Spotxel® Microarray 3.2

Array Editor Manual

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Spotxel® Microarray is designed solely for research purposes. It is not intended for, nor approved for, the diagnosis of disease in humans or animals.

SICASYS Software GmbH

Geschwister-Scholl-Str. 1

76726 Germersheim

Germany

Phone	+49 (7274) 973 8893
Fax	+49 (7274) 973 9133
Email	info@sicasys.de
Web	www.sicasys.de

1   Introduction

Starting with version 3.2, **Spotxel® Microarray**, previously known as Spotxel® Microarray Image and Data Analysis Software, now supports the creation and saving of array files in GAL format. This upgrade includes a user-friendly interface for block definition, complemented by handy editing utilities such as undo/redo, utility shortcuts, and precise adjustment of block positions.

Please note: The **GAL Array Editor module**, along with the functionality for handling microarray images, are entirely **free** and become available immediately upon software installation, with **no license** required.

This manual offers insights into the array editor module, concentrating on the functions for creating and editing arrays. For detailed instructions on software installation and microarray image and data analysis procedures, please refer to the User Guide and Quick Start Guide.

2   GAL Array Editor

To access the *Arrays* functions, you first need to load your microarray image in TIFF format. This can be done via the *Images > Open Image* menu. The TIFF image typically contains the resolution information (pixels per inch or per centimeter), which allows the software to draw the array accordingly, as the values in the array design are in *micrometers*.

2.1   Creating Blocks

To create an array file from scratch, navigate to *Arrays > Array File* and click on the *Create* button. In the dialog that appears, you will have the following options:

- **Block type:** Select either *Rectangular* (a commonly used layout, Figure 2) or *Hexagon (orange packing) even row* (Figure 3) for a more compact layout. Depending on your specific microarray requirements, you may choose another hexagonal layout.
- **Horizontal orientation:** Define the number of blocks to be arranged horizontally and specify the horizontal spacing between two blocks.
- **Vertical orientation:** Define the number of blocks to be arranged vertically and specify the vertical spacing between two blocks.
- **Block properties:** Define the number of rows and columns of spots, the spacing between them, and their diameter.

Please note that the values for spacing and diameter can be *fractional*, allowing for precise alignment of the array with the spots on the image later on. After clicking *OK*, the blocks will be added to the canvas. Figure 1 illustrates a sample setup, and Figure 2 shows the created rectangular blocks. You may then need to align these blocks with the spots on the image.

To mitigate the risk of data loss, it is advisable to frequently save your array to a file. To accomplish this, navigate to *Arrays > Array File* and click on the *Save* button. The first time you save an array file,

a dialog box will appear, prompting you to choose the file path. Each successful save will be confirmed on the status bar.
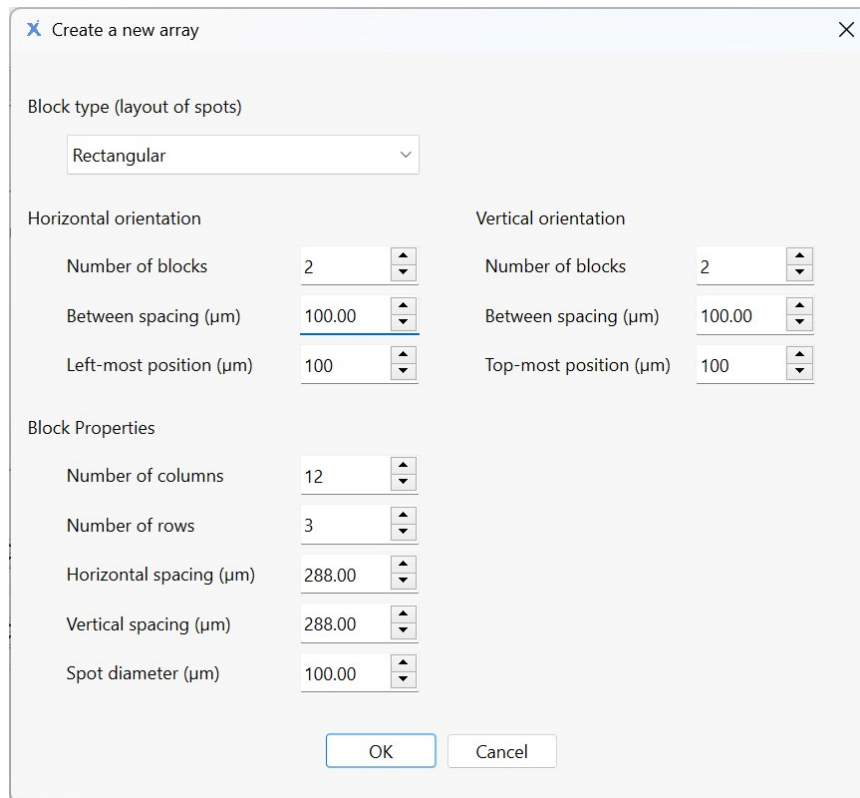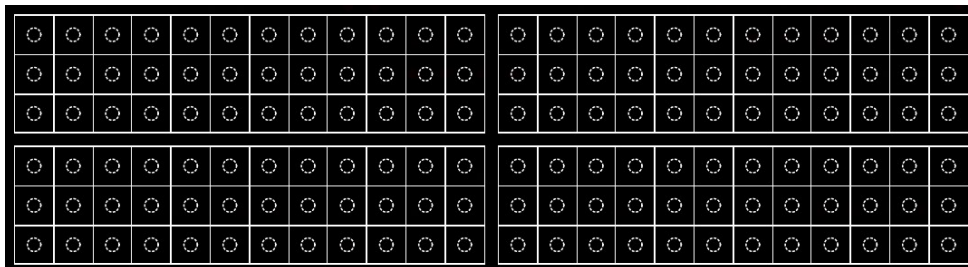

Figure 1: Creating a New Array.

Figure 2: Rectangular Blocks.

Figure 3 presents two hexagonal even-row blocks, each with 6 rows and 12 columns, as another example. The spot spacing are 288 µm horizontally and 249 µm vertically.
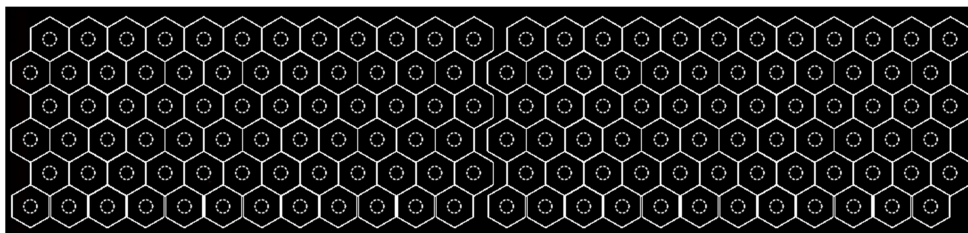

Figure 3: Hexagonal (Orange-Packing) Blocks.

2.2   Extending an Array

You can extend an existing array by adding new blocks. To do this, navigate to *Arrays > Array File* and click on the *Editing* page, followed by the *Add* button. A dialog box with the same parameters as when creating a new array (as shown in Figure 1) will appear. The key difference here is that the new blocks will be appended to the existing blocks in the array.

2.3   Editing Spots' Name and ID

You can modify the names and IDs of spots using a spreadsheet-like interface as follows:

- Proceed to *Arrays > Array File > Editing* page and click the *Edit* button. This will launch the *Array Spot Data* window (Figure 4), which exhibits a table with each row containing the data of a spot in the array.
- To edit a spot name or ID, navigate to the *ID* or *Name* cell on a row and input the new text. Press *Enter* to finalize the editing for that cell. You can traverse the table using either navigation keys or your mouse. The shortcuts *Control + Home* and *Control + End* can also be used in this table. Remember to save the array after editing.
- The table is in sync with the graphical canvas with the image and array. Choosing a row on the table emphasizes the corresponding spot on the canvas, and vice versa.
- You can arrange the table according to the values of a column by clicking on that column's header. To eliminate all sorting, double-click on any column header.

In addition, the *Data Filtering* widget on the left (Figure 4) enables you to select a field (*Block*, *Row*, *Column*, *ID*, *Name)* and filter the table according to a specific pattern. Position your mouse over the edit-boxes corresponding to the *Contains*, *Excludes*, or *Regular expression* options to view explanations and examples.

Figure 4: Table of Spot Data.

The feature is optimally utilized with *multiple screens*. Displaying the canvas on one screen and the table on another screen, while having them synchronized, facilitates convenient array editing.

2.4   Selecting and Editing Blocks

Click on a block to select it. To select multiple blocks, hold down the *Control* key while clicking on them. You can also select all the blocks in the array with the shortcut *Control A*. To deselect, click on a point in the canvas outside of the selection.

Change the spot size and spot spacing of blocks by first selecting them, then navigating to the *Arrays > Array File > Block* page. Here, you can adjust the values of the horizontal spacing, vertical spacing, and spot diameter.

2.5   Positioning Blocks

Align blocks with the corresponding spots on the image by selecting the blocks and *dragging* them to the desired position.

Fine-tune the position of selected blocks using the position tuning shortcuts. Hold down the *Control* key and press one of the four navigational keys (left, right, up, down) to *shift* the selected blocks a small *delta* in the navigated direction. You can shift multiple times until the desired position is reached.

The value of delta is equivalent to one micrometer and is derived from the image resolution. For example, if the image resolution is 1000 x 1000 pixels per centimeter, or 0.1 pixels per micrometer, then the delta shift on the canvas is equivalent to 0.1 pixels. If the derived value is less than 0.1, delta is also set to 0.1.

2.6   Rotating Blocks

Rotate the selected blocks using the options in *Arrays > Array Rotation*. Here, you can specify the center and direction of rotation. After inputting the angle value, press *Enter* to rotate the blocks.

2.7   Undo and Redo

You can undo or redo the changes made to the blocks in the array. The revertible changes include:

- Blocks' position
- Blocks' angle
- Spot spacing and spot diameter

Activate this function with the *Undo* or *Redo* button located in the *Arrays > Array File > Editing* page. Please note that the Undo and Redo functionalities are **not** applicable to actions such as adding block or shifting blocks (position fine-tuning).

2.8   Shortcuts and Keyboard Support

When editing arrays, you have the option to use either the buttons in the *Arrays* control panel or the keyboard shortcuts. These shortcuts are activated by holding down the *Control* key (*Ctrl*) and pressing the corresponding key. Please refer to Table 1 for a summary of the supported shortcuts.

Shortcut	Function
Ctrl N	Create a new array
Ctrl S	Save the array
Ctrl O	Open a new array
Ctrl L	Align the array
Ctrl T	Edit the table of spot data
Ctrl Z	Undo the last change
Ctrl Y	Redo the last change
Ctrl I	Add new blocks to the array
Ctrl Home	Move to the first block of array
Ctrl End	Move to the last block of array
Ctrl A	Select all blocks in array
Ctrl → (right-arrow key)	*Shift[1] right*
Ctrl ←	Shift left
Ctrl ↑	Shift up
Ctrl ↓	Shift down

Table 1: Shortcuts for Editing Arrays.

Note[1]: *Shift* refers to moving the *selected blocks* a delta distance in the specified direction.