

# Phenom User Manual



**PHENOM™**  
ProX / Pro / Pure



PHENOMWORLD

**Tip!**

*Clicking on a chapter title in the content pages, will bring you directly to the selected chapter.*

# CONTENTS

<b>Things you must know</b>	<b>6</b>
<b>Introduction</b>	<b>8</b>
1.1 Unpacking the Phenom components	8
1.2 Packaging contents	9
<b>System overview</b>	<b>10</b>
<b>Controls</b>	10
<b>Connections</b>	12
<b>Screens</b>	13
<b>Installing the Phenom</b>	<b>18</b>
<b>Preparation</b>	18
3.1 Requirements for positioning the Phenom components	18
3.2 Assembling the flat panel monitor	18
<b>Connections</b>	19
3.3 Connecting the Phenom	19
3.4 Activating the system	21
3.4.1 Switching on the Phenom	21
3.4.2 Switching 'on' the monitor	21
3.4.3 Calibrating the flat panel monitor (optional)	21
<b>Using the Phenom</b>	<b>22</b>
<b>Preparation</b>	22
4.1 Waking-up the Phenom	22
4.2 Preparing samples	22
4.2.1 Samples that cannot be prepared in colloidal graphite or silver paint	23
4.2.2 Particle samples	23
4.2.3 Polymers	24
4.2.4 Metals	24
4.2.5 Biological samples	24
4.2.6 Heavy metal coating	25
4.3 Loading samples	25
4.3.1 Activating the sample holder	26
<b>Operation</b>	26
4.4 Operating	27
4.5 Optical imaging	27
4.5.1 Adjusting focus	27
4.5.2 Adjusting brightness and contrast	27
4.5.3 Adjusting magnification ( <i>ProX / Pro</i> )	28
4.5.4 Moving the sample	28
4.5.5 Sample overview	28
4.5.6 Storing images	28
4.6 Electron imaging	30
4.6.1 Adjusting focus	30
4.6.2 Adjusting brightness and contrast	31
4.6.3 Magnifying the image	31
4.6.4 Rotating the image	31
4.6.5 Moving the sample	32
4.6.6 Storing images	32
4.7 Viewing stored images	33
4.7.1 Comparing images ( <i>ProX / Pro</i> )	34
4.7.2 Deleting stored images	34
4.8 Measuring on stored images ( <i>ProX / Pro</i> )	35

## Things you must know

### 1. Introduction

### 2. System overview

### 3. Installing the Phenom

### 4. Using the Phenom

4.9	Unloading the sample	35
4.10	Switching off the Phenom electron source	36
4.10.1	Switching off the Phenom	36
4.10.2	Switching off the flat panel monitor	37
4.10.3	Switching off the system completely	37
<b>5.</b>	<b>Phenom settings</b>	<b>37</b>
5.1	System settings	37
5.1.1	Mode	37
5.1.2	Intensity	38
5.1.3	Backscatter detector mode	38
5.2	Acquired image settings	38
5.2.1	Quality	38
5.2.2	Resolution	38
5.3	Live viewing settings	39
5.3.1	Resolution	39
5.3.2	Quality	39
5.3	Date and time	39
5.3.1	Adjusting the date	39
5.3.2	Adjusting the time	39
5.4	Databar / image type / UI mode	40
5.4.1	Databar	40
5.4.2	Image type	40
5.4.3	UI mode	40
5.5	Label	40
5.6	System	41
5.6.1	Standby	41
5.6.2	Hibernate	41
5.7	Advanced settings	41
5.7.1	SW (software) version	41
5.7.2	Shutdown	42
5.7.3	StoreSys(tem)Info	42
5.7.4	Routine pages	42
5.7.4.1	Source Tilt	42
5.7.4.2	Stigmat	43
5.7.4.3	Network	43
5.7.4.4	Service	45
<b>6.</b>	<b>Maintenance</b>	<b>46</b>
<b>7.</b>	<b>Troubleshooting</b>	<b>47</b>
7.1	Error recovery and reporting	51
7.1.1	Rotary knob state indicator	51
7.1.2	Error messages and warnings	51
7.2	Power down	53
7.3	Rebooting the Phenom software	53
<b>8.</b>	<b>Preparing the Phenom for transport</b>	<b>54</b>
8.1	Return procedure	54
8.2	Prepare for packing	54
8.3	Disconnecting and packing	55
<b>9.</b>	<b>Technical specifications</b>	<b>56</b>



Phenom-World and the Phenom-World logo are registered trademarks of Phenom-World Bv. Phenom™ is a trademark of Phenom-World BV.

## **Trademark Acknowledgments**

Other product and company names mentioned herein may be the trademarks of their respective owners.

This user guide was produced using XPress® document publishing software, a registered trademark of Quark Technology and the Arial™ family of typefaces. Arial is a trademark of The Monotype Corporation registered in the U.S. Patent & Trademark Office and may be registered in other jurisdictions.

## **Production Acknowledgments**

Rob Rood (ROOD Text productions)

## **Technical Publication**

Copyright © 2015 by Phenom-World BV

The information and materials contained herein are confidential and proprietary to Phenom-World BV. They are provided for your organization's internal use on a need to know basis. They cannot be duplicated or disseminated for any third party without the express consent of Phenom-World BV.

The information contained in this document has been composed with great care for quality, reliability and accuracy and may be changed without notice.

## **Disclaimer**

Phenom-World BV will not accept liability for any consequence of use of this document.

# Things you must know



**CAUTION!**

*Please read all of these instructions before you operate the Phenom.  
Save these instructions for future reference.*

## General Safety

## Important information

## To avoid Fire or Personal Injury

- Review the following safety precautions to avoid injury and prevent damage to the Phenom microscope.
- All safety and operating instructions must be read before the microscope is operated, this is to avoid personal injury and prevent damage to the Phenom.
- To avoid potential hazards, use this product only as specified.
- The user must not attempt to service the appliance beyond those means described in the user's operating instructions.
- All other servicing is to be performed by qualified service personnel.
- **Replace Fuse with identical type.**  
If a fuse is replaced, use the type as mentioned on the type plate.
- **Ground the Microscope.**  
The microscope is grounded through the grounding conductor of the power cord. To avoid electrical shock the grounding conductor must be connected to earth ground. Before using the microscope verify that the microscope is properly grounded.
- **Use correct power cord.**  
Only use the power cord specified for this product and approved for the country of use.
- **Power Disconnect.**  
The power switch on the mains supply disconnects the microscope from the mains. Do not block the power switch; it must be accessible to the user at all times.
- **Do not operate without covers.**  
The microscope must never be operated with the cover removed.
- **Do not operate the microscope with suspected failures or damaged covers.**  
If you suspect damage or failure of the product, do not disassemble this product. Have it serviced by qualified and authorized service personnel. Servicing is required when the microscope is damaged in any way, such as when the power supply cord or the plug is damaged, liquid has been spilled in the microscope, it does not operate normally or has been dropped.
- **Provide proper ventilation.**  
Adequate airflow must be allowed around the power supply and Phenom microscope. Do not block the ventilation openings. Respect at least 20 cm of free space to the sides, the front, the back and the top of the Phenom microscope. Do not put materials in the air gap between the Phenom microscope and the table.
- **Do not operate in wet and damp conditions.**  
The required room temperature and maximum humidity as specified in the system's technical specifications (see chapter 9, 'Technical specifications') must be respected at all times.
- **Do not operate in an explosive atmosphere.**  
Make sure that there is proper room ventilation such that the environmental air cannot contain combustible gasses.
- **Do not use compressed-gas canisters in the vicinity of the system.**  
Propellants of canisters are very often combustible.



### Equipment recycling

- To reduce the use of natural resources and to avoid the release of substances that could be harmful to the environment or human health we advise you to recycle this product.
- For information about recycling options please contact Phenom-World's Customer Support.

### Disposal of your old product

- Your product is designed and manufactured with high quality materials and components, which can be recycled and reused.
- When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.
- Please act according to your local rules and do not dispose of your old products with your normal household waste. The correct disposal of your old product will help prevent potential negative consequences for the environment and human health.



### Equipment classification

The Phenom should be used indoor in a controlled electromagnetic environment.

The Phenom electron microscope is CE compliant with the following directives:

- 73/023/EEC Low Voltage Directive
- 89/336/EEC Electromagnetic Compatibility Directive
- 96/29/EURATOM Ionizing Radiation Directive following article 3.2 e.

### Using the following standards:

EN61010-1 Safety measurements for electrical equipment for measurement, control and laboratory use.

EN61326-1 Electrical equipment for measurement, control and laboratory use – EMC requirements (industrial level) and that the X-ray emission is below 1  $\mu\text{Sv/h}$  at 10 cm distance from the surface

### Phenom microscopes are classified as:

- Safety class 1 (EN 61010-1)
  - Pollution class 2 (EN 61010-1)
  - Installation (Overvoltage) category 2 (EN 61010-1)
  - Plug connected
- 
- EMC ElectroMagnetic Compatibility
  - Licensing or registration for X-ray might be required according to local regulations. For most of Europe no licensing or registration is necessary (see 96 / 29 / Euratom directive, para. 3.2.e).

**Notes!**

# 1. Introduction

Congratulations on your purchase of the Phenom™ microscope. The Phenom™ is a high resolution desktop imaging tool that combines an optical camera for never-lost navigation and a high quality scanning electron microscope (SEM) for detailed imaging to bring a completely new approach to microscopy.

The Phenom's innovative user interface can be controlled by mouse or by optional touch screen which allows users to observe superb quality images with minimal operation training.

The Phenom can handle a wide range of samples with minimal preparation.

We are sure that if used properly, the Phenom will bring you years of enjoyment.

You will want to keep this user manual handy, as it is a convenient source of information about the Phenom.

## Preparation

## Unpacking

### 1.1 Unpacking the Phenom components

- Make sure the room where the Phenom components are to be placed is clean and dry and that room temperature is between 15 °C and 30°C (59 °F and 86°F). Room humidity should not exceed 80% RH.
- Avoid direct sunlight, vibrations and strong magnetic fields.
- Also refer to chapter 3.1 'Requirements for positioning the Phenom components'.

- 1 First inspect the packaging before opening it. If the packaging is damaged or if the locks are open, we recommend that you report this to Phenom-World's service Support:

- address: Dillenburgstraat 9E  
5652 AM Eindhoven  
The Netherlands

- e-mail: [service@phenom-world.com](mailto:service@phenom-world.com)

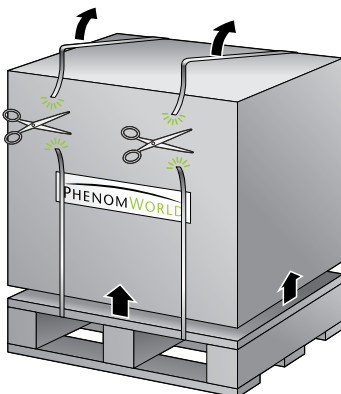
- phone: +31 (0)40 259 73 72

- fax: +31 (0)40 259 73 71

- opening hours: Monday - Friday, 09:00 - 17:00 (CET, GMT +1)

It is however very likely that, despite slight damage to the packaging, the Phenom components are still in good condition.

- 2 Remove the metal straps
- 3 Lift the complete cover upwards from the pallet.  
> *The wooden box contains the Phenom system.*
- 4 Use a number 5 Allen key to remove the six bolts from both sides of the wooden box.  
> *The space underneath the wooden box contains the Phenom unpacking instructions. Please verify these instructions first.*



## 1.2 Packaging contents

All Phenom items are packed in several boxes. Please unpack as mentioned in the unpacking instructions and verify if all items are present. If any of these items is missing or damaged, contact your dealer immediately.

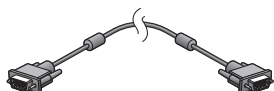
Save the packaging materials in case you need to transport the Phenom.



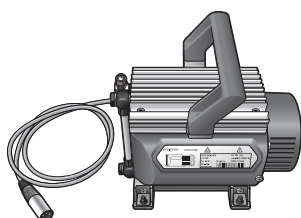
*Phenom microscope ProX / Pro / Pure*



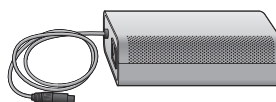
*- 19" flat panel monitor*



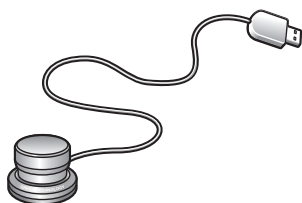
*Flat panel monitor  
VGA cable*



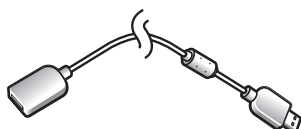
*Pre-vacuum pump*



*Power supply*



*Rotary knob*



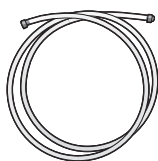
*Rotary knob  
extension cable*



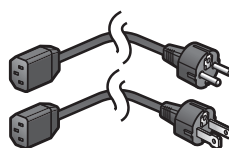
*Sample holder*



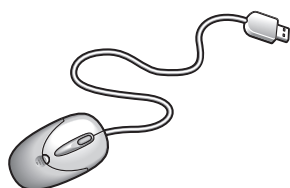
*USB Flash drive*



*Pre-vacuum pumpphose*



*- Power cable Europe 2 x  
- Power cable US 2 x*



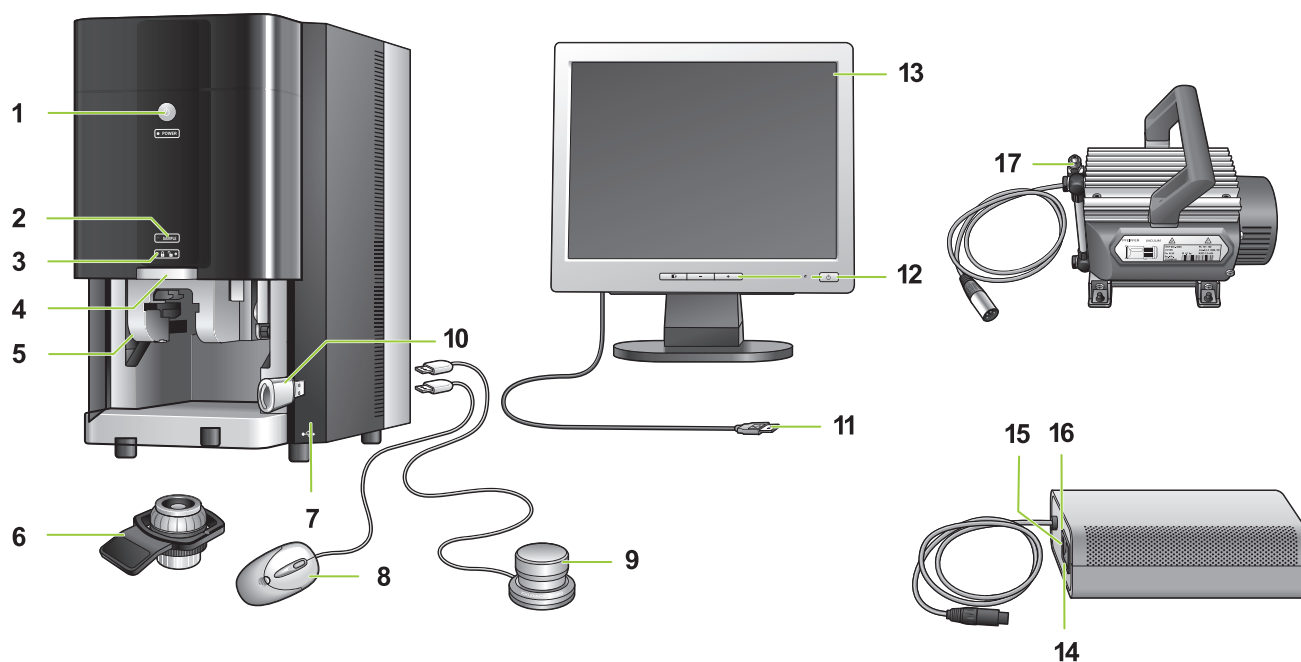
*Mouse*



*Phenom Starter Kit*



*User manual*

**Fig. 1****Phenom microscope**

- 1 **System control button**
  - Switches the Phenom from standby or hibernate mode to operation mode.
  - Switches the Phenom from operation mode to standby.
- POWER**
  - Blinks green when the Phenom power supply is switched on and the Phenom goes to operation mode.
  - Blinks green when the Phenom switches from standby or hibernate mode to operation mode.
  - Lights up orange in standby mode.
  - Blinks orange (1 second on, 3 seconds off) in hibernate mode.
  - Lights up green in operation mode.
- 2 **SAMPLE (sample indicator)**
  - Lights up green when a sample is loaded.
- 3 **Door lock indicator**
  - 🔒 - Lights up orange when the door is locked.
  - 🔓 - Lights up green when the door is unlocked.
- 4 **Door**
- 5 **Sample loading bay**
  - To insert the sample holder into the Phenom.
- 6 **Sample holder**
- 7 **USB ports**
  - To insert the supplied USB Flash drive.
  - To insert the mouse USB connector or the rotary knob USB connector.
- 8 **Mouse**
  - Operates the Phenom together with the and the rotary knob.
- 9 **Rotary knob**
  - Operates the Phenom together with the mouse.
- 10 **USB Flash drive**
  - To store images on.

**Mouse****Rotary knob****USB Flash drive**

**11 USB cable**

Connects the monitor to the Phenom (rear) USB port (*only for optional touch screen monitor*).

**Flat panel monitor**

**12 Monitor controls**

⏻ - switches the monitor on and off.

LED - lights up green when the monitor is switched on.



Displays monitor menu and selects menu items.

– and +

Navigate through and adjust monitor settings.

**13 Monitor**

**14 0 / I switch**

**Power supply**

**15 Connection for power cable**

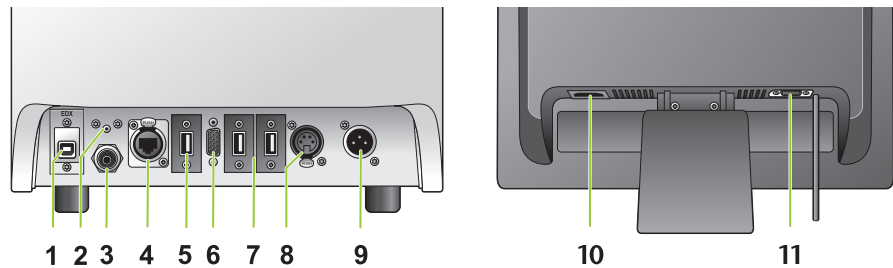
**16 Fuse holder**

Contains the fuses.

**17 Connection for pre-vacuum pumphose**

**Pre-vacuum pump**

## Connections



**Fig. 2** Rear view: microscope (left) and monitor (right)

### Phenom microscope

- 1 EDX / USB port**  
Connects the Phenom EDS (Energy Dispersive Spectroscopy) detector to the ProSuite EeeBox PC (*ProX*).
- 2 Reset button**  
Reboots the Phenom software.
- 3 Connection for pre-vacuum pumphose**  
Connects the Phenom to the pre-vacuum pump.
- 4 Ethernet connector**  
Connects the Phenom to the Local Area Network.  
**PUSH button**  
Opens the ethernet connector.
- 5 USB port**  
Connects the Phenom to the monitor USB port (*optional*).
- 6 VGA connector**  
Connects the Phenom to the monitor VGA connector.
- 7 USB ports**  
Connect the Phenom to the rotary knob and the mouse (*ProX / Pro*) and the ProSuite for *ProX*.
- 8 Power connector (out)**  
Connects the Phenom to the pre-vacuum pump.  
The Phenom supplies power to the pre-vacuum pump.  
**PUSH button**  
Opens the power connector.
- 9 Power connector (in)**  
Connects the Phenom to the power supply.

### Flat panel monitor

- 10 Power connector (in)**  
Connects the monitor to the mains outlet.
- 11 VGA connector**  
Connects the monitor to the Phenom VGA connector.



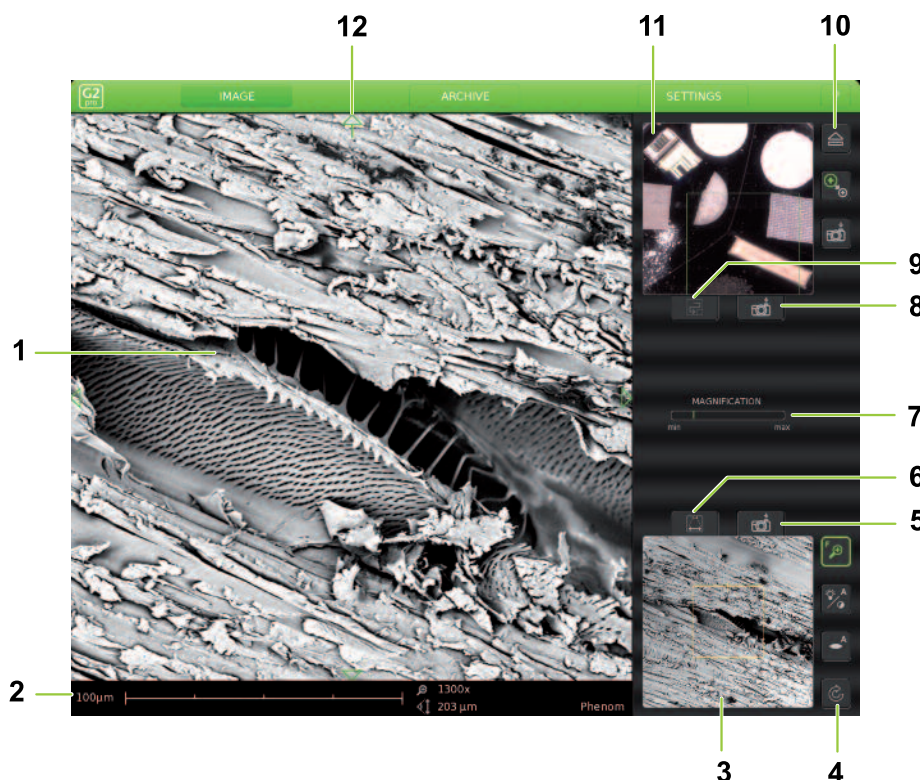
## Screens selection bar






- IMAGE** – selects Image screen.  
**ARCHIVE** – selects Archive screen.  
**SETTINGS** – selects Settings screen.  
**ADVANCED** – selects Advanced settings screen. Refer to 5. 'Phenom settings'.

The Image screen is used to view samples, take pictures, and operate the Phenom.

## Image screen








**Fig. 3**


- 1 Main viewing window**  
Displays magnified part of the sample.
- 2 Data bar**  
**10 µm** – Current ruler size.  
 – Dynamic representation of ruler size (depending on magnification factor)  
 .... x – Magnification factor.  
 .... µm – Field Of View (total picture size).  
**FEB 092006 12 : 15 PM** – Date and time.  
**IMG S121206\_0012** – Sample / file name.  
 Items to be shown can be selected on the Settings screen.  
**SH / BSD full** – Sample holder type or detector settings.  
**15Kv Point** – Acceleration voltage and beam intensity setting.
- 3 Electron overview window**  
Displays the part of the sample that is magnified in the main viewing window, with the largest field of view (lowest magnification factor).

#### 4 Button bar

The buttons define the functionality of the rotary knob:

-  - Magnifies part of the image.
-  - Adjusts overall contrast of the image.
-  - Adjusts brightness of the image.
-  - Adjusts focus of the image.
-  - Rotates the image (electron imaging mode only).

- 5  - Takes a picture of the image in the electron overview window.


- 6  - Refreshes the electron overview window.


#### 7 Status window

- Gives information on the current status of the Phenom.
- Displays messages during operation, when problems occur or when action by the user is required.

**Progress bar** 

- Indicates the remaining time when the Phenom is performing durative actions.
- Indicates the remaining wake-up time when the Phenom is waking up from standby and hibernate mode.

- 8  - Takes a picture of the image in the optical overview window. Refer to '10. Optical overview window'.



- 9  - Makes a composite image overview of the entire sample area.


#### 10 Button bar

-  - Transfers sample from loading position to optical imaging position and vice-versa.

-  - Selects electron imaging  or optical imaging .

The appropriate circle lights up green to indicate the active mode.

-  - Replaces  when the Phenom is waking up from standby or hibernate mode and indicates the progress of the wake-up process.

-  - Takes a digital picture of the image in the main viewing window.

#### 11 Optical overview window

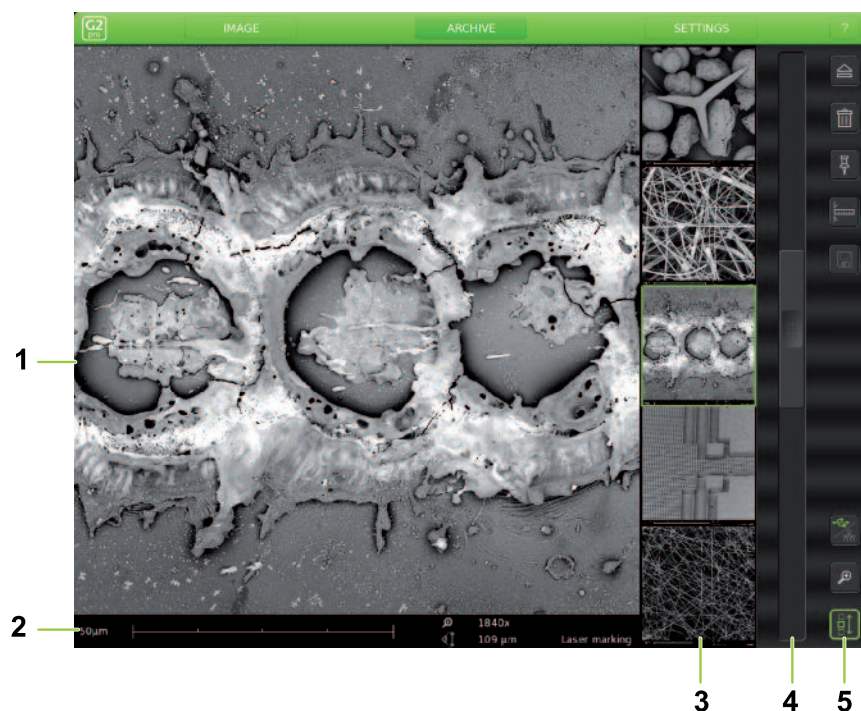
- Displays the part of the sample that is magnified in the main viewing window.
- Displays composite image overview of the entire sample area.

- 12 

Move the sample in up, down, left and right direction.

The Archive screen is used to view, compare and delete sample images stored on the USB Flash drive or on a Windows network share.

## Archive screen

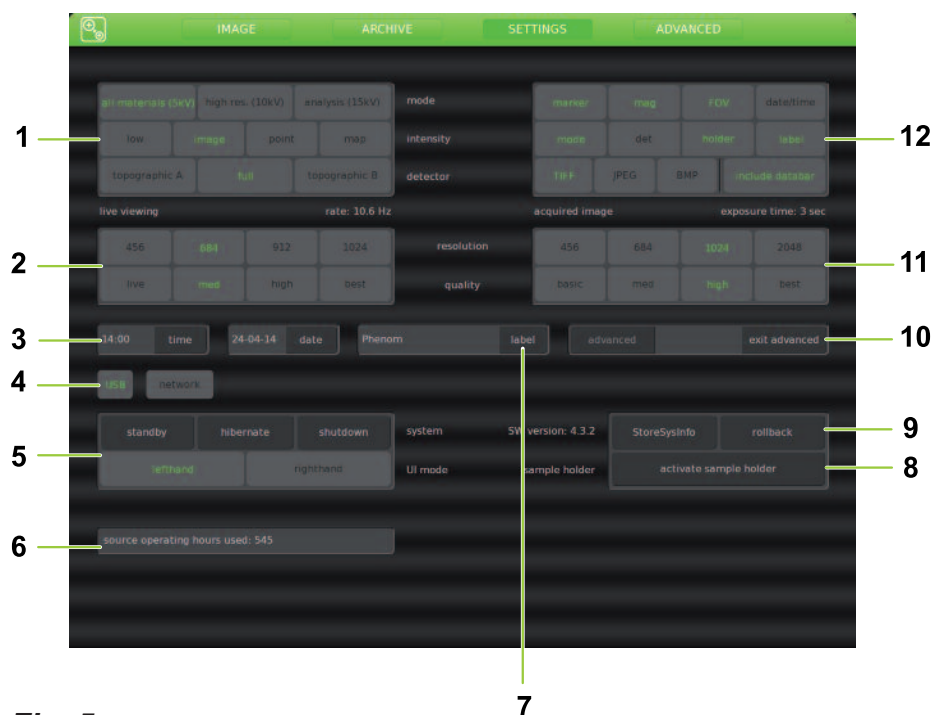


**Fig. 4**

- 1 Main viewing window**  
Displays currently selected image
- 2 Data bar**
- 3 Thumbnail gallery**  
Shows your pictures in thumbnail format.
- 4 Scroll bar**  
Move the slider to scroll through your images.
- 5 Button bar**
  - Ejects sample and allows door to be opened.
  - Deletes selected image.
  - Holds the selected image so it can be compared with other images.
  - Activates the measuring function.
  - Stores a copy of a measured image on USB Flash drive or network share, including measurement data.
  - Shows archive images stored on the USB Flash drive () or network share (). This button is only operational when both storage locations are available and valid network settings have been set in the Settings screen. For this refer to 4.5.5 'Sample overview' and 4.6.6. 'Storing images'.
  - Digital zoom: digitally magnifies the stored image.
  - Scrolls through your stored images.

## Settings screen

The Settings screen allows you to adjust the various Phenom settings to suit your own personal preferences. For this refer to 5. 'Phenom settings'.



**Fig. 5**

### 1 System settings

### 2 Live viewing

Adjusts and stores viewing conditions such as imaging mode, pixel resolution and averaging speed.

### 3 Date and time adjustment

Adjusts date and time.

### 4 USB / network

Selects USB Flash drive (**USB**) or network share (**network**) to store images.

### 5 System

- Switches the Phenom to standby or hibernate (power saving) mode.
- Prepares the Phenom for complete switch-off.

#### U(ser) I(nterface) mode

Selects the desired User Interface mode. Select whether the button bar on the Image screen will be placed on the left or on the right side of the screen.

### 6 Source

Displays the total time the Phenom electron source has been operational. Only visible when **Advanced** is activated. Refer to 10 'Advanced'.

## Notes!

- When the Phenom electron source is replaced, the timer will start counting again from zero. Operating hours of the previous source will not be taken into account.
- When new software is installed on the Phenom, the timer will copy the operating hours from the previous software versions.

### 7 Label

Enter image / file name. Refer to 5.5 'Label'.

## 8 **Sample holder**

Displays the sample holder name when an activated sample holder is inserted.

**No sample holder inserted** lights up when:

- you start imaging without a sample holder inserted.
- the inserted sample holder needs to be activated. Refer to 4.3.1 'Activating the sample holder'.

## 9 **SW version**

Shows current Phenom software version.

### **Rollback**

Returns to previous software version.

### **StoreSysInfo**

Stores a file with the current system information on the USB Flash drive (*fig. 1, 10*).

**SW version**, **Previous**, **Rollback** and **StoreSysInfo** are advanced settings that can be accessed by selecting the **Advanced** button (*10*) and entering the log-in password. Only visible when **Advanced** is activated. Refer to 11 'Advanced'.

## 10 **Advanced**

Protected login modes for experienced users.

## 11 **Acquired image**

Adjusts and stores settings such as pixel resolution, picture quality and detector mode for images to be saved.

## 12 **Data bar**

Selects the items to be displayed in the data bar in the main viewing window and / or on the saved images.

### **Image type**

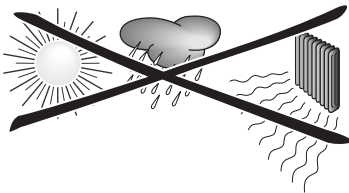
Selects file format for stored image.

## Preparation

### Note!


The indications between brackets behind button and connector names refer to the items in the overview illustrations on pages 10 - 17. E.g. (fig. 2,3) refers to item 3 in figure 2.

### ⚠ CAUTION!



## 3. Installing the Phenom

### 3.1 Requirements for positioning the Phenom components

- Place the Phenom, monitor, pre-vacuum pump and power supply on a flat, steady surface, out of direct sunlight and away from sources of excessive dust, dirt, heat, water, moisture, vibration, and strong magnetic fields.
- Place both the power supply and pre vacuum pump either on the floor or on the table near to where the Phenom microscope is placed.  
Make sure that the adapter **0 / I** switch (fig. 1, 14) switch is accessible at all times.
- Make sure the Phenom power supply is switched off before making any connections.
- Recommended table size is 120 x 75 cm (47" x 29.5") with a load rating of 100 kg (220.5 lbs).
- Allow sufficient cooling of the Phenom, power supply and pre-vacuum pump by keeping all cooling vents clear of obstructions.
- Make sure room temperature is between 15 °C and 30 °C (59 °F and 86 °F) and that room humidity does not exceed 80% RH.
- Position the monitor in such a way that you avoid glare or reflections from overhead lighting or outside sources of light.
- Keep the screen clean and set brightness and contrast to a level that enables you to see the screen clearly. For cleaning the screen, refer to 6. 'Maintenance' and for setting brightness and contrast, use the  and - / + buttons (fig. 1, 12) on the monitor.
- When positioning the Phenom always work with two persons, one at each end.

### 3.2 Assembling the flat panel monitor

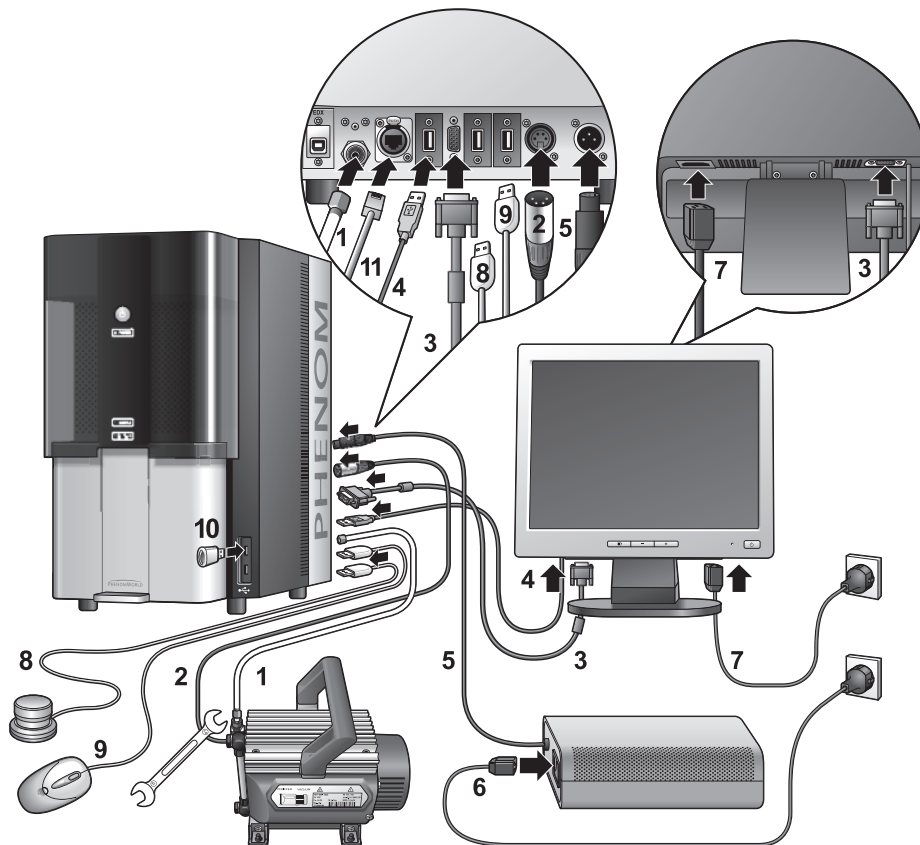
- Install the monitor foot on the monitor and tighten the plastic screw.





### 3.3 Connecting the Phenom

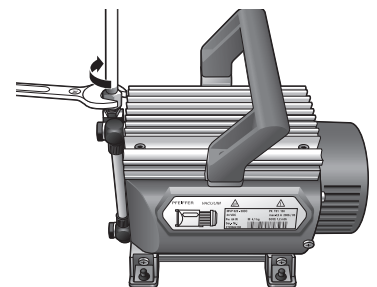
#### Connections



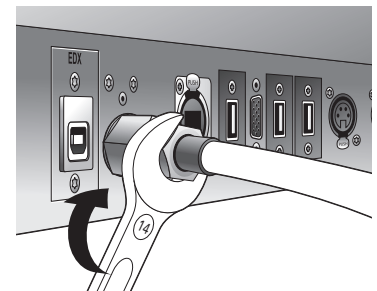
The figures between parentheses refer to the corresponding figures in the illustration.

**Note!**

- 1 Connect the pre-vacuum pumphose (1) between the pump inlet and the Phenom pre-vacuum pump connector.
  - Place the nut at one end of the hose onto the pump inlet screw thread and the nut at the other end of the hose onto the pump connector screw thread.
  - Turn both nuts clockwise until they are finger tight.
  - Use a 13 mm (0.51") spanner (wrench) to tighten the nut at the pump side. It takes 1 to 1.5 full turn to properly tighten the nut.

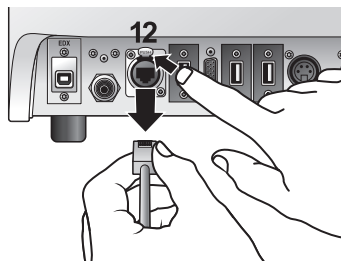
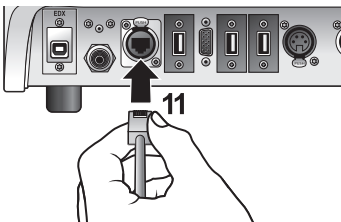


- Tighten the nut at the other end of the hose, using a 14 mm (0.51") spanner (wrench).



- 2 Connect the pump power cable (2) to the Phenom pump output connector.
  - > The Phenom will now provide power to the pre-vacuum pump.
  - To remove the pump power cable, first press the **PUSH** button to open the power connector.
- 3 Connect the monitor VGA cable (3) between the monitor VGA connector and the Phenom VGA connector.

- 4 Connect the monitor USB cable (4) to the USB port at the rear of the Phenom (optinal).
- 5 Connect the power cable (5) of the power supply to the Phenom power connector.
- 6 Connect the power cable (6) of the power supply to a wall outlet.
- 7 Connect the monitor power cable (7) to a wall outlet.
- 8 Connect the USB connector of the rotary knob (8) to one of the twin USB ports at the rear of the Phenom. If necessary, use the rotary knob extension cable.
- 9 Connect the USB connector of the mouse (9) to the other twin USB port.
- 10 Connect the USB Flash drive (10) to one of the USB ports at the Phenom front.
- 11 Optionally you can connect an ethernet cable (not supplied) between the Phenom Ethernet connector and your router / gateway or cable modem.
  - Connect an ethernet cable (11) between the Phenom Ethernet connector and your router / gateway or cable modem.
  - > The Phenom will now try to acquire an IP (Internet Protocol) address via DHCP (Dynamic Host Configuration Protocol).



**Note!**

*Sometimes assignment of IP addresses is MAC address based. A Media Access Control (MAC) address is a unique identifier, attached to most network adapters. It is a number that acts like a name for a particular network adapter.*

*Some companies assign IP addresses to known MAC addresses only, in order to avoid any non-company computer accessing the network or infecting the network with viruses.*

*When a MAC address is required, please contact Phenom-World's Service Support:*

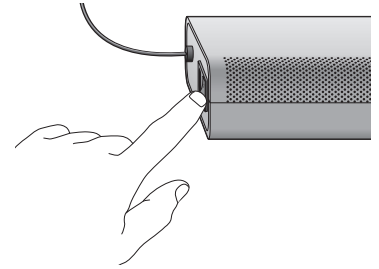
- address: Dillenburgstraat 9E  
5652 AM Eindhoven  
The Netherlands
- e-mail: [service@phenom-world.com](mailto:service@phenom-world.com)
- phone: +31 (0)40 259 73 72
- fax: +31 (0)40 259 73 71
- opening hours: Monday - Friday, 09:00 - 17:00 (CET)




## 3.4 Activating the system

### 3.4.1 Switching 'on' the Phenom

- 1 Make sure all connections are properly made.
- 2 Set the **0 / I switch** (fig. 1,14) on the power supply to I.
  - > The system starts up automatically.
  - The pre-vacuum pump noise fades away after approximately 1 minute. Refer to 7. 'Troubleshooting' if this is not the case.
  - > The **POWER LED** (fig. 1,1) blinks green.
  - > It takes between 30 minutes and 14 hours before the system is fully operational. The start-up time depends on the time the system has been switched off. Refer to 7.2 'Power down'.



### 3.4.2 Switching 'on' the flat panel monitor

- Press  (11) on the monitor.
  - > The power LED (fig. 1, 11) lights up.
  - > The Phenom splash screen appears, followed by the Image screen or the Calibration screen.




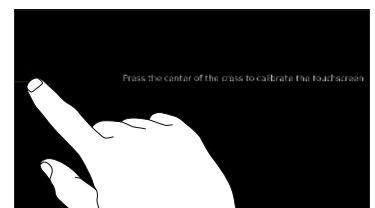
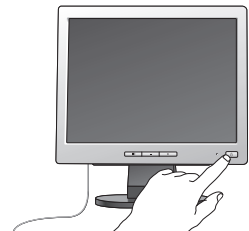
### 3.4.3 Calibrating the flat panel monitor (touch screen only)

Calibrating the monitor optimizes the performance of the touch screen and has to be done only once. When the monitor is connected and switched on for the first time the calibration screen appears automatically.

*The touch screen monitor is optional available.*

**Note!**

- 1 Press  (12) on the monitor to switch on the monitor.
  - 2 Press the center of the cross that is displayed on the screen.
    - > The cross disappears and then appears again on a different location on the screen. The cross will appear on four different locations.
  - 3 Press the center of the cross on all four locations it appears.
    - > After pressing the cross for the fourth time the monitor is calibrated and ready to operate the Phenom.
    - > After the calibration procedure, the normal Phenom UI (User Interface) is shown again.
- If you wish to redo the calibration process you can call up the calibration screen again by pressing the rotary knob (fig. 1,9) for 15 seconds.



## Preparation

### Note!

## 4. Using the Phenom

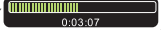



The indications between brackets behind button and connector names refer to the items in the overview illustrations on pages 10 - 17. E.g. (fig. 2,3) refers to item 3 in figure 2.

### 4.1 Waking-up the Phenom

After one hour of inactivity, the Phenom switches to standby. The **POWER** LED (1) lights up orange. After 72 hours of inactivity, the Phenom switches to hibernate (power saving) mode. The **POWER** LED (1) blinks orange (1 second on, 3 seconds off).

To wake up the Phenom from standby / hibernate mode:



- Press the System control button (fig. 1,1).
  - > The **POWER** LED (fig. 1,1) blinks green until the Phenom is completely activated again. From standby mode this will take approximately 4 minutes; from hibernate mode this will take approximately 6 minutes.
  - > The Phenom is immediately ready for optical imaging. Refer to 4.5 'Optical imaging'.
  - > A progress bar (  ) displays the remaining wake-up time.
  - > An hourglass (  ) indicates that the wake-up process is in progress. When the  icon changes into , the Phenom is ready for electron imaging. Refer to 4.6 'Electron imaging'.

### Note!

- The Phenom is also activated when  (fig. 3,9) on the IMAGE screen is selected during sample loading. Refer to 4.3 'Loading samples'.

### Important!

### 4.2 Preparing samples

This chapter is meant to give you better understanding of sample preparation before using samples inside the Phenom. By following the guidelines below you can maximize sample resolution and eliminate possible maintenance issues.

- The Phenom can accommodate samples up to 25 mm (1") in diameter and 30 mm (1.1811") in height.
- Never put wet samples in the Phenom. Wet samples will readily outgas under vacuum. This can cause serious problems in your imaging capabilities and can cause permanent damage to the Phenom. Make sure samples have been dried before placing them into the machine.
- Be absolutely sure there are no loose particles on the sample before loading it into the Phenom by slightly flushing it with compressed air.
- Always make sure the sample is firmly fastened to the sample stub. Moving a sample from atmosphere to vacuum can cause loose sample material to become dislodged from the stub. This debris can make its way up the SEM column and distort the electron beam. The general sample preparation section hereafter explains how to properly prepare samples for the Phenom. This will ensure higher quality imaging and reduce maintenance issues.

### What do you need?

For sample preparation you will need to have the following items available:

- sample stub (less than 25 mm (1") in diameter);
- stub gripping tweezers;
- standard tweezers;
- stub tray;
- toothpick (or other disposable pointed object);
- one of the following items: colloidal graphite, silver paint, or double sided carbon adhesive pads;
- a can of compressed air.



- 1 Begin by placing a bare stub into a sample tray. **Never** prepare a sample in the Phenom sample holder for loose particles may end up in the container.
- 2 Colloidal graphite or silver paint can be used to cement the sample down to the sample stub. Polymers, insects, and MEMS devices are some examples of samples that are large enough to affix to a stub using colloidal graphite or silver paint. For smaller objects like pollen, powders, and TEM grids it is advised to avoid using this method as it may submerge the sample before drying.  
Also note that once colloidal graphite and silver paint come in to contact with the sample, they cannot be removed.  
For smaller samples, or samples that may need to be removed from the sample stub after imaging, skip to step 1 of chapter 'Samples that cannot be prepared in colloidal graphite or silver paint'.
- 3 Begin by opening the bottle of graphite or silver paint in a well ventilated area.
- 4 Take a fine point disposable object such as a toothpick or pin and dip the tip into the silver paint or graphite. Remove the tip from the liquid and dab the residual graphite or silver paint onto the bare stub.
- 5 Replace the lid onto the jar of graphite or silver paint as these will dry out quickly.
- 6 The liquid will dry quickly so be aware of time during the next three steps.
- 7 Take the standard tweezers and firmly clamp the sample.
- 8 Move the sample to a bare area of the stub. Do not place the sample directly into the liquid.
- 9 Gently slide the sample into the drop of liquid so that the liquid beads around the bottom of the sample. Once a desired level or surface contact between the liquid and sample has been attained, let the liquid dry for 5-10 minutes. The sample is now ready to image.

### 4.2.1 Samples that cannot be prepared in colloidal graphite or silver paint

- 1 For these samples, a double sided adhesive can be used. Although these adhesive pads are not quite as conductive as the silver or graphite, they are much easier to use for a broader spectrum of samples. To begin, peel back the coating on top of the adhesive with tweezers.
- 2 Place a clean stub on top of the exposed adhesive. Pull the stub off the adhesive sheet to expose the other side of the adhesive pad.
- 3 Now place the sample on top of the exposed adhesive. Make sure the sample is firmly attached to the stub before placing the sample into the Phenom.

### 4.2.2 Particle samples

Particles include but are not limited to powders, pollen, small filings, diatomaceous material, and other dust-like matter.

- 1 To prepare a particle sample, attach a double sided adhesive pad to a bare sample stub. See 'General guidelines'.
- 2 Take a toothpick, tweezers, or other fine point object and collect some of the particle sample on the tip. Brush the sample coated tip against the exposed adhesive of the sample stub. Take the flat side of the toothpick or tweezers and press the particles firmly against the adhesive pad.
- 3 Grip the sample with stub holding tweezers and forcibly tap the stub on the side of a table or bench to remove loose particle from the sample stub.
- 4 With a can of compressed air, spray the surface of the sample to remove any other loose particles.  
> *The sample is now ready to be placed into the Phenom.*
- 5 Repeat steps 3 and 4 when re-imaging a prepared particle sample.

### 4.2.3 Polymers

- Polymer samples include plastics and glass and are typically mounted flat or on a cross section.
- Because of their organic and / or siliceous composition, polymers also tend to charge even at low magnifications and accelerating voltages.
- A light gold coating can eliminate most charging effects and optimize resolution.
- Polymers should be fixed down to the sample stub with colloidal graphite, silver paint, double sided carbon pad, or a clamping mechanism.

### 4.2.4 Metals

- Samples containing metal may have a certain affinity for the electromagnets within the SEM. This affinity may be strong enough to pull the sample from the stub and up into the detector region. This will cause degradation of imaging capability and will require a service technician to remove this material from the detector.

To avoid this scenario, all metal samples should be firmly fastened to the SEM stub.

**Metal powders** can be fastened to the SEM stub in the same fashion as non-metal powders. Please reference the 4.2.2 'Particle samples' section for instructions.

**Metal filings** can be attached to the stub in a similar fashion to metal powders. However, larger filings should be attached using colloidal graphite or even a clamping stub.

- Ferrous, or iron-containing samples should be mounted onto an SEM stub with great care. There are several powerful electromagnets inside the SEM that will attract iron containing materials within the sample chamber. Loose ferrous material can be pulled off the sample and onto the detector. This will cause a considerable, if not total, loss of imaging capability and can seriously damage the detector. Make sure the sample is firmly attached to the sample stub with colloidal graphite, silver paint, adhesive pad, or a clamp before imaging in the SEM.

### 4.2.5 Biological samples

- Biological samples may be more difficult for SEM imaging. High vacuum, low conductivity, and regular outgassing are all factors that reduce the clarity of biological samples in the SEM.
- To best image biological samples make sure the sample is dry. Here are a few methods of sample preparation for the Phenom.

**Air Drying** will remove a fair amount of moisture from a biological sample allowing for better imaging. The drawback to air drying is that surface morphology of the sample is sacrificed.

**Critical Point Drying (CPD)** is a complex way of drying biological samples without seriously disrupting surface morphology. Although sample preparation time will greatly increase with the use of CPD, samples will look much truer to their original state than with air drying.

**Heavy Metal Staining** using heavy metals such as osmium can be used for samples to be imaged in the Phenom. Heavy metal staining is also a complicated and potentially hazardous form of sample preparation. This type of preparation should only be attempted by a trained individual in an appropriate lab environment.

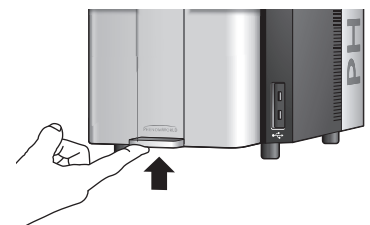
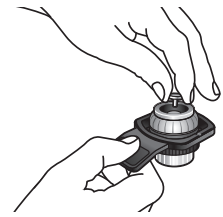
**Biological samples** are also fairly non-conductive and may charge under the SEM. A gold coating can reduce charging in these types of samples. Refer to 4.2.6 'Heavy Metal Coating'.

### 4.2.6 Heavy metal coating

- For materials that display a charging effect under the SEM, a coating of gold or other heavy metal will most likely improve imaging capability. Remember, it is best to begin with a light coat to reduce charge but more importantly to minimize change in surface morphology of your sample.  
Because every sputter coater is different, experiment with various coating times and currents to optimize imaging performance.

## 4.3 Loading samples

- 1 Make sure that the sample is properly mounted and immobilized on the stub.
- 2 Turn the height adjustment ring of the sample holder counter-clockwise until the mounting surface is in the highest position.
- 3 Insert the stub pin into the hole on the mounting surface, using tweezers if necessary.
- 4 Make sure that the stub is inserted in such way that the flat of the stub is seated on the mounting surface.
- 5 Lower the sample by turning the height adjustment ring clockwise.
  - The sample is positioned correctly if it is at least 2 mm (0.08") below the top surface of the holder.
  - Each one of the vertical marks on the adjustment ring corresponds to 0.5 mm (0.02"). Thus, rotating the adjustment ring by 4 marks will lower the sample 2 mm (0.08").
  - The best resolution is obtained when the sample is positioned 2 mm below the holder surface. The largest field-of-view is obtained when the sample is positioned 12 mm (0.48") below the holder surface.
  - Setting the specimen to positions between 2 mm (0.08") and 12 mm (0.48") below the holder surface allows the user to optimize the trade-off between maximum field-of-view (minimum magnification) and image resolution (maximum useful magnification).
  - It is very important that the top of the sample is below the top of the sample holder.  
**The sample will be destroyed and could cause severe damage to the Phenom if inserted into the Phenom while positioned above the top of the sample holder!**
- 6 Open the door (4) by pushing the handle upward.
  - Hold the handle and raise the door to its fullest extent.





- 7 Insert the sample holder into the holder slot.
  - > If the door is not fully open the sample holder will not insert.
  - The sample holder is inserted correctly when the **SAMPLE LED (2)** lights up green and the message 'Please load sample' disappears from the Image screen.

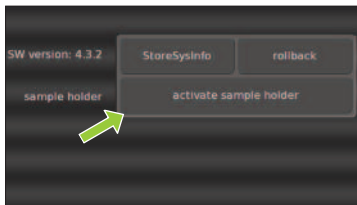


- 8 Close the door by sliding it down firmly (some initial force is required).
  - > The door will automatically be locked. '🔒' lights up orange.
  - > The sample is loaded and ready for imaging.
  - > If the Phenom was in standby or hibernate (power saving) mode, The Phenom will be now be re-activated. Refer to 4.1 'Waking-up the Phenom'.
  - > The sample automatically moves to the optical imaging position.
  - > **No sample holder inserted** (fig. 5,11) lights up when you start imaging without a sample holder inserted. Refer to 4.3.1 'Activating the sample holder'.

### 4.3.1 Activating the sample holder

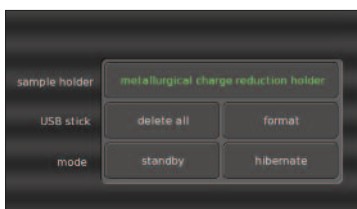
When a new sample holder is inserted for the first time, the holder needs to be activated.

- 1 Note the code that is located at the bottom of the sample holder.
- 2 Select **SETTINGS** in the selection bar.
  - > The Settings screen appears.
- 3 Insert the sample holder. Refer to 4.3 'Loading samples'.
- 4 Select **activate sample holder**.
- 5 Type in the code, noted in step 1.



#### Note!

If you forgot to note the code in step 1, you can still remove the sample holder from the holder slot, note the code, reinsert the sample holder and continue with step 5.



- 6 Select **OK** to confirm.
  - > The sample holder is now activated and its name will be displayed when the holder is inserted.

## 4.4 Operating




All Phenom operation is done via the mouse (fig. 1,8) and the rotary knob (fig. 1,9).

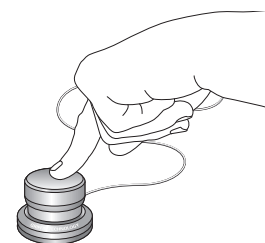
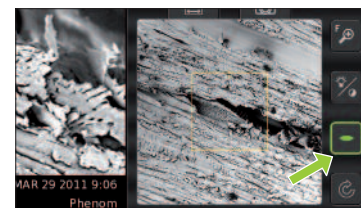
- 1 Click a button (icon) to activate its function.
- 2 Rotate the rotary knob to use the function.

## 4.5 Optical imaging

- > After the Phenom door (fig. 1,4) is closed, the sample is transferred automatically to the optical imaging position.
- > The optical camera is activated and the image is displayed in the main viewing window (fig. 3,1) of the Image screen.
- > The part of the sample that is magnified in the main viewing window is displayed in the optical overview window (fig. 3,10).

### 4.5.1 Adjusting focus



- Select  (fig. 3,4) to activate focus adjustment.
  - > A focus slider appears, showing the current focus setting.
- Rotate the rotary knob (fig. 1,8) to adjust the focus of the optical image.
  - > Adjustment is made visible by the slider.
- Press  (fig. 3,4) or the rotary knob (fig. 1,9) to select fine focus.
  - > An 'F' appears on the button and focus adjustment now takes place in small steps.
- Press  (fig. 3,4) or the rotary knob (fig. 1,9) again to return to normal (coarse) focus.

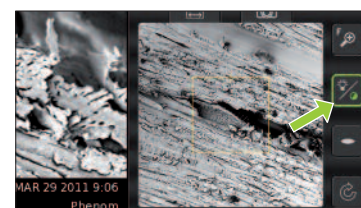


The focus setting at the Navcam position is used to set the initial focus for the SEM position. A good focus at the Navcam will give a better starting focus and improve the result of the Auto focus in SEM position.

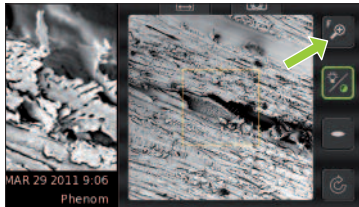
**Note!**

### 4.5.2 Adjusting brightness and contrast


- Select  (fig. 3,4) to activate brightness adjustment.
  - > A brightness slider appears, showing the current brightness setting.
- Rotate the rotary knob (fig. 1,9) to adjust the brightness of the optical image.
  - > Adjustment is made visible by the slider.
- Select  (fig. 3,4) again to activate contrast adjustment.
  - > A contrast slider appears, showing the current contrast setting.
- Rotate the rotary knob (fig. 1,9) to adjust the overall contrast of the optical image.
  - > Adjustment is made visible by the slider.
  - > This adjustment allows the optical image contrast to be changed from direct to indirect lighting



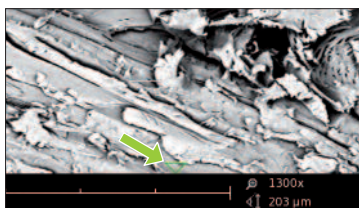




### 4.5.3 Adjusting magnification (ProX / Pro)

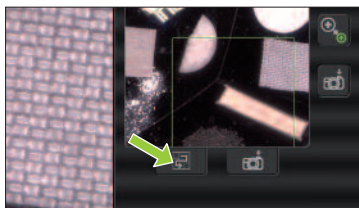
- Select  (fig. 3,4) to activate the magnification adjustment function.
  - > A magnification slider appears, showing the current magnification setting.
- Rotate the rotary knob (fig. 1,9) to adjust the magnification of the optical image.
  - > The adjustment is made visible by the slider.


### 4.5.4 Moving the sample



- Select a particular part of the sample on the main viewing window (fig. 3,1).
  - > This part will be moved to the center of the field of view.
- Select one of the directional arrows (fig. 3,12).
  - > The sample moves in the direction of the arrow.
- Select a particular part of the sample on the optical overview window (fig. 3,11).
  - > This part will be moved to the center of the field of view.

### 4.5.5 Sample overview



- Select  (fig. 3,9).
  - > The sample holder will now be moved into different positions, each covering a part of the holder. In each position the image is captured and shown in the optical overview window (fig. 3,11) to produce an optical overview of the entire holder content.

### 4.5.6 Storing images

Images can be stored on a USB 2.0 flash drive (USB Flash drive) as well as on a (Windows) network share. For network configuration, refer to 5.7.4 'Routine pages' - 'Network'.

#### Selecting storage location

When a USB Flash drive is inserted into one of the Phenom USB ports (fig. 1,7 / fig. 2,6), the USB Flash drive is automatically selected as storage location. To manually select a storage location:

- 1 Select **SETTINGS** in the screen selection bar.
  - > The Settings screen appears.
- 2 Select **USB**.
  - > Images will now be stored on the USB 2.0 flash drive.

OR:

- 1 Select **SETTINGS** in the screen selection bar.
  - > The Settings screen appears.
- 2 Select **network**.
  - > The **path** field appears on the screen, together with a keyboard.






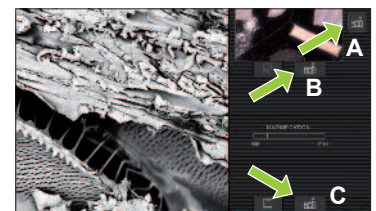


- 3 Enter server name, share path, domain name, user name and password. Enter the user name and password that you use to get access to Windows on your computer. For example: '//server001/folder/username'. Use forward slashes instead of backslashes.
  - If a USB Flash drive is inserted in the Phenom, the network settings are saved on it. When you later re-insert this USB Flash drive, the network settings will be filled in automatically and you will only have to enter your password.
  - If the USB Flash drive is removed from the Phenom, the network share is also disconnected as a security measure.
- 4 Select **OK** to confirm.
    - > If that fails (because you haven't filled in all fields, or something is wrong), a message with the details of the problem will be displayed.
    - > Images will now be stored on the selected network share.
  - 5 Select **Image** in the screen selection bar to return to the Image screen.



### Storing images

- Select  (A) to store the image displayed in the main viewing window (fig. 3,1).
- Select  (B) to store the image displayed in the optical overview window (fig. 3,11).
- Select  (C) to store the image displayed in the electron overview window (fig. 3,3).
- Parameters for settings associated with storing images can be selected on the Settings screen.
  - > Images will be stored on the selected storage location (USB flash drive or network share). The storage location will be displayed in the status window.

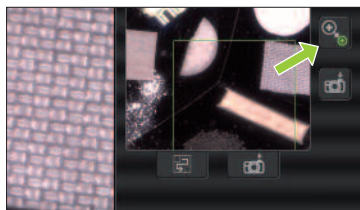



**Note!**

When storing images on the supplied USB Flash drive (fig. 1,10), make sure the USB Flash drive is correctly formatted and inserted into one of the Phenom USB ports (fig. 1,7 / fig. 2,6). The USB Flash drive can be inserted at any time.

## 4.6 Electron imaging

After the part of the sample you wish to view has been centered in the optical overview window (fig. 3,10), the sample can be positioned for high resolution (electron) imaging.

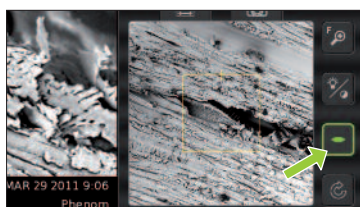





- Select  (fig. 3,9) to select electron imaging mode.
  - > The sample will be transferred to electron imaging position.
  - > A progress bar shows the transfer progress.
  - > All settings made for optical imaging will be saved for electron imaging.
  - > When the sample is positioned for electron imaging, an image of the sample is displayed in the main viewing window (fig. 3,1) of the Image screen. The image is displayed in the lowest possible magnification (depending on the physical height of the sample).
  - > The part of the sample that is magnified in the main viewing window (fig. 3,1) is displayed in the electron overview window (fig. 3,3). This is indicated by a colored square. The image is displayed at the lowest magnification factor.
  - > A colored rectangle or cross (above a certain magnification level) in the optical overview window (fig. 3,11) also indicates the part of the sample that is magnified in the main viewing window.

### 4.6.1 Adjusting focus


Depending on the current status, the focus can be set to automatic or manual control.

#### Auto focus






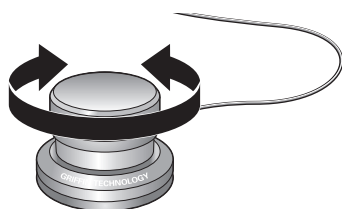
- Select  (fig. 3,4) for 2 seconds to activate the Auto focus function.
  - > An 'A' appears on the button .
- Select  (fig. 3,4) again to start Auto focus adjustment.
  - > The focus will now be adjusted automatically.

#### Manual focus


- Select  (fig. 3,4) to activate the focus function.
  - > A focus slider appears, showing the current focus setting.
- Rotate the rotary knob (fig. 1,8) to adjust the focus of the optical image.
  - > Adjustment is made visible by the slider.

#### Fine focus



- Select  (fig. 3,4) or the rotary knob (fig. 1,8) to select fine focus.
  - > An 'F' appears on the button  and focus adjustment now takes place in small steps.
- Select  (fig. 3,4) or the rotary knob (fig. 1,8) again to return to normal (coarse) focus.

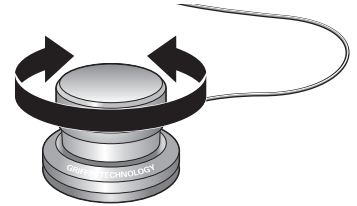
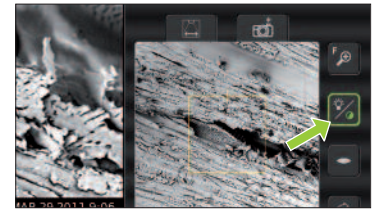


#### Notes!




- Auto focus works best when high contrast features are present in the center of the image screen.
- If auto focus does not produce the desired result, use manual focus.
- Manual focus takes place in steps that are proportional to the current magnification setting. The higher the magnification setting, the more sensitive the rotary knob will become.
- Select  (fig. 3,4) again for 2 seconds, to return to manual mode.

## 4.6.2 Adjusting brightness and contrast




- Select  (fig. 3,4) to activate brightness adjustment.
  - > A brightness slider appears, showing the current brightness setting.
- Rotate the rotary knob (fig. 1,9) to adjust the brightness of the electron image.
  - > Adjustment is made visible by the slider.
- Select  (fig. 3,4) again to activate contrast adjustment.
  - > A contrast slider appears, showing the current contrast setting.
- Rotate the rotary knob (fig. 1,9) to adjust the overall contrast of the electron image.
  - > Adjustment is made visible by the slider

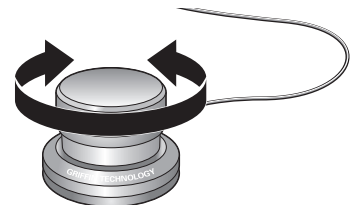
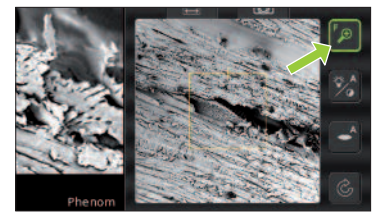


## Auto contrast / brightness





- Select  (fig. 3,4) for 2 seconds to activate the Auto contrast / brightness function.
  - > An 'A' appears on the button.
- Select  (fig. 3,4) again to start Auto contrast / brightness adjustment.
  - > Brightness and contrast will now be adjusted automatically.
- Select  (fig. 3,4) again for 2 seconds, to return to manual mode.

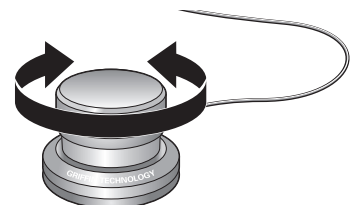
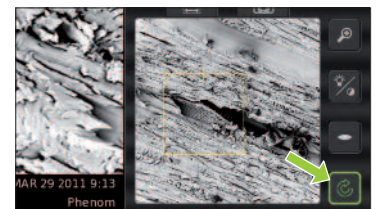
## 4.6.3 Magnifying the image

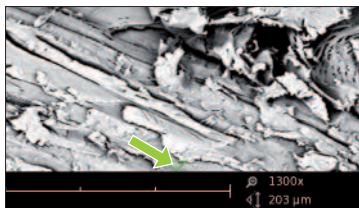
- Select  (fig. 3,4) to activate the magnification function.
  - > A magnification slider appears, showing the current magnification factor.  
The magnification factor is also shown on the data bar (fig. 3,2) if activated on the Settings screen.
- Rotate the rotary knob (fig. 1,9) to magnify the image to the desired size.
  - > The magnification factor is made visible by the slider and on the data bar (fig. 3,2).
- Select  (fig. 3,4) or the rotary knob (fig. 1,9) to select fine magnification.
  - > An 'F' appears on the button and magnification now takes place in small steps.
- Select  (fig. 3,4) or the rotary knob (fig. 1,9) again to return to normal (coarse) magnification.



## 4.6.4 Rotating the image

- Select  (fig. 3,4) to activate the rotation function.
  - Rotate the rotary knob (fig. 1,9) to rotate the image in the desired direction.
  - Press  (fig. 3,4) or the rotary knob (fig. 1,9) to select fine rotation.
    - > An 'F' appears on the button and rotation now takes place in small steps.
  - Press  (fig. 3,4) or the rotary knob (fig. 1,9) again to return to normal (coarse) rotation.
- Press  (fig. 3,4) for 2 seconds to deactivate the rotation function and show the image again in un-rotated state.



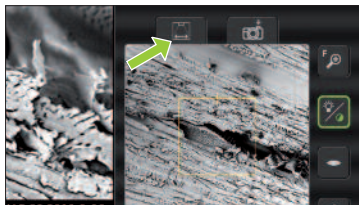


#### 4.6.5 Moving the sample

- Select a particular part of the sample on the main viewing window (fig. 3,1).  
> This part will be moved to the center of the field of view.
- Select one of the directional arrows (fig. 3,12).  
> The sample moves in the direction of the arrow.
- Select a particular part of the sample on the electron overview window (fig. 3,3).  
> This part will be moved to the center of the field of view.

If a sample has been moved outside of the original field of view, the electron overview window (fig. 3,3) turns black.

- Select  (fig. 3,6) to refresh the electron overview window (fig. 3,1).



#### 4.6.6 Storing images

Images can be stored on a USB 2.0 flash drive (USB Flash drive) as well as on a (Windows) network share. For network configuration, refer to 5.7.4 'Routine pages' - 'Network'.

##### Selecting storage location

When a USB Flash drive is inserted into one of the Phenom USB ports (fig. 1,7 / fig. 2,6), the USB Flash drive is automatically selected as storage location. To manually select a storage location:



- 1 Select **SETTINGS** in the screen selection bar.  
> The Settings screen appears.
- 2 Select **USB**.  
> Images can now be stored on the USB 2.0 flash drive.




- 3 Select **Image** in the screen selection bar to return to the Image screen.

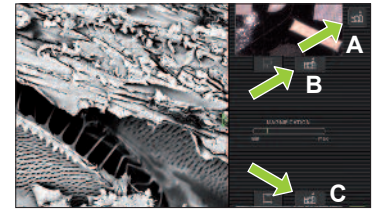
OR:



- 1 Select **SETTINGS** in the screen selection bar.  
> The Settings screen appears.
- 2 Select **network**.  
> The **path** field appears on the screen, together with a keyboard.
- 3 Enter server name, share path, domain name, user name and password. Enter the user name and password that you use to get access to Windows on your computer.
- 4 Confirm by pressing OK.  
> If that fails (because you haven't filled in all fields, or something is wrong), a message with the details of the problem will be displayed.  
> Images can now be stored on the selected network share.
- 5 Select **IMAGE** in the screen selection bar to return to the Image screen.

## Storing images

- Select  (A) to store the image displayed in the main viewing window (fig. 3, 1).
  - Select  (B) to store the image displayed in the optical overview window (fig. 3, 11).
  - Select  (C) to store the image displayed in the electron overview window (fig. 3, 3).
  - Parameters for settings associated with storing images can be selected on the Settings screen.
- > Images will be stored on the selected storage location (USB flash drive or network share). The storage location will be displayed in the status window.



**Note!**




When storing images on the supplied USB Flash drive (fig. 1, 10), make sure the USB Flash drive is correctly formatted and inserted into one of the Phenom USB ports (fig. 1, 7 / fig. 2, 6). The USB Flash drive can be inserted at any time. For formatting the USB Flash drive refer to 5.6.1 'USB Flash drive'.

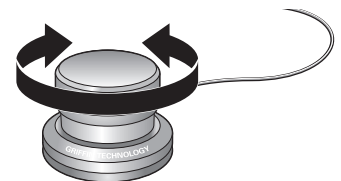
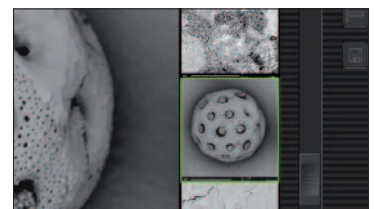
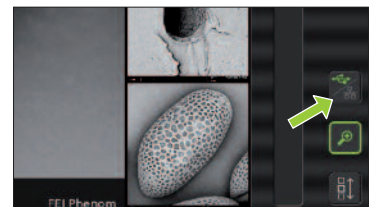
## 4.7 Viewing stored images

Images stored on the USB Flash drive or on a (Windows) network share can be viewed on the Archive screen. When the Archive screen is entered, it shows the images stored on the currently selected storage location. For selecting the desired storage location and configuring the network share, refer to chapters 4.5.5 'Sample overview' and 4.6.6 'Storing images'.

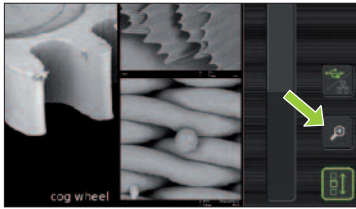
**Note!**


When viewing images stored on the supplied USB Flash drive (fig. 1, 10), make sure the USB Flash drive is correctly formatted and inserted into one of the Phenom USB ports (fig. 1, 7 / fig. 2, 6). The USB Flash drive can be inserted at any time. For formatting the USB Flash drive refer to 5.6.1 'USB Flash drive'.

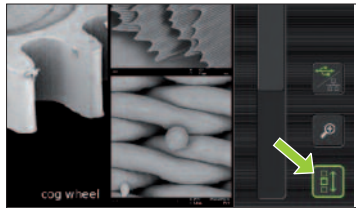
- 1 Select **ARCHIVE** in the screen selection bar.
  - > The Archive screen appears.
  - > The images stored on the current location are shown on the main viewing window (fig. 4, 1).
- Use the  button (fig. 4, 5) to select USB Flash drive () or network share (). This is only possible when both storage locations are available.
- 2 Use the rotary knob (fig. 1, 9) to scroll through your stored images.
  - The selected (highlighted) image can be displayed at full size on the main viewing window by pressing the rotary knob (fig. 1, 9) or selecting the thumbnail image.
  - > The other images are then shown in thumbnail format in the thumbnail gallery (fig. 4, 3).









- When the image is displayed at full size, digital zoom is available by selecting  (fig. 4,5).
- The image can then be magnified digitally using the rotary knob (fig. 1,9).



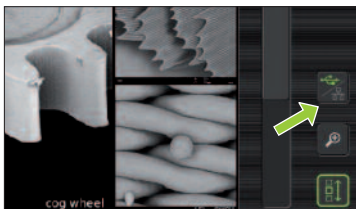
- 3 Select  (fig. 4,5) to continue scrolling through your images.





#### 4.7.1 Comparing images (ProX / Pro)



- 1 Select  (fig. 4,5) to select the image in the main viewing window as the first image for comparison.
- 2 Use the rotary knob (fig. 1,9) or the scroll bar (fig. 4,4) to select the second image you wish to compare to the image in the main viewing window.
- 3 Press the rotary knob (fig. 1,9) to switch between the 2 selected images for comparison.
  - Select  (fig. 4,5) to continue scrolling through your pictures.


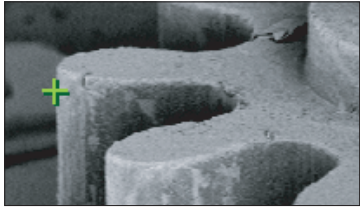
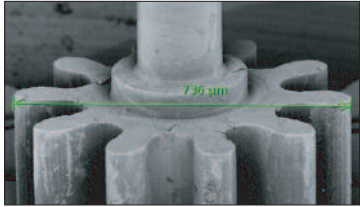




#### 4.7.2 Deleting stored images

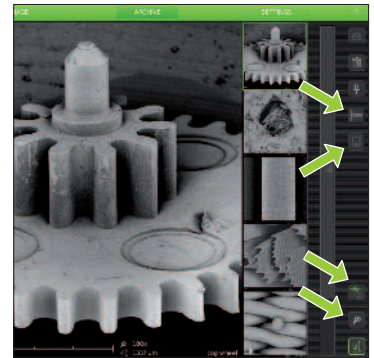


- 1 Use the  button (fig. 4,5) to select the storage location (USB Flash drive,  or network share, .
- 2 Use the rotary knob (fig. 1,9) or the scroll bar (fig. 4,4) to select the image you wish to delete.
- 3 Select  (fig. 4,5) to delete the image.
  - To delete all images select '✓' to confirm or '✗' to cancel. Refer to 5.6.1 'USB Flash drive' / 5.6.2 'Mode'.
  - For deleting all images stored on the USB Flasdrive, refer to 5.6.1 'USB Flashdrive'.




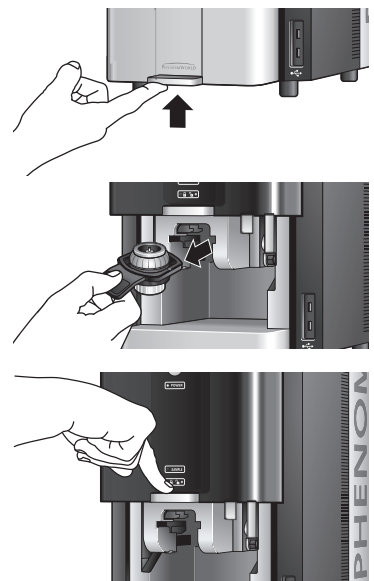
## 4.8 Measuring on stored images (ProX / Pro)

- 1 Select  (fig. 4,5) to activate the measurement function.
- 2 Select the desired starting point at the displayed image.  
> The starting point is indicated with a '+'.
 
- 3 Select the desired ending point at the displayed image.  
> The distance between starting point and ending point is displayed in microns ( $\mu\text{m}$ ).
 
- If desired, select  (fig. 4,5) to digitally magnify the image (digital zoom) so you can fine-tune starting and ending point. Use  (fig. 4,5) to toggle between starting and ending point.
  - If you wish to store a copy of the image with the measurement data, select  (fig. 4,5) to store the image.  
> A copy of the image with the measurement data 'burned in' will be stored at the selected (storage) location.  
> The copy contains colour information so the file size will be bigger than the original.  
> If the measurement button  cannot be selected the image is not suited for measurement, for example because it was stored as BMP or not made on the Phenom.



## 4.9 Unloading the sample

- 1 Select  (fig. 4,5) to eject the sample and allow the door to be opened.  
> 'Unload: are you sure?' appears on the screen.
- 2 Select '✓' to confirm or '✗' to cancel.  
> After confirmation the sample holder will be brought to the unload position.  
> 'U' (3) lights up green, indicating that the door (4) can be opened.
- 3 Open the door (fig. 1,4) by pushing the handle upward.
  - Hold the handle and raise the door to its fullest extent.
- 4 Remove the sample holder and close the door (fig. 1,4) by sliding it down (some initial force is required).




## 4.10 Switching off the Phenom electron source

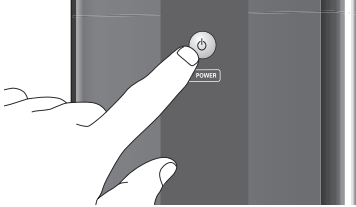
### 4.10.1 Switching off the Phenom

The Phenom can be switched off in several ways:

#### Standby

In standby mode the electron source will be switched off in order to increase lifetime.

- Press  (fig. 1, 1) on the Phenom.
  - > The **POWER** LED (fig. 1, 1) lights up orange. The Phenom is now in standby mode.



OR:

- 1 Select **SETTINGS** in the selection bar.
  - > The Settings screen appears.
- 2 Select **standby**.
  - > 'Do you want to go to standby? Approximate recovery time: 4 minutes.' appears on the screen.
- 3 Select '✓' to confirm or '✗' to cancel.
  - > The **POWER** LED (fig. 1, 1) lights up orange. The Phenom is now in standby mode.



#### Note!

If the Phenom is not used for one hour, it automatically enters standby mode.

#### Hibernate (Power saving mode)

- 1 Select **SETTINGS** in the selection bar.
  - > The Settings screen appears.
- 2 Select **hibernate**.
  - > 'Do you want to go to hibernate? Approximate recovery time: 6 minutes.' appears on the screen.
- 3 Select '✓' to confirm or '✗' to cancel.
  - > The **POWER** LED (fig. 1, 1) lights up orange. The Phenom is now in power saving (hibernate) mode.



#### Note!

If the Phenom is not used for 72 hours, it automatically enters hibernate mode.



### 4.10.2 Switching off the flat panel monitor

- Press  $\Phi$  (fig. 1, 1) on the monitor.
  - > The power LED (fig. 1, 1) goes out. The monitor is now switched off.



### 4.10.3 Switching off the system completely

Only use this option if you have to transport the Phenom or if the Phenom or the pre-vacuum pump requires repair.

For switching off the system completely, refer to 5.7.2 'Shutdown'.

## 5. Phenom settings

All Phenom settings are made on the Settings screen. The Settings screen can be accessed by selecting **SETTINGS** in the selection bar.

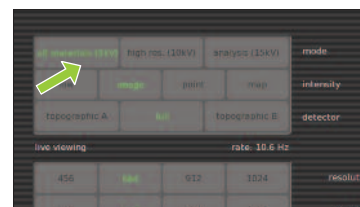


### 5.1 System settings

Here you can adjust and store viewing conditions for electron imaging.

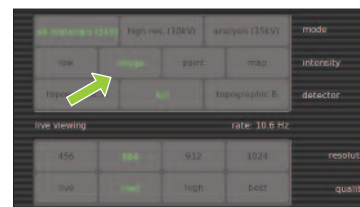
#### 5.1.1 Mode

- All materials** - selects the lowest acceleration voltage (5kV) with less beam penetration which can be used to image all different type of materials.
  - High res.** - selects medium acceleration voltage (10kV) which can be used for high resolution imaging on hard materials.
  - Analysis** - Selects high acceleration voltage (15Kv) for large beam penetration typically used for EDS analysis.
- Select the button with the desired mode.



#### 5.1.2 Intensity

- Low** - selects the lowest beam current/spot size to minimize charging effects on a non conductive sample and for high resolution imaging.
  - Image** - selects medium beam current/spot size for 'most common' imaging.
  - Point** - selects a high beam current which is used for EDS analysis.
  - Map** - selects maximum beam current which is used for EDS analysis.
- Select the button with the desired intensity.



### 5.1.3 Backscatter detector mode

The Phenom detector is a 4-segmented detector that can operate in 2 modes:

#### Full

Image contrast is mainly due to changes in the sample composition.

#### Topographic

Image contrast is mainly due to the sample topography. The signal strength in this mode is lower than in **full** mode so adjustment of contrast and brightness will be necessary.

To compensate for differences in signal strength, an auto contrast/brightness routine will be performed automatically when switching to a different detector mode.

Topographic mode has two settings: **Topographic A** which accentuates topography orientated in the X direction and **Topographic B** which accentuates topography orientated in the Y direction.

- Select the **topographic A**, **full** or **topographic B** button to select the desired detector mode.



## 5.2 Acquired image settings

Here you can adjust and store the conditions for stored images.

### 5.2.1 Quality

Here you can select the desired acquisition speed, picture quality, noise level and exposure time for image acquisition.

The exposure time is indicated above the **acquired image** frame

(e. g. **exposure time**: 0.9 sec).

**Basic** - quick but noisy image acquisition.

**Med(ium)** - fast acquisition with medium noise level.

**High** - high quality acquisition through medium exposure time.

**Best** - picture quality acquisition with long exposure time.

- Select the **basic**, **med**, **high** or **best** button to select the desired acquisition speed, exposure time, picture quality and noise level.



### 5.2.2 Resolution

For **acquired image** mode, pixel **resolution** settings are similar to those available for **live viewing** mode. The higher the resolution, the higher the exposure time.

- Select the desired setting by selecting the appropriate button (**456**, **684**, **1024** or **2048**).



## 5.3 Live viewing settings

Here you can adjust and store viewing conditions for electron imaging.

### 5.3.1 Resolution

Here you can select the desired pixel resolution. Pixel resolution is the number of pixels in the image.

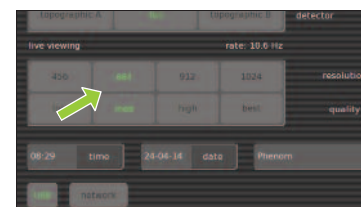
**456** - 456 x 456 pixel resolution.

**684** - 684 x 684 pixel resolution.

**912** - 1024 x 1024 pixel resolution.

**1024** - 2048 x 2048 pixel resolution.

- Select the button with the desired pixel resolution.



### 5.3.2 Quality

Here you can select the desired response speed, picture quality and noise level.

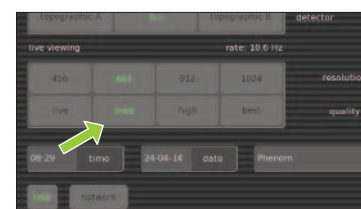
**Live** - highly responsive but noisy.

**Med(ium)** - quickly responding with medium noise level.

**High** - high quality but medium responsive.

**Best** - 'picture' quality but slowly responding.

- Select the **live**, **med**, **high** or **best** button to select the desired response speed, noise level and picture quality.



## 5.3 Date and time

Here you can adjust date (dd-mm-yy format) and time (24 hours format).

### 5.3.1 Adjusting the date

- 1 Select the **date** button.
  - > A keyboard appears on the screen.
- 2 Enter the correct date.
  - > The date will be displayed on the screen and on the databar if the **datetime** function is enabled. For this refer 5.4.1 'Databar'.
- 3 Select **OK** to store the date or **CANCEL** to quit date adjustment.



### 5.3.2 Adjusting the time

- 1 Select the **time** button.
  - > A keyboard appears on the screen.
- 2 Enter the correct time.
  - > The time will be displayed on the screen and on the databar if the **datetime** function is enabled. For this refer 5.4.1 'Databar'.
- 3 Select **OK** to store the time or **CANCEL** to quit time adjustment.



## 5.4 Databar / Image type / UI mode

### 5.4.1 Databar

Here you can select the items that will be displayed on the databar when operating the Phenom. You can also set the databar to be included in your stored images. The following items can be displayed on the databar:

**marker** -  $\mu\text{m}$  marker. Shows current active ruler size. E.g. 10  $\mu\text{m}$ .

**magnify** - shows magnification factor. E.g.  $\times 1000$ .

**FOV** (Field Of View) - shows total picture size. E.g. 10  $\mu\text{m}$ .

**datetime** - shows date and time.

**label** - shows sample name

**det** - shows the detector and its mode.

**holder** - shows the sample holder type that is loaded.

- Select the items to be shown on the databar by selecting the appropriate buttons (**marker**, **magnify**, **FOV**, **datetime**, **label**, **det**, **holder**).
- Select **include databar** if you wish the databar to be included in your stored images.



### 5.4.2 Image type

Here you can select the format you wish to store your images in.

**TIFF** - Lossless compression, larger file sizes.

**JPEG** - Lossy compression but smaller file sizes.

**BMP** - Windows bitmap format; no compression; large files and no measurement data included.

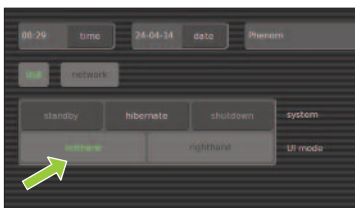
- Select the desired file format by selecting the appropriate button (**TIFF**, **JPEG** or **BMP**).



### 5.4.3 UI mode

Here you can select the desired User Interface mode. You can select whether the button bar on the Image screen will be placed on the left or on the right side of the screen.

- Select the desired position by selecting the **lefthand** button or the **righthand** button.



## 5.5 Label

Here you can enter a sample / file name.


- 1 Select the **label** button.  
> A keyboard appears on the screen.
- 2 Enter a sample name with a maximum of 15 characters.  
> The image will be saved with the name created and a numerical file extension will be added to subsequent images taken.
  - To erase the name, use the backspace button.  
> The name will be displayed left of the button and on the databar if the **label** function is enabled. For this refer 5.4.1 'Databar'.
- 3 Select **OK** to store the sample name or **CANCEL** to quit labeling.



## 5.6 System

To save the electron source and to reduce power consumption, the Phenom can be put into standby or hibernate mode.

### 5.6.1 Standby

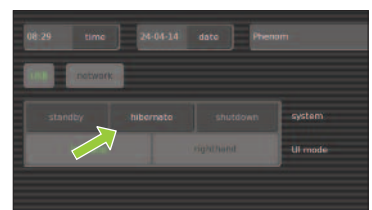
- 1 Select the **standby** button to put the Phenom into standby mode.
    - > 'Do you want to go to standby? Approximate recovery time: 4 minutes.' appears on the screen.
  - 2 Select '✓' to confirm or '✗' to cancel.
    - > The **POWER LED** (fig. 1,1) lights up orange. The Phenom is now in standby mode.
- If the Phenom is not used for one hour, it automatically enters standby mode.
  - You can also press  (fig. 1,1) on the Phenom to put the Phenom in standby mode.



**Notes!**

### 5.6.2 Hibernate (Power saving mode)

- 1 Select **hibernate**.
  - > 'Do you want to go to hibernate? Approximate recovery time: 6 minutes.' appears on the screen.
- 2 Select '✓' to confirm or '✗' to cancel.
  - > The **POWER LED** (fig. 1,1) lights up orange. The Phenom is now in power saving (hibernate) mode.



If the Phenom is not used for 72 hours, it automatically enters hibernate mode.

**Note!**

## 5.7 Advanced settings

Properly adjusted advanced settings highly determine the overall viewing quality of the Phenom and are therefore to be done by experienced users only. To avoid improper adjustment of the settings as well as accidental shutdown of the Phenom, these settings are password protected. Contact the tool owner for the password.

To access the advanced settings:

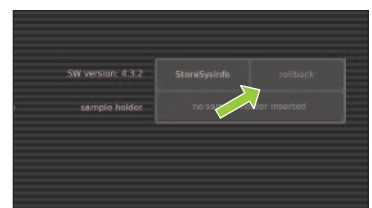
- 1 Select the **advanced** button
  - > A keyboard appears on the screen.
- 2 Enter the log-in PASSWORD (tool owner has received this password from Phenom-World), confirm with OK.
  - > The **SW version / Previous / Rollback / Shutdown / StoreSysInfo** frame appears on the screen and the **ADVANCED** button appears in the screen selection bar.



### 5.7.1 SW (software) version

**SW version** shows the current Phenom software version. If you wish to revert to the previous software version:

- Select **rollback**.
  - > The Phenom now reboots with the previous software version.



**Notes!**

- Only use the **rollback** option in case you encounter problems while upgrading the Phenom software or if you are unable to operate the Phenom when new software is uploaded.
- Information regarding software upgrades will be provided by Customer Support.

## 5.7.2 Shutdown

Only use this option if you have to transport or move the Phenom.

- 1 Select **Shutdown** to prepare the Phenom for complete switch off.
  - > The Phenom now starts preparing for complete switch off. This will take approximately 35 minutes when the Phenom is in operation mode and approximately 5 minutes when the Phenom is in hibernate mode. A countdown timer shows the remaining time until shutdown.
  - > After approximately 5 / 35 minutes the message 'It's now safe to turn off your system' appears.
- 2 Set the **0 / I** switch (fig. 1, 14) on the power supply to **0**.

## 5.7.3 StoreSys(tem)Info

- If a problem occurs you can select **StoreSysInfo** to store a file with the current system information on the USB Flash drive (fig. 1, 10).
  - > The file will be named **SysInfo\_<MachineID>\_yyyy-mm-dd\_hh-mm-ss.xml.gz** and can be found in the **phenom** folder on the USB Flash drive.
- The system information file can be sent to the Phenom help desk: support@phenom-world.com


## 5.7.4 Routine pages

In the **Source Tilt** and **Stigmat** pages you can optimize and store viewing conditions for electron imaging. In the **Network** and **Connectivity** pages you can configure your network settings and configure and activate the **Phenom Remote Assistant**, in the **Service** page you can select a different screen type.

### Notes!

- You can navigate through the Routine pages, using the **<** and **>** buttons in the top-right corner of the screen. With **>** you select the next Routine page; with **<** you go back to the previous Routine page.
- For setting the working distance and loading the sample, refer to 4.3 'Loading samples'; for unloading the sample, refer to 4.9 'Unloading the sample'.

### 5.7.4.1 Source Tilt

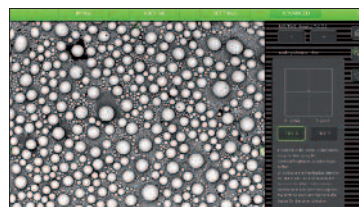
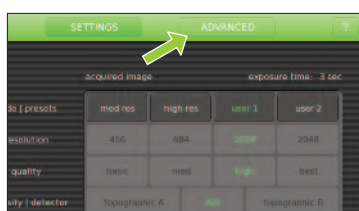
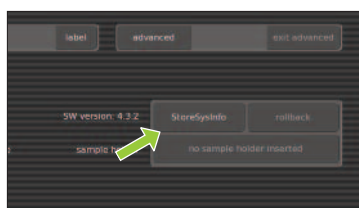
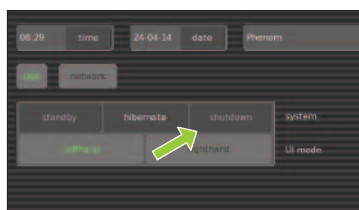
Here you can align the Phenom electron beam (optimize the illumination intensity). Alignment has to be made in electron imaging mode. When in optical imaging mode, first select electron imaging mode by selecting  (fig. 3, 10) or press the **Manual** button on the Source Tilt screen that appears after pressing **ADVANCED**.

- Select the **ADVANCED** button in the selection bar.
  - > The **Source Tilt** screen appears.

### Auto alignment

When using the Auto alignment function, the sample surface should be homogeneous and not contain large contrast differences.

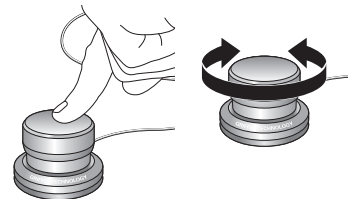
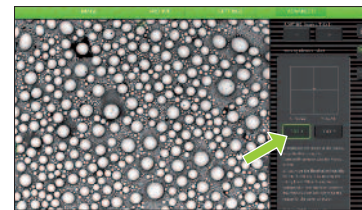
- 1 Select **Auto** to start an automatic Source Tilt alignment.
  - > The Phenom electron beam will now automatically be aligned. This usually takes a few seconds but in some situations may take several minutes.
  - > Adjustments made on the X and Y axis are visible on the screen.
- When automatic Source Tilt alignment is finished, you can fine-tune the adjustment manually, using the rotary knob as described in 'Manual alignment', hereafter.
- 2 Select **'I'** to save the adjustment or **'X'** to reset the previous settings and quit **Source Tilt** setting.
- 3 When finished, select **>** to select the next Routine page (**Stigmat**).





## Manual alignment

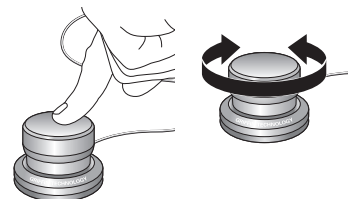
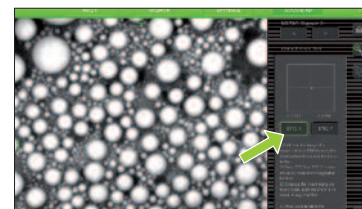
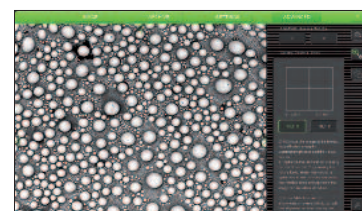
- 1 Select **Manual**.
- 2 Select **TILT X** or **TILT Y** and follow the on-screen instructions for electron beam alignment.
- 3 Use the rotary knob (8) to make the adjustment for **TILT X** and **TILT Y**.  
> *Adjustments made on the X and Y axis are visible on the screen.*
- 4 Select '📁' to save the adjustment or '✕' to reset the previous settings and quit **Source Tilt** setting.



## 5.7.4.2 Stigmat

Here you can adjust the roundness of the electron beam, so that image focus is identical in X and Y directions.

- 1 In the **Source Tilt** screen, select > to access the **Stigmat** screen.  
> *The **Stigmat** screen appears.*
- 2 Select **STIG X** or **STIG Y** and follow the on-screen instructions for sharpness adjustment.
- Use the rotary knob (fig. 1,8) to obtain the sharpest image for **STIG X** and **STIG Y**.  
> *Adjustments made on the X and Y axis are visible on the screen.*
- 3 Select '📁' to save the adjustments or '✕' to cancel and quit Stigmat setting.

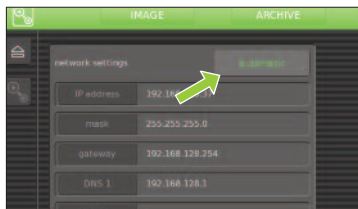


## 5.7.4.3 Network

If the Phenom is connected to your Local Area Network, you can store images on a Windows network share (refer to 4.5.6 and 4.6.6 'Storing Images').

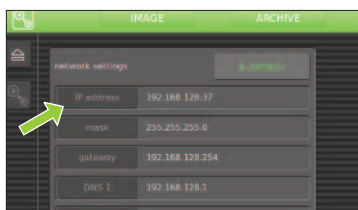
## Network configuration

- 1 Check if the ethernet cable is properly connected between the Phenom Ethernet connector (fig. 2,3) and your LAN (Local Area Network).  
For connection, refer to 3. 'Installing the Phenom' - 'Connections'.  
> *In most corporate networks, connected systems are automatically configured using DHCP (Dynamic Host Configuration Protocol). If the Phenom detects a DHCP server in your network, the message 'Status: DHCP server detected' is displayed in the **Status area** (bottom left of the screen).*  
> *If no DHCP server is detected, the **Status area** will remain empty.*



- 2 If a DHCP server is detected, select the **automatic** button in the **network settings** pane.
  - > **automatic** lights up green on the button. The DHCP server will now automatically configure the Phenom network settings.
  - > During configuration you will see data automatically being entered for all settings. When all network settings have been configured, continue from step 8.

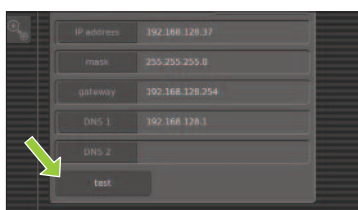
If no DHCP server is detected (check **Status area**), the **automatic** button lights up grey and the five network settings areas will be enabled. Manual configuration of the Phenom network settings is now possible. Continue with step 3.



- 3 Select the **IP address** button.
  - > A keyboard appears.
- 4 Enter the Phenom IP address, confirm by selecting the **OK** button on the keyboard and select the next setting by selecting the appropriate button (**mask**).
- 5 Enter in the data for the other settings (**mask**, **gateway**, **DNS 1** and **DNS 2**) in the same way. Confirm each setting with the **OK** button on the keyboard and select the next setting by selecting the appropriate button.

### Tip!

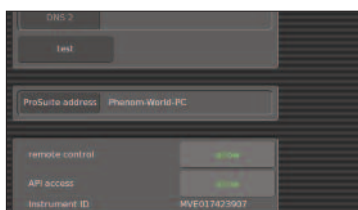
You can copy the values for these settings from a Windows system in your network, or contact your local network administrator.



- 6 After entering the data for all settings, select the **test** button to test the connection.
  - > The Phenom will now try to contact your gateway system.
  - > If all settings have been properly made and connection is established, the message 'Connection test succeeded' is displayed next to the **test** button.
  - > If the message 'Connection test failed' is displayed, check if the correct data have been entered for all settings or contact your network administrator.
- 7 Select '[save]' to save your settings.
  - > The message 'Network configuration settings correctly saved' appears in the **Status area**.
  - > From now on you can store images on a Windows network share.
  - > All settings will be stored in the Phenom memory even after rebooting the Phenom software. The network connection will be automatically restored after reboot or shutdown of the Phenom.

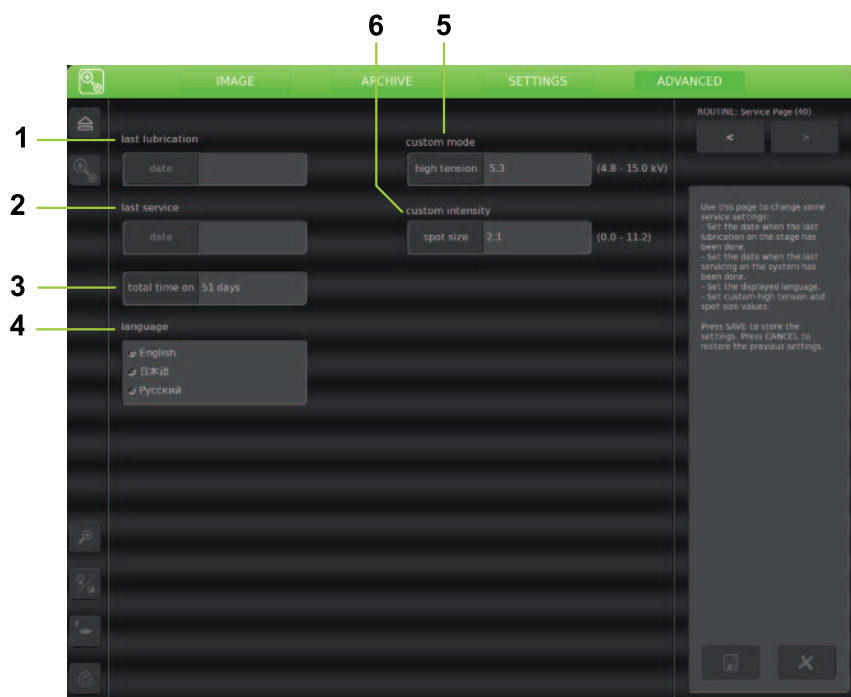
### ProSuite address

In case you have a ProSuite PC next to your Phenom then it is possible to operate both the Phenom and the ProSuite system with a single mouse/keyboard combination. The name or IP address of the ProSuite PC must be filled in to setup the communication. More information can be found in the ProSuite user manual.





## 5.7.4.4 Service



### 1 Last lubrication

Shows the date of the last lubrication (in case preventive maintenance has been performed on your system).

### 2 Last service

Shows the date when service performed the last hardware modification on your system.

### 3 Total time on

Shows and logs the number of days in which the system is powered. When the 'powered on' time has reached 18 months, a message will appear in the Settings screen to plan maintenance of your system. It is strongly recommended to schedule and perform maintenance after 18 months to prevent the turbo pump from damage (dry run).

### 4 Language

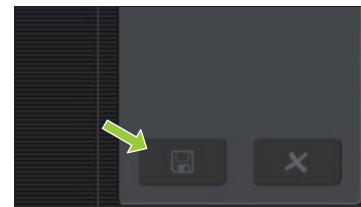
The User Interface supports different languages. After selecting your language and pressing the 'SAVE' button, the display will switch to the selected language.

### 5 Custom mode

Allows a user to fill in their custom high tension (between 4.8kV and 15kV). Selecting a high tension mode in the Settings page will overwrite the Custom setting again.

### 6 Custom intensity

Allows a user to fill in their custom spot size (between 0.0 and 5.9). Increasing the spot size will increase the beam current. Selecting a spot size (intensity) in the Settings page will overwrite the Custom setting again and the default value of that specific setting will appear again.



After selecting a custom mode or intensity, it might be required to optimize the Source tilt setting. Refer to chapter 5.7.4.1 'Source Tilt'.

**Note!**



**Warning!**

## 6. Maintenance

- Do not attempt to remove the microscope cover as this will expose electrical and mechanical hazards.
- Removing the cover will void all warranties.

The Phenom microscope is designed to be low maintenance. Scheduled PM (Planned Maintenance) is required to ensure optimum system performance. If problems with operation do arise, owners can contact Phenom-World's Customer Support:

- address: Dillenburgstraat 9E  
5652 AM Eindhoven  
The Netherlands
- e-mail: [service@phenom-world.com](mailto:service@phenom-world.com)
- phone: +31 (0)40 259 73 72
- fax: +31 (0)40 259 73 71
- opening hours: Monday - Friday, 09:00 - 17:00 (CET)

More information can also be found on our website: [www.phenom-world.com](http://www.phenom-world.com).

### Cleaning the screen

- As required, the screen should be cleaned with a commercially available flat panel display cleaner.
- The screen should only be cleaned when the monitor power is off.

### Cleaning the microscope

- As required the cover surface can be cleaned with a damp cloth.
- The floor of the specimen loading area should be kept dust free by wiping with a dust free dry cloth.

### Cleaning the sample holder

- The sample holder and rubber seal should be kept clean of dust by wiping with a dry cloth or blowing with a commercially available cleaner such as a dust-off can.
- The sample holder should be kept free of stains by wiping with a damp cloth as necessary.
- It is recommend to degrease the holder periodically by cleaning it with isopropyl alcohol applied to a cloth.

### Microscope environment

- Make sure that the table / desk the microscope is placed on is kept clean and dust free.
- The Phenom is equipped with ventilators that force air into the tool. An overload of dust could be harmful to the microscope.

## 7. Troubleshooting

If a fault occurs, first check the points listed below before taking the Phenom for repair. If you are unable to remedy a problem after following the troubleshooting tips, consult Phenom-World's Customer Support:

- address: Dillenburgstraat 9E  
5652 AM Eindhoven  
The Netherlands
- e-mail: [service@phenom-world.com](mailto:service@phenom-world.com)
- phone: +31 (0)40 259 73 72
- fax: +31 (0)40 259 73 71
- opening hours: Monday - Friday, 09:00 - 17:00 (CET, GMT + 1)

More information can also be found on our website: [www.phenom-world.com](http://www.phenom-world.com).

*Under no circumstances should you try to repair the Phenom yourself as this could invalidate the warranty.*

**Note!**


**Warning!** 

### Solution

- Use the Settings screen to select which information appears on the data bar. Refer to 5.4.1 'Databar'.

- Might be caused by (Ferro) magnetic or non-conductive sample. Verify image resolution with a standard SEM sample.
- Adjust the stigmatism values using the Stigmatism option in the Advanced settings menu. Refer to 5.7.4.2 'Stigmatism'.
- If the best values are at the end limits of the adjustment range, call the Phenom help desk.

- Check that detector mode is set to **full** instead of **topographic A** or **B**. Refer to 5.1.1 and 5.2.1 'Detector mode'.
- Check contrast with a standard sample (bare aluminum stub).
- Perform **Source Tilt** routine. Refer to 5.7.4 'Routine pages'.

- Select the  button on the button bar (fig. 3,10).
- Make sure the sample is loaded correctly.
- Check contrast with a standard sample (bare aluminum stub).
- If the sample holder is provided with chip, activate the sample holder using the chip code.

- The Q can be mistaken for an O. Try Q instead of O.

### Symptom

**Data bar (fig. 3(2)) on Image screen (fig. 3) does not contain the information I need.**

**Image resolution is poor at high magnification. Image is fuzzy and cannot be brought into focus.**

**No contrast information** .

**Sample does not automatically move from load position to the NavCam when the door is closed.**

**The Phenom does not accept my code.**

## Symptom

**Turning the rotary knob (fig. 1,9) does not influence the image as expected, based upon the selected icon in the tool bar.**

## Solution

- Ensure that the rotary knob (fig. 1,9) is plugged into one of the USB ports at the front (fig. 1,7) or the rear (fig. 2,6) of the Phenom.  
> A blue light should be visible on the base of the rotary knob.
- Even when the blue light is visible, unplug the rotary knob and then plug it back into the USB port to ensure that connection has been properly made.
- Try one of the other USB ports.


**Auto focus or Auto contrast and brightness do not work properly.**

- Make sure some high contrast features are in the center of the viewing window.
- Use auto contrast / brightness *first*, then auto focus. Refer to 4.6.1. 'Adjusting focus' and 4.6.2 'Adjusting brightness and contrast'
- First perform an Auto focus when fully zoomed out (this will perform a full focus scan). When working at higher magnifications, periodically perform the Auto focus again (this will perform a 'fine focus'). Refer to 4.6.3 'Magnifying the image'.
- Use manual focus and contrast controls to adjust the image. Some samples may not work well in auto mode due to sample charging or other sample related interactions with the electron beam. Refer to 4.5.1 'Adjusting focus' and 4.5.2 'Adjusting brightness and contrast'.
- Focus Optical Image before loading to SEM. Refer to 4.5.1 'Adjusting focus'.
- Adjust contrast and brightness manually. Refer to 4.5.2 'Adjusting brightness and contrast'.


**The Phenom does not recognize my USB flash drive.**

**I am unable to store an image.**

**The StoreSysInfo button is grayed out.**

- Make sure the USB Flash drive (fig. 1,10) is version 2.0.
- Check that the USB Flash drive is not full. The Camera buttons  and **StoreSysInfo** button will be grayed out if there is insufficient storage space on the USB flash drive.
- Unplug and reinsert the USB flash drive into one of the USB ports at the front (fig. 1,7) or the rear (fig. 2,6) of the Phenom.
- If this does not work, insert the USB flash drive (fig. 1,10) into another computer to verify that the USB flash drive is not damaged.
- USB flash drives can be fully erased or reformatted from the Settings menu.
- It can take up to 60 seconds to recognize the USB Flash drive after insertion.
- Try a different USB flash drive.


**System does not recognize that a sample holder has been loaded.**


- Re-insert the sample holder.
- Clean contacts with a pencil rubber (eraser) or general purpose degreaser such as Windex. Reinsert sample holder.
- Place the sample holder, close the door (fig. 1,4) and select the  button (fig. 3,10).
- Check that the seal is clean and centered around the sample holder.
- **No sample holder inserted** (fig. 5,11) lights up when you start imaging without a sample holder inserted.
- Activate the sample holder. Refer to 4.3.1 'Activating the sample holder'.

**Sample holder height adjustment ring does not turn.**

- Replace sample holder.

## Solution

- Check that the  is lit (green).

- Select the  button on the button bar (*fig. 3, 10*) to confirm sample is at unload position.
- Check that the sample holder seal is clean and uniformly seated around the sample holder.
- If this happens during loading, the sample might be too wet (outgassing). Try to unload the sample, remove the sample and load an empty sample holder to verify.
- If unloading is not possible, call Phenom-World's Customer Support.
- If this message shows during installation make sure that the pre-vacuum pumphose is connected and tightened correctly. Refer to 3.3 'Connecting the Phenom'.

- Check that the sample holder seal is clean and uniformly seated around the sample holder.

- Disconnect the power cable of the power supply from the wall outlet, remove the fuse holder (*fig. 1, 16*) from the power supply and check the fuses.  
Replace the fuse if necessary (250V, T5A).

- Call Phenom-World's Customer Support.

- Select Auto to start an automatic Source Tilt alignment. Refer to 5.7.4.1 'Source Tilt'.

- Align the Phenom electron beam (optimize the illumination intensity). Refer to 5.7.4.1 'Source Tilt'.

This can be caused by contamination, charging or a magnetic sample.

- Place a standard high-resolution SEM sample in the sample holder (at short working distance) and redo the stigmator adjustment to verify if the stigmation can be adjusted within the range.
- In case of a magnetic sample, try to demagnetize the sample or use a longer working distance (> 5mm (0.2") below the edge of the sample holder) to improve the stigmation correction.
- Shut down the Phenom and call Phenom-World's Customer Support.

- Shut down the Phenom and call Phenom-World's Customer Support.

## Symptom

**Door (*fig. 1(4)*) does not open.**

**Message 'Potential vacuum failure' appears (Error 512).**

**Message 'Place sample holder correctly' appears.**

**The system does not start up after switching on the power on the power supply.**

**The stage is stuck, makes an unusual sound when it moves or appears to be in the wrong place.**

**The image is dark after switching on the Phenom.**

**The image is partly dark at the lowest magnification factor.**

**Stigmation at the end of range.**

**Pre-vacuum pump makes excessive noise during normal operation.**

Symptom	Solution
The pre-vacuum pump starts but the system does not start up.	<ul style="list-style-type: none"> <li>Press the <b>RESET</b> button (<i>fig. 2.2</i>). Refer to 7.3 'Rebooting the Phenom software'.</li> </ul>
When selecting the buttons on the screen, the system behaves as if selecting a different location.	<ul style="list-style-type: none"> <li>Calibrate the touch screen. <ol style="list-style-type: none"> <li>Press the rotary knob (<i>fig. 1,9</i>) for &gt; 10 seconds.</li> <li>When a cross hair appears on the screen, select it. Continue to select the cross hairs until they no longer appear.</li> </ol> </li> </ul>
Buttons on the touch screen do not respond.	<ul style="list-style-type: none"> <li>Unplug the monitor USB cable (<i>fig. 1,11</i>) from the Phenom USB port (<i>fig. 2,4</i>), then plug it back in.</li> </ul>

## 7.1 Error recovery and reporting

The Phenom is capable of performing a routine self-check. If a parameter is found out of specification, the system will perform an auto recovery.

During self-check you will notice no difference in operating the system. Only when auto recovery is performed, touch screen functionality will be disabled until the operation has been completed.

If auto recovery was not successful, the system displays an alarm message with possible instructions. If the problem persists, consult Phenom-World's Customer Support:

- address: Dillenburgstraat 9E  
5652 AM Eindhoven  
The Netherlands
- e-mail: service@phenom-world.com
- phone: +31 (0)40 259 73 72
- fax: +31 (0)40 259 73 70
- opening hours: Monday - Friday, 09:00 - 17:00 (CET, GMT + 1)

### 7.1.1 Rotary knob state indicator

The Rotary Knob LED has been enabled as an additional indicator to support the error recovery and reporting function. In the event that the system can not recover itself from an error, the rotary knob LED (blue) will flash in conjunction with the error message that is displayed.

If this is the case you will need to contact Phenom-World's Customer Support and provide a brief description of the error.

### 7.1.2 Error messages and warnings

Errors in the image screen are displayed in the status window (*fig. 3, 7*). The error texts that can appear are explained below. In the rare case that multiple errors occur at the same time a combined error text might appear (e.g. Stage/NavCam Error). In addition to the text an error code is displayed. When contacting Phenom-World's Customer Support please provide the error code as well.

**Image screen**

#### Instrument in Error

The Phenom encountered an error that the automatic recovery mechanism doesn't recognize. Phenom-World's Customer Support. Customer Support can use the PRA portal to diagnose the exact error.

#### Optics Error

The Phenom encountered an error in the optics system. It will first attempt automatic recovery. If the problem persists contact Phenom-World's Customer Support.

#### System Error

The Phenom encountered a general system error. It will first attempt automatic recovery. If the problem persists contact Phenom-World's Customer Support.

#### Electronics Error

The Phenom encountered an error in the electronics. It will first attempt automatic recovery. If the problem persists contact Phenom-World's Customer Support.

#### Source Error

The Phenom encountered an error in the electron source. It will first attempt automatic recovery. If the problem persists contact Phenom-World's Customer Support.

#### Persistent Source Error

The Phenom encountered several errors in the electron source. Contact Phenom-World's Customer Support.

#### Vacuum Error

The Phenom encountered an error in the vacuum system. It will first attempt automatic recovery. If the error is caused by a leak in the sample holder, unloading the sample holder might help the recovery process. If the error persists contact Phenom-World's Customer Support.



## Settings screen

### Stage Error

The Phenom encountered an error in the stage system. It will first attempt automatic recovery. It is normal that you hear the stage moving during this process. If the problem persists contact Phenom-World's Customer Support.

### NavCam Error

The Phenom encountered an error in the navigation camera. It will first attempt automatic recovery. It is normal that you hear the navigation camera moving during this process. If the problem persists contact Phenom-World's Customer Support.

### Sample Error

The Phenom encountered an error in the sample holder. Try to unload the sample holder and contact Phenom-World's Customer Support.

### Imaging Error

The Phenom encountered an error in the image engine. It will first attempt automatic recovery. If the problem persists contact Phenom-World's Customer Support.

The following error messages can be displayed when the network storage connection fails:

#### No network cable detected

There is no network cable connected to the Phenom.

- Connect a network cable. For this, refer to chapter 3.3 'Connecting the Phenom'.
- Check that the cable is properly connected to the Phenom Ethernet connector (fig. 2,3) and your router / gateway or cable modem.

#### Permission denied. Please check your username, password and assigned rights.

Possible causes:

- Invalid username or password.
- LAN Manager authentication level is set to 'NTLMv2 only, refuse LM/NTLM'.

#### The provided share name is not available. Please check the share name and ensure you selected the correct server.

Possible cause:

The specified share name is invalid. It doesn't exist or the wrong server is specified.

#### The computer name does not exist or cannot be resolved. Check the server name.

Possible cause:

The name of the specified server cannot be resolved by DNS. Either the name is incorrect or DNS isn't available.

- Check the server name. If it is correct use the ip-address of the server instead of its name.

#### The server or IP address is unreachable

Possible cause:

Unable to connect to server. Invalid IP address, server turned off or network connectivity issue.

- Check the specified server name or ip-address.
- Check that the server is turned on and reachable from other computers.
- Check the Phenom network settings. For this, refer to chapter 5.7.4.3 'Network'.

#### The server does not support a compatible authentication method. Ensure the server supports NTLMv2 authentication.

Possible cause:

Mandatory signing and LAN Manager authentication level incompatible between server and Phenom. Check the authentication settings on the machine that provides the share.

#### Connection failed - check server name

Unable to connect to the server. Check the server name or ip-address.

#### Connection error: <some string>

Unknown error.

- Contact Phenom-World's Customer Support and provide them with the complete error message.

#### Unable to connect to the server or share

- Contact Phenom-World's Customer Support

#### Malformed //server/share name

The server and share name are not specified properly.

- Specify as: //server/share.

## Advanced settings screen

### Network (Routine page 3)

#### Connection test failed

The Phenom is not properly connected to the network.

- Check that the network cable is connected and that the network settings are correct.

## 7.2 Power down

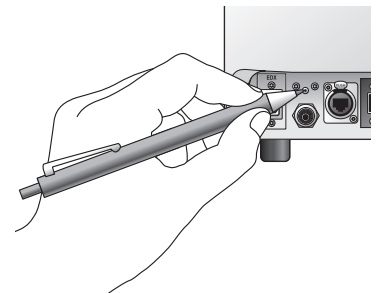
- When the system has been switched off (power off ) for **less than 60 minutes** the system will be back to operational mode in approximately 30 minutes.
- When the system has been switched off (power off) for **more than 60 minutes** the system will be back to operational mode as long as it has been off + 1.5 hour with a minimum of 2.5 hours and a maximum of 13.5 hours.

*For example:* if the system has been switched off for 4 hours, it will be operational again in 5.5 hours.

## 7.3 Rebooting the Phenom software

Only use this function if problems occur that can not be solved by following the suggestions in chapter 7 'Troubleshooting'.

- Reboot the Phenom software by pressing the **RESET** button (*fig. 2,2*).  
The **RESET** button is recessed to prevent accidental reboot of the Phenom software.
- Gently press the **RESET** button, using a pen or paperclip.



## 8. Preparing the Phenom for transport

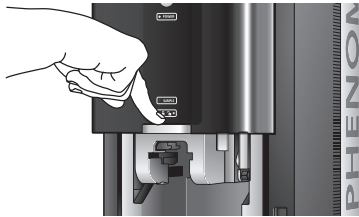
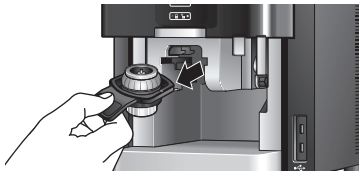
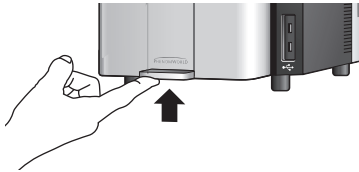
Follow the below procedure in case the Phenom needs to be sent back for maintenance or repair or if the rental period has ended.

### 8.1 Return procedure

- Return the Phenom in the wooden crate in which it arrived.  
If you do not have the original Phenom packaging anymore and/or need assistance in arranging transport contact Phenom-World's Customer Support.

### 8.2 Prepare for packing

The following procedure can also be found on the packaging instructions inside the flight case.



- 1 Unload the sample container. For this, refer to chapter 4.9 'Unloading the sample'.
- 2 Close the door.
- 3 Select **Shutdown** to prepare the Phenom for complete switch off. For this, refer to chapter 5.7.2 'Shutdown'.
  - > The Phenom now starts preparing for complete switch off. This will take approximately 40 minutes.
  - > A timer on the Image screen counts down the time.
  - > After approximately 40 minutes the message 'It is now safe to turn of your system'.
- 4 Now you can set the **0 / I switch** on the power supply to **0** and safely disconnect all system components.

## 8.3 Disconnecting and packing

The following procedure can also be found on the packaging instructions inside the flight case.

### Tools/Materials needed for de-installation

- 14 mm (0.51") or adjustable spanner (wrench);
- plastic packaging bag;
- Phenom flight case;
- Tip N Tell indicators;
- shock watch indicators.

### Hazard Warnings

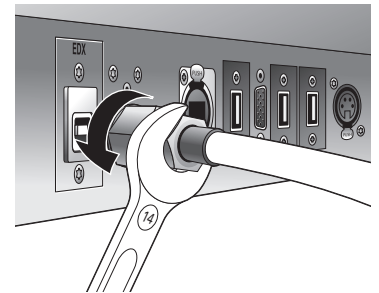
The following hazard(s) are associated with these operations:

- Heavy Lifting (2 persons required);
- Do not perform any of these operations without proper safety training specific to the hazard(s).

- 1 Disconnect all cables from the back of the Phenom. This includes the monitor VGA cable, the USB cable, both power cables, and the pre-vacuum pumphose.
- Loosen the nut at the end of the hose, using a 14 mm (0.51") spanner (wrench).
- 2 Place the plastic packaging bag over the top of the Phenom.  
Gently lift the Phenom and slide the bag under the feet to ensure the Phenom is sealed for the duration of the transportation process.
- 3 Using two people, one at each side, carefully lift the Phenom and place it in the flight case.
- 4 Place the top of the flight case over the Phenom and engage the clamps on each side of the case. There are four clamps.
- 5 Apply Tip N Tell and Shock Indicators to the outside of the flight case if current indicators were tripped during transit.
- 6 Strap the flight case to a standard pallet to prevent any potential damage while the Phenom is in transit.

*If any additional items are to be returned as well, this will be specified by Phenom-World BV.*

**Caution!** 



**Note!**

## 9. Technical specifications

<b>System</b>	<ul style="list-style-type: none"><li>■ Imaging module, 19" monitor (ProX / Pro / Pure), Rotary knob, mouse (ProX / Pro), diaphragm vacuum pump, power supply, USB flash drive.</li></ul>
<b>Imaging Modes</b>	<ul style="list-style-type: none"><li>■ Light Optical Magnification fixed: 20 - 135 x (ProX / Pro) 20 - 120 x, (Pure)</li><li>■ Electron Optical: Magnification range: 80 – 130,000x, digital zoom: 12 x (ProX / Pro) 70 – 30,000x, digital zoom: 12 x (Pure)</li></ul>
<b>Resolution</b>	<ul style="list-style-type: none"><li>■ 14 nm (ProX /Pro) 25 nm (Pure)</li></ul>
<b>Illumination</b>	<ul style="list-style-type: none"><li>■ Light Optical : Selectable axial and off-axis LEDs</li><li>■ Electron Optical: Long lifetime thermionic source (CeB6)</li></ul>
<b>Digital Image Detection</b>	<ul style="list-style-type: none"><li>■ Light Optical Color CCD Camera</li><li>■ Electron Optical: High Sensitivity Backscatter Electron Detector (multi-mode)</li></ul>
<b>Image Format</b>	<ul style="list-style-type: none"><li>■ JPEG, TIFF, BMP</li></ul>
<b>Image Resolution Options</b>	<ul style="list-style-type: none"><li>■ 456 x 456, 684 x 684, 1024 x 1024 and 2048 x 2048 pixels</li></ul>
<b>Data Storage</b>	<ul style="list-style-type: none"><li>■ USB 2.0 Flash drive</li></ul>
<b>Sample Stage</b>	<ul style="list-style-type: none"><li>■ Computer controlled, motorized X and Y</li></ul>
<b>Sample Size</b>	<ul style="list-style-type: none"><li>■ Maximum sample dimensions up to 32 mm (Ø) or 100 mm(h)</li></ul>
<b>Sample Loading Time</b>	<ul style="list-style-type: none"><li>■ Light Optical: &lt; 5s</li><li>■ Electron Optical: &lt; 30s</li></ul>
<b>Dimensions &amp; Weight</b>	<ul style="list-style-type: none"><li>■ Imaging module: 286 mm / 11" (w) x 566 mm / 22" (d) x 495 mm / 19" (h), 50kg / 110 lbs</li><li>■ Diaphragm vacuum pump: 145 mm / 5.5" (w) x 220 / 8.5" (d) x 213 mm / 8" (h) 4.5kg / 9.9 lbs</li><li>■ Power supply: 156 mm / 6" (w) x 300 mm / 12" (h) x 74 mm / 3" (d), 3kg / 6.6 lbs</li><li>■ Monitor: 429 mm / 19" (w) x 379 mm / 15" (h) x 207 mm / 8" (d), 7.9 kg / 17.4 lbs (ProX / Pro / Pure)</li></ul>
<b>Room Temperature</b>	<ul style="list-style-type: none"><li>■ 15 °C ~ 30 °C (59 °F ~ 86 °F)</li></ul>
<b>Humidity</b>	<ul style="list-style-type: none"><li>■ &lt; 80% RH</li></ul>
<b>Power</b>	<ul style="list-style-type: none"><li>■ Single phase AC 110 - 230Volt, 50/60Hz, 300W (max.)</li></ul>
<b>Recommended Table Size</b>	<ul style="list-style-type: none"><li>■ 120 cm / 47" x 75 cm / 9.5", load rating of 100 kg / 220 lbs</li></ul>
<b>Maximum operation altitude</b>	<ul style="list-style-type: none"><li>■ 2000 m</li></ul>

**GPL:**

This device contains software which is covered by the GNU Public License. The source code for these portions of the software is available on request.

**ACE**

[1] ACE(TM), [2]TAO(TM), [3]CIAO(TM), and [4]CoSMIC(TM) (henceforth referred to as "DOC software") are copyrighted by [5]Douglas C., Schmidt and his [6]research group at [7]Washington University, [8]University of California, Irvine, and [9]Vanderbilt University, Copyright © 1993-2005, all rights reserved.

**libtiff**

Copyright © 1988-1997 Sam Leffler.

Copyright © 1991-1997 Silicon Graphics, Inc.

Permission to use, copy, modify, distribute, and sell the libtiff software and its documentation for any purpose is hereby granted without fee.

**libjpeg**

© 1991-1998, Thomas G. Lane

We are required to state that "The Graphics Interchange Format © is the Copyright property of CompuServe Incorporated. GIF(sm) is a Service Mark property of CompuServe Incorporated. "This software is based in part on the work of the Independent JPEG Group".

**gSOAP**

Part of the software embedded in this product is gSOAP software.

Portions created by gSOAP are Copyright © 2001-2004 Robert A. van Engelen, Genivia inc. All Rights Reserved.

THE SOFTWARE IN THIS PRODUCT WAS IN PART PROVIDED BY GENIVIA INC AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

**FreeType:**

Portions of this software are copyright © 2007 The FreeType Project ([www.freetype.org](http://www.freetype.org)). All rights reserved.

**Anti-Grain Geometry Public License**

Anti-Grain Geometry - Version 2.4

Copyright © 2002-2005 Maxim Shemanarev (McSeem)

Permission to copy, use, modify, sell and distribute this software is granted provided this copyright notice appears in all copies.

This software is provided "as is" without express or implied warranty, and with no claim as to its suitability for any purpose.

