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ASH

INSPEX 3

User Manual

FI 806-005



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Section 1: Introduction

The INSPEX 3 (Fig 1.) is a full HD (1080p) digital microscope inspection system that operates without a PC. Inspex 3 is a powerful, flexible, and intuitive HD digital microscope designed around ASH's new 30X HD Zoom Camera module. ASH has developed unique patented high-speed image processing algorithms delivering exceptional image quality, super-fast focus speed, and smooth digital zoom that makes inspection simpler, ergonomic, and efficient.

Inspex 3 is ideal for industries such as medical device, pharma, precision engineering and electronics. The INSPEX 3 platform has a powerful image processing and control engine that delivers superb full live video image quality at 50/60 frames per second with no video latency. This enables the system to be utilised as a solution in a broad range of quality control, testing, assembly, inspection and documentation tasks. The INSPEX 3 provides efficiency, control and traceability of inspection.



Fig 1.

The INSPEX 3 platform has the following new key features and benefits

Superb Image Quality:

Experience unrivalled Full HD video imaging never seen before in an Ash system. The INSPEX 3 offers an enhanced, vibrant, crystal clear image for even the most demanding inspection applications.

Auto-Focus:

The INSPEX 3 features a one-click super fast auto-focus. Place any part under the camera and it will immediately adjust the focus position allowing you to seamlessly inspect your part without having to adjust manual focus or change the height of the part.

Manual Rocker Focus:

Automatically and rapidly adjust the focus using the manual rocker focus icons to inspect the area of interest on a sample part when in manual focus mode. No need to manually adjust to change focus position.

SpotFocus™:

Quickly focus on the area of interest by simply using the mouse pointer. Improve accuracy and reduce human error with the capabilities of Spot Focus*.

AshTruColour™ - True Colour Reproduction:

View true colour reproduction of your sample with the INSPEX 3. Replicate real colours as seen with the naked eye.

Advanced Camera Settings:

The new Advanced Camera Settings give the user more power to enhance the image for a wide range of inspection and measurement capabilities

RTLDC™ Real-Time Lens Distortion Correction*:

Lens distortion is inherent in all microscopes. Image distortion at the outer edges of large samples is automatically corrected by the INSPEX 3.

The INSPEX 3 maintains the following improved great features introduced with the hugely successful INSPEX II.

AshCal™:

INSPEX 3 is factory calibrated before shipping. The AshCal™ feature removes the need for time-consuming zoom change re-calibrations. Its unique ability to stay in calibration over the entire zoom range is one of the many features that differentiate the INSPEX 3 from other digital inspection systems.

Image Capture:

Image stamping with time, date, user details and magnification level allows for traceability of inspection. Capture annotation and measurement values on an image.

Image Stacking:

INSPEX 3's Image Stacking feature automatically captures several images at different focal depths to create a fully focused, sharp, clear image for easy inspection.

2D Measurement, Graticules & Annotation:

Point to point measurement and annotation of samples and creation of graticules.

Save to Network:

Networking enables direct saving to a server or cloud for increased workflow efficiency.

Internal Storage:

Over 10GB for storage of images or overlay files for off-network saving.

On Screen Preset Buttons:

On Screen Preset Buttons allow quick access to pre-configured part-specific system settings.

Save & Recall Inspection Settings:

Custom settings such as brightness, exposure and magnification can be saved and easily recalled enabling standardisation of inspection conditions.

User Privileges:

Access to functionality can be restricted to enable operational control and traceability.

GUI:

The INSPEX 3 GUI (Graphical User Interface) is a custom designed, mouse-controlled interface, delivering intuitive and efficient operation and control of the full application suite.

Camera Control Functions:

Auto and manual focus, exposure, gain, brightness, and white balance customization ensure ultra-sharp, high contrast imaging.

Illumination Options:

INSPEX 3 offers multiple types of quick release, cable free, interchangeable lighting; these include Ring Light, DomeLight, Polarised Light and UV Light to address any inspection application.

*Global Patent applied for by ASH.

Package Contents:

Your INSPEX 3 package contains:

- INSPEX 3
- Quadrant Controllable Ring Light (attached)
- Lens +5 (attached)
- Mouse
- Mouse Mat
- Keyboard
- Power Supply
- HDMI to HDMI Cable
- Mini USB Cable
- USB Memory Stick
- Grounding Cable
- Arm Brackets
- Arm Receiver
- User Manual
- Cleaning Cloth

Please retain the packaging in case there is a need to return the unit for service or repair.

Optional INSPEX 3 System Components:

Lens:

- +10 Plan 1x Lens (AI 100-055)
- +25 Lens (AI 280-053)
- +50 Lens (AI 100-064)

External Keypad KPII: (FI806-002)

- Optional extra for use with Preset function.
- Useful to improve workflow speed and for user access control.

External Keypad KPIII: (FI 806-003)

- Simple to use keypad interface
- Toggle through 5 Preset graticules, improving workflow speed & system usability
- Instant “desktop” access to system functions
- Improves and tailor’s user access
- Removes the risk of any accidental system movement throughout your process
- Ideal for Quality Control & Production environments

Diffused LED Dome Light: (AI 100-045)

- This system component offers diffused LED Light that reduces glare and shadow on the object under inspection.

UV LED Light Ring: (AI 801-421)

- A controllable UV Ring Light, providing optimum shadow-free illumination for a wide range of applications with no external power supply. This is particularly useful for the applications of counterfeiting or conformance coating of PCB’s.

Ash 360° Rotating Viewer: (AI 801-458)

- Inspect objects with a full 360° rotating view, allowing users to rapidly inspect samples from an oblique angle (28° from vertical).
- Useful for inspecting electronic components, medical devices and metal cutting tools.
- The rotating viewer easily attaches to the standard +5 Ash lens

**For full list of system components please contact us: info@ashvision.com*

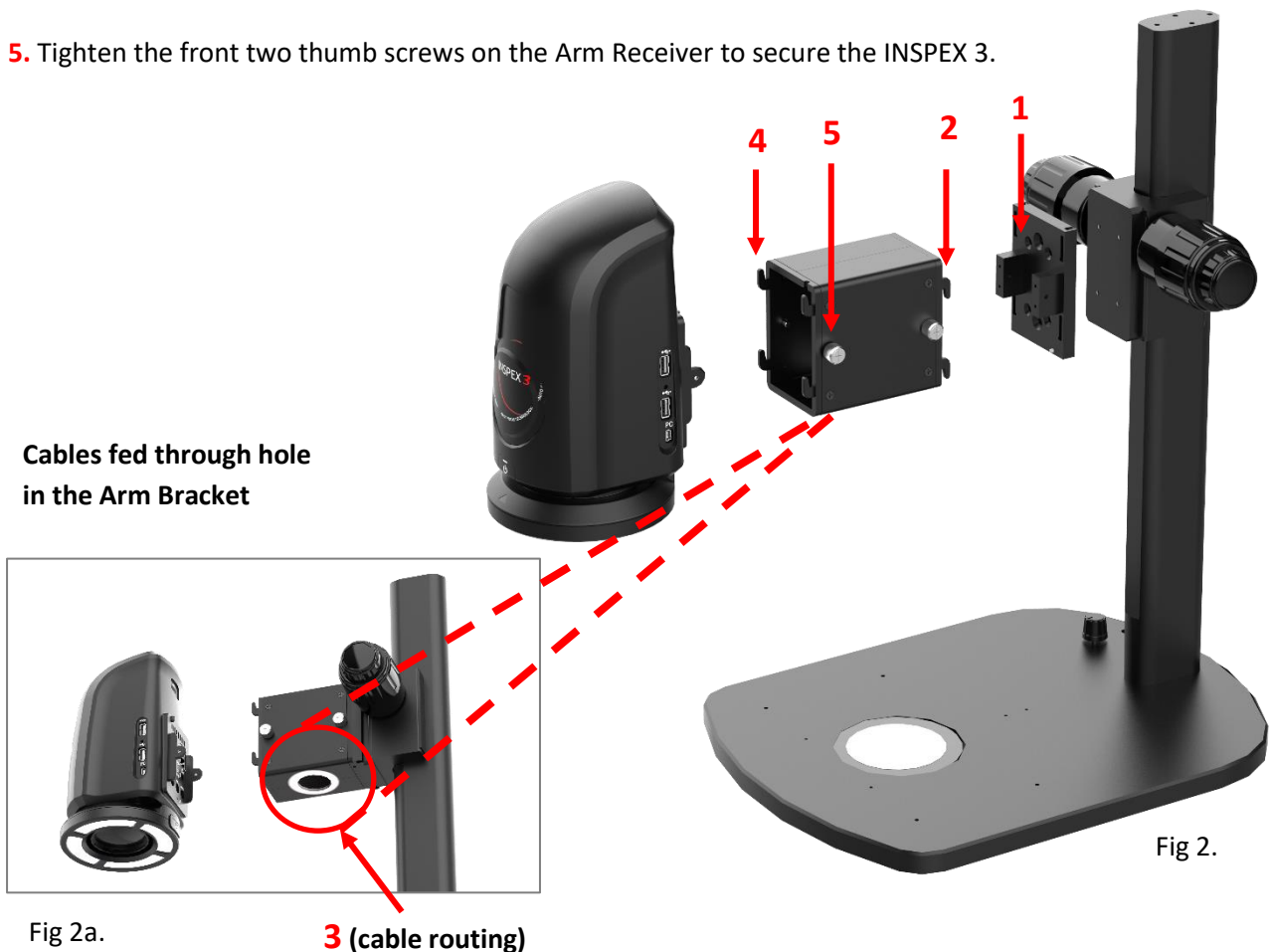
Section 2: Installation

Setup:

1. Attach the Arm Receiver to the Stand Focus block using the 4 screws provided (Fig. 2).
2. Hook the Arm Bracket onto the Arm Receiver using the 4 hooks. Tighten the two thumb screws at the rear of the Arm Receiver.

Cabling (Fig. 2a)

- 3a. Route all cables, such as power supply, External Keypad cables and ESD cables, through the hole of the underside of the Arm Bracket and ground the ESD cable to bench. Route the HDMI cable to the monitor. Insert the mouse dongle and keyboard dongle into the side ports on the INSPEX 3. **Note:** The mouse dongle must be plugged in before powering the INSPEX 3 unit on. This will enable the mouse to be detected,
- 3b. Connect the cables to their corresponding ports on the INSPEX 3.
4. Hook the INSPEX 3 onto the front hooks of the Arm Receiver.
5. Tighten the front two thumb screws on the Arm Receiver to secure the INSPEX 3.



Never look directly at the LED light source for any prolonged period.

Connections

Rear:

1. HDMI connector to TV/Monitor
2. 2 x USB Ports
3. Ethernet Connection for Networking
4. DC Power Jack to Power Supply
5. 3 x Auxiliary Communications Ports
6. Grounding Connection (for grounding cable supplied)


Side:

7. 2 x USB Ports (Recommended to keep mouse dongle located at side USB port, keyboard dongle can go in a rear USB port)
8. Mini USB (PC) Connection

Initial Start-up:

Setting the Correct Focal Plane

Before using the INSPEX 3 the user must set the focal plane of the lens first to suit the height of the object.

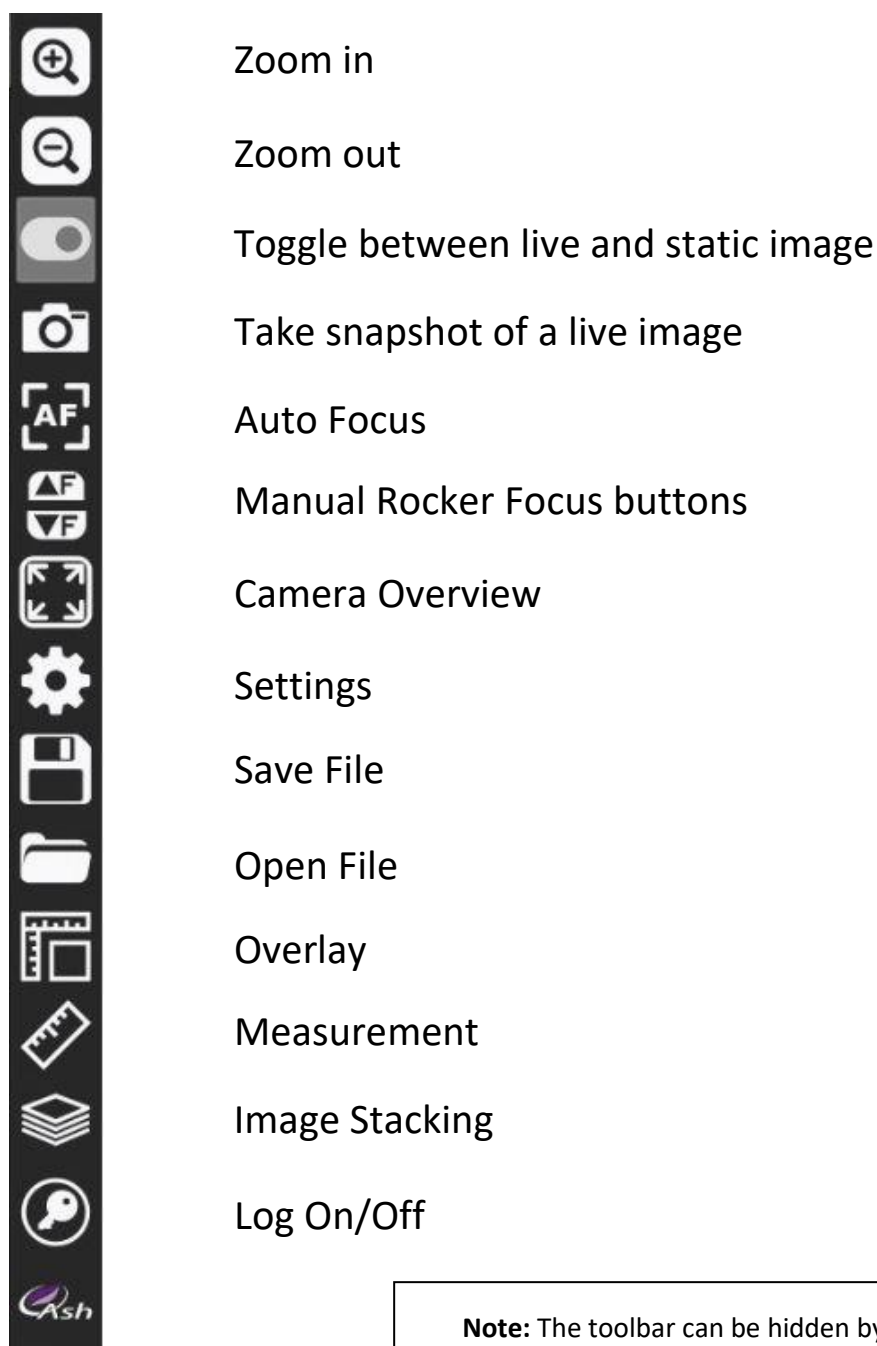
1. Power up the unit.
2. Place the unit in Overview Mode by selecting the Overview tab in the menu bar. 
3. Move the object until the desired viewing area is under the crosshair of the screen.
4. Exit Overview mode by again selecting the Overview tab in the menu bar.
5. Zoom to **full magnification**.
6. Manually adjust the height of the INSPEX 3 up or down on the stand via focus block adjustment until the object is in focus. You have now achieved your optimal focal point.
7. When the focal plane is set **you can only measure points at that plane**. If the user wishes to view a different object with a different height, then the focal point will have to be set again.
8. To recall an overlay Graticule file, you must also ensure the focal plane is set prior to opening the overlay.

Section 3: System Navigation

The Inspex 3 features an intuitive GUI (Graphical User Interface) for a simple and familiar user experience.

The Toolbar

INSPEX 3 toolbar icons (Fig 3):



Note: The toolbar can be hidden by selecting 'AutoHide Main Toolbar' from the System Settings. (Page 15)

Toolbar Icons Explained:

3.1 : Toggle

Use the toggle icon to switch between **LIVE** and **Saved/Captured** images. (an image must first be captured for Toggle to enable).



3.2 : Snapshot

To capture an image from a **Live** video feed, click on the Snapshot icon. A still image from the camera is captured and displayed. To switch back to the Live video feed, use the Toggle icon as explained above.



3.3 : Auto Focus

When this icon is highlighted in **green**, the INSPEX 3 is in autofocus. Click the icon to disable/enable autofocus. The icon will flash red as the camera makes a refocus if a sample is moved.



When AF is enabled measurements are **not possible and measurement tools deactivate; suitable for inspection only.*

If Autofocus on a sample cannot be achieved on a surface the working height may not be set correctly, adjust working height to correct.

3.4 : SpotFocus™

When autofocus has been enabled an additional focus feature becomes active, Spot Focus. The Spot Focus icon appears in place of the Rocker focus buttons, when clicked this intuitive feature allows the user to quickly focus on an area of interest by simply using the mouse pointer. Hold left click and drag to change the spot focus size.



3.5 : Manual Rocker Focus

Automatically and rapidly adjust the focus using the focus rocker icons to inspect the area of interest on a sample part when in manual focus mode. Use the Rocker focus up button to fine adjust focus and increase focal length, use the Rocker focus down button to decrease focal length.



3.6 : Overview

The Overview function will move the zoom position to a low magnification for an overview of the object being viewed and allow centring. A crosshair is provided for targeting areas of interest. When the Overview icon is clicked again, the camera will return to the original zoom level.



3.7 : Settings



3.7 a.1: Camera

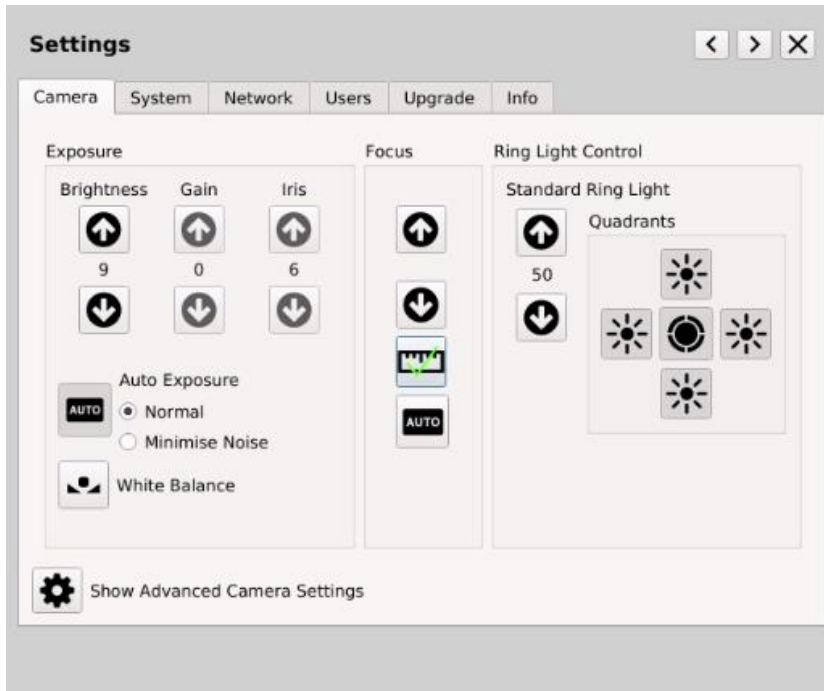


Fig 4.

Exposure:

Switch between Auto & Manual exposure modes. In Auto Exposure mode, the Gain and Iris settings are automatically adjusted, the user can adjust the image brightness if required. In Manual Exposure mode the user can adjust both the gain and the iris settings of the camera. Higher gain values will increase noise on the image. Lower iris value will reduce the amount of light entering the camera but will improve focus depth.

Auto Exposure has 2 settings that can be selected according to specific inspection needs, these are; Normal and Minimise Noise. Camera settings are adjusted when selected and this may improve an inspection scenario.


(note: when Auto Exposure is enabled Gain, Iris and Shutter adjustments are disabled and automatically adjusted. The values for these disabled settings are not relevant when auto exposure is set active)


White Balance:

White balance can be carried out to colour balance the camera

Focus: Switch between Auto & Manual Focus modes. In Manual mode the focal point can be set by the user (this can also be done by using the Rocker Focus buttons on the main menu)

Please note:

Measurements are only valid if the measurement icon shows. 

If the focus settings are not valid for measurement then click on the icon to set the focus to measurement mode. 

Lighting Control:

Select which ringlight LED quadrant to turn on/off. Set the intensity value of the LEDs and toggle all the LEDs ON/OFF. The INSPEX 3 will auto-detect the type of ringlight that is connected.

** When the INSPEX 3 Diffused Domelight is connected, the quadrant buttons are disabled.*

3.7 a.2: Advanced Camera Settings When the **Show Advanced Camera Settings** button in Camera Settings is clicked some additional camera settings can be accessed

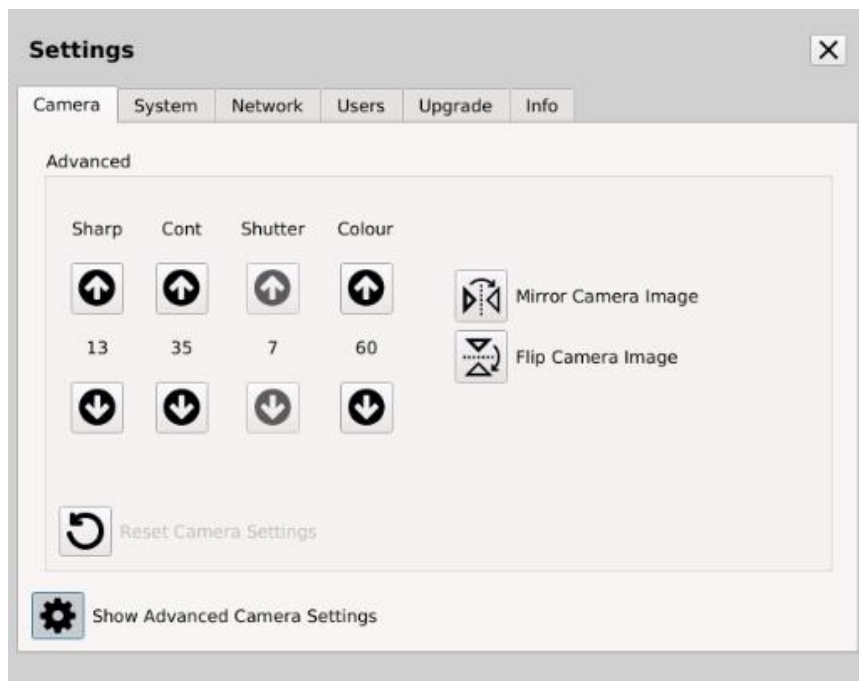


Fig 5.

Sharp:

Sharpness control is a function which adjusts the edge enhancement of objects. There are 15 levels of adjustment, a low value will produce a softer image vs a high value will produce a sharper image.

Advanced Camera Settings continued (Fig 5):

Cont:

Cont or Contrast allows the user to adjust the contrast of an image. The contrast level range can be adjusted from 1 to 64.

Note: A higher contrast value coupled with a high sharpness value can introduce noise into an image

Shutter:

When Auto Exposure is deselected the shutter speed can be adjusted. Increasing the value speeds up the shutter allowing less light to travel to the camera sensor, decreasing does the reverse.

Colour:

The camera colour can be adjusted to enhance the vibrancy of colours making use of the **AshTruColour™** algorithm.

Mirror and Flip:

The camera image can be mirrored or flipped to suit the needs of an application or the orientation of the camera head.

*Any camera changes that wish to be applied can be saved via Settings>System>Save Startup Settings or can be saved for a specific inspection or measurement by saving a .ash measurement file. These specific camera settings will reload when the file is reopened

3.7 b: System Settings

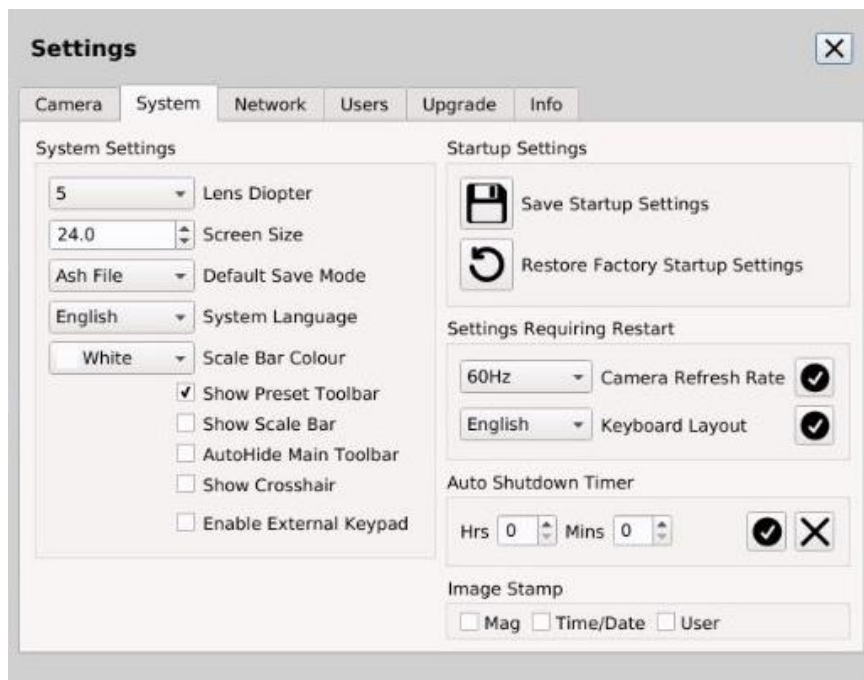


Fig 6.

Lens Diopter:

Choose a lens from the drop-down list to correspond with the lens that has been fit to the INSPEX 3.

System Settings continued:

Screen Size: Enter the correct screen size in order to correctly display the magnification.

Default Save Mode: Set the default file type to image files or measurement files.

Language: Select your system language.

Scale Bar Colour: Change the on-screen scale bar colour if required.

Show Preset Toolbar: Enable if using defined presets (see Presets section p36).

Show Scale Bar: Enable to show on-screen scale bar.

Auto-Hide Main Toolbar: To auto-hide the toolbar on the main window, enable this option. To reveal the toolbar, move the mouse over the toolbar area.

Show Crosshair: Display full screen Crosshair when selected.

Enable External Keypad: Enable this tick box if connecting and using a KP111.

System: Start-up Settings:

Save: Save the current settings as the System Startup Settings.

Restore: Factory (default) System Settings. (When performing, images will not be deleted. However, a backup is always recommended if performing this.)

Camera Refresh Rate: Set Frame Rate to 50Hz or 60Hz.

Keyboard Layout: Can be currently set to one of 4 configurations, they are; English, German, French or Swiss.

Auto Shutdown Timer:

We have always considered the environment when designing our systems. For this reason, we have introduced an Auto Shutdown Timer, to automatically shut-down the system at a specific time to save energy. This feature allows the user to set a shutdown time after start-up. Once the user has set the specific time and selected "Apply", the user is prompted with a message to confirm that this

Auto Shutdown Timer continued:

has been saved. This message will read: 'Auto Shutdown Timer Set. Please save start-up settings to make change persistent'.

After saving to start-up settings, the unit will power off after the set time has expired. To unset this, set the values to zero and select "Apply". The user will receive a confirmation message stating: 'Auto Shutdown Timer Disabled. Please save start-up settings to make change persistent'.

Image Stamp: Prints the magnification, time & date and/or user onto an image when taking a snapshot or saving a measurement/image file.

Settings N.B.* *If you are viewing a particular object which requires custom settings such as Brightness, Exposure, Magnification, etc.(System settings) then you may want to **save** them as a .ash file so you can easily **load** them if viewing the object again in the future as a graticule or measurement.
The .ash file holds all unique system settings for that file.*

3.7 c: Network Settings

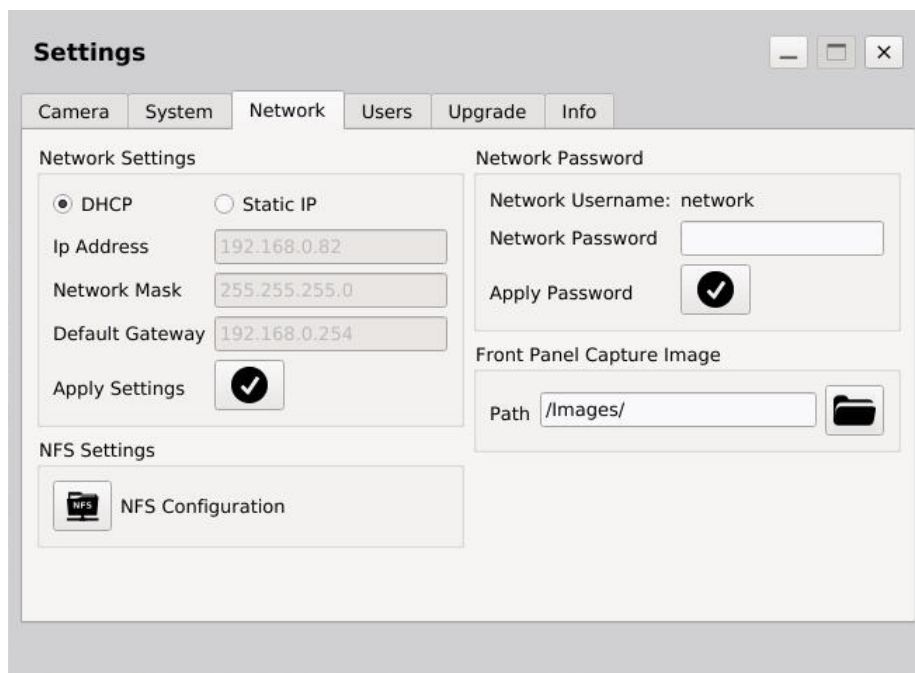


Fig 7.

The INSPEX 3 supports Networking via the Ethernet port on the back. The network settings (Fig. 7) can be configured automatically using (DHCP) Dynamic Host Configuration Protocol or manually by assigning a Static IP, Network Mask and Default Gateway.

To configure the DHCP, the INSPEX 3 **must** be connected to a network via a straight ethernet cable. Select DHCP and press apply and the network configuration will be automatically applied.

To configure the network with a Static IP, select Static IP and enter Static IP, Network Mask and Default Gateway. Press Apply and the Networks Settings will be updated with the changes.

INSPEX 3 SFTP Network connection:

The INSPEX 3 supports (SFTP) Secure File Transfer Protocol, allowing all files to be accessed from the INSPEX 3 as a Read Only Drive. Any operating system software that supports SFTP should work but below is software that has been verified by Ash Technologies.

For *Microsoft Windows*, Ash Technologies has tested and recommends WinSCP. This is open source and is available at <https://winscp.net> .

When using this software, "Host" is the INSPEX 3 IP address which can be found in Settings/Network.

For *Linux* this is already supported in the mainline distributions.

For *Android* Turbo Client has been tested and verified to work.

Username: network

Password: The network password needs to be set if you want to connect the INSPEX 3 to a network.

The User can then change the password by entering a new password and clicking Apply.

Network Settings continued:

NFS Configuration:

The INSPEX 3 can connect to a Network File System (NFS) server running on a Linux/Windows machine.

To connect to the NFS server you will need the **IP Address** of the server and the full **Path** to the shared folder. These details can be obtained from your IT Administrator.

It should be similar to IP Address: 192.168.0.11 Path: /home/user/nfs_server_directory

Click the NFS Configuration button in the Settings->Network tab.

Enter the NFS server address in the following format.

IPAddress:Path

Linux server: (example: 192.168.0.67:/home/user/nfs_server_directory)

Windows 10: (example: 192.168.0.11:/c/nfs_server_directory). (using FreeNFS, HaneWin)

Currently we do not support authentication with Windows Server



Fig. 8

Hard Mount: If the server connection is lost while navigating the NFS directory, the system may stall and will need to be manually restarted to reconnect.

Soft Mount: If the server connection is lost while navigating the NFS directory, the system will not stall but data corruption may occur.

Click Connect. The INSPEX 3 will verify the server address and mount a new folder in the top directory of INSPEX 3. If the connection is a success, Close the NFS Configuration window. Click on the Open File icon to see a new folder called NFS. This is your shared Network folder.

Auto connect will automatically connect to the server when the unit starts.

It is recommended to back up all NFS data periodically.

NB Username:** ‘network’ applies for all languages, **DO NOT TRANSLATE**. Some software versions may translate Network Username: network to selected language translation. ‘network’ is the username regardless of language and cannot be changed.

This applies for both SFTP and NFS connections.

For further detail and troubleshooting see supplied network document or contact

<mailto:info@ashvision.com>

Front Panel Capture Image:

This feature will allow the user to define a default path location for images captured by the Capture button on the optional accessory the *External Keypad KP111*. This can be set to a local or network location.

3.7 d: Users Settings

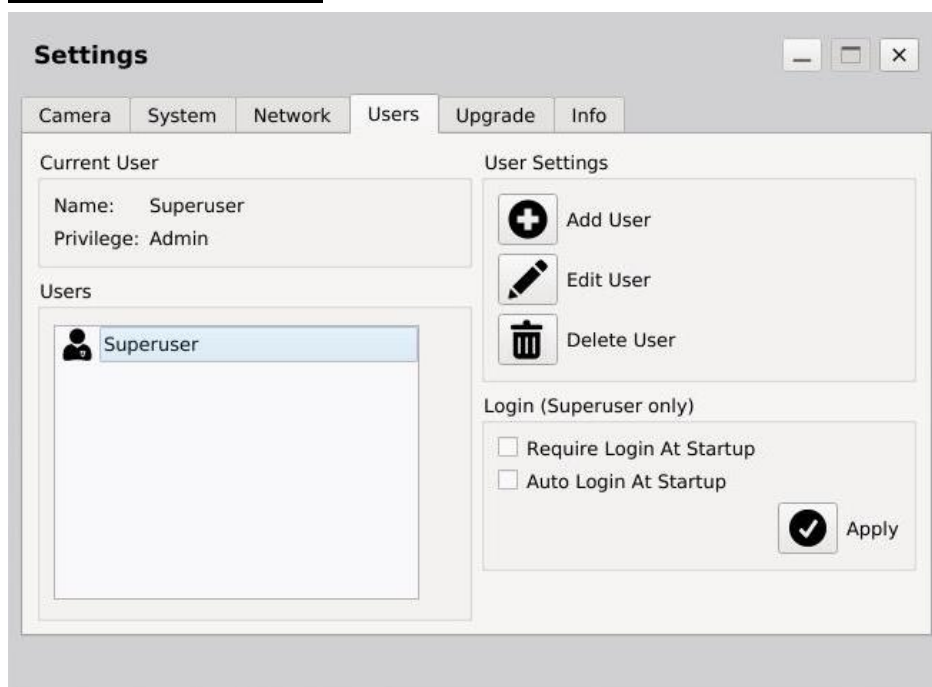


Fig 9. User Settings

There are 3 levels of access on the INSPEX 3. **Superuser**, **Admin** and **User**.

Superuser: Complete control of all functions with no restrictions. The Superuser can create, edit and limit all “Admin” and “User” accounts. Please see Fig. 9a. The Superuser can enable/disable a login requirement at startup.

Note: Once additional accounts are created, the Superuser must enable login at startup, this will enable the Login/Log-off feature.

**There is only one superuser and this user cannot be deleted.*

It is important to take note of the Superuser password if it is changed or before you enable login at Startup.

Admin: Admin can create and edit “Admin” and “User” accounts. Set Access to System functions, Apps and Networking for User accounts.

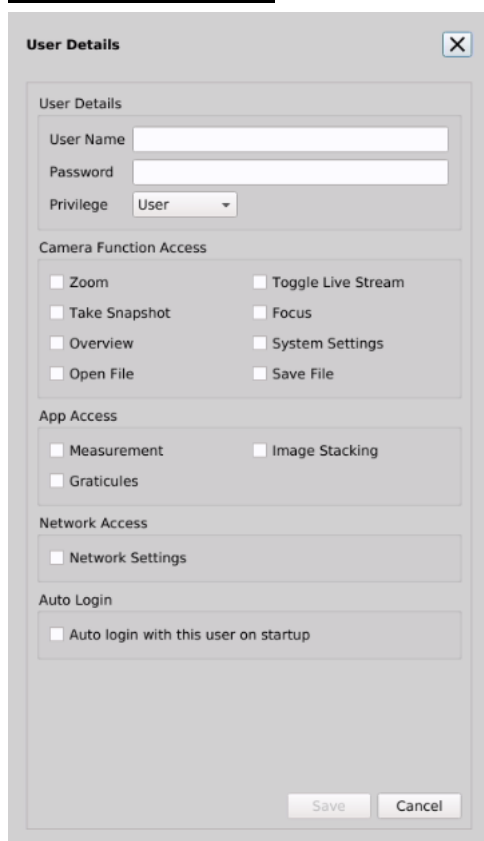
User: The User privileges are set by either the “Admin” or the “Superuser”. A User cannot create or edit another account.

⚠ Superuser Login ⚠

Username: **Superuser**
 Password: **password123**

You can view the Superuser password by selecting Superuser and clicking the edit button.

Users Continued:



The image shows a 'User Details' dialog box with a close button (X) in the top right corner. The dialog is organized into several sections:

- User Details:** Contains three input fields: 'User Name', 'Password', and 'Privilege'. The 'Privilege' dropdown menu is currently set to 'User'.
- Camera Function Access:** A grid of eight checkboxes: Zoom, Take Snapshot, Overview, Open File, Toggle Live Stream, Focus, System Settings, and Save File.
- App Access:** Three checkboxes: Measurement, Image Stacking, and Graticules.
- Network Access:** One checkbox: Network Settings.
- Auto Login:** One checkbox: Auto login with this user on startup.

At the bottom of the dialog are two buttons: 'Save' and 'Cancel'.

Fig 9a. User details

3.7 e: Upgrade Settings



System Upgrades:

To perform a system upgrade, insert a USB Memory Stick containing the upgrade file*. Click on the “Upgrade System Software” button to upload the files. Upgrades should be installed individually for Camera Software and Ringlight firmware. (Fig. 10)

**Upgrade files, if available, can be obtained from Ash. Upgrades are included in your standard warranty, which is valid one year from purchase. (Please see page 38 for full warranty policy). Please contact Ash for further details on upgrades.*

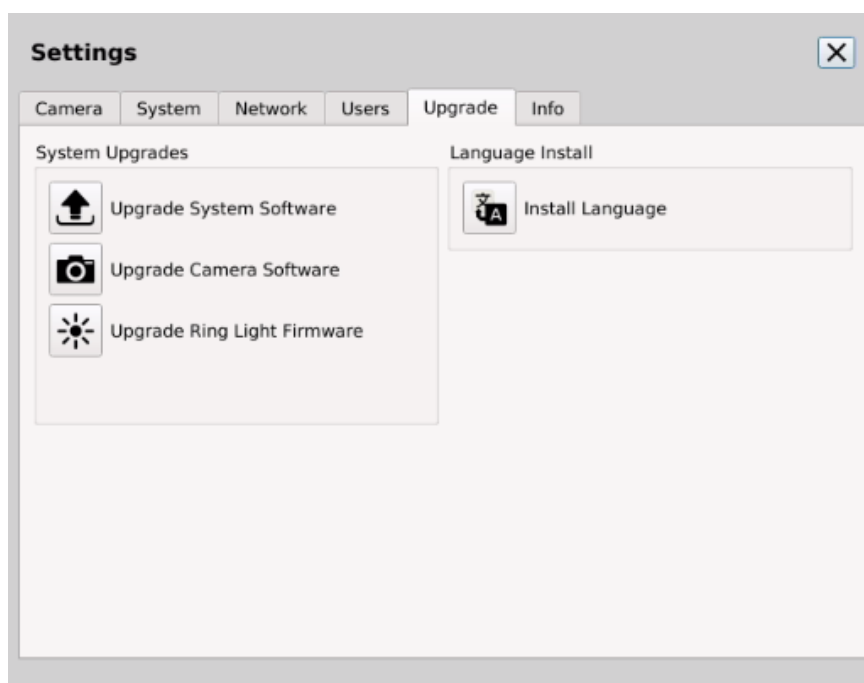


Fig. 10

Language Install:

Additional Language packages may also be installed by clicking the “Install Language” button and selecting the .alf file.

3.7 f: Information Settings

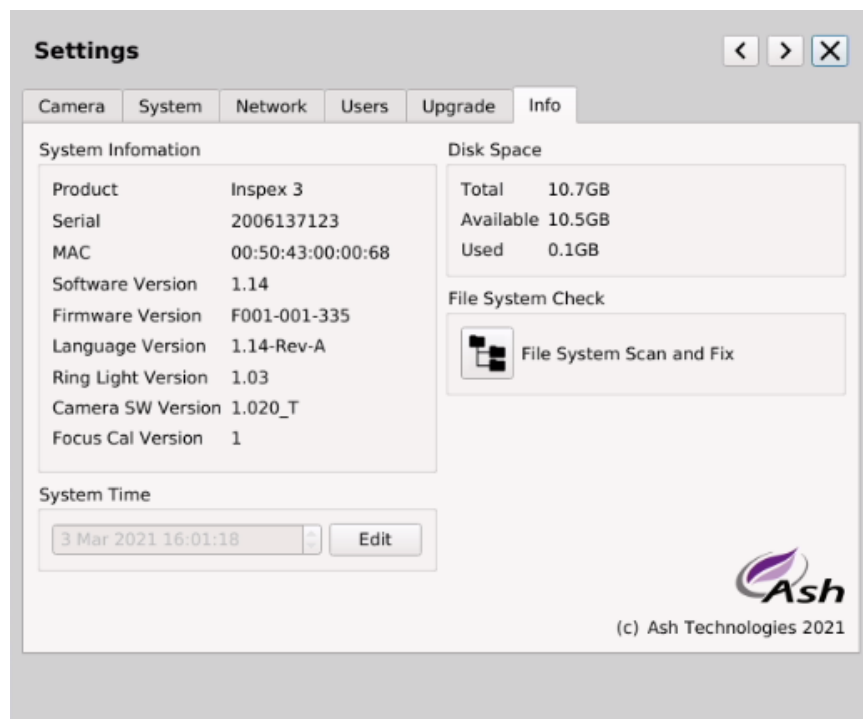


Fig. 11 Info

System Information:

System information shows details of the software, firmware and language versions, serial number, MAC address and Ring Light Version (if attached). **NB*** Please note or screenshot this detail if system update or troubleshooting is required.

Disk Space:

Disk space displays the total, available and used space on the system.

System Time:

Click the Edit button to change the system time and date to your locality.

File System Check:

The INSPEX 3 provides a File System Check utility that can be used to scan the internal file system for any errors, and repair any issues detected.

3.8: Save File

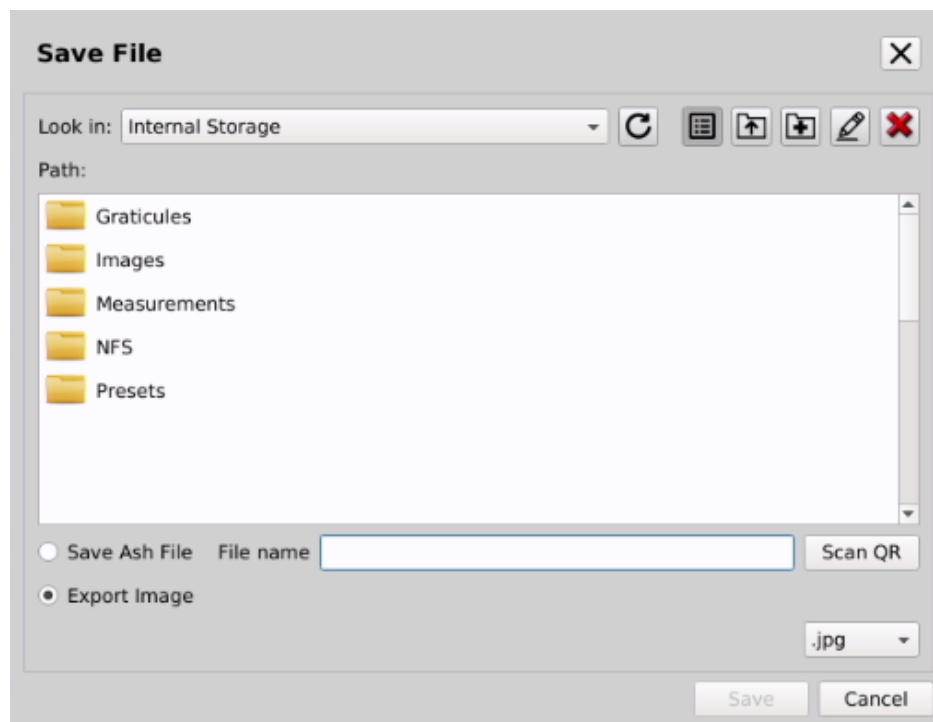


Fig. 12 Save File



If using external storage, ensure that the device is formatted to **FAT32**
(max. allowable size 16Gb)

When saving images, choose to save to Internal Storage, USB Key or NFS folder location.

A file can be saved in the following formats:

a. Measurement:

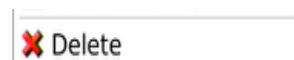
A measurement file is saved as a **.ash** format (Ash Technologies specific format). When the file is reopened on the INSPEX 3 as a measurement, the measurements can then be edited. They cannot be edited when opened via the Overlay Graticule function. This file is only recognized by INSPEX 3 units and cannot be opened on a PC.

b. Image:

An image is saved as a *.bmp* or *.jpg*. Any measurement, text, shapes or grids are saved onto the image and are not editable when the image is reopened. The *.bmp* and *.jpg* are standard image formats and can be opened on any computer.

3.9: Open File

To open an image (*.bmp* / *.jpg*), or a measurement file(*.ash*), click on the open file icon. Files can be accessed here from internal or USB storage. Folders or files can also be created or deleted. To delete an item, select open file, right-click the file and select the delete option.



Enable Open File Browser tick box for easier file/image navigation.



The INSPEX 3 will only recognize ASCII filenames. UNICODE file names are not supported.

Note: .ash files from other Ash measurement systems i.e. Inspex II and Omni are not compatible for import into the Inspex 3

3.10: Overlay (Graticule)



The Overlay feature can be used to show an overlay of reference edges or dimensions, giving the operator a Go/No-Go tool for multiple part inspections.

To Create An Overlay:

- Place the sample under the INSPEX 3 and set the focal plane. Do this by zooming to full magnification. Manually adjust the height of the INSPEX 3 until the image is in focus. (**Reference page 10 for how to set the focal point*).
- Adjust the zoom and illumination settings to the required levels.
- Take a Snapshot to maintain accuracy and avoid possible influence of vibration.
- Click on the Measurement icon. Use the tools to add dimensions, shapes and text over the image. Click on the Save icon and choose 'Save As Ash File'.
- To open and use this newly created file, click on the Overlay icon. When opening this file, the INSPEX 3 will recall any dimensions, shapes, or text that was saved. It will also load the zoom position and illumination settings.
- Samples can now be aligned with the overlay for qualitative analysis.

Using existing Overlay(s):

- Press the Overlay button and select the required Overlay file.
- Press open and the Overlay will be displayed at the correct magnification and lighting settings.



An Overlay contains the System settings specific to that file and will adjust lens diopter, illumination, magnification and so forth when opened. Note: Current settings will be overwritten when an Overlay/Measurement file has been opened.

Use the Overlay function to show an overlay of reference edges or dimensions i.e. as a Go/No-Go tool. The measurement function should be disabled in user level (see *p20-21*) to prevent unauthorized editing of created Overlays.

Alternative Method of Creating Overlays Using An Image Editor

- Create a new image 1920 pixels wide and 1080 pixels high in your image editor application.
- Flood-fill the image with 0xFFAEC9 color in RGB format.
- Draw the Overlay lines required in any scale or colour (**except 0xFFAEC9*).
- Make a note of the mm/pixel ratio by selecting a line/distance that has a known length in mm.
- Count the number of pixels of this line.
- The mm to pixel ratio is the length in mm divided by number of pixels.

Rename the .bmp file to **.ash** which is the standard format for all Ash measurement and overlay files.

- Copy the file to a USB memory stick.
- Insert the USB Key into the INSPEX 3 and click on the Overlay icon.
- Select USB Key from the 'Look In' drop down menu on the INSPEX 3 system.
- Browse to the Overlay .ash file.
- Select the file or right-click to copy and paste to the Internal Storage – then select.
- You will be prompted to select the mm/pixel ratio. If unknown, then adjust the zoom until the overlay aligns with your part.
- Click save.

Save Merged Overlay Image

When an Overlay/Preset has been loaded, it is possible to add additional measurements or annotation. Save this detail as a Merged Overlay Image (Fig.10) for reference, or alternatively save an observation. It can only be exported as an image .jpg/.bmp and **not** as an .ash file. This is to prevent the Overlay/Preset from being accidentally overwritten.

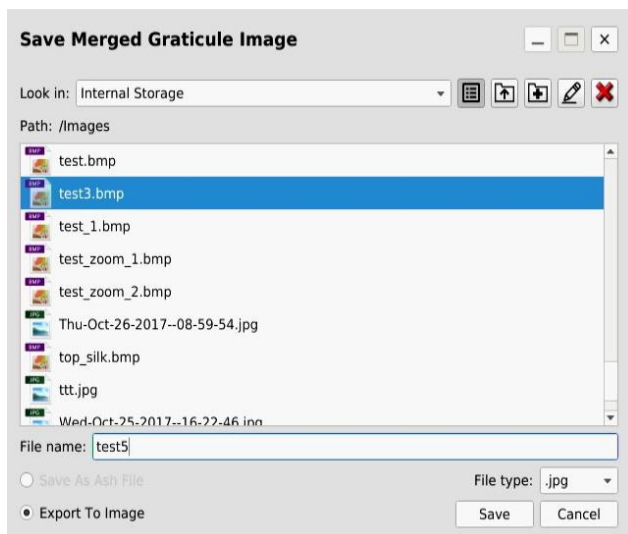


Fig. 13

3.11: Measurement & Annotation:



Add measurements, drawing objects or annotations when the Measurement and Annotation Application is used. Simply draw lines, measurements or insert text onto a static or live image. Save these drawings and notes with the image, directly to the INSPEX 3 memory, network location or to a USB key.

The Toolbar



Fig. 14 Measurement Toolbar

Toolbar Explained: (Fig. 14)

1. Open Measurement Settings
2. Selection tool
3. Restore view: restore snapshot zoom
4. Draw lines
5. Draw lines with dimensions
6. Add Text, Edit Text, Object colour
7. Line width
8. Grid on/off
9. Delete item
10. Clear all objects

Measurement Settings (Fig 15):

*Note: This is in a different location to main settings

- Line Style:** Selects the type of line to be used.
- Unit Type:** Set unit type to be Metric or Imperial.
- Precision:** Choose the number of decimal places.
- Ash Image Format:** Set default output format to be .bmp or .jpg files (.jpg to reduce file size)
- Antialiasing:** Enable this to smooth line curves.
- Show/Hide Dim Text:** Show/Hide Dimension text if required

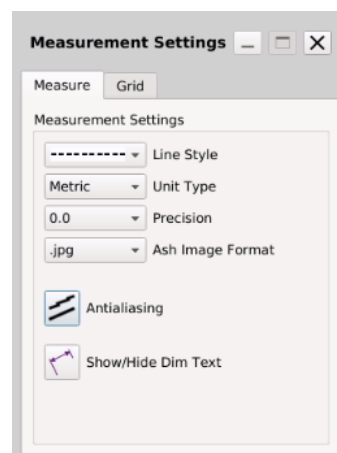


Fig. 15 measurement settings

Grid Settings:

Grid Spacing: Sets to a multiple of a unit type. Depending if the Measurement Settings are set to inches or mm, the default grid will have a spacing of 1mm or 1 inch.

Grid Line Width: Pixel width of the line.

Grid Colour: Set the grid line colour.

Grid Type: Lines or dots.



A measurement contains the System Settings specific to that measurement file and will adjust lens diopter, illumination magnification and so forth, when opened. The live view will **not** revert to current settings.

System Setup for Measurement:

- To set the focal point of the lens to the area being measured, follow the steps below.
- Click the Overview icon (see page 12).
- Move the area of interest of your object to the crosshair on screen.
- Exit Overview by pressing the Overview button again.
- Zoom in to **full magnification**.
- Bring the object into focus by manually adjusting the height of the INSPEX 3 on the stand until the image is in focus.
- The focal point of the INSPEX 3 is now set to the height of the area of interest on your object.
- **DO NOT manually adjust the height of the object or the height of the INSPEX 3.**
- You can now zoom out from full magnification (via zoom out icon) until the area you wish to measure can be viewed.
- You can now zoom in and out freely to take measurements of areas on the same plane as the focal point. The INSPEX 3 will automatically adjust the measurement value as you zoom.

For best accuracy at low magnifications, try to align the area being measured to the center third of the screen.

- If you wish to measure another area of interest which is at a different height/plane, then the focal point will need to be set again.

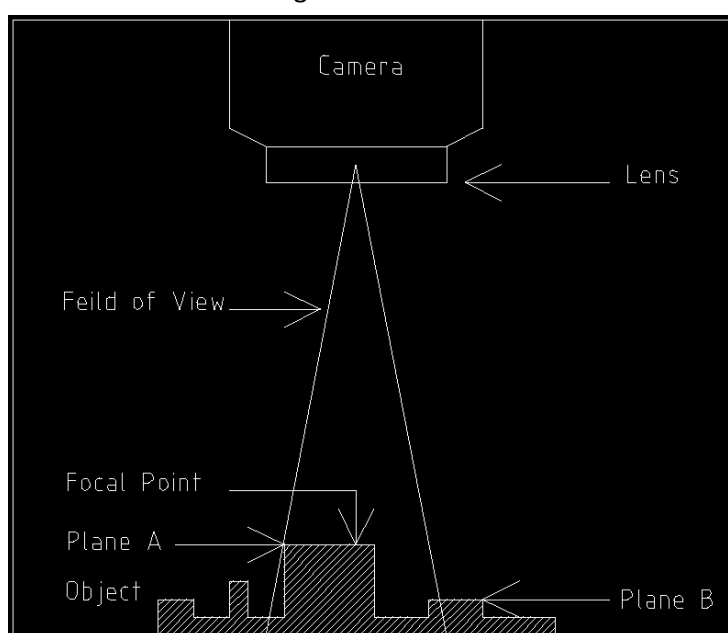


Fig. 16 focal point

- In the image (Fig. 16) **above**, the focal point has been set to measure Plane A. If the object is moved so that Plane B is within the field of view, then the Focal point will need to be set again for Plane B **before** you can measure.

3.12: Image Stacking



When viewing an object with different component heights at a higher magnification, all parts will not be in focus at the same time (Fig. 17), to overcome this you can switch the focus from auto to manual and move the camera closer or further away from the object. This however does not solve the issue of having all components in focus on the one image at the same time. To do this you can use the Image Stacking function.

Note: When processed, the stacked image will only be viewable as a static image.

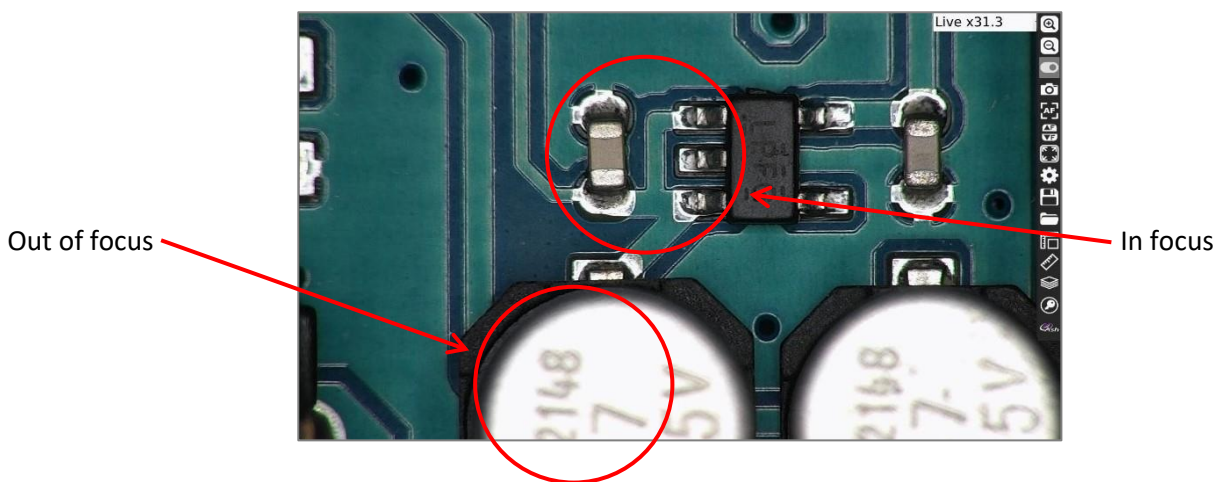
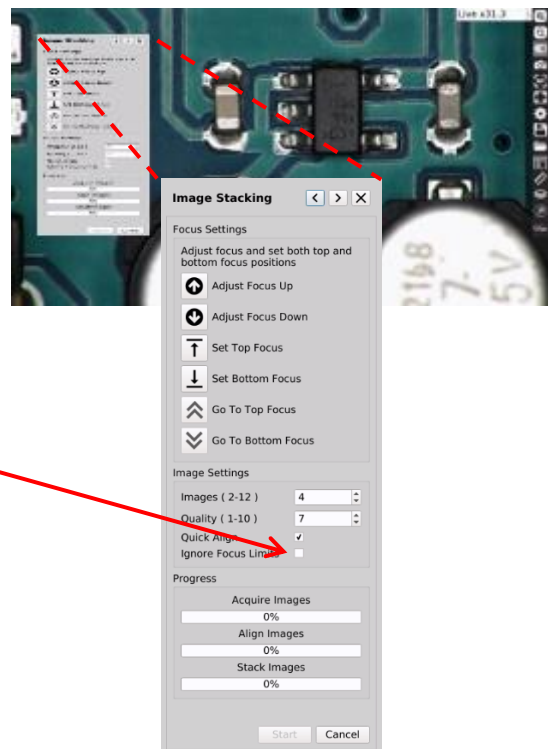


Fig. 17

Image Stacking Procedure:

1. Click on the Image Stacking icon. This will display the Extended Focus window (Fig.18).(after a reboot/mag. change some icons will be greyed out as the focus points have to be set again)



Note: If you wish to extend the range of the focus because of high components, you can check the **“Ignore Focus Limits box”**.
 Note: this may cause artefacts.

Fig. 18

2. Manually adjust the height of the camera until the bottom of the image is in focus (Fig. 19). This is done by using the height adjustment mechanism on the stand the Inspex 3 is mounted on. Click **Set Bottom Focus** and the **Go To Bottom Focus** button will become active.

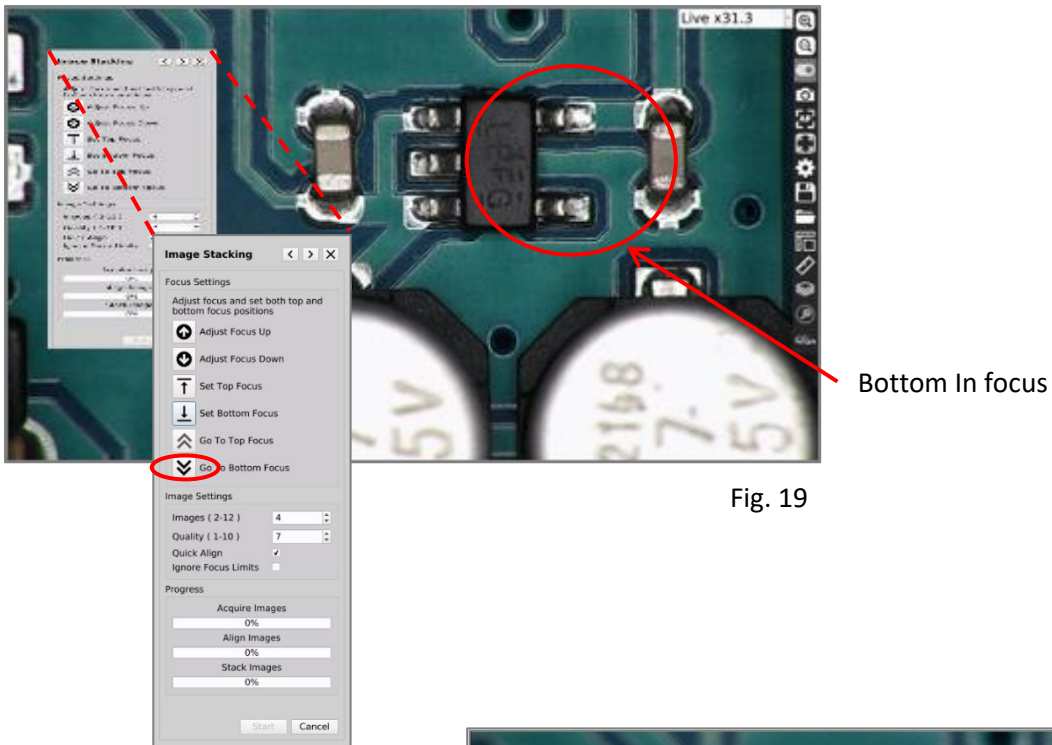


Fig. 19

3. Now bring the top of the sample into focus with the Adjust Focus up and down arrow buttons (A), click on the **Set Top Focus** button (B), the **Go To Top Focus** button (C) will then become active (Fig. 20).

When this is done you can press the **Go To Top Focus** and **Go To Bottom Focus** buttons to switch between both to double check your focus. Make an adjustment and set again if required.

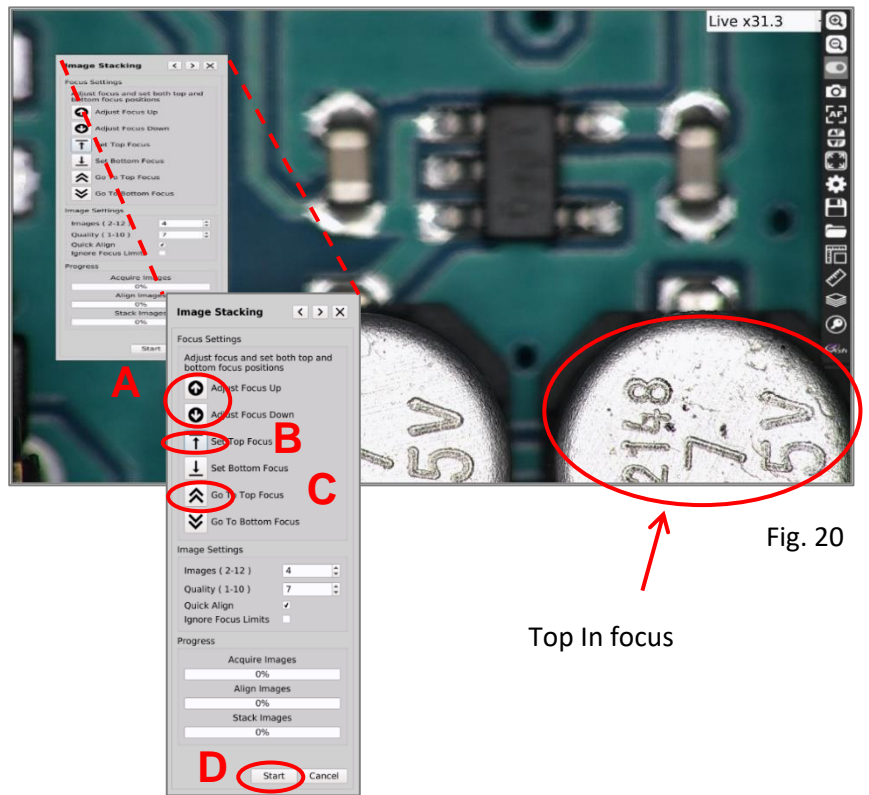


Fig. 20

4. When you are satisfied with the settings, click the **Start** button (D) and the Inspex 3 will start processing the image.

- 5. The processed image will now be displayed in static form with all components (heights) in-focus (Fig.21).

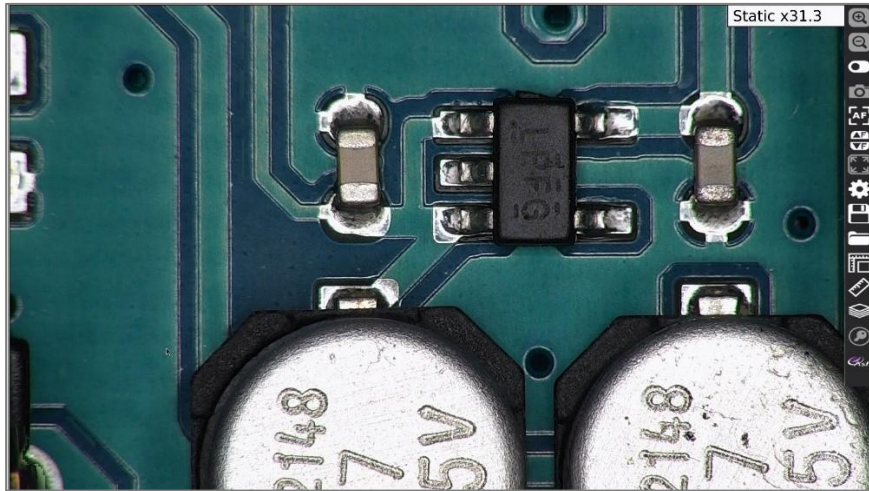


Fig. 21

- 6. For better image quality you can increase the number of images taken in the stack and/or you can increase the quality (Fig.22). Doing so will increase the time taken to process the image stack and will also increase the file size of the image.

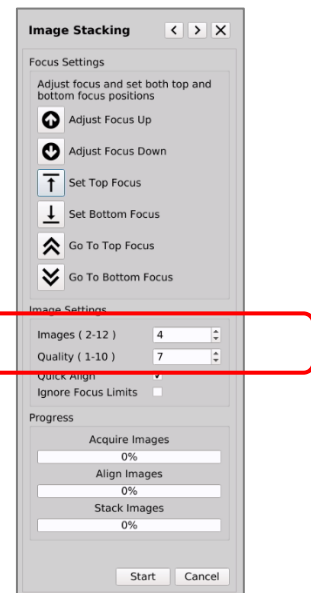


Fig. 22

Section 4: Measurement Accuracy

The accuracy of a measurement is specified as $\pm 1\%$ within the working range of each calibrated lens. The recommended working-range of each lens is shown in green in the table below Fig. 23 (magnification values refer to a 24" monitor). The min and max horizontal FOV (Field Of View) for measurements are shown in bold (this table should be used as a guide when deciding what lens to use for a particular application). The internal temperature of the INSPEX 3 also influences measurement and it is recommended to give 30mins for the INSPEX 3 to reach a stable internal temperature. Although the INSPEX 3 uses temperature compensation algorithms to adjust the measurement values to achieve $\pm 1\%$ accuracy, it should be noted that measurements of the same object may show small differences when measured at different temperatures. These differences are still within the specified $\pm 1\%$ accuracy.

Magnification	X6	X12	X25	X50	X85	X100	X125	X150	X175	X200	X350	X510	X620	X1250	
+5 Lens (FOV)		40mm to 3.83mm													
+10 Plan1x (FOV)				9.75mm to 1.975mm											
+25 Lens (FOV)									2.77mm to 0.7mm						
+50 Lens (FOV)											1.35mm to 0.35mm				

Fig. 23 working range

The maximum length that can be measured with the +5 lens is 40mm horizontal. It is recommended to use an Overlay if an item larger than 80mm is to be used. * See Overlay section Pg. 23.

Below is a reference table (Fig. 24) which shows a difference of 1% on some standard measurements.

Measurement(mm)	0.1	0.5	0.8	1	1.5	2	5	10	15	20	30
1% Difference(mm)	0.001	0.005	0.008	0.01	0.015	0.02	0.05	0.1	0.15	0.2	0.3

Fig. 24

It is recommended to use the centre third of the screen when making measurements at lower magnifications.



Correct setup of the INSPEX 3 is crucial to achieve accurate measurements. **It is important to remember that measurements are only accurate when the area being measured is at the correct focal point of the lens.**

Magnification Table:

Magnification

Lens Type		+5	+10 Plan 1x	+25	+50
Optical	Magnification Range (X)	2.1 - 65.6	4.1 - 130	51.7 - 323.4	97.7 - 628
	X-axis FOV (mm)	240 - 8.34	80 - 4.1	3.5 - 1.75	2.1 - 1
	Y-axis FOV (mm)	135 - 4.69	71 - 2.2	1.75 - 0.9	2 - 0.6
Digital	Magnification Range (X)	66.1d - 131.6d	130.5d - 259.9d	325d - 646.7d	631.2d - 1256.1d
	X-axis FOV (mm)	8.34 - 4.13	4.15 - 2.08	1.65 - 0.85	1.2 - 0.44
	Y-axis FOV (mm)	4.69 - 2.32	2.32 - 1.16	0.9 - 0.5	0.7 - 0.26
	Working Distance (mm)	195	79	49	36
	Depth of Field (mm)	80 - 0.5	42 - 0.2	0.3 - 0.015	15um - 4um
	Video Latency (milli seconds)	20 (50Hz)/ 17 (60Hz)	20 (50Hz)/ 17 (60Hz)	20 (50Hz)/ 17 (60Hz)	20 (50Hz)/ 17 (60Hz)

Fig. 25

- * Approximate specifications obtained using a 24" Monitor.
- * Depth of Field measured with optimal image settings

Section 5: Presets

A preset can be customised to hold specific system settings and measurement detail.

Up to 5 presets can be added.

- If using the preset function, first enable the Show Preset Toolbar function (**refer to 3.7b Settings page 15*).
- Presets 1-5 will then be selectable at the bottom right of screen if previously assigned. (Fig.26)
- Each Preset can be selected by clicking on the number of the Preset on the toolbar, or alternatively by pressing the corresponding button on the External Keypad (**refer to page 8 for optional system components*).
- To exit a Preset and return to normal operation, click the Overlay (Graticule) icon

***NOTE: Show Preset Toolbar must be enabled when creating and saving a Preset.**

Creating A New Preset:

5 sample Presets are supplied with the unit in the Presets directory. They can be updated as follows:

- Make necessary system adjustments, such as illumination, magnification and so forth.
- Select measurement and add new measurement detail if required (dimensions, text, and so forth). You can then save these changes as a (.ash) file in the Preset folder (Fig.27)

Note: This file must be called **preset1.ash** through to **preset5.ash**, corresponding to each preset number. If the saved file does not have the exact name, it will not apply as a preset.

- When creating an additional Preset: make system adjustments if required, select measurement, clear all and add new measurement detail. Then “Save As Ash File” as corresponding preset.



Fig 26.

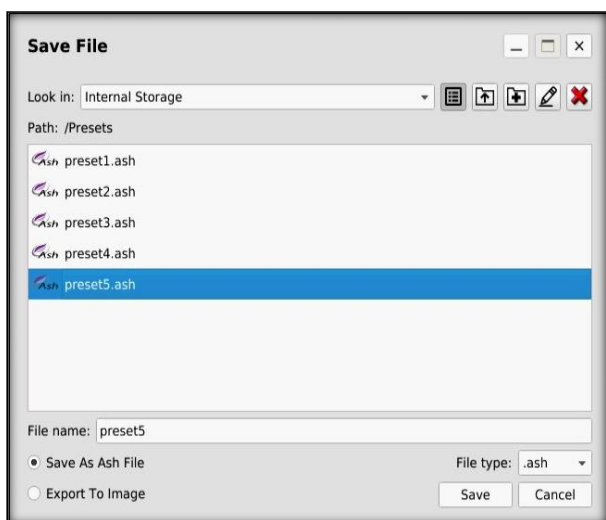


Fig 27.

Technical Specifications:

Zoom Range (with supplied +5 Lens)	2.1x – 131.6x		
Camera Resolution	1920 x 1080 Resolution	50/60 fps	30x Optical, 2x Digital
Monitor Connections	HDMI / DVI		
Monitor Requirements	HD Ready or Full HD (recommended)		
Input / Output	<ul style="list-style-type: none"> - HDMI Output - USB 2.0 Port x 4 - RJ45 Ethernet Connector (for networking) - General Purpose IO Port x 3 - DC Power Jack (24V) 		
Image Capture	<ul style="list-style-type: none"> - Internal Image Storage - Removable USB Image Storage - USB On the Go (PC Connectivity) 		
Input Voltage	90~264VAC, 50/60hz		
Power	24W		
Dimensions	216mm x 125mm x 136mm		
Weight	1.75Kg		
Humidity	20%RH to 80%RH (no condensation)		
Operating Temperature	Storage: -10C to +60C Operating: +5C to +40C		



Never look directly at the LED light source for a prolonged period of time.



General Safety

- Indoor use only
- Exercise caution when lifting, handling or moving the Inspex 3.
- Exercise caution when installing or removing accessories, ensuring a central and stable body position, thus preventing any possible strains or injury.
- Ensure all screws and fixings are properly secured.
- Disconnect all power sources prior to moving or working on equipment.
- Do not stare at operating lights as it may be harmful to the eyes.



Electrical Safety

To prevent electrical shock or accidental short circuits leading to component damage, follow the points outlined below.

- Ensure proper grounding of AC adapters.
- Do not operate with open housing, both from a safety and warranty perspective (There are no user-serviceable parts or fuses in the system).
- Do not operate in environments of excessive humidity and keep away from liquids.
- Operate away from metal filings and similar debris.
- Should any power cords become damaged, switch off, disconnect and replace before using the unit again.
- Do not position the equipment so that it is difficult to operate the disconnecting device, mains plugs in this case.
- Please be aware of protection impairment if used in a manner not specified by the manufacturer.

Declaration Of Conformity:

We, **Ash Technologies Ltd.**, declare under our sole responsibility that this product **INSPEX 3**, of the brand **Ash Technologies** to which this declaration relates, is in conformity with the following standards or other normative documents:

BS EN 60601-1-2:2015 Medical Electrical Equipment – Electromagnetic Compatibility.

Classification: Residential

Following the provisions of EMC directive 2004/108/EC.

Signed, for and on behalf of Ash Technologies Ltd,

Martin Cahill,

Naas, Ireland.

June 2016.



Warranty

Ash Technologies warrants the equipment, when purchased new, to be free from defects in material and workmanship and will repair or replace at Ash Technologies' discretion, any equipment which exhibits such defects; provided that the equipment has been operated under the proper conditions of installation and has not been tampered with by any persons not authorised by Ash Technologies or its agents and that it is solely serviced by Ash Technologies or its agents.

In no event shall Ash Technologies or its agents be liable for special, indirect, incidental or consequential damages; the original user's remedies being limited to repair or replacement. This warranty is valid only when serviced in the country of original purchase.

Ash Technologies makes no other or further warranty, express or implied, including and warranty of fitness for a specific purpose or warranty of merchantability.

**This warranty is valid for a period of
12 Months
Effective from the date of delivery.**

For warranty claims or service during or after warranty period please contact your distributor.

End User Licence Agreement – Ash Technologies Ltd. 2016

This End User Software Licence Agreement (the “**EULA**”) is a contract between the user of the Software (the “**End User**”) and Ash Technologies Limited (the “**Licensor**”), a company incorporated in Ireland under registration number 220749 whose principal place registered office is at B5, M7 Business Park, Naas, Co Kildare, Ireland. The Licensor and the End User together shall be referred to as the “**Parties**” and individually shall be referred to as a “**Party**”.

Please read this EULA carefully. The Software is provided to you pre-installed on your Ash Product. By purchasing and using the Ash Product, the End User accepts all of the terms and conditions set out in this EULA. If the End User does not wish to be legally bound by the terms and conditions of this EULA, do not use the Ash Product.

The Parties agree as follows:

Definitions

1.1 Definitions. Unless otherwise provided in the main body of this EULA, capitalised terms shall have the meaning given to them in the attached Exhibit A, which forms part of this EULA as if set out here.

Licence

Licence. In consideration of your purchase of the Ash Product and subject to the provisions of this EULA, the Licensor grants to the End User a non-transferable, non-sub-licensable, and non-exclusive licence to use, solely with the Ash Product and solely in object code form, the Software.

Reservation of rights. Except for the licence explicitly granted by Clause 0, the Licensor reserves all its rights. The End User acknowledges and agrees that the End User is licenced to use the Software only in accordance with the express provisions of this EULA and not further or otherwise.

No support, etc. Unless otherwise agreed by the Parties in writing, the Licensor shall have no obligation (other than the Licensor’s obligations under clause 0) to upgrade, update, bug-fix, to provide support or maintenance services, or to provide assistance or consultancy services in relation to the Software.

Use, etc.

Restrictions. Except to the extent permitted by applicable mandatory law, the End User shall not: (a) copy or reproduce the Software; (b) merge the Software with any other software; (c) translate, adapt, vary, or modify the Software; or (d) disassemble, decompile, or reverse engineer the Software, or otherwise attempt to derive the source code of the Software.

Further restrictions. The End User shall not: (a) provide, disclose, demonstrate, or otherwise make available the Software to any third party; or (b) use the Software to provide any services or training for any third party; or (c) sell, lease, rent, transfer, hire-out, licence, sub-licence, assign, distribute, publish, charge, pledge, encumber, commercially exploit, or otherwise deal with the Software (including by selling the Ash Product), or have any software written or developed that is based on or derived from the Software.

Obligations. The End User shall at all times: (a) effect and maintain adequate security measures to safeguard the Software from unauthorised access, use, and disclosure; (b) supervise and control access to and use of the Software in accordance with the provisions of this EULA; (c) provide the Licensor from time to time on request with contact details for the person responsible for supervising and controlling such access and use; and (d) ensure that the Software is at all times clearly labelled as the property of the Licensor. The provisions of this Clause 0 are without prejudice to the provisions of Clause 0.

Confidential Information

Confidentiality obligations. As between the Parties, all Confidential Information belongs to the Licensor. At all times during the term of this EULA and at all times subsequently, the End User shall: (a) maintain all Confidential Information securely and in the strictest confidence and shall respect the Licensor's rights therein; (b) not disclose or otherwise make available any Confidential Information to any third party; and (c) not use any Confidential Information for any purpose, except for the purpose of using the Software in accordance with the provisions of this EULA.

Exceptions to obligations. The provisions of Clause 0 shall not apply to Confidential Information which the End User can demonstrate by reasonable, written evidence: (a) is subsequently disclosed to the End User without any obligations of confidence by a third party who has not derived it directly or indirectly from the Licensor; or (b) is or becomes generally available to the public through no act or default of the End User or its agents, employees, or affiliates.

Disclosure to employees, etc. The End User shall procure that all its employees and other personnel who have access to any Confidential Information: (a) shall be made aware of, and subject to the obligations, set out in Clause 0; and (b) shall have entered into written undertakings of confidentiality and non-use which are at least as restrictive as Clause 0 and Clause 0 and which apply to the Confidential Information.

Return of Confidential Information. Upon any termination of this EULA for any reason, the End User shall: (a) return to the Licensor any documents and other materials that contain any Confidential Information including all copies made, except for one (1) copy as may be necessary to be retained for the purpose of compliance with any continuing obligations under this EULA; and (b) make no further use, copy, or disclosure thereof.

Acknowledgements, disclaimers, etc.

Acknowledgements. The End User acknowledges and agrees that software in general is not error-free and agrees that the existence of any errors in the Software shall not constitute a breach of this EULA by the Licensor.

Obligation to correct material errors, etc. If the End User discovers a material error in the functionality of the Software which substantially affects the End User's use of the Software and the End User notifies the Licensor of such material error in writing within one year of the date of this EULA, the Licensor shall use reasonable endeavours to correct, by patch or new release (at the Licensor's option), that part of the Software which is affected by such material error.

Further support. If the End User requires any further support and/or maintenance services in respect of the Software, the End User shall notify the Licensor in writing and the Parties may discuss the possibility of entering into a support agreement.

No such obligation in certain circumstances. The Licensor's obligations under Clause 0 shall be excluded in the following circumstances: (a) following wilful damage to the Software or the Ash Product or negligence in their use; (b) where the Software or Ash Product has not been used, maintained, and/or stored in accordance with any instructions or recommendations given by the Licensor or in accordance with the provisions of this EULA; (c) where the problem arises from software or hardware not supplied by the Licensor; (d) where the Software or Ash Product is used other than in the correct configuration; (e) where any warranty seal on the Ash Product is broken by the End User or a third party; and/or (f) following any unauthorised use of or modification to the Software or Ash Product.

Viruses, etc. The Licensor does not warrant that the Software supplied under this EULA shall be free from all viruses. The End User acknowledges and agrees that in respect of any software that is not pre-installed on the Ash Product (for example patches and upgrades) it is solely the End User's responsibility to conduct appropriate virus scanning of the Software prior to installation and use.

Possible charges. Where a defect in the Software is found upon investigation not to be the Licensor's responsibility, the Licensor reserves the right to charge the End User on a time and materials basis at the Licensor's then current rates for all time, costs, and expenses incurred by the Licensor in consequence of such investigation.

No implied warranties, etc. The express undertakings and warranties given by the Licensor in this EULA are in lieu of all other warranties, conditions, terms, undertakings and obligations, whether express or implied by statute, common law, custom, trade usage, course of dealing or in any other way, including any implied warranty of merchantability, satisfactory quality, fitness for any particular purpose. All of these are excluded to the fullest extent permitted by applicable law. Without limiting the scope of the preceding sentences, the Licensor gives no warranty or guarantee that the Software will meet the End User's requirements, that the use of the Software will be un-interrupted, or that any errors and/or defects in the Software can or will be corrected.

Open source software. Any open source software provided by the Licensor may be used according to the terms and conditions of the specific licence under which the relevant open source software is distributed, but is provided "as is" and expressly subject to the disclaimer in clause 0.

Indemnity. The End User shall indemnify the Licensor from and against any and all losses, damages, claims, demands, liabilities, costs, and expenses of any nature whatsoever that may be asserted against or suffered by the Licensor and which relate to: (a) any use by the End User of the Software; and/or (b) the development, manufacture, use, supply, or any other dealing in any products or services that were generated from the use of the Software, including any claims based on product liability laws.

Limit of liability. The cumulative maximum liability of the Licensor to the End User under or in connection with this EULA, irrespective of the basis of the claim (whether in contract, tort, negligence, or otherwise), shall be limited in accordance with the provisions of this Clause 0:

The Licensor does not seek to exclude or limit liability where such exclusion or limitation is precluded from applicable law, including any liability that may arise in respect of (i) death or personal injury resulting from the Licensor's negligence, or (ii) fraud.

Subject to the rest of the provisions of this Clause 0, the cumulative liability of the Licensor in respect of any and all claims made under or in connection with this EULA shall not exceed an amount that is equal to the price paid for the Ash Product excluding VAT and other applicable taxes.

Subject to Clause 00, the Licensor shall in no circumstances be liable for any type of special, indirect or consequential loss, for any loss of profit, revenue, or anticipated saving, lost, incorrect or spoiled data, loss of use, loss of contracts with third parties, loss of business or loss of goodwill, even if such loss was reasonably foreseeable or the Licensor had been advised of the possibility of the same arising.

Duration and termination

Commencement and termination. This EULA, and the licence granted hereunder, shall come into effect on the Start Date and shall continue in force unless and until terminated in accordance with Clause 0 or Clause 0.

Termination by either party. Either Party may terminate this EULA, and the licence granted hereunder, at any time by notice in writing to the other Party (the "Other Party"), such termination to take effect as specified in the notice:

if the Other Party is in material or persistent breach of any provision of this EULA and, in the case of a breach capable of remedy within 30 days, the breach is not remedied within 30 days of the Other Party receiving notice specifying the breach and requiring its remedy; or

if (i) the Other Party becomes insolvent or unable to pay its debts as and when they become due; or (ii) an order is made or a resolution is passed for the winding up of the Other Party (other than voluntarily for the purpose of solvent amalgamation or reconstruction); or (iii) a liquidator, examiner, receiver, receiver manager, or trustee is appointed in respect of the whole or any part of the Other Party's assets or business; or (iv) the Other Party makes any composition with its creditors; or (v) the Other Party ceases to continue its business; or (vi) as a result of debt and/or maladministration the Other Party takes or suffers any similar or analogous action in any jurisdiction.

Termination if the Ash Product is sold. This EULA will terminate automatically if the Ash Product is sold.

Consequences of termination. In the event of any termination of this EULA for any reason any licence granted by the Licensor under this EULA shall automatically terminate without further notice, and the End User shall make no further use of, or carry out any other activity in relation to, the Software; and

Accrued rights. Termination of this EULA for any reason shall not affect the rights and obligations of the Parties accrued before termination, including any right to claim damages. The rights and obligations of the Parties set out in Clauses 0, 0, 0, 0, 0, and 0 shall survive any termination of this EULA for any reason.

General

Amendments. This EULA may only be amended in writing signed by duly authorised representatives of the Licensor and the End User.

Invalid clauses. If any provision or part of this EULA is held to be invalid, amendments to this EULA may be made by the addition or deletion of wording as appropriate to remove the invalid part or provision but otherwise retain the provision and the other provisions of this EULA to the maximum extent permissible under applicable law.

No agency. Nothing in this EULA shall create, evidence, or imply any agency, partnership, or joint venture between the Parties. Neither Party shall act or describe itself as the agent of the other, nor shall it make or represent that it has authority to make any commitments on the other's behalf.

Interpretation. In this EULA:

references to persons include incorporated and unincorporated persons and references to the singular include the plural and vice versa;

references to Clauses and Exhibits mean clauses of, and exhibits to, this EULA;

references in this EULA to termination include termination by expiry; and

where the word "including" is used it means "including without limitation".

Governing law and jurisdiction. The validity, construction, and performance of this EULA shall be governed by and construed in accordance with the laws of the Republic of Ireland and shall be subject to the exclusive jurisdiction of the courts of the Republic of Ireland to which the Parties hereby submit.

No use of names, etc. Neither Party shall use the names, marks, trade names, trademarks, crests, logos, or registered images of the other Party without that Party's prior written consent.

Entire agreement. This EULA, including the attached Exhibits, sets out the entire agreement between the Parties relating to its subject matter and supersedes all prior oral and written agreements, arrangements, or understandings between them relating to such subject matter.

Exhibit A

Definitions

Confidential Information	The Software, and all information, data, drawings, designs, specifications, documentation, and other items (in any form whatsoever) which the Licensor may (directly or indirectly) disclose or otherwise make available to the End User during the course of or in anticipation of this EULA.
Ash Product	The product on which the Software is installed
Software	The software which is pre-installed on the Ash Product and any upgrades, revisions, or new versions which may be supplied by the Licensor or made available to the End User from time to time
Start Date	The date of purchase of the Ash Product