GIGA-0900 Vibratory Polisher

INSTRUCTION MANUAL

3601 E. 34th St. Tucson, AZ 85713 USA Tel. +1 520-882-6598 Fax +1 520-882-6599 email: pace@metallographic.com Web: http://www.metallographic.com

Equipment Type:	9-inch diameter GIGA-0900 variable frequency and voltage Vibratory Polisher
Model:	***GIGA-0900***
Electrical Requirements:	110 Volts (single-phase)
Frequency:	50/60 Hz
Frequency: Voltage: Timer:	0-240 Hz 0-200 V 9999 minutes
Manual Revision Date:	June 22, 2013

Please read this instruction manual carefully and follow all installation, operating and safety guidelines.

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WARRANTY

Terms and Conditions applying to all PACE Technologies Products

1. LIMITED WARRANTY AND DISCLAIMER:
PACE Technologies Products are warranted for one year from the purchase date to be free from defects in material and workmanship under correct use, normal operating conditions, and proper application. PACE Technologies obligation under this warranty shall be limited to the repair or exchange, at PACE Technologies option, of any PACE Technologies Product or part which proves to be defective as provided herein. PACE Technologies reserves the right to either inspect the product at Buyer's location or require it to be returned to the factory for inspection. Buyer is responsible for freight to and from factory on all warranty claims. The above warranty does not extend to goods damaged or subjected to accident, abuse or misuse after release from PACE Technologies warehouse, nor goods altered or repaired by anyone other than specifically authorized PACE Technologies representatives. PACE Technologies shall not in any way be responsible for the consequences of any alteration, modification or misuse unless previously approved in writing by an officer of PACE Technologies.

PACE TECHNOLOGIES MAKES NO EXPRESS WARRANTIES OTHER THAN THOSE WHICH ARE SPECIFICALLY DESCRIBED HEREIN. Any description of the goods sold hereunder, including any reference to Buyer's specifications and any description in catalogs, circulars and other written material published by PACE Technologies, is the sole purpose of identifying such goods and shall not create an express warranty that the goods shall conform to such description.

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3. DELIVERY:
Customer assumes and shall bear the risk of all loss or damage to the Products from every cause whatsoever, whether or not insured, and title to such Products shall pass to Customer upon PACE Technologies delivery of the Products to the common carrier of Pace Technologies choice, or the carrier specified in writing by Customer, for shipment to Customer. Any claims for breakage, loss, delay, or damage shall be made to the carrier by the Customer and Pace Technologies will render customer reasonable assistance in prosecuting such claims.

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4. ACCEPTANCE:
Customer shall inspect the Products promptly upon receipt of delivery. Unless customer objects in writing within thirty (30) business days thereafter, customer shall be deemed to have accepted the Products. All claims for damages, errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

5. PAYMENT:
Customer agrees to provide timely payment for the Products in accordance with the terms of payment set forth on the reverse side hereof or in any proposal submitted herewith. If any payment is not paid on or before its due date, Customer shall pay interest on such late payment from the due date until paid at the lesser of 12% per annum or the maximum rate allowed by law.

6. DEFAULT:
If Buyer is in default (including, but not limited to, the failure by Buyer to pay all amounts due and payable to Seller) under the work or purchase order or any other agreement between Buyer and Seller, Buyer's rights under the warranty shall be suspended during any period of such default and the original warranty period will not be extended beyond its original expiration date despite such suspension of warranty rights.

7. MISCELLANEOUS PROVISIONS:
This agreement has been made in and shall be governed by the laws of the State of Arizona. These terms and conditions and the description of the Products on the reverse side hereof or in any proposal submitted herewith constitute the entire agreement and understanding of the parties with respect to this sale and supersede all prior and contemporaneous agreements or understandings, inducements or representations, expressed or implied, written or oral, between the parties with respect hereto. Any term or provision of this Agreement may be amended, and any observance of any term of this Agreement may be waived, only by a writing signed by the party to be bounds. The waiver by a party of any breach shall not be deemed to constitute a waiver of any other breach. Should suit be brought on this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs of suit including costs and attorneys' fees incurred on appeal or in collection of any judgment.

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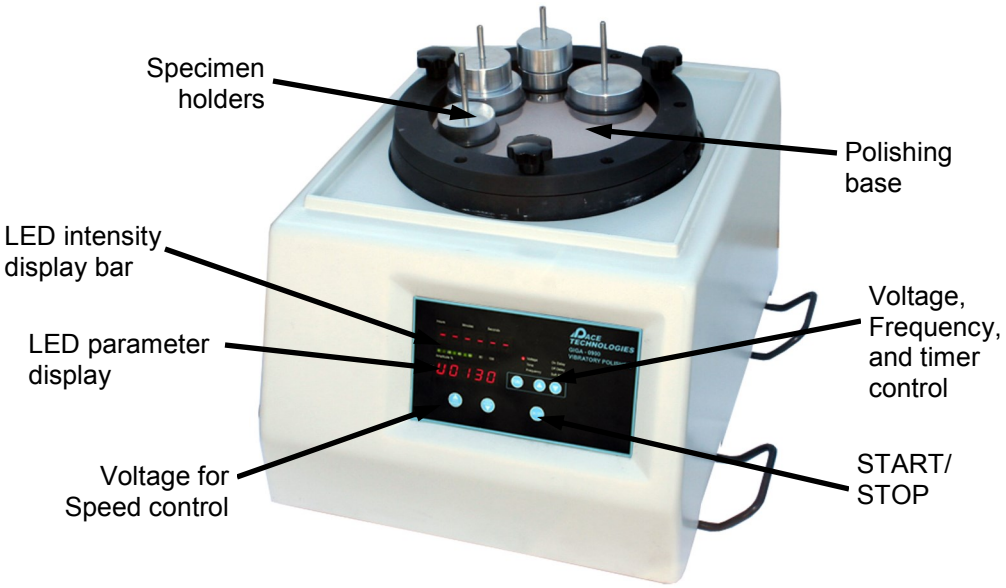
1.0 Product Description

1.1 General Description



The GIGA-0900 is a 9-inch vibratory polisher with independent frequency and voltage control. Frequency control adjustment also for easy adjustment for sample mass and voltage control for polishing speed.

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1.2 Technical Specifications

Electrical specifications:	220V single-phase (50/60 Hz)
Working wheel:	9-inch (235 mm)
Voltage control:	1-220V
Frequency control:	1-240 Hz
Timer:	0-9999 minutes (zero continuous)
Soft Start control:	0-25 seconds
Weight:	Approx. 180 lbs (82 kg)
Dimensions (WxHxD):	Approx. 21” x 20” x 17” (530 mm x 510 mm x 430 mm)
Working temperature:	32° - 100°F (0 - 40°C)
Shipping temperature:	32° - 100°F (0 - 40°C)
Storage temperature:	32° - 100°F (0 - 40°C)
Sample holder sizes	1, 1.25, 1.5 and 2-inch diameter

CE

EU Directives:	Machinery directive 2006/42/EC Low Voltage Directive 2006/95/EC Electromagnetic Compatibility directive 2004/108/EC
EU Harmonized Standards:	EN ISO 1200:2010 EN 61010-1:2010 EN 61326-1:2006

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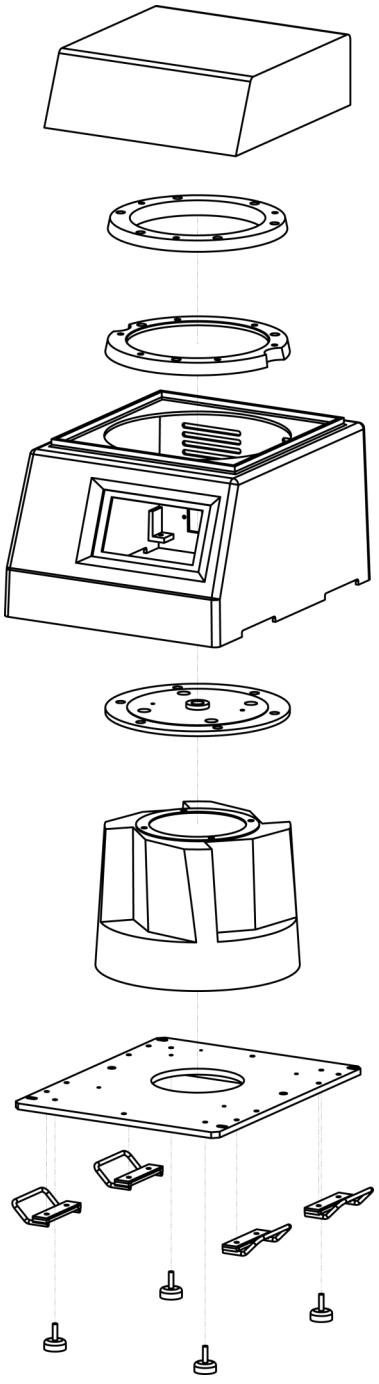
1.3 Mechanical Schematic



Note: Installation of the GIGA-0900 should be on a flat sturdy surface, with easy access to electrical connections.

1.4 BENEFITS

The ***GIGA-0900*** is equipped with a variable frequency and voltage controller.

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2.0 Unpacking, Shipping and Installation

2.1 Unpacking

Unit is delivered in a box. Unpack and check for completeness of parts.

Measures WxHxD: 25” x 25” x 23”

Weight: Varies, depending upon model (approximately 200 lbs).

2.2 Shipping

When moving box, lift from bottom.

! **Caution:** Heavy equipment. Take care to avoid bodily injury.

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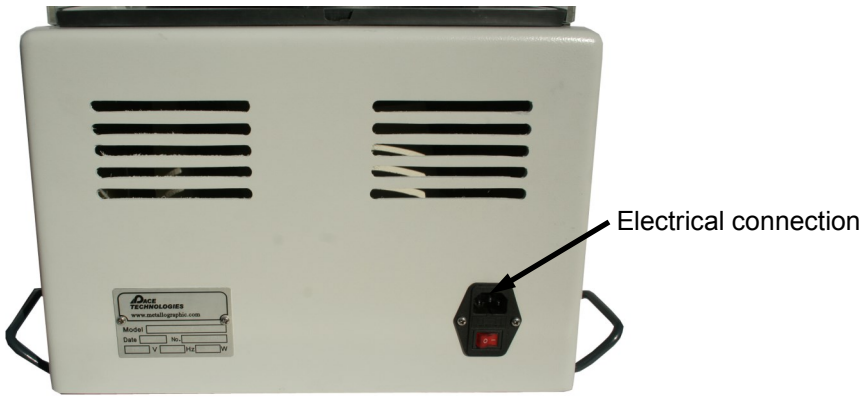
2.3 Installation

! Install unit carefully! Improper installation voids warranty.

The ***GIGA-0900*** should be placed on a flat stable surface.
Connect to electrical connections. Note input power can be either 110 or 220V

Backside connections



Electrical connection: Connect six-foot electrical power cable to source.

Note: Inspect the operating voltage on the name plate.

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3.0 Safety Guidelines

3.1 Warning Sign

! This sign points to special safety features on the machine.

3.2 Safety Precautions

! Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the ***GIGA-0900***.

! Proper operator training is required for operation of the ***GIGA-0900***. Any unauthorized mechanical and electrical change, as well as improper operation, voids all warranty claims. All service issues need to be reported to the manufacturer / supplier.

! Operate unit as specified in this manual.

! Disconnect power before opening unit.

! Do not leave any specimen or other parts on the working wheel.

3.3 Emergency Statement

Always follow proper operational guidelines and avoid contact with moving parts, lubricants and abrasives. Seek appropriate medical care for cutting injuries.

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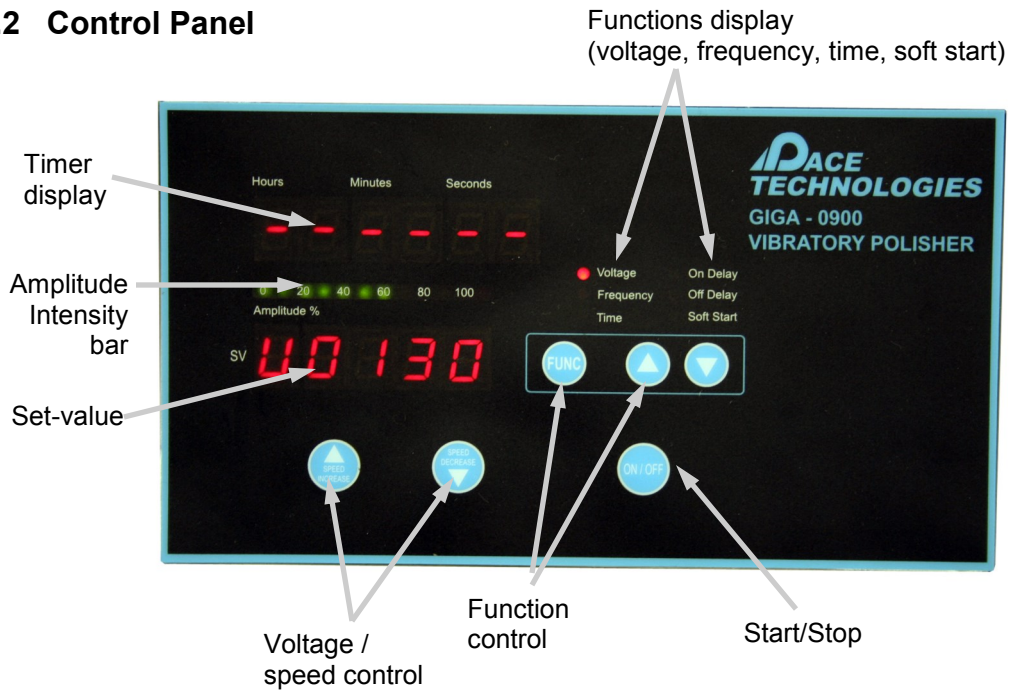
4.0 Start-up and Operation

4.1 General

The ***GIGA-0900*** is hands free vibrator polishing machine. It is a very low deformation polishing machine that is very useful for hard to polish as well as for final polishing most other materials.

4.2 Control Panel



Function control:	Values for FUNC (voltage, frequency and time) can be adjusted up or down
Voltage (speed):	The polishing speed is adjustable by increasing or decreasing the speed buttons
Start / stop buttons:	Start/stop the vibratory polishing action
Factory defaults:	The factory default setting are: Voltage: 145 volts Frequency 61.8 Hz Time: zero (continuous operation controlled by ON/OFF button)

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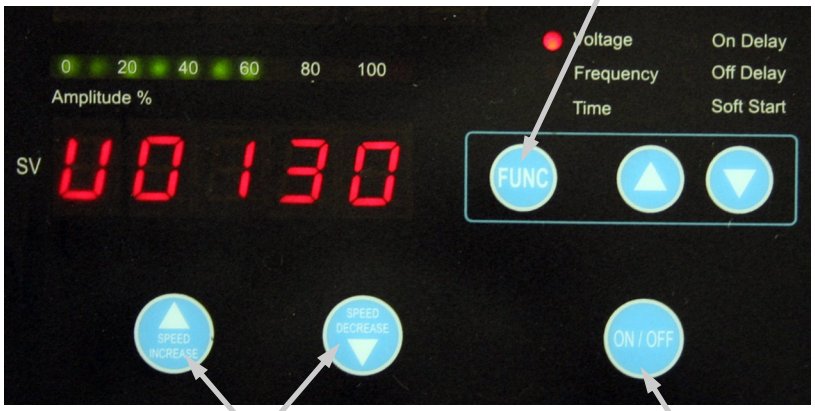
4.2.1 Controller Operation



IMPORTANT:

For 220V input voltage - DO NOT increase operating voltage on panel to over 220V.

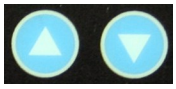
It is recommended that the default panel voltage setting for 220V input power be set to 150V.

1. For optimum operation, both the frequency and voltage (speed) need to be set.

2. To optimize the frequency, first start the polisher

   Press the FUNC button

for at least 2 seconds to enter programming mode. Use the FUNC key to highlight the light indicator by FREQUCNCY.

   Use UP and DOWN keys to adjust frequency 
The best setting is obtained when the sample Vibration or movement is maximized.
The factory default is approximately set to 61.8 Hz

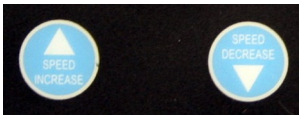
Frequency display

3. The second step is to optimize the speed or voltage after the frequency has been set.

   Press the FUNC button

to highlight VOLTAGE.

Speed / Voltage display

   Use the Speed Up and Speed Down buttons 

to adjust the speed to the desired value.

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4. To set or change the time press the FUNC button for at least two seconds to enter programming mode.

   Press the FUNC button

to highlight TIME.

Timer setting display (minutes)

   Use the Speed Up and Speed Down buttons to adjust the speed to the desired value (max 9999 minutes).

   Note: t0000 is the factory default and will run continuously until turned off

4.2.2 To Change Default or Saved Values

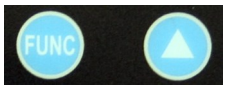
1. Press the FUNC button

for at least 2 seconds to enter programming mode. Use the FUNC key to highlight the light indicator by function to be changed.

   Use UP and DOWN keys to adjust parameter to the desired value.

   Adjust all of the parameters by repeating the above sequence.

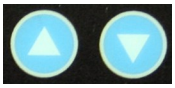
2. Press the FUNC and up button simultaneously until “def” appears in the LED screen.



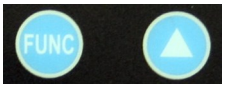
3. Use the FUNC

to display “st” in the LED window.

   Press the UP and DOWN buttons simultaneously until the change is accepted.



4. Press the FUNC and up button to exit the default changing mode.



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4.2.3 Changing the Polishing Cloth

To change the polishing with minimal liquid in bowl, simply remove thumb screws and lift of retaining ring. Remove cloth and replace.

If bowl has a significant amount of liquid, either soak up with paper towels or remove entire bowl by removing the three hex screws and lift the entire bowl out and pour out liquid.

Remove polishing pad by the procedure described above.

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4.3 Vibratory Polishing Basics

Vibratory polishing is a specialized polishing technique for minimizing specimen preparation damage. It is a slow polishing process which can take from minutes to several hours.

Vibratory polishing is a unique mechanical polishing technique which still uses the standard polishing abrasives. Vibratory polishing uses a spring and motor to create the vibration. Essentially, the sample is vibrating up and down; however, by angling the spring mechanism, the specimen will rotate around the polishing bowl. Vibratory polishing is a very low deformation polishing technique; however, polishing action is usually very slow and it is not uncommon to polish samples for hours with this technique. Figure 1 shows the effect of polishing a low carbon steel with standard polishing techniques compared to vibratory polishing. As can be seen in Figures 2 and 3 under DIC illumination, vibratory polishing is an effective polishing technique for removing surface deformation.

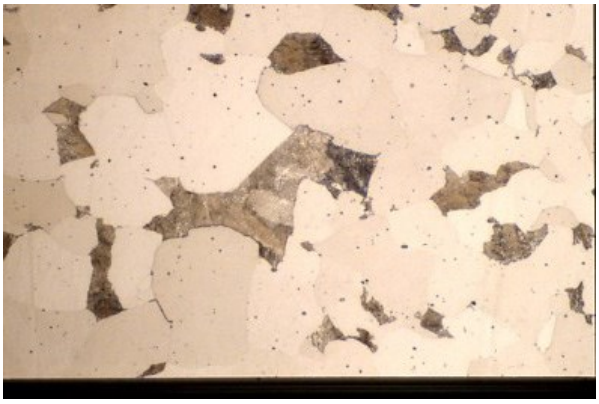

Figure 1 1018 Steel, standard polishing, 400X B.F., etchant 2% Nital, mag. 400X.

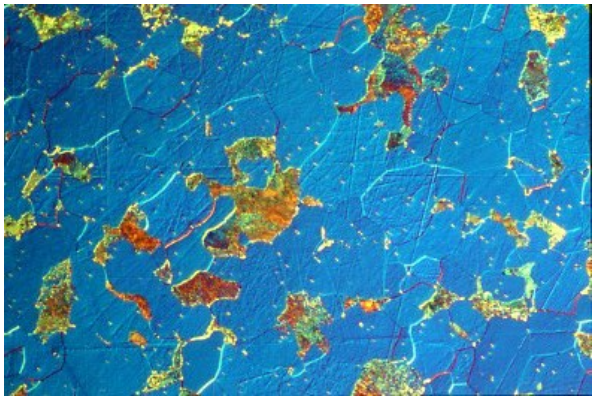

Figure 2 1018 Steel, standard polishing, 400X DIC., etchant 2% Nital,

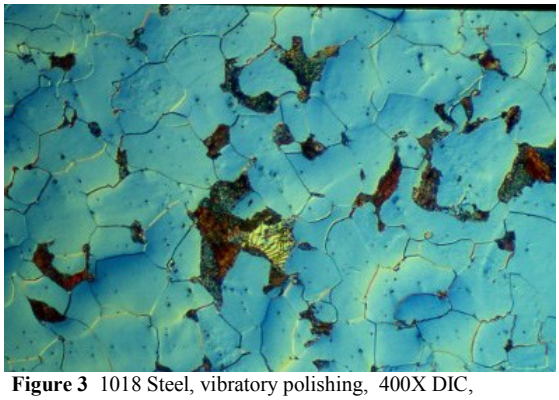

Figure 3 1018 Steel, vibratory polishing, 400X DIC, etchant 2% Nital, mag. 400X.

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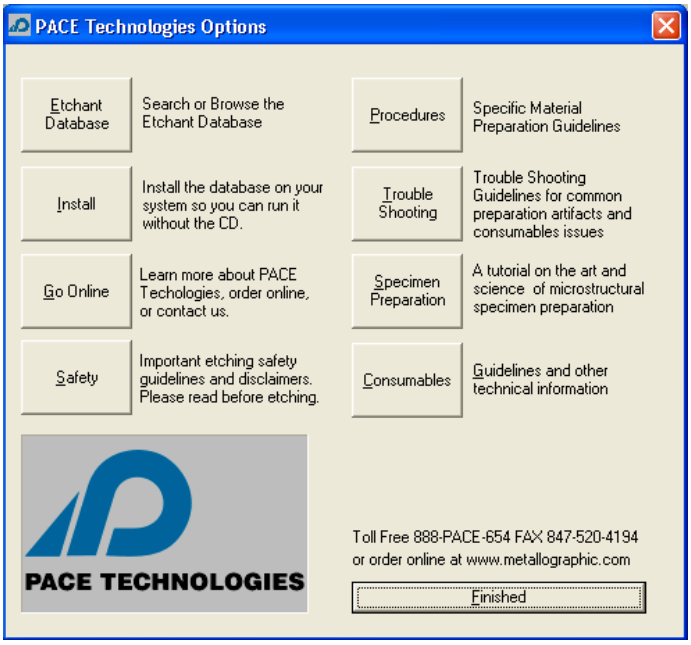
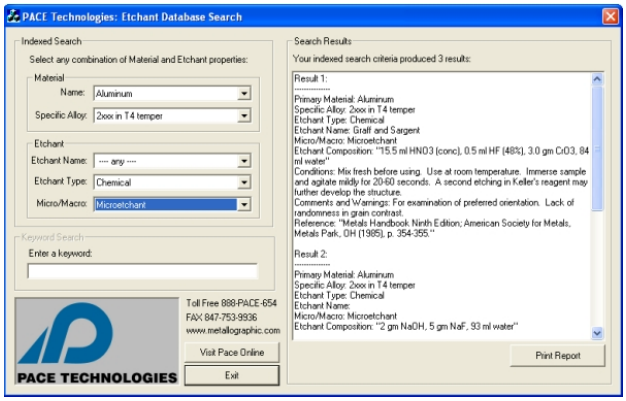
Educational Etchant and Procedure Database CD

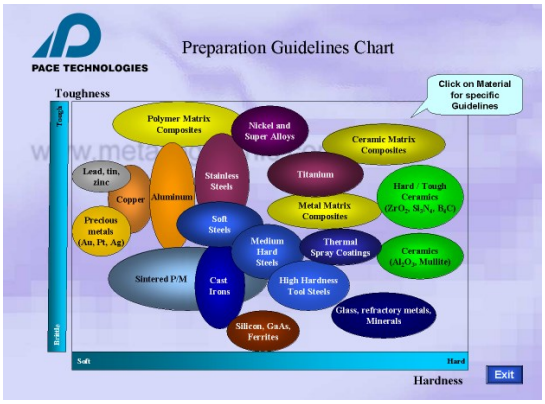
- **Etchant Database - *OVER 2200 ETCHANTS***
- **Search Fields**
  - Material or metal type
  - Specific alloys
  - Etchant name
  - Micro vs. Macro etchant
  - Keyword
- **MSDS for Etchant Chemicals**
- **Preparation Guidelines**
- **Preparation Basics**
- **Preparation Trouble Shooting**



Etchant Database



Preparation Guidelines



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5.0 Maintenance

5.1 Introduction

The ***GIGA-0900*** requires very minimal maintenance. However, to increase the life of the polisher, it is suggested that the unit be rinsed after use.

5.2 Cleaning outside cabinet

The cabinet should be cleaned occasionally with a moistened cloth. Do not use any chemicals or cleaning abrasives.

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6.0 Trouble Shooting

Problem	Cause	Solution
No power or function	a. Unit is disconnected from main electrical power supply b. Main power switch is off c. Blown fuse	a. Verify electrical source and connection. b. Turn on main power switch. c. Replace fuse
Samples not rotating	a. Frequency not set properly b. Voltage not set properly c. Table not bolted down securely	a. Reset frequency B. Increase voltage or speed C. Tighten hex bolts
Error Message Err 52	a. Voltage overload.	a. Turn off power switch at the back of the unit and wait until all the capacitors discharge and the panel light turn off. Turn unit back on and lower voltage (speed)

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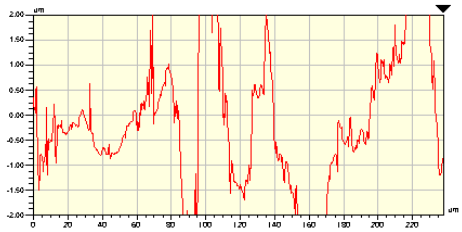
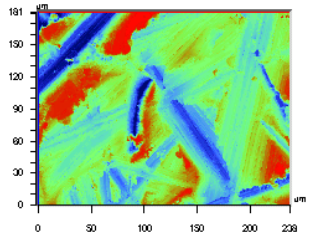
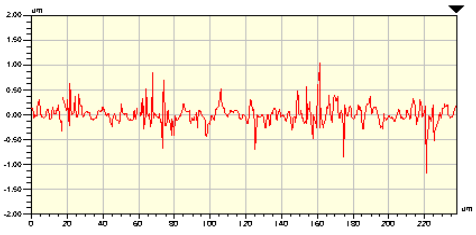
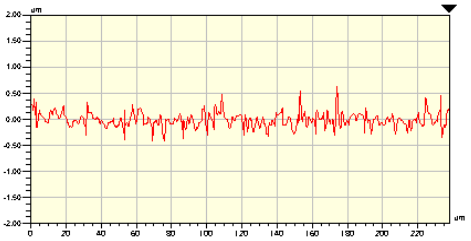
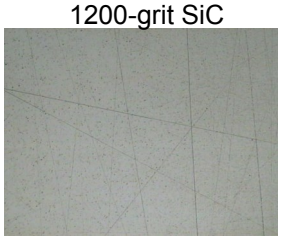
7.0 Metallographic Consumables

7.1 SiC Abrasive Paper, Surface Roughness

	2-dimensional line profile	3-D optical contour mapping
60-grit SiC		
240-grit SiC		
400-grit SiC		
600-grit SiC		
1200-grit SiC		

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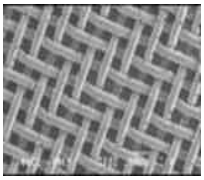
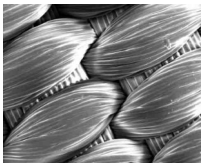
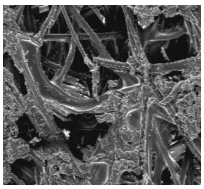
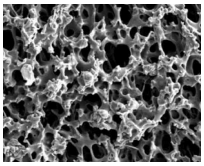
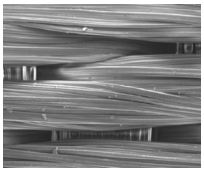
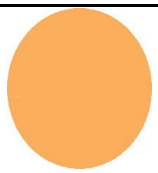
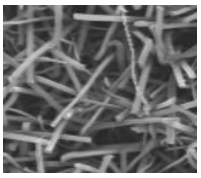
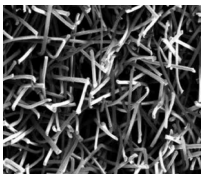
7.3 Polishing Pads

	**Metal Mesh Cloth.** This is a wire mesh material useful for coarse and intermediate lapping / polishing. The texture of this wire allows for the abrasive to become semi-fixed, thus offering the advantage of increased stock removal, while minimizing damage.	
	**POLYPAD™ Polishing Pad.** This cloth is a synthetic polyester polishing pad which has a similar action to a nylon pad, except that it is much more durable. It is used in the intermediate polishing steps.	
	**TEXPAN Polishing Pad.** This is the most commonly used polishing cloth material for the intermediate polishing steps. TEXPAN™ Polishing pad is a low-napped cloth.	
	**Black CHEM™ 2 Polishing Pad.** This porometric polymer pad has the consistency similar to a rubber type of pad. Black CHEM™ 2 pad has a low nap but behaves as an intermediate polishing pad with a performance between low-napped and high-napped pads.	
	**GOLDPAD Polishing Cloth.** This is a woven low-napped polishing pad used mostly for intermediate diamond polishing for ceramics and metals and polymers.	
	ATLANTIS Polishing Cloth. This polishing pad is a laminated polishing cloth having a resilient foam backing. The foam backing allows the polishing to conform better to the specimen surface.	
	**MICROPAD™ and MICROPAD™ 2 Polishing Cloth.** This is the most commonly used high-napped final polishing cloth for metals and polymers. Its high nap provides a very soft and gentle polishing action.	
	**NAPPAD™ Polishing Pad.** This is another high-napped final polishing pad useful for most metals and polymers. It has a higher nap than MICROPAD™, providing the most gentle polishing action of all the cloths.	

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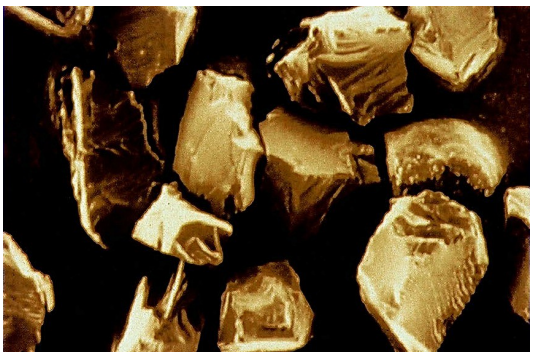
7.4 Polycrystalline Diamond Abrasives

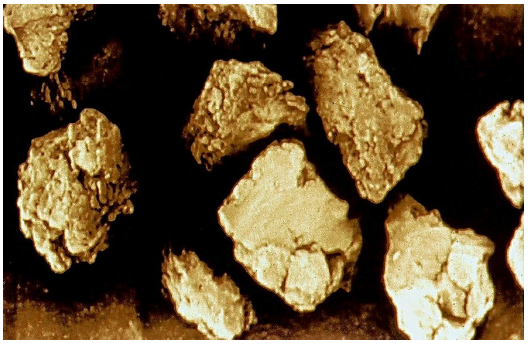
Polycrystalline diamond is a synthetic diamond which provides better surface finishes and higher removal rates than monocrystalline diamond. The following are the advantages of a polycrystalline diamond over a monocrystalline diamond:

- Higher removal rates (self-sharpening abrasive)
- Very uniform surface finish
- More uniform particle size distribution
- Harder / tougher particles
- Blocky - shaped particles
- Hexagonal (equally hard in all directions) microcrystallites
- Extremely rough surface (more cutting points)
- Surface area is 300% greater than with a monocrystalline diamond
- No abrasion-resistant directionality (abrasion independent of particle orientation)

Diamond Size (um)	Color code
0.10	**Charcoal**
0.25	**Gray**
0.50	**White**
1.0	**Blue**
3.0	**Green**
6.0	**Yellow**
9.0	**Red**
15	**Brown**
30	**Orange**
45	**Purple**



Monocrystalline blocky - diamond



Polycrystalline multi-faceted diamond

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7.5 Final Polishing Abrasives

Final polishing abrasives include fine diamond, alumina and colloidal silica. For successful microstructural preparation, the polishing abrasive / cloth combination must be appropriately matched to the specimen hardness, fracture toughness and corrosion properties of the specimen.

Colloidal Silica
Colloidal silica is a relatively soft abrasive with high chemical activity. It is an ideal chemical mechanical polishing (CMP) abrasive. The chemical activity of colloidal silica results from the electrochemical balance (zeta potential) required to keep very fine particles from aggregating. This chemical balance also produces a surface phenomenon which makes the specimen surface more chemically active. This produces a surface layer which can be mechanically removed by the colloidal silica particles themselves, or by the mechanical scrubbing of the surface with the polishing pad.

For ceramics, the combination of fine polycrystalline diamond and colloidal silica improves surface finishes and increases polishing rates.

Nanometer Alumina
Nanometer alumina is a polycrystalline colloidal alumina processed by a proprietary seeded gell process. Polycrystalline alumina offers two significant improvements over conventional alumina calcining processes:

1. Tighter, more controlled particle size distributions
2. Harder alpha alumina particles

The tighter, more controlled particle size distribution is a result of less particle aggregation which produces significantly less scratching in soft metals, such as aluminum, tin, lead, copper and soft steels.

Nanometer alumina is available in an acidic (pH 4) or basic (pH 10) range.

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8.0 Spare Parts

Part No.	Quantity	Description
VIB-0100	1	1-inch 304 SS holders (3/set)
VIB-0125	1	1.25-inch 304 SS holders (3/set)
VIB-0150	1	1.5-inch 304 SS holders (3/set)
VIB-0200	1	2.0-inch 304 SS holders (3/set)
VB-WT-0100	1	1-inch 304 SS holder weights (3/set)
VB-WT-0125	1	1.25-inch 304 SS holder weights (3/set)
VB-WT-0150	1	1.5-inch 304 SS holder weights (3/set)
VB-WT-0200	1	2-inch 304 SS holder weights (3/set)
PLATE-0900-1	1	Loading plate for 1-inch & 1.25-inch holders
PLATE-0900-2	1	Loading plate for 1.5-inch & 2-inch holders
GIG-004	1	Clear plastic cover for GIGA-0900
M3-FEET	4	Support feet
GIG-001	1	PC board controller
GIG-TR	1	12-inch top ring for polishing bowl
GIG-BOT	1	12-inch polishing bowl
GIG-002	1	Vibrating unit for GIGA-0900
GIG-003	1	FRP cover for GIGA-0900
IMG-0051	1	Bubble level

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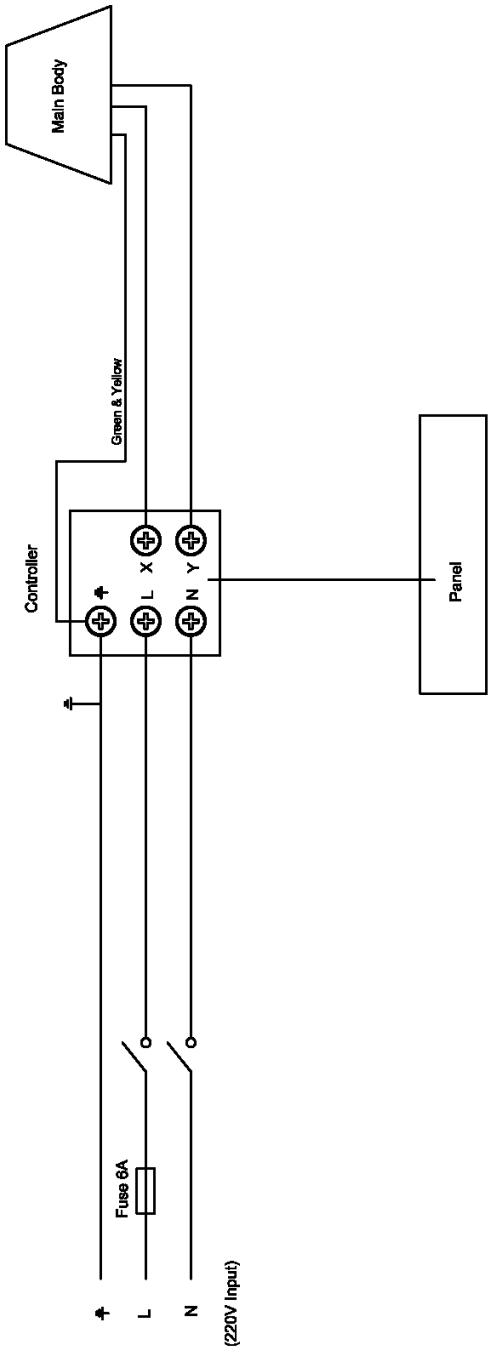
9.0 Electrical Schematic



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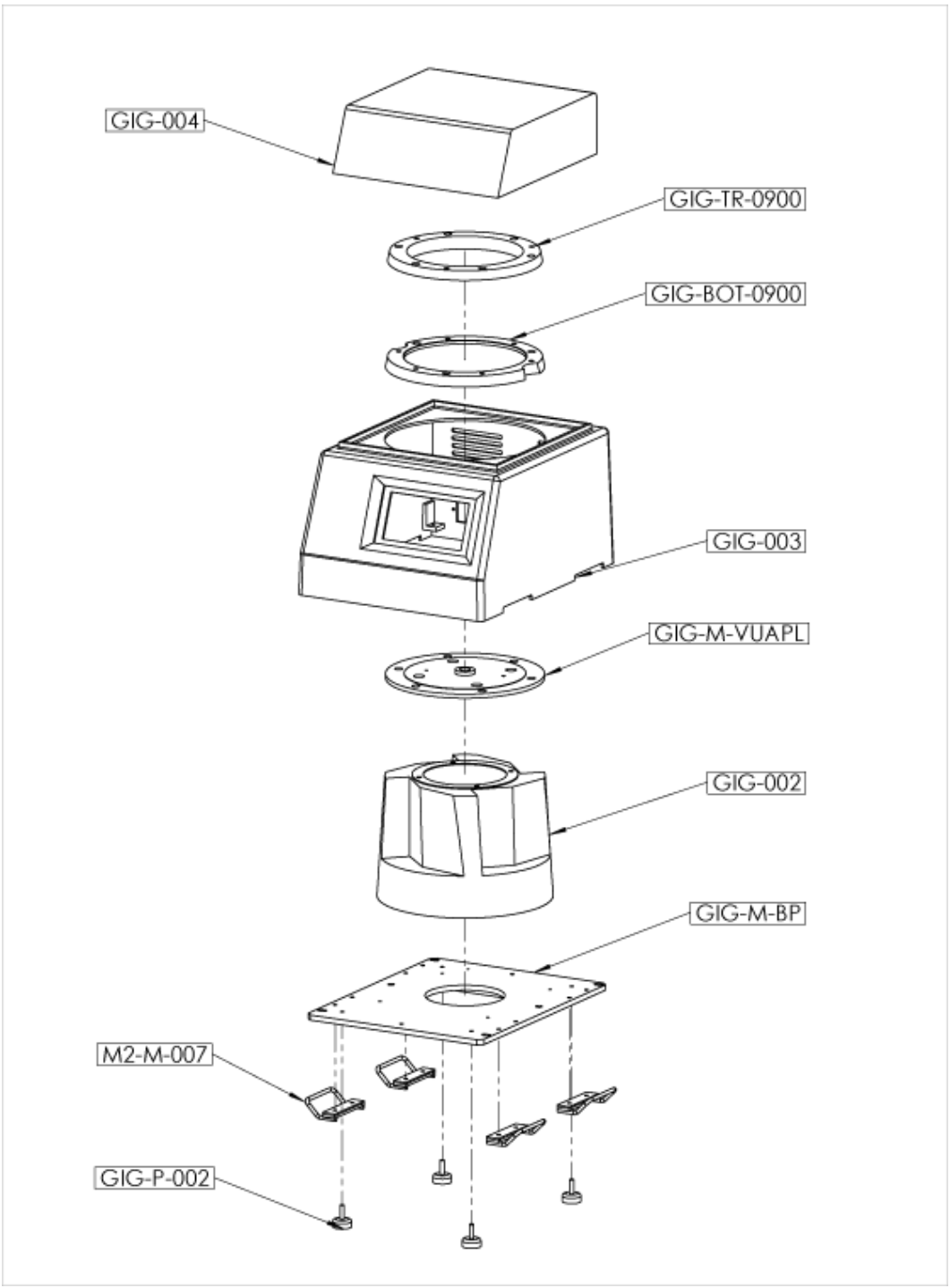

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ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	GIG-M-BP	Base Plate	1
2	GIG-002	GIGA-0900 vibrating unit	1
3	GIG-M-VUAPL	Vibrating unit adapter plate	1
4	GIG-003	GIGA 0900 FRP cover	1
5	GIG-BOT-0900	GIGA 0900 Bowl (bottom) - plastic	1
6	GIG-TR-0900	GIGA 0900 Bowl (top ring) - plastic	1
7	M2-M-007	Lifting handle	4
8	GIG-004	GIGA 0900 Top clear cover	1
9	GIG-FT	GIGA Vibrating Unit Support Feet	4