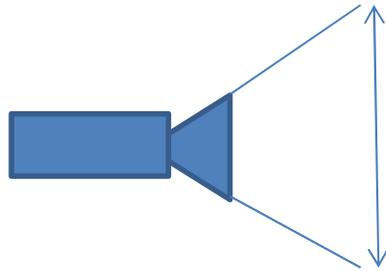# INSTALLATION OF A RTSS VIDEO EXTENSOMETER SYSTEM

The system consists of the following:
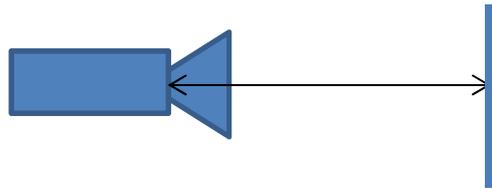
Camera

The camera has been specifically chosen for the application, the camera is a 2 megapixel digital camera with a fixed lens. The lens choice will dictate the following parameters;
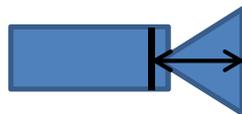
The Field of View; this is the maximum vertical distance the camera can view

The Working Distance; this is the physical distance that the camera must be placed away from the sample under test, the distance is measured from the front of the camera body and not the front of the lens

The lens has a focal length, distance from lens to camera CCD sensor

Mounting Stand or Tripod

Depending on your system the video camera is required to be fixed at the working distance, it will require movement in the vertical axis (to adjust the bottom of the field of view) the horizontal axis (to align the centre of the sample) pitch axis (to align the lens parallel with the sample)

Line Light

The sample requires additional illumination this is achieved using a LED line light; the light will typically be close to the length of the Field of View and require placing near to the sample under test so the entire length of the sample will be illuminated during the test
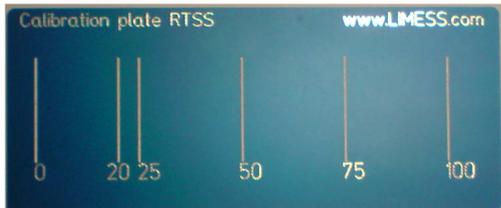
PC Card and Cable

The camera (AVT Type) will be supplied with a FireWire Card (1394) so the PC will require one free miniature PCI slot
The cable will connect from the PC card directly in to the back of the camera, the camera has two available ports, either are suitable (the round socket is not used)

Calibration Plate

A metal plate with accurate gauge length markers

Marker Plate and Pens

One black pen, one white pen and a stencil plate for accurate marking
Note (Adhesive stickers may also be used)

Step 1

Install the software

Windows 7™ is the recommended operating system

Your system came with a CD, this CD is the RTSS Software coded to the supplied camera

You are required to perform any software installation as an administrator in order to have full access you are required to access the User Access Control setting on the PC and lower the access slider to minimum, you must restart the PC for this to take effect
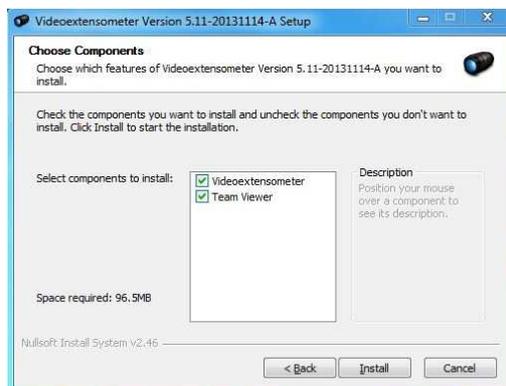
Insert the CD, if it does not auto run then access the CD drive and run the video extensometer setup executable to start the installation with the following settings
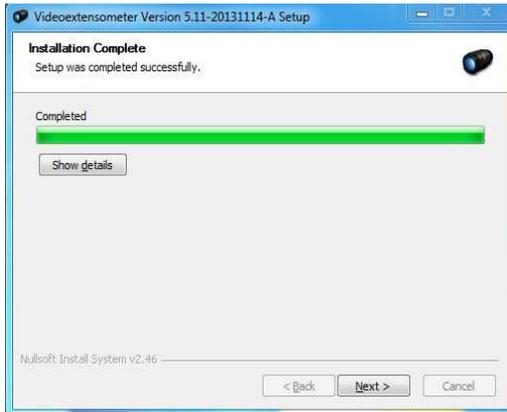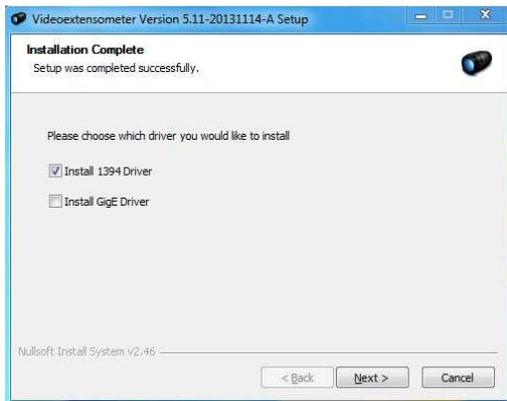

Install for anyone using this computer

Use the default directory

Install both options to software and the team viewer (note the team viewer software can allow remote access from technical support if the PC is connected to the internet)
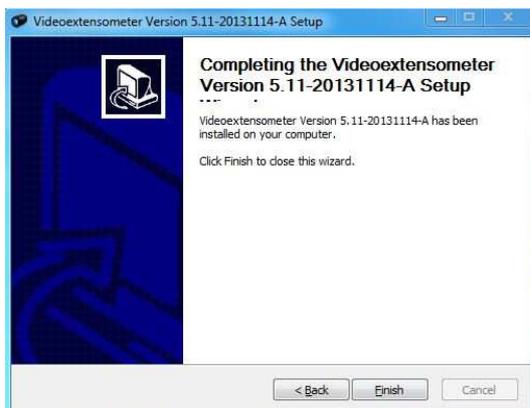
Installation is complete

Now choose the driver to install, the correct option is Install 1394 Driver

The driver will now be installed

Installing the FireWire Card

Turn the PC off, disconnect the mains and open the PC cover

Insert the PCI Fire Wire Card in an available PCI slot, secure the card, replace the cover, connect the mains cable and re-start the PC

Your PC should now detect the hardware change and install the drivers automatically, if it does not then go to START MENU, ALL PROGRAMS, LIMESS, VIDEOEXTENSOMETER, DRIVER INSTALLER. Right click and run as Administrator

Know issues;
On some PC systems there can be a conflict of devices that use the drivers, if this occurs then open the following folder and run the AVT Driver Install program, change the IEEE 1394 Host Controller Driver Source to AVT 1394 Transport Layer and apply the changes

Before another device can be used on the same FireWire interface the above installed INTEK driver must be deactivated and the Microsoft driver installed.

Typical symptoms that the drivers are an issue are the following:
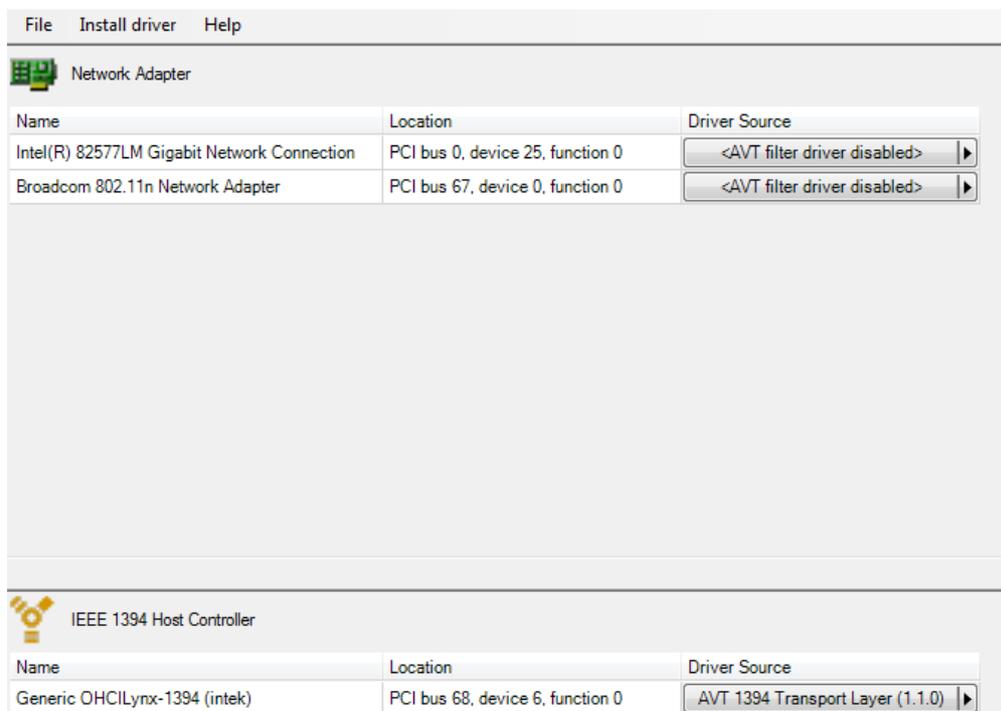
Before another device can be used on the same FireWire interface the above installed INTEK driver must be deactivated and the Microsoft driver installed.

On opening the RTSS Software no camera is detected or no image is visible on the screen

C:\Program Files\Limess\Videoextensometer\driver\32Bit

File	Install driver	Help		

Network Adapter

Name	Location	Driver Source	
Intel(R) 82577LM Gigabit Network Connection	PCI bus 0, device 25, function 0	<AVT filter driver disabled>	▶
Broadcom 802.11n Network Adapter	PCI bus 67, device 0, function 0	<AVT filter driver disabled>	▶

IEEE 1394 Host Controller

Name	Location	Driver Source	
Generic OHCILynx-1394 (intek)	PCI bus 68, device 6, function 0	AVT 1394 Transport Layer (1.1.0)	▶

The disc is coded to your camera when the software is installed it will create a .RLK File, this file will have a unique number that corresponds to your camera. The file can be found on the installation CD as well as in the root directory of the installed software

Connecting the Camera

Using the supplied cable connect to one of the sockets on the 1394 PCI Card and the other to the socket on the rear of the camera, ensure the cable is secured to both the card and the camera using the securing screws

Viewing the Camera Image

Open the RTSS Software and you should now be able to see an image on the screen

Hint; make sure you have removed the lens cap

Measurement Principle

RTSS (real time strain sensor) is Video extensometer for the optical measurement of specimen elongation during material tests with tensile test machines

Features:

The contact less determination of the longitudinal strain leads especially at weak materials to a improved measurement precision compared to measurements based on the traverse movement.

The measurement range is independent of the specimen size and can exceed 1000% of strain.

The field of view can range from a few millimetres to some meters.

The strain values can be transferred analogue or digital to the tensile test machine which can directly post process the data.

Image Analysis

The strain measurement in RTSS is based on accurate and speed optimized image analysis algorithms for edge detection. The measurement requires two line markers with good contrast on the surface of the tensile test specimen.
The markers can be applied by a marker plate and pencil (permanent marker) or line stickers
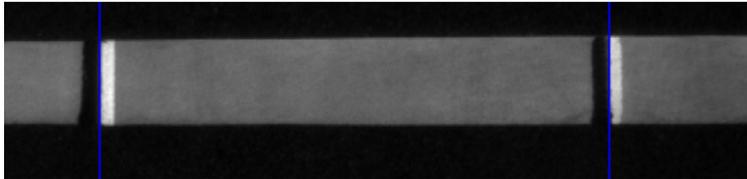
The analysis detects in the camera image the position of the two black-white edges from left to right with sub pixel precision, by comparison with the measured reference length L0 the strain is calculated.

A calibration of the system is not necessarily required because only relative distance changes are required for a strain measurement.
After a calibration the RTSS software can output the distance (and change) scaled to mm.

Software User Interface
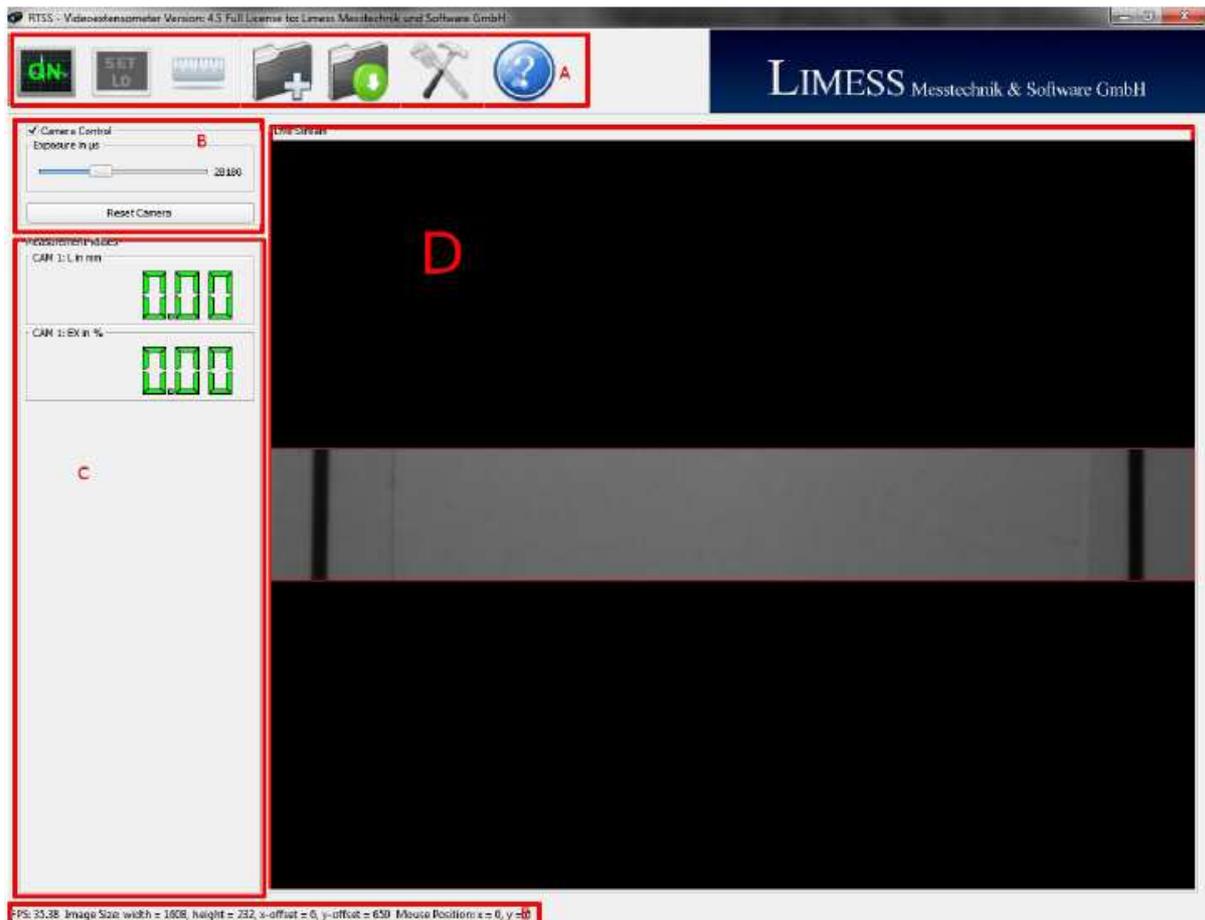
The main user interface is divided in to sections

The Toolbar

 Starts and stops the measurement analysis

 The Button SetL0 sets the actual length measurement as reference length L0 (initial gauge length). The strain measurement and the calibration are based on the reference length.

 Load a Template function. When the software is opened a template is opened "Default.ltmp" or manually load your own template

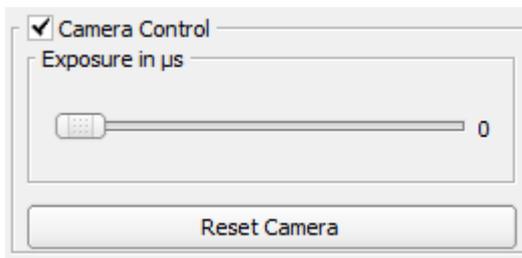 Save a template. Create and save your own template with different settings for different samples and tests

 Tools and settings, this gives you access to all adjustable parameters

The main help file

Camera Settings

Check or uncheck the box to enable or disable camera control

Exposure (Brightness)
The higher the number (more exposure) the brighter the image but image rate is relative to the exposure time the longer the exposure the lower the image rate
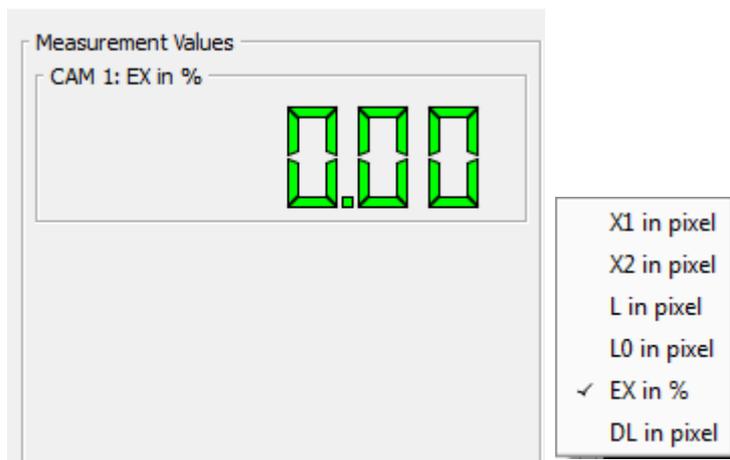
Rule: Image Rate = 1000 / exposure time in ms
Example: 20ms exposure would equal 50Hz (1000 / 20)

Reset Camera
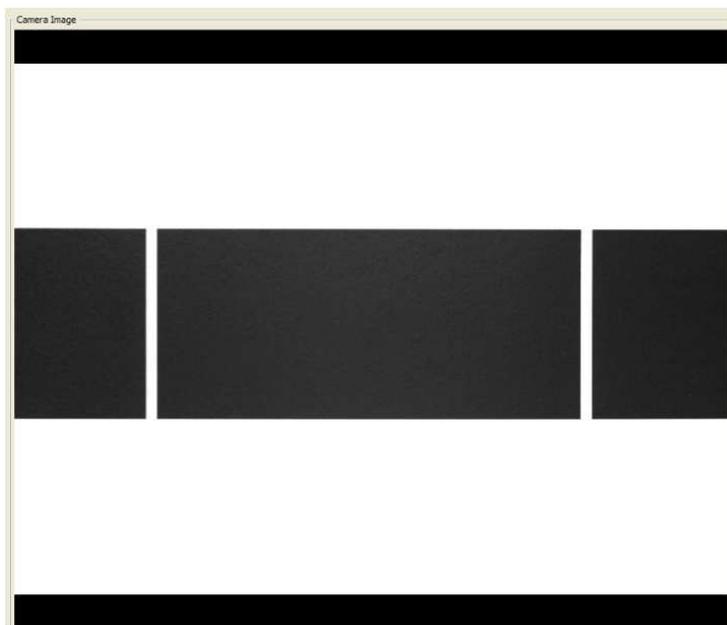Reverts back to full resolution settings

Measurement Display

This is a visual indication of the measured values, a right click of the mouse will display all available options, they are:

X1 = Marker X1 viewed as pixels
X2 = Marker X2 viewed as pixels
L = Image length in pixels
L0 = Gauge length in pixels
EX% = Percentage strain
DL = Change in length in pixels

Camera Image

The camera in default will show all the available image but as we are only interested in the specimen we need to define a AOI (Area of Interest)

To define an AOI a left click on the mouse will enable a window to be drawn that reduces the image size both vertically and horizontally

Tip, before you select a AOI move the camera vertically so the left hand side of the full camera image is able to just show the lower marker.

Draw your AOI to cover the lower marker and as far to the right as you expect the sample to extend

As less image date is transferred from the camera a smaller image increases frame rate

The Status Bar

FPS: 13.62 | Mouse Position: x = 152, y = 227 | Image Size: width = 1392, height = 1040, top = 0, left = 0 |

Seen at the bottom of the screen it shows;
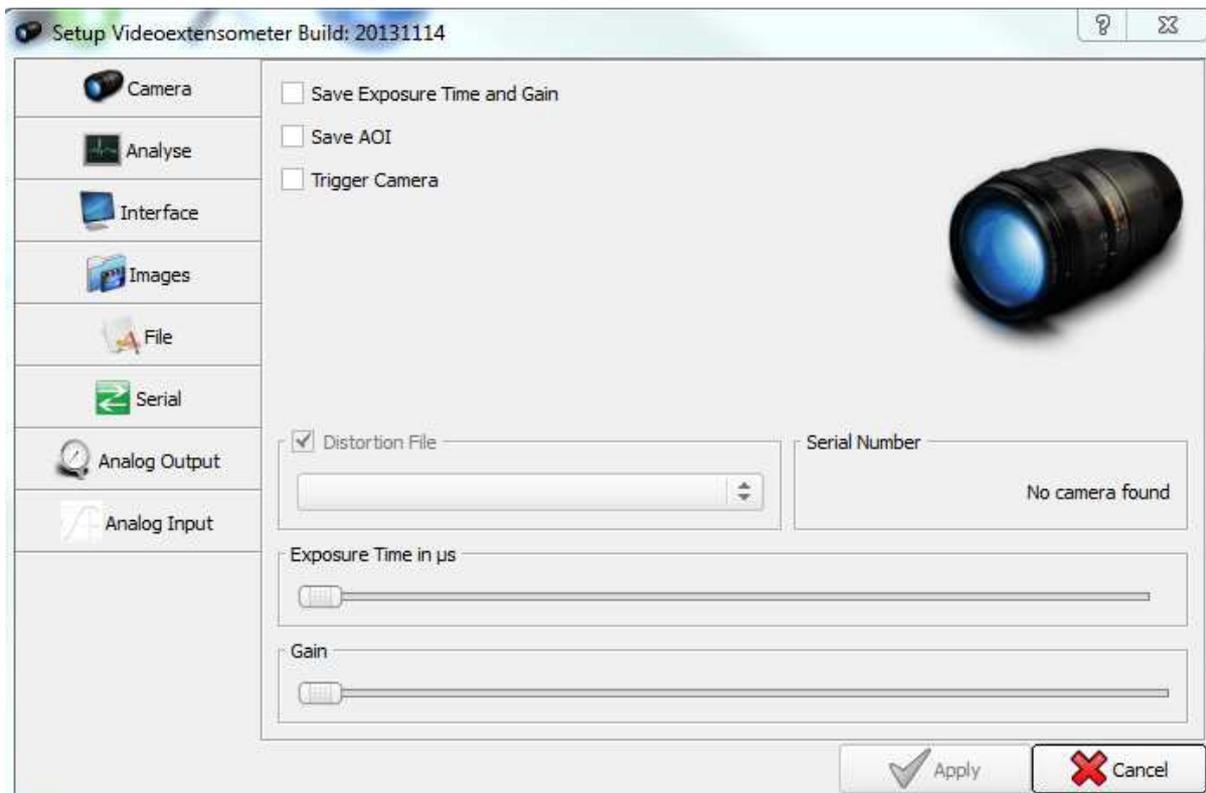
Actual Frame Rate (FPS frames per second)
Image size
Mouse position in the camera image

The Setting Dialogue

Access the settings by clicking on the setting icon

Save exposure Time and Gain Settings
    Saves the brightness and gain settings in the default file

Save AOI
    Saves your previous Area of Interest

Serial Number
    Shows the serial number of the camera if connected, this is the same as the .RLK file

Exposure Time
    Changes the camera exposure time

Gain
    Adjusts the gain of the camera

Hint: Leave the gain low, if the gain is increased it will also amplify the noise and reduce measurement precision
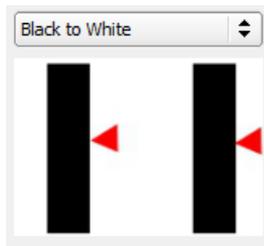Use more light and longer exposure

Analysis

Transverse measurement
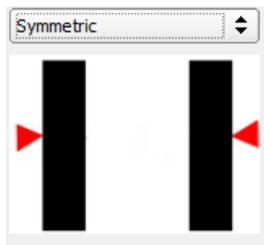*Not currently used*

Analysis Type
The type of analysis algorithm
Type 1 achieves the highest precision but also requires high quality markers

Marker Count
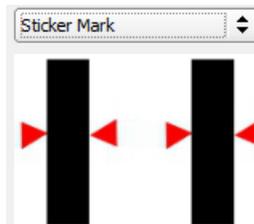*Number of markers used, normally 2*

Detection Type
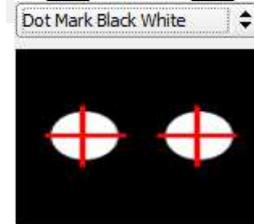*This is to define the marker type*

 Determines the black to white border from left to right
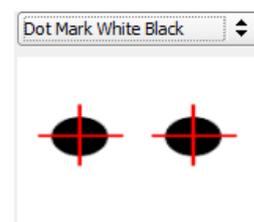
 Determines the black to white left marker and white to black right marker
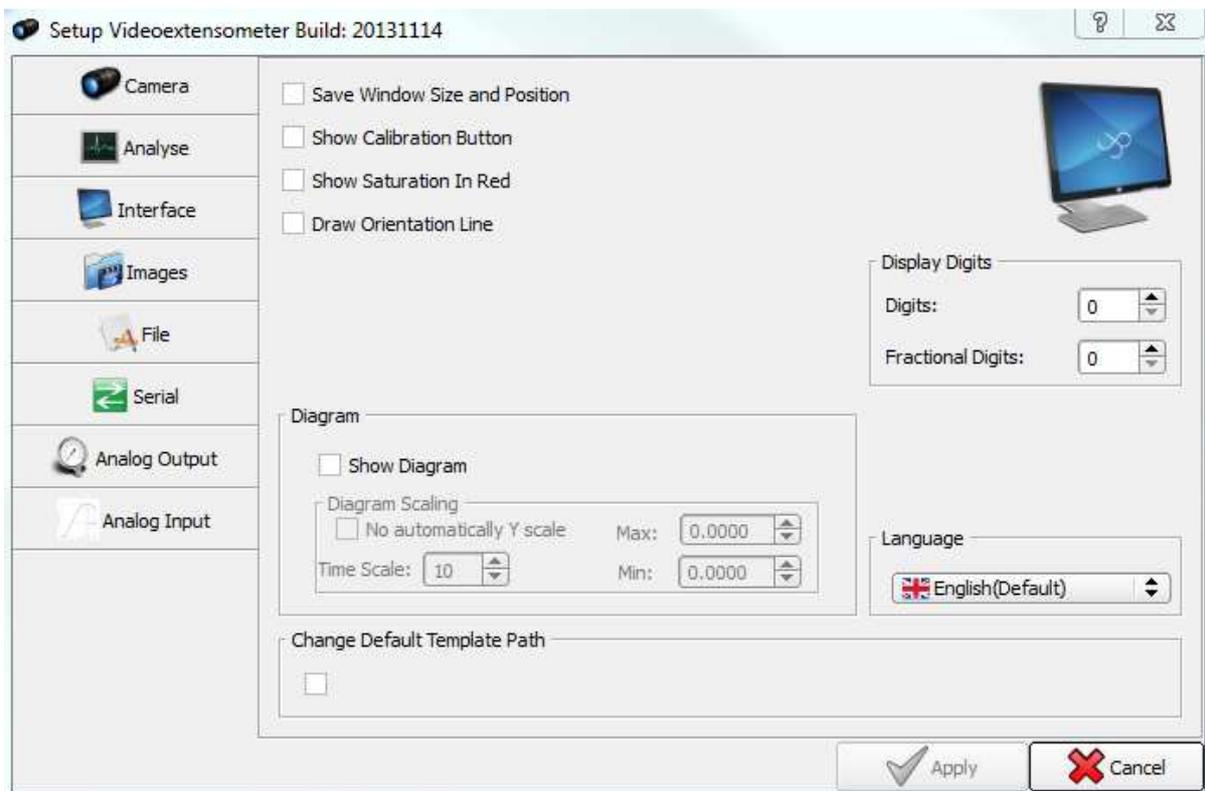
 Determines black lines with a set width (stickers)

 White dots (requires diameter set)

 Black dots (requires diameter set)

Interface

Save window size and position
> *Saves the position and size of the window interface*

Show calibration button
> *Enables the calibration button to be shown on the main toolbar, a password will be required to access this option*

Show saturation in red
> *If the image is saturated then pixels will show as red on the image, saturation on the markers will reduce the measurement precision*

Draw orientation line
> *Shows a line on the image to aid sample and camera alignment*

Display digits
> *Increase or decrease the number of digits on the measurement values*

Diagram
> *Shows a graphical output screen of the measured values*

Language
> *Changes the user language*

Template path
> *The path to the template folder*
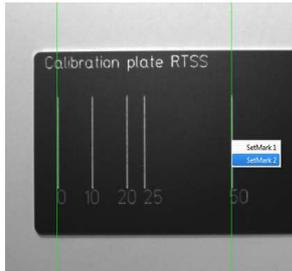
Calibration Button

To use calibration the show calibration button must be checked

The password is A6m1n

Start the analysis

Place the calibration plate at the same distance as the sample will be for testing

Manually set the X1 and X2 markers on to the gauge plate

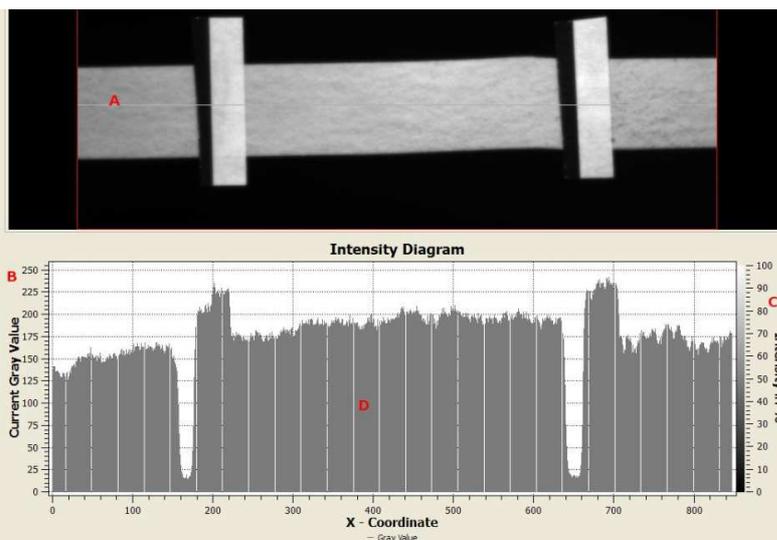If the markers are locked on correctly this measured can be recorded by pressing the Set L0 button

Select the calibration button

Enter the distance in the dialogue box (example above 50mm)

Click OK and save changes

Additional Feature

Intensity diagram – to assist in camera image set up – to activate press F2 on the keyboard

The diagram shows the grey value and saturation of the image, for best precision follow these rules and adjust exposure accordingly
Grey value below 250 and saturation (shown in RED) to a minimum

Testing the system with a MT Machine

The Video and machine are not connected in any way and the machine will still display extension from the internal encoder, this is used for return to zero function

A later version of Nexygen Plus 3 must be used (version 5084 or later) as this will support the functionality of the VE system

Open the RTSS Software and ensure it is working correctly

Open Nexygen Plus and create a new batch file (test), the parameters and use of Nexygen Plus are exactly the same with the exception of additional options in the Gauge Length section and the software console Set Up Scheme

These are the differences; your VE system is operating as an extensometer and as such is treated as any external extensometer that would be used in Nexygen Plus
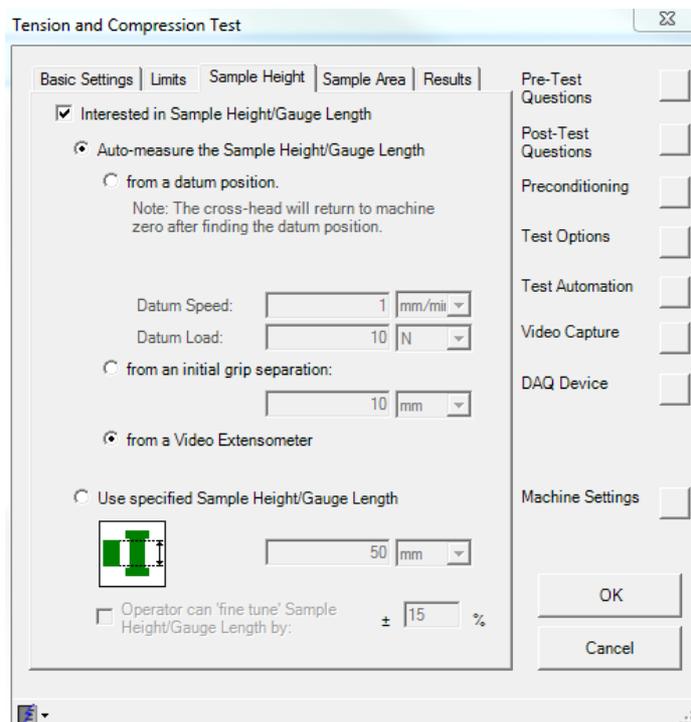
In the console machine set up schemes chose the option Axial Extension
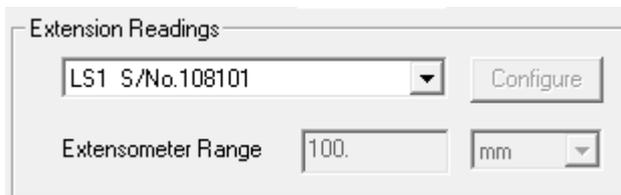
In the sample height section of the test set up choose Interested in Sample Height/Gauge length
Select Auto Measure the Sample Height/Gauge length
Select from a Video Extensometer

Nexygen Plus V3 will now pull in the gauge length from the one set in the VE software

To verify the system

Take a dumbbell sample and apply the markers at the 25mm gauge length, gauge length for the markers will be depending on how the marker recognition is set in the RTSS Software so ensure that the point at which the contrast in colour white to black reading vertically is actually 25mm and not the centre of the markers

Cut the sample in the middle to separate the two halves and place the two halves in the upper and lower grip

Move the machine until the markers are touching where the sample was cut

Align the Field of View to the sample so the maximum area is displayed or the maximum extension of a real sample would extend to

Draw the AOI on the screen

Select the X1 and X2 markers and lock them on the sample

Select the L0 to apply the gauge length, note that this must be set and calibrated I the RTSS software as Nexygen Plus will use this as the auto gauge length

Zero the machine using the software console

Jog the machine and check the distance displayed in mm on the machine console until the machine is at 25mm, the markers are now 25mm apart, the RTSS Software should now read 100% strain. You can repeat at other intervals of distance to verify the system is tracking correctly

Like to have

If possible it is advisable to have either a large monitor so the two software displays can share the screen at the same time or have a dual screen system with both software's displayed at the same time