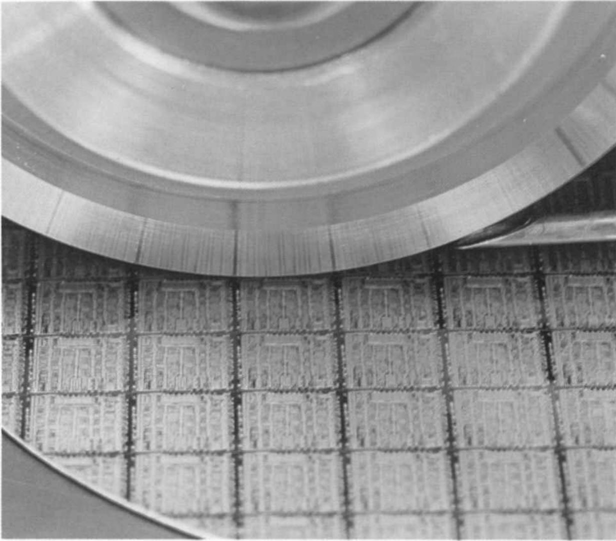
Automatic SCRIBER-DICER

DAD-2H

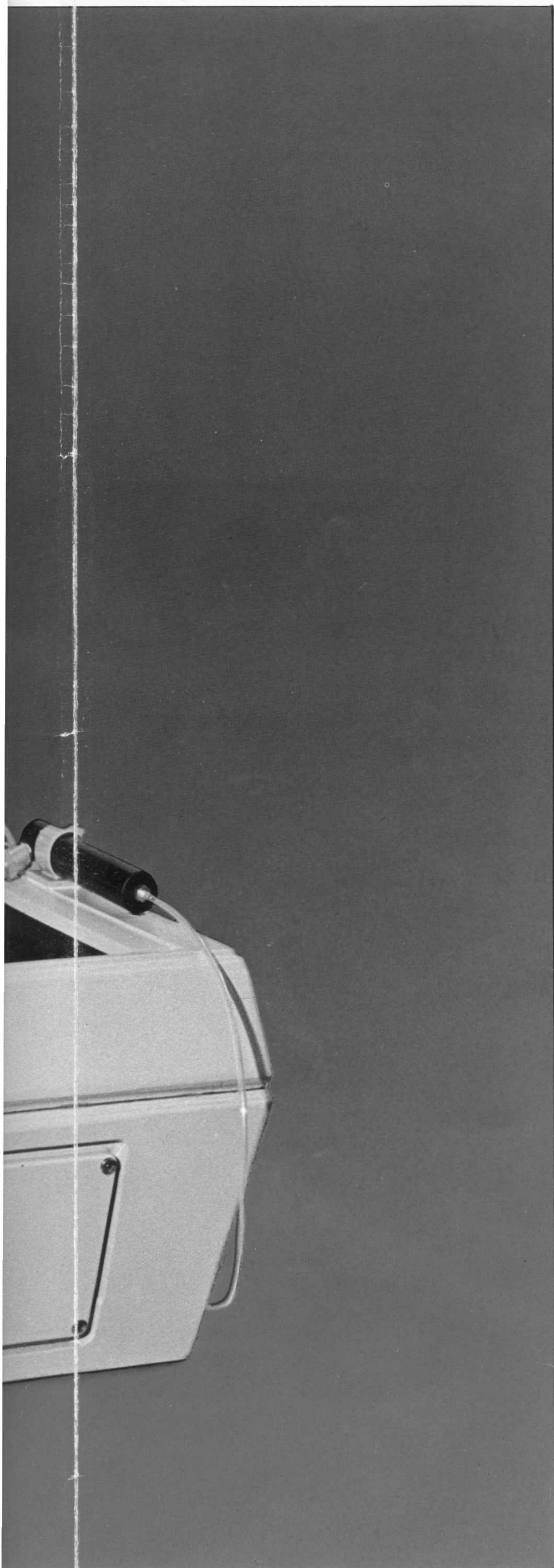


The Model DAD-2H Automatic Scriber-Dicer is a revolutionary system for precise and high-speed semiconductor wafer separation, either by dicing or scribing, with minimal kerf loss by the use of Dai-ichi's PSD Type ultra thin diamond blades.

The Model DAD-2H is the result of extensive tests involving a number of experimental models aimed at full development of capabilities inherent in the earlier Model DAD-3M Multiblade Dicing Machine.

For separation of semiconductor wafers such as diodes, transistors, IC's and LSI's, many methods have been introduced, the most widely used being diamond scribing system. More recent additions to the available techniques include dicing or scribing by the use of nickel bonded diamond wheel and laser scribing.

All of these methods, however, have disadvantages as well as advantages. Some typical disadvantages are: difficulty in handling thicker wafer materials, excessive kerf loss, damage to the surface of wafer or the edge of separated chips by cuttings, slow speed in deep cutting, complicated maintenance and operation, and high separation costs. The Model DAD-2H is the Dai-ichi's answer to all of these challenging problems.



Features of the Model DAD-2H

● **Can handle any wafer material**
The Model DAD-2H makes no demand on the type of wafer material, surface conditions or crystallographic axes. It can be used for dicing of silicon, germanium, gallium arsenide and gallium phosphide wafers, and sapphire, alumina ceramic, glass and other types of substrates.
The DAD-2H is also capable of separating wafers having passivated or coated surfaces, with such treatment as oxidation, nitriding or with metal or glass coating. It is suited for dicing devices of all kinds.

● **Minimal kerf loss**
Cutting is performed wet by very thin (up to 20 microns) NBC & PSD type diamond wheel rotating at ultra high speeds. The result is clean dicing with kert width as narrow as 35 microns, or 50 microns including edge chipping, for Si, GaAs, GaP, and GaAsP wafers.

● **Deep cutting and greater-yield**
The DAD-2H is capable of cutting Si, GaAs, GaP and GaAsP wafers to the depth of up to 400 microns without reducing the cutting rate. Any desired depth of cut as measured from the back of the wafer including complete cut-through can be selected. The result is very high chip yield.

● **Exact chip dimensions and perfect cut surfaces**
The chips separated by the DAD-2H have such exact dimensions and deep straight vertical surfaces that they are ideally suited for the processes requiring automated handling or orientation.

● **Minimal cutting distortions**
The DAD-2H gives smaller processing distortions, mechanical or thermal, than any other methods including diamond scribing system, nickel bonded diamond wheel sawing and laser scribing. Moreover, it does not stain or cause damage to the wafer surface or the chip edges.

● **Low separation costs**
The DAD-2H has no replacement parts except the low cost, long life diamond blade. Comparison with other scribing methods will prove the low operating cost of this system.

● **Selection of cutting speed**
Cutting speed is adjustable in 18 steps from 7.6 mm per second to 160 mm per second by selecting the switch on the control panel. The wafer-mounted chuck table moves crosswise under the dicing wheel at the selected speed.

● **Dicing stroke matched to wafer size**
A selector switch on the control panel permits adjustment of the chuck travel for 2", 3" and 4" wafers. The exact travel stroke reduces the overall time required for dicing operation.

● **Two cutting modes**
According to the cutting needs either Mode 1 or Mode 2 may be selected. Mode 1 provides cutting in both the left and the right directions (Down cut and Up cut). In Mode 2 cutting is performed only in the left direction. When returning to the right, the chuck table is lowered so that the wafer will pass clear of the blade. Mode 1 provides a maximum of 48 cuts and Mode 2 a maximum of 21 cuts, per minute ona 3" wafer with 0.4 mm dicing pitch.

● **Easy wafer alignment**
Microscope: A 50x erect image microscope is mounted on the spindle housing. A reticle in the microscope is aligned with respect to the dicing wheel.
Orientation: Fine adjustment of orientation is accomplished by a lever provided on the side of the chuck table within ± 3°. Another lever permits rotary indexing of the chuck 90°.
Wheel positioning: Positioning of the blade in a dicing street is accomplished by a switch on the control panel and a fine adjustment lever provided on the side of the chuck table. The fine adjustment lever permits adjustment of less than 10 microns.

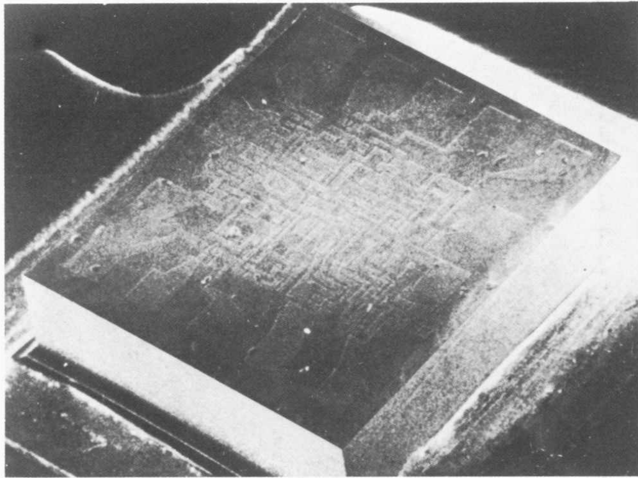
● **Two separate amounts of indexing**
The indexing amounts of Channel 1 and Channel 2 may be programmed independently and simultaneously so as to suit separation of rectangular chips. Channel switchover is effected automatically as the chuck table rotates 90°. Both channels provide an indexing range of 0.00 mm to 9.99 mm in increments of 10 microns, or 0.0000" to 0.9995" in increments of 0.0005".

● **Depth of cut programming**
Depth of cut or the thickness of wafer to be left uncut is programmed automatically and electrically. The upper end of the chuck table is at 0 level when it contacts the dicing wheel. Range of height adjustment is up to 990 microns in increments of 10 microns.

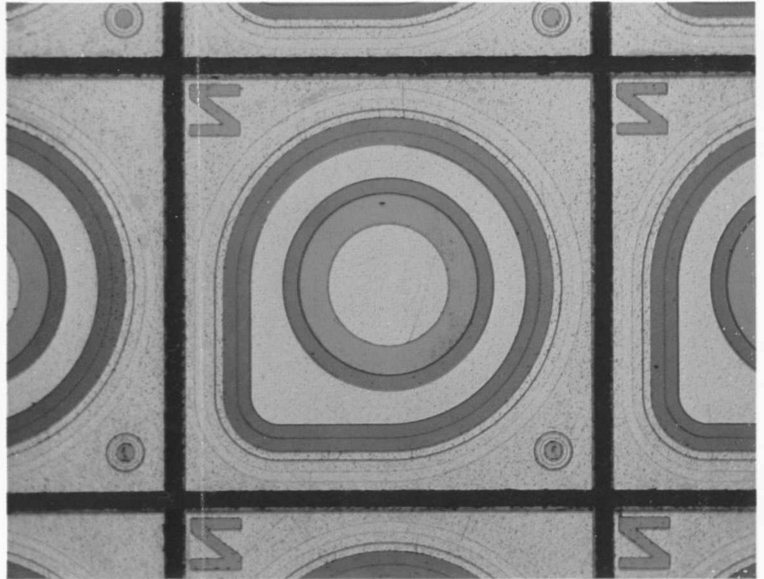
● **Blade cooling**
The dicing wheel is water cooled during the cutting operation. High purity water is normally used as coolant. Wet cutting helps eliminate such damage to the wafer as microcrack, material distortion, stain and scratch.

● **Blade handling**
Blade mounting and demounting is made simple, fast and safe by the exclusive handling tool. No fear of breaking thin diamond wheels.

● **Easy operation**
The Model DAD-2H Scriber-Dicer can be fully operated only by the switches on the control panel and hand levers provided on the side of the chuck table. The most inexperienced operator can learn how to operate and get the best out of this system in a matter of few hours.



• IC chip diced by the Model DAD-2H (400x)



• Transistor wafer diced by the Model DAD-2H. Dice street width 40 μm; kerf width 40 μm max. including edge chipping.

SPECIFICATIONS

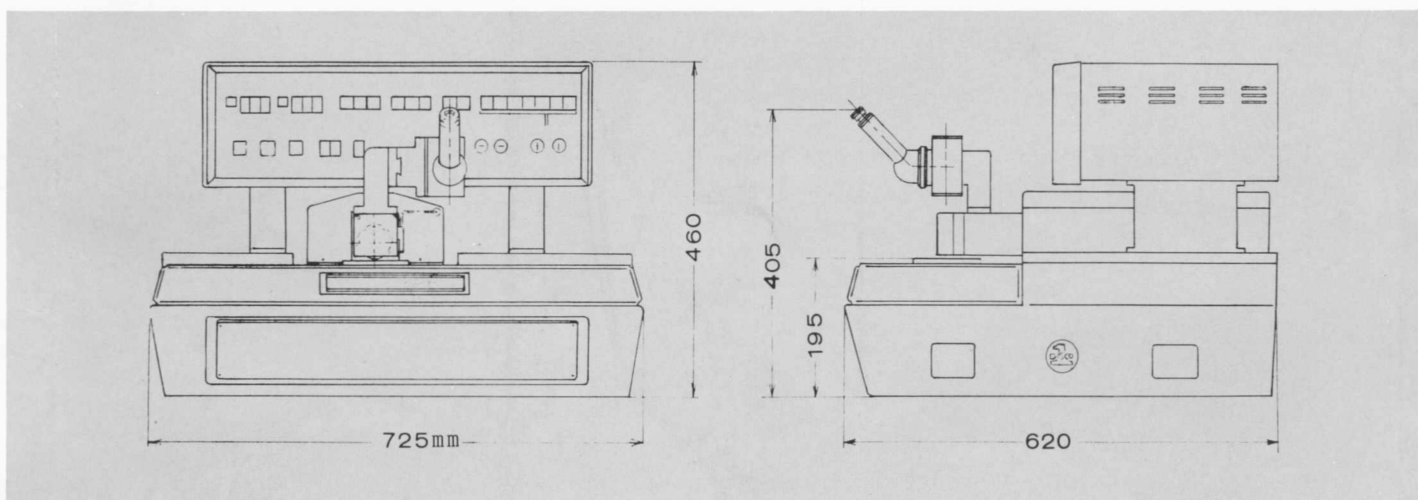
Saw Kerf	Kerf width Width including edge chipping Depth (Adjustable in 10 μm ± 2.5 μm increments) Straightness	35 μm max. 50 μm max. (for Si, GaAs, GaP wafers) 400 μm max. (for Si, GaAs, GaP wafers) Less than 2 μm deviation for 3" dice/scribe
Cutting Speed (Feed rate)		7.6 ~ 160 mm/sec
Wafer Size		Up to 4" (101.6 mm) diameter, max.
Chuck Table	Overall stroke Cutting stroke Parallelism Feed rate (Cutting speed) Reverse speed	175 mm 2" (50.8 mm) 3" (76.2 mm) 4" (101.6 mm) 0.01 mm 6.7 ~ 160 mm/sec 160 mm/sec
Spindle Slide	Index range Index steps	4" (101.6 mm) (metric) 0.00 ~ 9.99 mm in 0.01 mm increments (inch) 0.0000" ~ 0.9995" in 0.0005" increments
Spindle Speed		30,000 ~ 50,000 rpm (High frequency motor)
Wafer Alignment	Spindle step increments Chuck table fine adjustment Orientation (rotational) Height	0.01 mm or 0.0005" ± 0.5 mm Chuck rotation 90° Fine rotation ± 3° Chuck height range 5 mm in 0.01 mm increments (0.0025 mm) Automatic lowering distance 0.5 mm
Optics	Magnification Illumination	50X Split-beam vertical
Dicing Wheel	Micron Diamond Cut (NBC, PSD Type) Thickness	O.D. 50.8 mm Thickness 20 μm ~
Utilities	Electricity Air High purity water Vacuum	50 or 60 Hz, 100 V AC, single phase consumption 17 A Also built to suit your requirements. In ordering please specify phase, volts and Hz. 4.0 kg/cm² 4 liters/min. 500 mmHg
Dimensions		Width 725 mm x Depth 620 mm x Height 460 mm Weight 120 kg approx.

* Above specifications are subject to change for improvements without notice.

DIAMOND BLADE (PSDTYPE)

The PSD Type diamond blade for the Model DAD-2H Scriber-Dicer is the result of years of research and development at Dai-ichi. It is a specially designed resin bonded diamond wheel, a capable descendant of the series that won a prize as one of the ten major technological achievements in Japan for 1968. Because of its extremely thin thickness it gives no damage to wafer throughout its life.

MACHINE DIMENSIONS



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