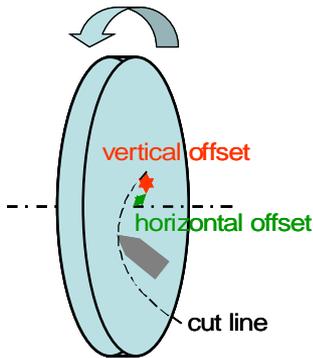


# Add-on: Tool offset

## General

The described module is available for all μShape™ Professional and former Ophthalmic versions. Older versions may have a modified user interface and/or reduced functionality.



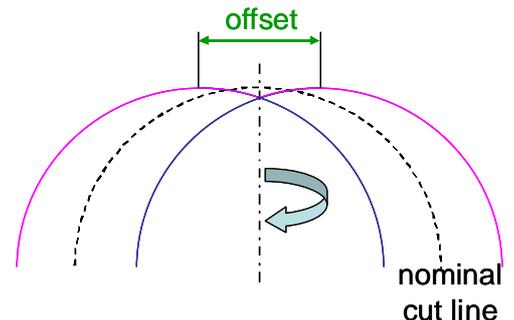
When manufacturing spherical surfaces with a lathe it is very important that the cutting line of the tool is well aligned in respect to the rotation axis of the machine. In case of misalignment, especially lateral offset, the part will not get the desired shape and radius.

The module *Tool Offset* enables you to determine the horizontal lateral offset of the cutting tool related to the axis of rotation of your lathe. Only the horizontal offset can be calculated by analyzing the shape of the produced part. A possible vertical offset cannot be determined by μShape™ currently, but results typically in an interferogram with "bad" fringes in cat's eye position.

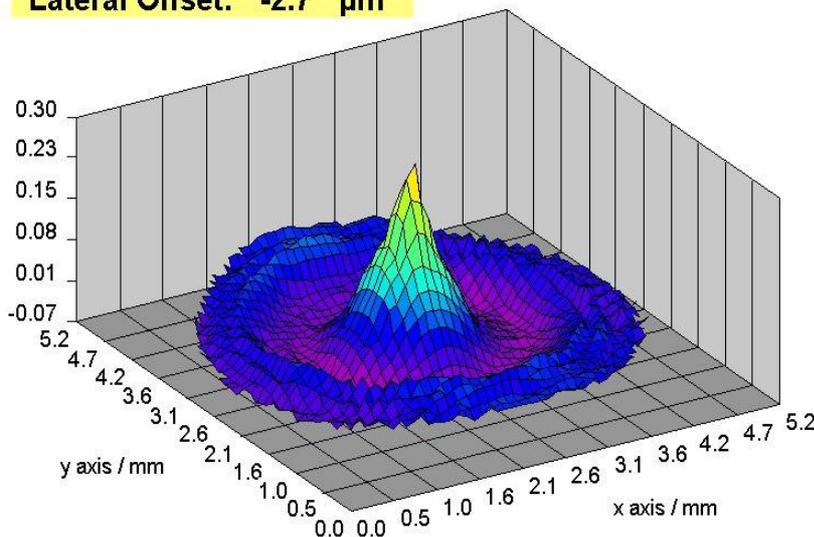
### 1. Tool Offset Error

If the actual spherical cutting path does not match the nominal cutting line the produced shape is not spherical. Instead you get an ogive shape. Shapes produced with a tool offset error do typically have a sharp peak in the center.

Convex and concave parts are affected differently by an offset error. In both cases the central peak determines inverse offsets. While a positive offset creates in one case a peak in the other case a hole is generated and vice versa.



**Lateral Offset: -2.7 μm**



The topography of a surface with lateral offset during cutting shows a very typical shape: After elimination of the tilt and defocus errors a bullet shape (as shown left) or a donut shape remains.

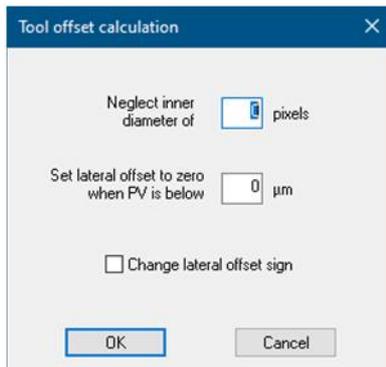
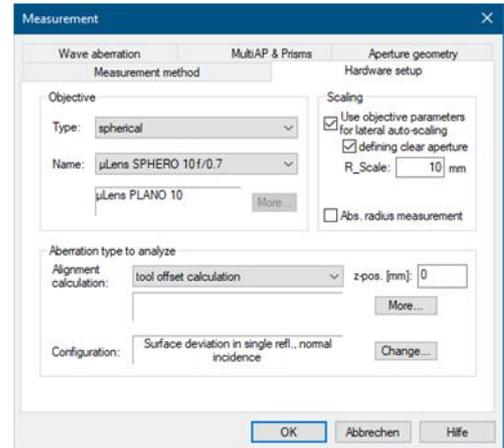
This typical shape can be used to determine the current offset error by fitting a specific error function to the measurement data. The corresponding fit coefficient is directly associated with the tool offset.

## 2. Tool Offset Analysis

### 2.1. Activation

The tool offset calculation is implemented in the μShape™ software as an alignment compensation method. It is only available if activated by the dongle and enabled by the module settings dialog.

For a correct analysis the proper spherical objective has to be selected and the (nominal) radius of curvature of the sample under test has to be specified. The radius of a convex surface must be given as positive value and for concave surfaces by a negative value. Otherwise the sign of calculated lateral offset may be incorrect. The sign can be easily changed by pressing the “More” button after selecting “tool offset calculation” from the “Alignment” dropdown list.



The Tool offset calculation dialog opens where you can change the display sign of the calculated offset value. This may also be necessary if the sign convention of the axis of your lathe differs from the assumed one.

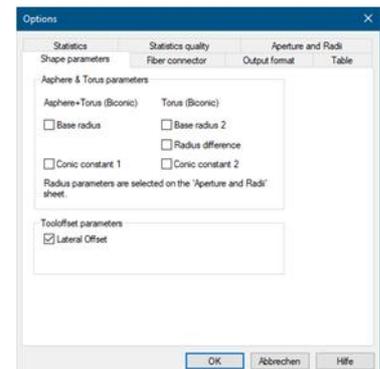
The tool offset dialog offers two additional analysis options:

Caused in the low cutting speed in the central region the shape here is possibly not well defined and will influence the tool offset calculation. To avoid this you can neglect this central area by defining its diameter in pixels.

When the tool offset error becomes small the topography is dominated by the shape error. In this case it may happen that this shape implicates a tool offset error even if there is none. To avoid this specify a PV threshold below the offset value is set to zero.

### 2.2. Result Display

The calculated tool offset can be displayed in the Surface Statistics window. Open a measurement result statistics window . To enable tool offset display click right mouse inside the window, select “Options” in the context menu and switch to tab “Shape parameters”. Check “Lateral Offset” and close dialog with OK. An additional entry appears in the statistics window.



## 3. Remarks

Often also a rounded peak is assumed as tool offset error wrongly. The μShape™ will fit the tool offset function also to such a shape but the reason for this shape is not caused by a tool offset. Tool offset analysis is strictly recommended just to be done if the central cross section shows a m- or w-shape with a sharp and not rounded central peak. Additional information especially according the algorithmic is given in the integrated online-help of μShape.

If you need more information don't hesitate to contact us at [software@trioptics-berlin.com](mailto:software@trioptics-berlin.com).