

8 - Vacuum coating and evaporation materials

The Agar range of coating units offers the user a wide choice of options to suit all the coating requirements needed in support of SEM and TEM applications. These compact bench-top coating units are built to a high specification and incorporate microprocessor technology.

A guide to selecting the correct coater

Basic coating

For routine gold sputtering of SEM samples, the manual sputter coater (**B7340**) provides a low cost solution. For high sample throughputs, or occasions where alternative target materials, such as gold/palladium, are required to achieve finer grained coatings, the automatic coating unit (**B7341**) should be selected.

For microanalytical applications where gold coating may not be appropriate, the carbon coater (**B7367A**) is ideal. The dual carbon rod source, with unique current feedback control, gives highly reproducible carbon coatings for SEM samples.

The pumping system (**B7366**) is designed for use with the coating units. It includes an anti-vibration platform, stainless steel bellows connection and vacuum fittings.

If both carbon and gold sputtering are required, the dual pumping system (**B7736**) with changeover valve can be used to pump two coating units.

Where an accurate determination of coating thickness is required, the manual film thickness monitor (**B7348**) can be used with all the units. It can also be shared between two coaters, by the addition of the hardware kit (**B7735**). Further automation of the coating process can be achieved by fitting the film thickness monitor with terminator (**B7349**) to the automatic sputter coater. With this fitted, sputtering is automatically terminated when the desired pre-set thickness has been reached.

High resolution coating

Preparing samples for examination in an FEG SEM requires fine grained coatings in order to make the most of the greater resolution available. The high resolution coater (**B7234**) includes chromium and platinum/palladium targets as standard. The turbomolecular drag pump provides the high vacuum and high volume gas handling necessary for sputtering these materials. The rotary planetary stage and film thickness monitor are also included as standard, to ensure that coating thickness can be kept to a minimum to prevent charging.

High vacuum carbon coating and metal evaporation

For carbon coating of mounted, polished samples for microprobe analysis and back-scatter applications, the SEM turbo coater (**B7230**) should be used. The higher vacuum gives a fine continuous carbon layer and the optional rotary planetary stage ensures a uniform coating over a number of samples. The SEM turbo coater should also be used for carbon coating of highly contoured or porous samples; tilting the rotary planetary stages ensures that all facets of the specimen are evenly coated and specimen charging can be eliminated with the minimum thickness of coating.

The TEM turbo coater (**B7232**) has been designed to provide all the facilities required for TEM and in the basic form can be used to make thin carbon support films or for coating grids.

The auxiliary power supply allows a range of other accessories to be easily fitted. These include a metal evaporation source, aperture cleaning and glow discharge for the hydrophilisation of grids. A rotary shadowing table is also available as an accessory.

Applications guide

The table offers guidance to help you select the coater type and configuration most appropriate for your application:

Applications	Instrumentation
SEM low magnification imaging	Manual sputter coater – Au target
SEM high magnification imaging High specimen throughput	Automatic sputter coater – Au/Pd target Film thickness monitor
FEG SEM high magnification imaging Low voltage imaging Highly contoured samples	High resolution coater – Cr, Pt/Pd targets Rotary planetary stage Terminating film thickness monitor
EDX analysis low atomic number coating	Carbon coater
EDX WDX analysis	SEM Turbo carbon coater
EBSD/CL/BE imaging of non-conductive samples	Film thickness monitor Rotary planetary stage
TEM support films	TEM Turbo carbon coater
Grid coating	Metal evaporation
Metal evaporation and shadowing	Rotary shadowing table
Hydrophilisation of grids	Glow discharge

For further information, please contact us.

Data sheets with full specifications for each type of coating system are available on request.

Manual sputter coater

This is a simple-to-use basic instrument for gold coating of SEM specimens. It has fully variable current control, a digital process timer with pause option, a variable height specimen table, a hinged top plate and an o-ring sealed vacuum chamber. The control allows the sputter current to be set independently of the gas pressure, which is adjusted separately by a manual leak valve. Coverage and grain size are optimised for any specimen. The cool magnetron type head with 57 mm diameter target gives efficient sputtering with minimal heating. Coating time is set by a timer with a digital readout and stored in the memory. The vacuum status and sputter current are displayed on the panel meter.

A modular desktop design combines sputter control unit, pumping system and thickness monitor into an area of only 400 x 600 mm. It is fully integrated using a quick release all-metal coupling system. The adjustable height specimen table will accept up to 12 pin type stubs or can be used as a platform for other types of stubs and specimens. A vacuum feedthrough is provided for the optional film thickness monitor.

Chamber size: 120 x 120 mm.

- B7340** Agar manual sputter coater
- B7366** Pumping system
- B7348** Film thickness monitor



Automatic sputter coater



A more advanced sputter coater where the complete sequence of flush, leak, coat and vent is automatically controlled. The solenoid operated leak valve allows the gas pressure to return automatically to pre-set conditions. The coater can also be operated in the manual mode if required. The sputter current is set by a digital programmer and is independent of the gas pressure. Sputtering currents up to 40 mA allow a range of target materials to be efficiently sputtered by the magnetron head. Coating time can be set, stored and displayed by the digital timer.

Further automation can be achieved with the addition of the terminating film thickness monitor. With this fitted, the desired thickness can be entered and the sputtering process is automatically terminated when this thickness has been reached.

Chamber size: 120 x 120 mm.

- B7341** Agar automatic sputter coater
- B7366** Pumping system
- B7348** Film thickness monitor
- B7349** Terminating film thickness monitor

SEM automatic carbon coater



The Agar automatic SEM carbon coater is a dedicated unit for routine coating of SEM and microprobe samples, where a conductive low atomic number coating is required. The dual carbon rod source with unique current feedback control gives highly reproducible carbon coatings. In automatic mode, the required voltage setting and evaporation time can be entered and displayed via the digital programmer. A manual and a pulsed mode for coating heat sensitive samples are also included. The adjustable height specimen table allows the working distance to be changed.

Where an accurate determination of coating thickness is required, the manual film thickness monitor (**B7348**) can be used with this coating unit and a vacuum feedthrough is included for this purpose.

Chamber size: 120 x 120 mm.

- B7367A** Agar automatic SEM carbon coater
- B7366** Pumping system
- B7348** Film thickness monitor

Pumping system



This compact pumping system is designed for use with Agar coating units. The 2.5 m³/hr two-stage rotary pump is mounted on an anti-vibration platform and is equipped with an oil mist filter. The metal bellows with KF fittings provides a short, wide bore connection for maximum pumping efficiency. Pump down time to 0.1 mbar is 30 seconds.

The dual pumping system includes an additional bellows, KF fittings and a changeover valve, which enables the combination of the Agar sputter coater and carbon coater to be operated from a single pump. An upgrade kit is also available to fit to existing pumps.

- B7366** Pumping system for Agar coaters
- B7736** Dual pumping system for Agar coaters
- B7379** Dual pumping system upgrade kit

Film thickness monitor

This is a compact, low cost, microprocessor-based film thickness monitor for use with the Agar range of coating units. Originally designed for electron microscopy applications, it is also suitable for use in complex deposition systems. A dual memory stores parameters for two deposition materials. The system uses a 6 MHz quartz crystal oscillator mounted in a crystal holder. The control unit has a digital readout, which displays coating thickness directly in nanometres, with a resolution of 0.1 nm. A tooling factor can also be entered to compensate for differences in specimen and crystal position. The film thickness monitor features a measurement range of 0 to 999.9 nm, and a display of crystal life.

An upgrade kit allows the single control unit to be shared between two Agar coaters. An alternative vacuum feedthrough is available to allow the thickness monitor to be used on other coating units.

- B7348** Agar film thickness monitor
- B7386** Film thickness monitor upgrade kit
- B7732** Quartz crystals, 6 MHz. Pack of 10



Terminating film thickness monitor

This unit is a low cost system designed for use with the Agar automatic sputter coater. The desired thickness can be entered using scroll keys. The control unit can then be used to terminate the sputtering process when the pre-set thickness has been reached. This monitor takes five measurements per second. It features a measurement range of 0 to 999.9 nm and has a crystal life display feature. Parameters for one material can be stored.

- B7349** Agar terminating film thickness monitor



High resolution sputter coater

The Agar high resolution sputter coater offers a real solution to the problems encountered when coating difficult samples for FEG SEM imaging. To minimise the effect of grain size, the coater gives full control over thickness and deposition conditions. The turbomolecular drag pump provides the high vacuum necessary for sputtering non-noble metals, while having excellent gas handling characteristics. The magnetron sputtering head has the high current capability required for sputtering chromium and a source shutter for target conditioning is provided as standard.

Chromium and platinum/palladium targets are included to give fine grain coatings of different densities. Other target materials are available and easily interchanged.

The rotary planetary stage with tilt ensures that highly contoured samples are evenly coated. This ensures that the minimum coating thickness can be applied to give conductivity without compromising fine specimen detail. The dual height 150 mm diameter work chamber gives easy adjustment of working distance.

The integrated terminating film thickness monitor allows the coating thickness to be closely controlled and reproduced for repeat samples.

- B7234** Agar high resolution coater



SEM turbo carbon coater



High vacuum evaporation of carbon gives the predictable spatial distribution and thickness required for X-ray microanalysis and imaging of non-conductive samples. The high vacuum is achieved by an 80 l/sec turbomolecular pump backed by a rotary pump. In addition to providing a rapid pump down time it has the advantage of not requiring water cooling or a long warm up period. The vacuum is continuously monitored. Carbon is evaporated from the dual shaped carbon rod source with operation in manual, pulsed or automatic modes. Thickness can be monitored by the optional film thickness monitor.

For highly contoured samples the optional motorised rotary planetary stage with tilt greatly increases specimen coverage. The four sample holders are interchangeable and can be configured to suit most types of specimen stubs or metallurgical mounts. Up to 24 pin type stubs can be coated at one time. The stage includes a smaller height work chamber. This allows the working distance to be changed. The long working distance using the standard 150 mm diameter x 150 mm high chamber with 0° tilt, can be used for even coating of flat polished microprobe samples, while the short working distance with high tilt is used for topographic samples.

This is the most advanced carbon coater with wide applications for TEM, SEM and microprobe techniques. The basic turbo carbon coater can be fitted with different accessories to make it suitable for SEM (with a high vacuum for microprobe or polished substrates, or a low vacuum for coarse or granular substrates), TEM (for support films, shadowing, aperture cleaning, glow discharge, etc.) or both.

The modular design permits rapid change between a variety of applications with optimised operating conditions:

- Voltage controlled rod source gives multiple evaporation capability
- Automatic evaporation control gives ease of use in a busy environment
- Low cost thickness monitor gives reproducible results
- 80 l/sec turbo pump on a 150 mm chamber gives very rapid pump down
- Reduces operating costs by no diffusion pump, no water or liquid nitrogen cooling

B7230 Agar SEM turbo carbon coater



Accessories



- B7231** Rotary planetary stage
- B7240** Film thickness monitor
- B7252** Auxiliary power supply for accessories
- B7253** Metal evaporation accessory
- B7254** Glow discharge accessory
- B7255** Aperture cleaning accessory



See opposite for accessories information.

TEM turbo carbon coater

The TEM turbo carbon coater has been designed to produce high quality thin carbon support films, and coating and shadowing of TEM grids. The system incorporates a turbomolecular pumping system to provide the high vacuum necessary to form coherent films. The 150 mm diameter x 150 mm high work chamber is equipped with a dual shaped carbon rod source, which can be operated in manual, pulsed or automatic modes. Thickness can be monitored by the optional film thickness monitor. Low angle shadowing can be achieved by use of the optional motorised low angle shadowing table.

A number of accessories are available for use with the coater. These are designed to provide the full range of facilities associated with TEM applications. All accessories require the auxiliary power unit for operation. A 'smart' cable is used from the power supply to the accessory in use and activates the appropriate controls.

B7232 Agar TEM turbo carbon coater



Accessories

Auxiliary power unit

The auxiliary power unit operates the metal evaporation, aperture cleaning or glow discharge accessories under optimum conditions. It has digital power control and a timer for reproducibility and ease of use. The power unit automatically protects the metal evaporation or aperture cleaning accessories from overheating and vacuum safety interlocking is incorporated with all accessories.

Metal evaporation

The metal evaporation accessory is mounted on the standard top plate. It can be mounted in place of, or together with, the carbon rod head. The adjustable clamps will accept standard type filaments for evaporation of metals.

Glow discharge

The glow discharge accessory is used for the hydrophilisation of grids. It is mounted on a separate top plate and can be easily fitted by tilting back the standard head. The top plate incorporates a support cradle onto which slides can readily be mounted.

Aperture cleaning

A separate top plate is also used for aperture cleaning. A molybdenum boat is suspended from the top plate for easy external loading.

- B7250** Film thickness monitor
- B7251** Rotary shadowing table
- B7252** Auxiliary power supply for accessories
- B7253** Metal evaporation accessory
- B7254** Glow discharge accessory
- B7255** Aperture cleaning accessory

Spare targets

A range of spare targets is available for most well known makes of sputter coaters. In most instances, foil or disc targets are employed, with some older instruments using solid plated targets.

Disc targets are plain discs. Foil and annular targets are supplied mounted on aluminium backing plates.

The table below shows some of the commonly used target materials.

Coater type	Target type	Au	Au/Pd	Pt	Pt/Pd	Pd	Ni	Ag	Cr
Disc targets									
1	57 mm dia x 0.1 mm	B7390	B7391	B7392	B7395	B7397	B7393	B7394	
1	57 mm dia x 0.2 mm	B7390-2	B7391-2	B7392-2	B7395-2				
2	57 mm dia x 3.2 mm								B7396
3	54 mm dia x 0.1 mm	B7199							
3	54 mm dia x 0.2 mm	B7199-2	B7164	B7165	B7166		B7167	B7168	
Foil targets on aluminium backing plates									
4	58 mm (nominal) dia x 0.1 mm	B7190	B7191	B7192		B7150	B7193	B7194	
5	60 mm dia x 0.1 mm	B7184	B7185	B7186	B7169	B7159	B7187	B7188	
6	40 mm dia x 0.1 mm	B7195	B7196						
7	20 mm dia x 0.1 mm	B7197	B7198						
8	40 mm dia x 0.1 mm	B7885	B7888	B7886			B7887	B7889	
	Set of 4								
Annular targets supplied on aluminium ring holders									
9	OD: 82 mm ID: 60 mm x 0.1 mm	B7370	B7371	B7372		B7398	B7373	B7374	
10	OD: 115 mm ID: 92 mm x 0.1 mm	B7876	B7881	B7882			B7883	B7884	
Other targets									
	Edwards S150A plated	B7355A							
	Edwards S150B 73 mm disc	B7351	B7356	B7357					
	Scancoat 6								
	JEOL JFC 1100 46.2 mm dia x 0.1 mm 2 mm high rim	B7145							

Other metals are available in certain sizes, please ask for details.

Coater type

- | | |
|---|--|
| 1. Agar coaters
Cressington coaters (not 308 series)
Polaron/Quorum/Bio-Rad/VG - E5000, E5200, E5400, SC502, SC7610, SC7620 | 5. Polaron/Quorum/Bio-Rad/VG/Emitech - K500X, K550X |
| 2. Agar turbo coater
Cressington turbo coater | 6. Polaron/Quorum/Bio-Rad/VG/Emscope - SM300, SC400 |
| 3. Bal-Tec/Leica SCD005, SCD050, MED010, MED020 | 7. Polaron/Quorum/Bio-Rad/VG/Emscope - K1250X, SP2000 |
| 4. Polaron/Quorum/Bio-Rad/VG/Emitech - SC500, SC500A | 8. Polaron/Quorum/Bio-Rad/VG/Emitech - SC650, SC650A |
| | 9. Polaron/Quorum/Bio-Rad/VG/Emitech - SC510, SC515, E5100, SC7640, SC7680 |
| | 10. Polaron/Quorum/Bio-Rad/VG/Emitech - E5175 |

Gold target replating service

A number of early sputter coaters, notably the Edwards S150 and S150A units, employ gold plated cathodes. A replating service is offered for this type of target which should make renewal a more economical proposition. The nominal replating thickness is 25 µm.

B7180 Replating cathode

Spare parts

Replacement spare parts including glass chambers, gaskets, valves and vacuum gauges can be supplied for current and older models of Agar, Polaron/Bio-Rad/VG and Edwards coating units.

Please ask for details, specifying make and model of coating unit.

Other spare parts include replacement quartz crystals for use with the Polaron film thickness monitor.

B7425 Quartz crystals. Pack of 3



Plasma etcher/asher

This plasma reactor is designed to meet the requirements of research and development, and small scale production for a wide and varied range of plasma etching, ashing and cleaning applications. Built to withstand heavy use, it features microprocessor control with automatic operation and offers durability and simplicity of operation. Barrel systems plasma etch or plasma ash isotropically (in all directions) and are suitable for the majority of applications.

The unit uses a low pressure, RF-induced gaseous discharge to modify specimen surfaces or remove specimen material in a gentle, controlled way. A significant advantage over alternative methods is that the plasma etching and ashing processes are dry (no wet chemicals needed) and take place at relatively low temperatures.

It is also fitted with a solid state RF power supply (0 - 100 W) and tuning circuits, plus dual process gas flow meters featuring full or restricted vent control. The chamber is cylindrical with a drawer system for ease of sample loading.

The use of reactive process gases such as CF₄ significantly reduces the life of the standard Pirani gauge. Therefore the use of a capacitance manometer for vacuum measurement is essential.

The unit requires a rotary pump with a capacity of 50 l/min. A fomblinised pump is strongly recommended when applications involve the use of oxygen as a process gas.

B7946 Plasma etcher/asher

B7385 Rotary pump, 50 l/min

B7947 Fomblinised rotary pump, 50 l/min

B7951 Capacitance manometer

B7946S Spares kit



Glow discharge system



This is a simple, free-standing glow discharge system, typically used for hydrophobic to hydrophilic conversion of carbon coated TEM grids thus allowing easy spreading of aqueous suspensions. The unit requires only a suitable rotary pump for operation. It has intuitive digital menu-driven operation which makes it easy to set up and run. For ultimate safety the system has a built-in implosion guard.

The system allows deep cleaning or ion etching of a specimen surface and is very useful for clearing contamination films or deposits. The polarity of the plasma can be changed for either surface treatment or surface etching of metallic specimens.

B8960 Glow discharge system

B7385 Rotary pump 50 l/min

Evaporation metals



These high purity wires are for use in evaporation and shadow casting. All wires are supplied in a convenient dispenser. Other thicknesses and purities are available, details on request.

Gold wire, 99.99 % purity, 0.2 mm dia

E401-1 Gold wire, 1 m length

E401-3 Gold wire, 3 m length

Aluminium wire, 99.99 % purity, 0.25 mm dia

E405 Aluminium wire, 3 m length



60/40 % Gold/palladium alloy wire, 0.2 mm dia

E402-1 Gold/palladium wire, 1 m length

E402-3 Gold/palladium wire, 3 m length

Silver wire, 99.99 % purity, 0.25 mm dia

E406 Silver wire, 3 m length



80/20 % Platinum/iridium alloy wire, 0.2 mm dia

E403-1 Platinum/iridium wire, 1 m length

E403-3 Platinum/iridium wire, 3 m length

Tungsten wire, pure, cleaned, for making evaporation sources

E407-1 Tungsten wire 1 mm dia, 10 m length

E407-8 Tungsten wire 0.89 mm dia, 6.1 m length

E407-2 Tungsten wire 0.5 mm dia, 10 m length

E407-3 Tungsten wire 0.37 mm dia, 10 m length

E407-4 Tungsten wire 0.125 mm dia, 25 m length

E407-5 Tungsten wire 0.2 mm dia, 10 m length

E407-6 Tungsten wire 0.25 mm dia, 10 m length

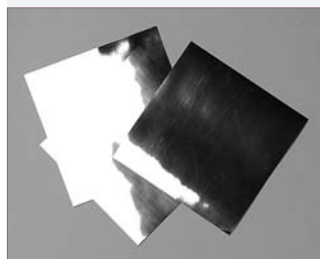
80/20 % Platinum/iridium alloy wire, 0.25 mm dia

E436-1 Platinum/iridium wire, 1 m length

E436-3 Platinum/iridium wire, 3 m length

Molybdenum wire, 99.99 % purity, 0.2 mm dia

E480 Molybdenum, 3 m length



Platinum wire, 99.99 % purity, suitable for platinum carbon evaporation

E404-1 Platinum wire 0.1 mm dia, 3 m length

E404-2 Platinum wire 0.2 mm dia, 1 m length

E404-3 Platinum wire 0.2 mm dia, 3 m length

E404-5 Platinum wire 0.2 mm dia, 25 m length

Molybdenum sheet, 0.05 mm thick, 150 mm square

E408 Molybdenum sheet

80/20 % Platinum/palladium alloy wire, 0.2 mm dia

E412-1 Platinum/palladium wire, 1 m length

E412-3 Platinum/palladium wire, 3 m length

Tantalum sheet, 0.076 mm thick, 120 mm square

E413 Tantalum sheet

Palladium wire, 99.99 % purity, 0.2 mm dia

E447-1 Palladium, 1 m length

E447-3 Palladium, 3 m length

E447-25 Palladium, 25 m length

Chromium chips

High purity 99.9 % chromium chips graded for use with wire baskets.

E435 Chromium chips. 100 g

Ready made evaporation sources

Our range of tungsten filaments, tungsten baskets and molybdenum boats offers convenient ready prepared, reproducible evaporation sources. Supplied in packs of 10.

Tungsten filaments

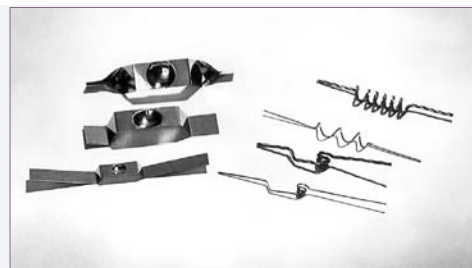
E420 Tungsten filaments, 40 amp

E421 Tungsten filaments, 20 amp

Tungsten baskets

E422 Tungsten baskets, 35 amp

E423 Tungsten baskets, 20 amp



Molybdenum boats

Cat. no.	Length (mm)	Width (mm)	Dimple diameter (mm)	Boat thickness (mm)	Evaporation current (amps)
E470	63	6.5	4.5	0.05	25
E471	51	9.5	9.5	0.05	45
E472	50	11	9.5	0.1	80
E473	54	14.5	13	0.1	100
E474	50	16	13	0.1	100

Molybdenum boats for aperture cleaning

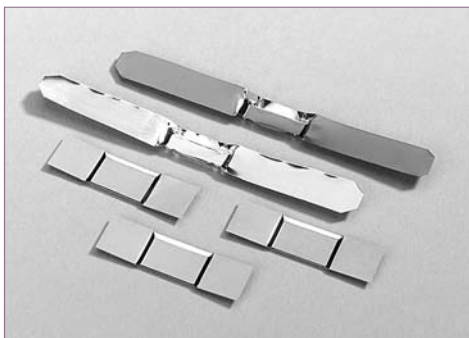
These boats accommodate several aperture discs which should be heated in a vacuum chamber to bright red heat for cleaning.

Dimensions 7.9 (w) x 76.2 (l) mm, trough: 4.8 (w) x 12.7 (l) x 0.8 (d) mm. Thickness 0.05 mm. Platinum and tantalum also available on request.

E446 Boats for aperture cleaning. Pack of 5



Evaporation boats



Platinum boat

Size: Overall length 75 mm, thickness 0.05 mm
Trough: 12 (l) x 5 (w) x 1 (d) mm

E437 Platinum boat

Tantalum boats

Size: Overall length 75 mm, thickness 0.05 mm
Trough: 12 (l) x 5 (w) x 1 (d) mm

E438 Tantalum boats. Pack of 5

Tungsten boats

Size: Overall length 32 mm, thickness 0.05 mm
Trough: 12 (l) x 9.5 (w) x 1 (d) mm

E439 Tungsten boats. Pack of 5

Carbon rods



E409-1 Carbon rods, 5 mm dia x 200 mm long. Pack of 10

E409-2 Carbon rods, 6.3 mm dia x 150 mm long. Pack of 10

E415 Spectrographically pure carbon rods, 3 mm dia x 300 mm long. Pack of 10
Impurities <2 ppm

E416 Spectrographically pure carbon rods, 3 mm dia x 300 mm long. Pack of 10

E417 Spectrographically pure carbon rods, 4.6 mm dia x 300 mm long. Pack of 10

E418 Spectrographically pure carbon rods, 6.15 mm dia x 300 mm long. Pack of 10
Impurities <5 ppm

Shaped carbon rods



These are softer (graphite type) carbon rods, 55 mm long, pre-shaped and ready for use in the vacuum coating unit. Each pack contains 10 rods shaped on one end.

E429 Shaped carbon rods, 6.15 mm dia. Pack of 10

E430 Shaped carbon rods, 4.6 mm dia. Pack of 10

E431 Shaped carbon rods, 3 mm dia. Pack of 10

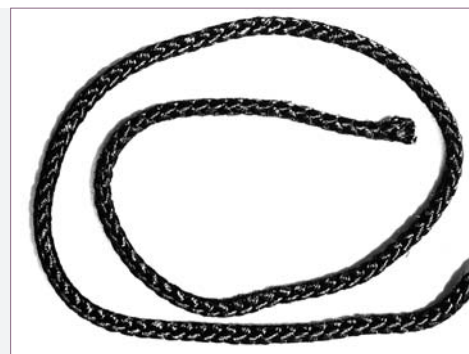
E441 Shaped carbon rods (45 mm long) for Agar coaters. Pack of 10

Impurities <5 ppm

Carbon fibre

Evaporation of braided carbon fibre gives a very reproducible film thickness. Three different thicknesses are available to suit the power supplies of coaters from different manufacturers.

- E428** Carbon fibre, 1.55 g/m, 2.5 mm dia, 3 m length
- E443** Carbon fibre, 0.7 g/m, 1.0 mm dia, 1 m length
- E445** Carbon fibre, 0.4 g/m, 1.0 mm dia, 1 m length
- E419E** Carbon fibre, 0.27 g/m, 0.7 mm dia, 5 m length
- E448** Carbon fibre for Balzers/Bal-Tec, 3.5 m length



Other thicknesses available. Please ask.

Platinum carbon rods for electron beam evaporation

These carbon rods have been loaded with platinum and are ready for electron beam irradiation. Rods are accurately machined to 2 mm diameter, suitable for Leica/Balzers/Bal-tec and Cressington electron guns. They should give a total evaporated thickness of 15 nm in their working life (for an evaporation distance of 125 mm). This is equivalent to 10 high resolution shadows or five heavy shadows.

- E434** Platinum carbon rods, 2 mm dia. Pack of 10

Carbon rod grinder

A motor-driven shaper with grinding wheel to produce profiled tips on carbon rods. Hard carbon is easily shaped as it is ground not cut. The rod holder is adjustable to produce tips of different diameter. The shaped grinding wheel can produce tips with a double shoulder or, alternatively, with a conical tip. It is supplied complete with a tray to collect the carbon dust. The standard grinder collet accepts 6 mm rods. A 3 mm collet is also available.

- T580** Carbon rod grinder
- T580-C3** Collet for 3 mm rods



Other collet sizes are available on request.

Hand tool for carbon rod shaping

This is a high precision hand-held tool for shaping carbon rods to make cylindrical tips. When evaporating carbon with one rod sharpened to a fine cylindrical tip and the other sharpened to a conical point, a reproducible and reliable evaporation takes place. The smallest size is 0.66 mm diameter, suitable when wrapping platinum wire around the carbon tip for evaporations. The next size is 1.5 mm diameter and the third 3.55 mm diameter.

Rotation of the blade in the holder alters the final diameters. This sharpener is suitable for use with **E417** and **E418** carbon rods.

- T592** Hand tool for carbon rod shaping



Carbon rod sharpener



A simple sharpener that gives a good conical point on carbon rods. The cutter is replaceable.

T579 Carbon rod sharpener

Carbon rod shaping tool for 3 mm rods



A simple but effective shaping tool for the thin rods now used in some equipment. Cylindrical tips are formed.

T5021 Hand tool for shaping 3 mm carbon rods

Protective goggles



Protective goggles with coloured glass in flip-front for observing the evaporation process.

G395 Protective goggles

Oil mist filters



Filters are available for the removal of oil mist from vacuum pump exhaust gases. The units are disposable and must be fitted vertically. Each unit consists of a microfibre element permanently sealed into either a nylon housing with 1/2" NPT male fitting suitable for a flow rate up to 5 m³/hour (83 l/min), or a steel housing with 1/3" NPT fitting suitable for a flow rate up to 15 m³/hour (250 l/min). Other sizes available on request.

G3623 Oil mist filter 5 m³/hour (83 l/min)

G3624 Oil mist filter 15 m³/hour (250 l/min)

G3615 Oil mist filter for Agar pumping system



The fixing thread on the oil mist filter may not be compatible with the threaded exhaust outlet on the rotary pump. In such cases an adaptor will be required and the two most commonly used adaptors are listed below.

G3623A Pump to filter (G3623) adaptor for Edwards pumps

G3624A Pump to filter (G3624) adaptor for Edwards pumps

For other makes of rotary pumps, please supply details of make and model.

Victawet®

Victawet is a phosphate based, water soluble, non-foaming anionic wetting agent that can act as a surfactant in a number of microscopy applications. It can be specifically used in vacuum evaporator units and evaporated onto various substrates to form a surface parting layer for carbon or other thin film replicas.

E440 Victawet. 5 g

Vacuum oils and greases

Periodic checking and replacement of vacuum pumping fluids is recommended, and some attention should be given to pump fluids when pump down times become excessively long.

For replacement, a selection of commonly used oils is available.

The choice of the appropriate oils and greases will depend on the types of pump and equipment in which they are used. The vapour pressure, viscosity, hydrocarbon content and compatibility with existing oils should all be taken into account before a selection is made.

Rotary pump oil

This range of Ultragrade® oils replaces all previous types and gives improved vacuum performance. Ultragrade 15 should be selected for small pumps or for cold start applications. Ultragrade 19 is suitable for all mid-range pumps, including those used with electron microscopes and evaporation systems. For large booster pumps, or where corrosive gases are encountered, Ultragrade 20 should be used. Alcatel 120 and Pfeiffer P3 oils are used in pumps supplied with the Agar coating units.

- B7644** Edwards rotary pump oil Ultragrade 15. 4 litres
- B7645** Edwards rotary pump oil Ultragrade 15. 1 litre
- B7640** Edwards rotary pump oil Ultragrade 19. 4 litres
- B7641** Edwards rotary pump oil Ultragrade 19. 1 litre
- B7642** Edwards rotary pump oil Ultragrade 20. 4 litres
- B7643** Edwards rotary pump oil Ultragrade 20. 1 litre

- B7294** Alcatel 120 rotary pump oil. 1 litre
- B7646** Pfeiffer P3 rotary pump oil. 500 ml



Fomblinised rotary pump oil

For use in fomblinised rotary pumps where reactive gases are present and where standard rotary pump oils are not appropriate.

- B7610** Fomblin® YVAC 06/6. 532 ml
- B7611** Fomblin® YVAC 06/6. 2.66 litres
- B7612** Krytox® 1506 fluid. 532 ml
- B7613** Krytox® 1506 fluid. 2.66 litres

Diffusion pump fluids



Diffoil-20 Ultra is a double-distilled, high-grade, hydrocracked oil and is ideal for use in diffusion pumps but can also be used in two-stage rotary vane pumps. It allows low ultimate pressures and suits the very clean systems required in optical coating, sputter and e-beam coating, and analytical instrumentation.

Apiezon A is intended for use in small vapour diffusion pumps where an ultimate pressure of 10^{-4} to 10^{-5} torr is all that is needed.

Apiezon C gives the highest vacuum of the Apiezon® oils, without a cold trap. With a water-cooled baffle, ultimate pressures of 10^{-7} torr or better can be obtained.

Apiezon AP-201 is based on a hydrocarbon oil but unlike other Apiezon hydrocarbon oils it is strongly resistant to oxidation.

Dow Corning® DC 704 Silicone Fluid is an ideal fluid for aggressive applications and can be used in medium and large pumping speed diffusion pumps in a wide variety of research and production applications.

Edwards L9 diffusion pump fluid is a naphthalene based synthetic material which is ideal for use in applications where silicone forming insulating films cannot be tolerated.

- B7243** Diffoil-20 Ultra. 950 ml
- B7245** Apiezon A. 500 ml
- B7291** Apiezon C. 500 ml
- B7246** Apiezon AP-201. 4 litres
- B7244** Dow Corning DC 704 silicone fluid. 500 ml
- B7634** Edwards L9 diffusion pump fluid. 1 litre

Silicone oil

Silicone oils are in wide use in vacuum systems but should be avoided in electron microscopes as an insulating layer may be formed in critical parts of the column.

- B7287** Silicone 704 (EU) oil. 250 ml
- B7288** Silicone 704 (EU) oil. 500 ml
- B7244** Dow Corning DC 704 Silicone fluid. 500 ml
- B7242** KJLC 704 Silicone fluid. 500 ml

Santovac® 5 oil

For some applications, a diffusion pump oil with exceptionally low vapour pressure may be necessary. One such oil is Santovac 5, a polyphenyl ether. It has exceptional thermal stability and a lower tendency to creep than other oils. If this oil is to replace a dissimilar oil, the diffusion pump must be thoroughly cleaned to ensure that it is free of the old oil before charging with Santovac.

- B7289** Santovac 5. 100 ml
- B7290** Santovac 5. 500 ml

Lion S oil

This is recommended as the standard diffusion pump oil in many Japanese electron microscopes. It is a naphthalene-based synthetic material and should not be mixed with other types of diffusion pump fluids.

- B7638** Lion S oil. 1 litre
- B7639** Lion S oil. 100 ml



Apiezon greases

Apiezon L is a general purpose, high vacuum grade. It can be used on all ground joints in a vacuum system. This grease softens at about 47 °C and is not recommended for joints likely to warm to over 30 °C. Vapour pressure 7×10^{-11} Torr at 20 °C.

Apiezon H can be used over a wide temperature range -10 to 250 °C. It is a relatively stiff grease that does not melt and increases in stiffness with increased temperature. It is especially suitable for use in the medium to low vacuum range. Vapour pressure 1.7×10^{-9} Torr at 20 °C.

Apiezon M is a silicone and hydrogen-free grease for both high vacuum use and also as a lubricant for general applications throughout the laboratory. Typical temperature working range is 10 to 30 °C. Vapour pressure 1.7×10^{-9} Torr at 20 °C.

Apiezon N is a widely recognised and recommended silicone and halogen-free cryogenic vacuum grease. It has a typical temperature working range of -269 to 30 °C. Vapour pressure 6×10^{-10} Torr at 20 °C.

Apiezon T is a filled hydrocarbon grease for general sealing and lubrication in the medium temperature range of 10 to 120 °C. At its higher operating temperature range, Apiezon T grease exhibits good vacuum properties in the lower to medium vacuum range, while at lower temperatures it can be used in the high vacuum range. Vapour pressure 4.6×10^{-9} Torr at 20 °C.

- B7270** Apiezon L, grease. 50 g
- B7271** Apiezon H, grease. 25 g
- B7272** Apiezon M, grease. 100 g
- B7273** Apiezon N, grease. 25 g
- B7277** Apiezon T, grease. 25 g



Other greases

- B7278** Silicone high vacuum grease. 150 g
- B7299** Fomblin® RT 15 vacuum grease. 100 g

Waxes and sealing compounds



Apiezon® W is a low vapour pressure wax for sealing joints in high vacuum pressure systems. It has a working temperature range of -10 to 75 °C. It is the most resistant to attack by acids and alkalis, has the lowest vapour pressures and is the most resistant to water.

Apiezon W40 is similar to type W but has a lower softening point which makes it very suitable for flow sealing in or around vacuum joints. It is not recommended for use at temperatures above 30 °C.

Apiezon W100 is an inherently softer wax. It can be used for semi-permanent vacuum seals or for temporary specimen mounting on SEM stubs. This wax softens at 50 - 60 °C.

Apiezon Q is a sealing compound which can be used for temporary seals at low vacuum. It remains firm for temperatures up to 30 °C but is sufficiently pliable to permit easy moulding.

- B7275** Apiezon W wax. 500 g
- B7276** Apiezon W wax. 100 g
- B7241** Apiezon W40 wax. 250 g
- B7282** Apiezon W100 wax. 250 g
- B7274** Apiezon Q sealing compound. 1 kg

WACKER® silicone paste

WACKER silicone paste is opaquely translucent when applied as a thin film. It has an average consistency, is relatively shear stable, slightly thixotropic, has good electrical characteristics and provides good adhesion to metals and ceramics. Parts coated with this silicone paste are particularly water repellent, and this provides a degree of corrosion protection.

- B7247** WACKER silicone paste. 90 ml

Indium wire

Indium wire for high vacuum seals in clean systems.

- E432** Indium wire 1 mm dia, 1 m length

High vacuum leak sealant



Vacseal® is a silicone-based resin with a low vapour pressure. It is specially formulated to seal leaks in high and ultra high vacuum systems. It is also useful for making permanent repairs in all types of glass vacuum gauge tubes and can be used as an adhesive at cryogenic temperatures. Available in aerosol or brush-on form.

- B7292** High vacuum leak sealant, aerosol can. 450 g
- B7293** High vacuum leak sealant, bottle with brush. 85 g

Carbon crucibles

High density graphite crucibles for electronic applications, available as standard or with a vitrified coating. Supplied in packs of 5.

Cat. no.		Major OD (mm)	Overall height (mm)	Volume (cm ³)
E450	Carbon crucibles	29.64	14.30	4.40
E451*	Carbon crucibles	29.64	14.30	4.40
E452	Carbon crucibles	50.80	26.97	30.20
E453*	Carbon crucibles	50.80	26.97	30.20
E454	Carbon crucibles	48.01	17.78	16.20
E455*	Carbon crucibles	48.01	17.78	16.20
E456	Carbon crucibles	22.48	15.11	2.10
E457*	Carbon crucibles	22.48	15.11	2.10
E458	Carbon crucibles	32.51	23.88	8.30
E459*	Carbon crucibles	32.51	23.88	8.30
E460	Carbon crucibles	48.77	20.57	21.90
E461*	Carbon crucibles	48.77	20.57	21.90
E462	Carbon crucibles	68.58	37.85	82.70
E463*	Carbon crucibles	68.58	37.85	82.70



*Vitrified

Mini hot vac vacuum desiccator

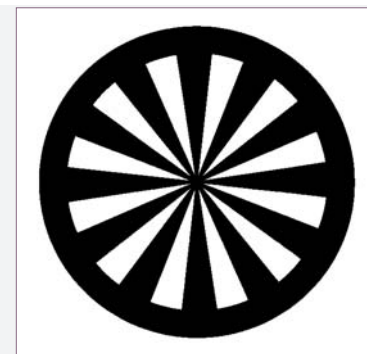
This mini hot vac vacuum desiccator warms embedding plastics while removing gas bubbles. The aluminium base is placed on a laboratory heating plate. A vacuum can be drawn through the porthole in the baseplate and a digital thermometer measures the plate temperature. It can be used up to 120 °C.

G3519 Mini hot vac vacuum desiccator



Evaporation masks

Custom made evaporation masks produced using an electroforming process can be manufactured. These can be made to a standard pattern or to a customer's own design. Electroforming has many benefits including clean straight edges, sub 2 µm tolerances and burr free holes and edges. They can be made to specific sizes from copper or nickel or if a reduction in reactivity is required the masks can also be gilded or platinised.



Please contact us for details.