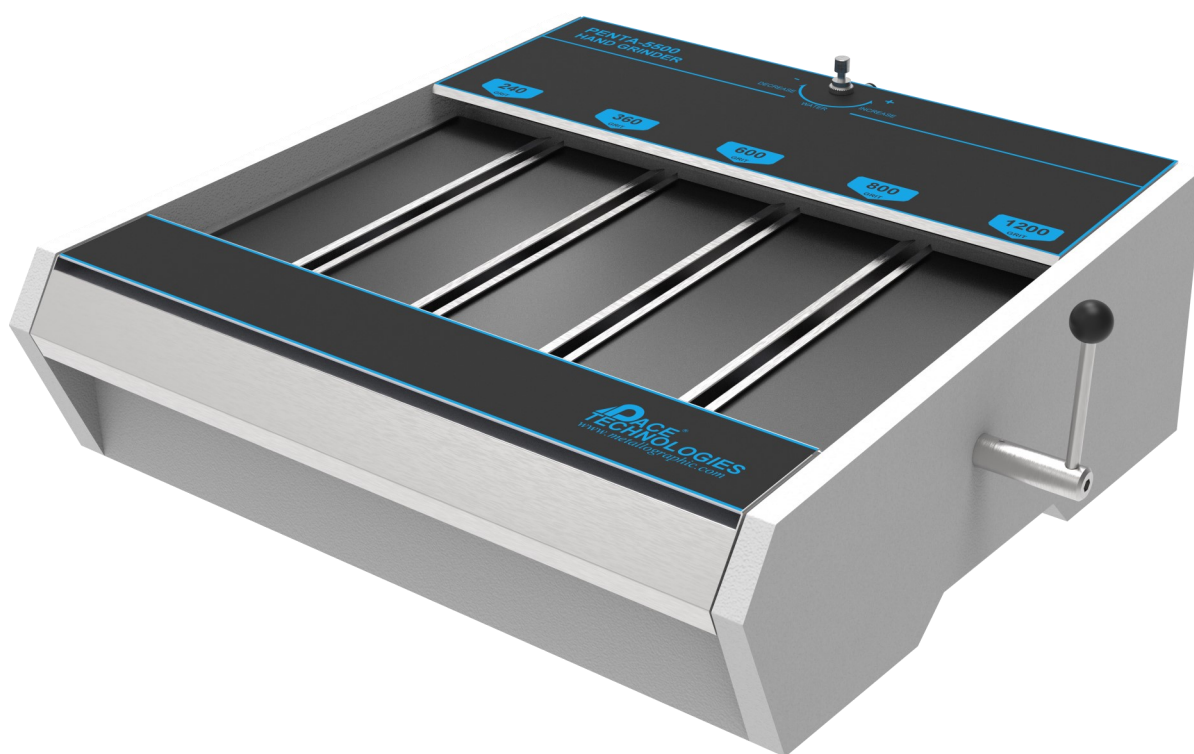




# **PENTA 5000A Hand Grinder**

## **INSTRUCTION MANUAL**

3601 E. 34th St. Tucson, AZ 85713 USA Tel. +1-520-882-6598 Fax +1-520-882-6599 email: [pace@metallographic.com](mailto:pace@metallographic.com) Web: <https://www.metallographic.com>



|                          |                           |
|--------------------------|---------------------------|
| Equipment Type:          | Five station hand grinder |
| Model:                   | <b>PENTA 5000A</b>        |
| Electrical Requirements: | N/A                       |
| Frequency:               | N/A                       |
| Motor Horsepower:        | N/A                       |
| Manual Revision Date:    | November 1, 2023          |

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 two years 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. Note: Corrosion is considered a maintenance issue and not a warranty issue.

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.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. THIS WARRANTY STATES PACE TECHNOLOGIES ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM FOR DAMAGES IN CONNECTIONS WITH PACE TECHNOLOGIES PRODUCTS. PACE TECHNOLOGIES WILL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, NOR FOR ANY SUM IN EXCESS OF THE PURCHASE PRICE.

##### 2. LIABILITY CAP:

PACE Technologies maximum aggregate liability for loss and damage arising under, resulting from or in connection with the supply or use of the Equipment and Consumables provided under this purchase, or from the performance or breach of any obligation (s) imposed hereunder, whether such liability arises from any one or more claims or actions for breach of contract, tort, (including negligence), delayed completion, warranty, indemnity, strict liability or otherwise, unless otherwise limited by the terms hereof, shall be limited to one hundred percent (100%) of the purchase price.

##### 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. All disputes arising under or relating to the purchase of the equipment shall be brought and resolved solely and exclusively in the State of Arizona, Pima County. 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 bound. 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., 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.

#### **8. RESTOCKING FEE:**

All Returns are subject to a restocking charge equal to 15% (fifteen percent) of the Invoice, unless the Goods are proved to be non-conformed by PACE Technologies.

## 1.0 Safety Guidelines

### 1.1 Warning Sign

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

### 1.2 Safety Precautions

**!** Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the **PENTA 5000A**.

**!** Proper operator training is required for operation of the **PENTA 5000A**. 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.

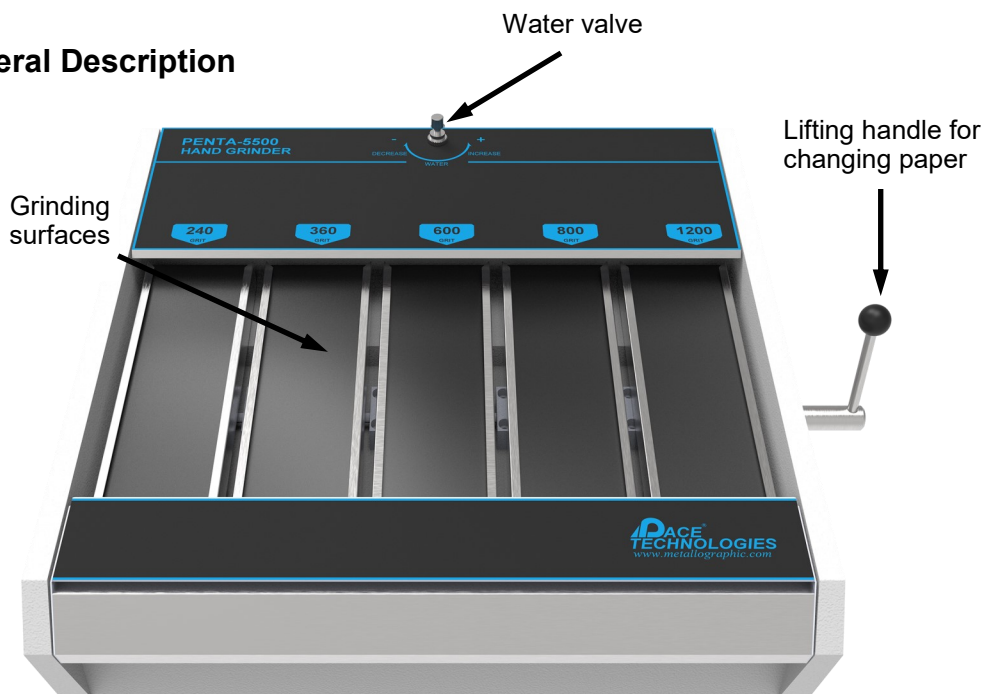
**!** Do not leave any specimen or other parts on the working wheel.

**!** When unit is not in use, turn off water.

**!** Securely hold the sample, preferably with two hands.

## 2.0 Product Description

### 2.1 General Description



The **PENTA 5000A** is a 5-station hand-grinder for manual wet grinding of metallographic specimens.

With 5 stations for coarse to fine grinding papers (240, 360, 400, 600, 800 and 1200 grit), specimens can be prepared to a near-polished surface. The surface quality after 1200 grit is typically acceptable for heat-treated and weld analysis specimens.

## 2.2 Technical Specifications

|                            |  |
|----------------------------|--|
| Electrical specifications: | N/A  |
| Roll sizes:                | 3-7/16" width x 60-feet length with 1-inch core        |
| Motor power:               | N/A  |
| Weight:                    | Approx. 62 lbs (28 kg)                                 |
| Dimensions (WxDXH):        | Approx. 21.5" x 24" x 9"<br>(550 mm x 610 mm x 230 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)                                 |
| Maximum diameter sample    | 2.5" (65 mm)   |
| Construction               | Aluminum casting and stainless steel                   |



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

### 3.0 Unpacking, Shipping and Installation

#### 3.1 Unpacking

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

Measures WxHxD: 23" x 11" x 25"

Weight: Varies, depending upon model  
(approximately 70 lbs).

#### 3.2 Shipping

When moving box, lift from bottom.



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

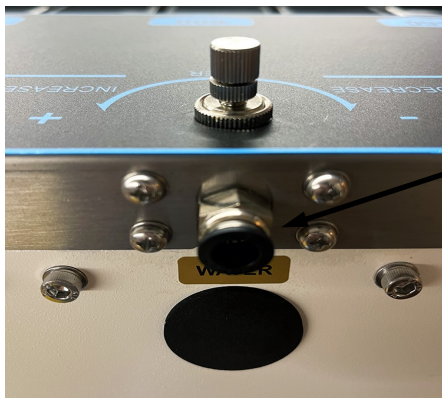
### 3.3 Installation

**!** Install unit carefully! Improper installation voids warranty.

The **PENTA 5000A** should be placed on a flat stable surface.  
Connect to water supply and drain.

After water and drain are connected, the system is ready for operation.

#### Backside connections



Water inlet  
connector

#### Water drain



Attach water and drain connections depending on drain location

Attach drain hose

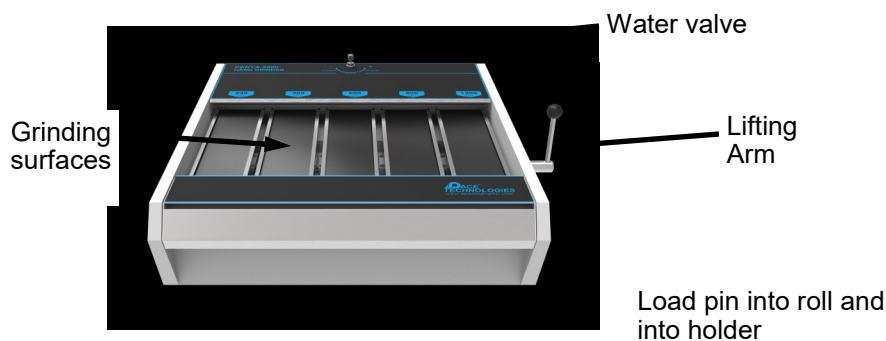
#### External water supply:

The water supply line requires a 1/4-inch compression fitting. It is recommended that the water supply be turned off when the unit is not in use. Inlet water should be clean and contamination-free to extend the life and performance of the systems.

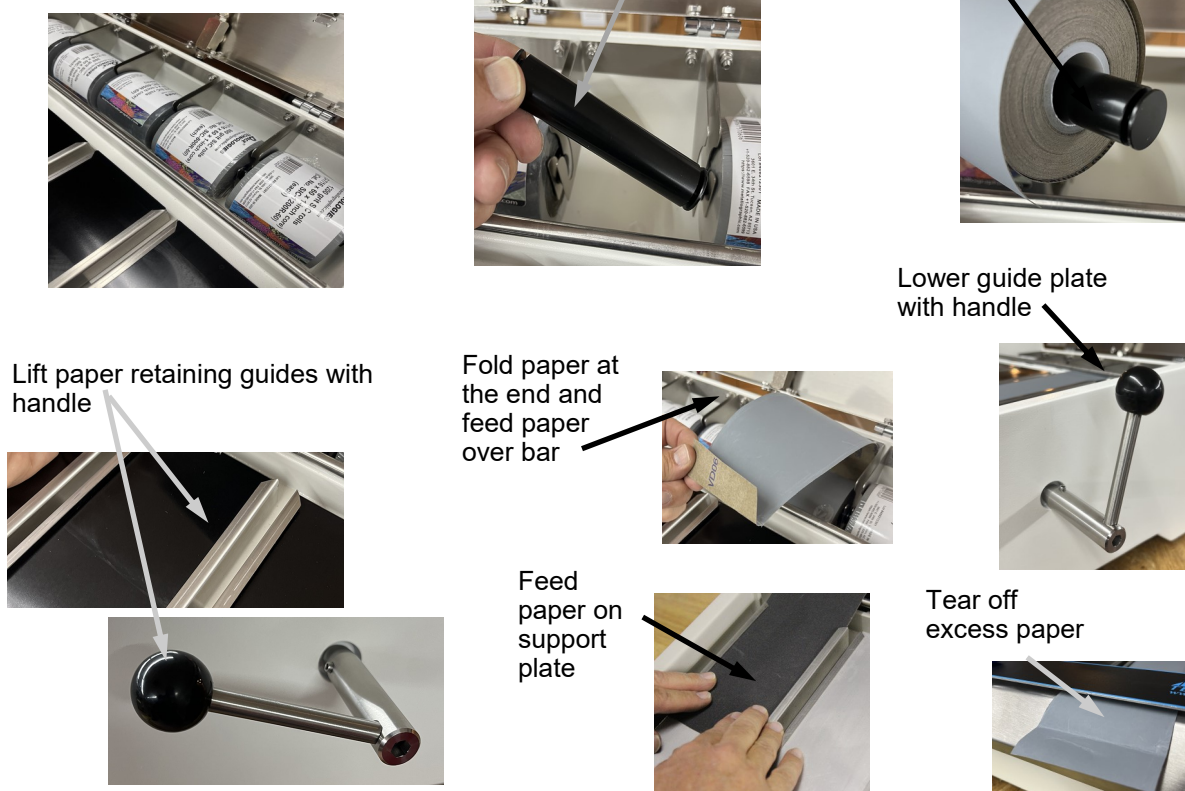
## 4.0 Start-up and Operation

### 4.1 General

The **PENTA 5000A** is a hand-grinding/polishing machine.



### 4.2 Loading Rolls



## 4.4 Metallographic Specimen Preparation Basics

A typical metallographic specimen preparation consists of the following basic steps:

| Preparation Stage         | Purpose   |
|---------------------------|---|
| Initial documentation:    | <ul style="list-style-type: none"><li>• To document the initial condition of the sample</li><li>• To map the sample surface</li><li>• To highlight the area of interest</li></ul>   |
| Sectioning / cutting:     | <ul style="list-style-type: none"><li>• To reduce the size of large samples</li><li>• To sample the specimens close to the area of interest.</li></ul>  |
| Rough or planar grinding: | <ul style="list-style-type: none"><li>• To obtain a planar surface</li><li>• To remove sectioning damage</li><li>• To approach the area of interest</li></ul>   |
| Rough polishing:          | <ul style="list-style-type: none"><li>• Ideally to remove all the subsurface damage and microstructural damage produced during cutting and rough grinding (Superficial scratches may still be present after this step).</li></ul>                   |
| Final polishing:          | <ul style="list-style-type: none"><li>• Generally, more for cosmetic purposes than for removing microstructural damage. In most cases, this stage should be minimized to avoid overpolishing and distorting the microstructural features.</li></ul> |
| Etching:                  | <ul style="list-style-type: none"><li>• To enhance microstructural features such as grain boundaries, grain size, phase differences, etc.</li></ul>   |
| Examination:              | <ul style="list-style-type: none"><li>• A variety of examination techniques are used in metallography, including: optical microscopy, electron microscopy and hardness testing.</li></ul>   |

**Educational Etchant Database online at:**<https://database.metallographic.com/pace-etchant.php>**Etchant Database**

- Over 2200 etchants
- Search fields
  - 1) Material or metal type
  - 2) Specific alloys
  - 3) Etchant name
  - 4) Micro vs Macro etchant
  - 5) Keyword
- MSDS for etchant chemicals

**- Material**

Name: Aluminum

Specific Alloy: 2xxx

**- Etchant**

Etchant Name: any

Etchant Type: Chemical

Micro/Macro: Micro

**- Keyword Search**

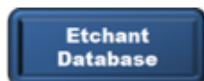
Enter a keyword: at least type 3 char

**- Browse Product: 20 results.**

Result 1

**Primary Material:** Aluminum  
**Specific Alloy:** 2xxx  
**Micro/Macro:** Micro  
**Etchant Type:** Chemical  
**Etchant Name:** Graff and Sargent  
**Etchant Composition:**  
84 ml Water 15.5 ml HNO3 0.5 ml HF 3 g CrO3  
**Condition:**  
Immerse sample 20-60 seconds with mild agitation.  
**Comments and Warning:**  
For 2xxx, 3xxx, 6xxx and 7xxx wrought aluminum alloys.  
**Reference:**  
G. Vander Voort, Metallography Principles and Practice; McGraw-Hill, New York (1984), p. 611.

PRINT REPORT



## 5.0 Maintenance

### 5.1 Introduction

The **PENTA 5000A** 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.

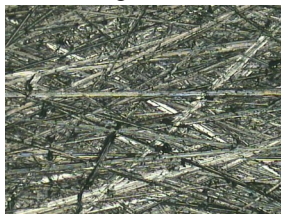
## 6.0 Troubleshooting

| Problem         | Cause                       | Solution                                 |
|-----------------|-----------------------------|--|
| No water supply | a. Water valve closed       | a. Open valve                            |
|                 | b. Water tube is kinked     | b. Straighten out water tube             |
| Water leaking   | a. Drain hose plugged       | a. Clean drain hose                      |
|                 | b. Unit not tilted properly | b. Adjust front feet for proper draining |

## 7.0 Metallographic Consumables

### 7.1 SiC Abrasive Paper, Surface Roughness

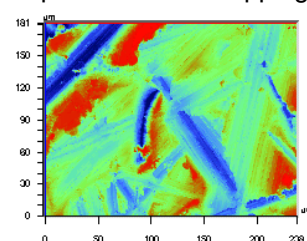
60-grit SiC



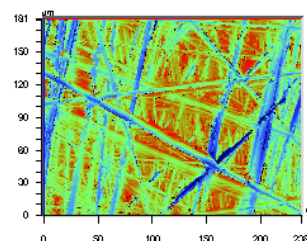
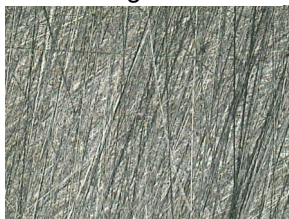
2-dimensional line profile



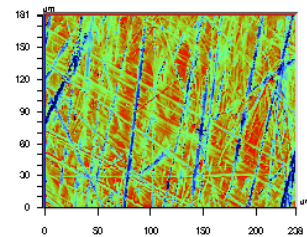
3-D optical contour mapping



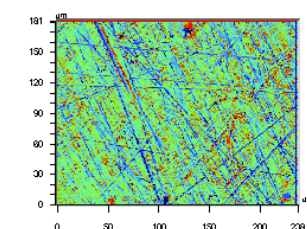
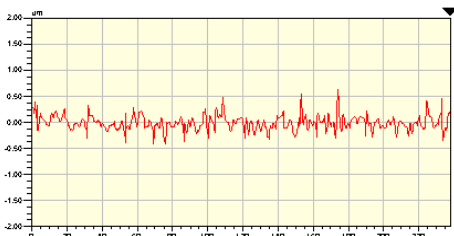
240-grit SiC



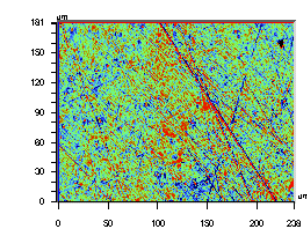
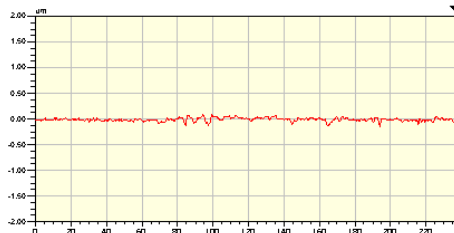
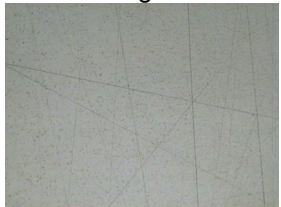
400-grit SiC



600-grit SiC



1200-grit SiC



### 8.0 List of Spare Parts

| Part No.     | Quantity | Description                                       |
|--------------|----------|---|
| SIC-240R-60  | Each     | 240-grit SiC (3-7/16" wide, 60' length, 1" core)  |
| SIC-320R-60  | Each     | 320-grit SiC (3-7/16" wide, 60' length, 1" core)  |
| SIC-360R-60  | Each     | 360-grit SiC (3-7/16" wide, 60' length, 1" core)  |
| SIC-400R-60  | Each     | 400-grit SiC (3-7/16" wide, 60' length, 1" core)  |
| SIC-600R-60  | Each     | 600-grit SiC (3-7/16" wide, 60' length, 1" core)  |
| SIC-800R-60  | Each     | 800-grit SiC (3-7/16" wide, 60' length, 1" core)  |
| SIC-1200R-60 | Each     | 1200-grit SiC (3-7/16" wide, 60' length, 1" core) |