Precision Lapping and Polishing Systems
when quality has to be continuous
Introduction

In today’s technologically advanced world, there are a growing number of applications where conventional machining techniques just are not accurate enough to meet precision finishing requirements. Loose abrasive processing, a technology developed and refined by Lapmaster International over the past 50 years, can often be the answer.

However, it takes more than the technology alone to produce precision finishing specifications. It takes a company with extensive knowledge and experience with a broad range of materials and applications. A company capable of creating customized, turnkey precision finishing solutions utilizing the latest conventional and super abrasive techniques. It takes Lapmaster International, your partner in precision finishing technology.

Since 1948, industry has relied upon Lapmaster International to solve the most challenging precision finishing problems. With over 50 years of experience, Lapmaster has a proven history of successfully developing cost effective processing solutions for virtually any application. Whether it's precision sizing, flatness, parallelism, or surface finish that’s required, Lapmaster has the solution.
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Background and Expertise

Since 1948, Lapmaster has built a reputation as a world-class manufacturer of precise, efficient, reliable and high quality lapping and polishing systems used in a variety of industries. Semiconductor, data storage, automotive, technical ceramics, metalworking, optics, medical devices, mechanical seals... Wherever industry requires parts with flat and parallel surfaces, parts with exacting tolerances for thickness and surface finish, you’ll find an application for Lapmaster International lapping and polishing systems. Our broad range of products and services fall into several key categories:

- Single and Dual Faced Flat Lapping, Polishing and Fine Grinding Equipment
- Lapping/Polishing Consumables and Accessories
- Contract Lapping and Polishing Services
- Research Development and Technical Support

Lapmaster International has been the most trusted manufacturer of flat lapping and polishing systems for over 50 years. Thousands of machines are currently being used for various applications in manufacturing processes around the world. Please contact your local Lapmaster representative to find out more about how we can help you achieve your specifications.

The Lapmaster Edge

What sets Lapmaster apart from the competition is our versatility. Every lapping and polishing system is designed specifically for the customer’s application. Lapmaster has no predisposed tendency to promote one specific abrasive finishing technology. The result is the development of the optimum process for the application. Conventional abrasives, fixed abrasives, polishing medias, super abrasives... No matter what type of processing technology suits the application, you can be sure that Lapmaster will provide you with the best possible equipment and process to produce optically flat surfaces and extremely fine surface finishes with unfailing uniformity.
What is lapping and polishing?

Lapping
Lapping is a loose abrasive machining process which combines abrasive particles within an oil or water base vehicle to form a slurry. The slurry is fed onto a rotating lap plate (usually cast iron) to form an abrasive film between the plate and the parts to be lapped, the result is a gray “matte” finish of uniform flatness.

Benefits of lapping include:
- Fast stock removal
- No clamping or heat distortion
- No expensive tooling required
- Very thin and non-magnetic parts can be processed
- Irregular-shaped parts can be easily processed

Polishing
While lapping produces a gray non-reflective surface, polishing will produce a reflective or “shiny” surface. The degree of reflectivity will vary as to the type of process used. Some of the typical processes include:
- Hard and soft pad polishing
- Diamond abrasive/composite plate polishing
- Optical pitch polishing

Typical lapping/polishing tolerances
- Flatness: Less than one light band (.0000116")
- Finish: Less than 1 micro inch Ra
- Size control: .0001 inches
- Parallelism: .00005 inches

Capabilities
Lapmaster offers products and services to match virtually any finishing requirements.
- Single and dual face lapping and polishing machines range in size from 12" tabletop models to 120" floor standing production machines.
- The most complete line of lapping and polishing consumables and accessories in the industry.
- Quick turn-around flat lapping and polishing contract services for prototype, short run, and high production requirements for customers in a wide variety of industries and materials.
- A wide variety of Metallographic sample preparation equipment and consumables.
- Established process development laboratories complete with the latest processing equipment to serve our customers.
The following list shows typical industries in which our precision lapping and polishing machines are commonly used.

**Automotive/Diesel**
- air bag initiators
- fuel pumps
- a/c compressor systems
- fuel injection systems
- transmission parts
- power steering components
- anti-lock braking systems
- windshield wiper motors
- hydraulic pumps
- piston rings
- locomotive air brakes
- diesel engines
- fluid sensors

**Aerospace**
- turbine engine components
- hydraulic systems
- remanufacturing services
- OEM production

**Compressors and Valves**
- compressors
- safety release valves
- gate valves
- remanufacturing services
- OEM production

**Pumps**
- hydraulic pumps
- hydrostatic components
- gasoline pump
- remanufacturing services
- OEM production

**Tool and Die**
- extrusion dies
- plastic injection mold polishing
- carbide dies
- punching dies
- PCD cutting tools
- carbide cutting tools
- spinneret extrusion dies
- fixturing
- printing equipment dies
- slitter knives

**Bearings**
- ball bearings
- thrust shoes
- motor bearings
- bearing races

**Optics and Electro Optics**
- quartz
- laser rods, prisms and gyros
- semiconductor equipment components
- fiber optics
- LED crystals
- plano optics
- telecommunications devices

**Technical Ceramics**
- alumina ceramics
- silicon carbide
- piezo ceramics
- ferrite

**Data Storage**
- read/write heads (wafer, bars and individual)
- storage media (aluminium, glass and others)
- tape heads
- glide burnish heads

**Semiconductors**
- virgin silicon wafer processing
- germanium devices
- silicon wafer reclaim
- gallium arsenide devices
- semiconductor equipment components

**Medical Devices**
- implants
- surgical instruments
- ultrasound equipment components
- pacemaker components

**Speciality Materials/Products**
- tungsten carbide
- carbon/graphite
- concrete core sections
- speciality coatings
- measuring systems
- pyrotechnics
- transformer heat sinks
- surge protectors

**Mechanical Seals**
- stationary seals
- mechanical shaft seals
- gas seals
- rotary unions

**Leaders in Lapping and Polishing Technology**
Lapmaster's most popular style of machine, these units are offered with 12”, 15” or 20” lapping/polishing platens, are compact enough to fit on a standard workbench, and are extremely cost-effective. The 12” and 15” models feature a rigid, lightweight, cast aluminum or fabricated steel base. The 20” machine features a heavy-duty welded carbon steel base, and can be equipped with a pneumatic pressure plate system for applications requiring high p.s.i. component loading. All of Lapmaster’s bench top machines are of the “ring lapper” configuration. This configuration enables you to achieve high standard of flatness and surface finish on a continuous basis through specific positioning of the conditioning rings.

Standard Features
- Rigid cast aluminum base (12” and 15” Models)
- Heavy duty welded carbon steel base (20” Model)
- Three conditioning rings with roller yoke and bearing assemblies
- Conventional abrasive feed system
- Automatic digital cycle timer
- Electrical system wired for various voltages 50/60 Hz, 1 phase (Ph) and 3 phase (Ph) to customer specification
- High torque drive unit with up to 2 hp motor and gear reducer
- Parts loading table (15” and 20” Models)

Available Options
- Soft start
- Electronic variable speed drive
- Stainless steel wetted parts
- Diamond slurry dispensing system
- Polishing media dispensing system
- Various lapping/polishing plates
- Non-standard voltages
- Pneumatic lift pressure plate system with radial adjustment (20” Model)
- Water cooling (20” Model)
- Custom machining and tooling
- Positive drive roller yokes with variable speed
- Heavy duty machine cabinet with locking storage bins

Standard Tooling
- High density, cast iron radially serrated lap plate
- Three high density cast iron serrated conditioning rings
- Three high density cast iron pressure plates
- Hardened straight edge
- Three PHENOLIC work holder discs
- Three sponge rubber pads
- Starter sample of Lapmaster abrasive
- Starter sample of Lapmaster vehicle
- Operation manual
- Allen wrench
- Vinyl machine cover

Bench Top Single-Sided Lapping/Polishing Machine Specifications

<table>
<thead>
<tr>
<th>Model Type</th>
<th>12</th>
<th>15</th>
<th>20</th>
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</thead>
<tbody>
<tr>
<td>Conditioning Rings</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ring ID</td>
<td>108mm/4.25”</td>
<td>140mm/5.5”</td>
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<tr>
<td>Plate Diameter</td>
<td>305mm/12”</td>
<td>381mm/15”</td>
<td>508mm/20”</td>
</tr>
<tr>
<td>Working Height</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Standard RPM</td>
<td>60</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>RPM Range (w/VSD)</td>
<td>0-60</td>
<td>0-60</td>
<td>0-70</td>
</tr>
<tr>
<td>Drive Motor HP/Lapper</td>
<td>0.5/0.37</td>
<td>0.5/0.37</td>
<td>1/0.75</td>
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<tr>
<td>Drive Motor HP/Polisher</td>
<td>0.75/0.56</td>
<td>0.75/0.56</td>
<td>1.5/1.1</td>
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<td>Dimensions O/F (LxWxH)</td>
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<td></td>
</tr>
<tr>
<td>Dimensions P/L (LxWxH)</td>
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<td></td>
<td></td>
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<tr>
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<tr>
<td>Est Shipping Weight P/L</td>
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<td>VSD/Variable Speed Drive</td>
<td>O/F: Open Face</td>
<td>P/L: Pneumatic Lift</td>
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<td>Est Shipping Weight P/L</td>
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<td>Est Shipping Weight P/L</td>
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Lapmaster floor standing machines are specially designed and built to withstand extreme conditions within a production environment while requiring minimal maintenance. These units are available with lapping/polishing platen from 24” up to 120” in diameter, and are configured specifically for each application. Applications requiring conventional abrasive, diamond super abrasive and fixed abrasive processes are all easily accommodated through robust construction and use of high quality machine components.

Lapmaster floor standing machines are available in two different configurations. Each model is available in an “open-face” version. Open-face machines are typically used within a low volume production environment. These machines require hand weights to apply down pressure to the parts being lapped. Electronic variable speed drive and slow start, water cooled machining plates, and a wide variety of lapping and polishing plates are available for each open-face model.

For high production applications, Lapmaster offers each floor standing model in a “pneumatic lift” version. Pneumatic lift machines automatically apply the programmed down pressure to the parts being lapped. These machines help automate the lapping process with such available options as multi-step programmable plate speed, down pressure, slurry feed, and pneumatic drop table for quick machine loading and unloading.

All of Lapmasters’ floor standing machines are of the “ring lapper” configuration. This configuration enables you to achieve high standard of flatness and surface finish on a continuous basis through specific positioning of the conditioning rings.

### Floor Standing Machines

**Standard Features**
- Heavy duty, tubular steel frame
- Heavy duty, vertically adjustable work table
- Three conditioning rings with adjustable roller bearing yoke assemblies
- Conventional abrasive slurry distribution system
- High torque drive unit with up to 25 hp motor and gear reducer
- Electrical system wired for various voltages 50/60 Hz to customer specification, 3 phase
- Operator control panel with start/stop controls
- Multiple range, automatic cycle timer

**Available Options**
- 4 ring model
- Electronic variable speed drive with soft start
- Water cooled lap plates
- Diamond slurry dispensing system
- Polishing media dispensing system
- Various lapping/polishing plates
- Non-standard voltages
- Pneumatic lift pressure plate system with radial adjustment
- Multi-step, programmable machine control package
- Custom machine and tooling
- Positive-drive roller yokes with variable speed

### Standard Tooling

- High density, cast iron radially serrated lap plate
- Three high density cast iron serrated conditioning rings
- Three high density cast iron pressure plates
- Hardened straight edge
- Three PHENOLIC work holder discs
- Lap plate lifting tool
- Three sponge rubber pads
- Starter sample of Lapmaster abrasive
- Starter sample of Lapmaster vehicle
- Operation and maintenance manual
- Set of allen wrenches

### Floor Standing Machines Floor Standing Machines

### Specifications

#### Model Type

<table>
<thead>
<tr>
<th>Model Type</th>
<th>24</th>
<th>36</th>
<th>40</th>
<th>48</th>
<th>56</th>
<th>72</th>
<th>84</th>
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<td>Conditioning Rings</td>
<td>3</td>
<td>3</td>
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<td>3</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Ring ID</td>
<td>248mm/9.75”</td>
<td>368mm/14.5”</td>
<td>465mm/18.3”</td>
<td>432mm/17”</td>
<td>530mm/20.875”</td>
<td>692mm/27.25”</td>
<td>813mm/32”</td>
<td>1092mm/43”</td>
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<tr>
<td>Plate Diameter</td>
<td>610mm/24”</td>
<td>914mm/36”</td>
<td>1016mm/40”</td>
<td>1219mm/48”</td>
<td>1422mm/56”</td>
<td>1329mm/52”</td>
<td>1854mm/73”</td>
<td>3048mm/120”</td>
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<tr>
<td>Working Height</td>
<td>914mm/36”</td>
<td>940mm/37”</td>
<td>965mm/38”</td>
<td>991mm/39”</td>
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<td>914mm/36”</td>
<td>914mm/36”</td>
<td>1016mm/40”</td>
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<tr>
<td>Standard RPM</td>
<td>70</td>
<td>60</td>
<td>60</td>
<td>50</td>
<td>50</td>
<td>30</td>
<td>20</td>
<td>8</td>
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<tr>
<td>RPM Range (w/ VSD)</td>
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<td>0-90</td>
<td>0-90</td>
<td>0-70</td>
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<td>5-32</td>
<td>4-42</td>
<td>1-10</td>
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<tr>
<td>Drive Motor HP/kW - Polisher</td>
<td>3/2.2</td>
<td>7.5/5.6</td>
<td>10/7.5</td>
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<td>15/11.2</td>
<td>15/11.2</td>
<td>15/11.2</td>
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<tr>
<td>Drive Motor HP/kW - Lapper</td>
<td>2/1.5</td>
<td>5/3.7</td>
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<td>10/7.5</td>
<td>15/11.2</td>
<td>20/15</td>
<td>25/18.7</td>
<td>15/11.2</td>
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<tr>
<td>RPM</td>
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<td>60</td>
<td>60</td>
<td>50</td>
<td>50</td>
<td>30</td>
<td>20</td>
<td>8</td>
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<tr>
<td>Dimensions P/L (LxWxH)</td>
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<td>1499mm/59”</td>
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<td>1600mm/63”</td>
<td>1651mm/65”</td>
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<tr>
<td>Dimensions O/F (LxWxH)</td>
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<td>1448mm/57”</td>
<td>1473mm/58”</td>
<td>1499mm/59”</td>
<td>1499mm/59”</td>
<td>1600mm/63”</td>
<td>1651mm/65”</td>
<td>1905mm/75”</td>
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<td>Weight</td>
<td>997kg/2,198lbs</td>
<td>1801kg/3,970lbs</td>
<td>1851kg/4080lbs</td>
<td>41996kg/9,250lbs</td>
<td>4536kg/10,000lbs</td>
<td>9072kg/20,000lbs</td>
<td>12700.5kg/28,000lbs</td>
<td>20865.1kg/46,000lbs</td>
</tr>
</tbody>
</table>

### Standard Features

- Heavy duty, tubular steel frame
- Heavy duty, vertically adjustable work table
- Three conditioning rings with adjustable roller bearing yoke assemblies
- Conventional abrasive slurry distribution system
- High torque drive unit with up to 25 hp motor and gear reducer
- Electrical system wired for various voltages 50/60 Hz to customer specification, 3 phase
- Operator control panel with start/stop controls
- Multiple range, automatic cycle timer

**Floor Standing Single-Sided Lapping/Polishing Machine Specifications**

#### Condition Rings

- 3

#### Plate Diameter

- 610mm/24”
- 914mm/36”
- 1016mm/40”
- 1219mm/48”
- 1422mm/56”
- 1329mm/52”
- 1854mm/73”
- 3048mm/120”

#### Ring ID

- 248mm/9.75”
- 368mm/14.5”
- 465mm/18.3”
- 432mm/17”
- 530mm/20.875”
- 692mm/27.25”
- 813mm/32”
- 1092mm/43”

#### Conditioning Rings

- 3

#### Model Type

- 24
- 36
- 40
- 48
- 56
- 72
- 84
- 120
The Lapmaster LSP line of dual face lapping and polishing machines feature 3 and 4 way, planetary models with sophisticated control systems. These machines are capable of executing complex lapping and polishing routines while producing precise and repeatable results. These units, available with carrier diameters of 4" up to 20" can lap or polish a wide range of materials to very tight specifications. Applications requiring conventional abrasive processes are all easily accommodated through robust construction of high quality machine components.

A programmable controller governs the machine operation. Custom software prompts the operator for specific operating parameters and stores a number of routines for recall as needed.

Through a load cell, the controller continually monitors and adjusts the top plate weight to maintain constant pressure on the parts. Automatic digital thickness control is obtained through the use of an extremely accurate, centrally-located electronic probe. Each machine is built on a heavy duty, rigid box beam frame. The top plate assembly is supported from a 4-post bridge for stability and durability. The unique combination of pneumatic controls, stiff frame design, and load control algorithms produce the most accurate and repeatable thickness results in the industry.

Custom lapping and polishing plates are available upon request, as are special electrical services. Each machine is custom designed for the specific application, and comes complete with a set of four conditioning gears, a flatness gauge, and a starter kit of consumables.

**Standard Features**
- Programmable process controller
- Pneumatic top plate control
- In-process lap plate flattening
- Universal, peristaltic pumping system with propeller type agitator, variable speed pump
- Transparent safety guard with access from 2 or 3 sides
- Retractable ring gear for easy machine loading and unloading
- Anti-vibration mounting and levelling pads
- Various voltages 50/60 Hz to customer specification, 3-phase electrical service
- Durable, polyurethane-coated work table
- Machine capacity of five carriers
- Heavy-duty, steel box beam frame construction

**Standard Tooling**
- High density, cross-hatched cast iron lap plates
- Four high density cast iron conditioning gears
- Flatness gauge
- Starter kit of Lapmaster consumables
- Operation and maintenance manual

**Available Options**
- Automatic thickness control
- Rinse at cycle end
- Custom lapping and polishing plate materials and configurations
- Machines to suit electrical supplies
- Conversion kit for machine use with different sizes and numbers of carriers
- Automatic machine loading and unloading (certain models)
- Water cooled machining plates
- Special feed systems to suit specific applications

Dual Face Lapping Polishing Machine Specifications

<table>
<thead>
<tr>
<th>Model Type</th>
<th>LSP-6</th>
<th>LSP-9</th>
<th>LSP-12</th>
<th>LSP-16</th>
<th>LSP-20</th>
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</thead>
<tbody>
<tr>
<td>Plate Diameter</td>
<td>381mm/15&quot;</td>
<td>635mm/25&quot;</td>
<td>900mm/35&quot;</td>
<td>1118mm/44&quot;</td>
<td>1372mm/54&quot;</td>
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<tr>
<td>Number of Carriers</td>
<td>S or B</td>
<td>S</td>
<td>S</td>
<td>S</td>
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</tr>
<tr>
<td>Carrier Root Diameter</td>
<td>107mm/4.2&quot;</td>
<td>140mm/5.5&quot;</td>
<td>224mm/8.8&quot;</td>
<td>318mm/12.5&quot;</td>
<td>419mm/16.5&quot;</td>
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<tr>
<td>Maximum Part Circle</td>
<td>89mm/3.5&quot;</td>
<td>127mm/5.0&quot;</td>
<td>216mm/8.5&quot;</td>
<td>300mm/12&quot;</td>
<td>406mm/16&quot;</td>
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<tr>
<td>Maximum Part Down Pressure</td>
<td>136kg/300lbs</td>
<td>317.5kg/700lbs</td>
<td>794kg/1750lbs</td>
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<td>Top Plate Drive HP/kW</td>
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<td>Sun Gear Drive HP/kW</td>
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<td>Ring Gear Drive HP/kW</td>
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<td>Compressed Air</td>
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<td>80 PSI 1 CFM</td>
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<td>Dimensions (LxWxH)</td>
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<td>7257kg/16,000lbs</td>
<td>16329kg/36,000lbs</td>
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“Lapmaster the accurate choice”
Lapmaster produces a wide range of air bearing spindle and conventional belt-driven optical pitch polishing machines for use in both plano optics production and R & D environments.

The air bearing line of optical polishers, available with 36” and 48” diameter pitch laps, are designed so that the pitch lap and support plate ride on a very thin cushion of compressed air. These machines are driven from an electric motor via a lay shaft, and power is transferred to the lap using a multi-vee drive belt around the circumference of the support plate. This unique design virtually eliminates vibration at the polishing surface and dramatically improves component flatness and finish results.

The conventional belt-driven line of pitch polishers, available with 60", 72", 84" and 120” diameter pitch laps, are built on a cruciform-shaped structural steel base. The mechanical reduction gearbox and motor are mounted to the side of the polishing plate. The polishing plate is supported by a graphite support plate turning on a heavy duty bearing. Power is transmitted via a flat belt, and the moving parts of the system are enclosed within a panel-clad base. This innovative polishing plate support design prevents plate deflection common on very large continuous polishers. Isolation of the motor and gearbox also help to virtually eliminate vibration at the polishing surface.

**Standard Features**
- Rigid structural steel base
- Water-cooled pitch lap
- Electronic variable speed drive pitch lap
- Friction drive glass faced workholder rings with VSD
- Friction drive conditioner with VSD
- Peristaltic pump slurry feed system
- Pitch trimming bar (manually operated)
- Automatic, digital cycle timer
- Eccentric, oscillating glass faced workholder ring assemblies (air bearing models only)
- Glass disc-faced conditioner
- Various voltages 50/60 Hz, 3 phase supply to customer specification

**Standard Tooling**
- Three high density cast aluminum workholder rings
- Three MICARTA workholder discs
- Starter sample of Lapmaster cerium oxide
- Operation manual

**Available Options**
- Programmable PLC control
- Suspended, non-contacting workholder rings
- Recirculating feed system with temperature control
- Eccentric, oscillating workholder ring assemblies (conventional models only)
- Automatic pitch trimmer
- Machines to suit electrical supplies
- Granite conditioner and/or support plate
- pH and/or temperature monitors

**Pitch Polishing Machine Specifications**

<table>
<thead>
<tr>
<th>Model Type</th>
<th>36</th>
<th>48</th>
<th>60</th>
<th>72</th>
<th>84</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Workholder Rings</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ring ID</td>
<td>305mm/12”</td>
<td>400mm/15.75”</td>
<td>508mm/20”</td>
<td>610mm/24”</td>
<td>711mm/28”</td>
<td>1016mm/40”</td>
</tr>
<tr>
<td>Plate Diameter</td>
<td>914mm/36”</td>
<td>1219mm/48”</td>
<td>1524mm/60”</td>
<td>1829mm/72”</td>
<td>2134mm/84”</td>
<td>3048mm/120”</td>
</tr>
<tr>
<td>Conditioner Diameter</td>
<td>457mm/18”</td>
<td>610mm/24”</td>
<td>762mm/30”</td>
<td>914mm/36”</td>
<td>1066mm/42”</td>
<td>1549mm/61”</td>
</tr>
<tr>
<td>Plate Working Height</td>
<td>991mm/39”</td>
<td>991mm/39”</td>
<td>914mm/36”</td>
<td>914mm/36”</td>
<td>914mm/36”</td>
<td>952mm/38”</td>
</tr>
<tr>
<td>RPM Range</td>
<td>2-17</td>
<td>1.5-13</td>
<td>1-10</td>
<td>0.6-8</td>
<td>0.5-7</td>
<td>0.1-5</td>
</tr>
<tr>
<td>Drive Motor HP/kW</td>
<td>3/2.2</td>
<td>5/3.7</td>
<td>7.5/5.6</td>
<td>7.5/5.6</td>
<td>7.5/5.6</td>
<td>10/7.5</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>10 CFM</td>
<td>80 PSI</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Dimensions (LxWxH)</td>
<td>1631mm/64.2”</td>
<td>2080mm/81.9”</td>
<td>2540mm/100”</td>
<td>2794mm/110”</td>
<td>3048mm/120”</td>
<td>5131mm/202”</td>
</tr>
<tr>
<td>Linear/”</td>
<td>1600mm/63”</td>
<td>1702mm/67”</td>
<td>2540mm/100”</td>
<td>2794mm/110”</td>
<td>3048mm/120”</td>
<td>5131mm/202”</td>
</tr>
<tr>
<td>Linear/”</td>
<td>1497mm/59”</td>
<td>1549mm/61”</td>
<td>1930mm/76”</td>
<td>2134mm/84”</td>
<td>2286mm/90”</td>
<td>2337mm/92”</td>
</tr>
<tr>
<td>Shipping Weight (kg/lbs)</td>
<td>1900kg/4,188lbs</td>
<td>3480kg/7,762lbs</td>
<td>5352kg/11,800lbs</td>
<td>7711kg/17,000lbs</td>
<td>10886kg/24,000lbs</td>
<td>14515kg/32,000lbs</td>
</tr>
</tbody>
</table>
Lapmaster also offers a variety of specialty lapping and polishing machines for various applications. In many cases, these types of machines are developed as a result of specific customer inquiries. In the event that you have lapping and polishing requirements that cannot be met by existing equipment on the market, we encourage you to contact Lapmaster Sales and Technical Service Centers or your local Lapmaster sales representative. We appreciate the opportunity to quote custom equipment to meet your specific lapping and polishing needs.

**LLCD Optical Polishing Machines**

The LLCD series of precision oscillating head polishing machines can accept a variety of polishing pads or lapping plates. Lapmaster offers five basic machines with lapping/polishing plates varying in size from 23.6” to 93.4” diameters. Single work pieces ranging from 18.9” to 30.7” diameters can be accommodated.

**Machine Features and Benefits**
- Heavy duty structural steel base
- Variable speed range (plate RPM, head oscillation)
- Multiple drive systems for lapping/polishing plate, head oscillation
- Precision slurry distribution system with agitator
- Various voltages 50/60 Hz to customer specification
- Maximum utilization of the lapping/polishing surface
- Suppression and elimination of “tracking” effects on the lapping/polishing surface
- Improved control of lapping/polishing surface flatness
- Precise optical flatness control of the workpiece

**Multi-station Lapping/Polishing Workbench**

These unique lapping/polishing systems are specially designed to contain 2 or 3 separate workstations in one bench. The flexibility of design allows Lapmaster to configure these systems specifically for the customers’ requirements. Modular options such as plate size, number of stations, lapping/polishing plate material, feed systems, positive ring drive, variable speed plate and ring drive controls, cleaning sink and storage cabinet make specifying the proper system quick and easy. The Multi-station Lapping/Polishing Workbench can be fabricated with either polypropylene or stainless steel panels.

**Machine Features and Benefits**
- Heavy duty structural steel frame covered in polypropylene or stainless steel
- Multiple workstations (up to 3) individually configured for specific applications
- 12”, 15” or 20” diameter lapping/polishing platens
- Modular design makes adding optional equipment easy
- Electronic, variable speed conditioning ring, lapping/polishing plate drives
- Lighted workstations
- Optional storage compartments and wash sink
- Custom slurry feed systems as required
The ideal solution

Diamond compounds and slurries are available in many standard variations from Lapmaster to suit specific customer requirements. Our expertise in micrograded diamond powder with extensive knowledge of chemistry, compounding techniques and carrier formulations allow us to provide the best possible diamond abrasive products for all of your precision finishing requirements. All diamond compounds and slurries can be supplied in virtually any concentration, particle size, diamond type, formulation, or container size.

Diamond Powder

For those customers who have applications involving the use of dry diamond powder, Lapmaster offers three types of diamond: Monocrystalline Synthetic (both resin and metal bond), Polycrystalline Synthetic, and Natural diamond powder. Maintaining Lapmaster’s high standard of quality, only premium virgin diamond is used for all applications.

Monocrystalline Synthetic

- Produced under high pressure and temperature.
- Multifaceted sphere-cuboid shape for strength and efficiency.
- Tough Monocrystalline structure with minimal friability.
- General purpose applications.
- Ivory in color.

Natural

- Premium quality natural powder.
- Sharper and more friable than synthetic.
- Excellent thermal stability.
- Recommended for harder materials, ceramic, various gemstones and glass.
- White in color.

Polycrystalline Synthetic

- Formed by explosive process-hardest of all diamond.
- Fused Polycrystalline structure resists cleavage under pressure.
- Excellent surface finishes on very hard materials such as: sapphire, ceramic, ferrite and CVD diamond.
- Black in color.

Due to the varying characteristics and cost of the different types of diamond, Lapmaster will recommend only the type of diamond suitable for your application.

Diamond Slurries

The Lapmaster range of diamond slurries has been formulated for use on composite lap plates, cast iron lap plates and polishing pads. The slurries can be hand sprayed or applied by an electronic dispensing system to control cost and waste. The standard slurry formulations are:

Oil Base

- Low viscosity
- Enhanced cleaning properties
- General purpose
- Good lubricity
- Excellent cutting action

Water Soluble

- No petroleum products
- Easy clean-up
- Excellent cutting action
- Environmentally friendly

Emulsion

- General purpose
- Low viscosity
- Easy clean-up
- Good lubricity

Diamond Compounds

Lapmaster offers a wide range of diamond compounds to process virtually any material used in today’s manufacturing processes. All compounds are specially formulated to withstand the most stringent of manufacturing processes. Fine diamond particles are coated to ensure uniform dispersion without agglomeration. These compounds are available in three standard formulations:

Oil soluble

- General purpose
- High thermal stability
- Excellent stock removal

Water Soluble

- Excellent stock removal
- Easy cleaning
- No petroleum product
- Environmentally and user friendly

Universal

- Easy cleaning
- Excellent stock removal
- Soluble in water and oil
- Environmentally and user friendly

Each of the above diamond slurry and compound formulations can be manufactured using resin bond, metal bond, polycrystalline or natural diamond powder.
Lubricating Fluids

Lubrication is necessary for a smooth running condition between the lap plate and conditioning rings and to help evenly disperse the diamond product on the lap plate. Lubricating fluids have been developed to ensure that specific diamond compounds and slurries cut and polish with maximum efficiency.

Type OS
A mineral oil base lubricant for use with oil or universal base compounds and slurries.

Type W
A water base lubricant for use with water or universal base compounds and slurries.

Composite Plates

These composite materials have been specifically designed, composed and developed as a carrier or lap for diamond abrasive compounds and slurries. Lapmaster composite plates consist of a combination of metallic and non-metallic constituents, held together in a non-metallic bond.

The advantages of using a composite plate versus a pure metal plate can be summarized as follows:

- Composite lapping plates normally take a more uniform charge of diamond particles compared to pure metal plates.
- Composite plates are superior in application where lapping and polishing are combined into one step.
- When used properly with lapmaster diamond compounds and slurries, these plates will produce excellent surface finish, flatness and consistent stock removal rates.

Iron - normally used with larger sized micron diamond for stock removal on hard materials such as steel, ceramic, tungsten carbide and silicon carbide. This process will produce a reflective finish on most components.

Copper - normally used with a medium range of diamond to produce a highly polished surface on most materials with a minimum of stock removal.

XP - when used with a medium to fine micron sized diamond, it will produce a mirror finish on materials such as ceramic, steel, ferrite and bronze.

Tin/Lead - tin is the softest plate of all composite plates offered in this product line. When used with a fine diamond, it will produce a mirror finish on fiber optic terminals, carbon steel faces, and many other hard materials such as tungsten carbide.

Ceramic - This is the hardest plate available on the product line. It is used for lapping and polishing ceramic and other hard materials where a “clean” process is necessary.

The Lapmaster range of lapping/polishing composite plates are formulated specifically to deliver optimum performance when used with our diamond compound and slurries.

Hand Lapping and Polishing Kits

Hand lapping and polishing kits are ideal for low volume production, when optimum surface finish is required, and where it is not economical to purchase a lapping or polishing machine.
Lapmaster offers an entire line of lapping and polishing accessories to serve nearly every application. From hand lapping and polishing plates, to ultrasonic part cleaning systems, Lapmaster is your "one-stop shop" for all of your lapping and polishing needs.

**Hand Lapping and Polishing Plates**

**Standard Hand Lapping Plates** - Lapmaster Hand Lapping Plates are ideal for research and development work and low volume production where extreme flatness is required. These plates are manufactured from a dense, low porosity cast alloy to insure maximum cutting action, minimum plate wear, and consistent surface finish. They are available in three standard sizes of 6", 12" and 18" with crosshatch, serrated or solid surfaces.

**Alloy Polishing Plates** - These plates have a cast base surface with a special alloy to insure minimum plate wear. Lapmaster Alloy Polishing Plates are recommended for soft materials such as carbon and plastic. Lapmaster Alloy Polishing Plates are available in 6" and 12" diameters.

**Ceramic Hand Polishing Plates** - Lapmaster Ceramic Polishing Plates are specially designed for use with ceramic, tungsten, tungsten carbide and ferrite materials. These plates are made of solid ceramic (15/16") and are available in 6", 9" and 12" diameters.

**Flatness Inspection**

**Portable Polishing Stands** - The Lapmaster Portable Polishing Stand provides an effective and practical means for polishing work pieces prior to inspection with an optical flat and monochromatic light. The Lapmaster Portable Polishing Stand is available with a standard 12" x 12" working surface or an 18" x 18" working surface for larger parts.

**Polishing Papers** - A variety of polishing papers are also available. These papers feature emery, aluminum oxide, or silicon carbide abrasive bonding. Lapmaster Polishing Papers are available in 12" or 18" x 50 yard rolls for use with the Lapmaster Polishing Stand. In addition, Lapmaster Polishing Papers are available in individual sheet form for stand-alone use.

**Lapping/Polishing Media**

In addition to diamond abrasive products, Lapmaster offers a complete line of lapping/polishing media for processing today’s complex materials. For conventional lapping applications, Lapmaster offers Garnet, Aluminum Oxide, White Calcined Alumina, Silicon Carbide and Boron Carbide. For polishing applications, Lapmaster offers Colloidal Silica, Colloidal Alumina, Cerium Oxide and other special medias. To complement our abrasive line, a choice of oil and water base vehicles in various viscosities is available to suit almost every application. Most of the materials listed above are available in both powder and premixed slurry form. For consistent, repeatable process results, ask about our premix concentrate and ready to use abrasive lapping and polishing slurry formulas.
Optical Flats - Lapmaster Optical Flats are manufactured using the finest quality materials and the latest manufacturing techniques. The optical flats are made from the highest quality clear fused quartz and Zerodur materials, which are known for very low thermal expansion characteristics and resistance to abrasion.

Lapmaster Optical Flats are available in a full range of standard sizes from 1" to 16" diameter. Larger, smaller and special shaped optical flats will be quoted upon request. All Lapmaster optical flats are available in certified optical accuracies of 1/10th light band, 1/5 light band and 1/2 light band in both single and double sided versions.

Precision Flatness Gauges - The Lapmaster Flatness Gauges provide a quick, reliable method of inspecting lap plates, polishing plates, surface plates and other large surfaces for flatness. The Flatness Gauge determines flatness by measuring the deviation from a straight line on a plane determined by the gauge body. This deviation, convex or concave, is then read directly in 0.0001" increments on a dial indicator (digital indicators also available).

Monochromatic Lights - Lapmaster Monochromatic Lights are used to measure surface flatness within millionths of an inch. These self-contained units use a helium or sodium light tube to produce a glare free light of known wavelength (2.32 millionths of an inch).

When used with Lapmaster Optical Flats, contrasting light and dark bands are readily observed on most reflective or semi-reflective surfaces. Surface flatness to within .000001" is quickly and easily measured on parts ranging in size up to 16" in diameter.

Ultrasonic Cleaning Systems

The final operation in the process of lapping and polishing is cleaning, and the Lapmaster Benchtop Ultrasonic Cleaner System offers performance second to none. Ultrasonic cleaning is faster, more thorough, and safer than any other method. Scrubbing, soaking and steam don’t even come close. The Lapmaster Benchtop Cleaners are powerful enough to remove heavy oils, waxes or slurries, yet gentle enough to clean tiny, precision assemblies.

Ultrasonic sound waves moving through a cleaning solution create an effect called cavitation: the rapid formation and implosion of microscopic bubbles. Heat enhances the process. The deep cleaning action of ultrasonics removes even the most stubborn dirt and contaminants.

There are six models available, with capacities of 0.5 gallon up to 10 gallons offered as follows:

- Ultrasonics with mechanical timer
- Ultrasonics with heat and mechanical timer
- Ultrasonics with heat, digital timer, degas and temperature monitor

Lapping/Polishing Machine Tooling

Workholder Discs and Pads - Workholder discs are used to separate fragile workpieces during lapping and polishing operations to prevent damage. They are also used when work pieces do not lend themselves to batch loading. The discs are made of a laminated phenolic and are available from 1/16" to 1" thick and in diameters of 4/16" through 35/16". Pads are available in sponge or felt material and are used to compensate for minimal height differential in the parts being lapped.

Dual Face Machine Work Carriers - Lapmaster offers work carriers for virtually any dual faced machine currently on the market. Stock materials include spring steel, steel with molded plastic inserts, G-10, PVC, lexan, vinyl and phenolic. Workholes can be custom cut to suit any part geometry.

Diamond Stop Fixtures - Lapmaster Diamond Stop Fixtures are used to control size and parallelism on very thin, fragile parts. Recommended when part thickness is .010" or less. These fixtures are available in both wax mount and vacuum applications and in sizes to fit Lapmaster’s machine models 12 through 48.

Accupol Precision Lapping/Polishing Fixtures - Lapmaster Accupol Precision Lapping/Polishing Fixture is used for very thin, fragile parts where diamond stops are not practical. Adjustable spring tension allows for variable down pressure on the workpiece. An LCD indicator allows for continuous monitoring of stock removal. The Accupol fixture also features vacuum mounting chucks for various component sizes and shapes. The Accupol is available in sizes to fit Lapmaster machine models 12, 15 and 20.
Lapmaster offers a variety of in-house lapping and polishing services to our customers, ranging from contract lapping to optical flat reconditioning and lab process development.

**Contract Lapping**

Lapmaster Contract Lapping service is available to take care of your work, demanding precision flatness and finish beyond the capabilities of your own equipment or expertise, or to supplement your own facilities. In our contract lapping department you will find the latest in high speed production lapping equipment and we are geared to give you the fastest possible delivery and to assure that you will have the parts when promised to meet your production schedules.

Let us demonstrate to you how this service will save you money. Send us a few parts with complete specifications, we will lap them and return them with full production data and a cost quotation without obligation.

**Optical Flat Reconditioning**

In our Optical Flat Reconditioning department you will find the latest and most accurate machines designed primarily for the production finishing and reconditioning of high-quality plano-optics; such as proof flats, prisms, filters, windows and ring laser gyroscope blanks. Our Optical Technicians have years of experience and are here to service your optical reconditioning requirements. Let Lapmaster show you how this service can save you time and money. Send us your optical flats and plano optics for a free evaluation. We will inspect them and return them to you with a complete report and cost quotation without obligation.
Laboratory Process Development

Find out whether production lapping will prove profitable in your manufacturing process by sending a few sample parts with surface finish specifications and production requirements to our Applications Laboratory. We will test run them and furnish you with a full production report. The lapped samples will enable you to positively determine the improvement in your product and/or the savings effected. The Lapmaster Applications Laboratory is maintained to aid you in every way possible to answer questions and solve problems that arise in connection with flat surfaces and finishes. This service is free of charge and does not obligate you in any way.

Through the lab, we regularly assist customers by developing new products and processes utilizing the latest precision finishing technology to: Shorten cycle times, Reduce the number of finishing steps, Lower finishing costs, Improve precision and performance.

After Sales Service and Support

Lapmaster provides continuous, reliable support to both prospective and current customers. Unfailing support is always available through our Sales and Technical Service Centers located in Morton Grove, IL and Plymouth, UK. Our customer service staff is standing by to assist you. We invite you to visit either one of our facilities for equipment and process training free of charge. On site training is also available for a nominal fee. Contact your local Lapmaster Sales Representative, or our Sales and Technical Service Centers for more information.
Fine grinding, also known as flat honing, is a new technology using fixed abrasive in lieu of loose abrasive for precision finishing. Depending upon the application, fine grinding technology utilizes fixed abrasive diamond or CBN suspended in resin, metal, and vitrified bonds to grind a wide range of materials to very tight specifications. Fine grinding technology uses similar planetary machine designs and kinematics to traditional lapping technology, with several significant advantages.

Fine grinding represents the next-generation precision finishing technology, offering several advantages over the traditional lapping process yet still yielding similar flatness, parallelism, surface finish, and size tolerances. The fine grinding process is much cleaner than lapping, virtually eliminating swarf disposal and work piece cleaning issues. This process is also typically 3-5 times faster than lapping, blurring the lines between traditional lapping and grinding technologies.

Lapmaster’s development of fine grinding equipment and processes are bridging the gap between traditional flat lapping and grinding machines, utilizing the best technologies of both. Significant growth is expected in this technology throughout the metal, ceramics, and composites finishing industries where fine grinding offers increased productivity, reduced manufacturing costs, and a positive impact on the work environment.

Effective component processing using fine grinding technology requires heavy-duty equipment with sophisticated control systems capable of high plate rotation speeds and down-pressure generation. Lapmaster offers several new fine grinding machine models, available in both single sided and dual faced configurations. This line of equipment has been designed using the latest machine construction and control system technology, capable of executing complex grinding routines while producing precise and repeatable results. Full specifications and advantages of Lapmaster fine grinding equipment are available in individual data sheets.

### Compare the advantages

<table>
<thead>
<tr>
<th>Traditional Lapping</th>
<th>Fine Grinding</th>
</tr>
</thead>
<tbody>
<tr>
<td>oPerformed with loose abrasive</td>
<td>oPerformed with superabrasive solid or pelleted plates</td>
</tr>
<tr>
<td>oStock removal through rolling action</td>
<td>oStock removal through scraping action</td>
</tr>
<tr>
<td>oLapped surface is dull and crater-like</td>
<td>oFine-ground surface has irregular crossing marks</td>
</tr>
<tr>
<td>oMaterial and lapping compound are not recycled</td>
<td>oCoolant/swarf is recycled</td>
</tr>
<tr>
<td>oLapping parts are contaminated and require cleaning</td>
<td>oFine ground parts are coated with thin layer of coolant and do not require cleaning</td>
</tr>
<tr>
<td>oSlow stock removal rates</td>
<td>o3-5 times faster than lapping</td>
</tr>
</tbody>
</table>

For more information regarding Lapmaster’s line of Fine grinding products, contact your local sales representative, or one of our sales and technical service centers.
How to Order

Our experienced Lapmaster staff can fill your orders promptly and accurately. To place an order, contact either Lapmaster location described below via phone or fax. To help prevent errors, please include the relevant Lapmaster part numbers on the order, if available.

Lapmaster International

International Lapping and Polishing Machine Systems

UNITED KINGDOM
Lee Mill Industrial Estate,
Ivybridge, Devon, PL21 9EN England, UK
Telephone: National 01752 893191
International: +44 1752 893191
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Email: sales@lapmaster.co.uk
Internet address: www.lapmaster.com

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Morton Grove, IL 60053 U.S.A.
Telephone: 847-967-2975
Fax: 847-967-3903
Toll Free Phone: 800-527-2631 X2975
Email: sales@lapmaster.com
Internet address: www.lapmaster.com

Lapmaster serves the Lapping/Polishing and Metallographic markets through an expanding network of sales and service offices located throughout the world. Sales and technical service is available either through your local Lapmaster Sales Representative, or our main Sales and Technical Service Centers located in Morton Grove, IL and Plymouth, UK.
For additional information regarding Lapmaster Products and Services, please contact one of our Technical Sales and Service Centers, or visit our website at www.Lapmaster.com

Lapmaster International
International Lapping and Polishing Machine Systems

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All data and specifications contained in this document are subject to change without notice.