

Deep Focus 3.1

User Guide

Deep Focus 3.1

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Preface

The Deep Focus 3.1 is an additional software module for QuickPHOTO programs that creates images with depth of field much higher than is the depth of field of optical microscopes. It can be used with stereo microscopes as well as with other types of optical microscopes for observation in transmitted or reflected light.

Principle of Function

The image with extreme depth of field is composed from several "slices" - images with different plane of focus. From each slice, only a well focused area is used. The completely focused image is composed from the focused areas. Shift and scale changes between slices are compensated automatically.



Installation

Note

For the successful Deep Focus 3.1 installation it is necessary to have QuickPHOTO CAMERA, MICRO or Industrial in version 2.3 or higher installed on your computer. If you have an older version of QuickPHOTO program installed, update it for free first. This can be performed via an Automatic Updating function of QuickPHOTO, which downloads the updates from Internet, or manually. The installation packages for manual update can be downloaded for free from www.promicra.com/downloads.php.

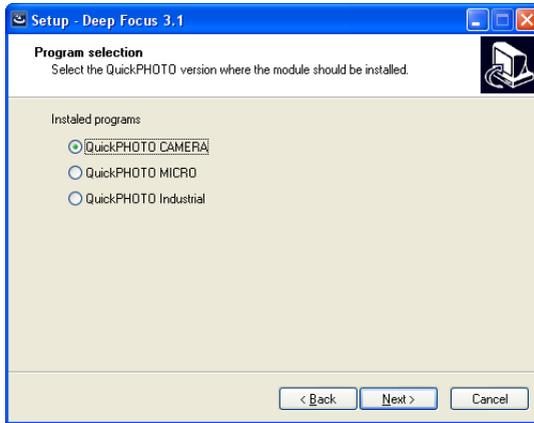
Note

In case you do not have permission to use the Deep Focus 3.1 module in your dongle, the module will run as a demo version. The demo version contains all the functions of a full version, but a watermark will be inserted into the created images. If you want to buy a full version, contact your supplier or visit www.promicra.com. Each time you run the demo version you will be informed about it.

Make sure you are logged to an account with administrative privileges. Insert the installation CD into your CD-ROM drive. An autorun screen appears. Select *Install Deep Focus 3.1*. If the autorun screen does not appear, launch *setup.exe* from the installation CD manually.

An installation wizard appears. Select the desired language and press the *Next* button. The wizard will search for QuickPHOTO CAMERA, MICRO or Industrial program. In case there are more than one QuickPHOTO version installed on your computer, choose the desired version into which the Deep Focus 3.1 should be installed from the displayed list and press the *Next* button.

Installation



Continue following the on-screen instructions.

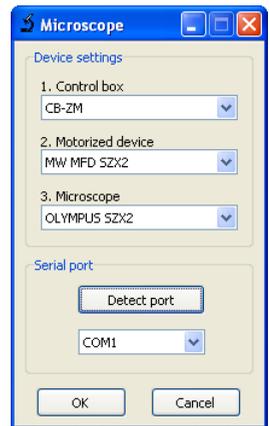
Settings for Automatized Image Capturing

In case of using a module for motorized focusing or a motorized microscope, the whole process of capturing slices and image composing can be automatized. To automate the process of capturing, Deep Focus 3.1 module cooperates with a software module for motorized focus control. This module called *Microscope* will be installed with the Deep Focus 3.1 and can also be run separately by clicking on the  icon in the tool bar.

The *Microscope* module supports several types of control boxes, motorized focusing devices and motorized microscopes. This module needs to be configured prior to the first use.

If you want to use the possibility to automate the capturing process, follow these steps:

1. Launch the *Microscope* module from QuickPHOTO tool bar by clicking the  icon.
2. In opened window in *Device settings* part select a desired control box (e.g. CB-ZM) first, then choose motorized device (e.g. MW MFD SZX2 motor) and a microscope. It is important to select the proper type of a microscope in order to get the proper z axis calibration.
3. In *Serial port* part choose the port the motorized device is connected to. Use the *Detect port* button to find out the correct port. In case the selected control box was not found, make sure the correct device is selected, it is connected to the PC and switched on.
4. Press the *OK* button to confirm settings.
5. The *Microscope* module will appear. One can try the functions of motorized focusing using the *Up* and *Down* buttons.



The module should be ready to use with Deep Focus 3.1 now.

To invoke the settings again press the *Device settings* button.

Note

Although the CB-ZM control box is connected to the computer using the USB cable, it communicates with a PC in the manner of serial port (COM). This device includes a special converter, and there will be installed so-called virtual COM port in the operating system. The CB-ZM device is usually connected to the serial port with the highest number.

Manual Capturing of "slices"

Note

The whole process of capturing the slices and image composing can be automatized using the module for motorized focusing or motorized microscope. For more information see "3. Capture and process images automatically" on page 15.

The first step is to capture a set of images with different plane of focus - "slices". In each slice the different area should be in focus. The change of plane of focus should be performed by the focus knob of a microscope and it should not be greater than is the depth of field of the microscope. It means the well focused area should move smoothly over the specimen.

Recommended Capturing Procedure

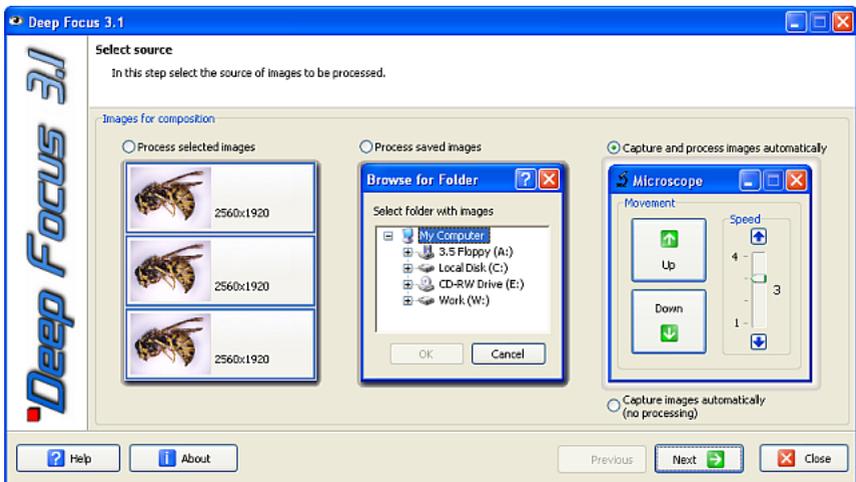
1. Open the control panel of your imaging device.
2. Set the exposure time manually so the exposition will not change during capturing of slices. In case of using automatic exposition, use the AEL (Auto Exposure Lock) function. Manual setting of all available camera parameters is recommended to achieve best results.
3. Focus the microscope to the bottom part of the specimen using the live image.
4. Capture the image and change slightly the plane of focus towards the highest part of the specimen using the microscope focus knob.
5. Repeat the step 4) until the highest part of the specimen is in focus and image captured.

How to Use Deep Focus 3.1 in QuickPHOTO Programs

Work with the Deep Focus 3.1 in QuickPHOTO CAMERA, MICRO and Industrial

The Deep Focus 3.1 module can be used in following modes:

1. Process selected images
2. Process saved images
3. Capture and process images automatically
4. Capture images automatically without processing



1. Process selected images

This option is intended to compose slices opened in QuickPHOTO CAMERA, QuickPHOTO MICRO or QuickPHOTO Industrial program.

The procedure of use is following:

1. Select the images (intended for composing) opened in QuickPHOTO by selecting their thumbnails displayed in the *Thumbnail panel*. The selected images will be blue-framed. The selection can be performed similarly to selecting files in Windows explorer (all images can be selected by [Ctrl+A] shortcut, the continuous selection can be performed while holding the [Shift] key or respectively [Ctrl] key for scattered selection. All slices to be processed have to be the same size in pixels (e. g. 1024x768).
2. Launch the Deep Focus 3.1 module from menu *Modules* → *Deep Focus 3.1* or by clicking the  icon.
3. In the opened window, select the *Process selected images* option and press the *Next* button.
4. The *Settings* page will display, see “Setting the Parameters of Composition“ on page 17.

2. Process saved images

This option allows you to compose images that are already stored on your hard drive. This option saves memory of your computer and therefore it is recommended for composing large size images.

The procedure of use is following:

1. Launch the Deep Focus 3.1 module from menu *Modules* → *Deep Focus 3.1* or by clicking the  icon.
2. In the opened window, select the *Process saved images* option and press the *Next* button.
3. Use the open dialog to select images to be composed. Make sure the selection does not contain any unwanted images.
4. The *Settings* page will display, see “Setting the Parameters of Composition“ on page 17.

3. Capture and process images automatically

This option allows to automate the process of creating images with extreme depth of field using the module for motorized focusing or motorized microscope.

The procedure of use is following:

1. Make sure the module for motorized focusing or motorized microscope is connected to the PC and is turned on.
2. Launch the Deep Focus 3.1 module from menu *Modules* → *Deep Focus 3.1* or by clicking the  icon.
3. In the opened window, select the *Capture and process images automatically* option and press the *Next* button.
4. The control panel of selected imaging device will open along with the module for focus control.
5. Set the exposure time manually so the exposition will not change during capturing of slices. In case of using automatic exposition use the AEL (Auto Exposure Lock) function. Manual setting of all available camera parameters is recommended to achieve best results.

6. In *Focus range* part of *Microscope* module proceed as follows:

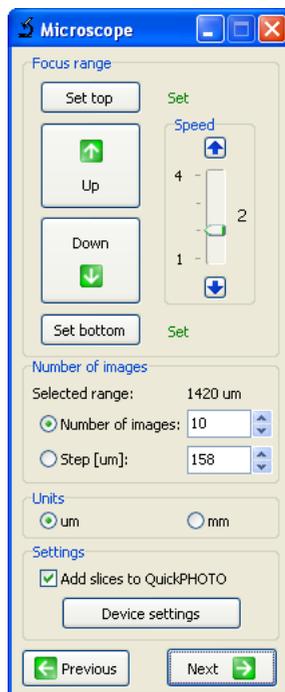
- a. Use the *Down* button to focus the microscope to the bottom part of the specimen. Press the *Set bottom* button to set the lower limit of the focus range. The *Not set* text on right side of the *Set bottom* button will change to *Set*.
- b. Use the *Up* button to focus the microscope to the highest part of the specimen. Press the *Set top* button to set the upper limit of the focus range. The *Not set* text on right side of the *Set top* button will change to *Set*.

The focus can be also controlled by the cursor keys (up and down arrows). Speed of focusing can be controlled by the *Speed* slider or also by the [+] or [-] keys.

7. In *Number of images* part enter the desired *Number of images* (slices) from which the image will be composed or enter the *Step* (distance) between slices. The second parameter will be calculated automatically. The

minimum number of slices is two. The *Selected range* indicator shows distance between lower and upper limit of the focus range in units selected in *Units* part.

8. If you want to keep the slices from which the image was composed, check the option *Add slices to QuickPHOTO*. The slices will appear in QuickPHOTO together with the composed image.
9. Press the *Next* button. The *Settings* page will display, see “Setting the Parameters of Composition“ on page 17.



Important

In order to begin the process of automatic capturing of slices and image composition, it is necessary to set the lower and upper limit of the focus range and the number of images.

Focus change during the capturing will be performed with the speed preset by the *Speed* slider.

In case the desired *Step* is selected, the focus range will be divided into integral multiple of the selected step and the remaining rest of the range. e.g. selected focus range is 170 microns, desired step is 50 microns - the range will be divided to 3 steps of 50 and one step of 20 microns.

Note

When using motorized OLYMPUS® BX61 microscope, the *Light* slider is present in the *Microscope* module. Use this slider to adjust the illumination intensity.

4. Capture images automatically without processing

This option is intended for automatic capturing of slices for further processing. The slices will be displayed in QuickPHOTO program immediately after acquisition and the process of composition will be omitted. The procedure of use is similar to article 3. *Capture and process images automatically.*

Setting the Parameters of Composition

1. On the *Settings* page, select the type of images intended for composition.

There are two options available:

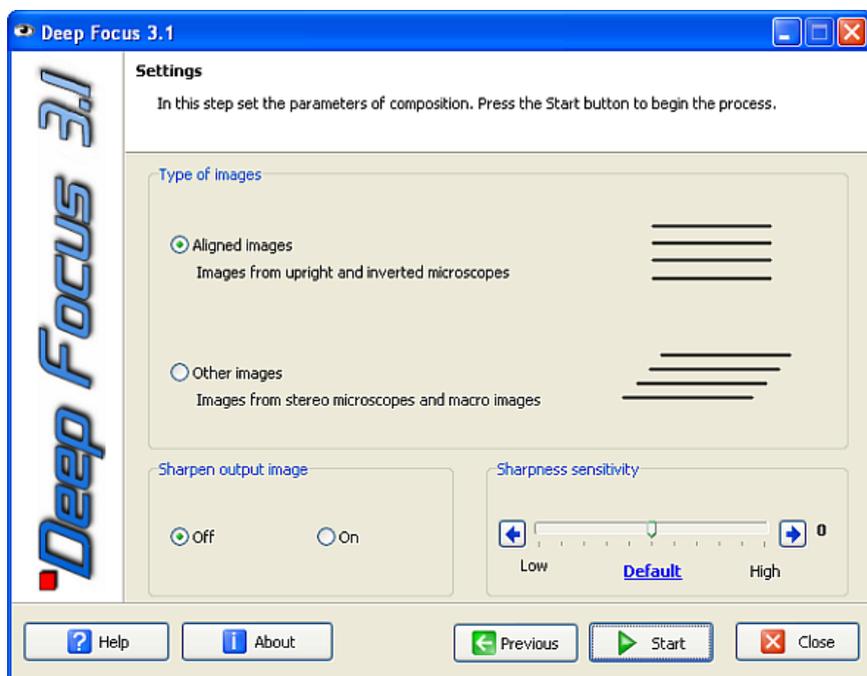
- **Aligned images (Images from upright and inverted microscopes)**

Select this option for composition of images captured from a microscope which does not cause shift of the specimen in the field of view during changing the plane

of focus (upright and inverted microscopes). Composition of aligned images is much faster than composition of shifted images (from stereo microscopes).

- **Other images (Images from stereo microscopes and macro images)**

Select this option for composition of images acquired from stereo microscopes, macrosopes and for macro images. Stereo microscopes cause shift of the specimen in the field of view during changing the plane of focus. Within macro images the change of scale (magnification) is usually present. The Deep Focus 3.1 module compensates the shift and scale changes between images automatically in this mode.



2. In the *Sharpen output image* part select whether you want to post-process the composed image with sharpen operation. The operation enhances edges and small details in the image.
3. Leave the *Sharpness sensitivity* trackbar in the *Default* position for most specimens. In case the composed image contains unfocused parts although they are focused in some of the slices, increase the *Sharpness sensitivity* and repeat the composing process. Every digital image contains a noise. The higher sensitivity you set, the more significant presence of noise can be. The noise level depends mainly on quality, type and settings of used imaging device. For example, when using a cooled digital camera, the noise level will be quite low. Conversely, when using a consumer digital camera with high ISO sensitivity set, the noise level will be significant. The noise impact, when the sharpness sensitivity is set too high, is usually manifested by presence of many unsharp islands in the composed image. In some cases, decrement of sharpness sensitivity can also be desired.
4. Press the *Start* button to begin the composing process. The button changes to *Stop* which can be used to interrupt the process of composition. The composed image will be displayed in the *Main window* of QuickPHOTO program after finishing the composing process and also a thumbnail named *f_xxxx.bmp* will appear in the *Thumbnail panel*. When the composition is repeated, the composed images are determined by numbering. One can interrupt the composing and close the window by pressing the *Close* button. The termination process can take a while.

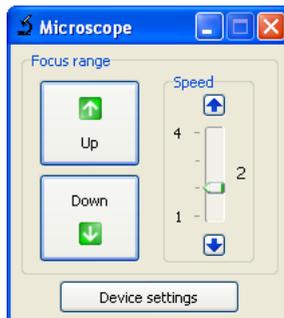
Note

The composed image will be slightly smaller than the slices due to an automatic crop function (necessary because of shift compensation).

Control of Microscope Motorized Focus in QuickPHOTO Programs

After installation the Deep Focus 3.1 module one can control the motorized focus of the microscope in the QuickPHOTO CAMERA, MICRO and Industrial programs also without launching the Deep Focus 3.1 module. For the focus control one can use the *Microscope* software module which can be launched by clicking on the  icon in the QuickPHOTO tool bar.

Using the *Down* button one focuses to the lower part of the specimen. Using the *Up* button one focuses to the higher part of the specimen. Focus can be also controlled by cursor keys (up and down arrows). Speed of the focus movement can be adjusted by the *Speed* slider or also by the [+] or [-] keys. When using OLYMPUS® BX61 motorized microscope one can adjust the illumination intensity using the *Light* slider.



Tips for Work with Deep Focus 3.1

Here are some recommendations to achieve the best results with Deep Focus 3.1:

1. Place the specimen to the centre of field of view of the imaging device.
2. Capture the whole series of slices with the same camera and microscope setting. Do not change the zoom value during capturing of slices.
3. When using consumer digital cameras it is recommended to use *Manual* exposure mode, turn the focus mode to manual with focus value set to infinity.
4. Do not change the illumination during capturing of slices.
5. The best results can be achieved when capturing larger amount of slices with small change in plane of focus.
6. Make sure there is no unwanted image in your selection intended for composing.
7. All slices to be processed have to be the same size in pixels (e. g. 1024x768).
8. Composing of large size images (8 MPx and higher) has high demands on hardware performance. It is necessary to have at least 1GB RAM for composing such images.

Note

The higher the resolution and number of slices is, the longer time the composing process takes.

Supported Motorized Devices

The Deep Focus 3.1 module supports several types of control boxes, motorized focusing devices and motorized microscopes. Each of the control boxes enables the control of various motorized devices and microscopes according to the following table:

Control Box	Motorized Device	Microscope
CB-ZM	MW MFD motor	OLYMPUS® BX/IX/GX series
		OLYMPUS® SZX series
	MW MFD SZX2 motor	OLYMPUS® SZX2 series
	PRIOR H122 motor	OLYMPUS® BX/IX/GX series
	OLYMPUS® SZX-FOA focusing unit	OLYMPUS® SZX series
	OLYMPUS® SZX2-FOA focusing unit	OLYMPUS® SZX2 series
	PRO-SZM1 focusing module	OLYMPUS® SZ series
	PRO-MLS motorized stand	
OLYMPUS® SZX-MDCU	OLYMPUS® SZX-FOA focusing unit	OLYMPUS® SZX series
OLYMPUS® BX-UCB	OLYMPUS® BX61	OLYMPUS® BX61

Minimum System Requirements

Minimum system requirements depend mainly on resolution of used imaging device:

1.3 MPx: IDS uEye® digital cameras, analog cameras

- 1.4 GHz processor
- 512 MB RAM
- Microsoft® Windows® 7/Vista/XP/2000

2-8 MPx: OLYMPUS® consumer digital cameras, IDS uEye® digital cameras, ARTRAY digital cameras, OLYMPUS® DP20

- 2.4 GHz processor
- 512 MB RAM
- Microsoft® Windows® 7/Vista/XP/2000

More than 8 MPx: OLYMPUS® DP70/DP71/DP72 digital cameras, OLYMPUS® digital SLR cameras

- 3 GHz or dual-core processor
- 1 GB RAM
- Microsoft® Windows® 7/Vista/XP/2000

Supported QuickPHOTO versions:

- QuickPHOTO CAMERA 2.3 or higher
- QuickPHOTO MICRO 2.3 or higher
- QuickPHOTO Industrial 2.3 or higher

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Minimum System Requirements
