

PR HOFFMAN MACHINE PRODUCTS:

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Since 1938

PR-1 Servo Series

Double-Sided Planetary Lapping/Polishing Machine



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PR-1 Servo Series

Double Side Planetary Lapping & Polishing Machine

The P.R. Hoffman PR-1 lapping and polishing machine is industry-proven to be durable and dependable, and has been adapted to finish many different materials with excellent results. The parts to be processed are placed in carriers (work-holders) which are driven in a planetary motion between two stationary plates. The planetary action simultaneously removes equal amounts of material from both sides of the parts.

The PR-1 machine is available in four different configurations, single and dual servo motor versions, and can be equipped to meet your process requirements by the addition of a wide variety of optional accessories.

General Description

| | | 32T | 50T | 66T | 85T |
|--------------------------------|------------------|--|---------------------|----------------|------------------------------|
| Configuration | No. of Carriers: | 13 | 8 | 5 | 5 |
| | Part Circle: | 2.1" [53mm] | 3.6" [91mm] | 5" [127mm] | 6.6" [168mm] |
| | Root Diameter: | 2.5" [64mm] | 4" [102mm] | 5.3" [135mm] | 6.9" [175mm] |
| | OD: | 14.4" [366mm] | 14.3" [363mm] | 14.3" [363mm] | 19.1" [485mm] |
| Plate Dimensions | ID: | 11" [279mm] | 9.4" [239mm] | 6.8" [173mm] | 6.8" [173mm] |
| | Track: | 1.7" [43mm] | 2.45" [62mm] | 3.75" [95mm] | 6.15" [156mm] |
| | 5/8": | 19 lbs. [8Kg] | 24 lbs. [11Kg] | 28 lbs. [13Kg] | 45 lbs. [20Kg] |
| Top Plate Weights | ¾": | 21 lbs. [9Kg] | 26 lbs. [12Kg] | 32 lbs. [15Kg] | 52 lbs. [24Kg] |
| | 1-1/8": | 27 lbs. [12Kg] | 36 lbs. [16Kg] | 44 lbs. [20Kg] | 80 lbs. [36Kg] |
| Weights (approximate) | Machine: | | 880 lbs. [400 kg] | | 1,150 lbs. [520Kg] |
| | Shipping: | | 1,000 lbs. [450 Kg] | | 1,250 lbs. [570 Kg] |
| Standard Electrical Utility | Motor: | 1 HP (0.750KW) Total Power | | | 1.5 HP (1.125KW) Total Power |
| | Voltage: | 208//220/230 VAC, 50/60Hz, 1 Phase, 15A (single), 20A (dual) | | | |

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Double-Sided Planetary Lapping/Polishing Machine

STANDARD EQUIPMENT

Models:

The PR-1 Series is available in four configurations: 32T, 50T, 66T, and 85T. The model number refers to the number of teeth on the different sizes of the carrier gears (work holders). The carrier size is chosen based on the size of the part being processed; the smaller and thinner the part, the smaller the carrier. The basic machine is the same for all models with the ring gear, center gear, drive components, and plates being changed to accommodate the size and number of carriers. A work surface and cabinet provides useful working space for the operator.

Machine Drive:

The ring gear and center gear are driven by a 1 HP [0.75KW] servo motor acting through a mechanical transmission. The 85T model uses a 1-1/2 HP [1.125KW] servo motor. The PR-1 Series servo motor drive provides a smooth speed ramp for soft starting of fragile parts as well as a programmed soft stop at the end of the cycle.

Lap Plates:

The standard PR-1 machine is equipped with smooth cast iron lap plates. Each plate has a steel ring pressed into the ID and onto the OD. These rings, set slightly below the plate surface, prevent thin carriers from flexing under load. The rings on the top plate also protect the operator from the gear teeth when the machine is running.

The top plate floats freely on the parts and is restrained from rotating by a dogging arm that pivots down and engages two posts on the plate. Handles are fitted on the top plate for lifting, and a post and hanger is included for storing the top plate when not in use. For machines equipped with a top plate lifter, the lifting arm prevents rotation. The top plate lifter is included as standard equipment on the 85T model due to the heavier weight of an 85T top plate.

The bottom plate height is adjustable relative to the ring and center gears, which allows the wear from the carrier teeth to be distributed across the entire face of the gear teeth for maximum ring and center gear life.

Controls:

The PR-1 has a touch screen display with integrated timer, optional thickness control gauge, selection of thickness control, display of ring gear, center gear and carrier orbital speeds, and motor power output. The lap selector switch activates the lap cycle, including timer, thickness control gauge (optional) and slurry delivery system (optional). The slurry system automatically turns off at the end of a cycle. The main drive is controlled by a master speed control knob. An emergency stop push-button deactivates all functions.



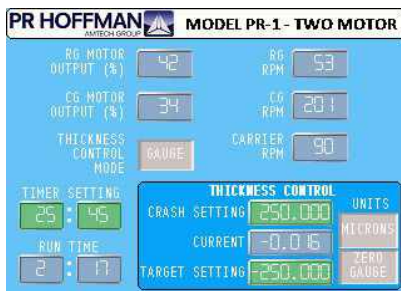
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OPTIONAL EQUIPMENT

Dual Motor Configuration:

On the dual motor Model PR-1 configuration, the ring gear and center gear are driven by separate servo motors which are integrated into the machine controls to enable self-flattening of the lapping or polishing surfaces. The operator selects high or low mode using a plate flatness mode selector switch. The controls allow the operator to choose pre-programmed gentle, medium or aggressive carrier rotations for the high and low mode machine operation, which allows great flexibility for processing parts and planarizing the plate surfaces.



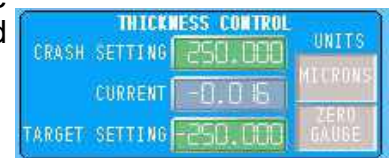
The dual motor PR-1 touch screen control is the same as the standard configuration, with the additional display of separate motor power outputs and the addition of a screen for selecting the pre-programmed carrier rotations for the high and low mode operation.

Digital Sizing Control:

The digital gauge sizing device is fully-integrated into the touch screen control. 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 top lapping plate, and makes contact with a tungsten-carbide anvil mounted on the machine center shaft. The gauge can be adjusted to account for slurry fluid boundary layer and for plate wear. It is recommended that the optional automatic abrasive distribution system be used with the digital gauge to insure that a consistent fluid boundary is maintained.

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.

A "crash" set-point allows the sizing control to automatically sense a "crash" and terminate the polishing cycle. This crash detection function also prevents the machine from running in the event that the parts are not loaded properly into the carriers.



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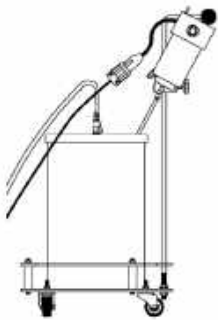
Thickness Measuring Gauge:

This digital indicator mounts directly to the top plate of a PR-1 machine. The thickness of the parts is approximated by direct measurement of the distance between the plates. This design provides a lower cost alternative to an automatic digital sizing system where automatic set-point controls are not needed. It allows the operator to determine when target is reached without having to stop to measure. It also provides the operator a tool to help prevent "crashes" caused by incorrect loading of carriers and parts.



Abrasive Distribution System:

Abrasive slurry is supplied from a 5 gallon [18 liter] polyethylene container. This container is mounted on a wheeled hand cart, which allows the operator to mix remotely. A high-quality variable speed mixer allows agitation to be adjusted precisely. A peristaltic pump powered by a variable speed high quality DC motor supplies slurry to the slurry divider block which evenly distributes abrasive to four slurry hole locations on the top plate. The divider block swings out of the way for removing the top plate and access to the parts. A drip pan is included. On plate lifter equipped machines, the divider block is rigidly mounted to the plate lifter arm. The pumping system and tank assembly can be purchased separately.



Water Sprayer:

Convenient water spray gun for part and machine wash down. The high-quality spray gun has precise spray control, and is made of Teflon®, which is compatible with de-ionized water. The flow rate is limited by a flow regulator that is installed in the plumbing system.

Note: The water sprayer system is included with the Abrasive Distribution System option.



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Special Lapping Plates:

Lapping plates can be provided in a variety of materials and configurations to meet your processing requirements. Popular variations include radial serrations to reduce hydroplaning, diamond pellets and ductile Martensite iron fine-grain lapping plates for scratch-free lapping of parts using fine 3 – 9 micron particle size slurry.

Serration Option on Cast Iron Plates:

Standard cross-hatch serrations help reduce hydroplaning when running larger parts.

Stainless Steel Plate Option for Polishing or Fixed Abrasive Lapping:

Top and bottom stainless steel polishing plates are recommended for processes such as polishing or fixed abrasive lapping, when fluids are used that are not compatible with cast iron. Available in standard or wide track width.

Aluminum Top Polishing Plate:

Light weight design in aluminum, as low as 6 pounds [2.75Kg] for a 66T model, drastically reduces the down force on fragile parts for precision polishing.

Stainless Steel Gears for Polishing or Fixed Abrasive Lapping:

Stainless steel center and ring gears are recommended for processes such as polishing or fixed abrasive lapping, when fluids are used that are not compatible with cast iron.

Flatness Gauge:

The lap plate flatness measuring gauge is available with a digital indicator, protective case and granite flat. The flatness gauge allows the operator to monitor and maintain optimum plate flatness. This option is recommended with the first machine purchase.

Top Plate Drive:

This system is useful when lapping very thin or fragile material by reducing carrier drag and carrier damage. The stationary dogging arm is replaced with a drive bar linked to a special dust cap with drive lugs. The top plate is specially grooved and drilled to distribute the slurry.

Note: Top Plate Drive is not compatible with the Digital Sizing Gauge option or the dual motor machine configuration.



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Top Plate Lifter:

The top plate is held in a bracket and lifted with a pneumatic cylinder. Two hand control push-buttons keep the operator's hands clear of the plate and mechanism during operation. A safety check valve prevents operation in the event of loss of air pressure. The plate lifter reduces operator fatigue, especially for short cycle processes.

Note: The plate lifter is **standard** on the 85T model because of the heavier top plate.



Bottom Plate Removal Tool:

This tool provides a safe and easy method for removal, installation and alignment of the bottom plate assembly. One bottom plate removal tool is included as standard equipment with all new machine purchases.



Conditioning Gears:

Bronze dressing gears are used to remove irregularities on the surface of the lapping plates such as grinding marks, scratches and rust. Consult factory for other materials.



Brush Carriers for Polishing Pads:

Brush carriers with scrubbing bristles are used with flush water to clean and restore glazed polishing pads. Brush carriers are commonly used in sets of 5.



Carriers (Work Holders):

Carriers are available in spring steel, stainless steel, Lamitex, PVC, Lexan®, phenolic, and vinyl.

A material thickness range from 0.002" [.05mm] to 1" [25mm] is matched to the part thickness to properly drive the parts between the plates. Work holes are laser cut, punched, milled, or EDM-cut as needed to any size and shape for any part.

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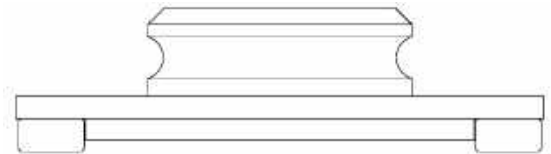
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Diamond Conditioning Carriers for Polishing Pads (Dual-Motor configuration only):

Each conditioning carrier 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.

Diamond Dressing Tool (for single motor configuration):

This simple hand tool is used for initial dressing of polyurethane polishing pads, as well as changing the shape of the pad. The diamond particles are electroplated on a stainless steel ring.



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.

Revised Aug. 2019