PR HOFFMAN
AMTECH GROUP

1900 SERIES

1900 Series
Double-sided Planetary
Lapping and Polishing Machine

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Servo RS™ 1900 Series

Double Side Planetary Lapping & Polishing Machine

The P.R. Hoffman ***Servo RS***™ 1900 Series double sided lapping and polishing machine can be adapted to finish many different materials. The planetary action simultaneously removes equal amounts of material from both sides of the pieces. Precise, asymmetrical removal can also be programmed when needed. The ***Servo RS***™ 1900 planetary lapping and polishing machine can be modified to meet your processing requirements with the addition of a wide variety of optional accessories.

GENERAL DESCRIPTION

Weight: Machine weight: 2,090 pounds [950 Kg] (3-way), 2340 lbs. [1065 Kg] (4-way)
Shipping weight: 2,500 pounds [1,140 Kg] (3-way), 2750 lbs. [1250 Kg] (4-way)

Footprint:
Left to Right: 56” [142cm]
Front to Back: 37” [94cm]
Assembled Height: 86” [218cm]
Shipping Height: 93” [236cm]

Plates:
I.D. 6.8” [173mm]
O.D. 19.1” [485mm]
Track: 6.15” [156mm]

Carriers:
Number per load: (5) 85 Tooth Gear Type
Root diameter: 6.9” [175mm]
Max Part circle: 6.6” [168mm]

Electrical Utility:
Top Plate Drive: 2.0 HP [1.50KW] Servo
Bottom Plate Drive: 2.0 HP [1.50KW] Servo (4-way, optional)
Ring Gear Drive: 1.0 HP [0.75KW] Servo
Center Gear Drive: 1.0 HP [0.75KW] Servo
208/230 VAC, 60 Hz, 3 Phase, 20 Amps (3-way), 30 Amps (4-way)
480 VAC, 60 Hz, 3 Phase, 10 Amps (3-way), 15 Amps (4-way)
380 VAC, 50 Hz, 3 Phase, 12 Amps (3-way), 18 Amps (4-way)

STANDARD FEATURES

The ***Servo RS***™ machines have a touch screen display for editing the 14 step recipes. The parameters that are controlled in each of the 14 steps include:

Automatic Speed Calculation

Automatic Plate Flattening using High or Low Mode

Programmed Shutdown Sequence

Ramp Steps for both speed & load

Lap Steps, 999 minute each capability

Programmed Slurry or Coolant Flow

Programmed Flush Water Flow

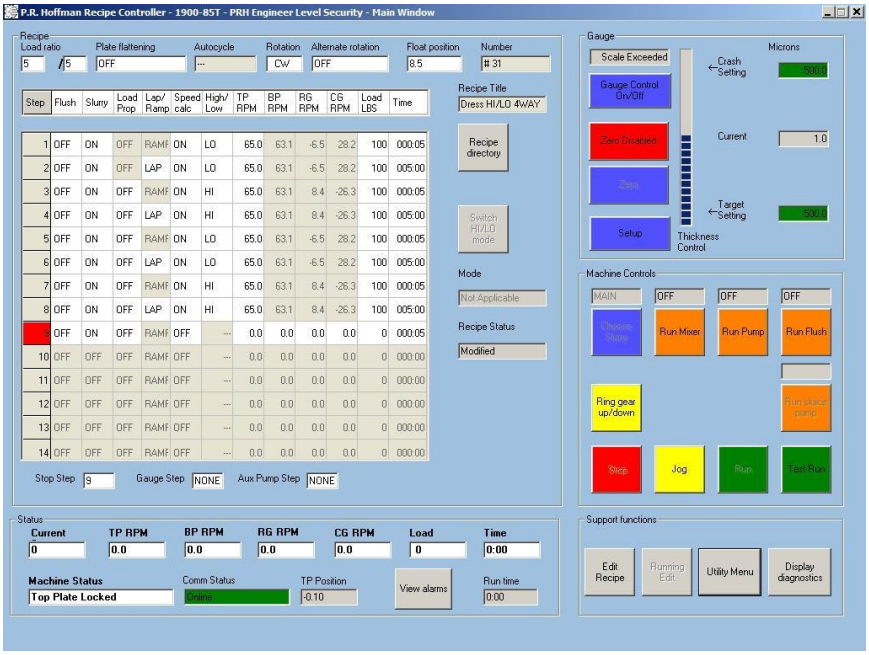
Top Plate RPM

Bottom Plate RPM (4-way, optional)

Ring Gear RPM (Auto or Manual)

Center Gear RPM
(Auto or Manual)

Load (Downforce on Parts)



Servo RS™ Main Recipe Screen

Digital Gauge Sizing Control (optional)

Digital "Crash Protection" (optional)

Timed Cycles (All Steps)

Hour Meter with Alarm

- The speeds of the top plate, bottom plate, ring gear and center gear can be programmed to ramp to a desired RPM over a period as long as 3:00 minutes.
- If an asymmetrical top to bottom removal ratio is required, the ***Servo RS***™ series is easily programmed for ratios as high as 50:1. This technology allows removal of material from one side of a substrate while minimally affecting the opposite side of the product.
- Automatic slurry feed system with a DC variable flow peristaltic pump and a DC variable speed propeller-style mixer.
- Two-hand controls for safely raising and lowering the top plate.
- Cast iron lapping plates.
- Nickel-plated cast iron ring gear and center gear.
- Stainless steel top support plate with stainless steel hardware.
- Complete, detailed machine instruction manual stored on machine's Windows® PC and accessible through the touch screen.

Controls:

The machine operation is computer-controlled. Unlimited recipes with 14 steps each can be stored, allowing processes for different products to be changed quickly. The controller governs all of the process operations. Ring gear, center gear, top and bottom plate speeds and direction as well as acceleration and deceleration ramping are controlled functions. Speed changes can be coordinated to avoid abrupt changes and shock to the parts.

The top plate downforce is controlled by a servo driven ball screw. The controller constantly adjusts the downforce based on feedback from a load cell that is mounted on the top plate drive shaft. This control loop allows precise control of downforce on the parts. The lapping force range is from 15 to 275 pounds [6.8 to 125 Kg]. Changes to the downforce are made gradually through the servo motor. This same motor is used to raise and lower the top plate.

A variable speed peristaltic pump feeds slurry or coolant to the process. The pump controls are fully-integrated into the operator panel and are activated within the process recipe steps.

The recipe is selected and the program is displayed and controlled on a touchscreen supported by Windows®. During operation, the touchscreen presents information to the operator on the progress of the process such as recipe step, speeds and top plate weight. The programming is done through various edit icons displayed on the touch screen. The 1900, as delivered, is fully programmed for process control and for lapping plate or polishing pad conditioning. Additional programs, customized for your application, can be written and altered easily.

The top plate is raised and lowered with two hand push buttons.

Construction:

Our machine design philosophy includes the use of heavy gauge materials. The rugged machine construction will withstand harsh environments and provide a stable platform for producing flat and parallel parts.

The plate and support plate designs include extra thickness to help prevent distortion from heat and force, resulting in a flatter lapping or polishing surface for making high-quality parts.

Our standard classic 3-way version has a non-rotating bottom plate, which is useful for most free-abrasive processes as well as for very thin and fragile processes.

Our optional 4-way version adds a counter-rotating bottom plate motion that significantly increases surface speeds for high-throughput applications and processing of hard materials such as sapphire, fused silica, ceramics and silicon carbide.

The Model 1900 machine design employs stainless steel hardware and polymer coatings, which protects parts exposed to process fluids against corrosion and makes cleaning easier.

Drives:

The rotating elements on the Model 1900 3-way and 4-way configurations are driven by independent, advanced servo motors coupled with cycloidal speed reducers, which offer an exceptional level of precise, seamless and efficient control for handling fragile parts. This high level of control greatly reduces the stress on the carrier teeth and the edges of the parts. The PR Hoffman 4-way machine version includes all of the features of our classic 3-way ***Servo RS***™ machines, with the addition of precise, independent motion control of the bottom plate. The new 4-way machine design platform is an extension of the 3-way family of ***Servo RS***™ machines, which are industry-proven for more than two decades.

Automatic Plate Flatness Control:

Flatness of the top and bottom plates is controlled during the processing cycle by automatically changing the relative speeds of the ring and center gears. It is typical for plate flatness to be held within 0.0001 to 0.0002 inches [2.5 to 5 microns] over the entire plate surface.

Slurry System:

The Model 1900 controls are integrated with a variable-speed peristaltic pump, which feeds slurry or coolant to a distribution ring on the top plate. A variable-speed, remote-controlled propeller-style mixer is specially designed to gently agitate shear-sensitive slurries.

End of Cycle Flush:

Flush water control is also fully-integrated into the process controller for rinsing the slurry from the parts, normally during the final process steps. The flush function is also useful for polishing pad dressing and cleaning processes using brush carriers. A hand held sprayer complements the automatic flush system, and can be used for cleaning the machine.

Retractable Ring Gear:

When processing is complete and the top plate is raised, the ring gear can be lowered below the level of the bottom plate. After first removing the carriers, small or fragile parts may be easily slid off the edge of the plate without damage.

Pad Punch:

For polishing applications, a plastic “backer plate” and “pad punch” are supplied. After pads are applied, the top plate is lowered onto the backer plate. The pad punch, inserted through the slurry holes, allows the operator to punch a clean, perfectly aligned slurry hole in the pad.

Carriers:

The 1900 holds five 85 tooth carriers (work holders) with a maximum part circle of 6.6” [168mm].

Set-Up, Training and Support:

All machines include set-up, operator and maintenance training. The normal set-up allowance is one week, including travel time. Continuing support is then provided by telephone, e-mail or teleconference. Remote diagnostics can also be initiated through the machine’s personal computer via the internet.

OPTIONAL EQUIPMENT

Counter-Rotating Bottom Plate 4-Way Configuration:

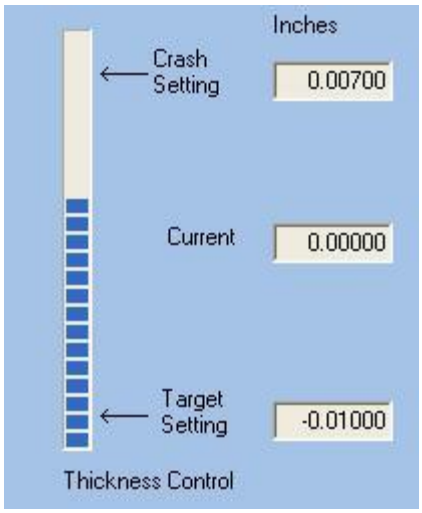
The 4-Way Model 1900 configuration integrates an additional 2HP [1.50KW] drive motor for high-throughput applications and for processing of hard materials.

Automatic Sizing Control (Available on 3-way Configuration):

The automatic sizing control system measures parts up to .065" [1.65 mm] thick. One piezoelectric quartz crystal is loaded into the center of one carrier work holder and is processed along with the parts. As the quartz is lapped, its resonant frequency increases and is monitored by an electrode inserted into the bottom plate. When the crystal resonates at the frequency preset on the ALC, the machine is stopped.

Digital Sizing Control:

The digital gauge sizing device is fully-integrated into the Windows® PC. This device approximates the thickness of the parts being processed by direct measurement of the distance between the plates. The digital gauge probe is mounted on the overarm, and makes contact with the end of the upper shaft. The gauge can be adjusted to account for slurry fluid boundary layer and for plate wear. The operator presets the amount of material to be removed on the touch screen control in inches, microns or millimeters. The gauge device then shuts the machine off when this amount of material is removed. Typically, this gauge can be used to process parts to tolerances of +/-0.0002" [+/-5 microns] or better.



Part Out of Carrier and Crash Protection:

Used on machines configured as polishers, this option will automatically sense a "crash" and terminate the polishing cycle. If parts are improperly loaded into the carriers during machine loading, the machine will not start the processing cycle and a caution message will be displayed.

Serration Option on Standard Cast Iron Lapping Plates:

Serrated standard cast iron plates when running larger parts to reduce hydroplaning.

Stainless Steel Polishing Plates Option (replaces standard smooth cast iron plates):

Used when greater corrosion protection is required.

Stainless Steel Option on Ring and Center Gear:

Replace the standard cast iron gears when greater corrosion protection is required.

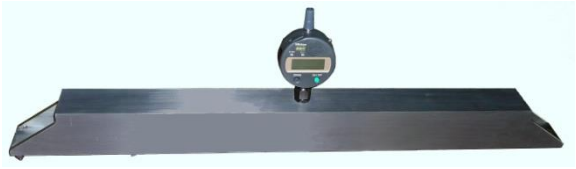
Lap Plate Cooling / Heating Option (Bottom Plate only, not available on 4-way version):

Special bottom subplate provides passages for re-circulating cooled or heated water, helping to maintain consistent process temperature. Water is directed through a closed circuit flow through a connection in the non-rotating bottom plate.

Water Cooling / Heating System:

A self contained chiller / heater system can be provided for maintaining coolant temperature for water cooled / heated plates.

Lapping Plate Flatness Gauge:



The lap plate flatness measuring gauge comes complete with a digital indicator and protective case. Regular checking of cast iron lapping plate flatness with this gauge will allow determination of when reconditioning of the plates is needed before part flatness and parallelism tolerances deteriorate. This option is recommended with the first lapping machine purchase. A granite reference flat is also available.

Conditioning Gears:

A set of rigid dressing sprockets is used to remove irregularities on the surface of the lapping plates such as scratches or rust deposits, and to flatten the plates as necessary. These gears are commonly used in sets of five.

Carriers (workholders):

Carriers are manufactured of spring steel, Lamitex™ (fiberglass), Lexan®, PVC, and phenolic. Workholes of any size and shape are available. Other materials are available on request.

(Example of Model 5400 Carrier)

Brush Carriers for Polishing Pads:

Brush carriers with scrubbing bristles are used with a water flush to clean and restore glazed polishing pads. Brush carriers are commonly used in sets of five.

Diamond Conditioning Carriers for Polishing Pads:

Each conditioning carrier assembly consists of a PVC carrier that holds a precision, diamond-electroplated stainless steel wheel that spans across the entire plate track width. The diamond coating is flat and uniformly applied to both sides of the wheel. The diamond conditioning carriers are used to break-in and planarize new polishing pads and to re-condition glazed polishing pads. The diamond conditioning carriers are commonly used in sets of four or five.

Warranty:

All processing machines are warranted by Seller to be free from defects in materials and workmanship for a period of one year after the date of shipment by Seller. Seller's warranty of processing machines covers parts only, does not cover labor, and does not cover any machine which has been abused, misused or negligently operated or maintained. If Buyer notifies Seller in writing within ten days after discovery of a defect during the warranty period only, and if such defect appears in Seller's sole judgment to be a defect in material and workmanship attributable to Seller, Seller will make such repair or replacement to correct such defects as Seller in its sole judgment shall deem appropriate. The above warranties supersede all warranties of merchantability or fitness for a particular purpose. There are no warranties, express or implied, which extend beyond the warranties contained herein.

The foregoing remedy shall be Buyer's sole and exclusive remedy against Seller. Broken or faulty parts must be returned to P.R. Hoffman for inspection and new or repaired parts will be returned.