



USER MANUAL

MikroCAD Software

Software version: 1.2.x.xx

Document revision: A

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Contact Information

For more information, please contact LMI Technologies.

LMI Technologies, Inc. 1673 Cliveden Ave.
Delta, BC V3M 6V5
Canada

Telephone: +1 604 636 1011
Facsimile: +1 604 516 8368

www.lmi3D.com

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Introduction

Welcome to the MikroCAD software user manual!

MikroCAD is an optical scanner capable of performing both 2D and 3D measurements on metallic or non-metallic surfaces down to the micron level (model-dependent).

This manual describes the set-up of MikroCAD scanners and explains how to acquire data, which is then passed to the measurement component of the MikroCAD software. (For information on performing measurements on acquired data, see the Reference Guide on the **Help** tab on the **Acquisition** page.)

MikroCAD scanners use digital stripe projection provided by micro-mirror projectors to scan surfaces. Due to the blue light used for illumination and narrow band optical filtering, the imaging process is highly robust against ambient light. A height map of the target is calculated from the position of the strips and the Gray value of the individual image points.

The main advantages of MikroCAD scanners include non-contact data recording, high-speed measurement, high resolution, and measurement precision, as well as ease of use. The scanners can be used for tasks which could not previously be solved with optical measuring systems.

Notational Conventions

This guide uses the following notational conventions:



Follow these safety guidelines to avoid potential injury or property damage.



Consider this information in order to make best use of the product.

Safety and Maintenance

The following sections describe the safe use and maintenance of MikroCAD scanners.



The scanner's LED pattern turns off after 5 minutes of non-use. Check the **Light** option to turn the LED pattern on.

Safety Information

This safety information is intended to ensure long service life of your MikroCAD scanner and protect against fire and electric shock. Carefully read and follow this and all other safety information.

- Before installing and starting the scanner, read this documentation.
- Incorrect handling of the scanner may cause personal injury or property damage.
- To avoid the risk of fire or electric shock, do not expose the scanner to rain or moisture.
- To avoid the risk of fire or electric shock, do not open the cover of any of the scanner component. These devices contain high voltage components. All service must be performed by qualified LMI personnel.
- Do not look into the projection lens when the projector is turned on. This can cause serious injury to your eyes.
- Do not reach between motorized moving components when the scanner is in operation. You may cause serious injury to your hands and fingers.
- The scanners contain electrostatic-sensitive components which may be damaged through improper handling. Discharge your body before touching them. Avoid contact with highly insulating substances (synthetic fibers, plastic foils etc.). Place the electrostatic-sensitive device on a conducting surface.
- Do not open scanner components. Keep all covers and switching cabinet doors closed during operation. There is a risk of death or severe harm to health or material damage.
- Never disconnect the electrical connections under current. In some conditions, electric arcs may form and cause personal injury, as well as damage to contacts.
- Adjustment of the scanner can only be performed by trained personnel.

Environment and Lighting

To ensure precise measurements and to prevent damage to the scanner, avoid the following:

- large temperature variations
- strong vibrations
- strong magnetic fields
- high air humidity

Direct sunlight and direct light exposure through the room lighting onto the measuring area leads to increased noise in the scanned data or incomplete 3D data and must therefore be avoided.

When setting up the scanner, ensure sufficient distance between the scanner components and walls, furniture etc. All ventilation openings must be left uncovered. Ensure that no fluids, particularly when cleaning the unit, enter the scanner.

Transporting

Before transporting the scanner, all components must be carefully packaged. Handle all system components carefully during transportation. Strong vibrations, shaking, shocks, etc., can cause misalignment in components, which may negatively affect later measurements.

Mechanical influences, particularly if the system is dropped, may destroy sensitive components.

After transporting the scanner, you must calibrate it, or at least verify the calibration. See *Calibrating the Scanner* on page 33 for information on how to calibrate the system.

LMI excludes all liability for damage due to improper transport.

Getting Started

This section provides information on system requirements and software installation.

For information on setting up the hardware, see the Quick Start Guide for your scanner model.

System Requirements

Computer Requirements

	Minimum	Recommended
Operating System	Windows 7 (64-bit)	
CPU		Quad-core
Memory	4 GB	8 GB
Video Card	OpenGL or Direct3D hardware accelerated	
Resolution	1280 x 768, thousands of colors	1600 x 1024, thousands of colors
Free Disk Space	1 GB	
Ethernet	<i>MikroCAD lite 1.6 x 1.2 / premium 1.6 x 1.2</i> 1 free Ethernet port	
USB	<i>MikroCAD lite 1.6 x 1.2 / premium 1.6 x 1.2</i> 1 free USB port (for software dongle; required only for measurements) <i>MikroCAD premium 13 x 10 / 80 x 60 / 140 x 105 and plus 1.7 x 1.4</i> 2 free USB ports (one port for software dongle; required only for measurements)	
FireWire 800	<i>MikroCAD premium 13 x 10 / 80 x 60 / 140 x 105 and plus 1.7 x 1.4</i> 1 free FireWire 800 port	

Installing the Software

The MikroCAD setup wizard easily guides you through the installation of the software.

To install the MikroCAD software:

1. Download the software from <http://lmi3d.com/support/downloads>.
If you purchased the MikroCAD software (Standard or Professional), download 14471-x.x.x.x_SOFTWARE_MikroCAD_Measurement.exe, which lets you scan data and perform measurements.

If you purchased only the scanner, download 14470-x.x.x.x_SOFTWARE_MikroCAD_Scan.exe, which only lets you scan data.

2. Double-click on the installer and follow the instructions to install the MikroCAD software.

Measurement Modules

The MikroCAD software is available in two versions: Standard and Professional. The following table describes which modules are included with each version, as well as the optional modules:

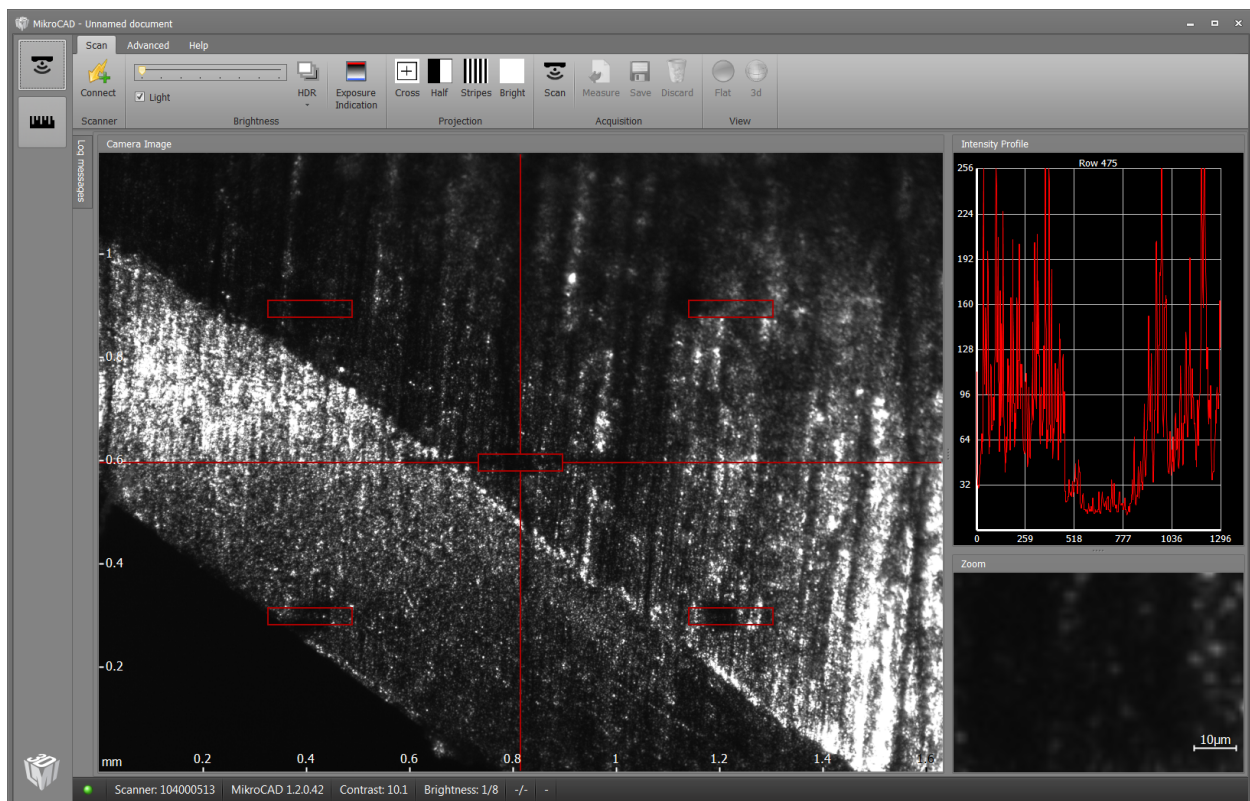
	Standard	Professional
2D Advanced Surface Texture	optional	included
Contour	included	included
Advanced Contour	optional	optional
2D Automotive	optional	included
3D Advanced Surface Texture	included	included
3D Fourier & Wavelets	optional	included
Colocalization	optional	included
Lead Analysis (Twist)	optional	optional
4D Series	optional	included
Statistics	optional	included
Grains & Particles	optional	included

Software Overview

The MikroCAD software provides two main modes: an acquisition mode and a measure mode. This manual describes the steps you must follow to acquire data and pass it to the software's measurement component. For information on performing measurements, see the documentation integrated in the software.

Scan Tab

The **Scan** tab lets you set up your scanner, and acquire and view data.



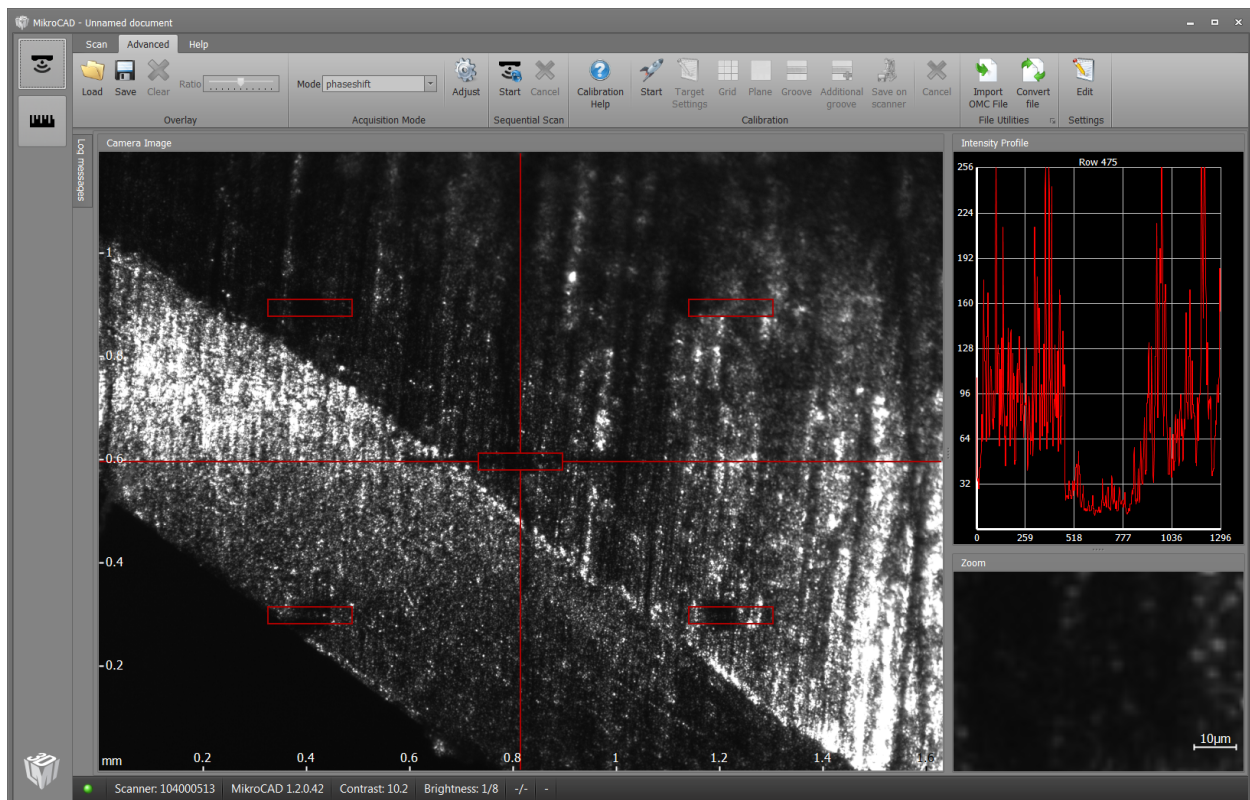
Scan tab

Element	Description
Scanner group	Lets you connect to scanners.
Brightness group	Lets you set the brightness of the scanner. Properly setting the brightness ensures that acquired data will be good, which is necessary for good measurements.

Element	Description
	Use Exposure Indication to toggle a color representation of overexposed and underexposed areas. You can also turn the scanner's LED light on and off using the Light option.
Projection	Lets you choose the projection pattern. Different patterns are used for different operations. See <i>Choosing the Projection Pattern</i> on page 17 for more information.
Acquisition	Lets you acquire data (scan), save or discard the data, and pass it to the measurement component.
View	Lets you view acquired data as either a 2D heightmap or as a 3D representation.
Camera Image window	Displays the live camera image.
Intensity Profile window	Displays a histogram of the row or column in the live image that is currently under the mouse pointer. Choose Horizontal in the drop-down to display the intensity of the current row. Choose Vertical in the drop-down to display the intensity of the current column.
Zoom window	Shows a zoomed-in view around the mouse pointer when you hover it above the Camera Image window. Zoom in or out using the mouse wheel.

Advanced Tab

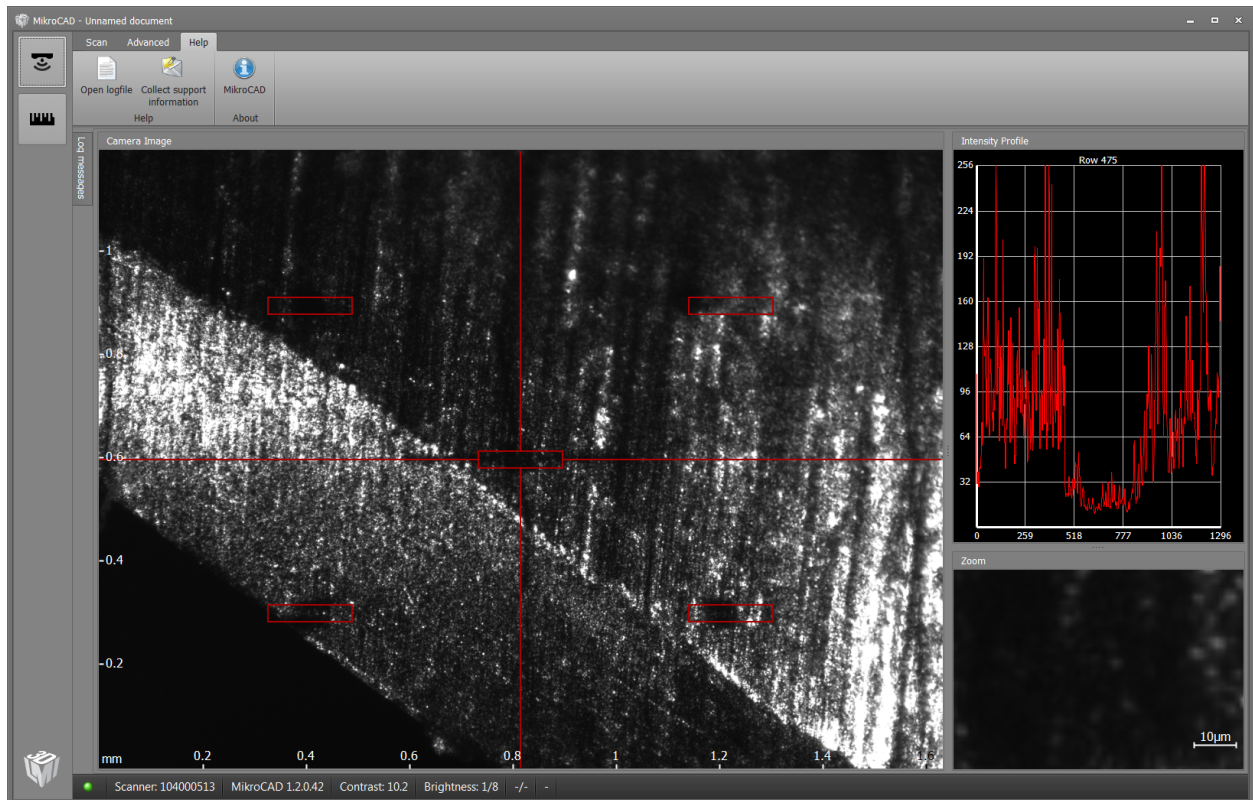
The **Advanced** tab provides functions that are used in less common scenarios.



Element	Description
Overlay	Lets you save and load overlays, which you can use to align samples a desired orientation and position. See <i>Working with Overlays</i> on page 29 for more information.
Acquisition mode	Lets you create custom acquisition modes, defining grey code stripe patterns, phase shift patterns, and prefilters. Custom acquisition modes can improve data quality in some scenarios. See <i>Creating Custom Acquisition Modes</i> on page 30 for more information.
Sequential Scan	Lets you take a series of scans. Useful for quality assurance scenarios.
Calibration	Lets you calibrate the scanner and save calibration information on the scanner. Also provides a Help dialog that reminds you of the required steps. See <i>Calibrating the Scanner</i> on page 33 for more information.
File Utilities	Lets you import .omc (ODSCAD) files, and convert files to different formats.
Settings	Lets you edit various advanced settings.

Help Tab

The **Help** tab lets you access help topics, and also save information for support issues.

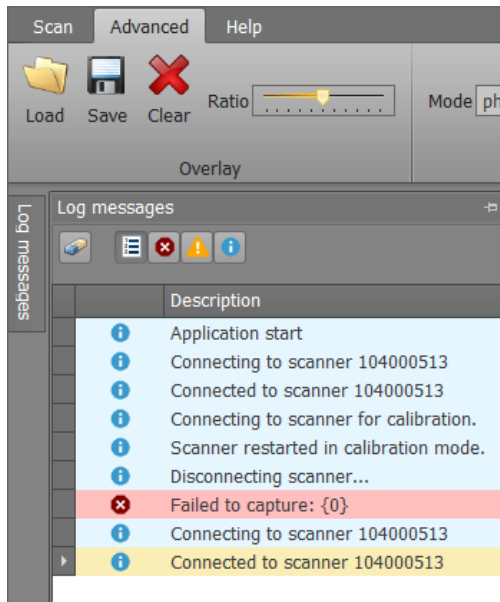


Help tab

Element	Description
Open logfile	Opens a text logfile.
Collect support information	Saves settings and state information, which Technical Support may ask for in case of issues.

Log Messages

You can use the log to see system messages that can help in troubleshooting.



To open the log:

- From any page, click the vertical **Log messages** tab.

The log lists the following types of messages: errors, warnings, general information, and debug information.

To filter messages by type:

- Click one of the four icons at the top of the log (   ).

To clear messages:

- Click the Clear Messages icon ().

Acquiring Scan Data

Once you have set up your scanner and installed the software on your computer, you are ready to acquire data by scanning a sample.

After acquiring scan data, you pass the data to the Measurement component of the MikroCAD software.

Follow the procedures in the next topics to acquire scan data.

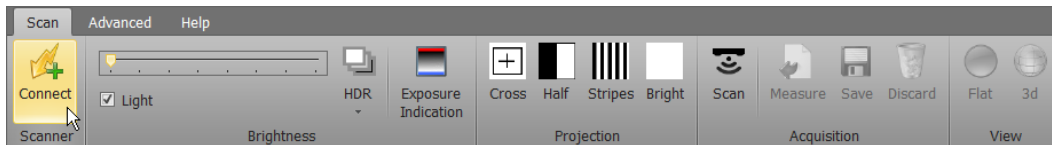
Connecting to a Scanner

When you launch the MikroCAD software, it will try to connect to a scanner.

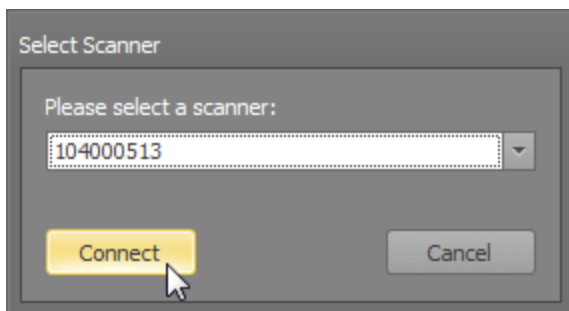
If more than one scanner is connected to your computer, you can choose which scanner to connect the software to.

To choose a scanner:

1. On the **Scan** tab, in the **Scanner** group, click **Connect**.



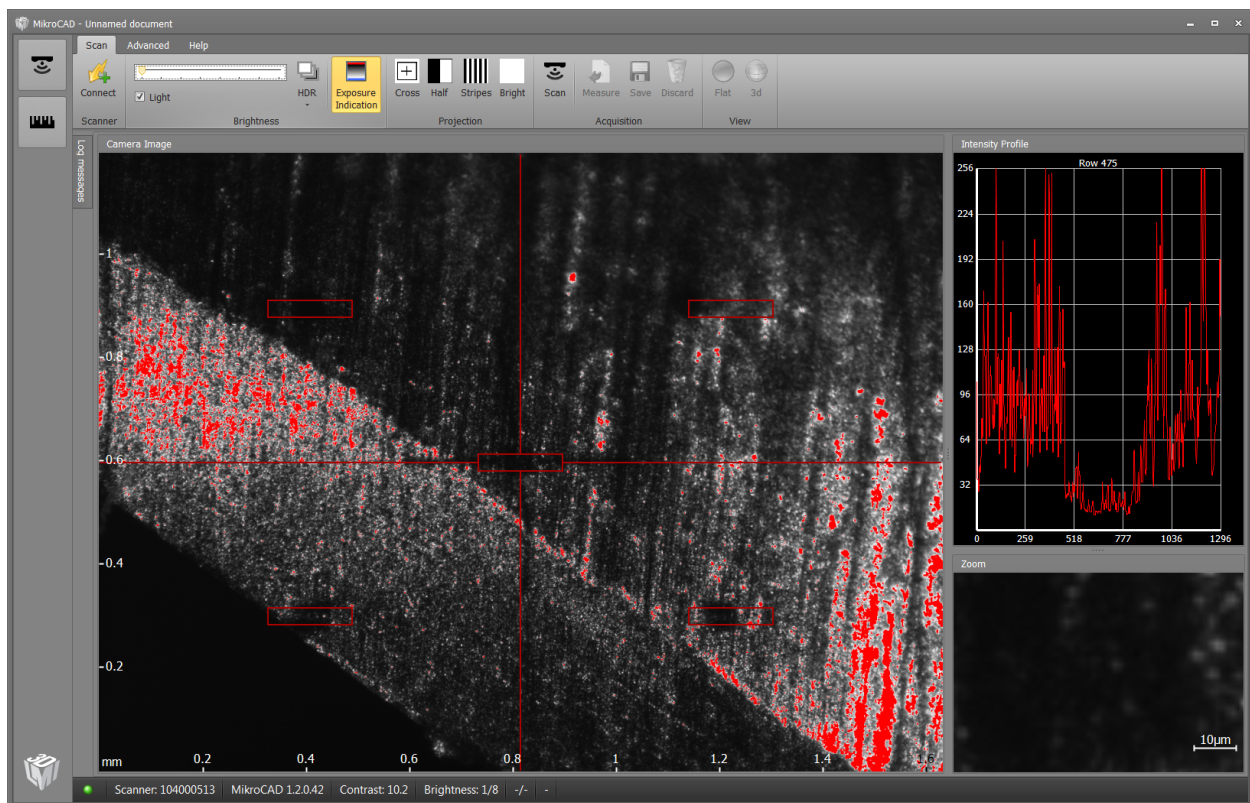
2. In the **Select Scanner** dialog, select a scanner and click **Connect**.



The camera image of the connected scanner is displayed.

Viewing the Live Image

Before you scan data, or after discarding scanned data, the main area of the window shows the live camera image, an intensity profile, and zoom window.



Live view

You use the live view to adjust brightness and focus the scanner before scanning data.

Live view elements

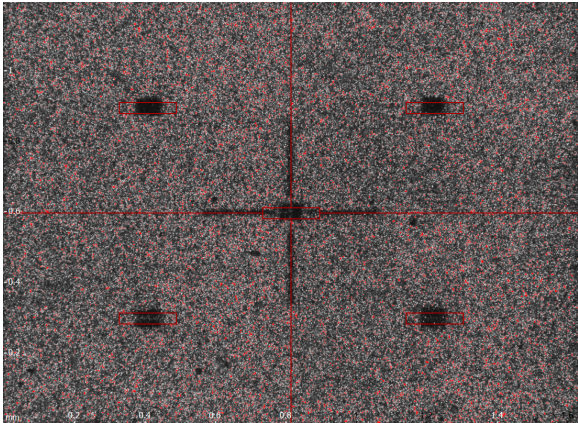
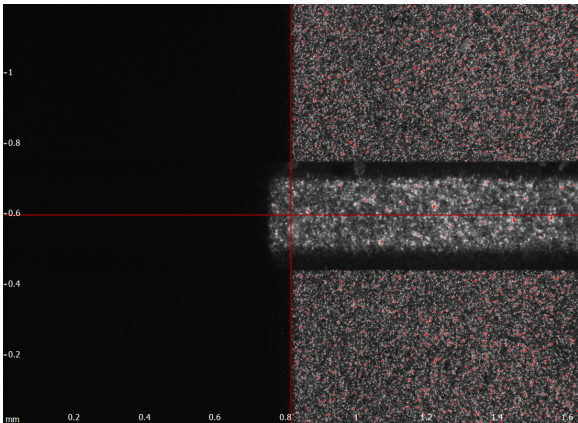
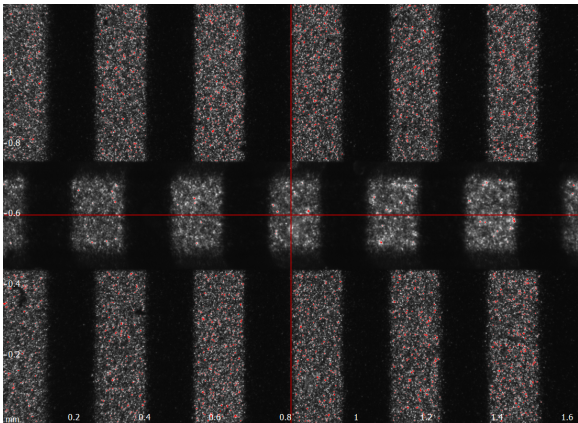
Element	Description
Camera Image window	Displays the live camera image.
Intensity Profile window	Displays intensity values of the pixels in the row or column in the live image that is currently under the mouse pointer. Choose Horizontal in the drop-down to display the intensity of the current row. Choose Vertical in the drop-down to display the intensity of the current column.
Zoom window	Shows a zoomed-in view around the mouse pointer when you hover it above the Camera Image window. Zoom in or out by first clicking in the Camera Image window and then using the mouse wheel.

Choosing the Projection Pattern

Various projection patterns are available in the MikroCAD software. Different patterns are used for different operations.

Projection patterns

Pattern	Use
Cross	Used for focusing samples with a regular surface.

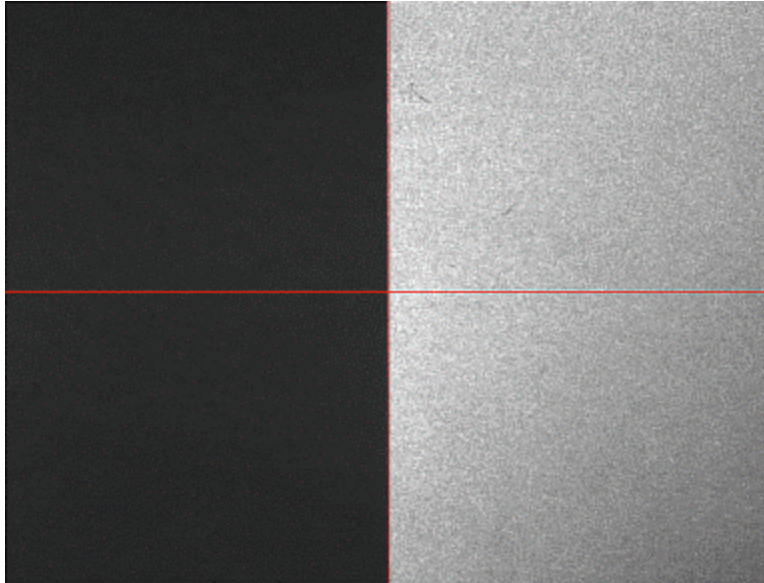
Pattern	Use
	
Half	Used for adjusting brightness with most samples and also for focusing samples with a less regular surface. 
Stripes	Used for adjusting brightness with samples whose surface has varying brightness.  Clicking on this button cycles through a predefined set of finer and finer stripe patterns.
Bright	Lights the entire field of view. Lets you see all details of the surface and can be used for capturing camera images, such as for overlays. See <i>Working with Overlays</i> on page 29 for more information on overlays.

To choose a projection pattern, on the **Scan** tab, in the **Projection** group, click on the pattern you want.

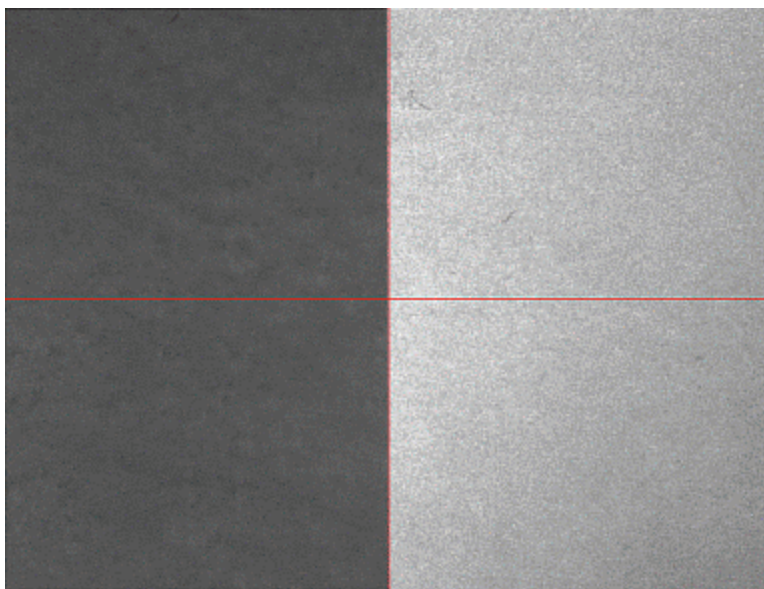
Adjusting the Brightness

Setting the brightness correctly helps ensure that data quality will be good. Specifically, if the brightness is incorrect, the contrast may be too low, which results in bad data quality. Adjusting the brightness must be done often to adapt it to the sample being scanned.

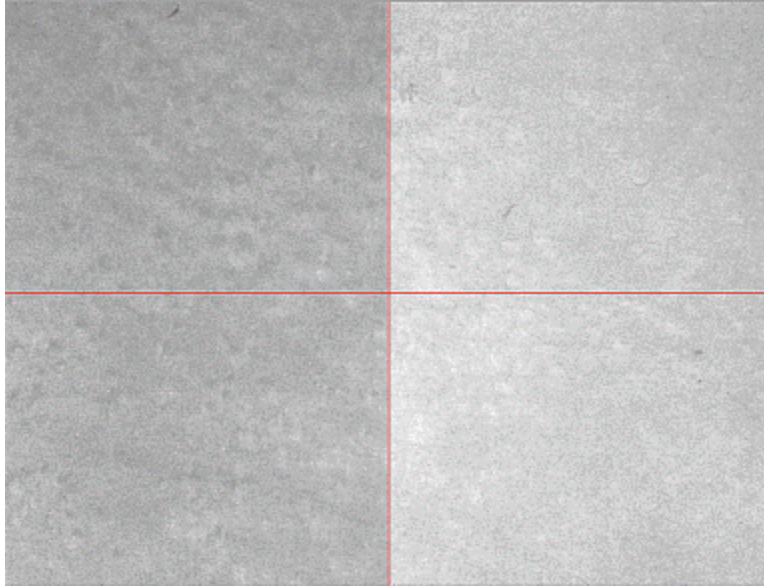
Ideal brightness is achieved when there is good contrast between the dark and the light stripes in the image.



Good contrast. Provides the best data quality.



Poor contrast. Provides poor data quality.



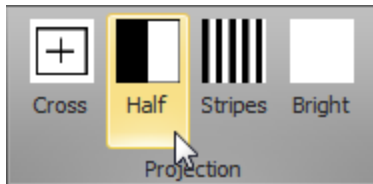
Very poor contrast. Provides very poor data quality.



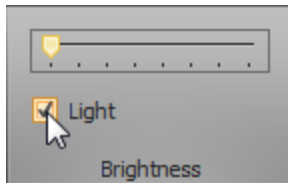
Make sure that ambient lighting, such as light from windows and strong electrical lighting, is limited.

To adjust the brightness:

1. Place the sample you want to scan under the scanner.
2. On the **Scan** tab, in the **Projection** group, choose the **Half** pattern.



3. In the **Brightness** group, check the **Light** option to turn on the projector light.



4. Move the slider until there is a high contrast between the halves of the images.
For examples of good and bad contrast, see the images above
Move the slider to the left to decrease the brightness and to the right to increase the brightness.
The number of steps available in the slider is model-dependent.

Working with High-Contrast Samples (HDR)

When a sample's surface has a high contrast, that is, both light and dark regions, whether because of reflectivity or the color of the surface being scanned, you can use the HDR (High Dynamic Range)

settings to improve the scan data.

When you enable HDR and then scan a sample, the scanner takes multiple exposures, setting the brightness a certain number of steps above and below the current **Brightness** setting for each exposure (model-dependent), and then combines the exposures into a single scan image.

The following HDR settings are available:

HDR settings

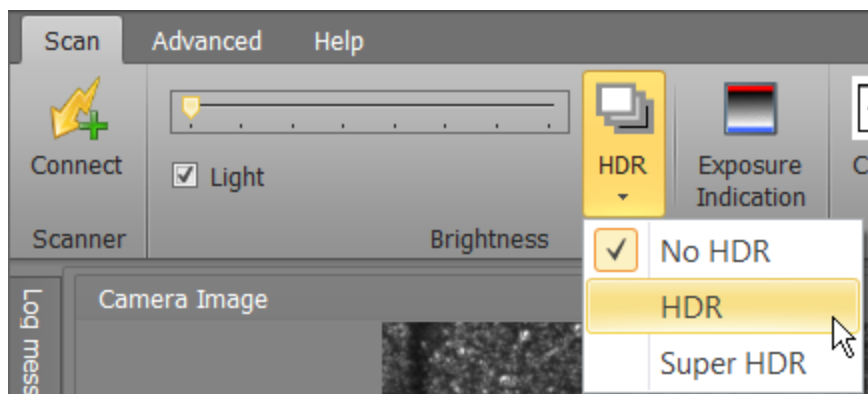
HDR setting	Number of exposures
None	1
HDR	2
Super HDR	3



Scans using HDR take roughly twice as long as scans without HDR using the same initial brightness. Scans using Super HDR take roughly three times as long as regular scans without HDR using the same initial brightness.

To enable HDR:

1. On the **Scan** tab, in the **Brightness** group, click **HDR**.
2. In the drop-down, choose **HDR** or **Super HDR**.



If **Brightness** is set to the lowest or highest setting when you enable HDR, the **Brightness** setting is raised or lowered by one step, respectively, to account for the brightness variation that occurs during scans using HDR. Also, when HDR is enabled, you can't raise the **Brightness** setting to its highest setting, or lower it to its lowest setting.

Focusing the Scanner

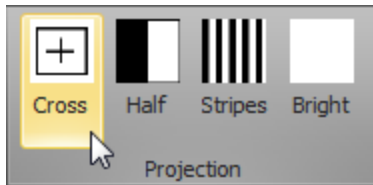
You must focus the scanner properly to get good scan data, which is necessary to successfully take measurements, and also to properly calibrate the scanner.

Use the Cross pattern to focus the scanner.

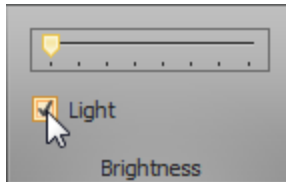
To focus the scanner:

1. Place the sample you want to scan or a calibration target under the scanner.

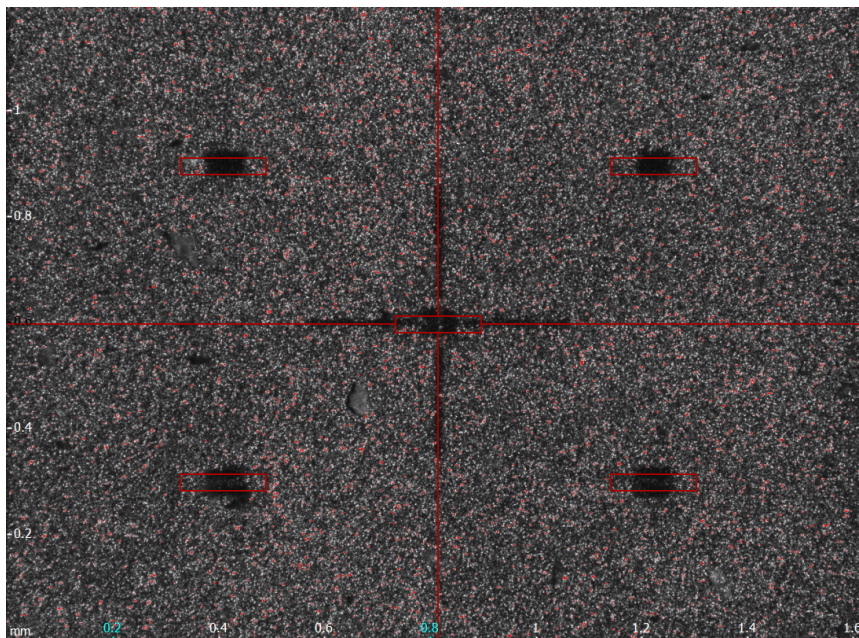
2. On the **Scan** page, in the **Projection** group, choose the **Half** pattern.



3. In the **Brightness** group, check the **Light** option to turn on the projector light.



4. Align the vertical line of the projected cross pattern with the vertical line of the red cross in the MikroCAD software.



For *lite* 1.6 x 1.2, *premium* 1.6 x 1.2 / 13 x 10 / 26 x 20, and *plus* 1.7 x 1.4:

Use the small knob on the column stand to fine-tune the focus. Use the large knob on the column stand to move the scanner more quickly.

For *premium* 140 x 105 / 320 x 240:

Use the column control box to raise and lower the camera.

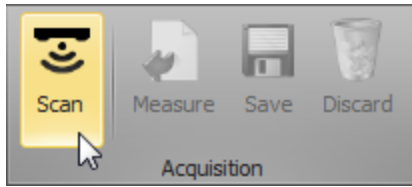
Scanning Data and Managing Results

Scanning

After you have adjusted the brightness so that it is appropriate for your sample and have focused the scanner, you are ready to acquire data. After scanning, you may save, measure (using the Measurement component), or discard the data to scan again.

To acquire data:

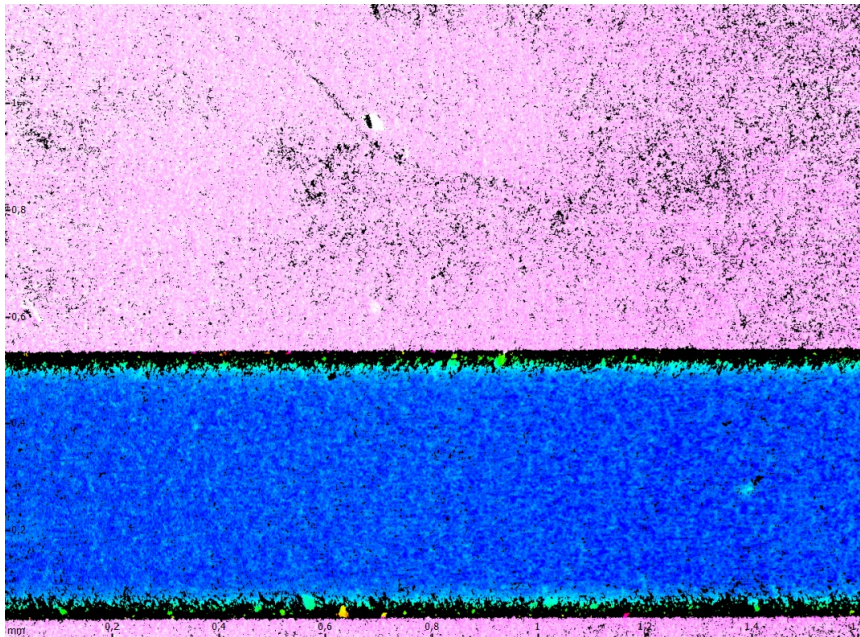
1. On the **Scan** page, in the **Result** group, click on **Scan** to perform a scan.



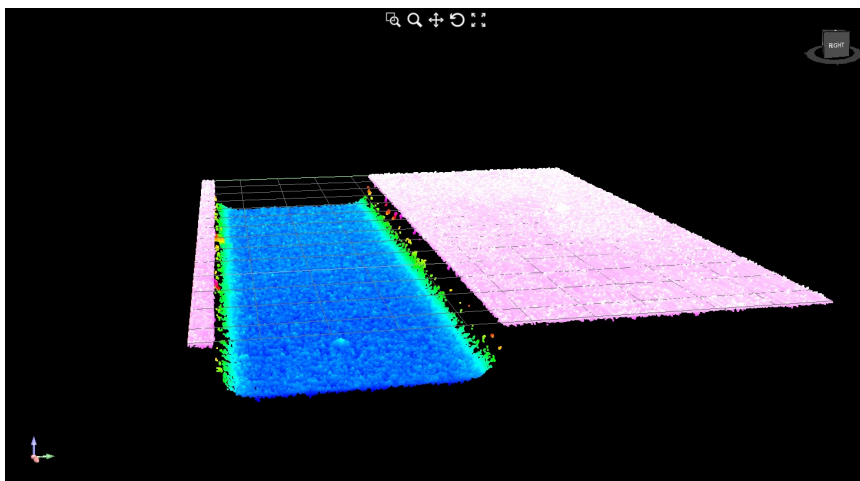
Scanned data appears in the viewer.

You can choose a 2D view or a 3D view by clicking the **Flat** and **3D** buttons to switch to a 2D and 3D view, respectively.

The 2D view is a heightmap.



The 3D view provides tools that you can use to rotate, zoom, and pan the image.



See *Viewing Scanned Data* on the next page for more information on viewing scanned data in 3D.

2. After using the scanner, be sure to close the MikroCAD software *before* disconnecting the scanner.



Failing to close the software before disconnecting the scanner will result in damage to the scanner.

The scanner does not need to be powered to perform measurements on the acquired data.

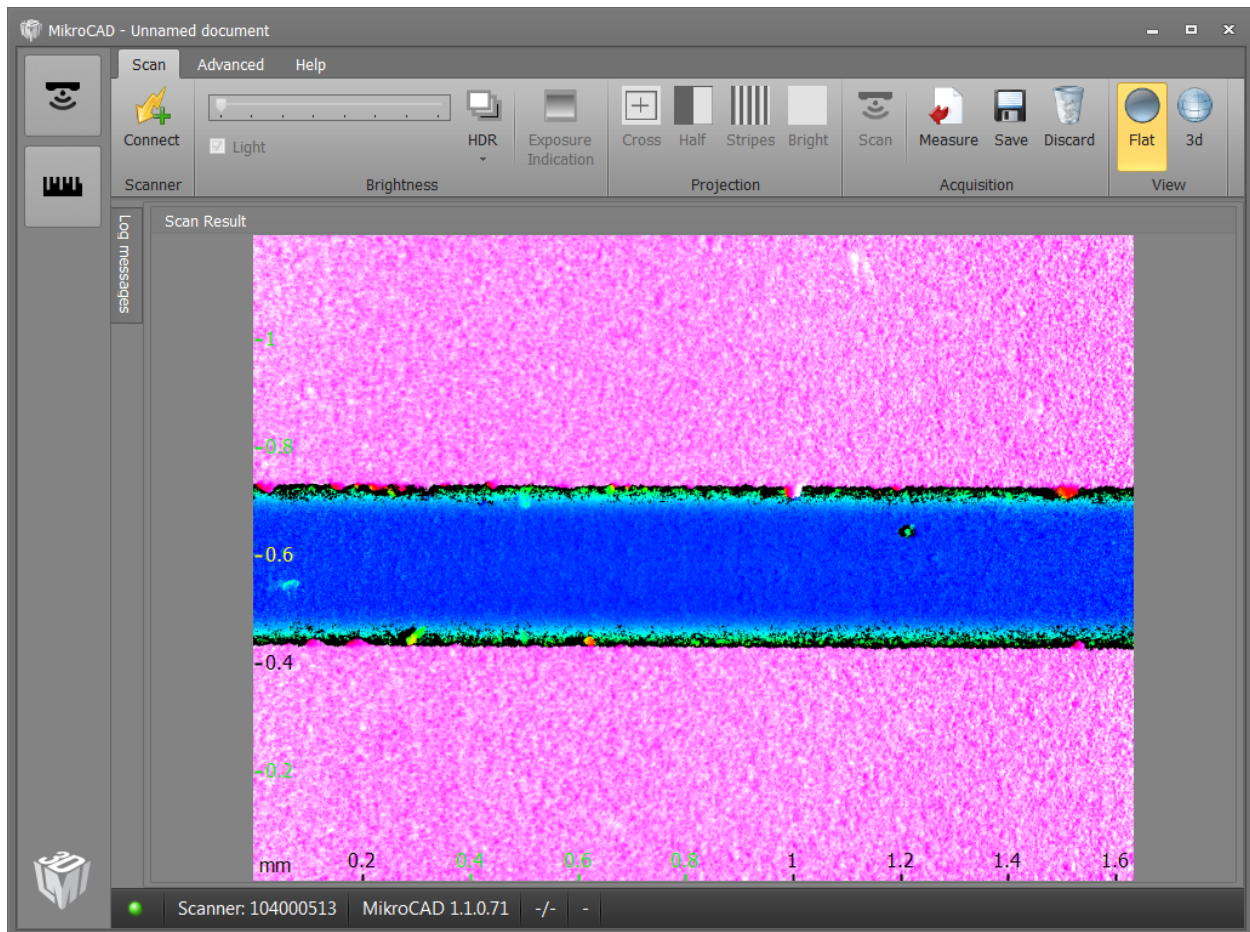
Viewing Scanned Data

After you have acquired data, it is displayed in the MikroCAD software **Camera Image** window.

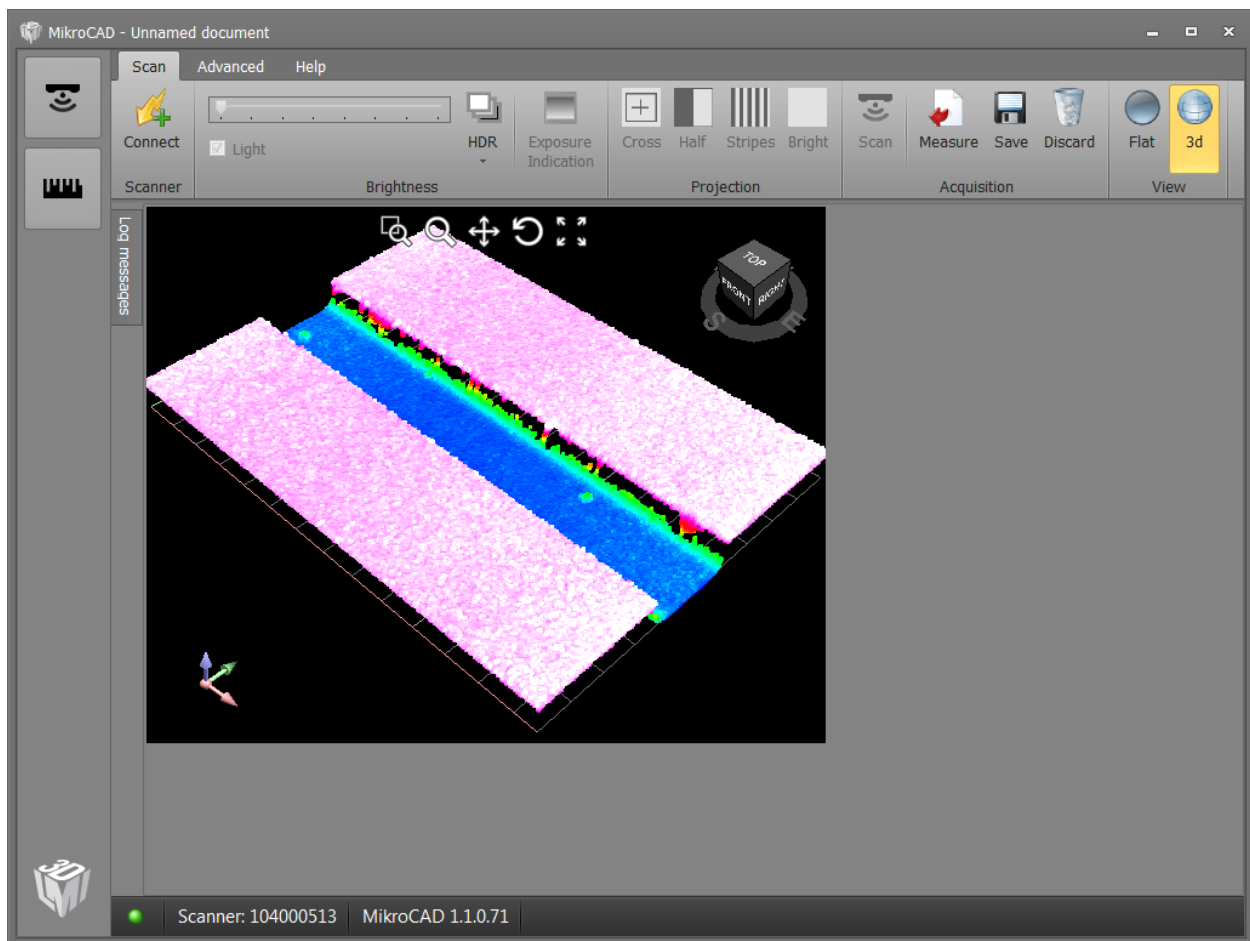
You can view the data as either a 2D heightmap or as a 3D representation, in order to evaluate whether the acquired data is ready to pass to the Measurement component.



After you have determined that the scanned data is good, you should save the data. See *Saving and Discarding Data* on page 26 for more information.



Scanned data - 2D view (heightmap)



Scanned data - 3D view

You can rotate, pan, and zoom the 3D representation by clicking on a manipulation control to select it and then using the mouse or keyboard to manipulate the image.



3D image manipulation controls



Orientation cube

The following controls are available when viewing a 3D representation:

Scanned image manipulation tools

Element	Description
Zoom Window	Lets you select and then zoom in on a region.
Zoom	Lets you zoom the image in and out using the mouse wheel or by clicking in the image, holding the mouse button, and moving the mouse up or down.
Pan	Lets you pan the image using the mouse.
Rotate	Lets you rotate the image using the mouse.
Zoom Fit	Fits the scanned data into the window.
Orientation cube	Lets you rotate the image quickly to a specific orientation. Clicking on labels (such as "Top" or "Left"), on a corner or edge of the orientation cube, or on one of the "compass points (such as "N" or "W") snaps the 3D representation to that orientation. You can also click on the cube and hold the mouse button, and then move the view by moving the mouse.

Saving and Discarding Data

After you have acquired scan data and have decided that the data is good by viewing it either as a 2D heightmap or as a 3D rendering, you can save the data in one of the following formats:

File formats

Format	Description
.sur	The "studiable" format. You can load .sur files into an analysis document in the Measurement component.
.omc	The ODSCAD format. Use this format if you need to work with data in ODSCAD.
.obj	The Wavefront OBJ format. This format lets you import, align, and combine MikroCAD's scan data in FlexScan3D and other mesh-processing software.
.stl	STL Binary or STL ASCII.

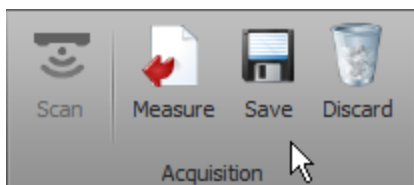
You do not need to save data to pass it to the Measurement component, but saving the data is recommended.

For more information on viewing data, *Viewing Scanned Data* on page 24.

After you save data, the **Measure**, **Save**, and **Discard** buttons, as well as the **Flat** and **3d** buttons in the **View** group, become disabled. After that, you may start the next scan.

To save acquired data:

1. On the **Scan** tab, in the **Acquisition** group, click on **Save**.



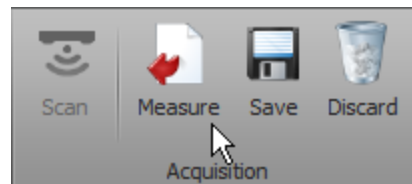
2. In the **Save As** dialog, choose a location for the data and provide a name.

The data is saved as a "studiable," in the .sur format, which the measurement tools can use to perform measurements.

If the acquired data is not satisfactory, you can discard it by clicking **Discard** in the **Acquisition** group.

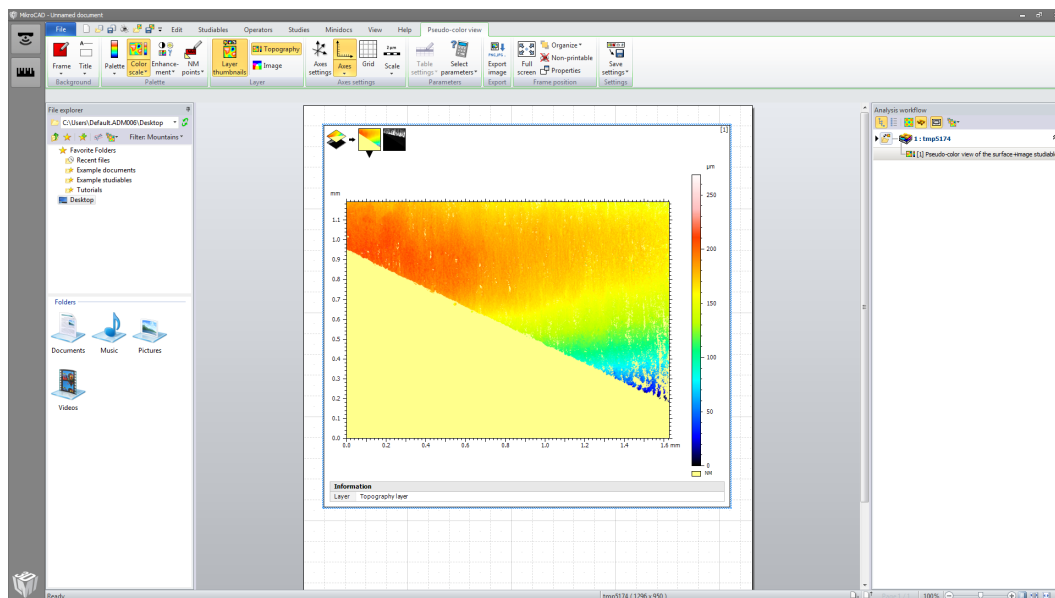
Measuring

After performing a scan, click on **Measure** in the **Result** group, on the **Scan** tab, to transfer the acquired data to the Measurement component.



Passing data to Measurement component

The **Measurement** page will open automatically after clicking **Measure**.



Data passed to Measurement component

You can switch between the **Acquisition** page and the **Measurement** page using the icons in the upper left corner of the interface.



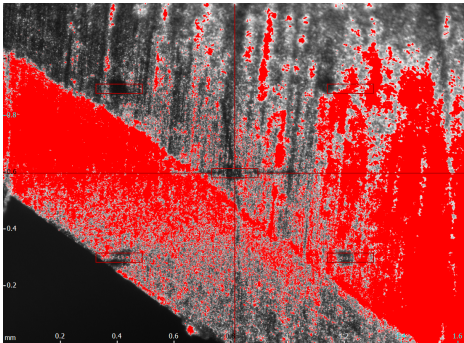
Switching to Measurement page

For information on performing measurements on the acquired data, see the Reference Guide on the **Help** tab on the **Measurement** page.

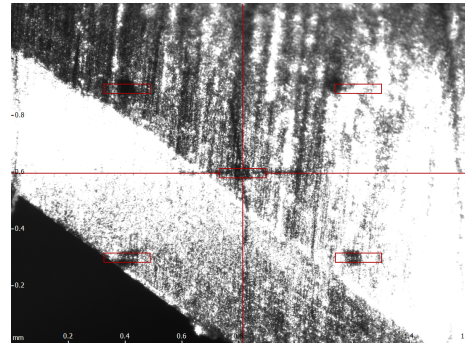
Using Exposure Indication

You can use the **Exposure Indication** setting to see what parts of the live image are overexposed and underexposed. You can use this function to help determine whether the brightness is appropriately set.

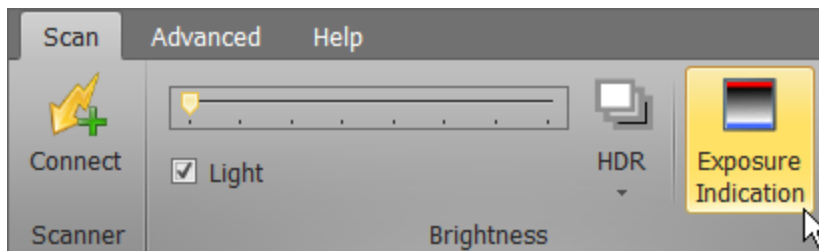
By default, overexposed areas are indicated in the live image by red; underexposed areas are indicated by blue. You can change these colors in the Advanced Settings editor. For information on the editor, see *Editing Advanced Settings* on page 43.



Exposure indication turned on



Exposure indication turned off



To enable Exposure Indication:

- On the **Scan** tab, in the **Brightness** group, click **Exposure Indication**.

Advanced Settings

The following topics describe the advanced settings in the MikroCAD software.

Working with Overlays

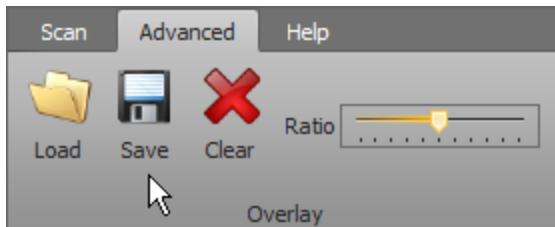
Overlays let you use saved images of a sample in the camera's view to easily align subsequent samples so that the area you want to scan is properly positioned under the scanner. A previous scan image is laid on top of the live view so that you can move and orient the sample to produce scans similar to the previous scan. For example, you could use a previous scan of a drill bit to help orient a different drill bit so that the new scan is similar to the previous scan.

To create an overlay:

1. Place a sample under the scanner.

Make sure the brightness is properly set (see *Adjusting the Brightness* on page 19) and that the camera is focused (see *Focusing the Scanner* on page 21).

2. Move the sample so that the area you will want to measure is properly positioned and oriented.
3. On the **Advanced** tab, in the **Overlay** group, click **Save**.



If scanned data is displayed in the **Scan Result** window, rather than live data in the **Camera Image** window, the **Overlay** buttons are disabled. To save an overlay, return to the **Scan** tab and either pass the data to the **Measurement** page by clicking **Measure** in the **Acquisition** group, or discard the data by clicking on **Discard**. After this, you can return to the **Advanced** tab on the **Acquisition** page and save the overlay.

4. In the **Save As** dialog, choose a location and provide a name for the overlay image.

The overlay is saved as a .PNG file.

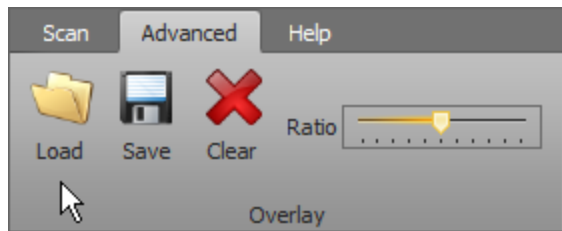
After you have created an overlay, use it to position subsequent samples.

To use an overlay:

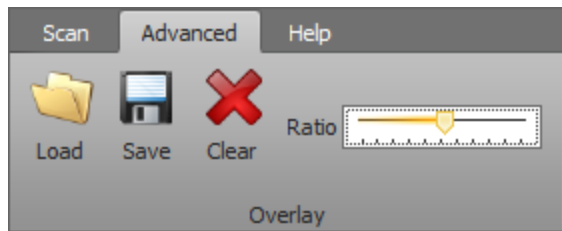
1. Place a new sample under the scanner.

Make sure that the brightness is properly set (see *Adjusting the Brightness* on page 19) and that the camera is focused (see *Focusing the Scanner* on page 21).

2. On the **Advanced** tab, in the **Overlay** group, click **Load** and choose a previously saved overlay image in the **Open** dialog.

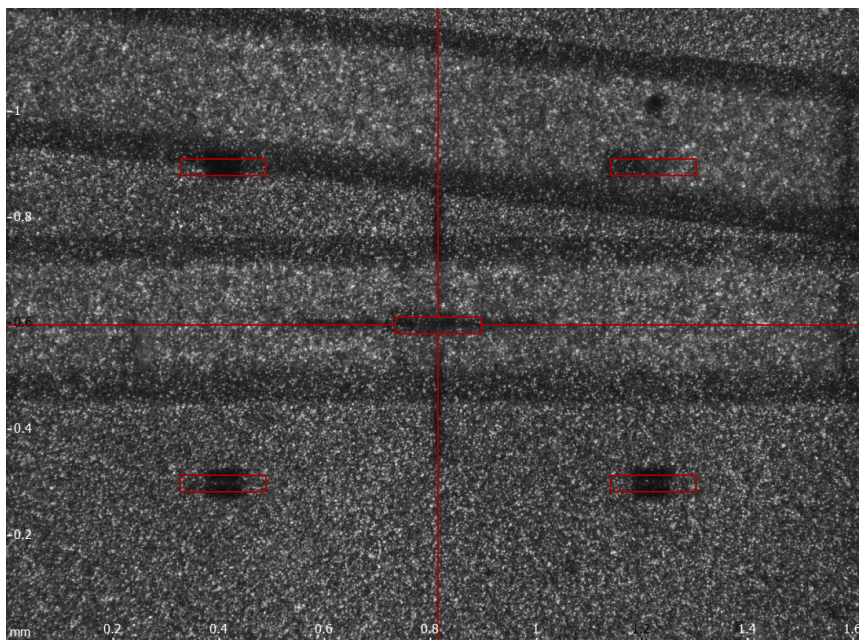


3. Using the **Ratio** slider, adjust the transparency of the overlay image.



Sliding the slider to the left makes the overlay more transparent.

In the image below (a calibration target is used as an example), the horizontal groove is the overlay image, whereas the diagonal groove is the "new" sample that needs to be properly positioned. You would move the sample under the scanner until the two images are roughly aligned.



4. After positioning the new sample, click **Clear** and return to the **Scan** tab to scan the new sample.
See *Scanning* on page 22.

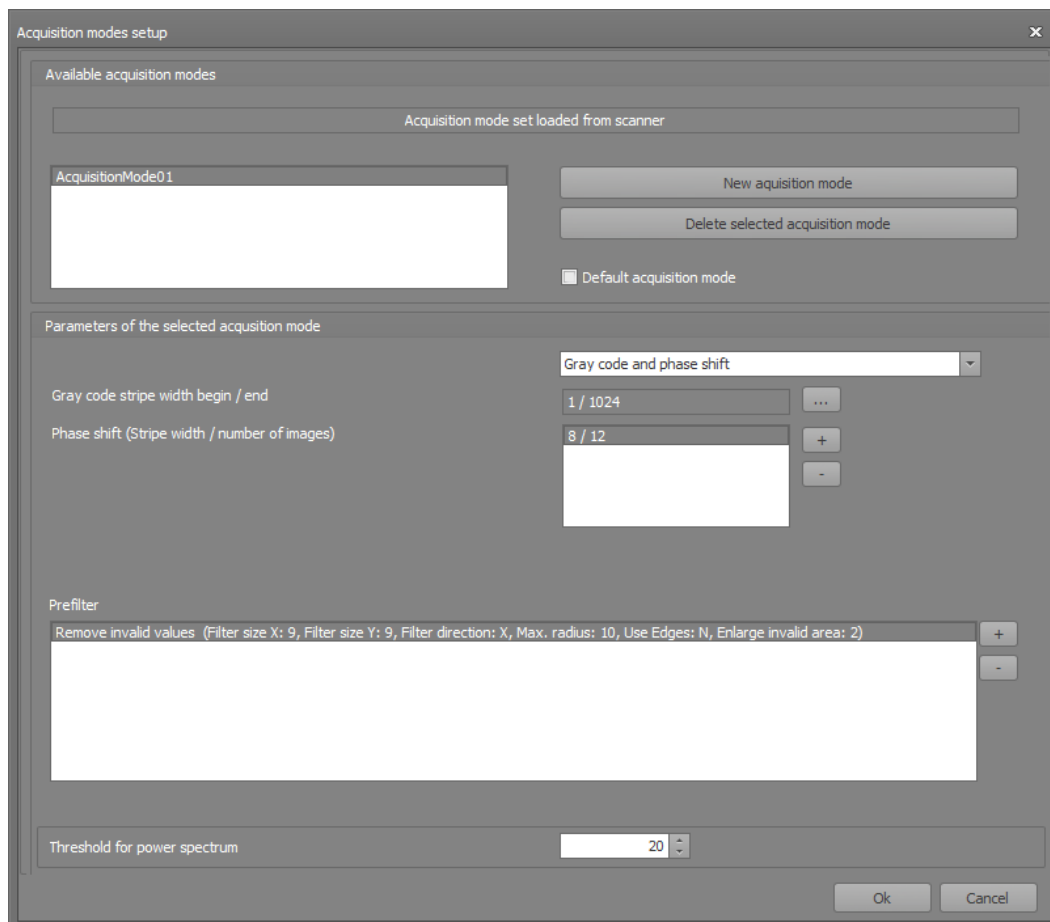
Creating Custom Acquisition Modes

With some types of materials and targets, you will need to define a custom acquisition mode to maximize the quality of the data.

MikroCAD scanners use structured light to determine the location of points on an object in 3D space. To do this, two methods are used: "Gray coded" patterns (named after Frank Gray, and not because the patterns are "gray") and phase-shifted patterns.

For Gray coded patterns, the software cycles through a predefined number of black/white (lit/unlit) stripe projection patterns, changing the width of the stripes each time.

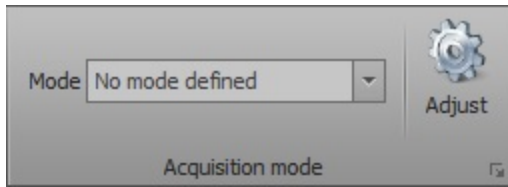
For phase-shifted patterns, the software varies the intensity of light across the width of the stripes to create "smooth" transitions from light to dark in the pattern. The software cycles through a series of these projection patterns, each one of which is "shifted" by a certain amount of the width of each stripe in successive projected images, namely, the reciprocal of the number of images. For example, if twelve images are used, each image is shifted by 1/12 the width of the stripes. Doing this in effect increases the resolution of the scanner.



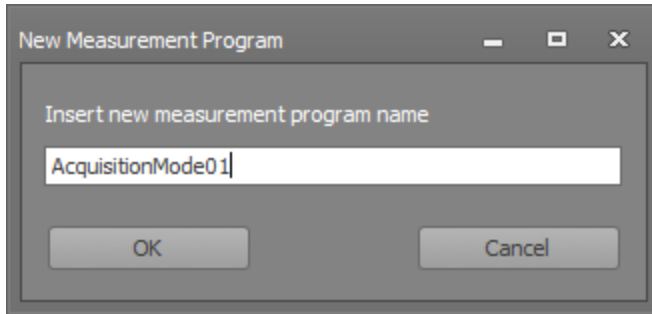
Acquisition mode setup dialog

To create a custom acquisition mode:

1. On the **Advanced** tab, in the **Acquisition mode** group, click **Adjust**.

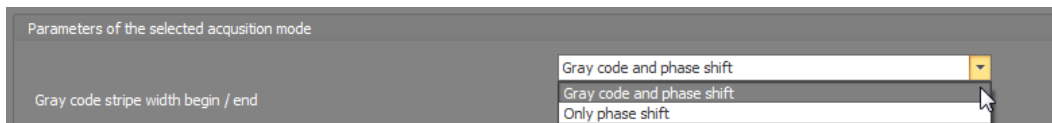


2. In the **Acquisition modes setup** dialog, click **New acquisition mode** and type the name of the new acquisition mode in the **New Measurement Program** dialog.

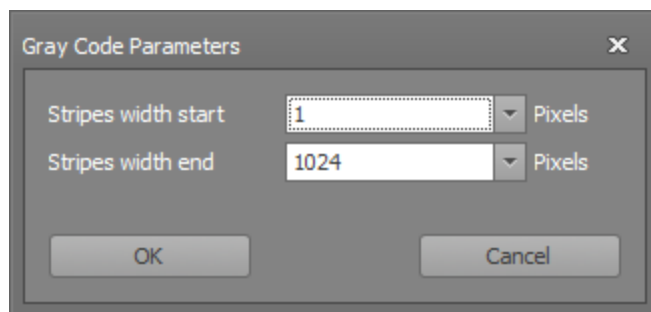


In the main dialog, you can select an acquisition mode in the list and check **Default acquisition mode** to set it as the default.

3. Choose whether both Gray code and phase shift patterns will be enabled, or phase shift only.

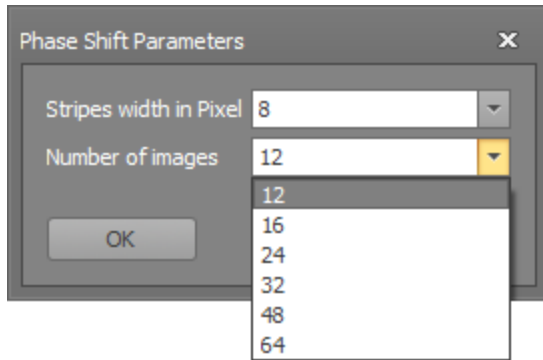


4. Choose the Gray code settings if you have enabled them.
 - a. Click the "..." button near **Gray code stripe width begin / end** and choose the values in the **Gray Code Parameters** dialog.



The **Stripes width start** value represents the width, in pixels, of the stripes in the first image. The **Stripes width end** value represents the width, in pixels, of the stripes in the last image.

- b. Click **OK**.
5. Choose the phase shift pattern settings.
 - a. Click the "+" button near **Phase shift (Stripe width / number of images)** and choose the values in the **Phase Shift Parameters** dialog.



The **Stripes width in Pixel** setting represents the width of the "smooth" stripes. The **Number of images** setting represents the number of images the software will cycle through, shifting each one by the reciprocal of the number of images selected.

You can add multiple phase shift patterns.

- b. Click **OK**.

To delete a phase shift pattern, select it in the list of phase shifts and click the "-" button.

6. Choose the prefilter settings and set a value in **Threshold for power spectrum**.

These settings are for advanced users only.

Calibrating the Scanner

Calibrating the scanner ensures that measurements will be precise and accurate.



You should calibrate a scanner or at least verify its calibration each time after you transport it.

Calibrating results in the following:

- The 0 height reference (baseline) is determined using a plane calibration target in the camera focus.
- The vertical reference is determined using a step or groove calibration target in one or several steps.
- The horizontal reference is determined using a grid calibration target.

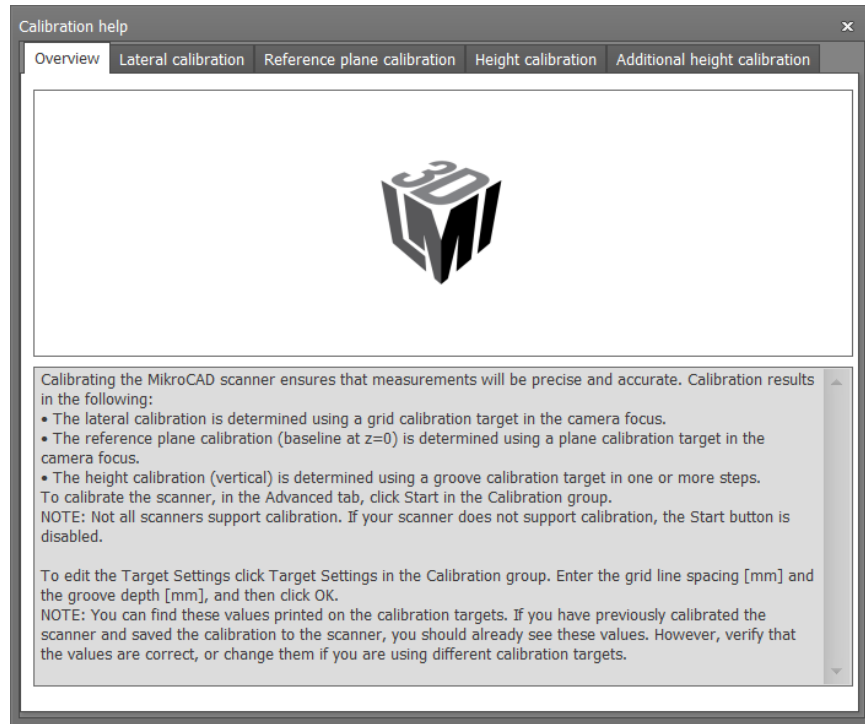


Calibration must be performed in a room where no direct sunlight can fall on the calibration target.



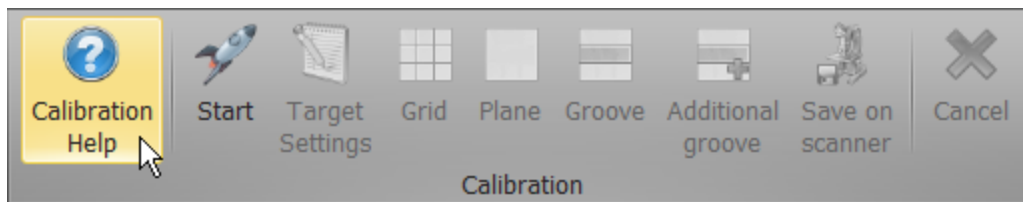
The calibration targets must be handled using gloves.

The MikroCAD software provides an integrated calibration Help guide to remind you of the steps required for the calibration process.



Calibration help

To open the Calibration Help, click **Calibration help** in the **Calibration** group on the **Advanced** tab.

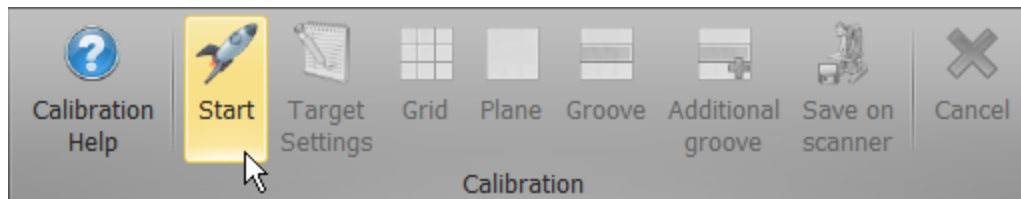


Clicking Calibration Help

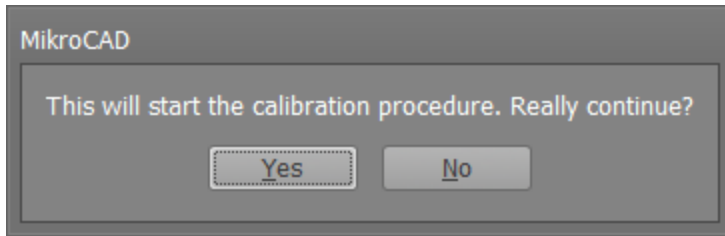
In the following procedure, a MikroCAD premium 1.6 x 1.2 scanner is used. Different scanners use different sizes of calibration targets.

To calibrate the scanner:

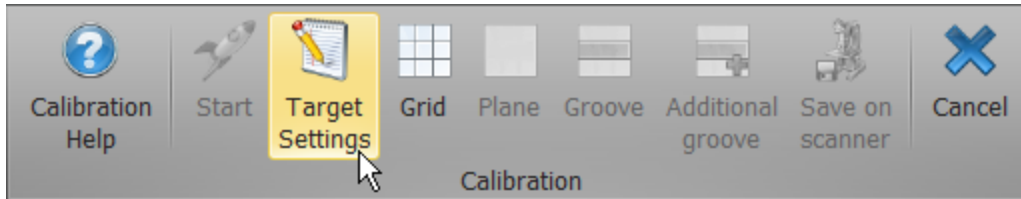
1. On the **Advanced** tab, in the **Calibration** group, click **Start**.



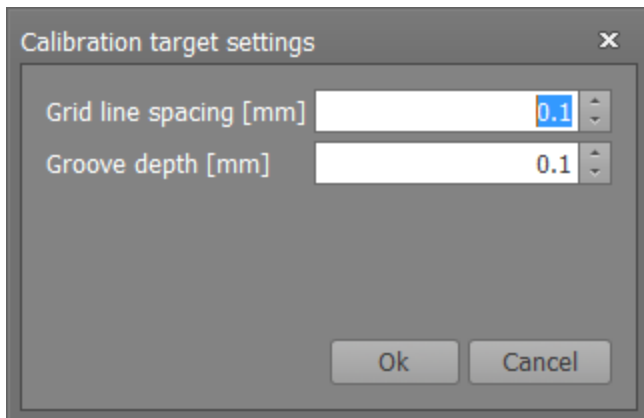
2. Click **Yes** in the confirmation dialog.



3. In the **Calibration** group, click **Target Settings**, enter the grid line spacing and the groove depth values, and then click **OK**.

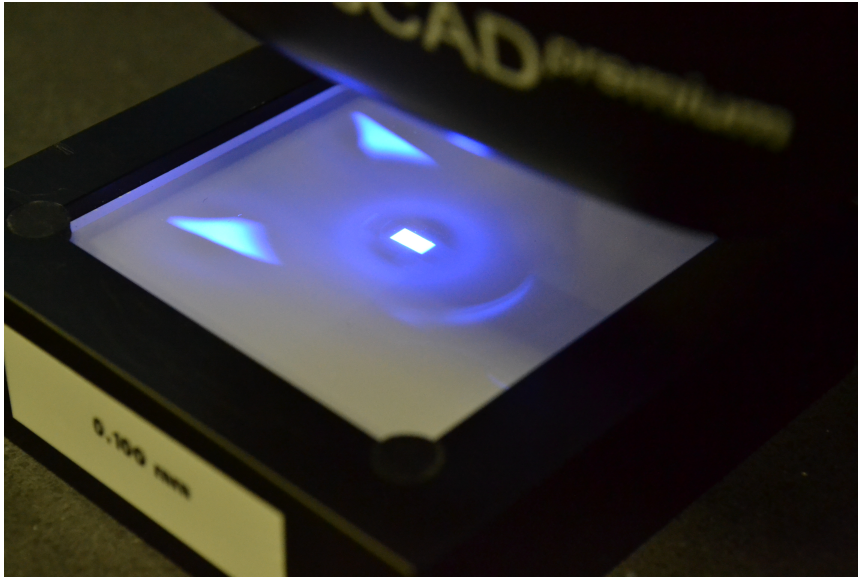


You can find these values printed on the calibration targets.



If you have previously calibrated the scanner and saved the calibration to the scanner, you should already see these values. However, verify that the values are correct, or change them if you are using different calibration targets.

4. Perform the grid calibration.
 - a. Place the grid calibration target under the device.



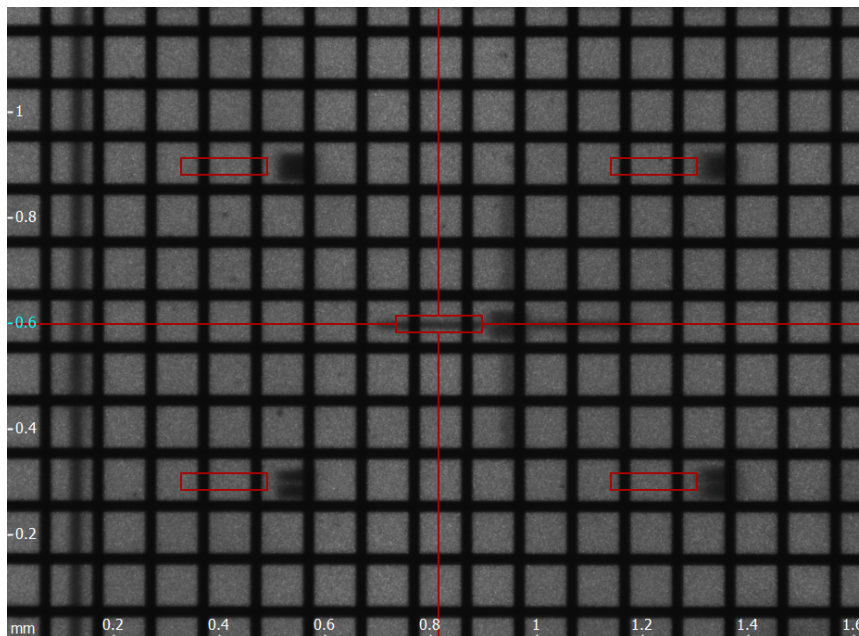
- b. If necessary, focus the camera by moving it up or down until the grid pattern of the calibration target is as sharp as possible in the **Camera Image** window.

You can use the **Zoom** window to help you focus the image.

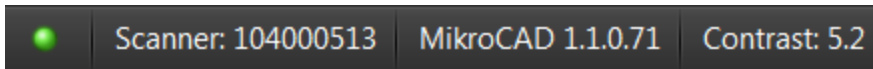
See *Focusing the Scanner* on page 21 for more information on focusing the scanner.

In later steps, you align the red cross pattern in the software with the projected cross pattern. For this step, you only want to focus scanner so that the grid pattern is sharp.

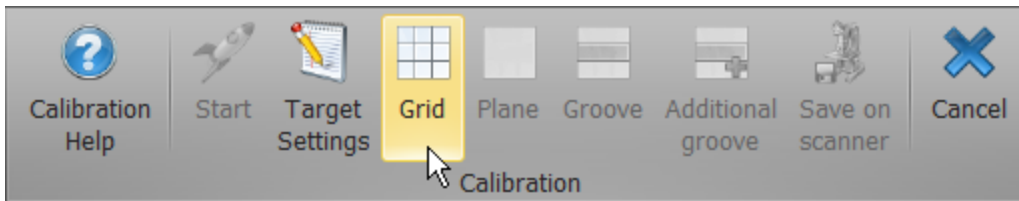
- c. Position the calibration target so that the grid is roughly aligned to the red cross in the software.



If the projected black cross is shifted left or right in relation to the red cross, ignore the black cross when focusing the sample surface. You may use the Contrast indicator to find the best focus, adjusting the scanner up and down until the Contrast value is at its greatest.



- d. Click **Grid**.

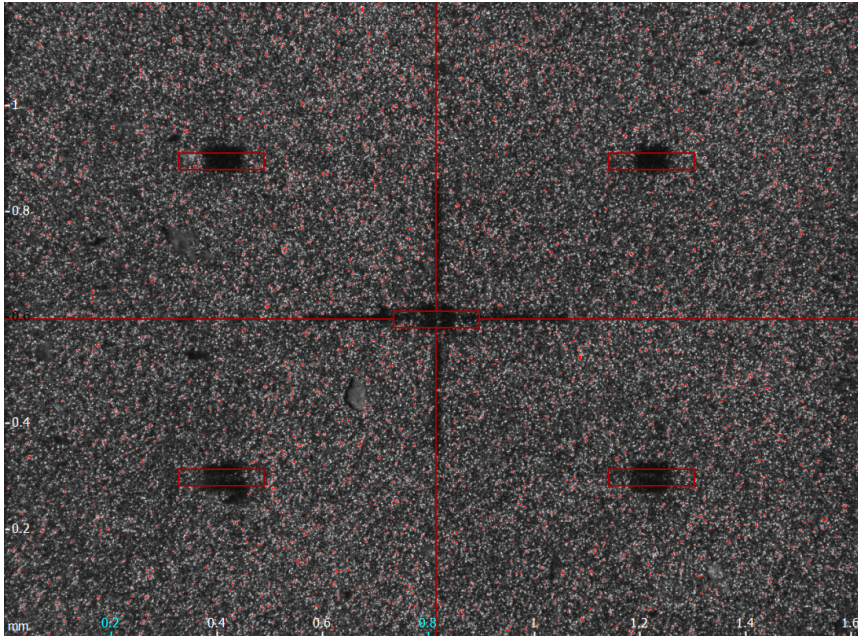


5. Perform the plane calibration.

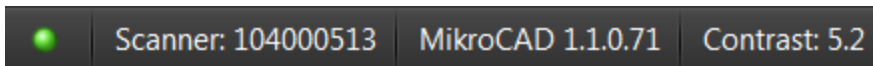
- a. Place the groove calibration target under the device and position it so that *only* a flat surface is visible in the camera image (no groove).



- b. Adjust the brightness of the scanner.
See *Adjusting the Brightness* on page 19 for instructions on setting the brightness.
- c. Focus the scanner by moving it up or down until the vertical line of the projected cross pattern aligns with the vertical line of the red cross.

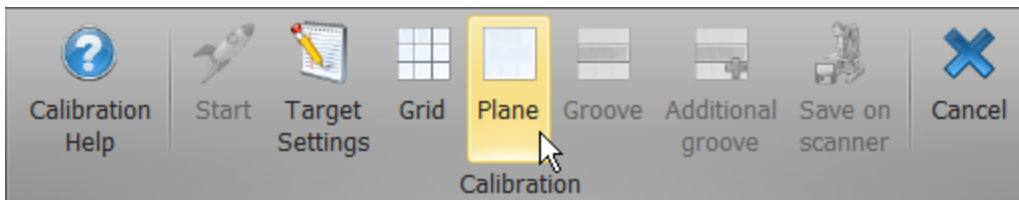


You may use the Contrast indicator to find the best focus, moving the scanner up and down until the Contrast value is at its greatest.



See *Focusing the Scanner* on page 21 for more information on focusing the scanner.

- d. In the **Calibration** group, click **Plane**.



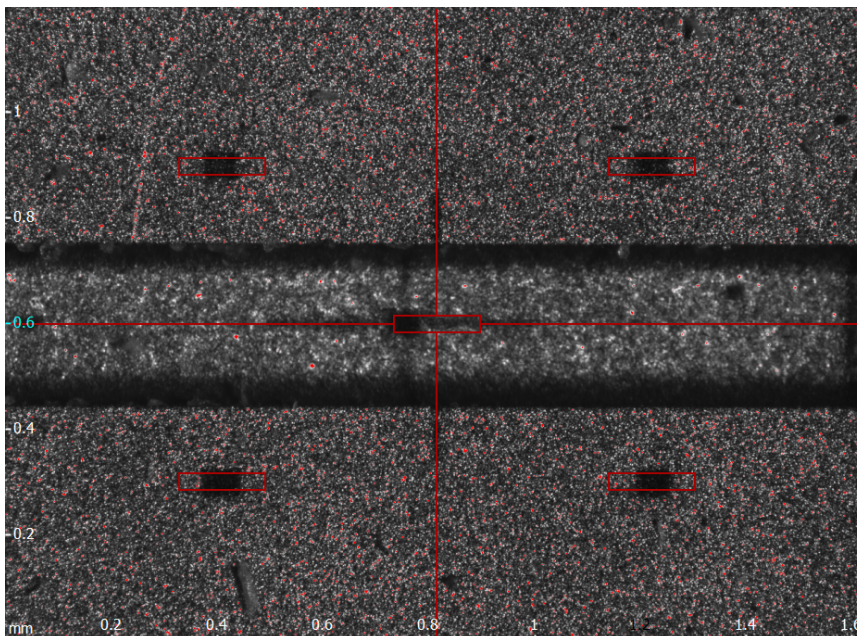
The MikroCAD software will perform the plane calibration. This may take a minute, and the scanner may disconnect and reconnect during this time. A smaller image of the data scanned during the plane calibration will appear next to the **Camera Image** window.

6. Perform the groove calibration.
 - a. Place the groove calibration target under the device.



- b. If necessary, focus the camera by moving it up or down until the vertical line of the black projected cross pattern aligns with the vertical line of the red cross.

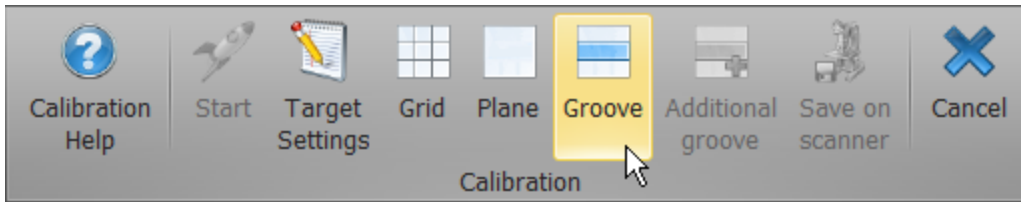
The vertical line of the projected pattern will appear shifted at the bottom of the groove. You should use the projected pattern at the *top* of the groove for alignment.



See *Focusing the Scanner* on page 21 for more information on focusing the scanner.

In the software, the horizontal line should be parallel with the groove and roughly in its center.

- c. Click **Groove**.



The MikroCAD software will perform the groove calibration. This may take several seconds, and the scanner may disconnect and reconnect during this time. A smaller image of the data scanned during the groove calibration will appear next to the **Camera Image** window.

7. Perform additional groove calibration, if necessary.

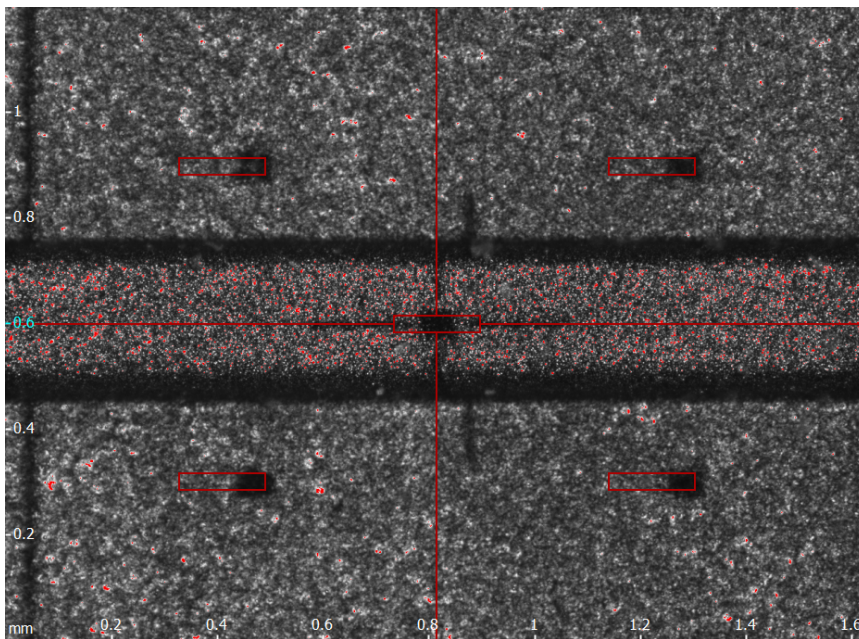
Additional groove calibration is not required with all MikroCAD scanners.

- a. Place the groove calibration target under the device.



- b. If necessary, focus the camera by moving it up or down until the vertical line of the black projected cross pattern aligns with the vertical line of the red cross.

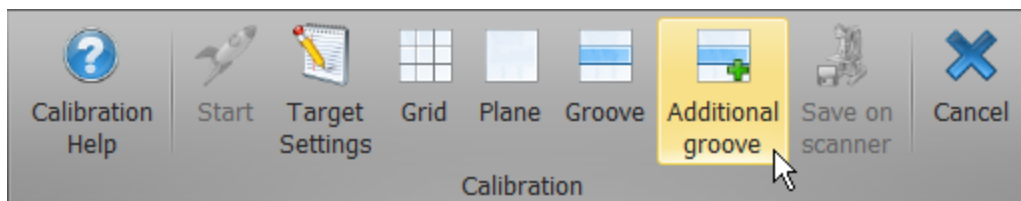
The vertical line of the projected pattern will appear shifted at the bottom of the groove. You should use the projected pattern at the *bottom* of the groove for additional groove calibration.



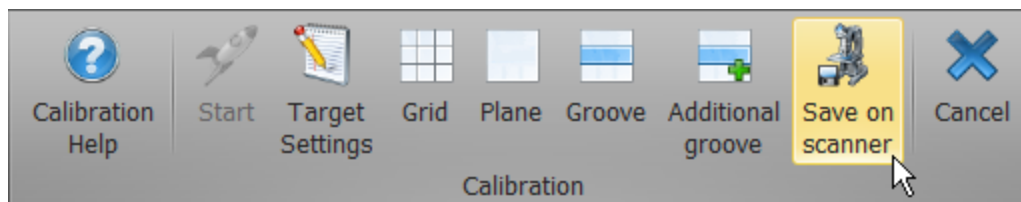
See *Focusing the Scanner* on page 21 for more information on focusing the scanner.

In the software, the horizontal line should be parallel with the groove and roughly in its center.

- c. Click **Additional Groove**.



8. Click **Save on scanner** to save the calibration onto the scanner.



You can cancel the calibration at any time by clicking **Cancel** in the **Calibration** group.

You are now ready to start acquiring data using the scanner. For more information, see *Acquiring Scan Data* on page 16.

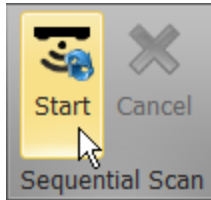
Acquiring Sequential Scans

In Quality Assurance systems, users often need to perform a series of scans, for example, 25 or 50 scans, to later demonstrate the repeatability and reproducibility of the scanning device using the Measurement component. MikroCAD lets you acquire several scans sequentially with a single click of a button.

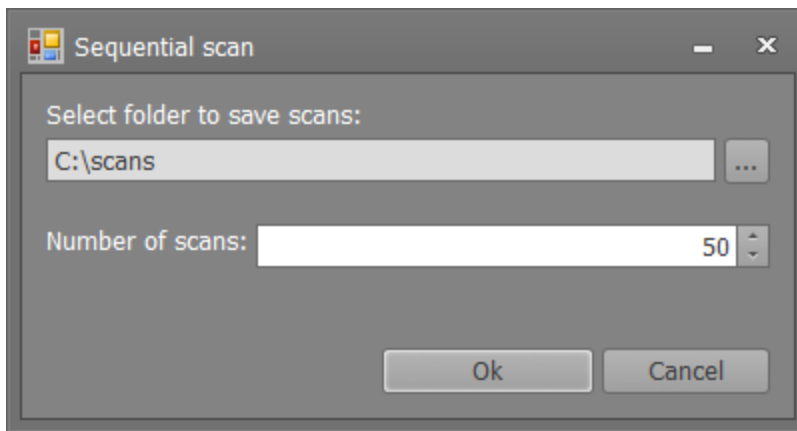
To acquire multiple scans sequentially:

1. Place a sample under the scanner.

2. Move the sample so that the area you want to measure is properly positioned and oriented.
3. Make sure the brightness is properly set (*Adjusting the Brightness* on page 19) and that the camera is focused (see *Focusing the Scanner* on page 21).
4. On the **Advanced** tab, in the **Serial scan** group, click **Start**.

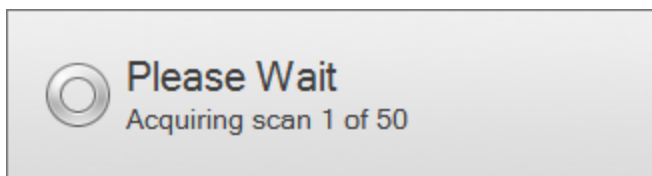


The **Serial scan** dialog displays.



5. In the **Serial scan properties** dialog, do the following:
 - a. Under **Select folder to save scans**, click  and choose or create a folder.
 - b. In **Number of scans**, choose a number of scans.
 - c. Click **OK**.

MikroCAD performs the specified number of scans sequentially, saving each scan as a Studiable (.sur file) in the specified folder.



You can then switch to the Measurement component, load the scans into an analysis document, and perform a repeatability or reproducibility analysis.

To cancel sequential scans at any time:

- On the **Advanced** tab, in the **Serial scan** group, click **Cancel**.

Converting Files

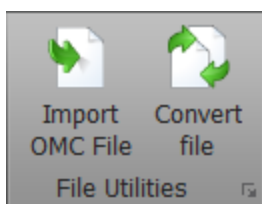
By default, the MikroCAD software saves scans as .sur files ("Studiable" files that can be loaded into analysis documents in the Measurement component). You can convert files to different formats. The following target formats are available:

File formats

Format	Description
.sur	The "studiable" format. You can load .sur files into an analysis document in the Measurement component.
.omc	The ODSCAD format. Use this format if you need to work with data in ODSCAD.

To convert a file:

1. On the **Advanced** tab, in the **File Utilities** group, click **Convert file**.



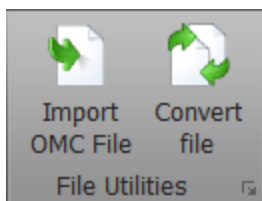
2. In the **Open** dialog that appears, choose the file format of the file that you want to convert from the drop-down, locate the file in the dialog, and click **Open**.
3. In the **Save As** dialog that appears, in **Save as type**, choose the file format you want to use for the conversion from the drop-down.
4. In **File name**, type a name, and then click **Save**.

Importing .OMC (ODSCAD) Files

The MikroCAD software lets you import .omc files created with the ODSCAD software. When you import an .omc file, MikroCAD inserts it into the analysis document that is active in the Measurement component.

To import an .omc file:

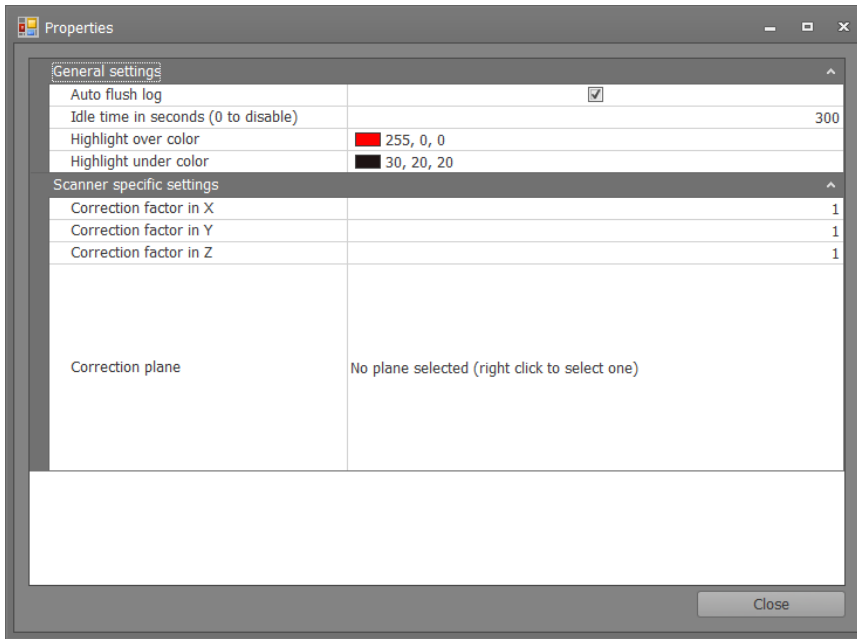
1. In the **Advanced** tab, in the **File Utilities** group, click **Import OMC File**.



2. In the **Open** dialog that appears, locate the file you want to import and click **Open**.
3. MikroCAD switches to the **Measurement** page and inserts the file in the active analysis document.

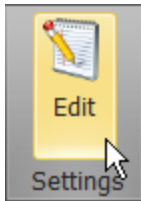
Editing Advanced Settings

You can edit several advanced settings through a dialog in the MikroCAD software.



To edit the advanced settings:

1. In the **Advanced** tab, in the **Settings** group, click Edit.



The settings dialog opens.

2. Make changes to the desired setting and then click **Close**.

Software Development Kit

The following topics describe the MikroCAD software development kit (SDK).

The MikroCAD software development kit (SDK) includes open-source software libraries that can be used to programmatically access and control MikroCAD scanners. The latest version of the SDK can be downloaded by going to <http://lmi3d.com/support/downloads/>, selecting MikroCAD, and clicking on the *Product User Area* link.

Setup and File Locations

Examples

Examples showing how to perform various operations are provided, each one targeting a specific area. All of the examples can be found in *SDK_Examples.sln* in the *SDKExample* folder.

All sample code, including C++ examples, can be downloaded by going to <http://lmi3d.com/support/downloads/>, selecting a product type, and clicking on the *Product User Area* link.



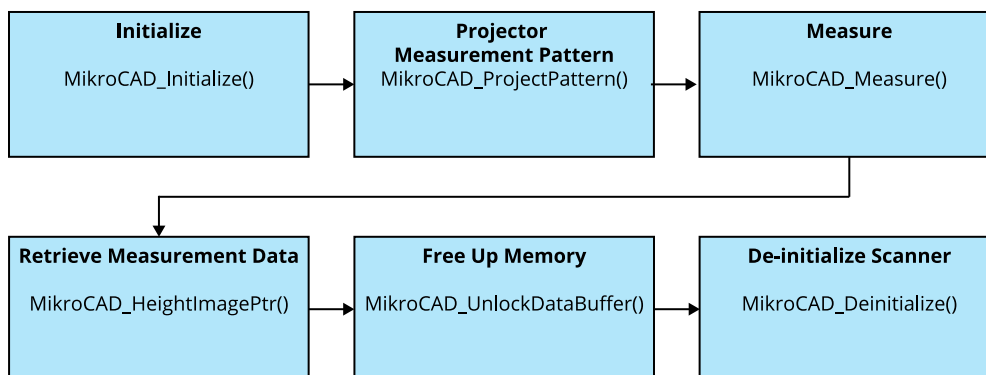
The project solution is for Visual Studio 2013 only.

Header Files

Header files are referenced with *SDKInterface* as the source directory, for example: `#include "../SDKInterface/MikroCADSDK.h"`.

Operation Workflow

Applications created using the SDK typically use the following programming sequence:



Functions

The following functions are available in the MikroCAD SDK.

General

MikroCAD_GetModuleVersionInfo

Returns version information contained in Measurement.dll. No connection to a scanner is necessary.

```
void MikroCAD_GetModuleVersionInfo(unsigned long& dwModuleVersion,  
                                   unsigned long& dwInterfaceVersion);
```

Parameters

dwModuleVersion: Returned module version.

dwInterfaceVersion: Returned module interface version.

MikroCAD_GetNumConnectedSensorModules

Returns the number of connected sensor modules.

```
unsigned long MikroCAD_GetNumConnectedSensorModules();
```

Returns

Number of connected sensor modules.

MikroCAD_GetSensorModuleInfo

Returns sensor information of a connected sensor module.

```
unsigned char MikroCAD_GetSensorModuleInfo(unsigned long dwIndex,  
                                           unsigned long& dwModuleVersion,  
                                           unsigned long& m_dwFirmwareVersion,  
                                           unsigned long& dwInterfaceVersion,  
                                           SensorTypeID& SensorType);
```

Parameters

dwIndex: Index in list.

dwModuleVersion: Returns version of the module (DLL).

dwFirmwareVersion: Returns the firmware version of the sensor.

dwInterfaceVersion: Returns the version of the interface (protocol) to hardware.

SensorType: Returns sensor type ID.

Returns

Success: true.

MikroCAD_ListAllSensors()

Lists all available sensors. (Before connection to the sensor.)

```
unsigned long MikroCAD_ListAllSensors();
```

Returns

Number of listed Sensors.

MikroCAD_GetSensorSerialNumber

Returns the serial number of a listed sensor.

```
unsigned long MikroCAD_GetSensorSerialNumber(unsigned long dwIndex);
```

Parameters

dwIndex: Index in list.

Returns

The serial number.

MikroCAD_GetSensorTypeID

Returns the sensor ID.

```
MikroCAD_GetSensorTypeID();
```

Returns

The Sensor ID.

MikroCAD_Initialize

Initializes the measurement module.



Do not call [MikroCAD_CalibrationOnSensor](#) after the sensor has been initialized.

```
long MikroCAD_Initialize(unsigned long dwSensorNo,  
                          SensorOperatingMode OperatingMode = SensorOperatingMode_  
                          Measure);
```

Parameters

dwSensorNo: The sensor number.

OperatingMode: Operating mode (measurement, simple calibration....).

Returns

The error code.

MikroCAD_Deinitialize

Deinitializes the measurement module.

```
void MikroCAD_Deinitialize();
```

Parameter

MikroCAD_ParameterAvailable

Parameter available.

```
unsigned long MikroCAD_ParameterAvailable(MeasurementParameterID ParameterID);
```

Parameters

ParameterID: The parameter ID.

Returns

Availability of the parameter (flags).

MikroCAD_SetIntegerParameter

Write an integer parameter.

```
long MikroCAD_SetIntegerParameter (MeasurementParameterID ParameterID,  
                                   long lParameter);
```

Parameters

ParameterID: The parameter ID.

lParameter: The returned parameter value.

Returns

An error code.

MikroCAD_GetIntegerParameter

Reads an integer parameter.

```
long MikroCAD_GetIntegerParameter (MeasurementParameterID ParameterID,  
                                   long& lParameter);
```

Parameters

ParameterID: The parameter ID.

lParameter: The returned parameter value.

Returns

An error code.

MikroCAD_GetIntegerParameterLimits

Reads the integer parameter limits.

```
long MikroCAD_GetIntegerParameterLimits (MeasurementParameterID ParameterID,  
                                         long& lMinParameter,  
                                         long& lMaxParameter);
```

Parameters

ParameterID: The parameter ID.

lMinParameter: The returned minimum value of the parameter.

lMaxParameter: The returned maximum value of the parameter.

Returns

An error code.

MikroCAD_SetFloatParameter

Writes a float parameter.

```
long MikroCAD_SetFloatParameter (MeasurementParameterID ParameterID,  
                                 double dParameter);
```

Parameters

ParameterID: The parameter ID.

dParameter: The parameter value.

Returns

An error code.

MikroCAD_GetFloatParameter

Reads a float parameter.

```
long MikroCAD_GetFloatParameter(MeasurementParameterID ParameterID,  
                                double& dParameter);
```

Parameters

ParameterID: The parameter ID.

dParameter: The returned parameter value.

Returns

An error code.

MikroCAD_GetFloatParameterLimits

Reads the float parameter limits.

```
long MikroCAD_GetFloatParameterLimits(MeasurementParameterID ParameterID,  
                                       double& dMinParameter,  
                                       double& dMaxParameter);
```

Parameters

ParameterID: The parameter ID.

dMinParameter: The returned minimum value of the parameter.

dMaxParameter: The returned maximum value of the parameter.

Returns

An error code.

Measurement and Projection Area

MikroCAD_SetMeasurementArea

Sets the measurement area.

```
void MikroCAD_SetMeasurementArea(double dSizeX,  
                                  double dSizeY,  
                                  double dX0,  
                                  double dY0);
```

Parameters

dSizeX: X dimension of the measurement area as a percentage of the camera image limits (0.0 to 1.0).

dSizeY: Y dimension of the measurement area as a percentage of the camera image limits (0.0 to 1.0).

dX0: X origin of the area (-1.0 to 1.0) as a percentage of the camera image limits.

dY0: Y origin of the area (-1.0 to 1.0) as a percentage of the camera image limits.

MikroCAD_ResetMeasurementArea

Resets the measurement area.

```
void MikroCAD_ResetMeasurementArea();
```

MikroCAD_SetProjectionArea

Sets the projection area.

```
void MikroCAD_SetProjectionArea(double dSizeX,
                                double dSizeY,
                                double dX0,
                                double dY0);
```

Parameters

dSizeX: X dimension of the projection area as a percentage of the camera image limits (0.0 to >1.0).

dSizeY: Y dimension of the projection area as a percentage of the camera image limits (0.0 to >1.0).

dX0: X origin of the projection area (< -1.0 to >1.0) as a percentage of the camera image limits. The projection image is greater than the camera image.

dY0: Y origin of the projection area (< -1.0 to >1.0) as a percentage of the camera image limits. The projection image is greater than the camera image.

MikroCAD_SetProjectionMask

Sets the projection mask.

```
void MikroCAD_SetProjectionMask(unsigned char* pbyMask);
```

Parameters

pbyMask: The projection mask in camera coordinates.

MikroCAD_ResetProjectionArea()

Resets the projection area.

```
void MikroCAD_ResetProjectionArea();
```

Camera Images

MikroCAD_GetCameraImage8

Gets a camera image (black and white).

```
long MikroCAD_GetCameraImage8(unsigned char* pbyImage,
                                unsigned long dwAverage = 1);
```

Parameters

pbyImage: The buffer for the camera image.

dwAverage: The number of averages.

Returns

An error code.

MikroCAD_GetCameraImage24

Gets a camera image (color).

```
long MikroCAD_GetCameraImage24(unsigned char* pbyImage,
                                unsigned long dwAverage = 1);
```

Parameters

pbyImage: The buffer for the camera image (red, green, blue, red, green,...).

dwAverage: The number of averages.

Returns

An error code.

Projector

MikroCAD_ProjectValue

Projects an image with one overall constant gray value.

```
long MikroCAD_ProjectValue(unsigned char cValue);
```

Parameters

cValue: Gray value.

Returns

An error code.

MikroCAD_ProjectColorValue

Projects a color value (entire image is the same color).

```
long MikroCAD_ProjectColorValue(unsigned char cRed,
                                unsigned char cGreen,
                                unsigned char cBlue);
```

Parameters

cRed: Red color value.

cGreen: Green color value.

cBlue: Blue color value.

Returns

An error code.

MikroCAD_ProjectImage8

Projects a black and white image.

```
long MikroCAD_ProjectImage8(unsigned char* pbyImage);
```

Parameters

pbyImage: The buffer for the projector image.

Returns

An error code.

MikroCAD_ProjectImage24

Projects a color image.

```
long MikroCAD_ProjectImage24(unsigned char* pbyImage);
```

Parameters

pbyImage: The buffer for the camera image (red, green, blue, red, green,...).

Returns

An error code.

MikroCAD_ProjectPattern

Projects a predefined pattern.

```
long MikroCAD_ProjectPattern(short nPatternIndex);
```

Parameters

nPatternIndex: 0...NumPattern. 0 = off.

Returns

An error code.

MikroCAD_ProjectStripePattern

Projects a predefined pattern.

```
long MikroCAD_ProjectStripePattern(short nPatternIndex,  
                                   bool bInvers);
```

Parameters

dwPatternIndex: 0...NumStripePattern. 0 = off.

bInvers

Whether the pattern is inverted.

Returns

An error code.

MikroCAD_SwitchOnOffProjectorLampAvailable

Determines whether the projector lamp switch on / off switch is available.

```
bool MikroCAD_SwitchOnOffProjectorLampAvailable();
```

Returns

true if the projector lamp switch on / off switch is available; false otherwise.

MikroCAD_SwitchOnOffProjectorLamp

Switch the projector lamp on or off.

```
void MikroCAD_SwitchOnOffProjectorLamp(bool bOn);
```

MikroCAD_GetProjectorLampState

Returns the projector lamp state.

```
ProjectorLampState MikroCAD_GetProjectorLampState();
```

Returns

The projector lamp state.

Data Acquisition

MikroCAD_GetNumPredefinedMeasParameterSets

Returns the number of predefined measurement parameter sets.

```
unsigned long MikroCAD_GetNumPredefinedMeasParameterSets();
```

Returns

The number of predefined measurement parameter sets.

MikroCAD_GetPredefinedMeasParameterSetName

Returns the name of a predefined measurement parameter set.

```
char* MikroCAD_GetPredefinedMeasParameterSetName(unsigned long dwIndex);
```

Parameters

dwIndex: The index in the list.

Returns

The name of the predefined measurement set.

MikroCAD_SelectCurrentMeasurementProgram

Selects the current measurement program.

```
long MikroCAD_SelectCurrentMeasurementProgram(char* pszMeasProgName = NULL);
```

Parameters

pszMeasProgName: Measurement program name (not case-sensitive). NULL = default program.

Returns

An error code.

MikroCAD_GetCurrentMeasurementProgramIndex

Gets the current measurement program index.

```
long MikroCAD_GetCurrentMeasurementProgramIndex();
```

Returns

The current measurement program index. A value less than 0 indicates the default measurement program.

MikroCAD_GetCurrentMeasurementProgram

Gets the current measurement program.

```
char* MikroCAD_GetCurrentMeasurementProgram();
```

Returns

The current measurement program. "" indicates the default program.

MikroCAD_GetDefaultMeasProgramName

Returns name of the measuring program that is identical to the default measuring program.

```
char* MikroCAD_GetDefaultMeasProgramName();
```

Returns

The name of the measurement program identical to the default measuring program or "-1" if no measurement program is identical.

Measurement

MikroCAD_Measure

Performs a measurement.

```
long MikroCAD_Measure(bool bOnSensor = true);
```

Parameters

bOnSensor: Height image calculation on sensor or sensor DLL if possible. Always true for normal cases, false for development or tests.

Returns

An error code.

MikroCAD_HeightImagePtr

Returns a pointer to height image data.

```
short* MikroCAD_HeightImagePtr();
```

Returns

A pointer to height image data or NULL if not available.

MikroCAD_ValidDataPtr

Returns a pointer to valid data or NULL if not available.

```
unsigned char* MikroCAD_ValidDataPtr();
```

Returns

A pointer to valid data. NULL if not available.

MikroCAD_CameraImagePtr

Returns a pointer to camera image data (texture). The image is a 24 bit color image (red, green, blue, red, ...).

```
unsigned char* MikroCAD_CameraImagePtr();
```

Returns

A pointer to camera image data (texture). NULL if not available.

MikroCAD_CameraRawImagePtr

Returns a pointer to camera image data (raw data). The image is a 24 bit color image (red, green, blue, red, ...).

```
unsigned char* MikroCAD_CameraRawImagePtr();
```

Returns

A pointer to camera image data (raw data). NULL if not available.

MikroCAD_PowerSpectrumPtr

Returns a pointer to the power spectrum.

```
short* MikroCAD_PowerSpectrumPtr();
```

Returns

A pointer to the power spectrum.

MikroCAD_IsDataBufferLocked

Determines whether the data buffer is locked.

```
bool MikroCAD_IsDataBufferLocked();
```

Returns

true if the data buffer is locked; false otherwise.

MikroCAD_UnlockDataBuffer

Unlock the data buffer.

```
void MikroCAD_UnlockDataBuffer();
```

Configuration Measurement Programs and Other Settings

MikroCAD_GetMeasProgramSetPtr

Returns a pointer to the measuring program set object.

```
CMeasProgramSet* MikroCAD_GetMeasProgramSetPtr();
```

Returns

A pointer to the measuring program set object.

MikroCAD_ReadConfig

Reads the configuration.

```
long MikroCAD_ReadConfig();
```

Returns

An error code.

MikroCAD_WriteConfig

Writes the configuration.

```
long MikroCAD_WriteConfig();
```

Returns

An error code.

MikroCAD_ReadInitialParameterFromFile

Reads the initial parameters from a file.

```
long MikroCAD_ReadInitialParameterFromFile(char* pszFileName);
```

Parameters

pszFileName: The file name, including the path.

Returns

An error code.

MikroCAD_WriteInitialParameterToFile

Writes the initial parameters to a file.

```
long MikroCAD_WriteInitialParameterToFile(char* pszFileName);
```

Parameters

pszFileName: The file name, including the path.

Returns

An error code.

MikroCAD_ReadMeasProgramDataFromFile

Reads the measurement program data from a file.

```
long MikroCAD_ReadMeasProgramDataFromFile(char* pszFileName);
```

Parameters

pszFileName: The file name, including the path.

Returns

An error code.

MikroCAD_WriteMeasProgramDataToFile

Writes the measurement program data to a file.

```
long MikroCAD_WriteMeasProgramDataToFile(char* pszFileName);
```

Parameters

pszFileName: The file name, including the path.

Returns

An error code.

MikroCAD_ListAllSensorsType

List all available sensors of a special type. (Before connection with the sensor).

```
unsigned long MikroCAD_ListAllSensorsType(SensorTypeID SensorType);
```

Parameters

SensorType: The sensor type ID.

Returns

The number of listed sensors.

MikroCAD_GetSensorSerialNumberType

Returns the serial number of a listed sensor of a special type.

```
unsigned long MikroCAD_GetSensorSerialNumberType(unsigned long dwIndex);
```

Parameters

dwIndex: The index in the list.

Returns

The serial number.

MikroCAD_ListSensorDescriptions

List all sensor descriptions. (Only for sensors with separate camera and projector.)



Sensor must not be initialized!

```
long MikroCAD_ListSensorDescriptions(SensorTypeID TypeID);
```

Parameters

TypeID: The sensor type ID.

Returns

The number of description items.

MikroCAD_ReadSensorDescription

Reads the sensor description.

```
TSensorDescription* MikroCAD_ReadSensorDescription(long lIndex);
```

Parameters

lIndex: The index in a list.

Returns

A pointer to a sensor description.

MikroCAD_ReadMeasProgramDataFromFile

Reads the measurement program data from a file.

```
long MikroCAD_ReadMeasProgramDataFromFile(char* pszFileName);
```

Parameters

pszFileName: The file name, including the path.

Returns

An error code.

MikroCAD_WriteMeasProgramDataToFile

Writes the measurement program data to a file.

```
long MikroCAD_WriteMeasProgramDataToFile(char* pszFileName);
```

Parameters

pszFileName: The file name, including the path.

Returns

An error code.

MikroCAD_ListAllSensorsType

List all available sensors of a special type. (Before connection with the sensor).

```
unsigned long MikroCAD_ListAllSensorsType(SensorTypeID SensorType);
```

Parameters

SensorType: The sensor type ID.

Returns

The number of listed sensors.

MikroCAD_GetSensorSerialNumberType

Returns the serial number of a listed sensor of a special type.

```
unsigned long MikroCAD_GetSensorSerialNumberType(unsigned long dwIndex);
```

Parameters

dwIndex: The index in the list.

Returns

The serial number.

MikroCAD_ListSensorDescriptions

List all sensor descriptions. (Only for sensors with separate camera and projector.)



Sensor must not be initialized!

```
long MikroCAD_ListSensorDescriptions (SensorTypeID TypeID);
```

Parameters

TypeID: The sensor type ID.

Returns

The number of description items.

MikroCAD_ReadSensorDescription

Reads the sensor description.

```
TSensorDescription* MikroCAD_ReadSensorDescription(long lIndex);
```

Parameters

lIndex: The index in a list.

Returns

A pointer to a sensor description.

Calibration (General)

MikroCAD_CalibrationOnSensor

Determines whether there is a calibration on the sensor.



The sensor must not have been initialized by calling [MikroCAD_Initialize](#) when you call this function!

```
bool MikroCAD_CalibrationOnSensor(unsigned long dwSensorNo,  
                                   CalibrationMode CalMode);
```

Parameters

dwSensorNo: The sensor number.

CalMode: The calibration mode.

Returns

true if any calibration is on the sensor.

Calibration (Simple)

MikroCAD_GridCalibration

Executes a grid calibration.

```
long MikroCAD_GridCalibration();
```

Returns

An error code.

MikroCAD_PlaneCalibration

Executes a plane calibration.

```
long MikroCAD_PlaneCalibration();
```

Returns

An error code.

MikroCAD_GetNumGrooveCalibrations

Gets the number of groove calibrations.

```
long MikroCAD_GetNumGrooveCalibrations();
```

Returns

The number of groove calibrations.

MikroCAD_GrooveCalibration

Executes a groove calibration.

```
long MikroCAD_GrooveCalibration(long lIndex);
```

Parameters

lIndex: The Index. basic calibration = 0; additional groove calibration - nIndex = 1, etc. See also number of MikroCAD_GetNumGrooveCalibrations().

Returns

An error code.

MikroCAD_GetCalibrationState

Returns the calibration state:

```
#define SIMPLE_CALIB_STATE_NONE 0
#define SIMPLE_CALIB_STATE_PLANE 1
#define SIMPLE_CALIB_STATE_GRID 2
#define SIMPLE_CALIB_STATE_GROOVE 4
```

```
unsigned long MikroCAD_GetCalibrationState();
```

Returns

State flags.

MikroCAD_CalibrationToSensor

Sends calibration data to sensor.

```
long MikroCAD_CalibrationToSensor();
```

Returns

An error code.

MikroCAD_GetCalibrationResultData

Returns a pointer to result data.

```
short* MikroCAD_GetCalibrationResultData();
```

Returns

A pointer to result data.

MikroCAD_UnlockCalibrationDataBuffer

Unlocks the data buffer.

```
void MikroCAD_UnlockCalibrationDataBuffer();
```

MikroCAD_ReadCalibrationParameter

Returns a pointer to the calibration parameters.

```
TSimpleCalibPar* MikroCAD_ReadCalibrationParameter();
```

Returns

A pointer to the calibration parameters.

Events

MikroCAD_GetNumAvailableEventTypes

Returns the number of the available event types.

```
unsigned long MikroCAD_GetNumAvailableEventTypes();
```

Returns

The number of the available event types.

MikroCAD_GetEventType

Returns the sensor event type .

```
SensorEventType MikroCAD_GetEventType(long lIndex);
```

Parameters

lIndex: Index in the event type list.

Returns

The sensor event type, or "SensorEventType_None" if not found.

MikroCAD_StartSensorEvent

Starts the sending of sensor events.

```
void MikroCAD_StartSensorEvent(MikroCADEventFunc EventFunc);
```

Parameters

EventFunc: Sensor event function.

MikroCAD_StopSensorEvent

Stops the sending of sensor events.

```
void MikroCAD_StopSensorEvent();
```


Support

For assistance regarding a component or product, please contact LMI Technologies.

World

Email	support@lmi3d.com
Web	http://www.lmi3d.com
Phone	+49 3328 9369-6

Contact

Americas	EMEAR	ASIA PACIFIC
LMI Technologies (Head Office) Vancouver, Canada +1 604 636 1011	LMI Technologies GmbH Berlin, Germany +49 (0)3328 9360 0	LMI (Shanghai) Trading Co., Ltd. Shanghai, China +86 21 5441 0711

LMI Technologies has sales offices and distributors worldwide. All contact information is listed at lmi3d.com/contact/locations.