

# Quantity Results & Flexibility

Silicon Processing System Range				
<b>Wafer Slicing &amp; Dicing</b>				
	Positional Accuracy	Speed	Dicing (max)	Slicing (Max)
APD1	y-axis 7.5µm/x-axis 5µm	100 - 5000 rpm	102mm	55mm
APD2	y-axis 7.5µm/x-axis 5µm	100 - 3000 rpm	152mm	78mm
AWS1	-	0 - 400 rpm	-	102mm
<b>Wafer Bonding</b>				
	Average Process Time	Max Head Temperature	Wafer Diameter Process (Max)	
WSB (1 or 3 station unit)	45 mins	180 °C	102mm (4") or 152mm (6")	
WSB3000	60 mins	188 °C	300mm (12")	
<b>Wafer Lapping Systems</b>				
	No Workstations	Removal rates	Flatness	Wafer Diameter Process (Max)
PM5	1	5-10µm/min	<2µm: 2" & 4" <4 to 6: 6" & 8"	Up to 100mm (4")
LP50	3	5-10µm/min	<2µm: 2" & 4" <4 to 6: 6" & 8"	150mm (6") or smaller multiples
DL1	1	5-10µm/min	<2µm: 2" & 4" <4 to 6: 6" & 8"	Up to 200mm (8")
DL4	4	5-10µm/min	<2µm: 2" & 4" <4 to 6: 6" & 8"	4 of 200mm (8") or smaller multiple
<b>Wafer Polishing Systems: Chemical Mechanical Polishing</b>				
	No Workstations	Av. Surface Roughness	Wafer Process (Max)	
PM5: CMP model avail	1	<3nm	Up to 100mm (4")	
LP50: CMP model avail	3	<3nm	150mm (6") or smaller multiples	
Tribo	2	<3nm	Up to 100mm (4")	
Orbis	2	<3nm	2 of 200mm (8") or smaller multiples	
DP1	1	<3nm	300mm (12") or smaller multiples	
DP4	4	<3nm	250mm (10") or smaller multiples	
<b>Measurement &amp; Inspection</b>				
CG-10	Linear measuring range: 10mm	Accuracy over range: 1µm	Up to 300mm (12")	
NCG-2	Measurement range: ±1.25mm	Accuracy: ±1µm	Up to 150mm (6")	
L110 Fizeau Interferometer	Surface Roughness: <20nm	Fringe Spacing: 0.335µm	100mm (4")	
GI20	Surface roughness: 1nm to 300nm Ra	Fringe spacing: 2µm	150mm (6")	
LG2 Autocollimators	Typical setting accuracy: <2 arc secs	Adjustment Range: ±3 mins of arc	Aperture: 25mm (1")	

Complete Systems for the preparation of

## Silicon



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Where applications demand precise tolerances and optimum surface finish.



## Client Support

Support is provided directly by Logitech and via an extensive global network of, Logitech trained, dealers. This enables us to provide a consistently high level of localised support and services from our technical base in Scotland.

A 12 month warranty is provided for all Logitech machines purchased. The client support policy at Logitech aims to resolve any client issues, be it mechanical, electrical or technological, in a fast and effective manner. The "no quibble" policy for replacement of faulty components ensures that any response to client difficulty is immediate.

# Precision Materials Processing

## Introduction

Logitech Limited has a wealth of knowledge and problem solving skills in the processing of silicon. Increasingly R&D and production sites worldwide are realising the benefits of using Logitech precision cutting, lapping and polishing machines for accurate silicon processing. Whether for semiconductor or optical applications, such as wafer and chip manufacture or IR and polymer wave production, the exacting design and manufacture of Logitech equipment ensures you achieve the highest quality results.

This brochure provides a brief analysis of how your sample will benefit from the versatility and precision offered by the latest Logitech technology, regardless of whether your application is x-sectional polishing, backthinning or delayering.

To support our clients we provide comprehensive technology transfer and customer support with every full system purchased.

## Application Analysis

Our technical team work, in confidence, with customers to identify the most relevant system for optimum results on their particular silicon processing issues. Initial discussions provide a detailed understanding of production quantity, sample dimensions, surface finish and geometric tolerance requirements.

Typical options in this area are;

- Wafer lapping and/or polishing
- Preparation of substrates for use in waveguide manufacture
- Planarization of surface layers
- Cross-sectional polishing (such as physical failure analysis)
- CMP, delayering or face polishing up to 200mm (8")



Logitech Chemical Mechanical Polishing System

Logitech's unique consultative approach ensures that customers achieve the best possible results from the advanced Logitech machine system and application processes.

*Whatever your cutting, shaping and surface finishing requirements, Logitech equipment and support can enhance your process.*

## Products & Services

Logitech offer systems which cover the complete range of production capacities and accuracies. From R&D applications processing a few high accuracy wafers to detailed production units, processing high quantities of ultra-thin high accuracy wafers.

### Logitech Systems

Logitech systems are designed to be flexible with changing production requirements in terms of accuracy and outputs. The family of products enable customers to start with a single workstation machine and add other single or multi workstation machines as necessary. This approach provides two major benefits:

- Low initial investment during the development stages.
- Ability to create a multi-machine production unit.

**Wafer slicing:** Due to the expense of crystal growing, sawing operations must minimise material waste (kerf loss), making the Logitech APD range of precision saws ideal. The highly tensioned blades ensure minimal kerf loss and reduce wafer damage, enabling users to cut very fine wafers with a high yield per crystal.



**Wafer bonding:** High yield processing of delicate, ultra thin materials (typically below 100µm) normally requires temporary or permanent bonding of wafers to support discs. The techniques and equipment used depend on wafer thickness, uniformity requirements, sample diameter and whether there are fabricated devices on the wafer. Logitech supply products to meet the most demanding requirements. Options range from hand bonding to high volume precision bonding systems.

**Wafer Lapping:** Optimum geometric control is achievable through the use of high precision fixtures during lapping processes. Fine mechanical lapping is normally used for backlapping or thinning of wafers, such as bulk removal of material using Aluminium Oxide abrasives. Wafers are mounted using Logitech holding fixtures such as PP5, PP6 and PP8 jigs. Lapping systems are based on the standard single workstation PM5 or DL1 and the multi workstation LP50 or DL4. Versions of the PM5 and LP50 are available with automatic plate flatness control, providing greater levels of repeatability and improved sample quality.

**Wafer Polishing:** Processes involving chemical action are essential for polishing III-V and II-VI semiconductor wafers where minimal crystalline damage, under the polished surface, is required. Equipment used for this process must resist chemical attack and rapidly extract the corrosive fumes. Suitable systems are DP1, DP4, Tribo, Orbis and the PM5, LP50 with optional hood.

**Chemical Mechanical Polishing/Planarization/Ultra-thin Wafer Polishing:** The Logitech Orbis and Tribo systems have been designed specifically for chemical mechanical polishing and are ideal for the accurate and effective removal of selected layers by planarization.

This technique allows a damage free and smooth surface to be produced to the required standards of flatness on wafers with a maximum diameter of 200mm (8"), ICs and isolated opto-electronic chips. An alternative method for planarization using a Logitech system is with the use of automatic plate flatness, available on the PM5 and LP50 systems.

In addition to planarizing, there is often a requirement to analyse a device by lapping and polishing the backface of the silicon substrate. Accurate material removal at the lapping stage can be achieved using the Programmable Sample Monitor (PSM) on either the single station PM5 or three station LP50 systems. Ultra-thin wafer polishing is ideal for TEM analysis where optimal surface finish is assured. The flexibility of a Logitech system enables you to obtain rapid, accurate results. For example production of ultra-thin wafers of 20µm, whilst achieving sample TTV of +/- 2µm.



The PP5 & PP6 Precision Polishing Jigs allow high quality, repeatable processing results to be achieved with silicon and

**Cross-Sectional Analysis:** Shrinking feature sizes and the increasing complexity of multi-layer architecture continue to present challenges for the accurate identification and analysis of defects in part or complete silicon wafers. Precise edge polishing of a cross section can reveal, with excellent clarity, micro-features within the epitaxial layers.

The most appropriate system is based on a Logitech PM5 lapping and polishing machine with a PP5D jig, holding fixture and APD saw for initial wafer dicing. The PM5auto machine incorporating automatic plate flatness control is also suitable for this process.

Before lapping or polishing the section, fine tuning of the sample orientation can be achieved using the angular adjustment plate on the PP5D jig, with a +/-3 degree range.

**Delayering:** Polishing silicon based multi-layer circuit dies to specific metallized or oxide layers requires a high degree of precision. Logitech systems offer flexibility in polishing different film materials. Oxidized and other layers are removed whilst exposed layers are kept completely planar to the wafer surface.

Using a Logitech CMP system you can maintain nanometer accuracy and uniformity. This allows parallelism over the whole wafer to be maintained, whilst increasing the ability to identify sample defects.

Individual die, ICs or wafers up to 200mm (8") in diameter are retained using the Tribo and Orbis range of carriers, shims and templates. Each process parameter is directly controlled from the automated control panel and saved for future use, thus helping to maintain process uniformity.

Subsequent polishing exposes the required layer for analysis. This approach allows:

- Removal of epi-layers with nanometer level precision
- Polishing accuracy to nanometer levels for fault isolation
- Capability to delayer up to 200mm (8") diameter wafers using the Orbis system
- Surface polishing to sub-nm levels

## Technology Transfer

Training and process technology transfer at Logitech cover equipment and wafer handling, cleaning, bonding, gauging and process adjustments, with which the operator needs to be familiar. Logitech are dedicated to complete success and through training at our purpose built laboratories or at client premises, the team ensures that personal training is provided at a level relevant to the clients process requirements.

Years of experience has identified that instruction manuals alone do not provide operators with the levels of knowledge and success that are achievable through personal training and practical experience. Logitech are so committed to this programme of technology transfer that it provides a full three day training course, with all material processing systems purchased. Courses cover all aspects of system operation, maintenance and customer focussed process trials. This unique approach ensures successful installation, optimum use and maintenance of Logitech systems.



Lap & polish silicon wafer or devices using the PM5 lapping & polishing machine.