

14 - Diamond knives

Diamond knives are manufactured from high purity, gem quality diamonds as an alternative to metal and glass knives, providing a sharp, durable edge for sectioning applications in biological and materials sciences. The robust cutting edge is particularly suited for use in ultramicrotomy to prepare ultrathin sections for TEM studies. Diamond cryosectioning knives are available for a wide range of low temperature applications. Diamond histo knives have been designed to section both hard and soft embedded specimens for

optical microscopy studies of biological and industrial materials, and have become an essential tool in many biological and medical investigations.

We offer both DiATOME and DDK (Delaware Diamond Knives) products.

Further details of all these knives are available on request.

DiATOME diamond knives

DiATOME diamond knives are well known, have proven reliability and are made from the highest possible gem quality stones. Since 1970, the Company has developed and manufactured diamond knives which have been used successfully for a wide range of room and low temperature sectioning applications. Each knife is subject to extensive inspection and testing before delivery.

A re-sharpening and exchange service is available for DiATOME knives, see page 275.

DiATOME Ultra diamond knives

DiATOME diamond knives are compatible with all ultramicrotomes and are suitable for producing ultrathin sections and surfacing various biological and industrial samples for SEM and SPM. The anodised blue boat is designed so that the water surface is horizontal when the clearance angle is set, resulting in good reflection. This allows easy wetting of the cutting edge even with a very low water level, which is particularly important for sectioning Lowicryl® and other hydrophilic embedding media and water sensitive samples.

The shape of the boat allows easy pick-up of floating sections.

Ultra

These knives are available with a 35° or 45° angle and in six edge lengths ranging from 1.5 to 4.0 mm.

Ultra 45°

The Ultra 45° angle knives are used for routine sectioning (30 nm - 200 nm) of both biological and materials specimens. They can also be used for ultrathin/semi-thin sectioning (50 nm - 1 µm). They are acknowledged to offer a good compromise between section quality and durability.

Ultra 35°

The 35° angle knives have proved advantageous for sectioning the Lowicryls and non-homogenous specimens as well as non-decalcified bone, dental material etc. They are also the choice for sectioning relatively soft materials research specimens, including metals and polymers, as well as hard specimens, such as semiconductors, superconducting oxides, catalysts and nanocrystalline ceramics.

Cutting range: 30 nm - 200 nm.

This knife in the triangular holder can be used for cutting dry sections (100 nm to 2 µm) of epoxy or acrylic embedded biological specimens for elemental analysis and SIMS.

When ordering please specify edge length, angle and type of boat required.

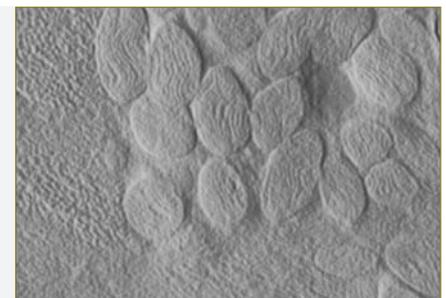


Ultra AFM

These knives have been designed for surface sectioning of biological and industrial specimens for atomic force microscopy. They produce extremely smooth sample surfaces, and offer the best possible structure preservation. The knives have been specially tested to ensure that they meet the increased quality requirements of AFM investigations. The knives have a 35° blade angle and are available in sizes of 2.0 or 3.0 mm.

G3437-2 Ultra AFM diamond knife, 2.0 mm

G3437-3 Ultra AFM diamond knife, 3.0 mm



Muscle of Otodectes cynotis

Diamond knives

DiATOME Ultra Sonic



The major obstacle to creating perfect ultrathin sections is compression, which can be as much as 20 % at room temperature and significantly limits quality. DiATOME's Ultra Sonic is a patented oscillating diamond knife that produces ultrathin sections almost free from compression for room temperature ultramicrotomy. A piezo actuator produces an oscillation of the knife at a desired frequency (20 to 45 kHz) and amplitude, in parallel with the cutting edge. The 35° angle, 3.0 mm knife produces section thicknesses ranging from 10 to 80 nm.

G3469 Ultra Sonic diamond knife with controller



DiATOME Cryo diamond knives

DiATOME cryo knives can be used for a wide range of low temperature applications. Cryosectioning of biological specimens is important in immunocytochemistry, elemental analysis and ultrastructural studies. In materials science, cryosectioning is used for polymers, rubber, paints and gels.

The knives are available in a range of sizes with angles of 25°, 35° and 45°. They can be supplied in triangular holders for dry sectioning or in boats for wet sectioning.

For all cryosectioning the use of an ioniser is essential (see page 275).

Cryo 25°



This 3 mm knife has been designed for dry sectioning of frozen hydrated specimens, resulting in the least compression and best structural preservation.

Cutting range: 25 - 200 nm.

G3438 Cryo 25° diamond knife, 3.0 mm

Cryo 35°

The Cryo 35° is accepted as a standard knife for the low temperature sectioning of polymers, rubber, paints etc. It represents a balanced compromise between section quality and durability.

Available in a range of sizes from 1.5 to 4.0 mm, and supplied in triangular holders for dry sectioning or in boats for wet sectioning.

Cutting range: 30 nm - 1 μ m.

When ordering, please specify edge length, angle and type of boat required.



Cryo 45°

The Cryo 45° knife is suited to routine cryosectioning of both biological and materials specimens.

Available in a range of sizes from 1.5 - 4 mm and supplied with boat for either dry or wet sectioning.

Cutting range: 30 nm - 1 μ m.

When ordering, please specify edge length, angle and type of boat required.



Cryo Immuno

This diamond knife has a diamond platform which ensures easy and gentle sectioning for cryo-immunocytochemistry. Sections are collected directly from the diamond surface using a loop (**T5112**) and a droplet of sucrose/methyl cellulose. The 35° cutting angle leads to a reduction in mechanical stresses and thus improved structural preservation in sucrose protected samples.

Available in 2.0 and 3.0 mm sizes.

Cutting range: 30 nm - 1 μ m.

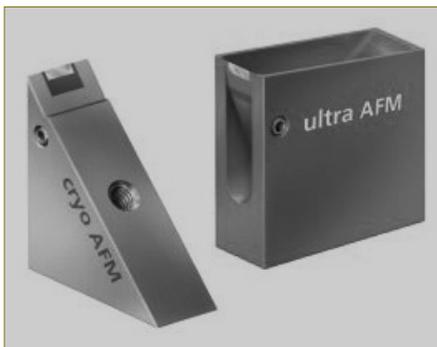
G3439-2 Cryo immuno diamond knife, 2.0 mm

G3439-3 Cryo immuno diamond knife, 3.0 mm



Diamond knives

Cryo AFM



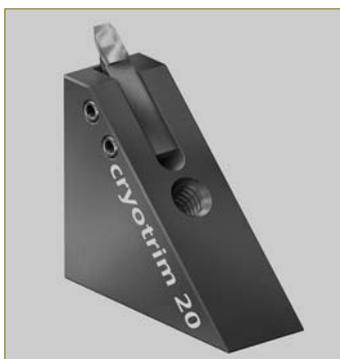
This knife has been designed for surface sectioning of biological and industrial specimens for atomic force microscopy, producing extremely smooth sample surfaces, and offering the best possible structure preservation. The knives have been specially tested to ensure that they meet the increased quality requirements of AFM investigations. The knives have a 35° angle and are available in sizes of 2.0 or 3.0 mm.

G3394-2 Cryo AFM diamond knife, 2.0 mm

G3394-3 Cryo AFM diamond knife, 3.0 mm

Diamond trimming tools

Cryotrim 20 and 45



For successful ultramicrotomy, precise trimming of the specimen is essential. These extremely sharp blades ensure quick, easy and accurate trimming with minimal mechanical damage. The resulting shiny surfaces and very smooth block faces aid with alignment. The Cryotrim 20 produces pyramidal sides with an angle of 20°, while the Cryotrim 45 gives an angle of 45°.

G3577 Cryotrim 20



G3578 Cryotrim 45

Ultratrim

This trimming tool produces 90° square sides and is more suitable for trimming epoxy and acrylic resin blocks, polymers and non-ferrous metals.

Available in two sizes, 3 and 4 mm.

All these trimming tools are compatible with Leica and RMC equipment.

G3579-3 Ultratrim 3 mm

G3579-4 Ultratrim 4 mm

DiATOME Histo knives

These 45° angle knives are designed for sectioning hard and soft biological and material specimens which have been embedded in acrylic or epoxy resins for optical microscopy. The knives are capable of cutting sections from 0.2 to 5 µm thick, free from score marks or compression, and are ideal for serial sections. They are available in a range of sizes and are also available for cryosectioning. They can be used with all ultramicrotomes and microtomes having a retraction of the specimen in the return phase.

Histo

These 45° knives have been designed for room temperature sectioning of histology specimens, and are available with edge lengths of 4.0, 6.0 and 8.0 mm and section thicknesses from 0.2 to 5 µm. They have a large boat for easy retrieval of sections.

G339-11 Histo diamond knife, 4 mm

G339-10 Histo diamond knife, 6 mm

G339-12 Histo diamond knife, 8 mm



Histo Cryo

These 45° knives are available in boats for wet cryosectioning or triangular holders for dry cryosectioning of histology specimens. Edge lengths of 4.0 and 6.0 mm are available.

Cutting range: 0.2 - 5 µm.



When ordering, please specify edge length and type of boat required.

Histo Jumbo

These 45° knives have a large boat to allow easy production of section ribbons with no loss or folding. The knives are suitable for room temperature sectioning of large histology specimens, producing easy to collect ribbons with all sections in the same orientation. Multiple ribbons can be put on one glass slide, ideal for immunohistochemistry and 3-D reconstruction. Available with edge lengths of 6.0 and 8.0 mm.

Cutting range: 0.2 - 5 µm.

G3399-6 Histo Jumbo diamond knife, 6 mm

G3399-8 Histo Jumbo diamond knife, 8 mm



Diamond knives

DiATOME Static Line II



For all cryosectioning and cryotrimming of industrial specimens, the use of an ioniser is essential. The Static Line II ioniser is an anti-static device which emits negative and positive ions, neutralising the electrostatic charging in the cryo chamber. This prevents the sections sticking to the knife edge or collecting on top of each other, and allows ribbons to float cleanly over the knife surface, facilitating the pick-up of sections.

G3468 DiATOME Static Line II

Resharpener service

DiATOME diamond knives can be resharpened. They are restored to their original condition and size and undergo the same stringent procedures as new knives, including optical checking and sectioning testing.

Reworking service

This service allows for a knife type change, eg. ultra to cryo, 45° to 35°, etc.

Exchange service

Please ask for details.

DDK (Delaware Diamond Knives) diamond knives

DDK was formed in 1986 with the purchase of the diamond knife business from the E.I. DuPont Company. Only gem quality diamonds are used in the production of DDK diamond knives. The entire length of each knife is inspected and tested by cutting trial sections prior to shipping. A resharpening and knife evaluation service is available.

All DDK diamond knives and boats are constructed of materials that withstand cryogenic temperatures, and knives are available with a choice of boat styles:

The **Standard** boat has a large oval-shaped specimen pick-up area, and is suitable for both ultrathin and histo knives. This boat fits all modern ultramicrotomes.

The **Dry-Cryo** boat is made of stainless steel with the shape and dimensions of a classical glass knife, and fits all modern cryo accessories.

The **Wet-Cryo** boat is made of stainless steel and has a long, narrow reservoir with vertical side walls. It fits all modern cryo accessories and it is particularly suitable for cryosectioning of polymers where floating sections on alcohol is desired.

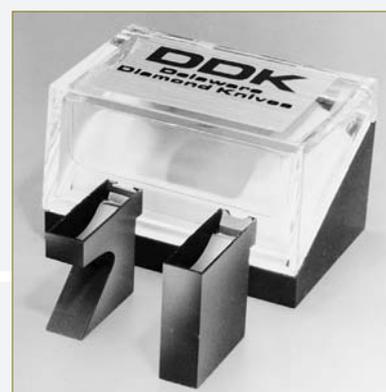
DDK diamond knives for ultrathin sectioning

These knives are available in 10 sizes with edge lengths from 1.0 to 5.9 mm, and are suitable for section thicknesses ranging from 30 to 200 nm. They are available with three knife angles:

- 45° angle blades for routine sectioning;
- 35° angle blades for soft biological samples, polymers and soft metals;
- 55° angle blades for hard material samples, eg. ceramics and crystals.

Knives that are suitable for section thicknesses from 10 to 30 nm for EELS analysis are available by special order.

For cryosectioning, cryo boats should be stipulated.



When ordering any of the above knives, please specify edge length, angle and type of boat required.

DDK Histo knives

These knives have an angle of 45° and are suitable for sectioning through epoxy, epon or acrylic embedded material to produce section thicknesses from 500 nm to 5 µm. The knives are available in four sizes with edge lengths from 2.0 to 5.9 mm.

For cryosectioning, cryo boats should be stipulated.

When ordering any of the above knives, please specify edge length and type of boat required.

Resharpener service

There is a resharpener service available which will restore the cutting edge to its original condition and to the same cutting edge length.

Exchange service

An exchange service is available. Please ask for details.

Accessories for cleaning diamond knives

For details of cleaning sticks and pith, please refer to section 10, page 235.