



Series IV ALM/Mill

■ Features

- Air Bearing Spindle(s)
- Air Bearing Slides
- 3-Axis Interpolation
- Servo Current Control
- Digital Motion Control System
- Continuous Velocity Milling
- Linear Motor Drive
- Sub-nanometer Resolution
- Vibration damped 200mm Granite base
- Graphic Part Display
- Automatic Z Axis Programs
- CAD/CAM Input
- Windows or DOS Operating Software
- Linear encoder feedback



■ Description

The DAC ALM/Mill with air bearing spindle(s), linear motors and linear encoders is particularly designed for milling of intraocular lens haptics, as well as other plastic and non-ferrous materials. Both one and two spindle versions are available.

The ALM/Mill is based on a granite surface plate for accuracy and stability. The surface plate is mounted on vibration isolators on a welded steel frame. The controller and electronics are housed inside the machine base.

The X and Y slides are air bearing, driven by linear motors. Linear encoders are employed

to provide the fine resolution necessary for high accuracy and the blending of interpolated surfaces.

The air bearing, high frequency (speeds from 15 to 160k RPM), liquid cooled milling spindle(s) is mounted on the vertical Z axis, which also uses air bearing slides that are counter balanced and driven by linear motors. Linear encoder(s) is used as a feedback system.

Either one spindle may be provided on a single slide, or two spindles may be mounted on two separate slides.

■ Operation

Table travel is 152 mm (6") x 304 mm (12"). The 355 mm (14") x 355 mm (14") work area allows parts to be mounted in a "gang" fixture or separately mounted for "one at a time" processing.

The two spindle, two slide version allows simultaneous milling under both spindles with subsequent drilling under both spindles or alternated milling and drilling. Spindle spacing may be specified to match tooling.

Important features are the fine resolution (sub-nanometer) and "continuous velocity" milling. Both features are necessary to allow the continuous, smooth blending of arcs, line segments and tangents required to provide mark free blending of haptic contours.



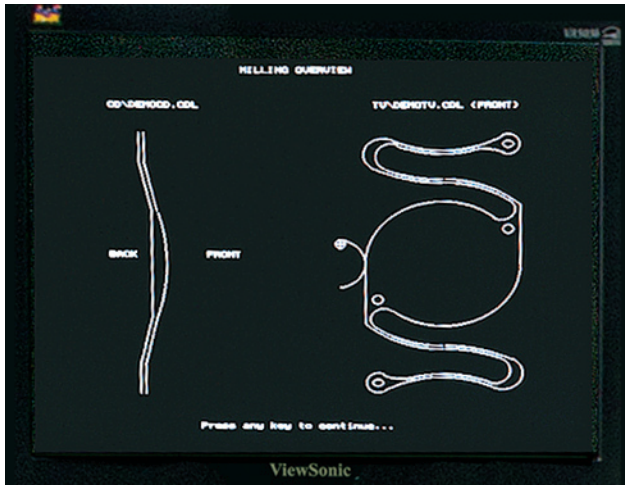
The machine also provides for 3-axis (helical) interpolation to allow the tool to be translated vertically in coordination with the X-Y table movement.

The air bearing spindle incorporates pneumatic open/close collets for easy tool changes.

■ Programming

Programs may be prepared offline, then transferred to the DAC IOL Mill via a USB port or down-loaded from a host computer via a network system.

The tool path may be determined by manual



calculations; or a commercial CAD system, such as CADKEY, Solid Works or Auto Cad, may be used to produce the part program.

The program for coordination of the third axis (the spindle vertical travel) with the X-Y motion of the table can be derived automatically from the CAD-defined geometry of the lens crosssection.

A graphic presentation of the lens is presented on the color monitor. "Menus" guide the user through machine setup, calibration and operation. Full "on-screen" editing is available for program modification.

Machining parameters, such as spindle speed, in-feed rate, peck cycles, table feed rates and auxiliary functions, are all controlled by the part program.

■ Control System

All DAC IOL Mills employ Digital Motion Control (DMC) which is housed, with the servo amplifiers, in the base of the machine. This controller is identical to the system used in the DAC Series IV Lathes.

The DMC utilizes a PC based computer with Read/Write CD backup system. The DAC DMC is used for the servo control of each pair of axes.

All axes employ digital position feedback. The machine runs DSL (DAC Script Language) in a subset of RS274D language.

Special software enables the DAC IOL ALM/Mill to calculate, in real time, the correct path for milling the haptic contour. Pauses between blocks of data are thereby eliminated which produces very smooth and nick-free haptics.

■ Tooling

The 355 mm (14") x 355 mm (14") steel work table top may be removed from the machine to facilitate the addition of jigs, fixtures and other tooling items. The machine may be equipped with a single position air operated collet closer, or gang fixtures of the user's design may be attached to the work table.

Software provides that fixtures with multiple work positions may be "mapped" and stored in memory to allow accurate registration of repeated patterns.



■ Specifications

Slides:	All slides are DC motor/zero backlash, linear motor driven with linear encoder feedback.		
	X	Y	Z (Spindle Slide)
Travel:	12" (304 mm)	6" (152 mm)	4" (102 mm)
Resolution:	Sub-Nanometer	Sub-Nanometer	Sub-Nanometer
Traverse rates:	200 IPM (5 m/min.)	200 IPM (5 m/min.)	200 IPM (5 m/min.)
Spindles:	15,000 to 160,000 RPM air bearing, liquid cooled, high frequency, synchronous motor. 1/8" (3.2 mm) automatic air operated collet is standard. Air blow off jets are provided adjacent to tool tip.		

■ Installation Data

Power:	208, 220, 230, 240 VAC, \emptyset , 50/60 Hz, 20 Amps	Vacuum:	User-furnished 1.25" (3.2 cm) Dia Manifold
Spindle Cooling Air:	5.5 CFM @ 80 PSIG (9.4 m ³ /hr. @ 5.6 Kg./cm ²)	Floor Space:	53" w x 40" d x 78" high (1,346 mm x 1,016 mm x 1,980 mm)
Temperature:	68 to 74 degrees Fahrenheit (20 to 23.3°C)	Weight:	<i>Floor</i> 2,400 lbs. (1,090 kg) <i>Shipping</i> 2,800 lbs. (1,272 kg)

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