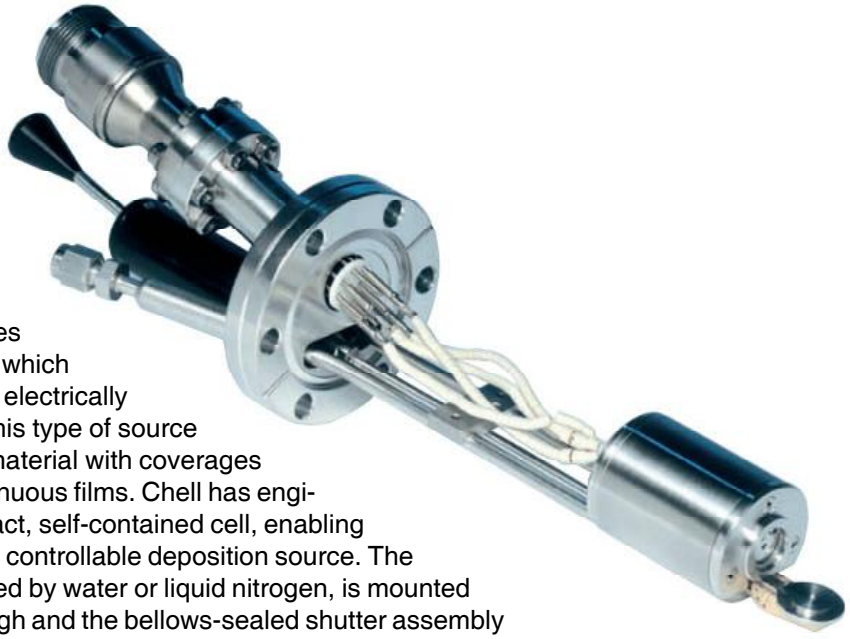
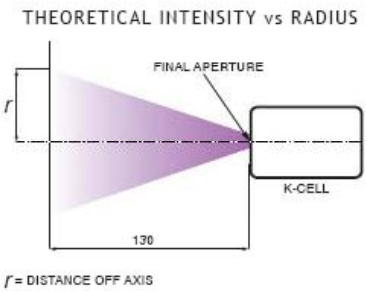
The Miniature K-Cell Series

Principle



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 a 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 leadthrough 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.



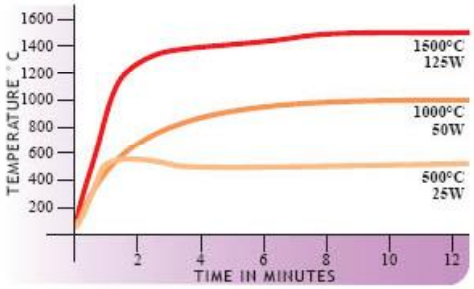
The furnace of the K-Cell is designed as a removable cartridge which contains the crucible, heater element and heat shields. The crucible is heated by a Tantalum foil element which is isolated with Pyrolytic Boron Nitride (PBN) shields. The central crucible is Graphite with an embedded thermocouple for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

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

Power and Temperature Control

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.



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 - 3 SERIES / 3 FLANGE

K-CELLS - 3 SERIES	
Crucibles:	**Very Fine Grain Graphite** Density : 1.82 gms/cc Open Porosity 0.5cc
	Pyrolytic Boron Nitride (PBN Liner) Density : 2.15 gms/cc Open Porosity 0.4cc
It should be noted that nitrogen dissociates from PBN and 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 0.25 l/min
Thermocouple	Type R (Pt/Pt-14%Rh) 20-1500°C
Bakeout	Bakeable at 250°C
Apertures	1mm dia standard (other sizes available on request)
Heating	Tantalum foil heating element insulated with PBN
Maximum operating temperature	1500°C

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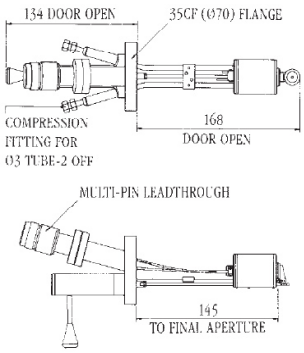

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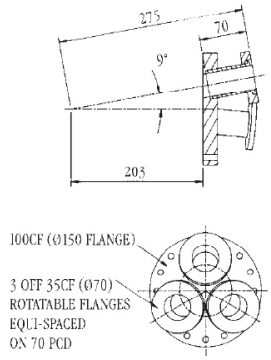

CONTROL UNIT
Microprocessor managed three term PID control
RS232 for PC Interfacing
Power output adjustable up to 250W
Temperature control stability +/-2 or 0.3%
Digital temperature setting and display
19" x 2U rack mounted
Weight 10.5Kg
Size w : 425mm x d : 470mm x h : 85mm

ORDERING INFORMATION	
Body and shutter assembly	KC3-BODY
Graphite furnace with (pt/pt-13%Rh) thermocouple	KC3-GRA-R
PBN liner and end caps	KC3-PBN
Alumina liner and Ta aperture	KC3-ALU+TA
PBN end caps (x2)	KC3-PBN-CAP
Graphite end cap (x1)	KC3-GRA-CAP
Heat shield aperture	KC3-HSA
3 Cell 100CF flange	KC3-3F
K-Cell multipin socket	KC3-SKT
Control unit	250-PTC
Connection lead - 4m (supplied with above)	KC3-PTC-4

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