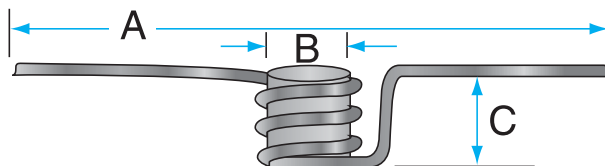


Figure 3 (EVB9)

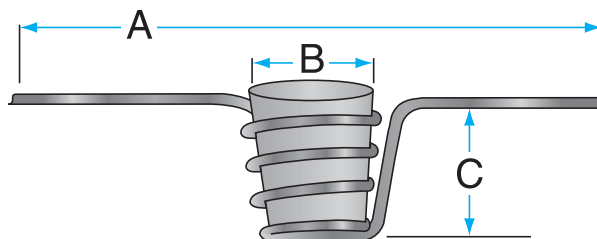


Figure 4 (EVB10)

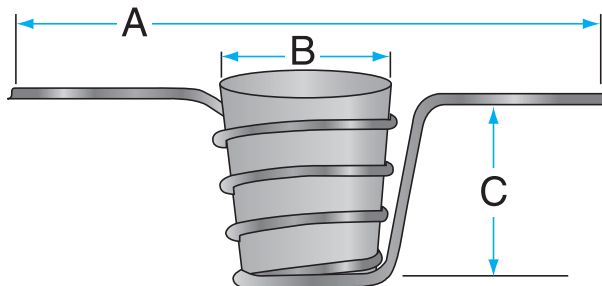
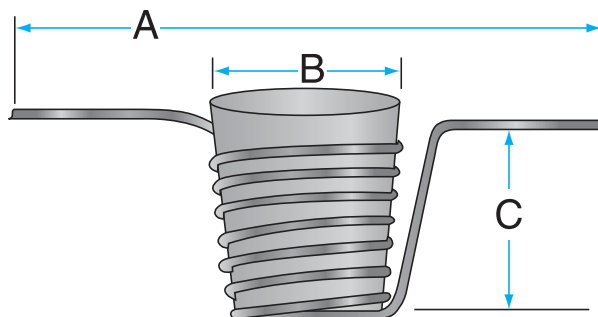


Figure 5 (EVB11)



Description	For Crucible	Figure	No. per Pack	Dimensions (in.)			Power Requirements				Part No.	Price
				A	B	C	Volts	Amps	Watts	Temp.		
Tungsten Basket Heater												
3 Wire x .025"	EVC1	1	5	3/4	1/2	1/2	6.28	47	295	1800° C	EVB8A3025W	Call
3 Wire x .030"	EVC1	1	5	3/4	1/2	1/2	6.06	55	333	1800° C	EVB8A3030W	Call
3 Wire x .025"	EVC9	2	5	3/4	1/2	1/2	5.80	43	249	1800° C	EVB8B3025W	Call
3 Wire x .030"	EVC9	2	5	3/4	1/2	1/2	5.15	57	294	1800° C	EVB8B3030W	Call
3 Wire x .030"	EVC2	3	5	4	0.82	1	8.42	57	480	1800° C	EVB93030W	Call
4 Wire x .030"	EVC2	3	5	4	0.82	1	7.76	70	543	1800° C	EVB94030W	Call
3 Wire x .040"	EVC2	3	5	4	0.82	1	7.18	85	610	1800° C	EVB93040W	Call
4 Wire x .030"	EVC5	4	5	4	1	1 1/8	9.76	71	693	1800° C	EVB104030W	Call
3 Wire x .040"	EVC5	4	1	4	1	1 1/8	8.73	85	742	1800° C	EVB103040W	Call
3 Wire x .040"	EVC6	5	1	5	1 1/2	1 1/8	19.70	84	1655	1800° C	EVB113040W	Call

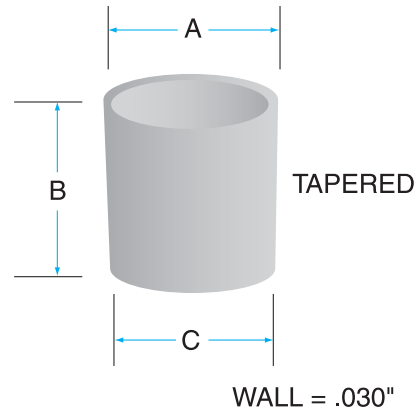
► Crucibles for Thermal Sources

■ Crucibles: Thermal Sources

- The crucibles illustrated below fit into tungsten baskets
- Select from six different materials



Figure 1 (EVC1)



9

Figure 2 (EVC2)

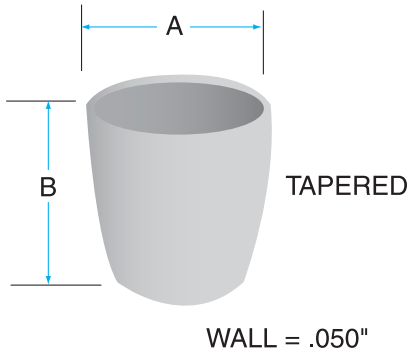


Figure 3 (EVC3)

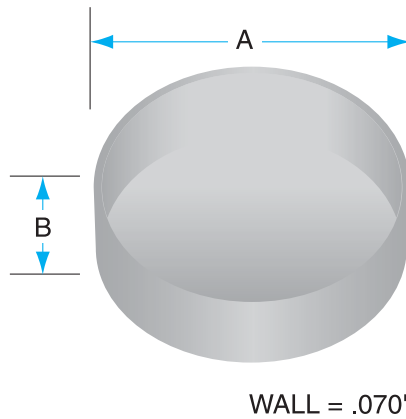


Figure 4 (EVC4)

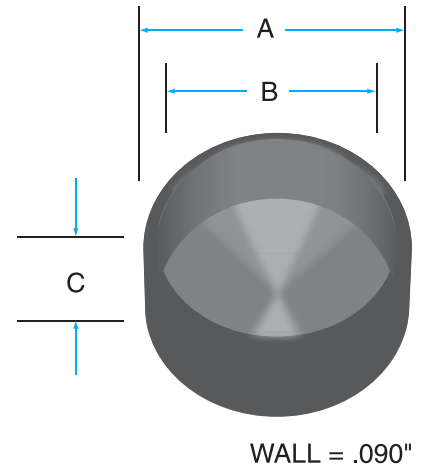


Figure 5 (EVC5)

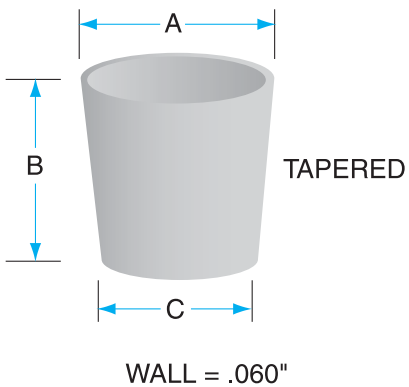


Figure 6 (EVC6)

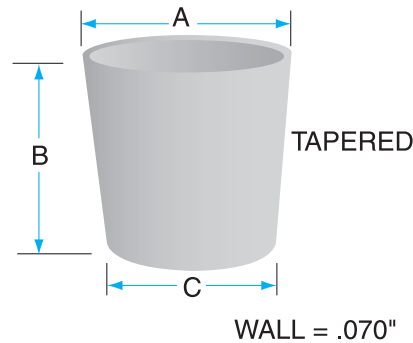
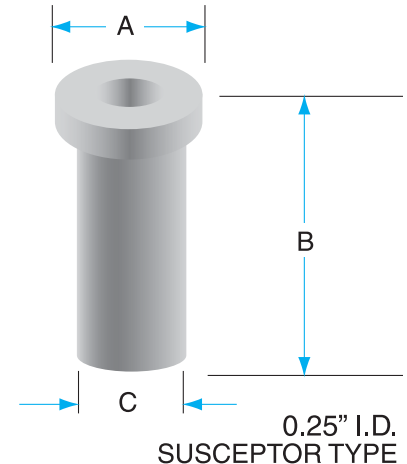


Figure 7 (EVC7)



Evaporation Sources

► Crucibles for Thermal Sources

■ Crucibles: Thermal Sources

Figure 8 (EVC8)

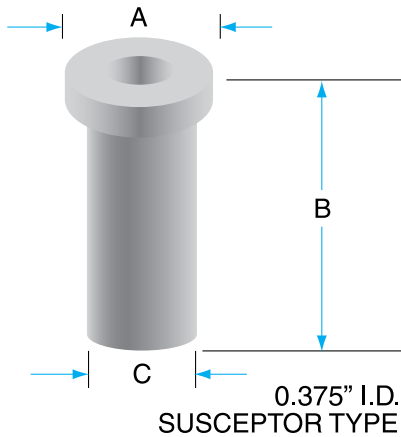


Figure 9 (EVC9)

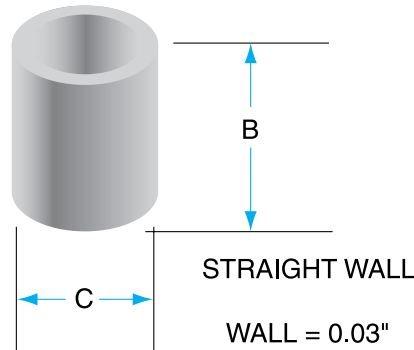
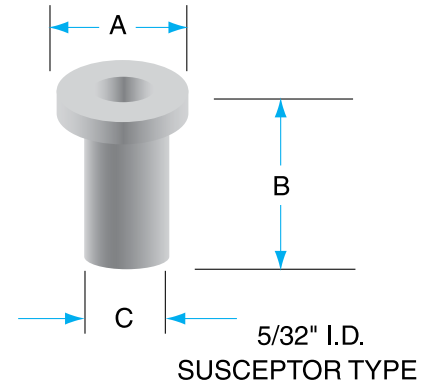


Figure 10 (EVC10)



Description	Figure	No. per Pack	Dimensions (in.)			Part No.	Price
			A	B	C		
Aluminum Oxide Crucible for EVB8A, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	1	1	0.5	0.5	0.460	EVC1AO	Call
Quartz Crucible for EVB8A, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	1	1	0.5	0.5	0.460	EVC1Q	Call
Boron Nitride Crucible for EVB8A, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	1	1	0.5	0.5	0.460	EVC1BN	Call
Quartz Crucible for EVB9 Heaters	2	1	0.820	0.85	N/A	EVC2Q	Call
Quartz Crucible	3	1	1.35	0.375	N/A	EVC3Q	Call
Tantalum Crucible	4	1	1	0.8125	0.4375	EVC4TA	Call
Molybdenum Crucible	4	1	1	0.8125	0.4375	EVC4MO	Call
Carbon Crucible	4	1	1	0.8125	0.4375	EVC4C	Call
Aluminum Oxide Crucible for EVB10, EVCH5, EVCH12, EVCH13 Heaters	5	1	1	1	0.900	EVC5AO	Call
Quartz Thermal Crucible for EVB10, EVCH5, EVCH12, EVCH13 Heaters	5	1	1	1	0.900	EVC5Q	Call
Boron Nitride Crucible for EVB10, EVCH5, EVCH12, EVCH13 Heaters	5	1	1	1	0.900	EVC5BN	Call
Aluminum Oxide Crucible for EVB11, EVCH14 Heaters	6	1	1.5	1.5	1.23	EVC6AO	Call
Quartz Thermal Crucible for EVB11, EVCH14 Heaters	6	1	1.5	1.5	1.23	EVC6Q	Call
Boron Nitride Crucible for EVCH7 Heaters	7	1	0.5	1	0.375	EVC7BN	Call
Carbon Crucible for EVCH7 Heaters	7	1	0.5	1	0.375	EVC7C	Call
Quartz Crucible for EVCH7 Heaters	7	1	0.5	1	0.375	EVC7Q	Call
Tantalum Crucible for EVCH7 Heaters	7	1	0.5	1	0.375	EVC7TA	Call
Molybdenum Crucible for EVCH7 Heaters	7	1	0.5	1	0.375	EVC7MO	Call
Boron Nitride Crucible for EVCH8 Heaters	8	1	0.625	1.5	0.5	EVC8BN	Call
Carbon Crucible for EVCH8 Heaters	8	1	0.625	1.5	0.5	EVC8C	Call
Quartz Crucible for EVCH8 Heaters	8	1	0.625	1.5	0.5	EVC8Q	Call
Tantalum Crucible for EVCH8 Heaters	8	1	0.625	1.5	0.5	EVC8TA	Call
Molybdenum Crucible for EVCH8 Heaters	8	1	0.625	1.5	0.5	EVC8MO	Call
Aluminum Oxide Crucible for EVB8B, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	9	1	N/A	0.5	0.5	EVC9AO	Call
Quartz Crucible for EVB8B, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	9	1	N/A	0.5	0.5	EVC9Q	Call
Boron Nitride Crucible for EVB8B, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	9	1	N/A	0.5	0.5	EVC9BN	Call
Tantalum Crucible for EVB8B, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	9	1	N/A	0.5	0.5	EVC9TA	Call
Molybdenum Crucible for EVB8B, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	9	1	N/A	0.5	0.5	EVC9MO	Call
Carbon Crucible for EVB8B, EVCH1, EVCH10, EVCH11, EVSME19 Heaters	9	1	N/A	0.5	0.5	EVC9C	Call
Boron Nitride Crucible for EVCH9, EVSME20 Heaters	10	1	0.375	0.5	0.25	EVC10BN	Call
Carbon Crucible for EVCH9, EVSME20 Heaters	10	1	0.375	0.5	0.25	EVC10C	Call
Quartz Crucible for EVCH9, EVSME20 Heaters	10	1	0.375	0.5	0.25	EVC10Q	Call
Tantalum Crucible for EVCH9, EVSME20 Heaters	10	1	0.375	0.5	0.25	EVC10TA	Call
Molybdenum Crucible for EVCH9, EVSME20 Heaters	10	1	0.375	0.5	0.25	EVC10MO	Call

► Crucible Box Heaters



■ Crucible Box Heaters

Designed to heat various sizes of crucibles.

- Provides more uniform heat than simple wire basket heaters

Models listed include radiation shields that:

- Protect delicate instrumentation from overheating
- Protect chambers from heat
- Concentrate the heat source toward the crucible

Figure 1 (EVCH1)

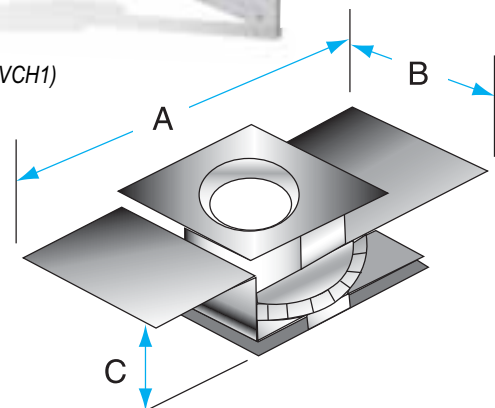


Figure 4 (EVCH8)

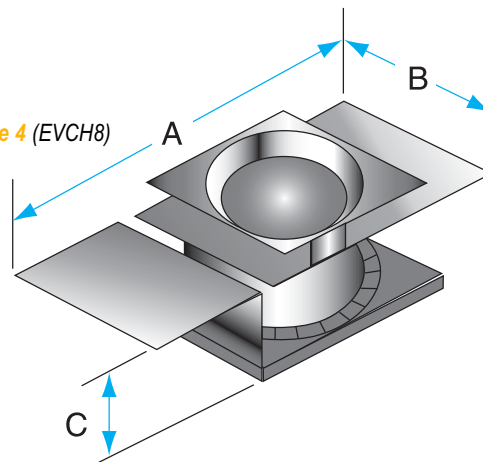


Figure 2 (EVCH5)

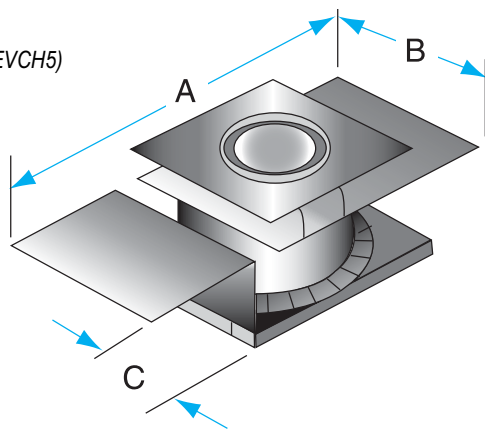


Figure 5 (EVSME19)

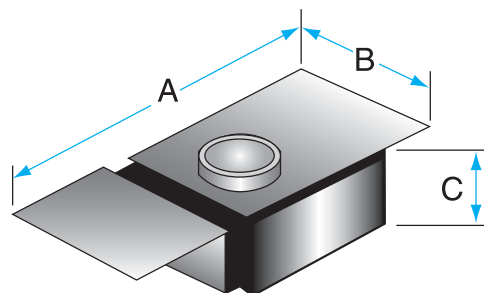


Figure 3 (EVCH7)

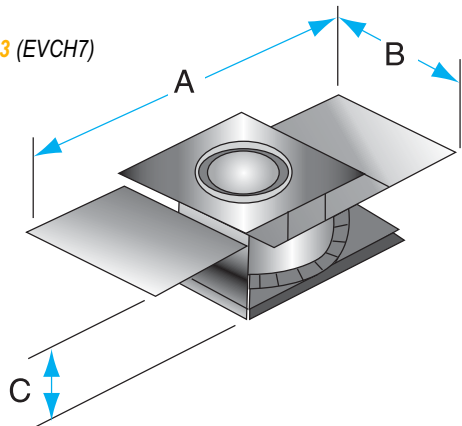
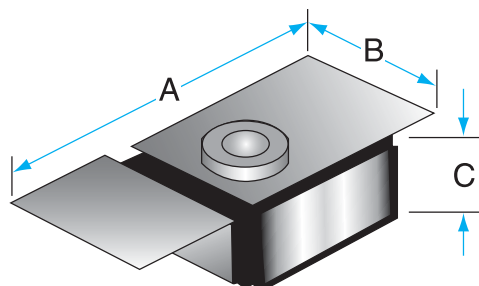


Figure 6 (EVSME20)



► Crucible Box Heaters

Figure 7 (EVCH9)

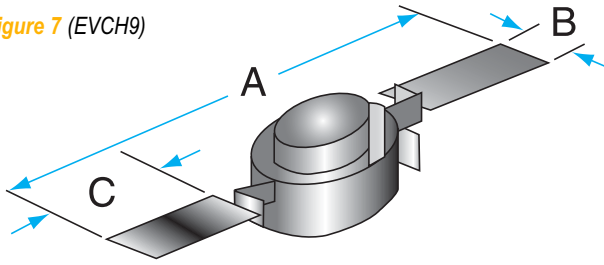


Figure 10 (EVCH12)

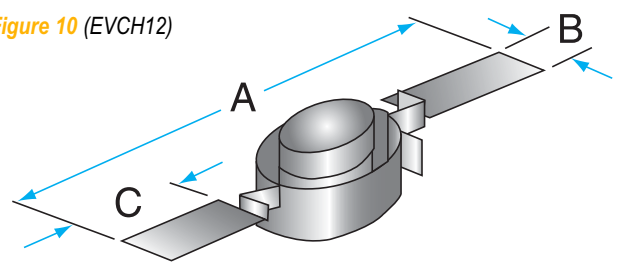


Figure 8 (EVCH10)

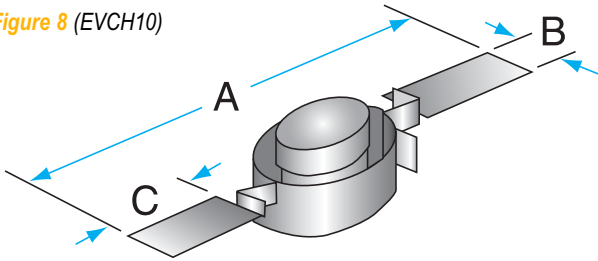


Figure 11 (EVCH13)

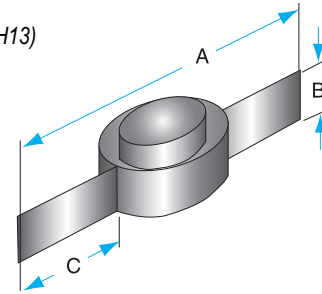


Figure 9 (EVCH11)

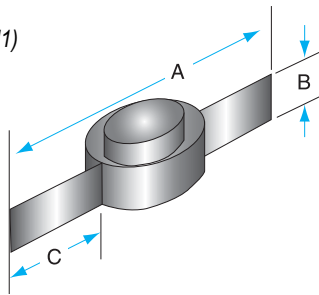


Figure 12 (EVCH14)

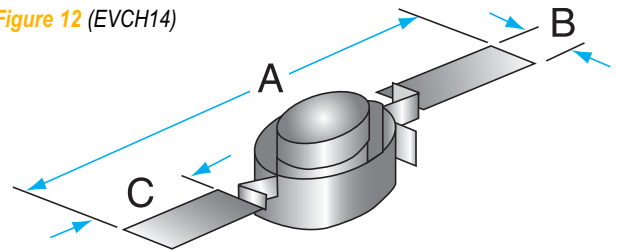
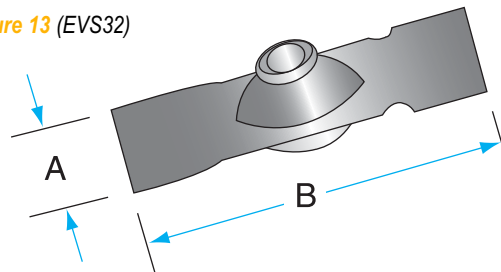


Figure 13 (EVS32)



Description	Figure	No. per Pack	Dimensions (in.)			Volts	Amps	Watts	Temp.	Part No.	Price
			A	B	C						
Tantalum Crucible Heater box heater for:											
EVC1 and EVC9	1	1	2 ³ / ₄	1 ¹ / ₄	5 ⁵ / ₈	1.34	273	366	1600° C	EVCH1	Call
EVC5	2	1	4	1 ³ / ₄	1 ¹ / ₈	1.79	346	619	1600° C	EVCH5	Call
EVC7	3	1	2 ³ / ₄	1 ¹ / ₄	1 ¹ / ₄	1.47	187	275	1600° C	EVCH7	Call
EVC8	4	1	2 ⁷ / ₈	1 ³ / ₈	1 ⁵ / ₈	1.73	199	344	1600° C	EVCH8	Call
EVC1 and EVC9	5	1	2	1	9 ⁹ / ₁₆	1.23	242	298	1600° C	EVSME19	Call
EVC10	6	1	2	1	9 ⁹ / ₁₆	1.12	159	178	1600° C	EVSME20	Call
EVC10	7	1	3	1 ¹ / ₂	1	1.93	191	369	1600° C	EVCH9	Call
EVC1 and EVC9	8	1	3	5 ⁵ / ₈	1	1.70	191	325	1600° C	EVCH10	Call
EVC1 and EVC9	9	1	3	5 ⁵ / ₈	1	1.70	191	325	1600° C	EVCH11	Call
EVC5	10	1	3 ¹ / ₂	1 ¹ / ₈	1	2.19	339	742	1600° C	EVCH12	Call
EVC5	11	1	3 ¹ / ₂	1 ¹ / ₈	1	2.19	339	742	1600° C	EVCH13	Call
EVC6	12	1	5	1 ⁵ / ₈	1 ¹ / ₈	3.82	525	2006	1600° C	EVCH14	Call
Tungsten Boat Heater for:											
EVC1 and EVC9	13	1	1 ³ / ₁₆	4	N/A	2.38	738	1756	2000° C	EVS32010W	Call