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VERTICAL E-BEAM EVAPORATOR EBVV

- UHV compatible, low outgassing
- High purity evaporation
- Hearth volumes 4 cm^3 or 5 cm^3
- Long filament lifetime
- High frequency x-y-beam deflection
- Optimized version for SiGe MBE with silicon shielding parts

EBVV 63-4 on DN63 (O.D. 4.5") CF-flange

Vertical Electron Beam Evaporators EBVV allow introducing real e-beam evaporation into many growth systems originally designed for radiation heated effusion cells only.
Despite its small footprint, the EBVV features a complete electromagnetic x- and y-dynamic beam deflection system and is capable of delivering beam powers up to 3kW.

The unique and extremely compact design makes it possible to install the EBVV instead of an ordinary effusion cell on any MBE system having a (near) vertical DN63 port with I.D. ≥ 60mm.
Inclined ports can be used without any difficulty for sublimating crucible charges. For materials that become liquid during operation EBVV evaporators are available with a tilted hearth geometry.

Two different hearth volumes are available: the 4 cm^3 geometry is compatible with standard crucible liners, while the 5 cm^3 model is recommended for Si epitaxy (in combination with specially adapted silicon shielding parts).

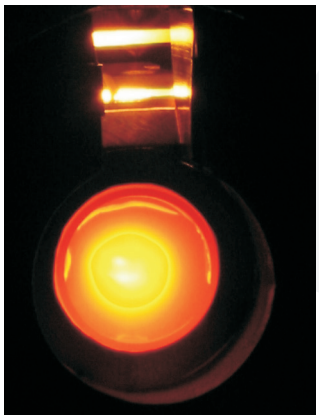
Especially for hot parts only UHV-grade materials are used without any compromise: molybdenum emitter block, tungsten filament and Al_2O_3 insulating ceramics. The main body is manufactured from OFHC (Oxygen-Free High-Conductivity) copper. For highly effective cooling the copper hearth is closely surrounded by a complete turn of an Ω-shaped water channel.

Application

The EBVV closes the gap between small rod-fed e-guns, that usually provide very low fluxes and are only suitable for sublimating materials, and common horizontally mounted e-beam evaporators, which often are excessively space consuming and far overrated for many MBE applications.

EBVV evaporators may even be a good alternative for radiation heated high temperature effusion cells running into their flux, temperature or purity limits.

The EBVV is the ideal evaporator for any low vapor pressure material, including refractory metals or dopants like, e.g., boron or carbon. It can also serve the upcoming demands in newly developed material systems like high-k materials (Al_2O_3 or Pr_2O_3) or other oxides and dielectrics.



EBVV 63-5 filled with high purity Si-B charge and optimized for clean Si evaporation with silicon shielding parts

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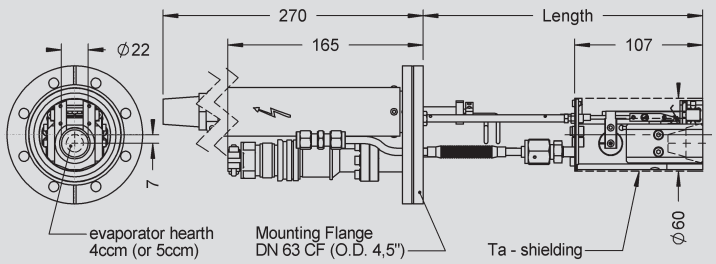
For Si growth in an MBE system a specially adapted set of shielding parts manufactured from high purity single-crystalline silicon is available for the EBVV 63-5. A Si plate and a ring cover all parts of the metallic body that are potentially subject to electron or ion bombardment and that face the substrate. This Si-shielding is a qualification for the growth of highest purity Si-based films with virtually no metallic contamination. The set is complemented by a high purity Si charge (source material in superior quality machined from wafer-grade Si single crystals) that fits the hearth closely.

For metal deposition the EBVV 63-4 can be used with bare copper hearth for all metals that do not melt completely (e.g., Al) or that do not react with the cooled copper wall. Crucible liners manufactured from graphite or refractory metals are available for all other materials. Please inquire about a solution for your particular evaporant.

Technical Data

Mounting flange	DN63 CF (O.D.4,5") or DN100 CF (O.D.6")
Dimensions in vacuum	L: 234-400mm; ØD: 60mm
Crucible capacities	4 cm^3 (EBVV 63-4, EBVV 100-4) or 5 cm^3 (EBVV 63-5, EBVV 100-5)
Hearth dimensions	Ø22mm (15° taper) x H 15mm or Ø23mm (12° taper) x H 15mm
Filament type	Short-legged coil of W wire, electron emitting filament
Bakeout temperature	200°C (all air side connectors removed)
Operating pressure	1×10^{-11} mbar ....1×10^{-5} mbar
Acceleration voltage	4 - 6 kV
Beam power	Max. 3 kW
Filament current	Max. 25 A at 10V (AC)
Spot size	5 mm diameter, approx.
Primary beam deflection	270° by permanent magnet system
Dynamic beam deflection	KAPTON™-isolated wire coils; deflection frequency: max. 150 Hz
Max. deflection currents	x-deflection current: ± 1.5 A; y-deflection current: ± 2 A
Water cooling	Min. water flow rate 5 l/min at 4 bar
Options	Tilted hearth (**T**); integrated rotary shutter (**S**)



Schematic drawing of the Vertical Electron Beam Evaporator EBVV (drawing shows EBVV 63-4 (5))

The DN100 CF version only differs in the base flange dimension.

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