



Miniature K-Cell

Miniature Knudsen Evaporation Cell

- **Compact, self-contained evaporation cell.**
- **Unique cartridge design to facilitate quick material change.**
- **Available in four aperture sizes.**
- **Available with power supply and temperature controller.**
- **Complete assembly contained on a 35CF, 2.75" OD flange.**

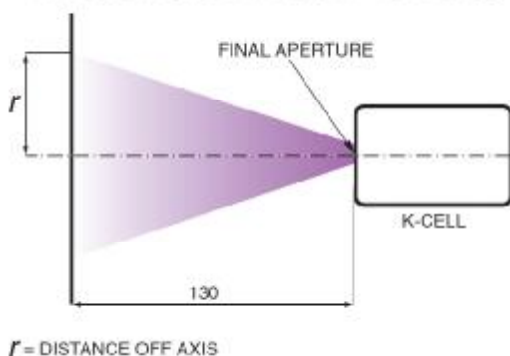


The Chell K-Cell utilises the principle of molecular effusion (demonstrated by Knudsen in 1909). Material to be deposited is heated to a suitable vapour pressure in an isothermal enclosure with an aperture in its wall. Molecular effusion occurs when the mean free path is large compared to the dimensions of the aperture. This gives rise to a cosine intensity distribution which can be collimated to form a beam of electrically neutral material. The advantage of this type of source is its ability to reproducibly deposit material with coverages ranging from sub-monolayer to continuous films. Chell has engineered these principles into a compact, self-contained cell, enabling the researcher to have a convenient, controllable deposition source. The furnace housing, which may be cooled by water or liquid nitrogen, is mounted together with the electrical feed through and the bellows-sealed shutter assembly on a 35CF (2.75"OD) flange. This arrangement allows the cell to pass down a 35mm bore tubulation.

The furnace of the K-Cell is designed as a removable cartridge which contains the crucible, heater element and heat shields. The crucible is heated by a Tantalum foil element which is isolated with Pyrolytic Boron Nitride (PBN) shields.

The central crucible is Graphite with an embedded thermocouple for accurate temperature measurement. The position of this thermocouple has been selected to follow the internal furnace temperature as accurately as possible. The design, developed by Chell's engineers, gives a stable high temperature furnace for controlled deposition of a wide range of materials. For maximum versatility a PBN liner may be fitted into the main furnace. Both the graphite and PBN crucibles are supplied with removable apertures to define and limit the output beam. Chell's unique cartridge design gives maximum flexibility to the user since complete cells of just the PBN liner can easily be replaced when the deposition of a different material is required.

THEORETICAL INTENSITY vs RADIUS

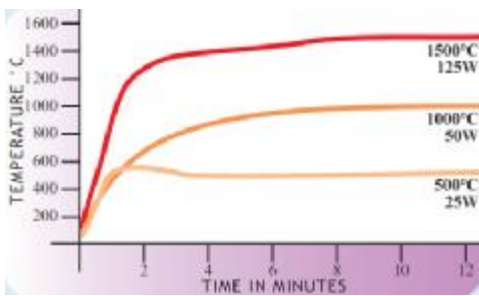


r = DISTANCE OFF AXIS

APERTURE SIZE				
r	1mm	1½mm	2mm	3mm
0mm	100%	100%	100%	100%
1	94	96	97	98
2	87	91	93	96
3	80	87	90	94
4	74	82	87	91
5	68	78	83	88
6	61	74	78	86
8	50	65	73	81
10	38	57	67	77
15	13	37	51	65

Evaporation distance to specimen 130mm

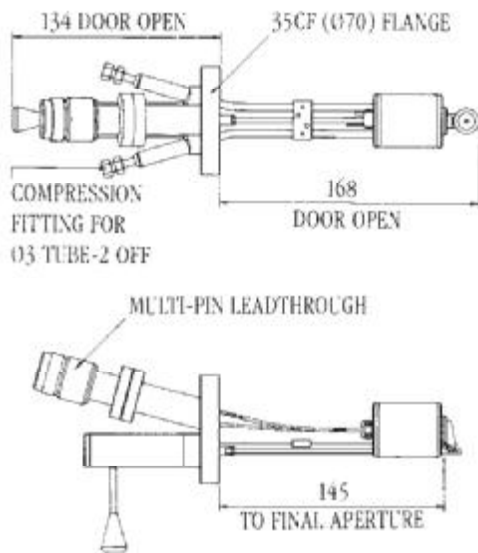
VFK-CELL - Power Supply



Since the characteristics of the heater element change with temperature both input power and temperature must be regulated. A microprocessor managed three term PID (Proportional, Integral, Differential) controller determines the power level necessary to reach and maintain the required temperature, within the specified limits. Changes in the cell temperature are simply achieved by changing the set temperature digitally displayed on the controller.

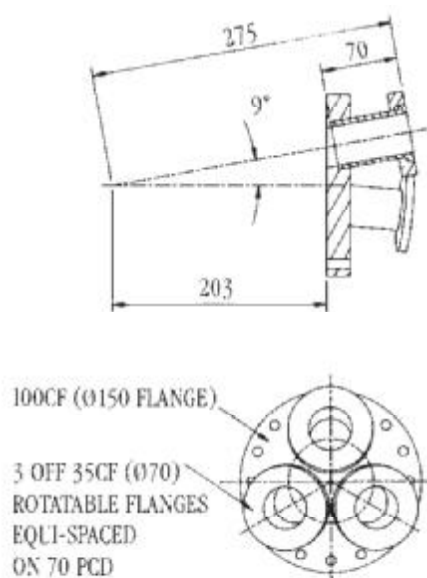


K-Cell - Dimensions



K-Cell - 3 Cell Flange Assembly

For studies where simultaneous or sequential deposition of different materials is required the Miniature K-Cell may be fitted in a group of three on a 100CF (6"OD) flange; in this configuration the cells target a common area 130mm from the shutter.



K-Cell Specifications			
		Very Fine Grain Graphite	Pyrolytic Boron Nitride (PBN)
Crucibles	Density	1.82 gms/cc	2.15 gms/cc
	Open Porosity	8%	0%
	Capacity	0.5cc	0.4cc
It should be noted that nitrogen dissociates from PBN at high temperatures. Typical dissociation pressures: 2.4 x 10 ⁻¹⁰ mb N ₂ at 1200K, 4.1 x 10 ⁻³ mb N ₂ at 1800K			
Cooling		Integral water or LN ₂ . Water flow requirement 0.25l/min	
Maximum operating temperature		1600°C	
Thermocouple		Type R (Pt-Rh) 20 to 1600°C	
Apertures		1mm standard, 1.5, 2 and 3mm available	
Bakeout		Bakeable at 250°C	
Heating		Tantalum foil heating element insulated with PBN	
Power Supply Specifications			
Temperature Control		Microprocessor managed three term PID control	
Heater Power		Adjustable up to 250W	
Temperature Control Stability		±2°C or 0.3% (whichever is greater)	
Size		19" rack : 2U (425 x 470 x 85mm)	
Weight		10.5 Kg	

K-Cell Ordering Codes	
KC3-BODY	Miniature K-Cell and shutter assembly
KC3-GRA-R	Graphite furnace cartridge with PtRh thermocouple (200 - 1600 deg C) (Standard)
KC3-GRA-K	Graphite furnace cartridge with K thermocouple (Option)
KC3-PBN	PBN liner and two apertures for graphite furnace
VFK-CELL	Power and Temperature controller for K-Cell with 4m connection lead.

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