TRIOPTICS
See the Difference

Software Description

OptiCentric® 9

Translation of the Original Software Description, Rev. 02, 26.11.2019

Subsidiaries/Customer Service

Germany (Head office)

TRIOPTICS GmbH
Strandbaddamm 6
22880 Wedel
Germany

Phone: +49 4103 18006-0
Fax: +49 4103 18006-20
Email: sales@trioptics.com
www.trioptics.com

USA

TRIOPTICS USA
9087 Arrow Route, Unit 180
Rancho Cucamonga
CA 91730
USA

Phone: +1 626 962 5181
Fax: +1 626 962 5188
Email: sales@trioptics-usa.com
www.trioptics-usa.com

China

TRIOPTICS China
Block A, Bldg. 4, Hongtai Industrial Park,
No. 2 Yongchang Road, Yizhuang District,
Beijing, 100176
China

Phone: +86 10 8456 6186
Fax: +86 10 8456 4486
Email: info@trioptics-china.com
www.trioptics-china.com

Taiwan

TRIOPTICS Taiwan Ltd.
3F, No.5 Andong Rd
Zhongli Dist.
Taoyuan City 32063
Taiwan

Phone: +886 3 462 0405
Fax: +886 3 462 3909
Email: info@trioptics.tw
www.trioptics.com.tw

France

TRIOPTICS France
76 rue d’Alsace
69100 Villeurbanne
France

Phone: +33 (0)4 7244 0203
Fax: +33 (0)4 7244 0506
Email: info@trioptics.fr
www.trioptics.fr

Korea

TRIOPTICS Korea Co., Ltd.
#701-101, Digital Empirell 486
Sin-Dong, Youngtong-Ku Suwon-City
Kyunggi-Do
440-050 Korea

Phone: +82 31 695 7450
Fax: + 82 31 695 7459
Email: info@trioptics.co.kr
www.trioptics.co.kr

Japan

TRIOPTICS Japan Co., Ltd.
4-6-25, Nakada, Suruga-ku
422-8041 Shizuoka-city
Japan

Phone: +81 54 203 4555
Fax: +81 54 203 4556
Email: info@trioptics.jp
www.trioptics.jp

Singapore

TRIOPTICS Singapore Co., Ltd.
7030 Ang Mo Kio Ave 5
#09-59 Northstar
569880 Singapore
Singapore

Phone: +65 9067 3787
Email: danny.ng@trioptics.com.sg
www.trioptics.com.sg

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1 Introduction

Measuring systems of the OptiCentric® product series are high-precision measuring and production devices for centration error testing of lenses and objectives in the entire spectral range, as well as for active and automatic assembly and alignment of objectives.

The measurement and production tasks are supported by the powerful OptiCentric® 9 software, whose basic structure is oriented on the separation of optical design, measurement specification and result.

This has the advantage that the sample can be evaluated with the measurement instruments in several ways without needing to recreate the design every time.

The results can be managed separately from the technical details of the lens design.

Measurements can be repeated several times based on the same specifications, allowing statistical statements to be made.

1.1 Other applicable documents

Only the functions and use of the OptiCentric® 9 software are described in this manual.

The following documents are part of the complete documentation for the measurement system:

- Operator's manual of the measurement system, operator's manual (hardware description)
- OptiCentric® 9, Software Description (User Manual)

These documents are issued separately.

Read the operator's manual carefully before commencing work on the measurement system. In particular, observe the safety notes.

The documentation, including any third-party documentation, must be kept within reach at the location of the measurement system.

For more information, please refer to the manufacturer or your local representative.

1.2 Software structure

The following figure shows a schematic representation of the software structure:

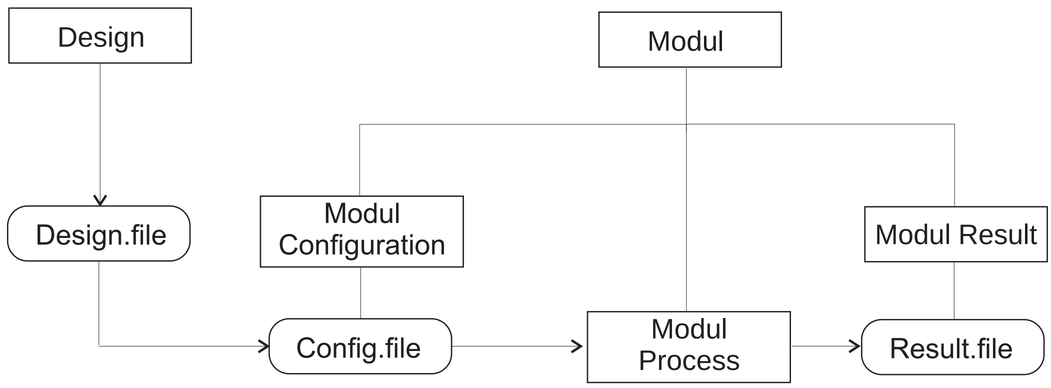


Fig. 1: Software structure

Design

The design parameters of the sample are saved in a design file. The design file is created using the design editor.

Configuration (`config`)

The measurement data is generated in different action modules depending on the measurement task.

The design file is accessed by an action module for configuring a specific measurement task (e.g. measurement, alignment, bonding).

Here you define the specifications for how the sample is to be measured and how the measurement results are to be evaluated. The specifications are saved in a configuration file.

Measurement/Processing (`process`)

The configuration file is used to run an action module.

Results (`results`)

The action module delivers measurement results that are stored in a database. From there they can be exported as value tables or certificates.

This process is software-controlled. This guarantees a higher degree of process reliability.

1.3 Software modules

Different software modules are provided, depending on the measurement or production task.

They are divided into two groups: "Measurement" and "Production".

Measurement group

The "Measurement" group performs all tasks related to measuring individual lenses or multi-lens optical systems.

Depending on the configuration of your measurement system, the following measuring modules are available:

MultiLens® module (ML)

The MultiLens® module enables you to measure centration errors in reflection in multi-lens optical systems. You can use both optical and mechanical references.

You can measure both surface centration errors of individual optical surfaces with reference to specific axes or centration errors between individual lenses.

Centration module (CE)

The Centration module enables you to determine centration errors of single lenses or objectives in transmission or reflection.

Production group

Tasks for aligning and bonding lenses and for setting up multi-lens optical systems are performed in the Production group.

Depending on the configuration of your measurement system, the following measuring modules are available:

Lens Alignment module (LA)

The Lens Alignment module enables you to align and bond lenses to a frame axis, align and bond lenses to each other or build multi-lens optical systems (objectives).

You can select a mechanical axis, an optical axis or the rotation axis of the air bearing as the reference axis.

2 Software operation, general

2.1 Software installation

The software is pre-installed when the measurement system is delivered.

The software version installed on delivery is also included on the installation CD.

For more information on software installation, please contact Customer Service.

2.2 Starting the program and initializing the measurement system

Fig. 2: Copy protection key (hardware dongle)

The OptiCentric® 9 program can be started as soon as the computer has booted completely and the measurement system is switched on. To switch on the measurement system, follow the instructions in the hardware manual of your measurement system.

NOTE

The software can be started only if the copy protection plug (hardware dongle) is plugged into a USB port on your PC.

1. Start the software by double-clicking the desktop icon with the TRIOPTICS logo and labeled `Opti-Spheric 9`.
   ⇨ You will see the splash screen with vendor and version information.
   ⇨ Then the welcome screen appears.

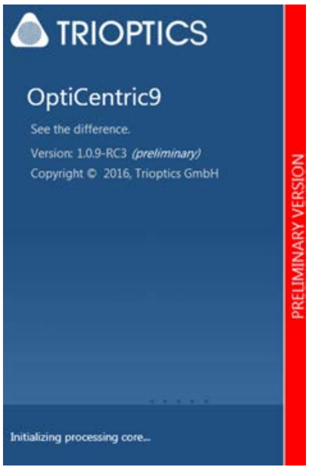


Fig. 3: OptiCentric 9, Starting the software

Fig. 4: Start screen, before reference cycle

2. Click on the `Homing of motorized stages` button **(1)** to start a reference cycle.

WARNING

Risk of injury from moving components

When working on the measurement system, injuries can be caused by movable components.

– During the reference cycle, maintain sufficient distance from the movable components of the measurement system.

⇨ When all stages are homed, the system is ready for use. The welcome screen now looks like this:

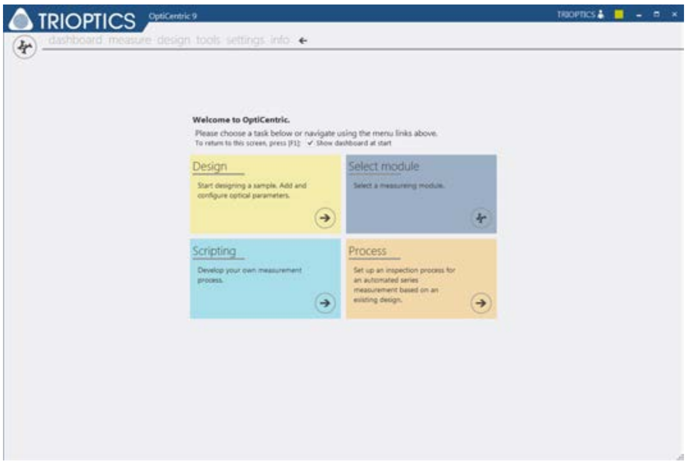


Fig. 5: Start screen, after reference cycle

Skipping the reference cycle

When restarting the software, you may skip the reference cycle if the following conditions are met:

- You are logged in as a superuser.
- The measurement system is completely switched on.
- The reference cycle has already been completed (only the software was restarted).

When these conditions are fulfilled, the `skip` button **(2)** is active. When you press this button the reference cycle is skipped and the welcome screen is displayed.

2.3 Login / Logout

1. Click on the login icon or in the upper right corner of the menu bar.

   This opens the login window:

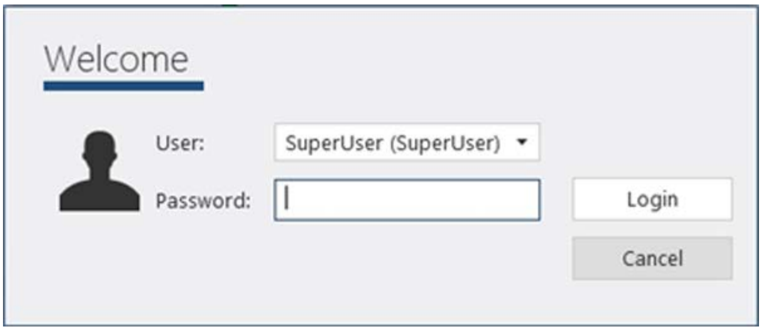


Fig. 6: Login

2. Enter your username and password.
3. Confirm with `Login`.
   ⇨ You are now logged on as an operator or administrator, depending on what user rights are assigned to your user account.
4. To log out, click on your username in the upper right corner of the menu bar.

NOTE

When you log in using your username, your username appears on the measurement certificates.

For information on how to create certificates after the measurement, refer to the `Export measurement results` or `Save measurement results as a certificate` chapters.

See also

Save measurement results as certificate [▸ 25]

2.4 User permissions

The OptiCentric® 9 software has the following user levels:

User	Rights
[Not logged in]	User account with the rights of an operator
Operator	Has basic operating rights: Can load measurement configurations and perform measurements.
Administrator	Has full operating rights: • Can select and define measurement parameters • Can create and design measurement configurations.
SuperUser	Reserved for TRIOPTICS employees for installation and maintenance of the measurement system.

If your user account is linked to the Windows login, and administrator rights are assigned to this user account, you are automatically logged on as an administrator after the software starts.

– If you want to perform operations for which you require administrator rights, log on as an administrator.
– If your user account is not associated with the Windows login, or if you want to change the status, log in as described in the *Log in/Log out [▸ 13]* section.

2.5 Switch display

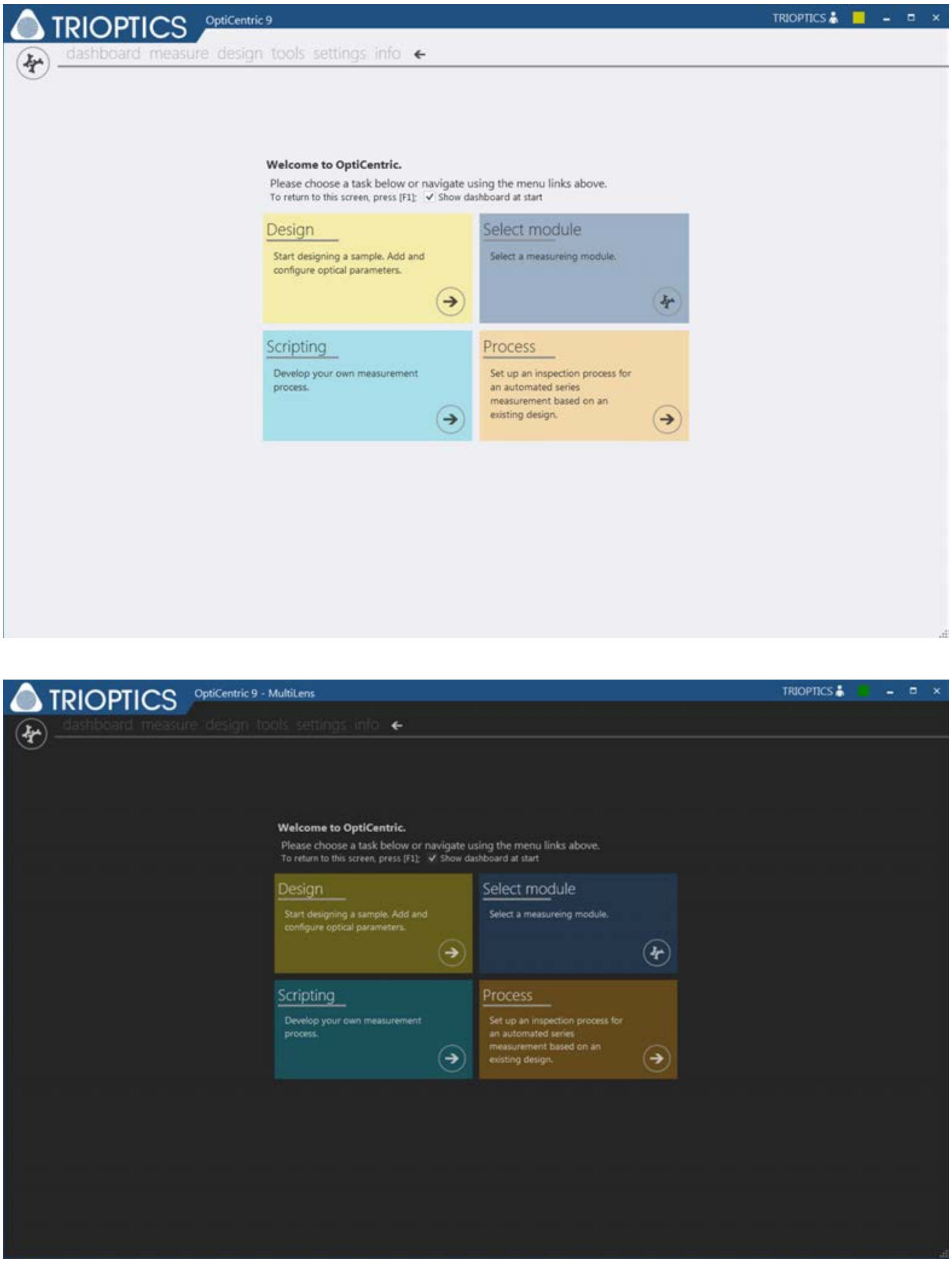


Fig. 7: Changing the background

The program window can be displayed on a white or black background.

– To change the background, press the **F12** key.

NOTE

Displaying on a dark background is beneficial for working in a darkened laboratory.

2.6 Dashboard

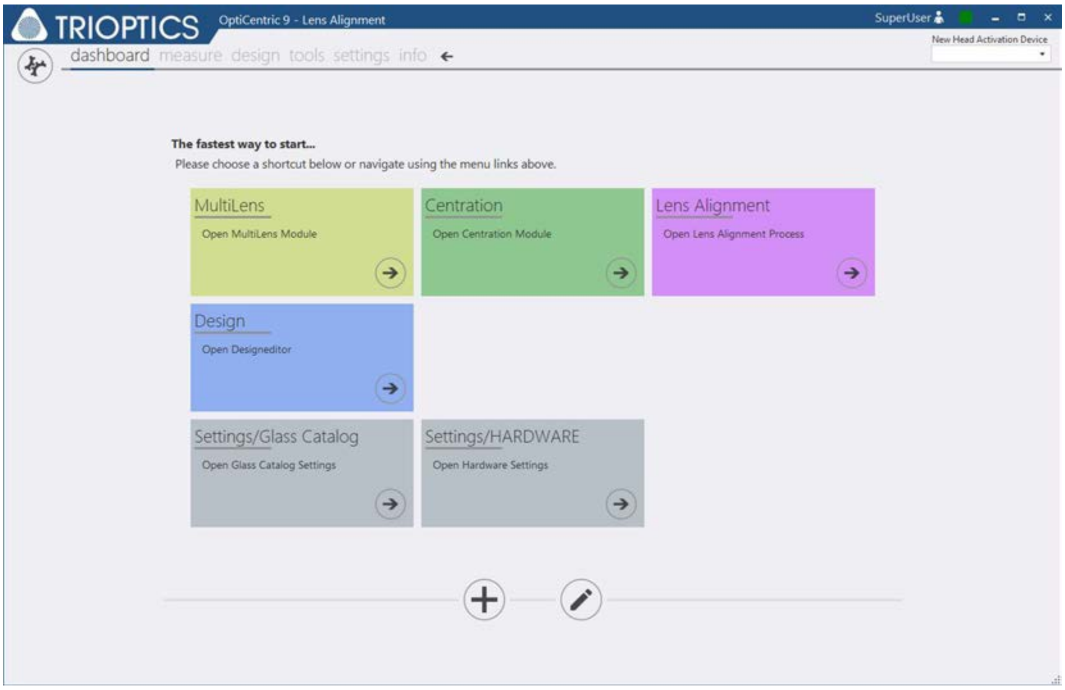


Fig. 8: Dashboard with shortcuts

This section describes how to set up shortcuts to frequently used views or commands on the home screen (Dashboard).

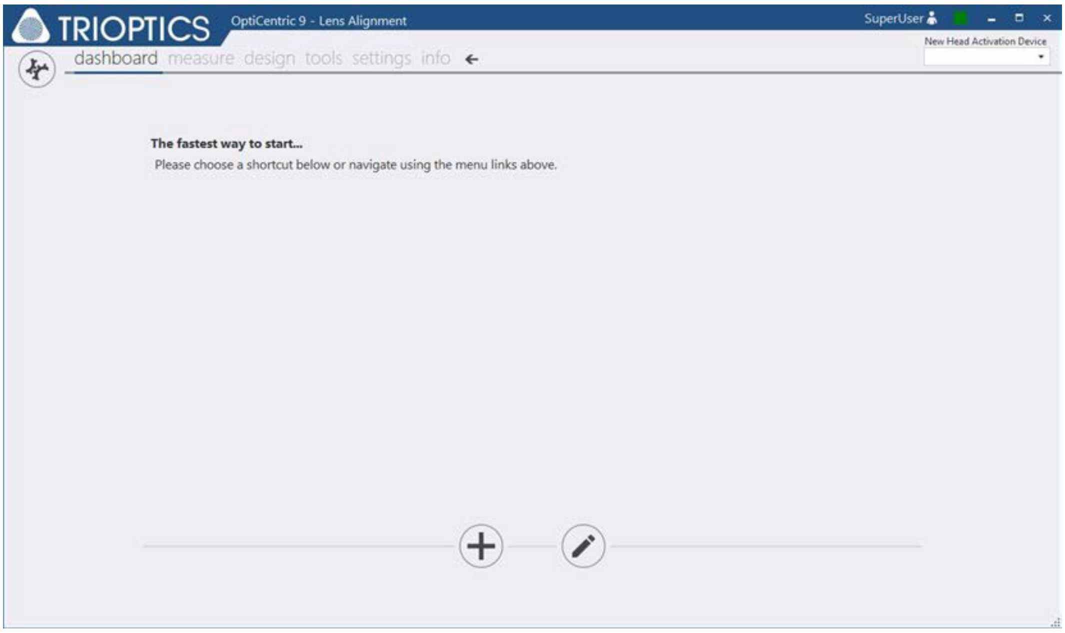
You can access the home screen at any time by pressing **F1**.

NOTE

The configuration of the home screen is saved to the user profile and is available again the next time you launch the software and log in.

Add a shortcut

View A



View B

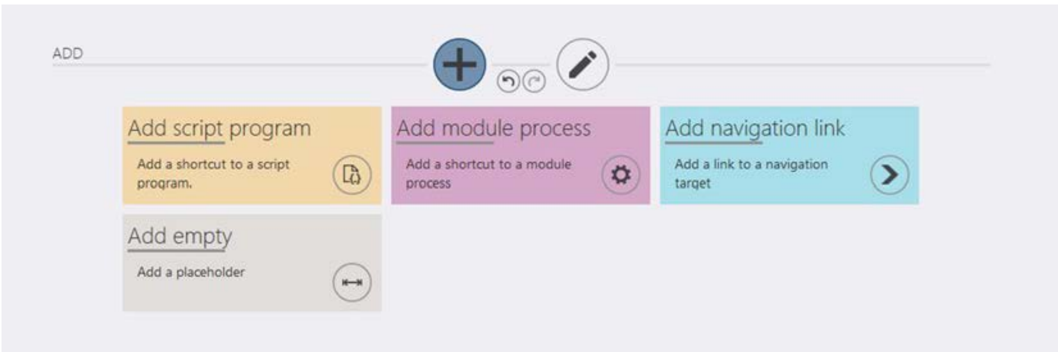


Fig. 9: Dashboard, add shortcut

1. If necessary, log on with your user name (see *Login / Logout [▸ 13]*).
2. Select the <`dashboard`> menu.
   ⇨ The first time the software starts, the home screen is empty **(View A)**.
   ⇨ Click ⊕ `add new shortcut` to open the selection of shortcuts **(View B)**.
3. Select the desired shortcut type.
   ⇨ In the upper section, a button is inserted that contains the desired shortcut type.

The table below shows an overview of the available shortcut types

Shortcut type	Description
Measuring module	Creates a shortcut to a measuring module. Can be assigned to a configuration file for a measurement or production process.
Navigation target	Creates a shortcut to a navigation target (e.g. frequently used tools).
Script	Creates a shortcut to a script program. This function is reserved for employees of TRIOPTICS GmbH for installation and maintenance purposes.
Placeholder (blank)	Creates a blank field on the home screen. This can be useful if you want to arrange the shortcuts in a certain order.

Edit properties of a shortcut

1. If necessary, log on with your user name (see *Login / Logout [▸ 13]*).
2. Select the <`dashboard`> menu.
3. Click `edit shortcut` to open editing mode.
4. Select the shortcut you want to edit.
5. Change the properties of the shortcut (depending on the shortcut type).

Properties for all shortcuts

Property	Description
Title	Enter a title for the shortcut. The shortcut is displayed on the home screen underneath this title.
Description	Enter a short description text that describes the
Accent	Select which color the shortcut should appear in on the home page.
User level	Select the user group for which this shortcut should be available.

Properties for a shortcut to a measuring module

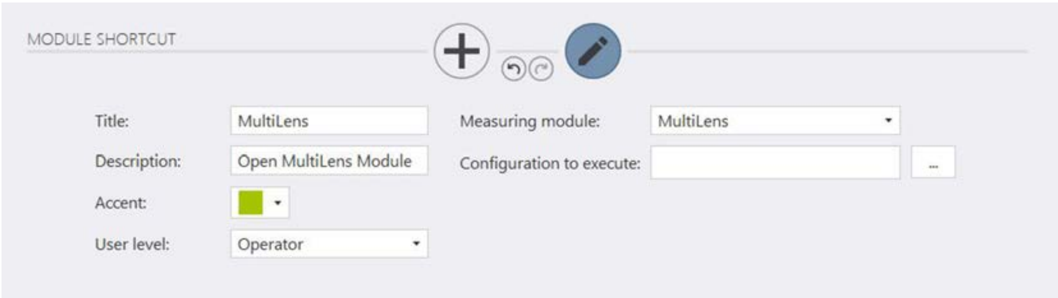


Fig. 10: Dashboard, setting up a shortcut to a measuring module

Property	Description
Measuring module	Select a measuring module from the list
Configuration to execute	Click the ••• button and select the desired configuration file.

Properties for a shortcut to a navigation target

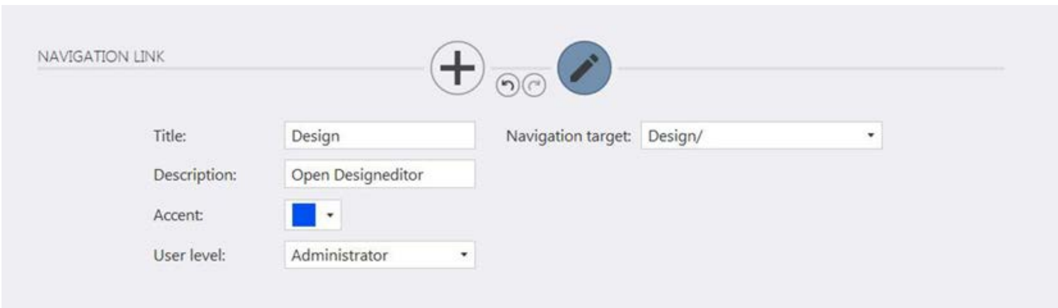


Fig. 11: Dashboard, setting up a shortcut to a navigation target

Property	Description
Navigation target	Select a navigation target from the list

Properties for a shortcut to a script

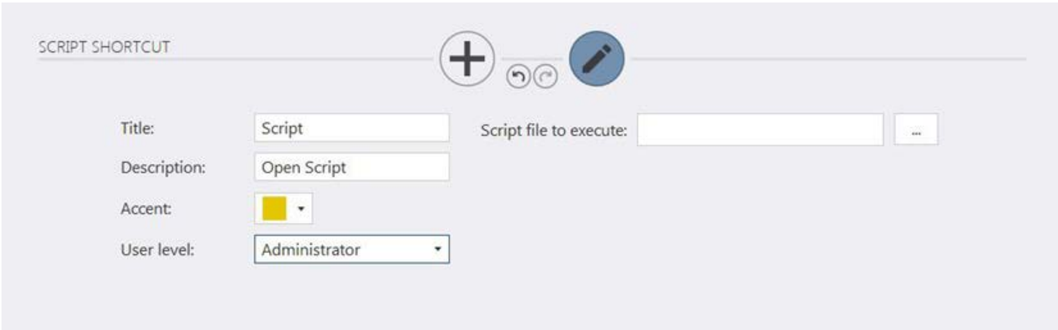


Fig. 12: Dashboard, setting up a shortcut to a script

Property	**Description**
Script file to execute	Click the ••• button and select the desired script file.

Arrange shortcuts on the home page

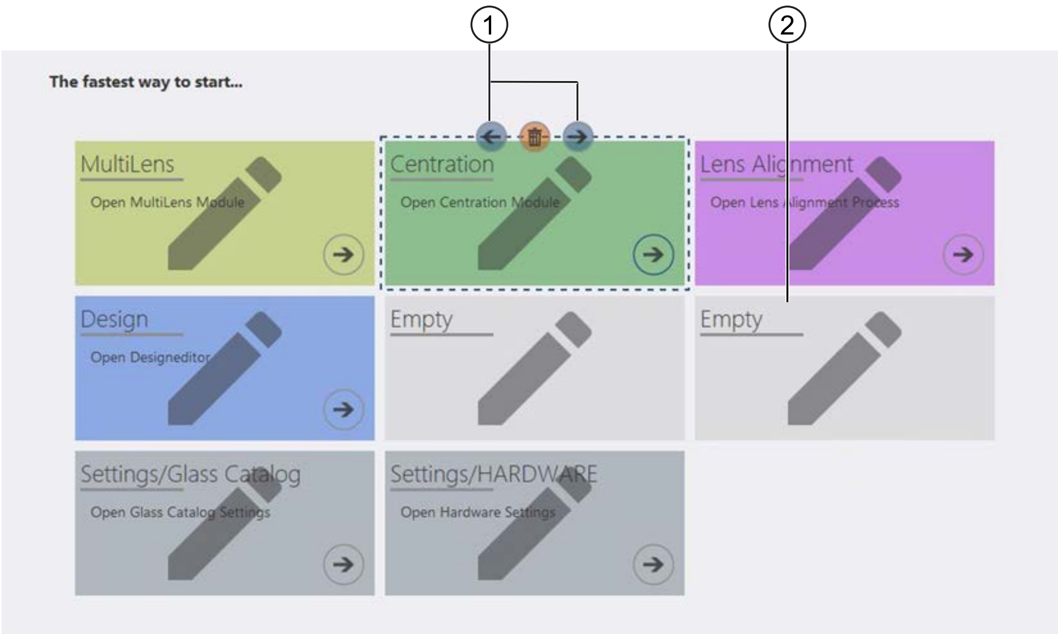


Fig. 13: Dashboard, arranging shortcuts

1. Click `edit shortcut` to open editing mode.
2. Select the shortcut you want to edit.
3. Click the `Move` buttons **(1)** to move the shortcut.
4. If desired, insert placeholders (Empty) **(2)** to group shortcuts in a meaningful way.

Delete shortcuts

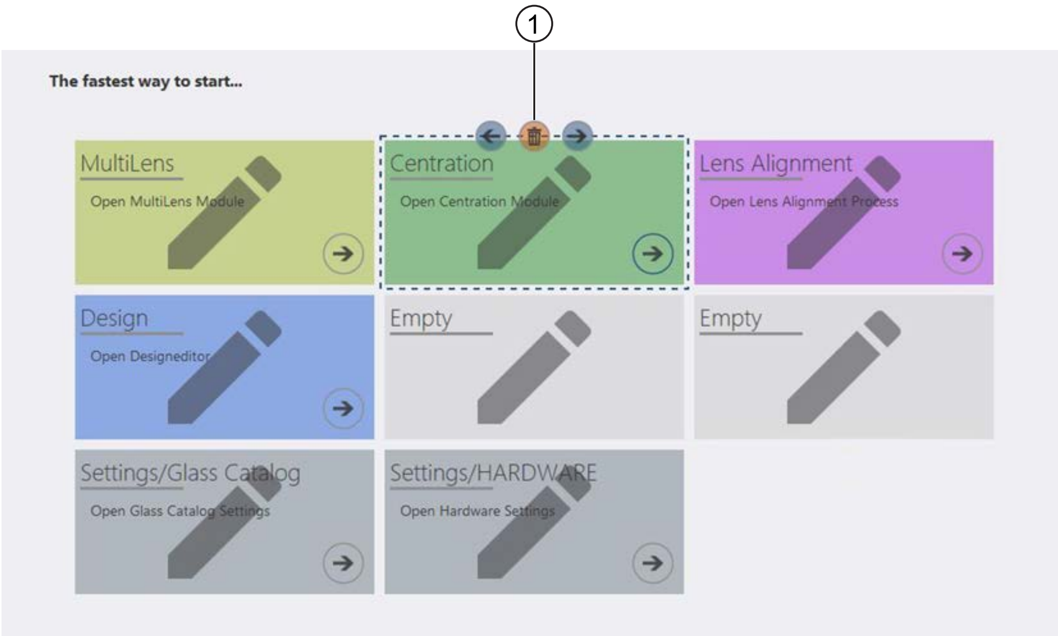


Fig. 14: Dashboard, deleting shortcuts

1. Click `edit shortcut` to open editing mode.
2. Select the shortcut you want to edit.
3. Click the `Delete` button **(1)** to delete the shortcut.

Close editing mode

– Click `edit shortcut` again to close editing mode.

2.7 Accessing measuring modules

The measurement and production modules you can choose from depend on the hardware and software configurations you have purchased.

Click the button to bring up the selection of measuring modules.

2.7.1 MultiLens (ML)

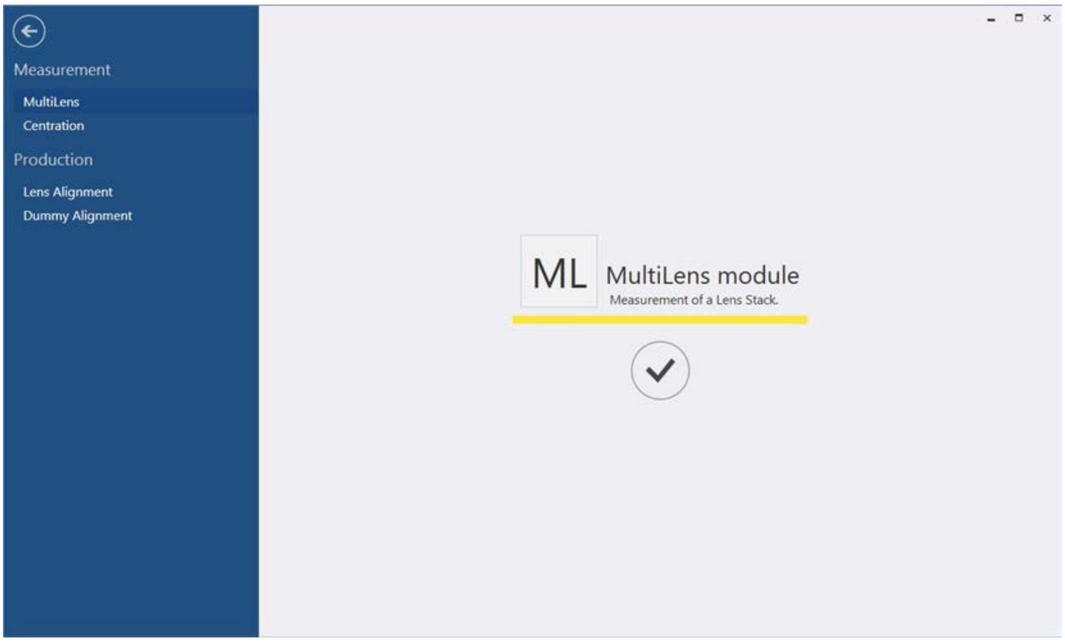


Fig. 15: ML (MultiLens) measuring module

1. Select `<Measurement>` `<MultiLens>`.
2. Click the button.

⇨ The ML (MultiLens) measuring module opens.

The procedure for performing a MultiLens® measurement is described in *The MultiLens® module (ML) [▸ 123]*.

2.7.2 Centration (CE)

Fig. 16: CE (Centration) measuring module

1. Select `<Measurement> <Centration>`.
2. Click the ✓ button.

⇨ The CE (Centration) measuring module opens.

The procedure for performing a centration error measurement is described in *The Centration module (CE) [▸ 131]*.

2.7.3 Lens Alignment

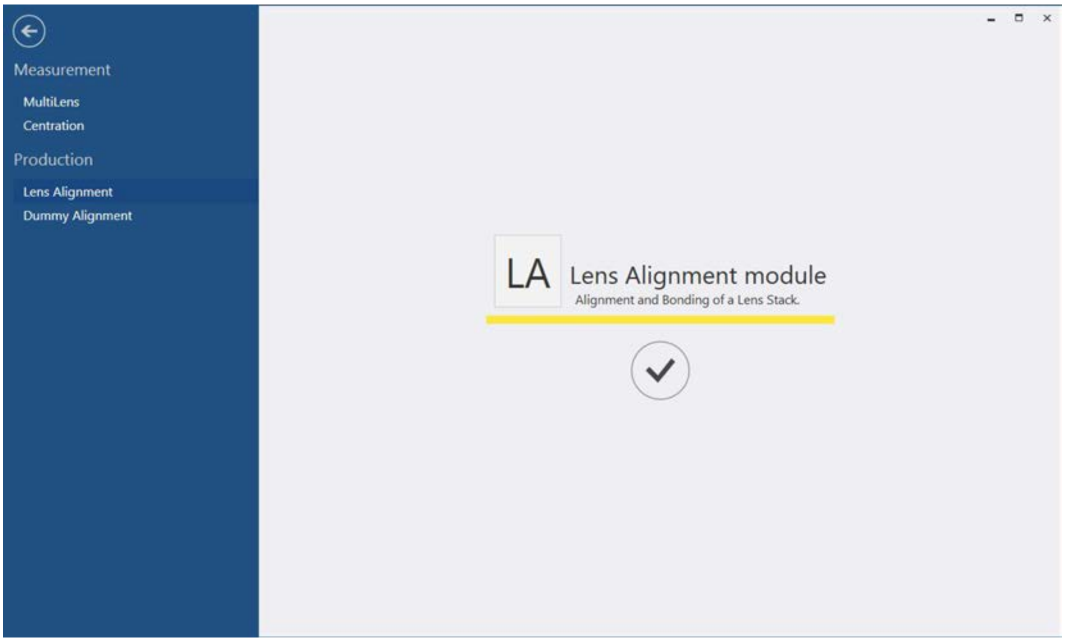


Fig. 17: LA (Lens Alignment) measuring module

1. Select `<Production> <Lens Alignment>`.
2. Click the ✓ button.

⇨ The LA (Lens Alignment) measuring module opens.

The procedure for performing an alignment and bonding process is described in *The Lens Alignment module (LA)* *[▸ 137]*.

2.8 Save measurement results as certificate

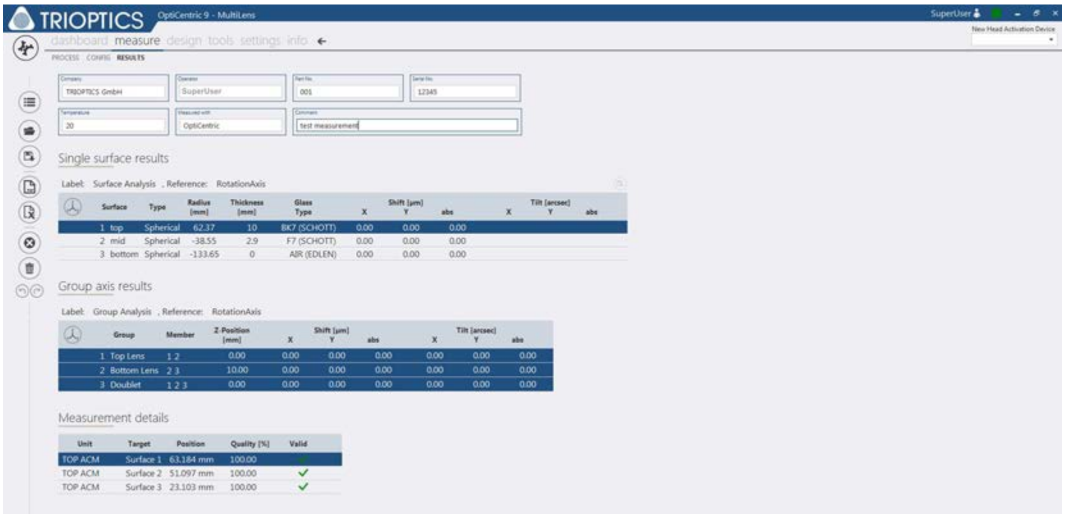


Fig. 18: Evaluate measurement, MultiLens®

You can export all measurement results as *.xlsx or *.pdf files.

To do so, proceed as follows:

1. If necessary, open the desired measuring module (see *Accessing measuring modules [▸ 21]*)
2. Select the <RESULTS> tab.
3. If desired, enter additional information about your measurement:
   - `Company`: Company name
   - `Operator`: If you are logged in, your username will appear here. The entry in this field cannot be overwritten.
   - `Part No.`: Part number of the sample
   - `Serial No.`: Serial number of the sample
   - `Temperature`: Temperature at which the measurement was performed.
   - `Measured with`: Enter which measuring instrument was used for the measurement here.
   - `Comment`: Here you can enter further comments on the measurement (e.g. date, time, operator, special special features of the measurement).
4. Click `Export as *.xslx` to export the measurement results to an Excel file.
   or:
   Click `Export as *.pdf` to export the measurement results to a PDF file.

See also

Accessing measuring modules [21]

2.9 The coordinate systems

The OptiCentric® 9 software uses three coordinate systems:

- World coordinate system
- Visual coordinate system
- Stage coordinate system

NOTE

Each motorized axis of the measurement system has its own coordinates. However, the software is generally operated based on world or visual coordinates.

The coordinate system currently in use is indicated by a symbol:

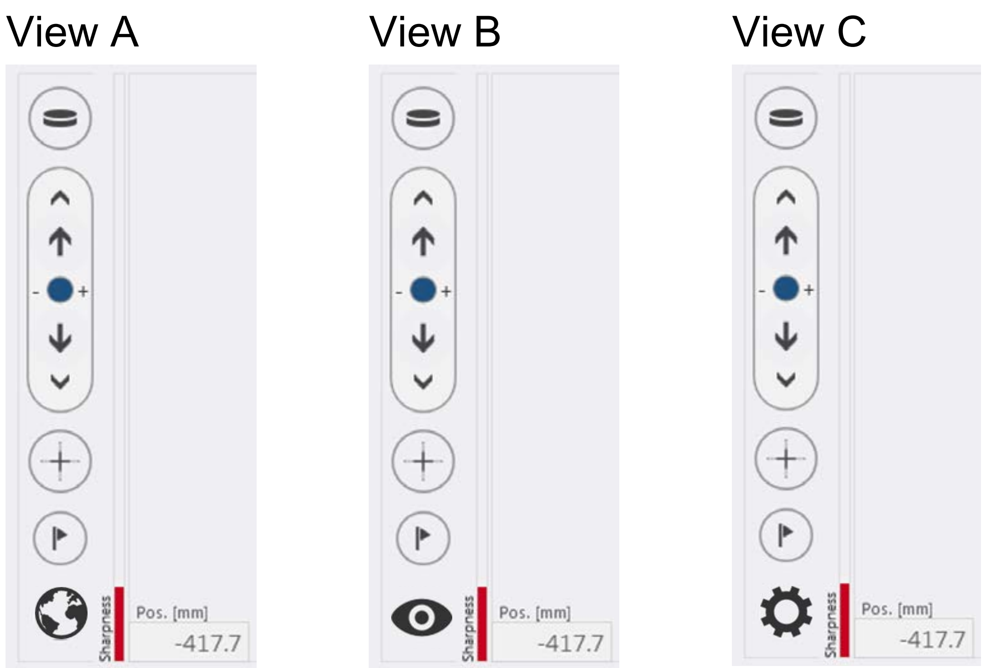


Fig. 19: Coordinate systems: Labelling

	World coordinate system (**View A**)
	Visual coordinate system (**View B**)
	Stage coordinate system (**View C**)

2.9.1 Conventions

All tools and measuring devices work in a right-handed coordinate system.

The following conventions apply to the names of the movements:

Definition

Rotation

The term rotation is used to describe a rotation of the sample about an axis in the mathematically positive direction of rotation (mathematical convention).

Tilt

The term tilt is used to describe the movement of the sample surface resulting from the rotation of the sample (OptiCentric 9 convention).

Tilt in the Y direction (Tilt Y)

Tilt in the Y direction results from a rotation of the sample about the X-axis.

The surface of a sample which is rotated in the mathematically positive direction of rotation about the X-axis tilts forward from the operator's point of view. This movement is called negative tilt Y.

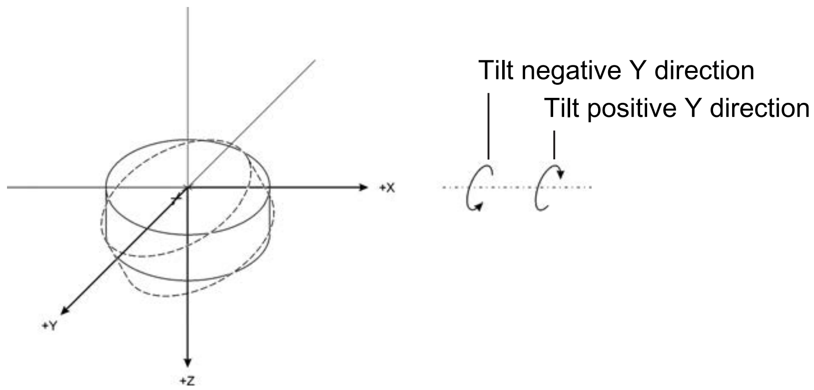


Fig. 20: Coordinate system: Conventions (tilt Y)

Movement of the sample	Mathematical right-handed movement	Movement according to OptiCentric 9 convention
The sample tilts forward from the operator's point of view.	The sample rotates in the positive direction about the X-axis: αX+	The sample tilts in the negative Y direction: αY-
The sample tilts back from the operator's point of view.	The sample rotates in the negative direction about the X-axis: αX-	The sample tilts in the positive Y direction: αY+

Tilt in the X direction (Tilt X)

Tilt in the X direction results from a rotation of the sample about the Y-axis.

The surface of a sample which is rotated in the mathematically positive direction of rotation about the Y-axis tilts to the left from the operator's point of view. This movement is called positive tilt X.

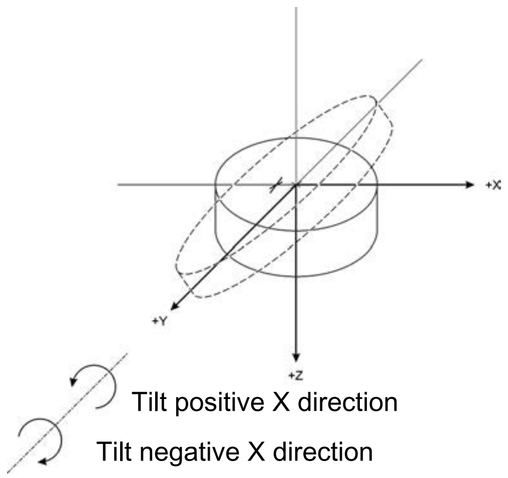


Fig. 21: Coordinate system: Conventions (tilt X)

Movement of the sample	Mathematical right-handed movement	Movement according to OptiCentric 9 convention
The sample tilts to the left from the operator's point of view.	The sample rotates in the positive direction about the Y-axis: αY+	The sample tilts in the positive X direction: αX+
The sample tilts to the right from the operator's point of view.	The sample rotates in the negative direction about the Y-axis: αY-	The sample tilts in the negative X direction: αX-

Rotation about the Z-axis

A point on the surface of a sample which is rotated in the mathematically positive direction of rotation about the Z-axis moves in the positive clockwise direction about the axis of rotation from the operator's point of view.

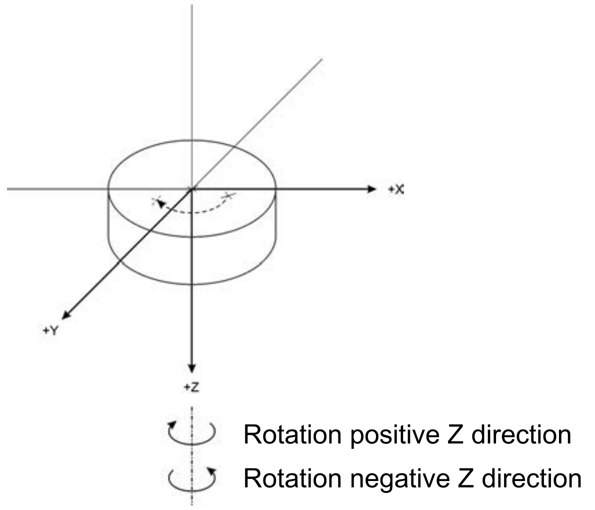


Fig. 22: Coordinate system: Conventions (rotation Z)

Movement of the sample	**Mathematical right-handed movement**	**Movement according to OptiCentric 9 convention**
The sample rotates in a positive clockwise direction about the axis of rotation	The sample rotates in the positive direction about the Z-axis: αZ+	The sample rotates in the positive direction about the Z-axis: αZ+
The sample rotates in a positive clockwise direction about the axis of rotation	The sample rotates in the negative direction about the Z-axis: αZ-	The sample rotates in the negative direction about the Z-axis: αZ-

2.9.2 The world coordinate system

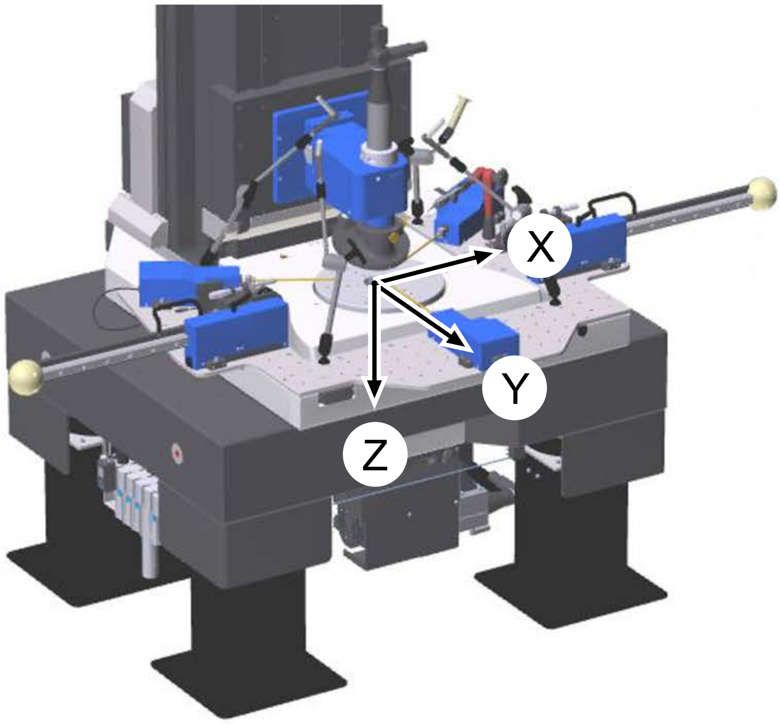


Fig. 23: World coordinate system (example configuration of a measurement system)

The measurement system is delivered with a right-handed coordinate system.

The origin in Z-direction is defined on the rotary table.

X-axis	• parallel to the front of the measurement system • points right from the operator's point of view
Y-axis	• points forwards from the operator's point of view
Z-axis	• points downwards in the table • is parallel to the optical axis of the measuring head • corresponds to the rotational axis of the air bearing

2.9.3 The visual coordinate system

The measurement system is delivered with a right-handed coordinate system.

The origin in the Z-direction is defined on the vertex of the sample (vertex of the uppermost lens surface).

X-axis	• parallel to the front of the measurement system • points right from the operator's point of view
Y-axis	• points forwards from the operator's point of view
Z-axis	• points downwards in the table • is parallel to the optical axis of the measuring head

3 Hardware operation

3.1 Moving the measurement head

This chapter describes the various possibilities for moving the measurement head.

The measurement head is controlled via the software. There are the following options for moving the measurement head:

- Move the measurement head with the arrow keys
- Move the measurement head with the Go To function
- Move the measurement head with the Autofocus function

The functions and buttons of the measurement head control system are described in *General control of the measuring head [▸ 211]*.

CAUTION

Risk of material damage

Improperly configured safety limit switches can result in substantial property damage to the measurement system.

– Set the safety limit switches properly.

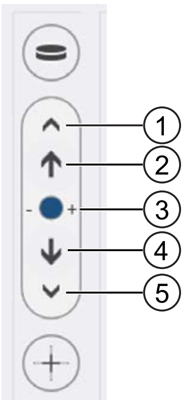


Fig. 24: Measurement head, moving with arrow keys

Move the measurement head with the arrow keys

– Click on the arrows **(1)** or **(5)** to quickly move the measurement head up or down.

– Click the arrows **(2)** or **(4)** to slowly move the measurement head up or down.

NOTE

You can set the default speed with the button **(3)**.

– To change the default speed, move the point **(3)**.
  – "+": Increase default speed
  – "-": Reduce default speed

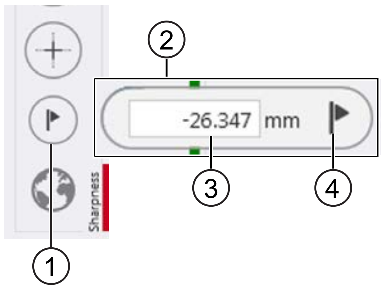


Fig. 25: Measurement head, moving with Go To

Moving the measurement head with the Go To button

1. Select `to absolute position` **(1)**.
   ⇨ This opens the input field for the position to be approached **(2)**.
2. Enter the desired position (relative to the set zero position) in box **(3)** using the keypad.
3. Click the `go to absolute position` button **(4)**.

⇨ The linear stage is moved to the specified position.

Move the measurement head with the Autofocus function

1. Click `automatic focus` to determine the precise focus position.
   ⇨ The measuring head searches in an area around the set zero point for the position with the best image quality and moves back to this position.
2. Click `write measuring head values to configuration`.

NOTE

You can adjust the number of focus steps and the range around the zero point in the hardware settings.

Please refer to *HARDWARE <TOP MEASURING HEAD> view [▸ 269]* for information on how to change the settings for the Autofocus.

3.2 Manually focus on a surface

First option

1. Set the exposure time to the highest possible value, e.g. 0.64 ms.
   (See *Setting the exposure time and intensity [▸ 37]*)
2. Use the arrow keys to move down until the distance to the first surface is approximately equal to the effective focal length of the head lens.
   Example:
   AMT100, focal length 100 mm
   Distance to first surface: approx. 100 mm
3. Reduce the travel speed and continue to move down until a cross reflection appears in the center of the camera image.

NOTE

To ensure that the focus is on the surface, gently tap on the autocollimator or move the sample. The cross in the camera view should not move.

If the focus is not on the surface, proceed as follows:

1. Click `write measuring head values to configuration`.
   ⇨ The current position is set as the zero position.
2. Slowly move approx. 10 mm upwards or downwards, until another cross reflection appears.

NOTE

If you cannot find the cross reflection using this method, try the second option described below.

Second option

1. Place a sheet of paper on the surface.
2. Use the arrow keys to move the guide until the crosshair can clearly be seen on the paper.
3. Remove the paper and make any fine adjustments via the camera image.

3.3 Determine the center of curvature and check relative positions

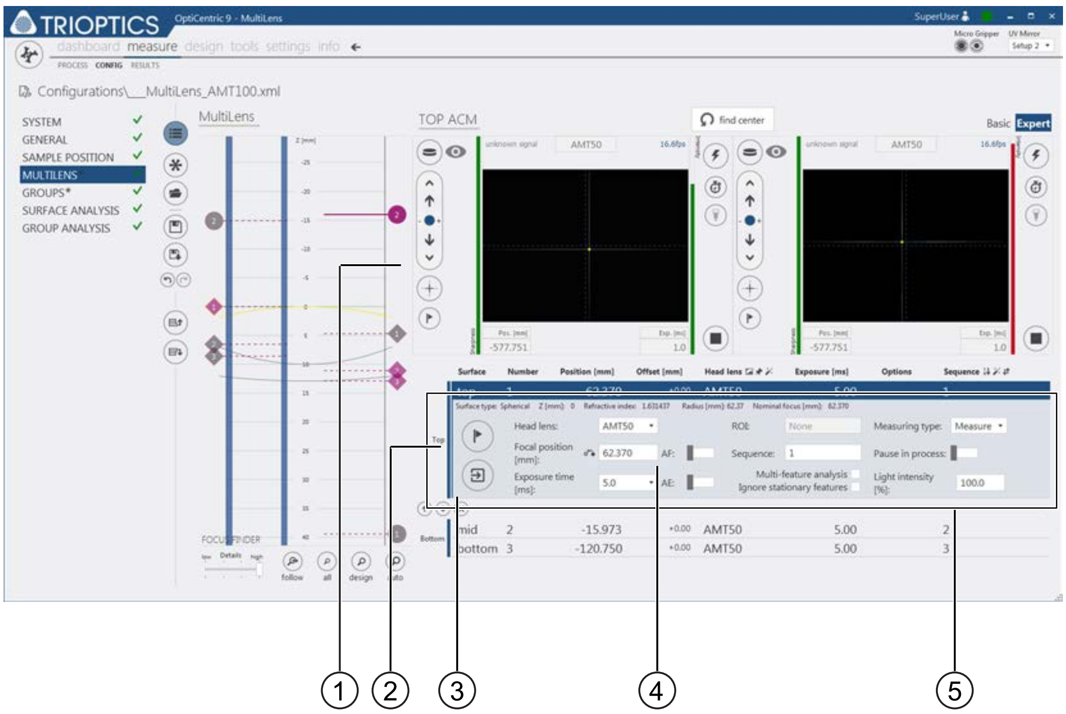


Fig. 26: Check relative positions

1. In the table, select the surface for which you wish to check the relative position.
   ⇨ The row is highlighted and a dialog for entering the relative position opens **(5)**.

2. To move to the image position of the surface, click `apply measuring head values to configuration` **(2)**.
3. If the camera image is out of focus, click `automatic focus` **(1)** to perform an autofocus.
   ⇨ You can automatically use the autofocus option prior to each measurement.

   To enable this option, click `AF` (auto focus) **(4)**:
   Autofocus option is disabled.
   Autofocus option is enabled.
4. Adjust the exposure time if necessary. Proceed as described in the *Exposure time and intensity [37]* section.

5. To apply the determined value to the configuration as the new image position, click `write measuring head values to configuration` **(3)**.
6. Repeat these steps for the remaining surfaces.
7. Click `save` to save your settings.

3.4 Setting the exposure time and intensity

Fig. 27: Camera window, setting the intensity

The intensity of the camera image depends on various factors:

- Brightness of the light source
- Exposure time
- Number of surfaces
- Reflectivity of the lens surface
- Objective used

The bar graph **(1)** shows the light intensity in the measuring window (AOI):

- Bar display green: Saturation within a certain range
- Bar display red: Saturation level exceeded or undershot

NOTE

The exposure time should be as small as possible. Low exposure times mean the effect of ambient light is minor. Excessive exposure times have a negative effect on the measurement results.

The required exposure time is shorter if brightness increases.

The required exposure time is shorter if brightness increases.

– If necessary, change the exposure time until the light intensity is within the tolerance limits (bar display green).

Manually setting the exposure time

1. To set the exposure time manually, click `manual shutter control` **(3)**.

   ⇨ The dialog for entering the exposure time opens.

2. Enter the desired exposure time.

Automatically setting the exposure time

– To adjust the brightness of the light source automatically, click `automatic shutter` **(2).**

Setting the intensity of the light source

1. To switch the intensity of the light source on or off or to adjust it, click `intensity` **(4)**.

   ⇨ The dialog for adjusting the light intensity opens.

2. Change the percentage value.

3.5 Changing head lenses

3.5.1 Criteria for selecting a head lens

Observe the following criteria when selecting the head lens:

- The focal length of the head lens should generally be as small as possible. The smaller the effective focal length, the higher the measurement accuracy. However, this will also decrease the size of the image field. A greater focal length and thus a larger image field may be required if the sample is not fully pre-centered or if the tolerance is high.
- For a convex sample surface, the back focal length of the head lens must be greater than the radius of curvature to prevent the optics mechanically colliding with the sample.
- For positive relative/focal position, the effective focal length of the head lens should be greater than the relative position to prevent the optics mechanically colliding with the sample.
- When measuring objectives, it may be necessary to use different head lenses.
- Head lenses with an effective focal length between 100 and 300 mm are very versatile.

3.5.2 Changing head lenses

When using a measurement head without objective changer

Fig. 28: Selecting the head lens

Requirement:

✓ The manual objective changer has already been set up as described in the chapter *Setting up the manual change of the head lenses [▸ 156]*.

1. Screw the desired head lens into the holder of the X/Y adapter.
2. To open the dialog for selecting a head lens, click `change head lens` (in the toolbar for measurement head control).
3. Select the entry for the selected head lens from the drop-down list **(1)**.

   Note: Only those head lens which have been assigned to the measurement head set for this surface are displayed.
4. To apply the selected settings, click `change head lens`.

When using a manual objective changer

Fig. 29: Selecting the head lens

Requirement:

✓ The manual objective changer has already been set up as described in the chapter .

✓ The objective changer has already been equipped with the head lenses.

1. Rotate the objective changer so that the desired head lens is in the working position.
2. To open the dialog for selecting a head lens, click `change head lens` (in the toolbar for measurement head control).
3. Select the entry for the selected head lens from the drop-down list **(1)**.
4. To apply the selected settings, click `change head lens`.
5. Turn the manual objective changer to the desired position.

When using a motorized objective changer

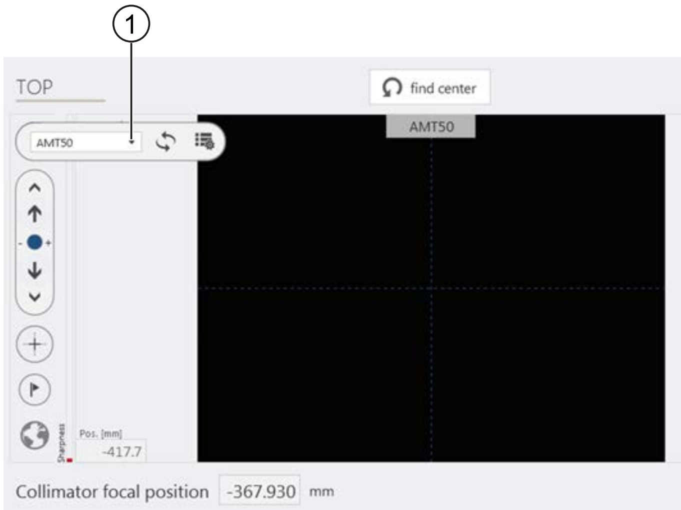


Fig. 30: Selecting the head lens

Requirement:

✓ The motorized objective changer has already been set up as described in the chapter .

1. To open the dialog for selecting a head lens, click in the toolbar for measurement head control
2. Select a suitable head lens from the drop-down list **(1)**.
3. To apply the selected settings, click .

⇨ The selected head lens is automatically placed in its operating position.

4 Creating a design file

For the centering error measurement of single lenses or multi-lens optical systems, the optical design must be taken into account.

Optical design

The optical design describes the imaging effect of successive lens surfaces using the following parameters:

- Radius of curvature of the surfaces
- Refractive index of the medium behind the surface
- Distance to next surface

Design file

The optical parameters are stored in a design file.

Later, a configuration file referring to a design file is created for a measurement process or an alignment and bonding process.

Design files can be created and saved separately from a measurement process or an alignment and bonding process.

4.1 Creating a new design file from an existing ZEMAX file

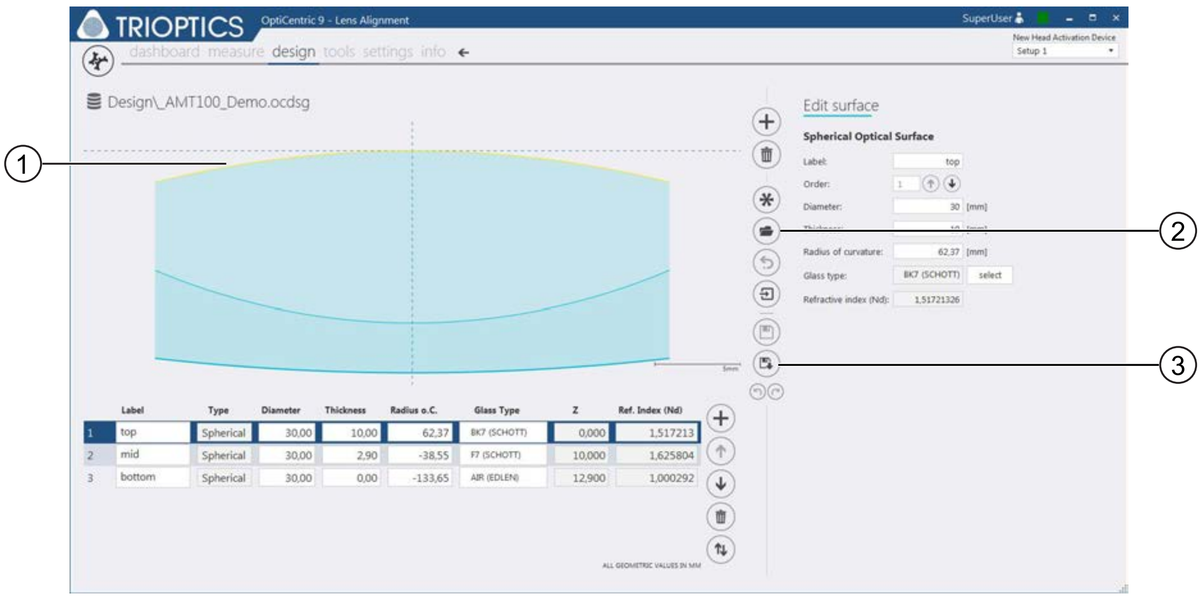


Fig. 31: Create design from existing file

If you have already saved design data in a ZEMAX design file, you can load this data. Based on this data, you can then create a new design file.

1. Select <configure> and open the <DESIGN> view
2. To load an existing design file, click the Load icon **(2)**.
   ⇨ This reads in and displays the data.
3. Change the parameters as described below.
4. To save the design file under a new name, click the Save as **(3)** icon.

Changing optical surfaces

1. Select the optical surface to be changed in the graphics window **(1)**.
   ⇨ The marked surface is displayed in yellow and the input fields for the corresponding parameters are enabled for editing.
2. Change the required parameters.
3. To save the changes, click the save icon.

Additional information on the parameters is given in *Entering parameters for optical surfaces [▶ 47]*.

NOTE

Once assigned, the surface type of a surface cannot be changed. If a change is necessary, the surface must first be deleted. Then a new surface can be created.

4.2 Creating a new design file manually

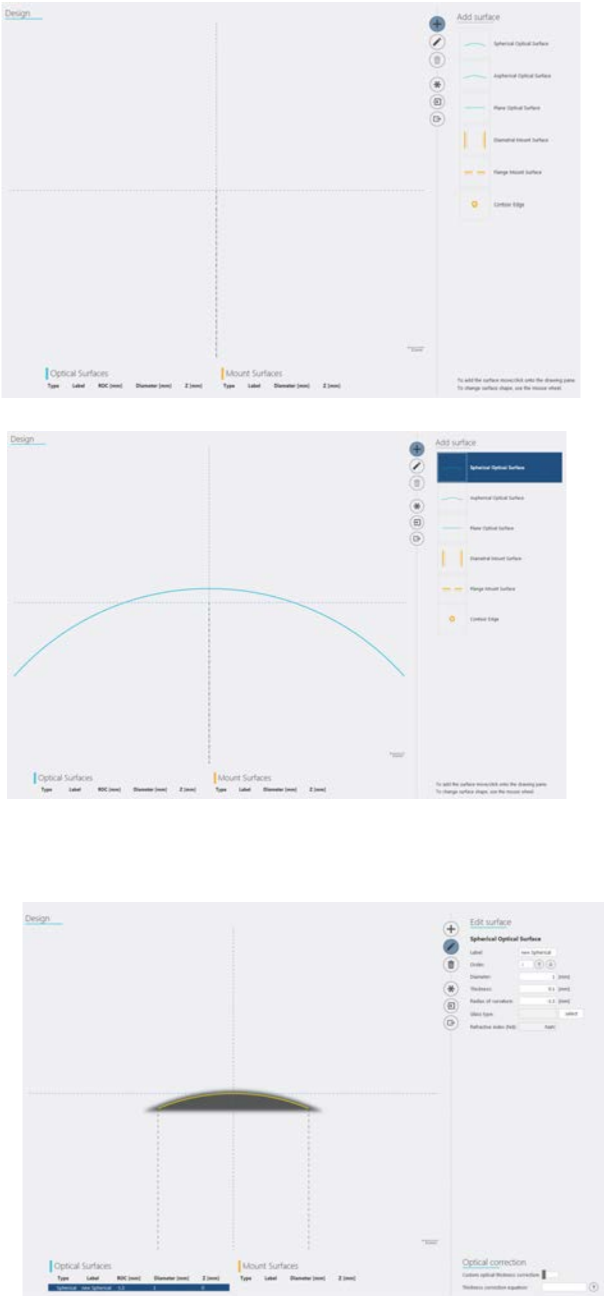


Fig. 32: Creating a design manually

1. To create a new design file, click the `New` icon.
2. An empty design is created **(view A)**.
3. Select a surface type in the editing area and click in the graphics area **(view B)**.
   ⇨ The created surface is displayed in yellow.
   ⇨ The input fields are displayed in the editing area to define the parameters for this surface **(view C)**. Different input fields are displayed depending on the selected surface type.
4. Enter the parameters for the selected surface type. To do this, follow the instructions in *Entering parameters for optical surfaces [▸ 47]*.
   ⇨ Take the information from the technical documents (technical drawings, etc.)
5. Proceed in the same way for all other surfaces.
6. To save the defined parameters to a design file, click the `Save as` icon.
   ⇨ Pay attention to the correct path.
7. Select the file type `*.ocdsg` (OptiCentric design file)
8. To finish exporting the design data, click the `Save` button.

Additional information on inputting parameters is given in *Entering parameters for optical surfaces [▸ 47]*.

See also

Entering parameters for optical surfaces [▸ 47]

 OptiCentric® 9 Software Description

4.3 Entering parameters for optical surfaces

Surface types

The following types of optical surfaces are differentiated:

- Spherical surface
- Aspherical surface
- Plan surface

Fig. 33: Optical surface, spherical surface

Spherical surface

Rotationally symmetrical surface with a spherical surface

Fig. 34: Optical surface, aspherical surface

Aspherical surface

rotationally symmetrical surface, which deviates from the spherical shape

Fig. 35: Optical surface, plan surface

Plan surface

flat boundary surface on lenses, prisms or mirrors.

Fig. 36: Optical surface, standard design for transmission measurement

Standard design for transmission measurement

For centering error measurement in transmission, the imaging effect of the individual optical surfaces is unimportant. A standard design can therefore be used to configure a measurement process.

The surfaces of this design cannot be edited further.

Fig. 37: Edit surface, spherical surface

Entering spherical surface

A spherical surface is determined by the following parameters:

`Name`	Enter a name for the optical surface here. The optical surface is displayed with this name in later configuration steps.
`Sequence`	The value entered here corresponds to the position of the surface within the optical design. In the design table this corresponds to the row number. If several surfaces already exist, the sequence can be changed with the arrow keys.
`Diameter`	Diameter of the optical surface
`Thickness`	Enter the distance to the next optical surface. This corresponds to the center thickness of the lens or the air gap to the next lens.
`Radius of curvature`	Enter the radius of curvature of the optical surface. Note the preceding positive or negative sign.
`Glass type`	Select the glass type (see *Assigning a glass type [▸ 50]*).
`Refractive index`	The refractive index results from the selection of the glass type and cannot be changed manually (see the *Glass catalog [▸ 175]* chapter).

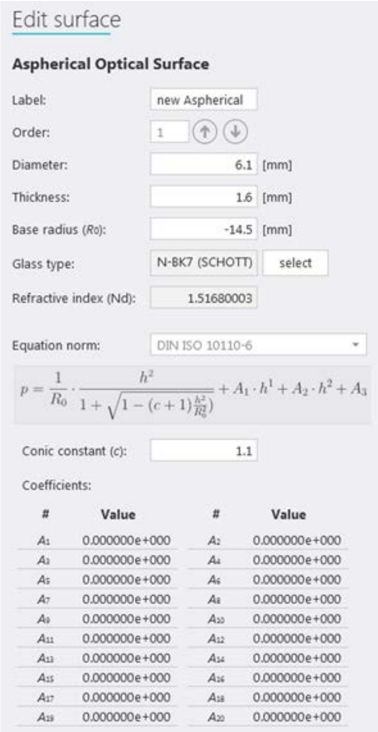


Fig. 38: Edit surface, aspherical surface

Entering aspherical surface

An aspherical surface is determined by the following parameters:

`Name`	Enter a name for the optical surface here. The optical surface is displayed with this name in later configuration steps.
`Sequence`	The value entered here corresponds to the position of the surface within the optical design. In the design table this corresponds to the row number. If several surfaces already exist, the sequence can be changed with the arrow keys.
`Diameter`	Diameter of the optical surface
`Thickness`	Enter the distance to the next optical surface. This corresponds to the center thickness of the lens or the air layer between two lenses (see *Entering spherical surface [▸ 48]*).
`Base radius r0`	Enter the paraxial radius of the optical surface here. Note the preceding positive or negative sign.
`Glass type`	Select the glass type (see *Assigning a glass type [▸ 50]*).
`Refractive index`	The refractive index results from the selection of the glass type (see *Entering spherical surface [▸ 48]*).
`Equation (standard)`	Asphere equation. Select the equation which describes the asphere.
`Conic constant`	Conic constant Enter the conic constant according to the technical drawing.
`Coefficients`	Enter the coefficients according to the technical drawing.

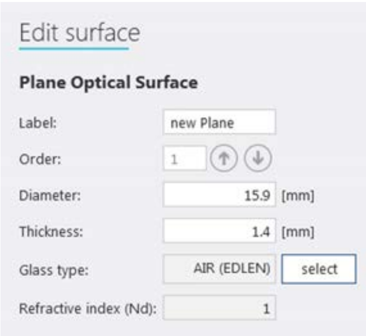


Fig. 39: Edit surface, plane surface

Entering a plane surface

A plane surface is determined by the following parameters:

`Name`	Enter a name for the optical surface here. The optical surface is displayed with this name in later configuration steps.
`Sequence`	The value entered here corresponds to the position of the surface within the optical design. In the design table this corresponds to the row number. If several surfaces already exist, the sequence can be changed with the arrow keys.
`Diameter`	Diameter of the optical surface
`Thickness`	Enter the distance to the next optical surface. This corresponds to the center thickness of the lens or the air layer between two lenses (see *Entering spherical surface [▸ 48]*).
`Glass type`	Select the glass type (see *Assigning a glass type [▸ 50]*).
`Refractive index`	The refractive index results from the selection of the glass type (see *Entering spherical surface [▸ 48]*).

See also

🗎 HARDWARE <HOMING SEQUENCE> view [▸ 152]

4.4 Assigning a glass type

The software is connected with a glass database. This database contains the refractive indexes for different wavelength ranges for the different glass types.

The wavelength of the light source used for the measurement is known from the definition in the hardware settings. The refractive index is determined under the standard conditions stored in the glass catalog (see *Glass catalog [▸ 175]*).

1. Select the surface in the optical design you want to assign a glass type to.
   ⇨ In the design table, the row for the parameters for this surface is active.

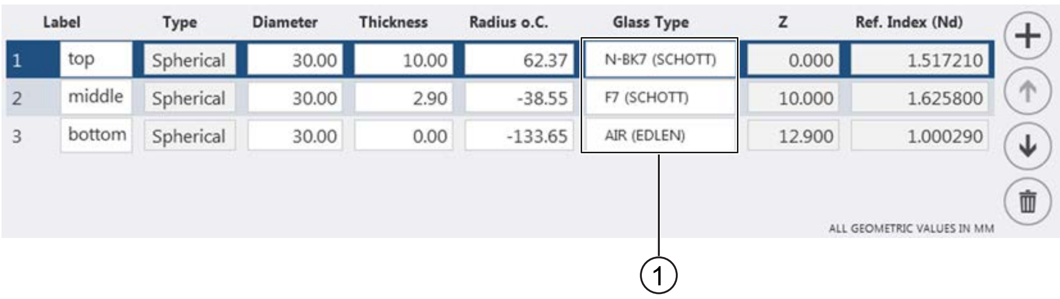


Fig. 40: Design table, assigning a glass type

2. Click on the glass type field (**1**).
   ⇨ The assistant for selecting a glass type is opened.

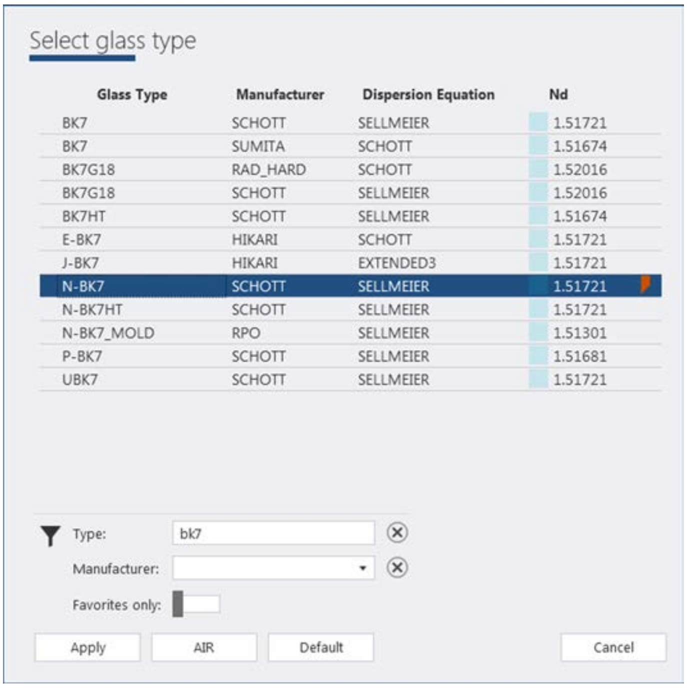


Fig. 41: Glass catalog, selecting a glass type

3. Select the desired glass type in the list
4. To apply the selected glass type, choose `Apply`.

Assigning a refractive index for air

If there is a gap between two lenses in a multi-lens optical system, this gap must be assigned the refractive index for air.

1. To assign the refractive index for air to the surface, select `AIR`.
2. To accept the selection, press **Enter** or select `Apply`.

Detailed information on the functions and buttons can be found in *<settings>, <GLASS CATALOG> [▸ 296]*.

5 Configure a process

In order to carry out the various measurement or production tasks, you require a measurement or production process. This process contains necessary parameters such as the sample design, the measurement or production conditions and the stored data.

A process must be configured and saved for each sample type and for each measurement or production task.

This section describes how to configure a measurement or production process.

NOTE

In order to create a measurement configuration, you must have at least Administrator rights.

Different configuration steps are required, depending on the measurement or production task.

5.1 Configuration wizard

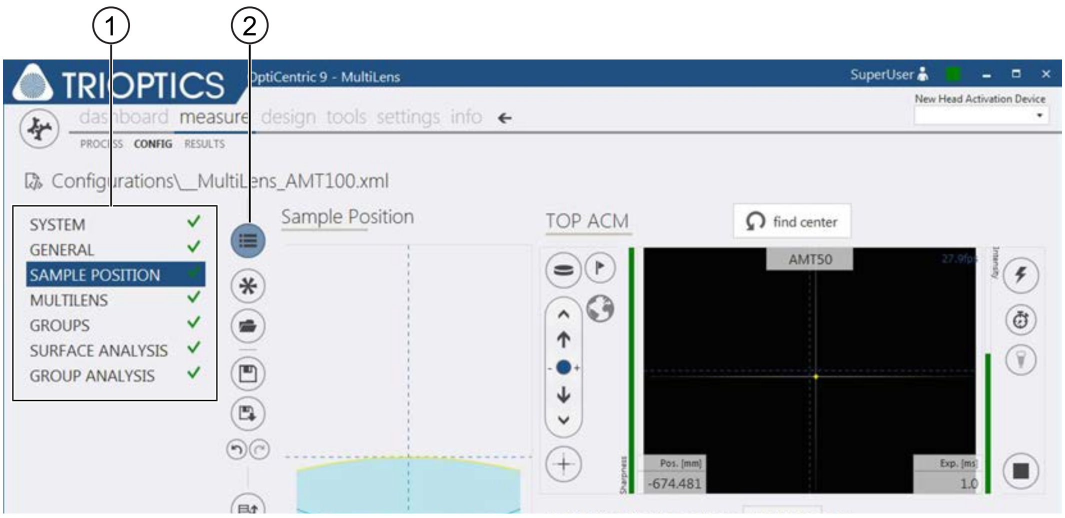


Fig. 42: Configuration wizard

The configuration wizard provides help with the configuration of measurement specifications.

The path view **(1)** can be shown or hidden on the far left of the screen. The current configuration step is highlighted.

The standard screen does not include the path view.

Click `Show configuration structure` **(2)** to show the path view.

Click `Show configuration structure` once more to hide the path view again.

5.2 Special features when configuring a lens alignment process

5.2.1 Steps and sub-steps

Multi-lens optical systems are structured in layers. Each layer corresponds to one step. A mount with lens is also called a cell.

In each step, the lens can be aligned to a mechanical reference axis, the rotation axis of the air bearing or an optical axis.

The steps required to do this are called sub-steps.

– Configure the following features for each step:

Feature	Described in
Step options	*STEP (options) [▸ 83]*
Sample position	*REFERENCE (SAMPLE POSITION) [▸ 63]*
User axis*	*USERAXIS [▸ 85]*
MultiLens	*MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS [▸ 66]*
Glue application*	*GLUE APPLICATION [▸ 87]*
Hole detection*	*HOLE DETECTION [▸ 90]*
UV curing	*UV CURING [▸ 105]*
SmartAlign	*ALIGNMENT [▸ 93]*
Analysis	*ANALYSIS (Step) [▸ 106]*

*) not relevant for alignment cementing

NOTE

Certain steps may not be available depending on the device and process configuration.

5.2.2 The Teaching, Execution and System tab

The views in all sub-steps have at least the following three tabs:

Teaching

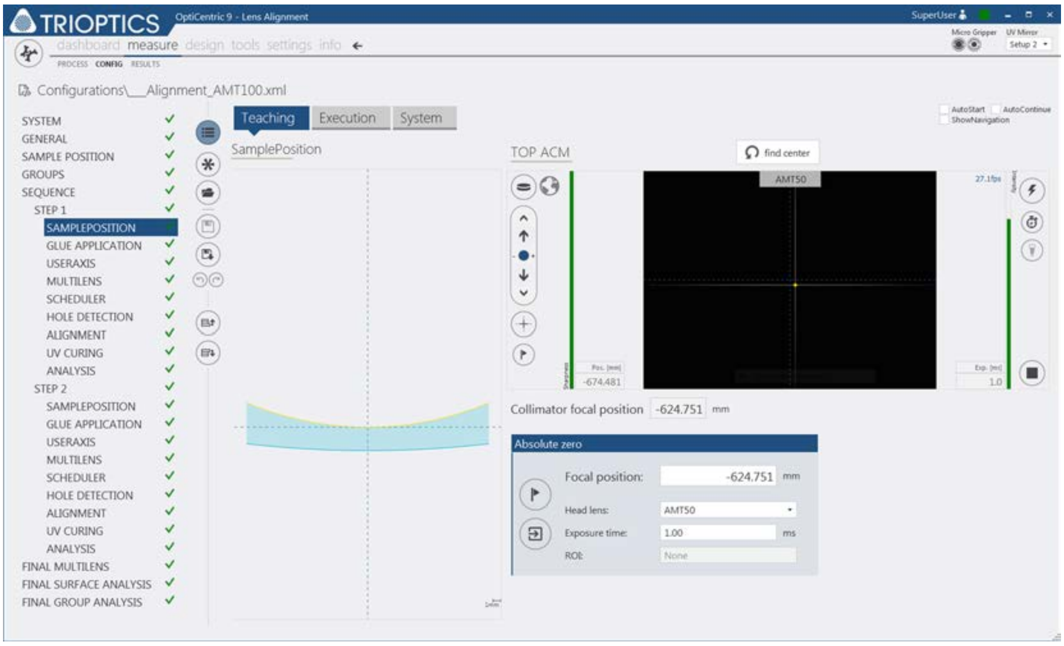


Fig. 43: Tab: Teaching

The settings for the respective configuration step are defined here.

Execution

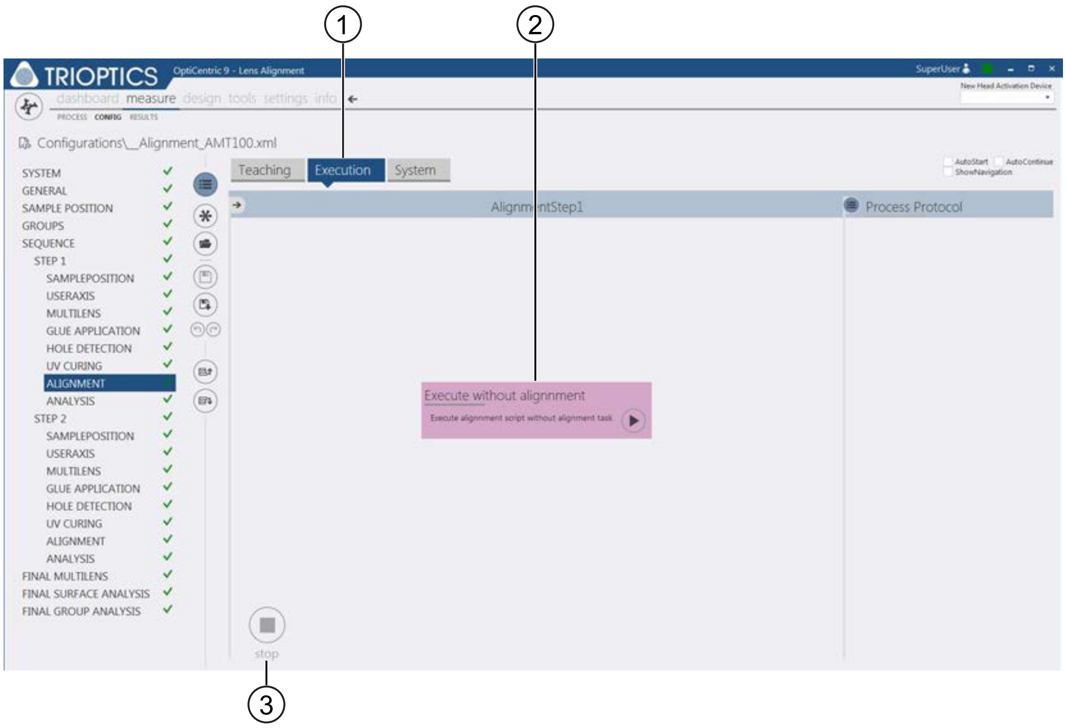


Fig. 44: Configure process: LENS ALIGNMENT (Alignment, Execution)

The settings of the current configuration step can be tested here.

1. Select the `Execution` **(1)** tab.
2. Click ▶ **(2)** to test your settings.
3. Click ■ `stop all movements` **(3)** to stop the movement of all actuators in case of emergency.

NOTE

For some sub-steps / process steps, not all functions are executed when the settings are tested. For example, with GLUE APPLICATION, ALIGNMENT and UV CURING, only the axes are positioned.

System

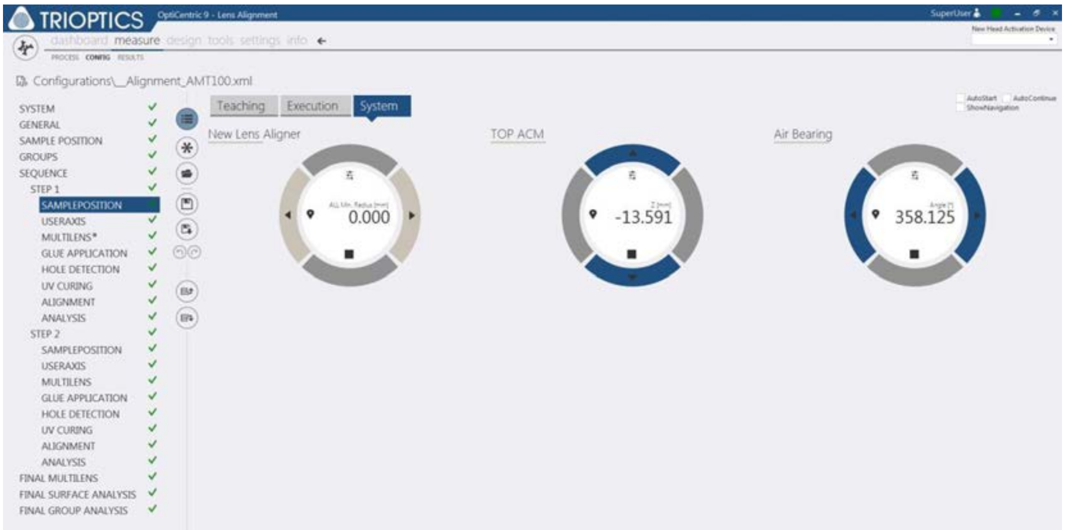


Fig. 45: Tab: System

Here you can move other axes without leaving the configuration step.

CAUTION

Risk of material damage

Uncontrolled movement of the axes may result in material damage due to collision.

– Always check the current step size before moving a positioning axis.
– Be very careful!

5.2.3 The AutoStart and AutoContinue options

When configuring a lens alignment process, you can determine the degree of automation with which the process will subsequently be executed. Depending on the selected options, the process is then executed fully automatically, semi-automatically (the process stops after certain processing steps) or manually.

The degree of automation is affected by the `AutoStart` and `AutoContinue` options, which you can select in the configuration menus of the individual sub-steps.

If no options are set, each process step must be called and started manually (the process is run through manually).

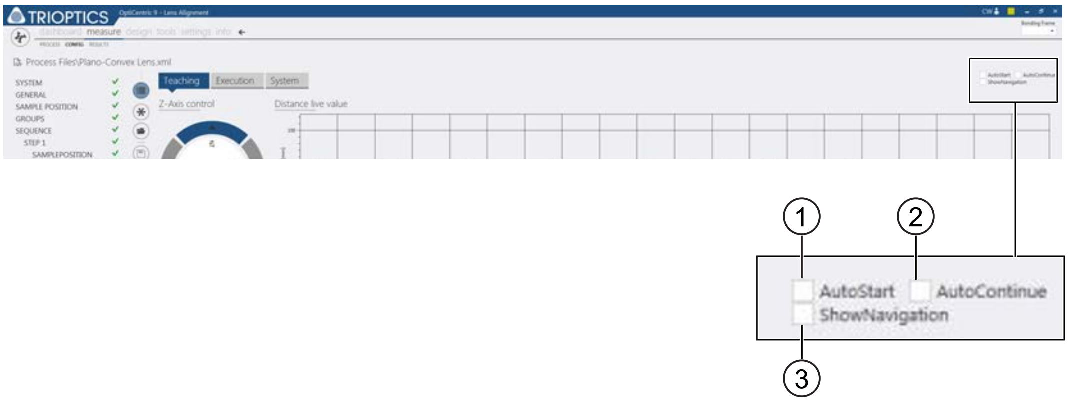


Fig. 46: Configure lens alignment process, set degree of automation

AutoContinue

Select the `AutoContinue` **(2)** option to automatically open the next process step when a process step is completed.

NOTE

NOTE

`AutoContinue` does not mean that the next process step is started automatically. This is only the case if the `AutoStart` option has been selected in the next process step.

AutoStart

Select the `AutoStart` **(1)** option to start a process step automatically.

NOTE

NOTE

The process step only starts automatically if the `AutoContinue` option has been selected in the previous process step.

Show navigation

The `Show navigation` **(3)** setting is useful if the process is executed semi-automatically and stops after a process step (e.g. to check an intermediate result).

If you choose this option, a navigation bar is displayed for this process step. Depending on the options selected (`AutoStart` or `AutoContinue`) you can jump between the process steps and repeat them if necessary.

5.3 Configuration steps

This section describes the individual configuration steps in detail.

Different parameters must be configured depending on the measurement task.

The following table shows an overview of the parameters to be configured for each measurement or alignment process:

Configuration step	Description	ML	CE	LA	Described in...
SYSTEM	Define system components	x	x	x	*SYSTEM [▸ 60]*
GENERAL	Define general parameters for the process (sample design, configuration file, etc.)	x			*GENERAL [▸ 62]*
CENTRATION			x		
SAMPLE POSITION	Defining the origin of the coordinate system on the lens vertex	x	x	x	*REFERENCE (SAMPLE POSITION) [▸ 63]*
MULTILENS	Determine image positions along the Z-axis and camera parameters	x			*MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS [▸ 66]*
GROUPS	Combine lens surfaces into groups	x			*GROUPS [▸ 77]*
SEQUENCE	Number of steps required			x	*SEQUENCE [▸ 82]*
STEP	Process steps per step			x	*STEP (options) [▸ 83]*
SAMPLEPOSITION	Define the origin of the visual coordinate system on the lens vertex (of the respective step)			x	*SAMPLEPOSITION [▸ 85]*
USERAXIS	Determine the position of the mechanical reference axis			x	*USERAXIS [▸ 85]*
MULTILENS (Step)	Determine image positions along the Z-axis and camera parameters (for the respective step)			x	*MULTILENS (Step) [▸ 86]*
GLUE APPLICATION	Define conditions for the application of adhesive			x	*GLUE APPLICATION [▸ 87]*
HOLE DETECTION	Define conditions for the detection of holes			x	*HOLE DETECTION [▸ 90]*
UV Curing	Define conditions for UV irradiation			x	*UV CURING [▸ 105]*
ALIGNMENT	Define safe position and start position for the individual actuators			x	*ALIGNMENT [▸ 93]*
ANALYSIS (Step)	Evaluation of the centration errors of the individual steps			x	*ANALYSIS (Step) [▸ 106]*
SURFACE ANALYSIS	Determine single surface centration errors	x			*SURFACE ANALYSIS [▸ 79]*

GROUP ANALYSIS	Determine centration errors of individual lenses or the lens system	x			*GROUP ANALYSIS [▸ 81]*
FINAL MULTILENS	Determine image positions along the Z-axis and camera parameters after completion of the alignment and bonding process			x	*FINAL MULTILENS [▸ 107]*
FINAL SURFACE ANALYSIS	Determine individual surface centration errors after completion of the alignment and bonding process			x	*FINAL SURFACE ANALYSIS [▸ 107]*
FINAL GROUP ANALYSIS	Determine centration errors of the individual lenses or the lens system after completion of the alignment and bonding process			x	*FINAL GROUP ANALYSIS [▸ 107]*
MEASUREMENT			x		

5.3.1 SYSTEM

In this step you define which hardware components are used for the measurement.

NOTE

If the measurement system includes only one component to be selected per functional unit this configuration step is skipped automatically. The configuration of the measurement specification then begins with the step `General`.

If the measurement system includes multiple components for at least one functional unit, the System configuration step is opened.

NOTE

The following figure shows an example configuration of a measurement system for a MultiLens® measurement. This view may differ depending on the actual configuration of your measurement system.

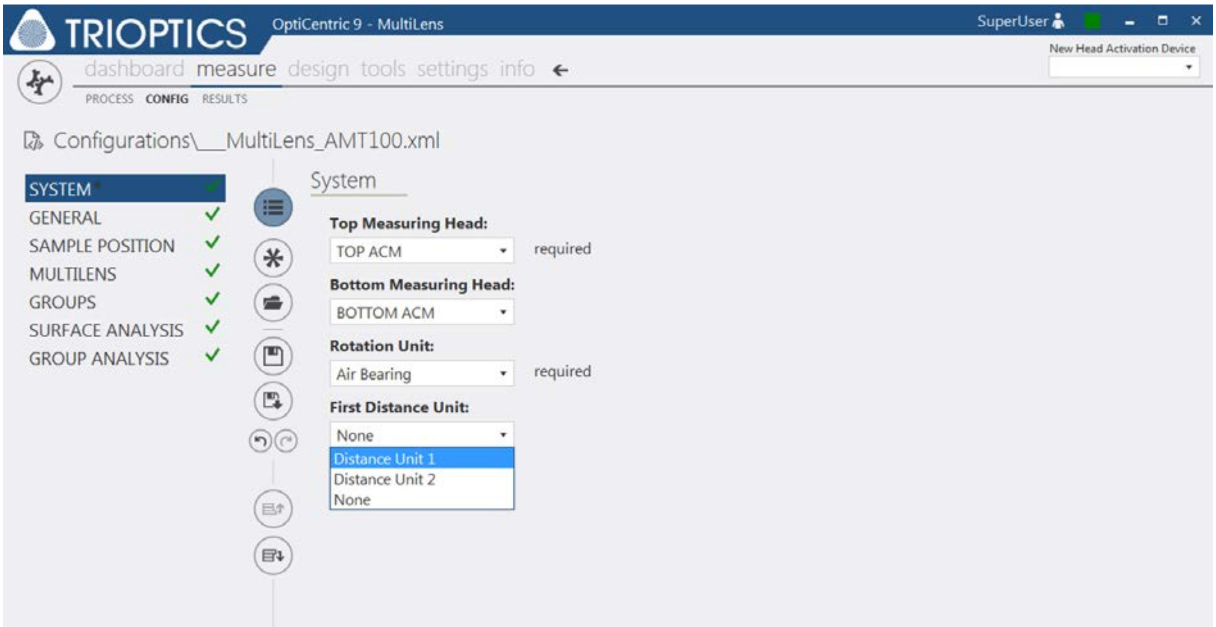


Fig. 47: ML_Config_SYSTEM

All functional units of the measurement system are listed as defined in the hardware settings. Please refer to *Settings [▸ 262]* for further information on the hardware settings.

Functional units that are assigned several components include a drop-down list from which you can select the desired component for the current measurement.

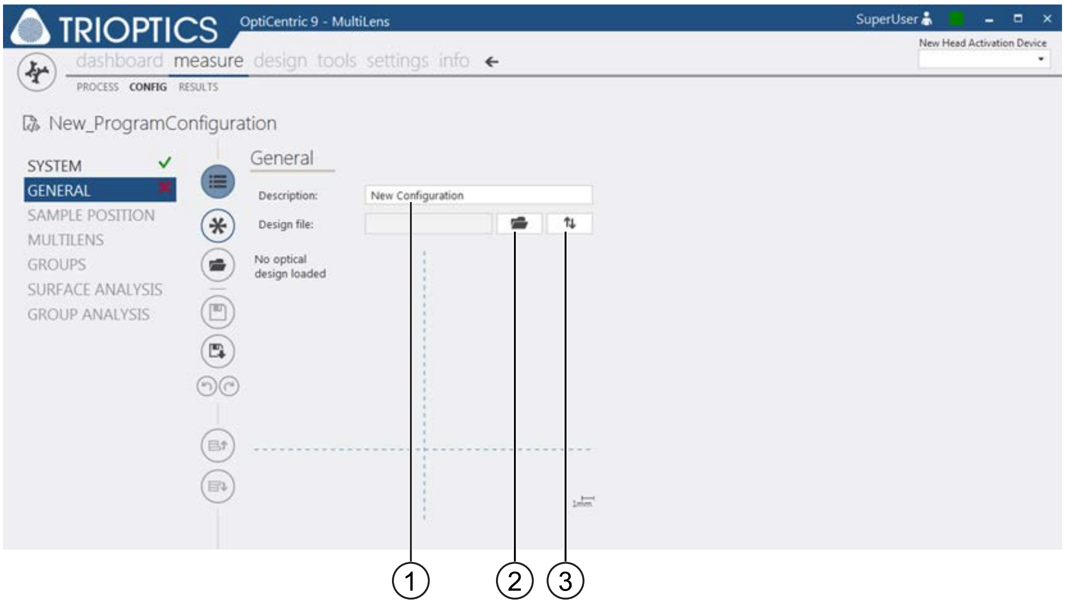
1. For each functional unit, select the component you wish to use for the measurement.

2. Click `Save configuration as ...` to save the settings under a new name.

⇨ The entries in the `SYSTEM` configuration step are now complete.

5.3.2 GENERAL

View A



View B

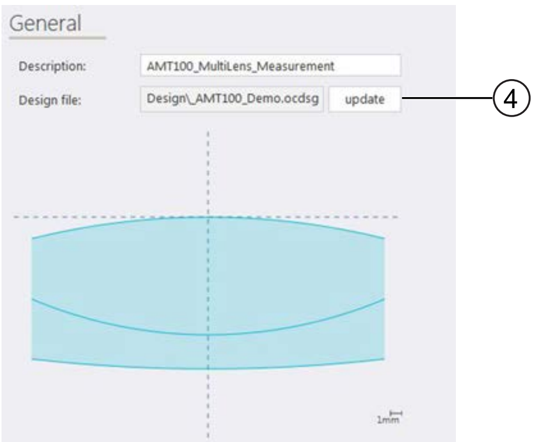


Fig. 48: Configure: GENERAL

In this configuration step, you create the link to the design data to which this configuration applies.

You have the option of changing the orientation of the design when it is loaded.

NOTE

All subsequent configuration steps depend significantly on the design. Therefore, the link to a design file for the same process configuration can only be changed at a later date if the number of optical surfaces remains the same.

1. Enter a description for the current configuration in the `Description` **(1)** field.
2. Click `Load design file` **(2)** to load a design file from a defined directory.
   ⇨ The design data is imported.
   ⇨ A preview of the design is displayed in the graphics area.
3. Click `Load design file in inverted order (upside down)` **(3)** to reverse the orientation of the design.
4. Click `Save configuration` to save your settings.

NOTE

Click the `update` **(4)** button to remove the link to the selected design file. This means that all previous design-dependent settings will be lost. A new configuration file is created automatically.

5.3.3 REFERENCE (SAMPLE POSITION)

In this configuration step, you determine the vertex of the optical system and set it as the zero position for the measuring head. This defines the origin of the visual coordinate system.

Moreover, you define the required exposure time for this setup step.

NOTE

Depending on the measurement or production task, the reference position of the measuring head is determined (again) at different times of the process and is partly named differently in the software for better differentiation.

However, the procedure for configuring them is the same in all cases.

This description applies to the following configuration steps:

Configuration step	Module	Description
SAMPLE POSITION	MultiLens® module (ML)	Define the reference position of the measuring head on the surface of the sample. Important for the measurement of the sample
SAMPLEPOSITION	Centration module (CE)	Define the reference position of the measuring head on the surface of the sample. Required when configuring a centration error measurement of a spherical lens surface or a multi-lens optical system.
SAMPLE POSITION	Lens Alignment module (LA)	Define the reference position of the measuring head on the surface of the complete sample. Important for the final measurement of the sample
SAMPLE POSITION (Step)	Lens Alignment module (LA)	Define the reference position of the measuring head on the lens surface of a single step. Important for the measurement of the individual steps.

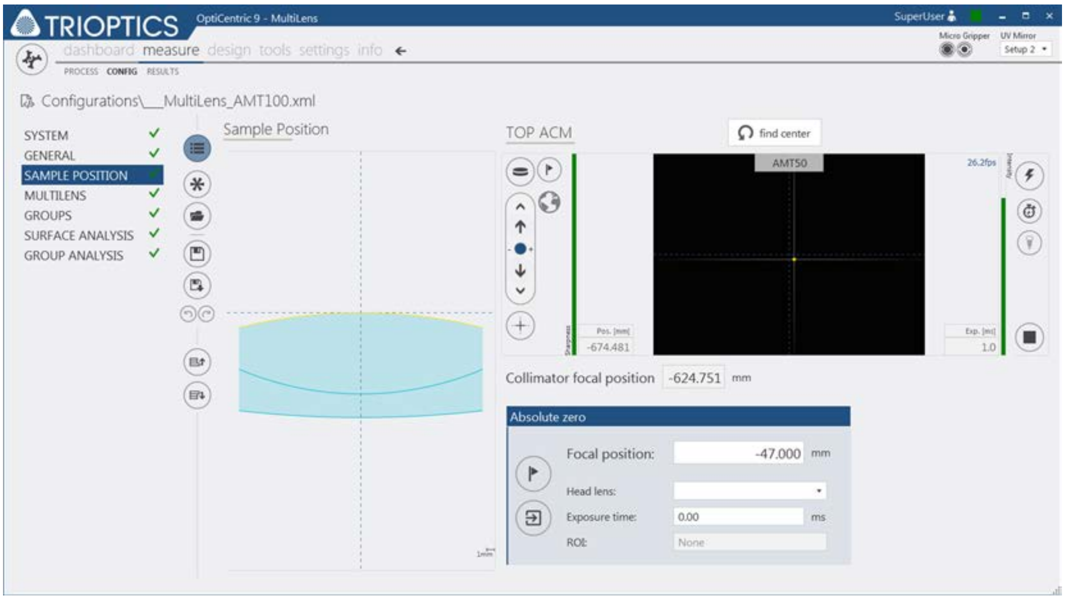


Fig. 49: Configure process: Reference (SAMPLE POSITION)

The zero position of the measuring head depends on the focal length of the head lens used. To find the zero position, focus mus be on the uppermost surface of the optical system.

You can determine this position manually or with the help of the autofocus function.

NOTE

Using the wrong head lens leads to incorrect measurement results.

– Make sure that the correct head lens is used, especially when using a manual lens changer.

1. Move the measuring head until the reticle is clearly visible in the camera window.
2. Click `automatic focus` to determine the precise focus position.
   - ⇨ The maximum image quality is achieved with the best possible focus.
   - ⇨ The intensity should not be set too high.
   - ⇨ The camera image should now be clearly seen. If this is not the case, change the exposure time and/ or the brightness of the light source as described in *Setting the exposure time and intensity [▸ 37]*.
3. If necessary, repeat steps 1 to 2.
4. Click on `write measuring head values to configuration` to apply the determined measuring head position to the configuration as zero position.
5. Click `Save configuration` to save your settings.

5.3.4 MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS

In this configuration step you determine the location of the image positions of the individual optical surfaces along the Z-axis. This ensures that each optical surface is approached and measured correctly.

In the same configuration step, you define the required exposure time for each individual optical surface and other camera parameters (e.g. intensity, AOI).

In dual measurement systems you also define which optical surfaces are measured with the top or bottom measuring head in this step.

It is also possible to exclude surfaces from the measurement for multi-lens optical systems.

NOTE

Depending on the measurement or production task, a MultiLens® measurement is performed at different times of the process and is partly named differently in the software for better differentiation.

However, the procedure for configuring them is the same in all cases.

This description applies to the following configuration steps:

Configuration step	**Module**	**Description**
MULTILENS	MultiLens® module (ML)	Determine the location of the image positions along the optical axis for the entire optical system. Important to be able to move to all image positions correctly during the measurement.
MULTILENS [Sub-step]	Lens Alignment module (LA)	Determine the location of the image positions along the optical axis for the current step.
FINAL MULTILENS	Lens Alignment module (LA)	Determine the location of the image positions along the optical axis for the entire optical system once the alignment and bonding process has been completed. To check the achieved quality of the imaging effect.

When you call up the MULTILENS configuration step, the following window appears:

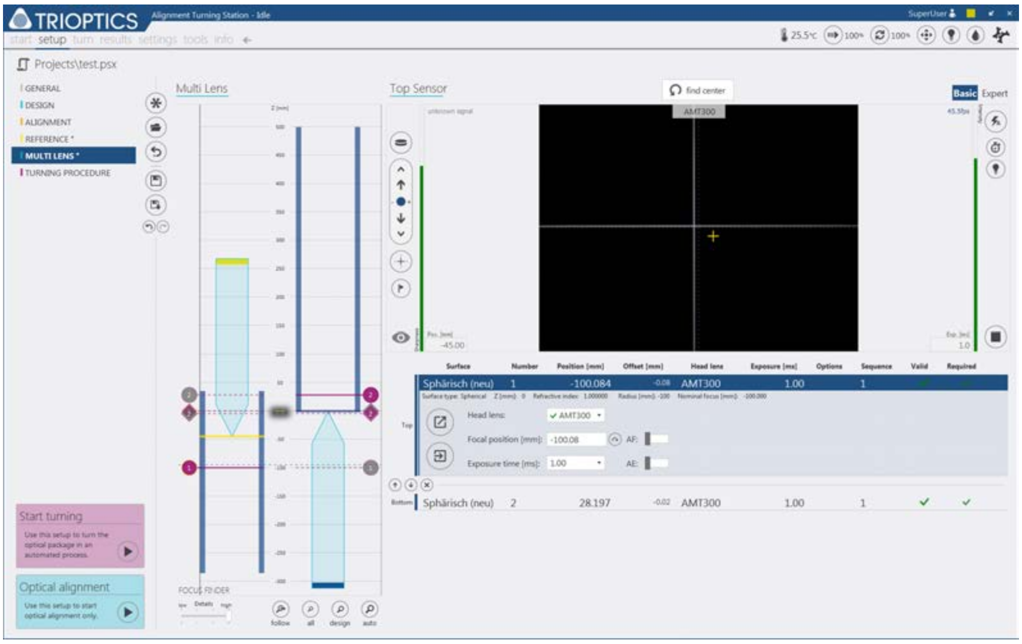


Fig. 50: Configure, MULTILENS view

Determine location of the image positions

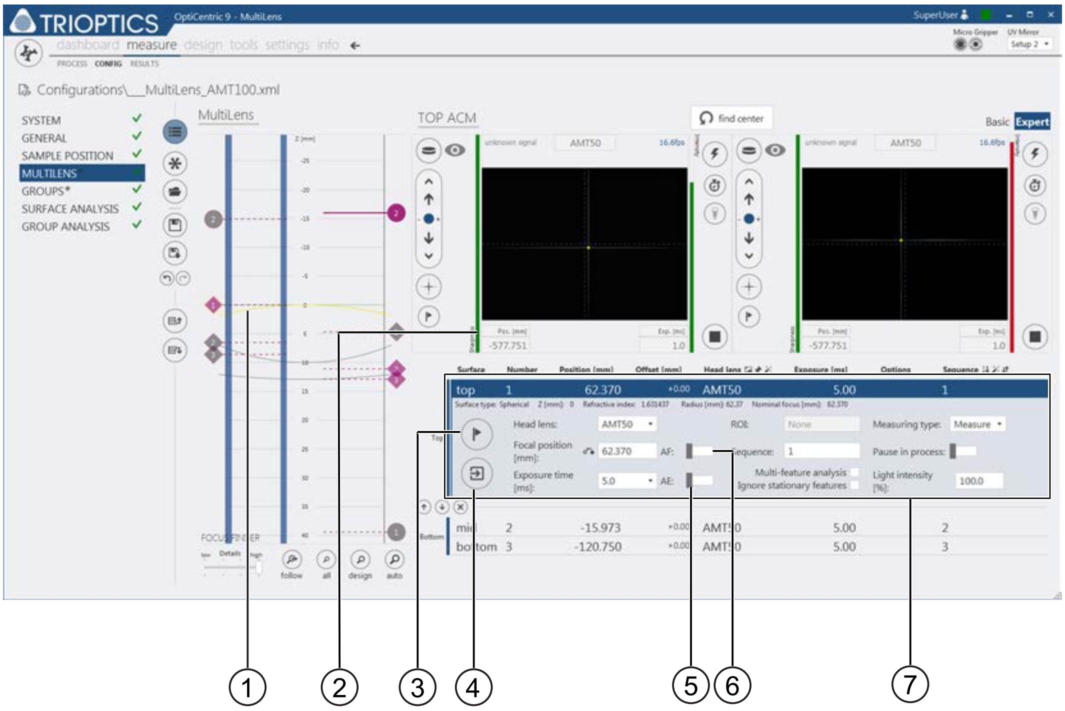


Fig. 51: Configure process: MULTILENS (determine image positions)

1. In the table, select the surface for which you wish to determine the image position.
   - ⇨ The area for editing the measurement parameters for this surface **(7)** opens.
   - ⇨ The area is highlighted.
   - ⇨ In the focus finder, the current surface is highlighted in yellow **(1)**.
2. Choose a suitable head lens (see *Changing head lenses [**38**]*).
3. Click `apply configuration to measuring head` **(3)** to move to the calculated image position of the surface.
   - ⇨ The reticle should be clearly visible in the camera window.
     If the camera image is out of focus, proceed as follows:
4. Click `Auto focus` to perform an autofocus.
   or:
   Use the arrow keys to move the measuring head manually until the camera image is clearly visible.
   - ⇨ The center of curvature is reached when the focus is as good as possible and the `Sharpness` bar chart reaches its maximum extent **(2)**.
5. Click `write measuring head values to configuration` **(4)** to apply the determined measuring head position to the configuration as the new relative position.
6. Repeat these steps for the remaining surfaces.
7. Click `Save configuration` to save your settings.

NOTE

You can automatically use the autofocus option prior to each measurement. Click `AF (Auto focus)` **(6)** to enable this option.

NOTE

You can automatically use the auto exposure option prior to each measurement. Click `AE (Auto Exposure)` **(5)** to enable this option.

 OptiCentric® 9 Software Description

Measuring surfaces from the top or bottom

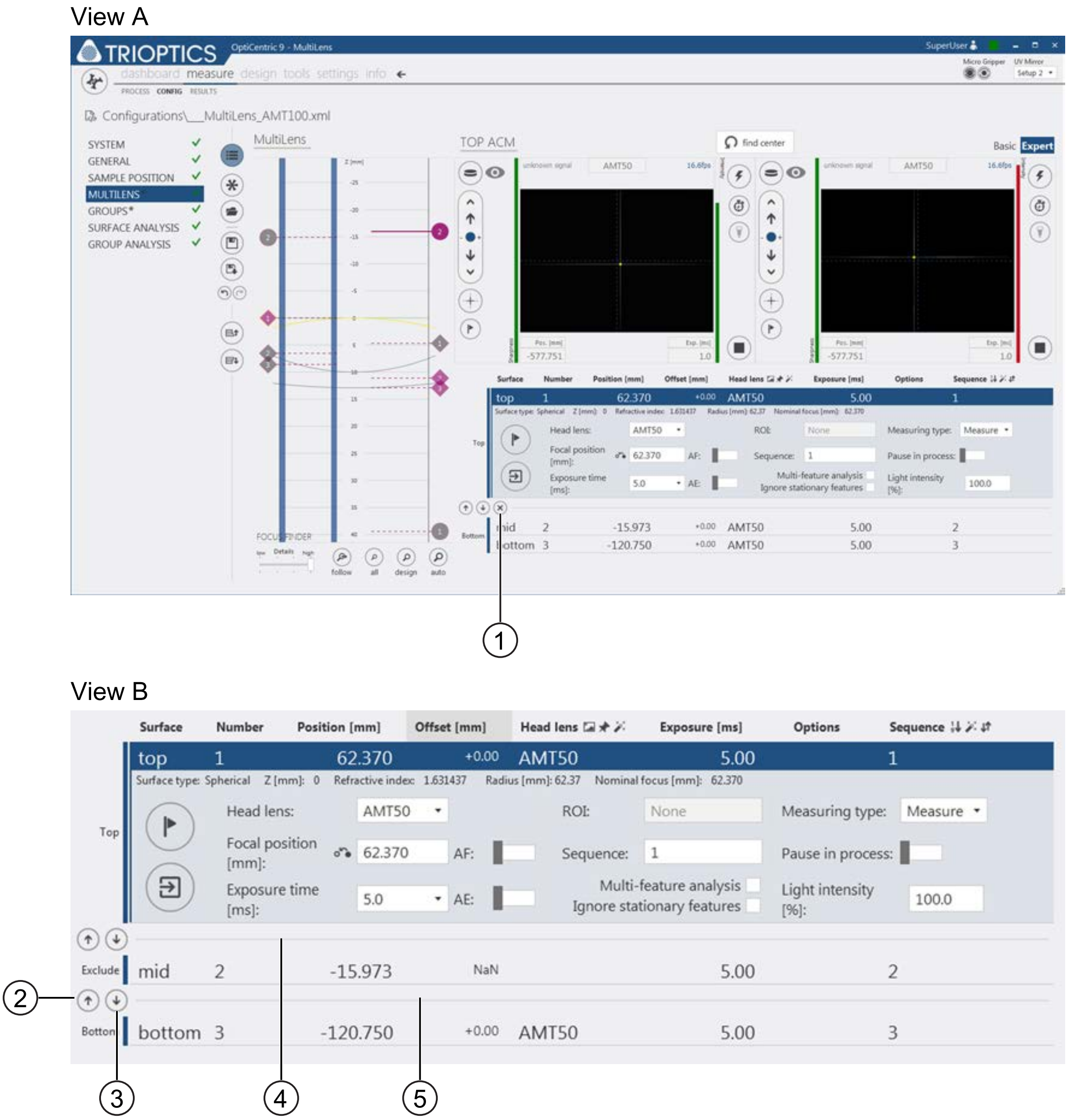


Fig. 52: Configure process: MULTILENS (define measuring direction)

In dual measurement systems it is possible to measure surfaces both from above and from below.

The measurement from below can be useful for example for more complex lens systems, depending on the sample design.

For simple lens systems, the measurement can be performed more quickly when both collimators are used.

For alignment, both centers of curvature of the lens to be aligned can be observed.

NOTE

The surfaces in multi-lens optical systems cannot be measured with just any, i.e. top or bottom, measuring head. You have to define up to which surface measurements are to be performed with the top measuring head and from which surface the bottom measuring head is to be used. During a measurement you can only switch between top and bottom measuring head once. However, surfaces can be excluded from the measurement.

1. To show the exclusion area, click the ⊗ icon `open exclude group` **(1)**.

   Select the arrow keys to move the borders of the exclusion area:

2. To move the border up, click on the ↑ icon `up` **(2)**.
3. To move the border down, click on the ↓ icon `down` **(3)**.

NOTE

You can exclude interior surfaces from the measurement. In this case, move the border of the top measuring head **(4)** to ensure that the surface to be excluded is below this border. Move the border of the bottom measuring head **(5)** to ensure that the surface to be excluded is above this border **(View B)**.

Setting the sequence

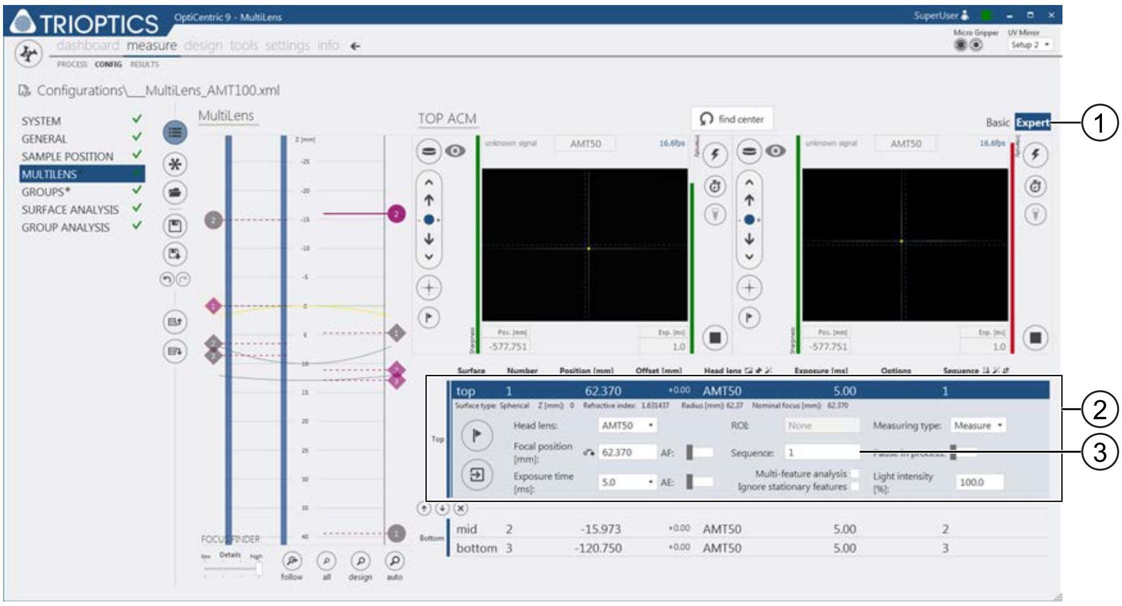


Fig. 53: Configure process: MULTILENS (define sequence)

The sequence in which the individual surfaces are measured is irrelevant. The only decisive factor is that all surfaces that are to be included in the calculation of the optical axis are measured.

During the measurement, the measuring head moves to the relative position of each surface to be measured. Unless specified otherwise, the surfaces are measured one after the other as indicated in the `Sequence` column.

Depending on the sample, the sensor may have to travel up and down a lot if the centers of curvature are approached in the order of the lens surfaces.

To avoid unnecessary movements and thus save time, it is possible to set the sequence in which the surfaces are measured.

NOTE

It is recommended to measure the surfaces from top to bottom in order to minimize the influence of the linear bearing mechanism.

1. Select the `Expert` **(1)** tab.
2. In the table, select the surface for which you wish to define the sequence.
   ⇨ The row is highlighted and a dialog for entering the sequence opens **(2)**.
3. Enter the figures for the desired sequence into the `Sequence` **(3)** field.
4. Repeat these steps for the remaining surfaces.
5. To save your settings, click the `Save configuration` icon.

Measuring method of a MultiLens® measurement

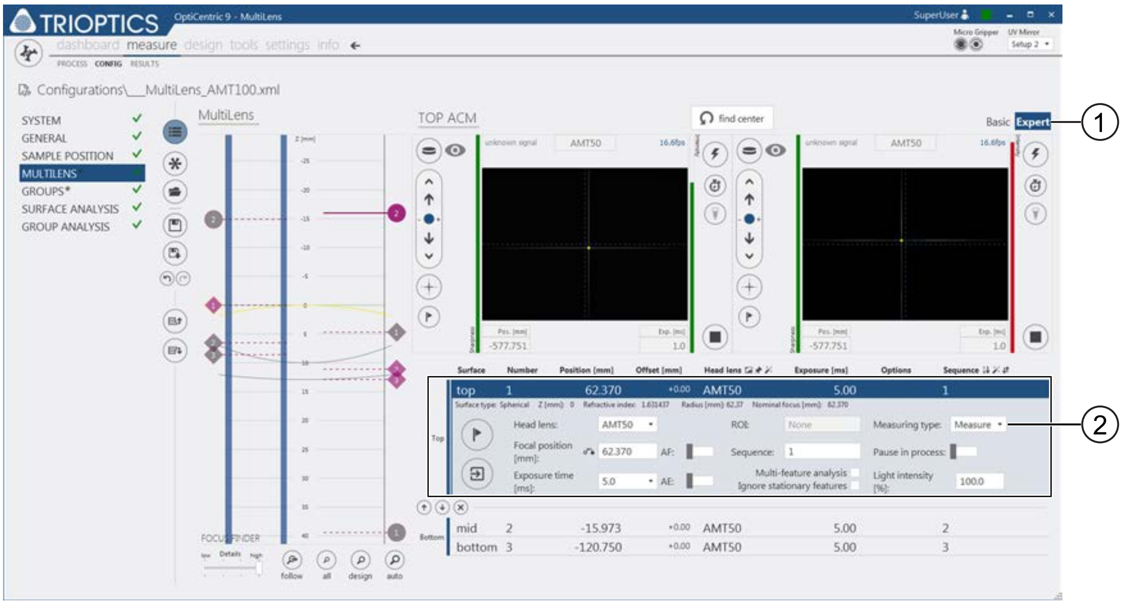


Fig. 54: Configure process: MULTILENS (define measuring method)

The appropriate method for measuring the centration error must be determined and entered separately for each surface.

1. Select the `Expert` **(1)** tab.
2. Select the desired measuring method from the drop-down list in the `Measuring type` **(6)** field.
3. To save your settings, click the `Save configuration` icon.

The following table shows an overview of the different measurement methods:

 OptiCentric® 9 Software Description

Measurement	The sample is rotated by 360°. During the rotation, the software detects the position of the reticle image. After rotation, the software automatically calculates the centration error. **Application:** This method is recommended for most measurements.
Select	The sample is first rotated by 180°. The "`Select a cross`" message is displayed. – Click on the crosshair in the camera image. The software looks for a crosshair near where you clicked the mouse. Then the air bearing is turned by 180° back to the starting position. The "`Select a cross`" message is displayed. – Click on the crosshair in the camera image. The software automatically calculates the centration error. **Application:** This method is recommended if the intensity is low or the contrast is very weak and the measurement using the `measure` measuring method is not successful.
SelectAutomatically	The sample is first rotated by 180°. The software automatically captures the image from the crosshair. Then the air bearing is turned by 180° back to the starting position. The software automatically captures the image from the crosshair. The software automatically calculates the centration error. **Application:** This method is recommended if a good circle cannot be obtained through very specific aberrations (interfering reflections, several cross images).
SelectAndGrab	The sample is first rotated by 180°. The "`Select a cross`" message is displayed. – Click **precisely** on the reticle in the camera image. The software adopts the position of the mouse click as the position of the crosshair. Then the air bearing is turned by 180° back to the starting position. The "Select a cross" message is displayed. – Click **precisely** on the crosshair in the camera image. The software automatically calculates the centration error. **Important!** If the mouse click is not precisely on the reticle, incorrect positions will be used when calculating the centration error. **Application:** This method is recommended if a good circle cannot be obtained through very specific aberrations

Pause in process

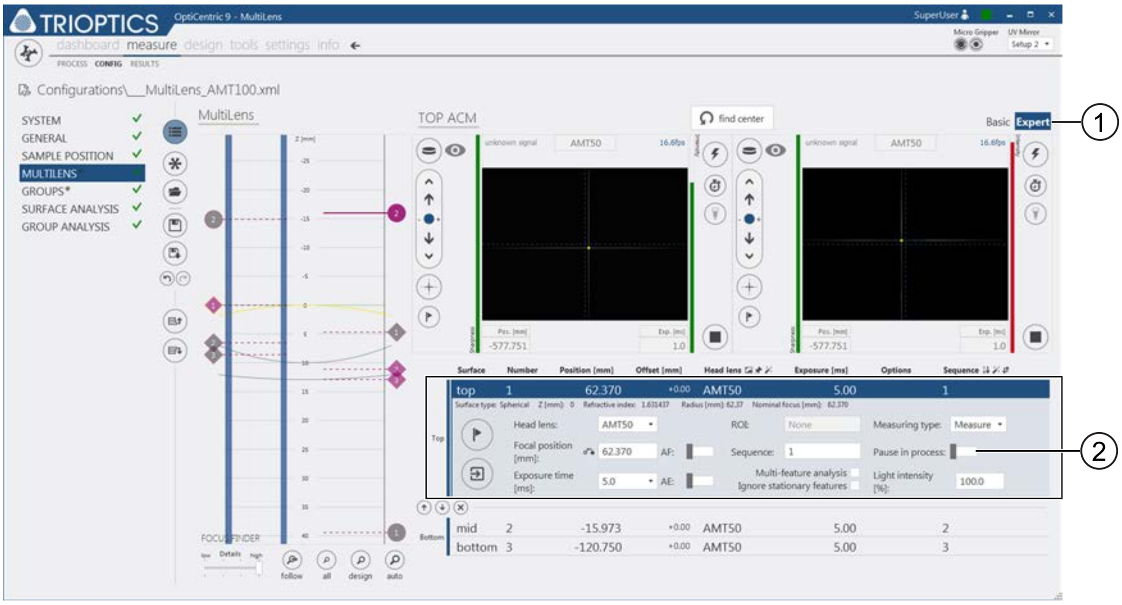


Fig. 55: Configure process: MULTILENS (pause in process)

You can automatically stop the process before a surface measurement.

This may be necessary if changes have to be made during the measurement.

1. Select the `Expert` **(1)** tab.
2. Click on `Pause in process` **(2)** to enable this option.
   ⇨ The `Pause in process` option is disabled.
   ⇨ The `Pause in process` option is enabled.
3. Click `Save configuration` to save your settings.

Light intensity

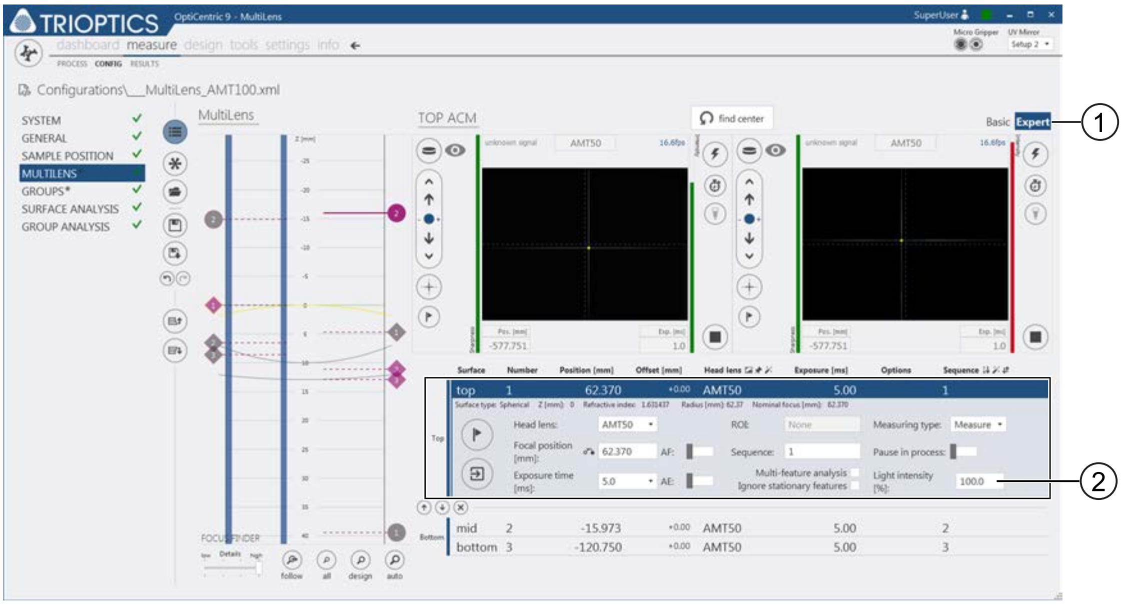


Fig. 56: Configure process: MULTILENS (set light intensity)

The default intensity setting of the light source is 100%.

To change this setting proceed as follows:

1. Select the `Expert` **(1)** tab.
2. Enter the desired value in the `Light intensity` **(2)** field.
3. Click `Save configuration` to save your settings.

Region of interest (ROI)

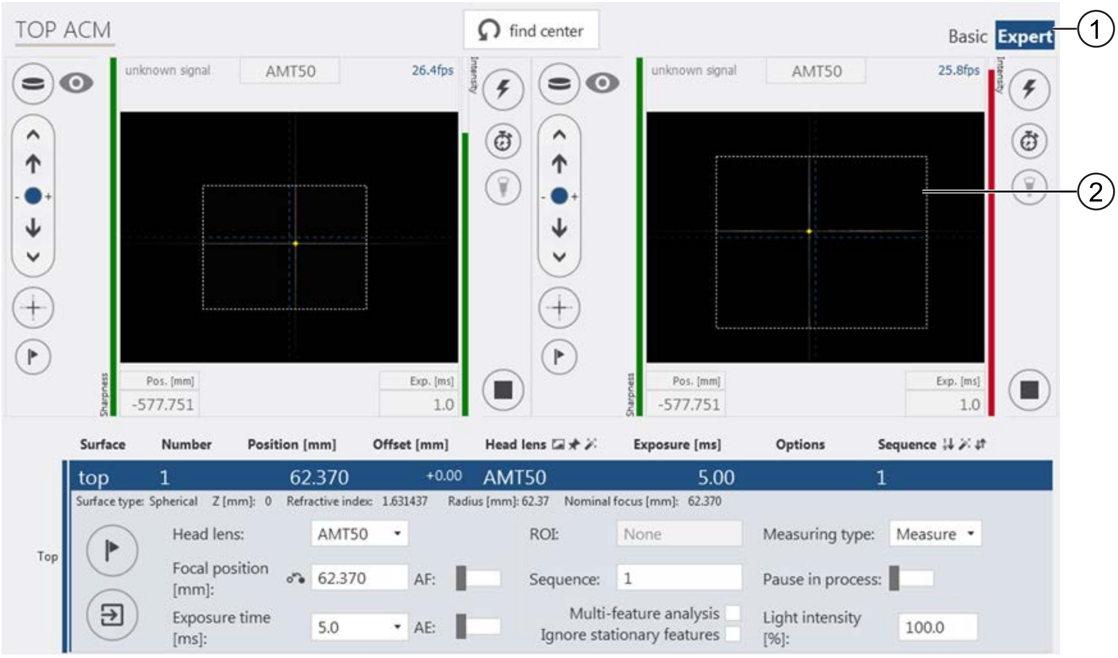


Fig. 57: Configure process: MULTILENS (Region of interest)

With this function you can limit the search area based on the image of the crosshair in the camera window.

1. Select the Expert **(1)** tab.
2. Press and hold down the **Shift** key on the keyboard.
3. Left-click in the camera window and, keeping the mouse button held down, draw a rectangle in the area in which you want to search for the image of the reticle **(2)**.
4. Click on `write measuring head values to configuration` to apply the measuring head settings to the configuration.
5. Repeat these steps for the remaining surfaces.
6. Click `Save configuration` to save your settings.

NOTE

To cancel this setting again hold down the **Shift** key on the keyboard and right-click in the camera window.

The entries in the MULTILENS configuration step are now complete.

5.3.5 GROUPS

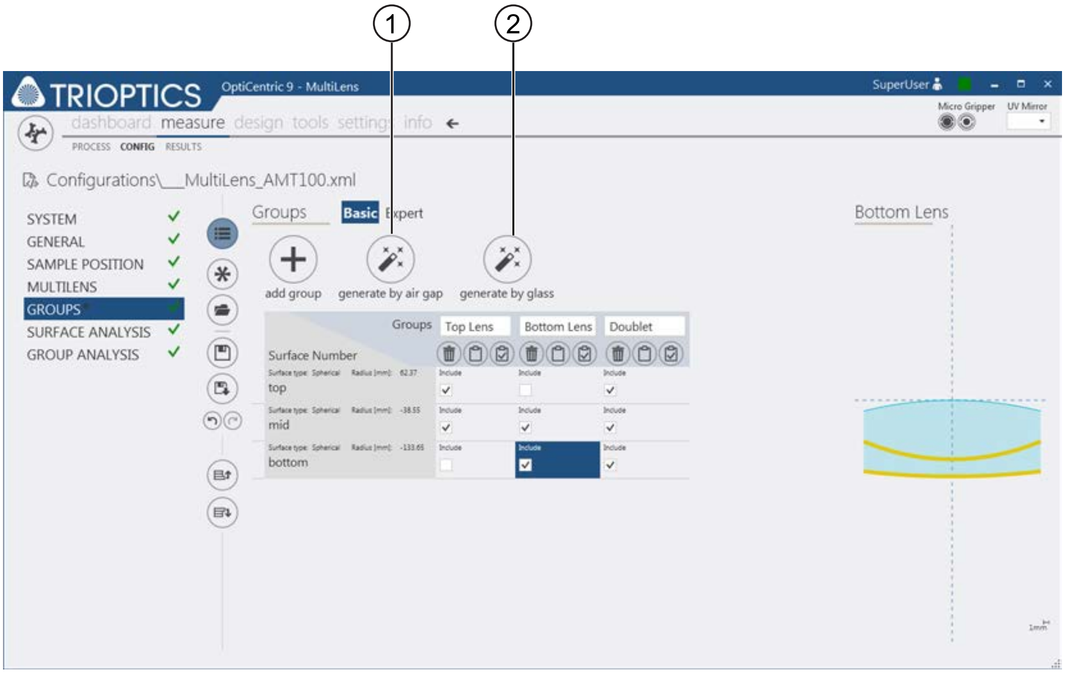


Fig. 58: Configure process: GROUPS

In this configuration step you define groups from the optical design surfaces.

The group definitions are used both for setting up the steps and for creating surface and group analyses.

You can create lens groups manually or automatically. The following options are available for this purpose:

- Add lens group (manually create a lens group)
- Generate lens groups by air gap
- Generate lens groups by glass type

Create lens groups manually

1. Click `add group` to create a new group.
2. Enter a name for this group in the `Groups` field (e.g. Top Lens).
3. In the `Includes` column, select the surfaces of the optical design that belong to this lens or group of lenses and that are to be grouped together.
   ⇨ This group has now been created.
4. Repeat these steps for additional groups.
5. Click `Save configuration` to save your settings.

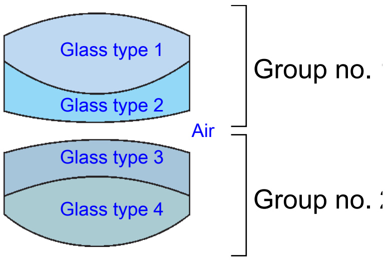


Fig. 59: Generate lens groups: by air gap

Generate lens groups by air gap

– Select the option `generate by air gap` **(1)**.

Several lenses without an empty space in between (e.g. doublet) are combined into a group.

The criterion is the refractive index for air.

Starting with the vertex, all successive surfaces are combined into a group whose refractive index is not equal to the refractive index for air.

If a surface has been assigned the refractive index for air, this surface forms the lower boundary surface of the group.

In a multi-lens optical system with internal empty spaces, several groups are automatically generated in this way.

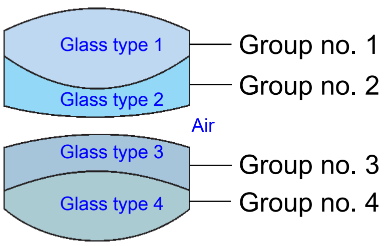


Fig. 60: Generate lens groups: by air glass type

Generate lens groups by glass type

– Select the option `generate by glass` **(2)**.

If you select this option, two consecutive surfaces are combined to form a group, starting with the vertex.

Unless it has been assigned the refractive index for air, the lower boundary surface of a group is also the upper boundary surface of the next group.

If a surface has been assigned the refractive index for air, the gap to the next surface is recognized as an empty space. In this case, no group is created from the two surfaces.

Further information on the functions of the buttons can be found in *<GROUPS> view [▸ 228]*.

5.3.6 SURFACE ANALYSIS

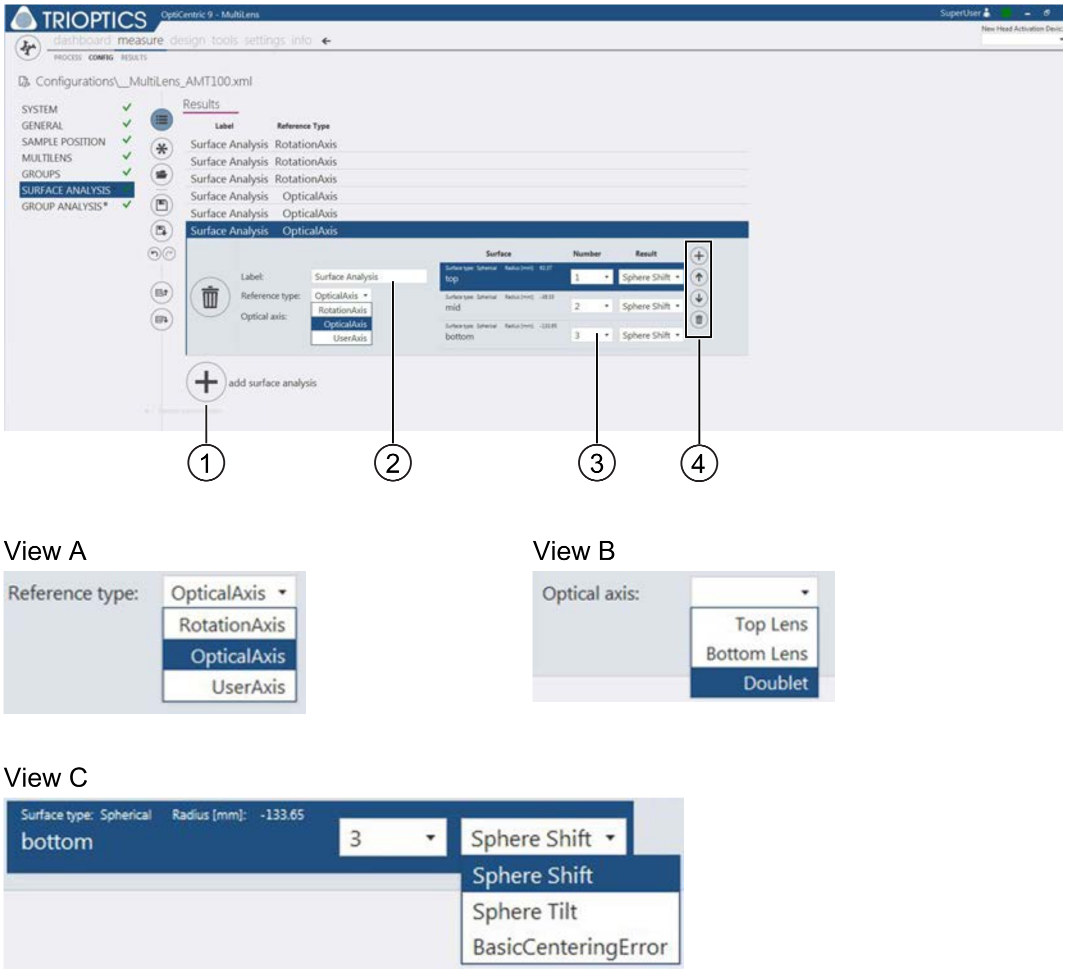
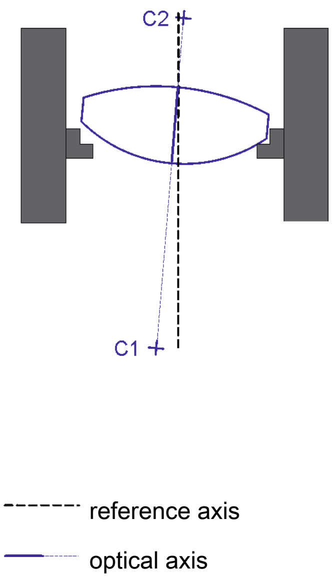


Fig. 61: Configure process: MULTILENS (surface analysis)



In this configuration step you define which individual surface errors of the entire optical system are measured against specific axes.

As a reference axis you can select a mechanical axis, an optical axis or the axis of rotation of the air bearing.

1. To add a surface analysis, click the icon `add surface analysis` **(1)**.
2. Enter a name for the analysis in the `Label` **(2)** field.
3. In the `Number` **(2)** field, select the surface for which you want to define an individual surface analysis.
   ⇨ Which surfaces are available depends on the optical design.
4. Enter the reference axis against which you wish to determine the deviation in the `Reference Type` field. You have the following options **(View A)**:
   ⇨ `OpticalAxis`: optical axis of a lens or lens group
   ⇨ `UserAxis`: mechanical axis (e.g. housing axis)
   ⇨ `RotationAxis`: Axis of rotation of the air bearing
5. If you selected the `OpticalAxis` option:
   In the `Optical axis` field, select the group whose optical axis you want to use as the reference **(View B)**.
6. In the `Result` field, select which individual surface error you want to identify for this surface **(View C)**. You have the following options:
   ⇨ `Sphere Shift`: [µm]

   The unit in which the results are displayed can be adjusted directly in the results. This setting applies globally to the whole software program. Make changes to this setting in the `settings` menu under `units`.
   ⇨ `Sphere Tilt`: [arcsec]

   The unit in which the results are displayed can be adjusted directly in the results. This setting applies globally to the whole software program. Make changes to this setting in the `settings` menu under `units`.
   ⇨ `BasicCenteringError`: Surface centration error
7. By default, all surfaces are added for this analysis. To add or remove individual surfaces or to change the order in the certificate, click on the corresponding icons **(4)** on the right in the small window.
8. Repeat these steps for the remaining surfaces.
9. To save your settings, click the `Save configuration` icon.

NOTE

Please note that a separate single surface analysis must be defined for each surface and each centration error type, if required.

5.3.7 GROUP ANALYSIS

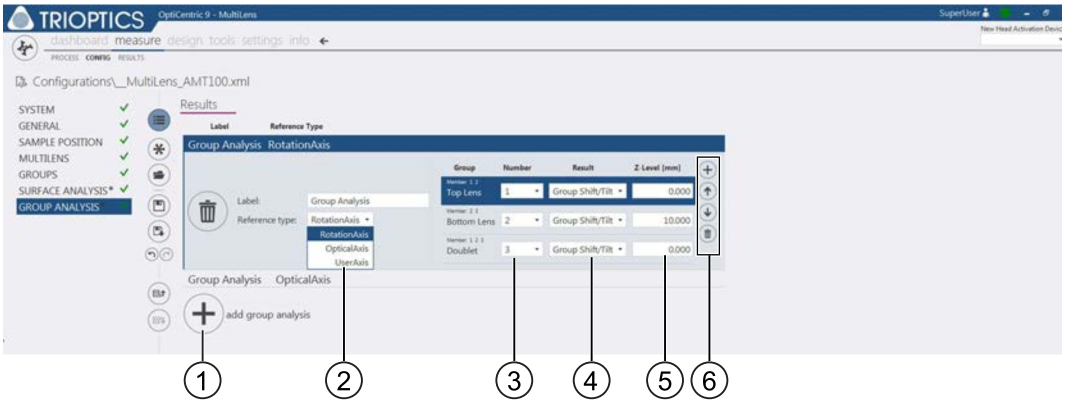
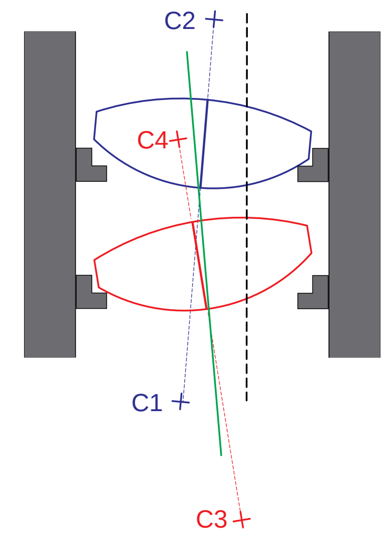


Fig. 62: Configure process: MULTILENS (group analysis)



Reference axis

Optical axis lens 1

Optical axis lens 2

Group axis

In this configuration step you define which centration errors of a lens or lens group are measured against specific axes.

As a reference axis you can select a mechanical axis, an optical axis or the axis of rotation of the air bearing.

1. To add a group analysis, click the (+) icon `add group analysis` **(1)**.
2. Enter a name for the analysis in the `Label` field.
3. Enter the reference axis against which you wish to determine the deviation in the `Reference Type` **(2)** field. You have the following options:
   - ⇨ `optical axis`: Axis of a lens or lens group
   - ⇨ `user axis`: mechanical axis (e.g. housing axis)
   - ⇨ `rotation axis`: Axis of rotation of the air bearing
4. If you selected the `OpticalAxis` option:
   In the `Optical axis` field, select which optical axis you want to use as the reference.
   - ⇨ The lenses or lens groups previously defined in the "Groups" configuration step are available.
5. In the `Number` **(3)** field, select the group for which you want to define a single-group analysis.
   - ⇨ The lenses or lens groups are available in the sequence defined previously in the Groups configuration step.

6. In the `Result` **(4)** field, select which centration error you want to identify for this lens or lens group. You have the following options:
   ⇨ `Group Shift/Tilt`: Shift and tilt of the lens or lens group to the reference axis.
7. By default, all groups are added for this analysis. To add or remove individual groups or to change the order in the certificate, click on the corresponding icons **(6)** on the right in the small window.
8. In the `Z-Level` **(5)** field, define at which Z-position the centration error is to be identified. By default, the vertex height of the first or uppermost surface of the group is entered here.
9. Repeat these steps for the remaining lenses or lens groups.
10. To save your settings, click the `Save configuration` icon.

Further information on the functions of the buttons can be found in *<GROUP ANALYSIS> view [▸ 232]*.

5.3.8 SEQUENCE

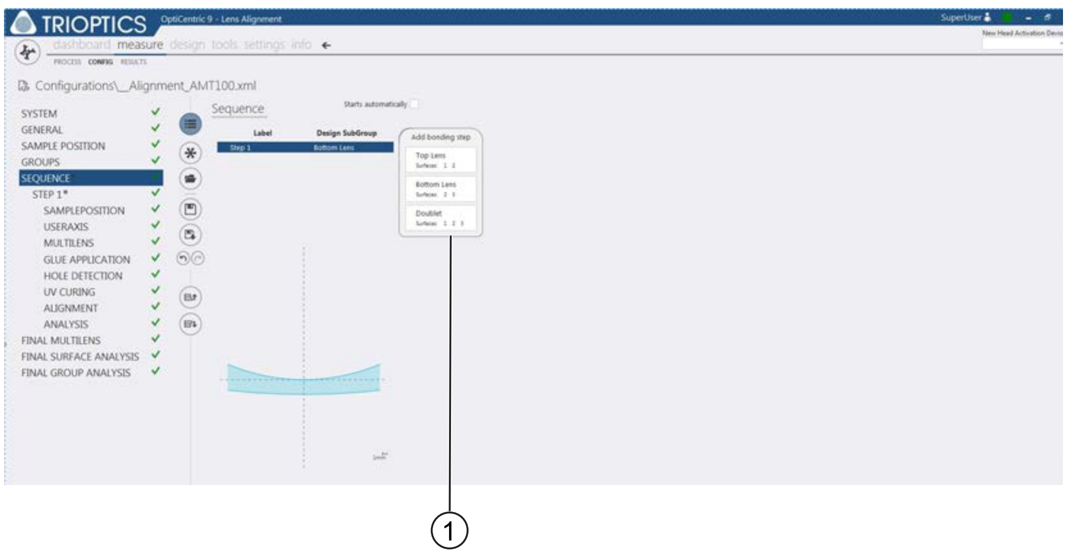


Fig. 63: Configure process: LENS ALIGNMENT (sequence)

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step, you specify the number of steps required to set up the optical system.

1. Click on ⊕ `Add bonding step` to create a new step.

NOTE

The next step is to select the group that is currently on the table.

Example: If group 2 is to be aligned to group 1, then group 3, consisting of group 1 and 2, must be selected here.

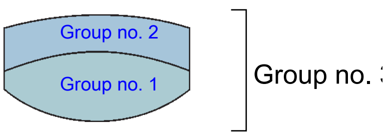


Fig. 64: Create steps: by lens groups

2. From the list **(1)**, select the group you wish to align in this step.

   ⇨ The lenses or lens groups previously defined in the "Groups" configuration step are available. (Please refer to *GROUPS [▸ 77]* for information on how to define a group.)

3. Repeat these steps for the number of steps required.

4. Click `Save configuration` to save your settings.

5.3.9 STEP (options)

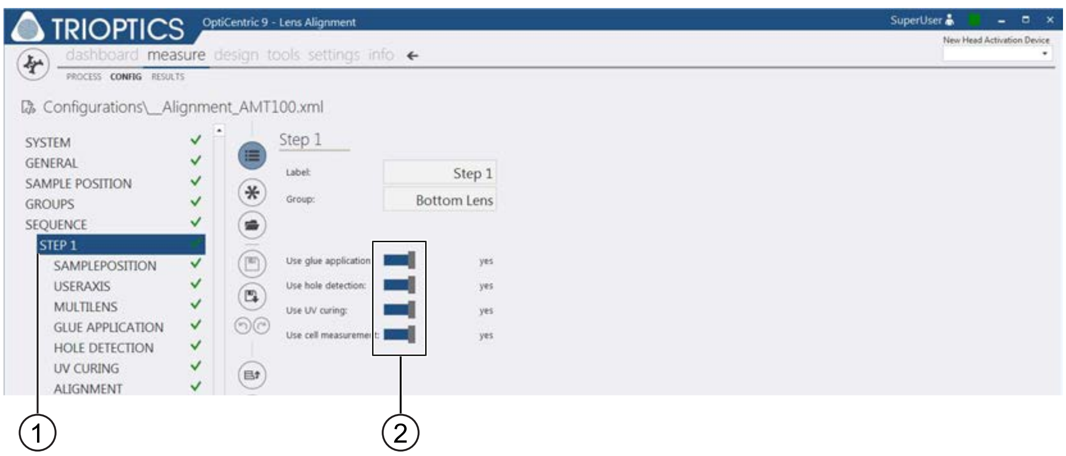


Fig. 65: Configure process: LENS ALIGNMENT (STEP)

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step you define for every step which system options can be applied to the step.

1. Click on the step **(1)** for which you wish to configure the system options.
2. Move the slider **(2)** to the left to exclude the corresponding option.
   or:
   Move the slider to the right to apply the corresponding option.
3. Click `Save configuration` to save your settings.

The table below shows an overview of the available options:

Option	Description
`Glue application`	Use of the automatic glue dosing option Select this option if you want to bond the lens to the mount.
`Hole detection`	Use of the hole detection option Select this option if you wish to align the lens or mount with three actuators through holes in the mount prior to bonding.
`UV curing`	Use of the automatic UV irradiation option Select this option when using UV-curing adhesive.
`Final cell measurement`	Final cell measurement Select this option if you wish to measure the mount (mechanical axis) again after bonding.
`Final lens measurement`	Final lens measurement Select this option if you wish to carry out a final measurement of the lens after bonding.

5.3.10 SAMPLEPOSITION

In this step you determine the zero position of the measuring head for the current step by focusing on the uppermost lens surface of the current lens group using the head lens. To do this, follow the steps as described in *REFERENCE (SAMPLE POSITION) [▸ 63]*.

5.3.11 USERAXIS

In this configuration step you determine the shift errors with regard to shift and tilt of the lens mount against the rotation axis of the air bearing. The system then calculates the position of the mechanical reference axis from this information.

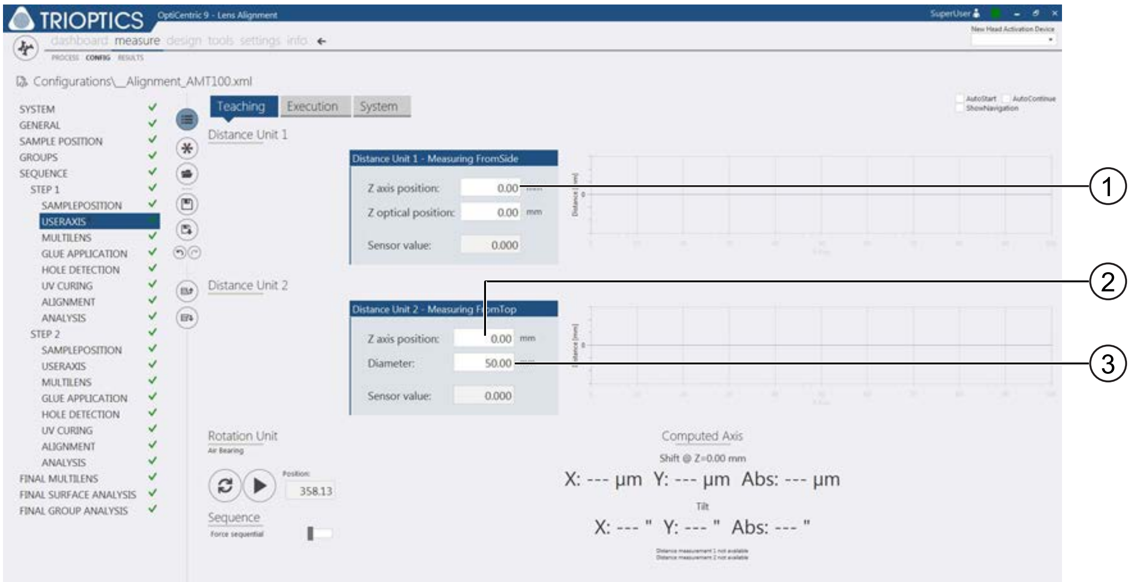


Fig. 66: Configure process: LENS ALIGNMENT (USERAXIS)

In order to determine the position of the mechanical reference axis, two distance sensors are needed, which can be used in different variants:

- Tesa distance sensor (contact sensor) for mechanical distance measurement
- Chromatic confocal distance sensor for non-contact distance measurement

The assignment is carried out in the SYSTEM configuration step.

NOTE

The sensors must be defined and configured in the settings as "1D Sensor" beforehand and this in turn defined and configured as "Distance Unit" (see *HARDWARE <DISTANCE UNIT> view [▸ 165]*).

Distance sensor 1

This distance sensor measures the case during one rotation of the air bearing and records the horizontal "run-out" to the axis of rotation of the air bearing.

This corresponds to the shift of the enclosure relative to the axis of rotation of the air bearing.

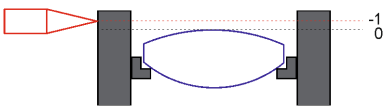


Fig. 67: Configure process: LENS ALIGNMENT (Useraxis)

1. Enter the position of the distance sensor 1 in the `Z optical position` **(1)** field.

   ⇨ This indicates the measuring position of the sensor. It does not necessarily have to correspond to the Z-position of the vertical positioning device (on which the sensor is located).
   Negative values mean that the measuring point is above the top lens surface.

2. Click `write sensor position to configuration` to apply the determined position of the distance sensor 1 to the configuration.

Distance sensor 2

This distance sensor measures the distance to the upper plane surface of the enclosure during one rotation of the air bearing and records the vertical "run-out" to the axis of rotation of the air bearing.

This corresponds to the tilt of the enclosure relative to the axis of rotation of the air bearing.

1. Enter the position of the distance sensor 2 in the `Z optical position` **(2)** field.

2. Enter the radial position of the distance sensor 2 in the `Diameter` **(3)** field.

3. Click `write sensor position to configuration` to apply the determined position of the distance sensor 2 to the configuration.

The system then calculates the position of the mechanical reference axis from the measured values of the two sensors.

NOTE

Distance sensor 2 can also be operated as a second shift sensor (as described under "Distance sensor 1"). In this case, the horizontal shift of the cylinder surface is measured at two different Z positions. The system can calculate the position of the mechanical reference axis from these values.

5.3.12 MULTILENS (Step)

In this configuration step you determine the location of the image position of the individual optical surfaces along the Z-axis for the current step. This ensures that each optical surface is approached and measured correctly.

This information will later be required for the alignment bonding process.

To define the parameters, proceed as described in *MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS [▶ 66]*.

5.3.13 GLUE APPLICATION

Fig. 68: Configure process: LENS ALIGNMENT (Glue application)

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step you define the conditions for applying the glue.

The following parameters must be defined:

- Number of glue applications in one rotation of the air bearing
- The percentage ratio between glue application and gap for each application of glue.

The system then calculates the width of a glue dot and the size of the gap between two glue dots from this information.

This information is displayed at the bottom of the screen in a value table **(4)** and as a graphic **(7)**. You can manually overwrite the values in the table. The changes are applied to the graphical view.

Glue application can be defined both manually and automatically.

Define glue application manually

1. Click ⊕ `add step` **(5)** to add a glue application operation.
   ⇨ A row for this glue application is created in the value table.
2. In the `Glue span [deg]` field, enter the angle around which the air bearing rotates during the glue application.
3. In the `Gap span [deg]` field, enter the angle around which the air bearing is to rotate without glue being applied.
4. Repeat these steps for the desired number of glue applications.
   ⇨ Changes are transferred directly to the graphical view.
   ⇨ In this way, you can define the individual glue applications independently of each other.

Define glue application automatically

Click `auto step mode` **(6)** to open the menu for setting the glue parameters **(View A)**.

1. Click on the `Glue application steps` **(8)** slide bar to define the number of glue applications distributed along the circumference of the lens.
   or:
   Enter the number of adhesive applications in the input field **(10)**.
   - ⇨ A value table with one row per glue application is created.
   - ⇨ Click on the right of the slide bar to increase the number of glue applications by 1.
   - ⇨ Click on the left of the slide bar to reduce the number of glue applications by 1.
2. Click on the `Gap ration` **(4)** slide bar to define the ratio between glue point and gap span for a glue application.
   or:
   Enter the ratio directly into the input field **(11)**.
   - ⇨ Click on the right of the slide bar to increase the percentage of the gap width.
   - ⇨ Click on the left of the slide bar to reduce the percentage of the gap width.
3. If necessary, you can adjust the values in the table manually.

Setting the Z-position and rotation speed of the glue dosing device

NOTE

The following steps are only required when the glue dispenser is on a positioning axis and glue positioning is automated.

1. Move the positioning axis of the glue dosing device to the desired position using the axis controller **(1)**. (The function of the buttons is described in *General control of the axes [▸ 213]*).
   or:
   In the `Z-axis position`**(2)** dialog field, enter the Z-position to which the positioning axis must be moved to apply the glue.
2. In the `Rotation velocity` **(3)** dialog field, enter the percentage of the maximum air bearing speed at which the glue application is to be carried out.
3. Click on `write dispensing unit values to configuration` to apply the glue dispenser settings to the configuration.

NOTE

You can test the settings for glue dispensing on the `Execution` tab. No glue is applied. Only the positioning is tested.

5.3.14 HOLE DETECTION

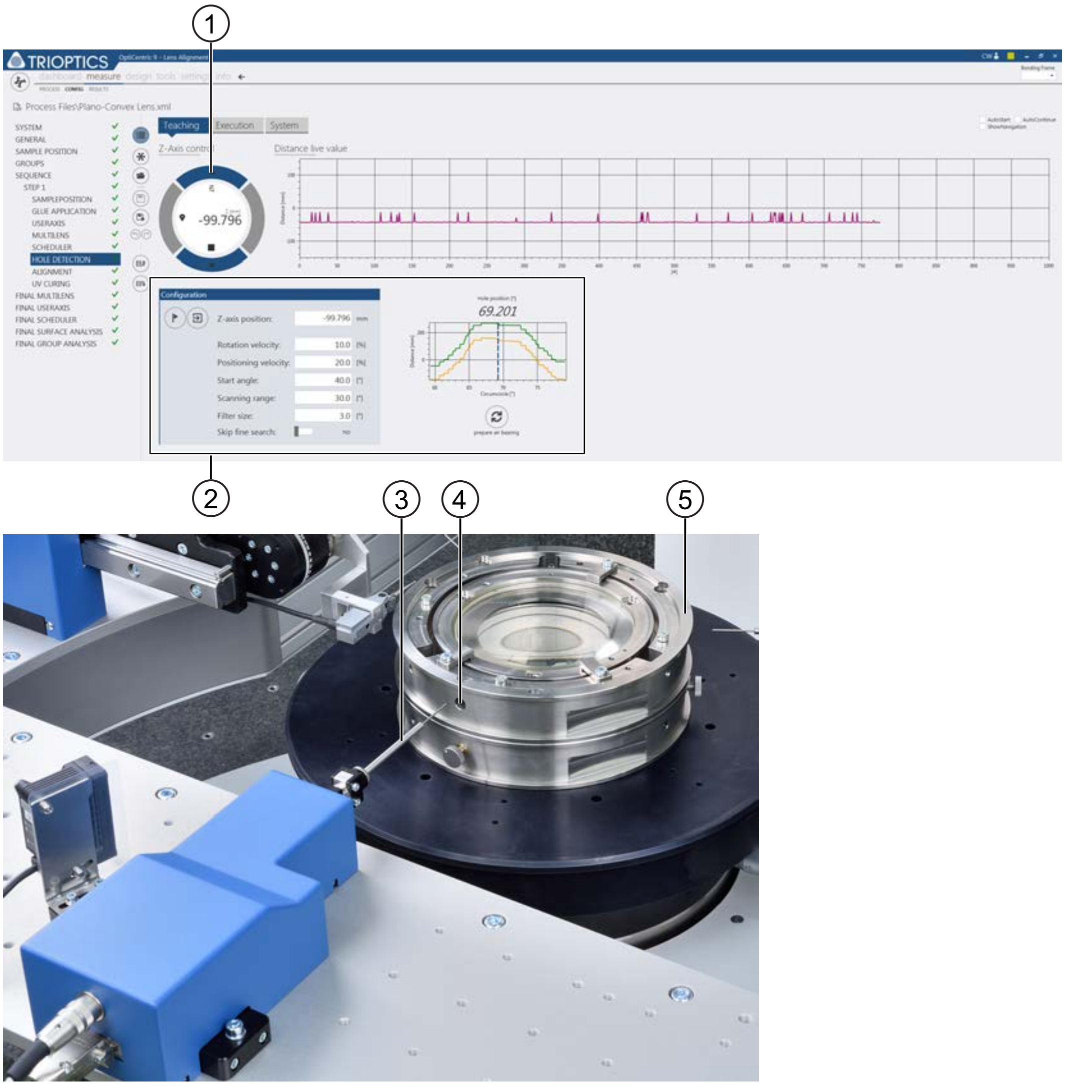


Fig. 69: Configure process: LENS ALIGNMENT (Hole Detection)

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step you reference the position of the mount drill holes relative to the axis of rotation of the air bearing and the Z-position of the alignment unit for the alignment bonding process.

A distance sensor measures the distance to the external lateral surface of the lens mount during the rotation of the air bearing.

At the position of the drill hole the sensor detects a changed signal.

1. Rotate the air bearing until the mount **(5)** with the hole **(4)** is positioned directly next to the actuator **(3)**.
2. Move the positioning axis of the alignment unit using the axis controller **(1)** so that the actuators are exactly in the plane of the holes.
   - ⇨ The actuator must point directly at the center of the drill hole.
   - ⇨ The position of the hole detection sensor is displayed in the `Z-axis position` field.
   - ⇨ The position of the air bearing is displayed in the `Start angle` field.
3. If necessary, enter the following values in the corresponding fields **(2)**:
   - ⇨ `Rotation velocity`: Rotational speed as percentage of the maximum rotational speed of the air bearing.
   - ⇨ `Positioning velocity`: Travel speed of the positioning axis on which the alignment unit is located. Indicated as a percentage of the maximum travel speed.
   - ⇨ `Scanning range`: To ensure that a hole is detected, the air bearing performs a rotation within this range.
   - ⇨ `Filter size`: Area in which the hole is expected to be drilled
   - ⇨ `Skip fine search`: A fine search is performed after the hole is detected. Activate the `Skip fine search` option to skip the fine search.

1. Click on `write hole detector values to configuration` to apply these positions to the configuration.

Test settings

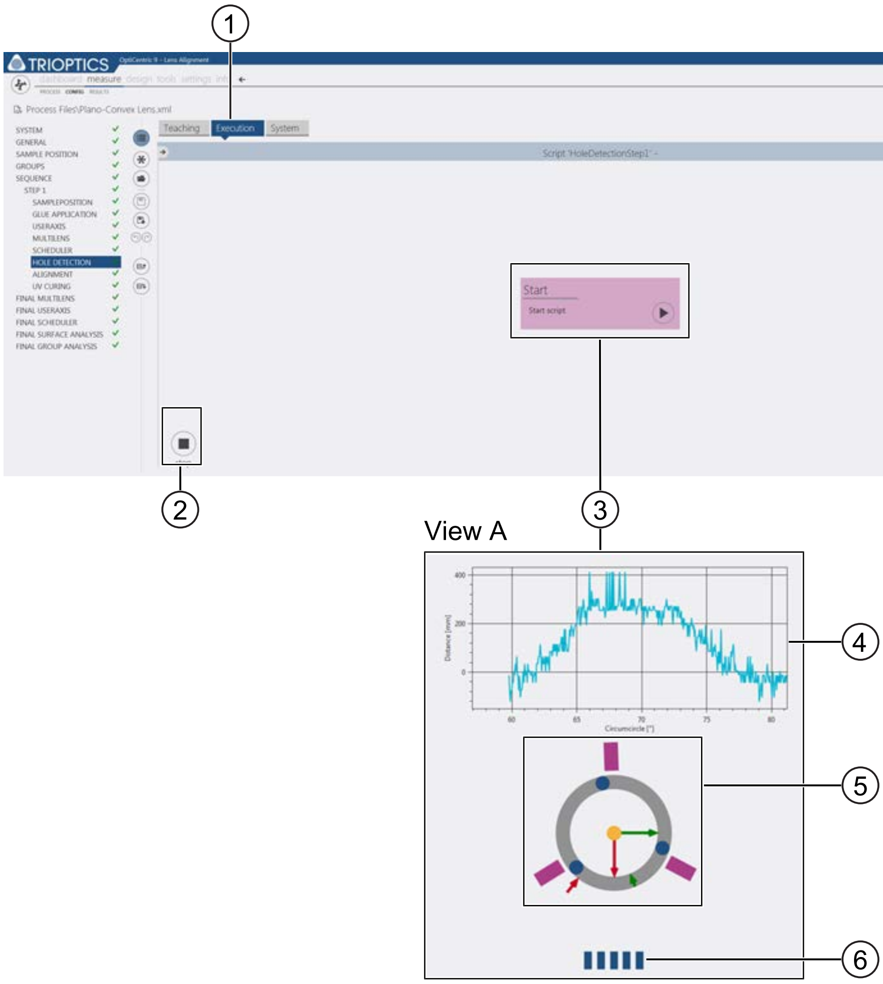


Fig. 70: Configure process: LENS ALIGNMENT (Hole detection, Execution)

1. If necessary, click `Find center` to return the air bearing to its starting position.
2. Select the `Execution` **(1)** tab.
3. Click ▶ `Start script` **(2)** to test your settings.

NOTE

In configuration mode, the air bearing rotates until the first drill hole is detected and then returns to the original position. During the lens alignment process, the air bearing remains in the detected position.

5.3.15 ALIGNMENT

In this configuration step, you define for each step the reference axis to which the current lens group is to be aligned and how large the tolerance can be.

You also define the conditions for the actuators.

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

Define general parameters

NOTE

Depending on the hardware configuration, the view in the `Lens Aligner Settings` **(2)** area may look different (see *General control of the axes [▸ 213]*).

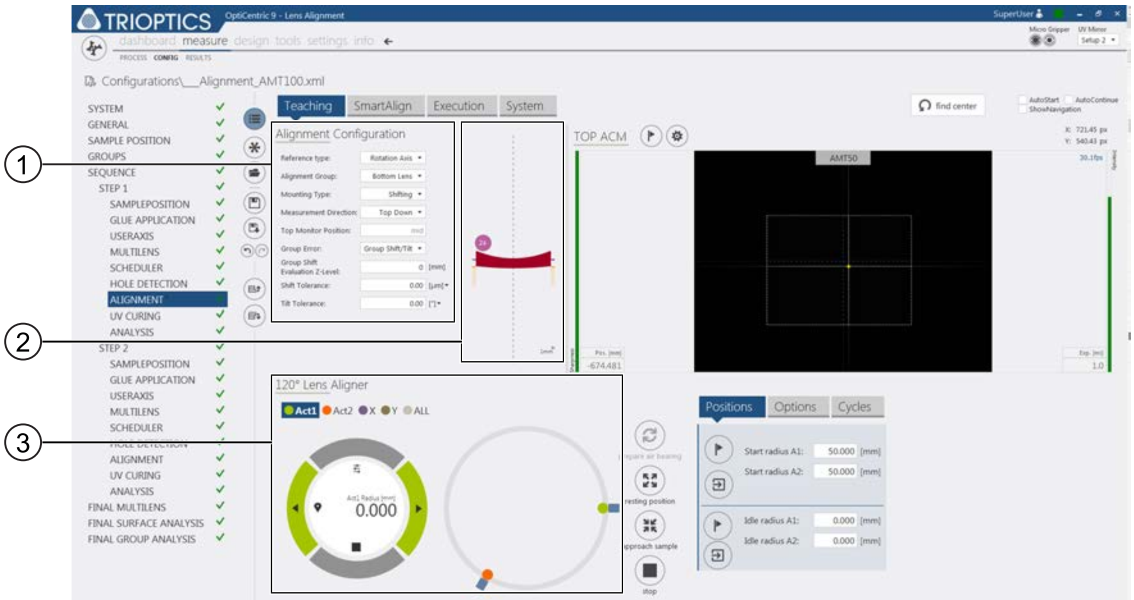


Fig. 71: Configure process: ALIGNMENT

1. In the `Alignment Configuration` **(1)** area, define the general parameters for alignment in this step.
2. Click `Save configuration` to save your settings.

Parameters	Description
`Reference type`	Reference axis Type of reference axis to which the current group is to be aligned. Options: RotationAxis (rotation axis of the air bearing) OpticalAxis (optical axis) UserAxis (mechanical reference axis)
`Reference Group`	Reference group If the optical axis was selected as the reference type, you must define here which optical axis is to be used as the reference.
`Alignment Group`	Group to be aligned Specify the group to be aligned in this step. **Important!** **By definition, the software assumes that ALL OTHER groups and surfaces are fixed, i.e. they are not moved at any time during the measurement and alignment process! Otherwise the result will be wrong!**

`Mounting Type`	Mandatory condition
	Specify how the lens TO BE ALIGNED is mounted. Depending on the geometry of the lens or lower lens surface, the lens can only be moved or tilted. You can choose between the following options:
	`Shifting`
	`Tilting`
	It is assumed that, due to gravity, the lens always rests on the lower surface of the group to be aligned.
	If only the upper lens surface is to be aligned (Alignment Group: "Surface 1 - top"), the position of the tilt pivot point must also be specified for "Tilting". Usually this is the position of the center of curvature of the second lens surface. This position is automatically calculated and suggested.
	Note:
	If you are using a 4D, 5D or 6D aligner (depending on the device configuration), the lens does not rest on its lower surface, but is held on the manipulator (hexapod or grabber). In this case the lens can be shifted AND tilted. Then the only option available is "`Mounted on Manipulator`"

`Measurement Direction`	Measurement direction Specify which autocollimator is to be used for measurement during alignment. Usually this is the upper autocollimator. In exceptional cases, with Bonding 5D, the option "`both`" can be selected. In this case, it is also possible to measure with the lower autocollimator during alignment.
`Top Monitor Position`	Position of the upper measuring head
`Group Error`	Centration error of the group

Parameters	Description
`Group Shift Evaluation Z-Level`	Z-position at which the shift for the group is to be calculated.
`Shift Tolerance`	Permissible tolerance for the shift
`Tilt Tolerance`	Permissible tolerance for the tilt

NOTE

If only the upper lens surface has been selected as the group to be aligned, then for "`Surface Error`" you must select whether the surface error is to be specified as an angle or as a distance. The error can then be called "`Shift Tolerance`" or "`Tilt Tolerance`".

Setting the safe radius for the actuators

> **NOTE**
>
> This view and the number of actuators available may differ depending on the configuration of the measurement system.

Fig. 72: Configure process: LENS ALIGNMENT (Alignment, safe radius)

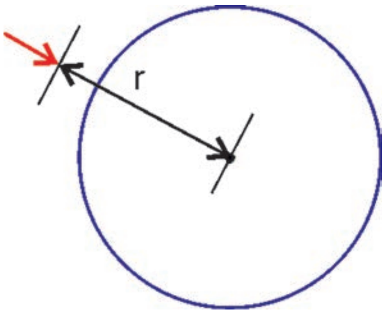


Fig. 73: Schematic diagram: Safe radius

The safe radius is the position at which the actuators can move in the Z-direction and at which the air bearing can make one revolution without a collision between the actuators and the sample.

1. In the axis controller are **(1)**, select the actuator whose settings you want to change.
2. Enter a safe radius for the selected actuator in the `Idle radius` **(4)** input fields. Select a radius with a safe distance to the sample:
   ⇨ The air bearing must be able to perform a full rotation without the actuators and sample colliding.
   ⇨ The actuators should be able to move in the Z-direction without the actuators and sample colliding.

NOTE

The value for the safe radius refers to the distance of the rotation axis.

A larger value means a safe distance to the sample.

3. Repeat these steps for the remaining actuators.
4. Click on `write lens aligner idle position to configuration` **(3)** to apply these positions to the configuration.

Or:

1. Move all actuators (individually or together) to a safe position. Observe the criteria for a safe radius (see above).
2. Click on `write lens aligner idle position to configuration` **(3)** to apply these positions to the configuration.

Setting the Z-position for the actuators

CAUTION

Risk of material damage

While the air bearing is rotating or when moving the positioning axis, there is a risk of collision between the actuators and the sample.

– Only move the Z-axis if the actuators are in a safe position.
– Only switch to a different window or process when the actuators are in a safe position. (Resting Position)

1. Move the Z-axis using the axis controller so that the actuators are exactly in the plane of the holes (see *General control of the axes [▸ 213]*).
   ⇨ The current Z-position is displayed.
2. Rotate the air bearing until the mount with the hole is positioned directly next to the actuator.

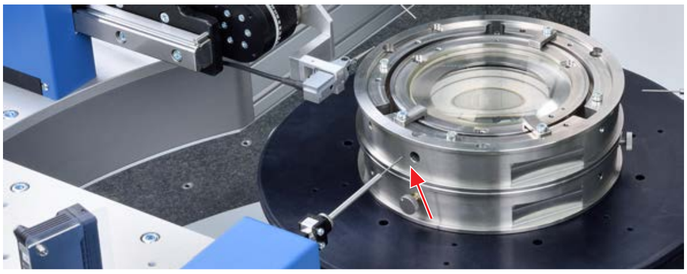


Fig. 74: Lens Alignment: Define safe radius (idle radius)

3. If necessary, correct the Z-position of the actuators.
4. Click `Save configuration` to save your settings.

Setting the starting position for the actuators

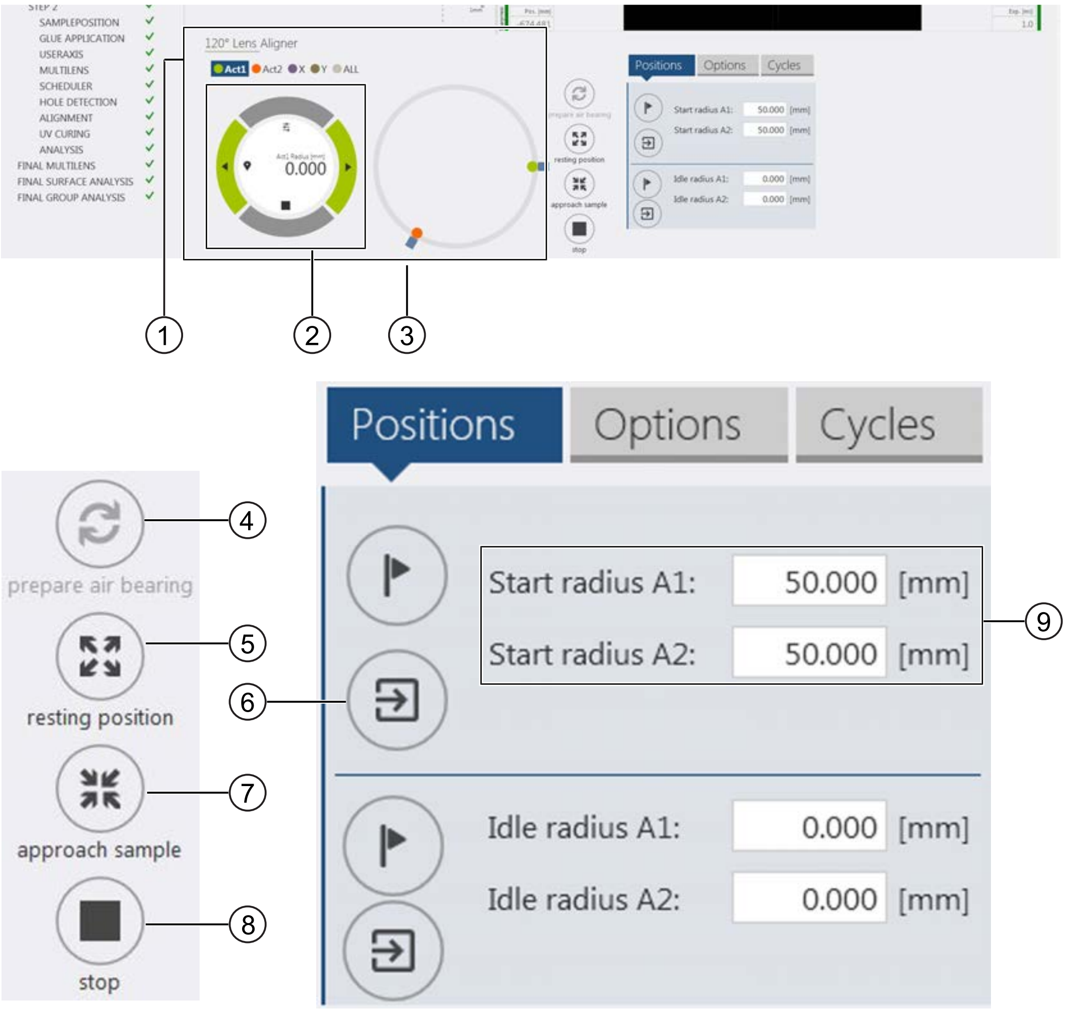


Fig. 75: Configure process: LENS ALIGNMENT (Alignment, Starting position)

CAUTION

Risk of material damage

There is a danger of collision between the actuators and the sample.

– Make sure that the top autocollimator presents the center of curvature of the top lens surface of the sample and that the reticle is clearly visible.

1. Click `prepare air bearing` **(4)** to position the air bearing so that the actuators point directly to the mount holes.

NOTE

This button is only active if the `Hole detection` configuration step was carried out before.

2. In the `Lens Aligner Settings` **(3)** area, select the actuator whose position you wish to change **(1)**.
3. Move the actuator close to the lens using the axis controller **(2)**. (The functions of the axis controller are described in *General control of the axes [▸ 213]*).
   ⇨ Make sure that the actuator can approach the sample without colliding.
4. Repeat these steps for the remaining actuators.

CAUTION

Risk of material damage

The actuators move until the center of curvature of the surface to be aligned moves into the camera window of the upper camera (green cross).

– Before the next step, make sure that the TOP camera is looking into the TOP center of curvature of the lens/surface to be aligned.

– Be very careful!

5. Click `approach each actuator slowly to sample` **(7)**.
   ⇨ One by one, all actuators automatically approach the sample.
   ⇨ The current positions of the actuators are displayed in the `Start radius` fields **(9)**.
6. Click `stop all movements` **(8)** to stop the movement of all actuators in case of emergency.

CAUTION

Risk of material damage

If operated incorrectly (danger of confusing the buttons) there is danger of collision between the actuators and the sample.

– Make sure to use the `write lens aligner start position to configuration` button **(6)** for the following step.
– Be very careful!

7. Click `write lens aligner start position to configuration` **(6)** to apply this position to the configuration.
8. Click `move all actuators to resting position` **(5)** to bring the actuators into a safe position.
   ⇨ It is also sufficient to move the actuators to the "`Idle Position`". In this case, do not exit the software window.
9. Click `Save configuration` to save your settings.

Additional conditions for alignment (Options tab)

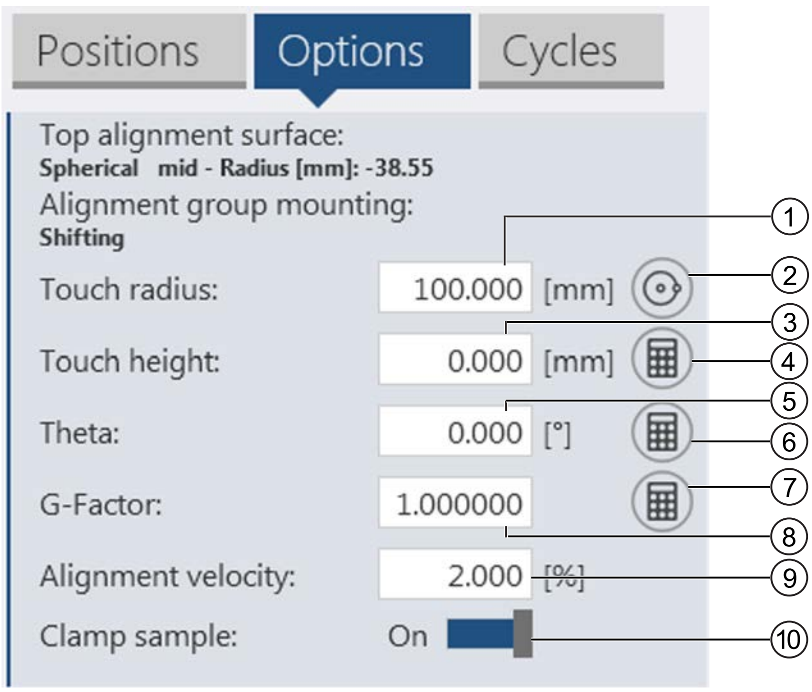
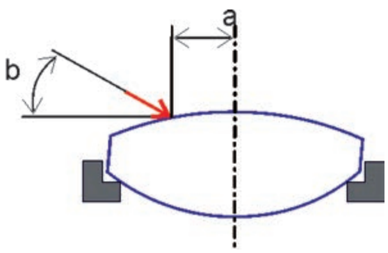


Fig. 76: Configure process: LENS ALIGNMENT (ALIGNMENT, Options)



Dimension a = Touch radius

Dimension b = Angle of attac

Fig. 77: Schematic diagram: Touch radius and setting angle

`Touch radius`:

The value corresponds to the radius at which the actuators touch the sample. (Dimension a)

NOTE

The value for the touch radius refers to the distance of the rotation axis.

A larger value means that the actuators touch the sample further away from the rotation axis.

– Enter this radius in the `Touch radius` field.

`Touch height`

– In this field, enter the height in optical coordinates at which the actuators touch the sample.

This value is required for the calculation of the G-factor.

You can determine the optimum height using the `compute touch height` function **(4)**. If necessary, you can overwrite the calculated value in the input field **(3)** manually.

The value applies for all actuators.

`Theta`:

To achieve a greater impact when correcting tilt errors, the actuators can approach the sample at an angle. (Dimension b).

1. Click `compute optimal theta` **(3)** to determine the optimal angle of attack.
2. Enter the setting angle in the `Theta` field.

⇨ The value applies for all actuators.

`Geometry factor (G-factor)`:

The geometry factor depends on the lens design and the actuator geometry. It indicates the ratio between the distance an actuator has covered and the actual movement of the center of curvature.

This means that in order to move a center of curvature by a distance ΔCenter, the actuator must be moved by a distance ΔPiezo.

1. Click `compute g-factor` **(4)** to determine the geometry factor.

2. Enter the determined geometry factor in the `G-Factor` field **(5)**.
   ⇨ In order to enable slower and more controllable alignment movements – especially when setting up a new sample – it is advisable to initially select a slightly smaller G-factor than suggested (e.g. factor 5 to 10 smaller). In this case, more iterations are needed to reach the target.

NOTE

A smaller G value means a small actuator travel distance.

NOTE

The geometry factor must always be entered with the correct preceding sign.

`Alignment velocity`:

Here you set the speed at which the actuators are moved during the alignment.

– Enter the value in percent of the maximum actuator speed.

`Clamp sample`:

You have two options to align a sample:

Clamp sample activated

In this mode all actuators approach the sample at the same time and clamp the sample. The sample is then aligned by moving all actuators simultaneously.

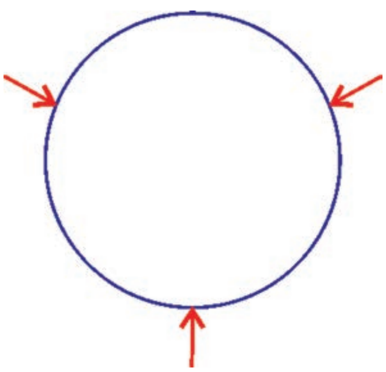


Fig. 78: Schematic diagram: Clamp sample activated

NOTE

The sample may slip again due to stresses in the actuator needles when the actuators are retracted.

– Only use this option if you are using stable (thick) needles.
– Only use this option if one of the actuators has a preloaded spring.

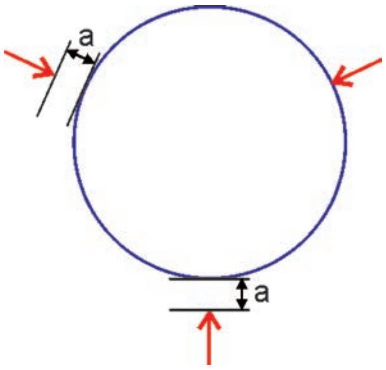


Fig. 79: Schematic diagram: Clamp sample deactivated

Clamp sample deactivated

In this mode the actuators approach the sample individually, one after the other. The actuators that are not used are in a waiting position, while the currently active actuator moves the lens.

When this mode is active you have to define a distance by which the actuators move away from the start radius (`Actuator backlash`).

NOTE

This option is not suitable for alignment cementing.

`Actuator backlash`

This field is only active when the `Clamp sample` option is deactivated.

In this case you have to define a distance from the start radius (dimension a). The actuators move away from the start radius by this value.

NOTE

The value applies for all actuators.

We recommend selecting a value of > 0.1 mm for Backlash.

– Click `Save configuration` to save your settings.

Additional conditions for alignment (Cycles tab)

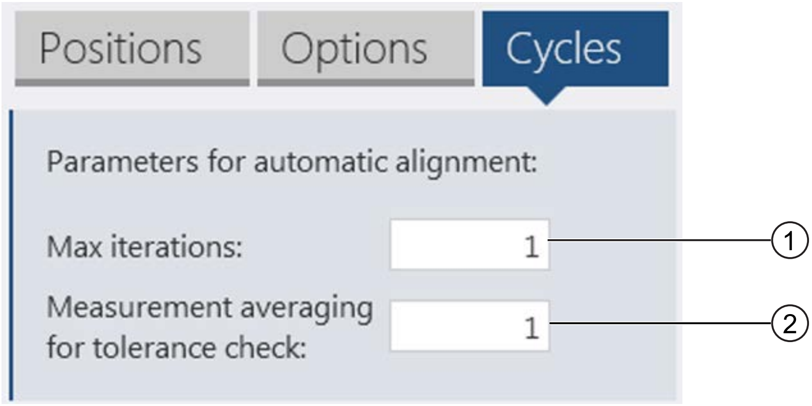


Fig. 80: Configure process: LENS ALIGNMENT (ALIGNMENT, Cycles)

The conditions for automatic alignment are defined here.

`Max iterations`

Enter the maximum number of iterations here.

`Measurement averaging for tolerance check`

Enter the number of measured values from which the mean is to be calculated in order to check compliance with tolerances.

5.3.16 UV CURING

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step you define the conditions for the curing process when using UV-curing adhesive.

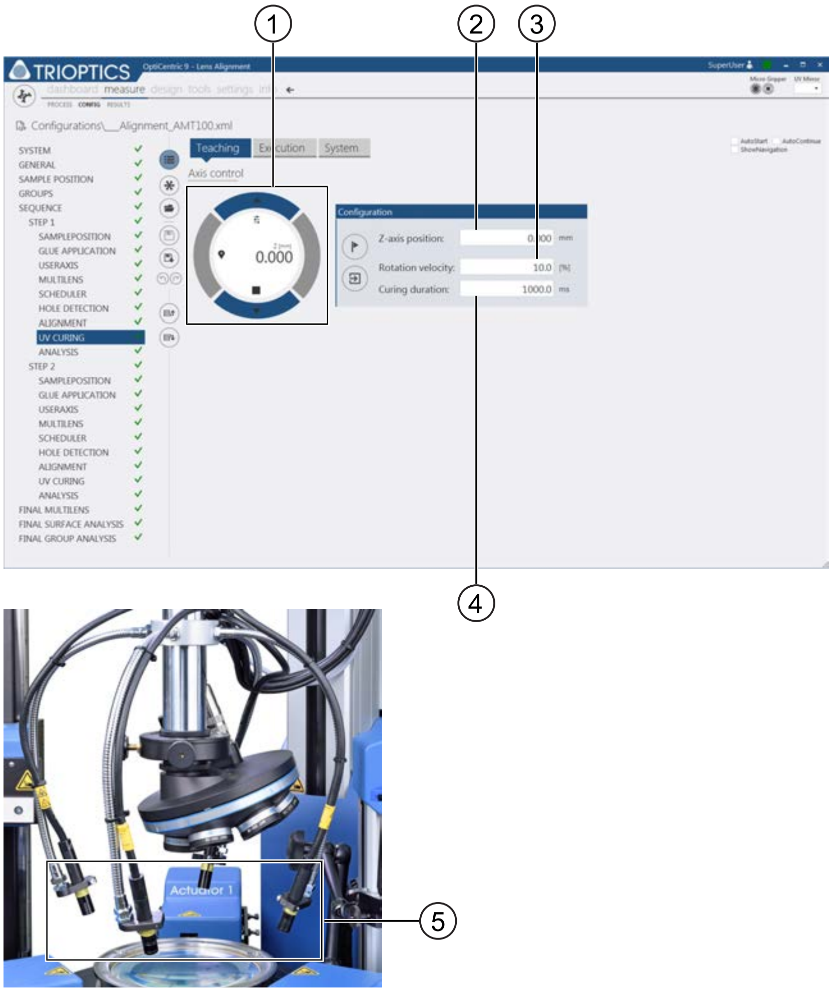


Fig. 81: Configure process: LENS ALIGNMENT (UV Curing)

NOTE

The figure shows an exemplary configuration of a measurement system. Depending on the configuration of the measurement system the actual arrangement of the UV lighting unit may vary.

1. If necessary, move the positioning axis, on which the UV lamps are located, with the help of the axis controller **(1)** until the sample is suitably illuminated with UV light.
   ⇨ The `Z-Axis` input field **(2)** displays the current Z-position of the bonding frame.
2. If necessary, you can manually adjust the UV lamps **(5)** to the gap between the lens and mount such that they have a defined distance.
3. In the `Rotation velocity` dialog field **(3)**, define the speed as a percentage of the maximum rotational speed of the air bearing.
4. In the `Curing duration` dialog box **(4)**, enter the time span for how long the illumination with UV light should last.

WARNING

Risk of injury

Improper use of (in)visible UV radiation poses a risk to the health of the user or third parties.

– Avoid radiation to the eyes or skin due to scattered radiation.

5. Click `write curing unit values to configuration` to apply these settings to the configuration.
6. Click `Save configuration` to save your settings.

5.3.17 ANALYSIS (Step)

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step, you define how the lens of a step is finally measured (after alignment and gluing).

NOTE

Only the centration errors of the lens and/or group of lenses to be aligned in a step are measured here.

The results will be incorporated into the final analysis of the multi-lens optical system.

– To define the parameters, proceed as described in *SURFACE ANALYSIS [▸ 79]* and *GROUP ANALYSIS [▸ 81]*.

5.3.18 FINAL MULTILENS

In this configuration step you finally (after completing all steps) determine the location of the image positions of the individual optical surfaces of the whole optical system along the Z-axis.

– To define the parameters, proceed as described in *MULTILENS / MULTILENS [Sub-step] / FINAL MULTI-LENS [▸ 66]*.

5.3.19 FINAL SURFACE ANALYSIS

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step you define which surface single errors of the entire optical system are measured against specific axes at the end of the alignment and bonding process.

– To define the parameters, proceed as described in *SURFACE ANALYSIS [▸ 79]*.

5.3.20 FINAL GROUP ANALYSIS

NOTE

This description only applies to the configuration of a lens alignment (LA) process.

In this configuration step you define which centration errors of a lens or lens group of the entire optical system are measured against specific axes at the end of the alignment and bonding process.

– To define the parameters, proceed as described in *GROUP ANALYSIS [▸ 81]*.

5.3.21 CENTRATION

In this configuration step you define the parameters for a centration error measurement. A distinction must be made between whether the measurement is to be carried out in reflection mode or in transmission mode.

You can repeat a measurement several times to compensate for random errors during a single measurement. The result is then calculated as a mean value from the individual measurements.

A centration error measurement in reflection provides the following results:

- Centration errors of a spherical lens surface
- Wobble of a plane surface

A centration error measurement in transmission provides the following results:

- Overall centration error of a multi-lens optical system (centration error of the focus)
- Wedge angle of a wedge

– Select <measure> <CONFIG> <CENTRATION>
The following view opens:

Fig. 82: Configure process: CENTRATION

Configure centration error measurement of a spherical lens surface

1. Select the Reflection button.
   The following view opens:

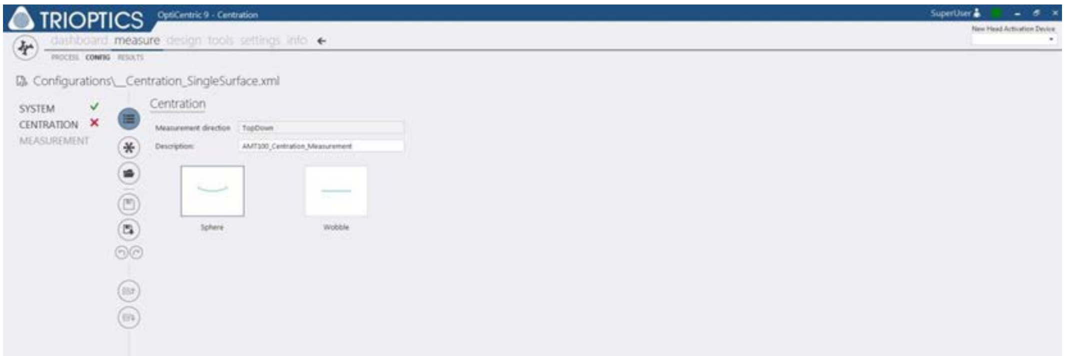


Fig. 83: Centration error measurement in reflection

2. Select the `Sphere` button to configure a centration error measurement of a spherical lens surface.

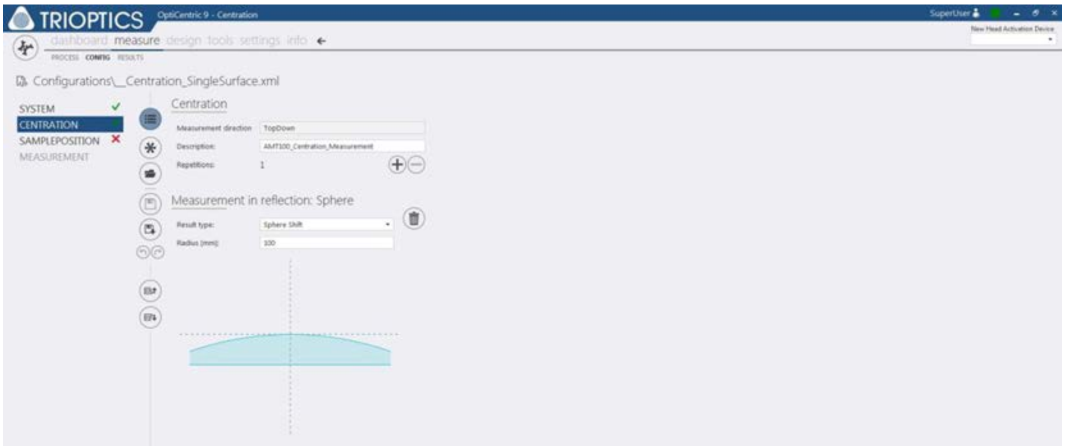


Fig. 84: Configure centration error measurement in reflection: spherical lens surface

3. Select the measurement direction in the `Measurement direction` field.
4. Enter a description for this measurement in the `Description` field.
5. Set the number of repetitions in the `Repetitions` field. Use the `increase repetitions` or `decrease repetitions` buttons.

6. In the `Result type` field, select the desired result type:
   - ⇨ `Sphere Shift`: Offset
   - ⇨ `Sphere Tilt`: Tilt
7. In the `Radius` field, enter the radius of curvature of the upper lens surface.
8. Click `Save configuration` to save your settings.

Configure the wobble measurement of a plane surface

1. Select the Reflection button.
   The following view opens:

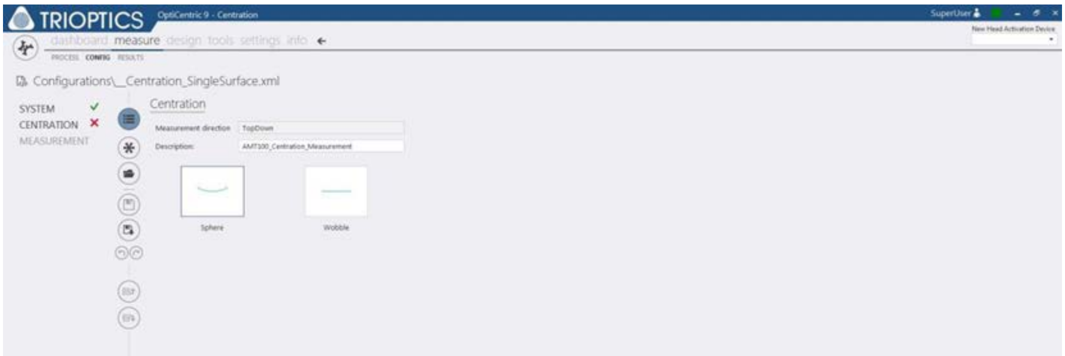


Fig. 85: Centration error measurement in reflection

2. Select the `Wobble` button to configure a wobble measurement of a plane surface.

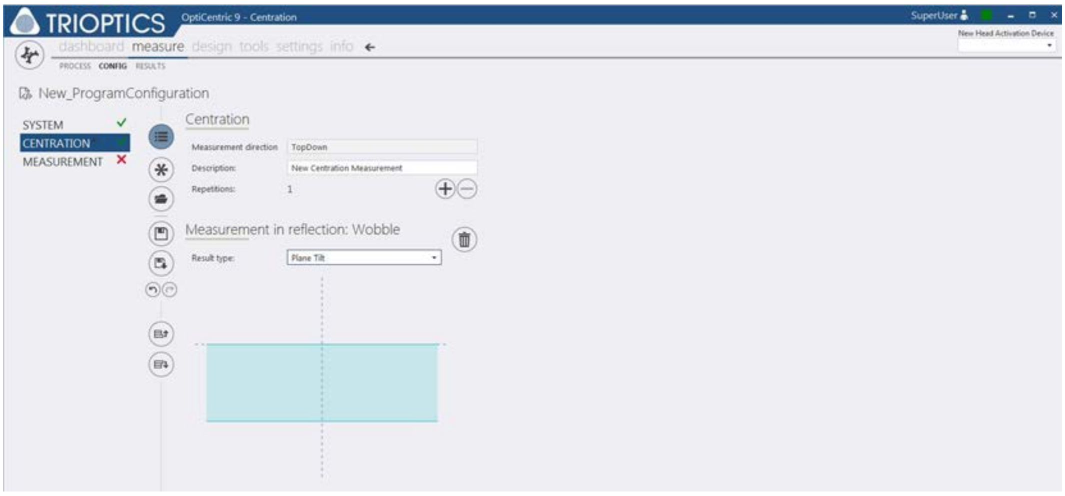


Fig. 86: Configure centration error measurement in reflection: Wobble measurement of a plane surface

3. Select the measurement direction in the `Measurement direction` field.
4. Enter a description for this measurement in the `Description` field.
5. Set the number of repetitions in the `Repetitions` field. Use the `increase repetitions` or `decrease repetitions` buttons.
6. Set the desired result type in the `Result type` field.
   ⇨ `Plane Tilt`: Tilt of the plane surface
7. Click `Save configuration` to save your settings.

Configure centration error measurement of an optical system in transmission:

1. Select the `Transmission` button.
   The following view opens:

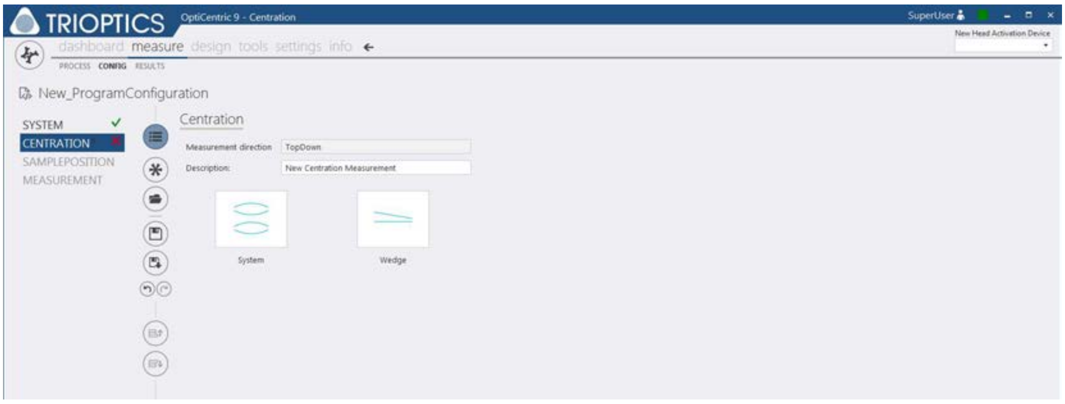


Fig. 87: Centration error measurement in transmission

2. Select the `System` button to configure a centration error measurement of an optical system.

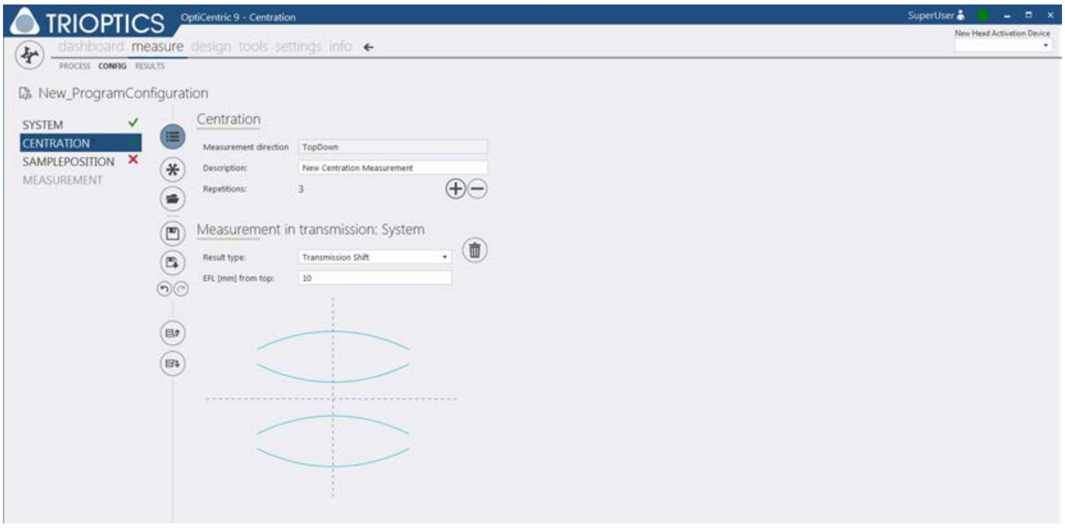


Fig. 88: Configure centration error measurement in transmission: Centration error of a multi-lens optical system

3. Select the measurement direction in the `Measurement direction` field.
4. Enter a description for this measurement in the `Description` field.
5. Set the number of repetitions in the `Repetitions` field. Use the `increase repetitions` or `decrease repetitions` buttons.

6. Set the desired result type in the `Result type` field.
   - ⇨ `Transmission Shift`: Shift of the focus of the entire optical system relative to the axis of rotation.
   - ⇨ `Transmission Tilt`: Tilt of the focus of the entire optical system relative to the axis of rotation.
7. In the `EFL [mm] from top` field, enter the focal length of the sample.
8. Click `Save configuration` to save your settings.

Configure wedge measurement

In a wedge measurement, the wedge angle is measured by deflecting the light within an optical wedge.

The algorithm of the wedge measurement is based on the assumption that the normal of the lower plane surface is parallel to the axis of rotation (otherwise incorrect measurement results are obtained).

1. Select the `Transmission` button.
   The following view opens:

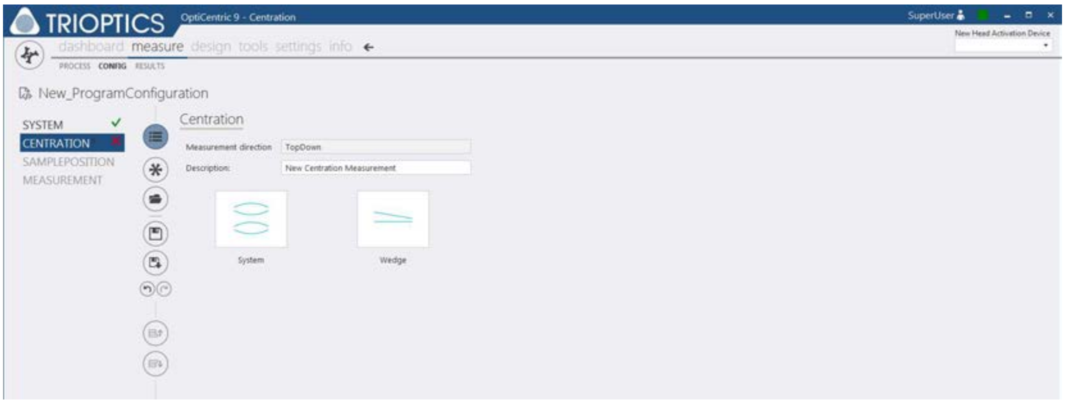


Fig. 89: Centration error measurement in transmission

2. Select the `Wedge` button to configure a wedge measurement.

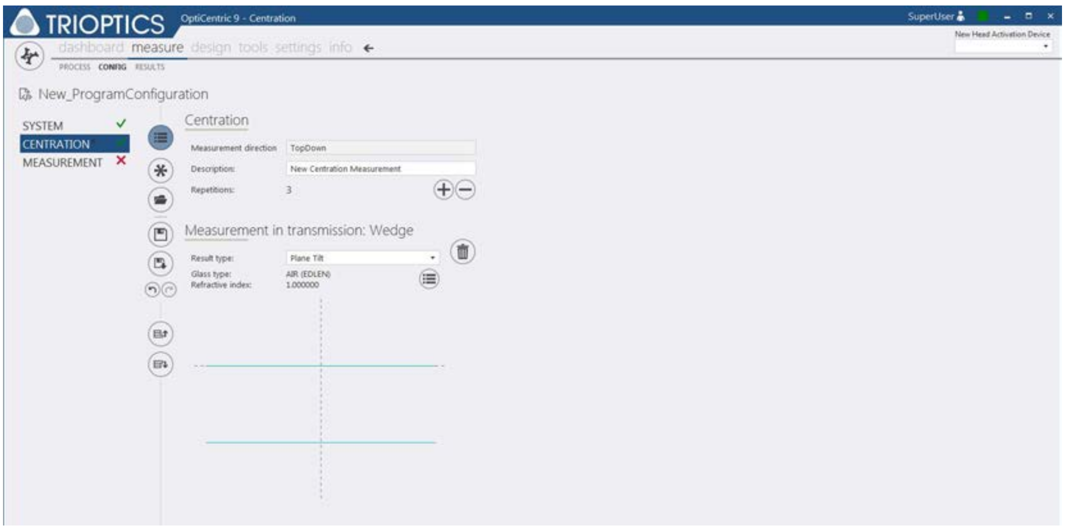


Fig. 90: Configure centration error measurement in transmission: Calibration wedge measurement

3. Select the measurement direction in the Measure-ment direction field.
4. Enter a description for this measurement in the De-scription field.
5. Set the number of repetitions in the Repetitions field. Use the increase repetitions or decrease repetitions buttons.
6. Set the desired result type in the Result type field.
   ⇨ Plane Tilt: Deviation of the wedge angle.
7. Set the desired glass type in the Glass type field.
   Use the Change glass type button to open the glass database and select another glass type.
8. No head lenses are required for the wedge measure-ment. Always use a head lens with the designation "None" (see *HARDWARE <HEAD LENS> view [▸ 154]*).
9. Click Save configuration to save your set-tings.

5.3.22 MEASUREMENT

In this configuration step you define the camera settings and the settings of the light source for the centration error measurement.

– Select <Centration> <CONFIG> <MEASUREMENT>
The following view opens:

General settings

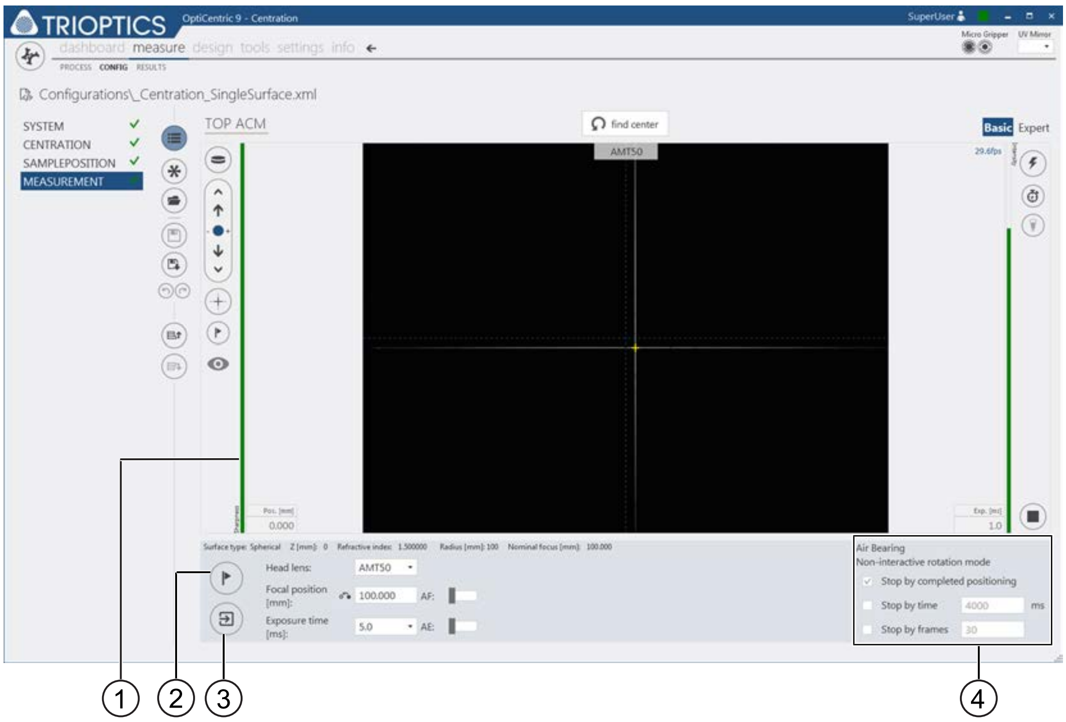


Fig. 91: Configure process: MEASURE, General settings

1. In the `Head Lens` field, select a suitable head lens (see *Changing head lenses [▷ 38]*).
2. Click `apply configuration to measuring head` **(2)** to move to the calculated image position.
   ⇨ The reticle should be clearly visible in the camera window.
   If the camera image is out of focus, proceed as follows:
3. Click `Auto focus` to perform an autofocus.
   or:
   Use the arrow keys to move the measuring head manually until the camera image is clearly visible.
   ⇨ The center of curvature is reached when the focus is as good as possible and the Sharpness bar chart reaches its maximum extent **(1)**.
4. You can perform an autofocus prior to each individual measurement. To do this, use the `AF` (Autofocus) option:

⇨ Autofocus option is deactivated.

⇨ Autofocus option is activated: an autofocus is performed prior to each individual measurement.

5. If necessary, correct the exposure time in the `Exposure time [ms]` field.
6. You can set the exposure time automatically prior to each individual measurement. To do this, use the `AE` (Auto Exposure) option:

   ⇨ Auto Exposure option is deactivated.

   ⇨ Auto Exposure option is activated: the necessary exposure time is determined prior to each individual measurement.

7. Click `write measuring head values to configuration` **(3)** to apply the determined measuring head position to the configuration as the new relative position.
8. Click `Save configuration` to save your settings.

Air bearing settings

You can select the following settings for the air bearing in the `Air Bearing` area **(4)**:

`Stop by completed positioning`: The air bearing performs one complete revolution.

`Stop by time`: The measurement stops after a specified time interval.

`Stop by frames`: The measurement stops after a specified number of steps.

Measurement methods

A suitable measuring method must be selected for the centration error measurement.

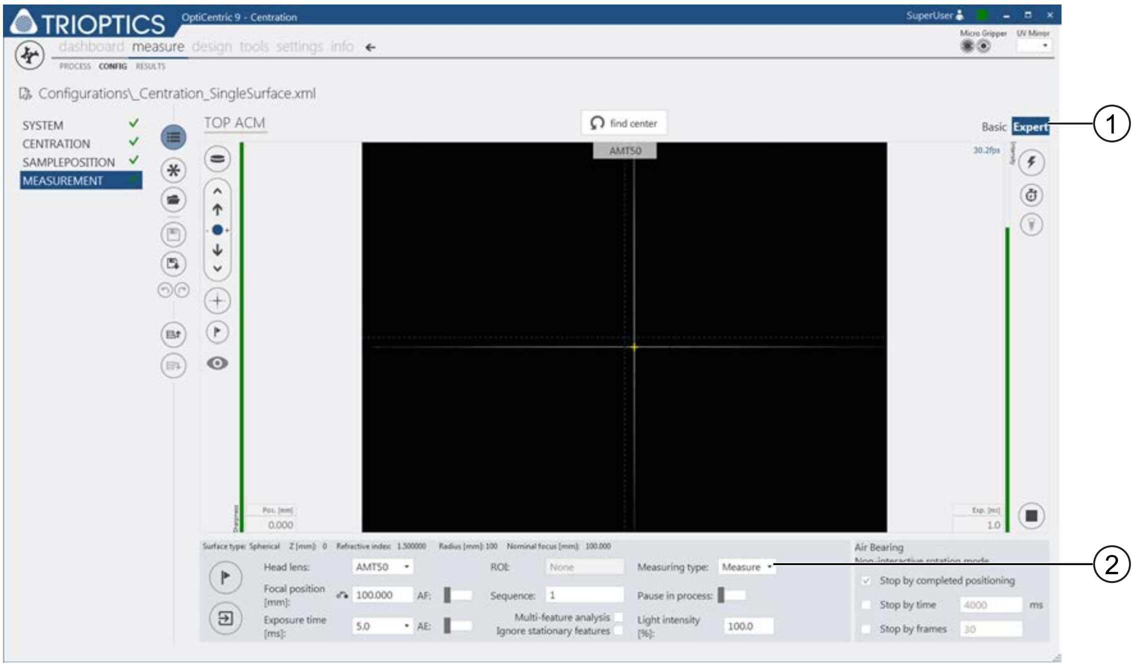


Fig. 92: Configure process: MEASURE, Define measuring method

1. Select the `Expert` **(1)** tab.
2. Select the desired measuring method from the drop-down list in the `Measuring type` **(6)** field.
3. Click `Save configuration` to save your settings.

The following table shows an overview of the different measurement methods:

Measurement	The sample is rotated by 360°. During the rotation, the software detects the position of the reticle image. After rotation, the software automatically calculates the centration error. **Application:** This method is recommended for most measurements.
Select	The sample is first rotated by 180°. The "`Select a cross`" message is displayed. – Click on the crosshair in the camera image. The software looks for a crosshair near where you clicked the mouse. Then the air bearing is turned by 180° back to the starting position. The "`Select a cross`" message is displayed. – Click on the crosshair in the camera image. The software automatically calculates the centration error. **Application:** This procedure is recommended if the intensity is low or the contrast is very weak and the "M" measurement is not successful.
Select automatically	The sample is first rotated by 180°. The software automatically captures the image from the crosshair. Then the air bearing is turned by 180° back to the starting position. The software automatically captures the image from the crosshair. The software automatically calculates the centration error. **Application:** This method is recommended if a good circle cannot be obtained through very specific aberrations (interfering reflections, several cross images).
Select and grab	The sample is first rotated by 180°. The "`Select a cross`" message is displayed. – Click **precisely** on the reticle in the camera image. The software adopts the position of the mouse click as the position of the crosshair. Then the air bearing is turned by 180° back to the starting position. The "Select a cross" message is displayed. – Click **precisely** on the crosshair in the camera image. The software automatically calculates the centration error. **Important!** If the mouse click is not precisely on the reticle, incorrect positions will be used when calculating the centration error. **Application:** This method is recommended if a good circle cannot be obtained through very specific aberrations

Pause in process

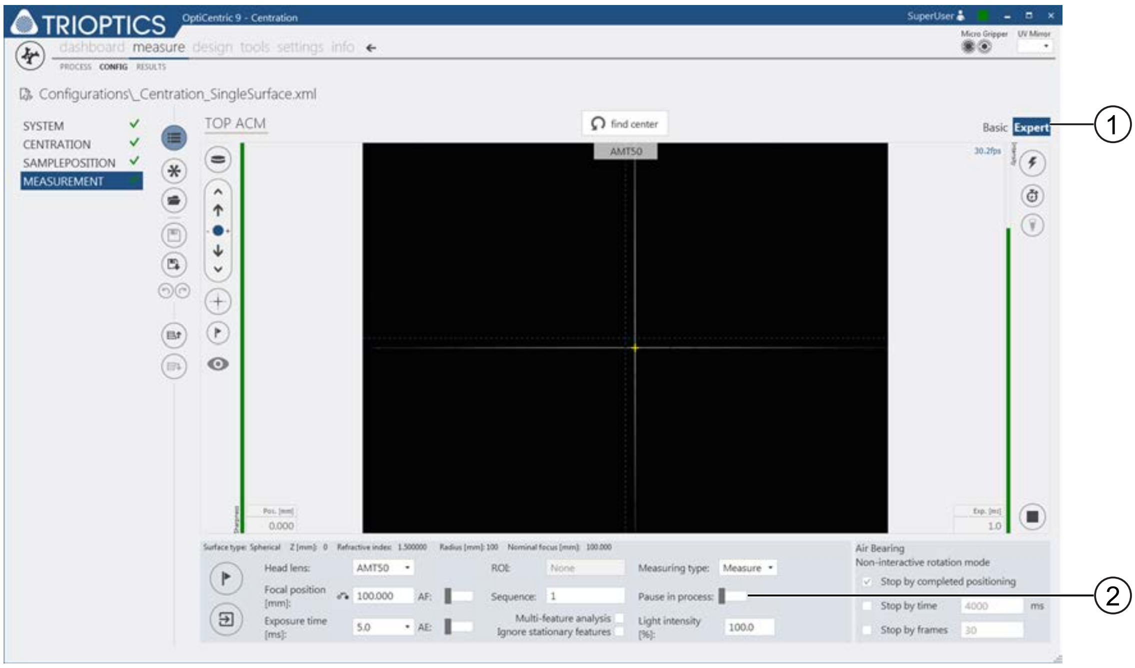


Fig. 93: Configure process: MEASURE, Pause in process

You can automatically pause the process before an individual measurement.

This may be necessary in order to check interim results and, if necessary, make changes.

1. Select the `Expert` **(1)** tab.
2. Click on `Pause in process` **(2)** to enable this option.
   - ⇨ The `Pause in process` option is disabled.
   - ⇨ The `Pause in process` option is enabled.
3. Click `Save configuration` to save your settings.

Light intensity

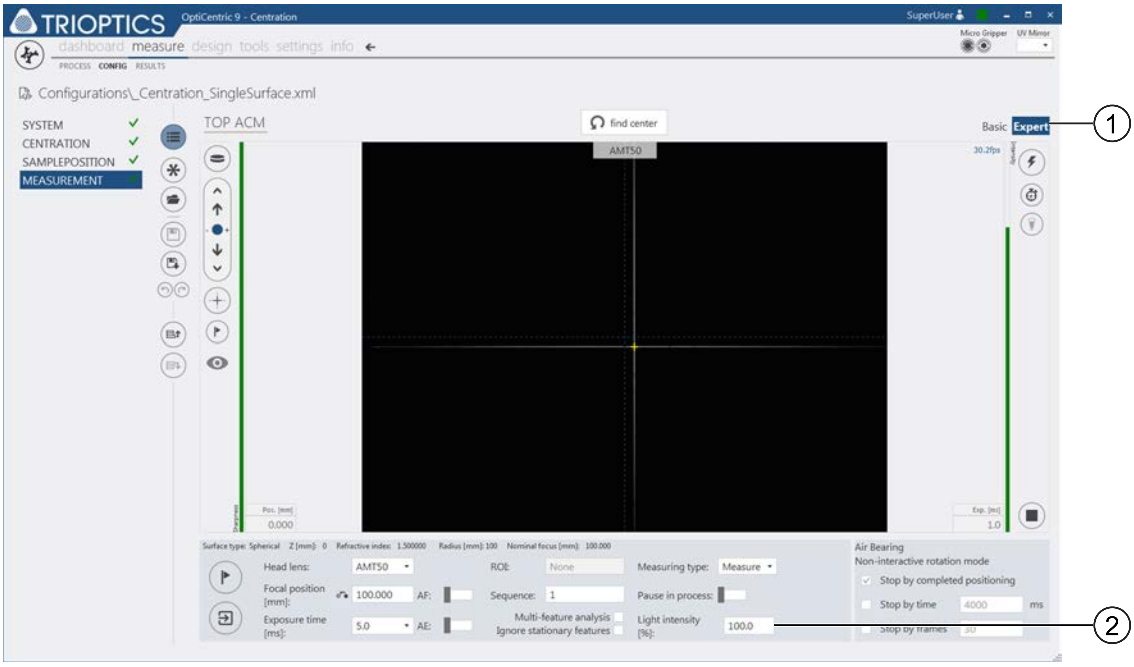


Fig. 94: Configure process: MEASURE, Intensity of the light source

The default intensity setting of the light source is 100%.

To change this setting proceed as follows:

1. Select the `Expert` **(1)** tab.
2. Enter the desired value in the `Light intensity` **(2)** field.
3. Click `Save configuration` to save your settings.

Region of interest (ROI)

With this function you can limit the search area based on the image of the crosshair in the camera window.

1. Select the `Expert` **(1)** tab.
2. Press and hold down the **Shift** key on the keyboard.
3. Left-click in the camera window and, keeping the mouse button held down, draw a rectangle in the area in which you want to search for the image of the reticle **(2)**.
4. Click on `write measuring head values to configuration` to apply the measuring head settings to the configuration.
5. Click `Save configuration` to save your settings.

NOTE

To cancel this setting again hold down the **Shift** key on the keyboard and right-click in the camera window.

The entries in the MEASUREMENT configuration step are now complete.

6 The MultiLens® module (ML)

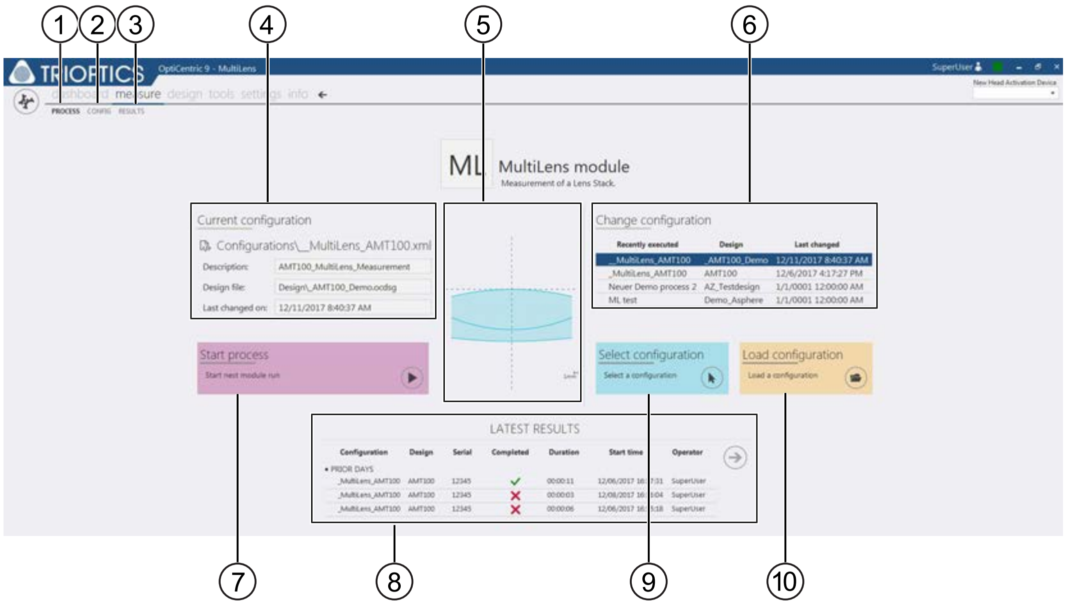


Fig. 95: The MultiLens® module, overview

With the MultiLens® module you can measure centration errors in reflection in multi-lens optical systems. You can use both optical and mechanical references.

You can measure both surface centration errors of individual optical surfaces with reference to specific axes or centration errors between individual lenses.

This section describes how to

- precisely measure centration errors of each individual surface within multi-lens optical systems
- interpret the measurement results.

By default, the MultiLens® module is always opened in process mode.

In the top left of the screen you can select which mode you would like to run the MultiLens module in.

Select `PROCESS` **(1)** to perform a MultiLens® process.

Select `CONFIG` **(2)** to configure a MultiLens® process.

Select `RESULT` **(3)** to display and analyze the results.

Section **(4)** on the left of the screen displays information on the current configuration. If you have not yet created or loaded a configuration, this section will be empty.

Use the `Load Configuration` **(10)** button to load a configuration from a defined directory.

The section on the right of the screen **(6)** displays a drop-down list of the configurations that are already loaded. Use the `Select Configuration` button **(9)** to select the desired configuration for further processing.

The center of the screen **(5)** displays a preview of the optical design based on the currently selected configuration.

Use the `Start Process` button **(7)** to start a MultiLens® process.

A list of the last measurement results is displayed in the lower area of the screen **(8)**. If no measurements have been taken yet, the list is empty.

6.1 Preparation

1. Perform the checks prior to operation as described in the Operator's Manual of your measurement system.
2. Switch on the measurement system as described in the Operator's Manual of your measurement system.
3. Place the sample in the center of the rotary air bearing or in the center of the tip-tilt table. To do this, proceed as described in the Operator's Manual of your measurement system.
4. If necessary, check that the end stops of the measuring axes are set correctly (see *Hardware Operation [▸ 33]*). This ensures that collisions are avoided.
5. Create a design file as described in *Creating a design file [▸ 43]*.
6. Start the MultiLens® module as described in *Accessing measuring modules [▸ 21]*.
7. Configure a measurement specification as described in *Configure a process [▸ 53]*.

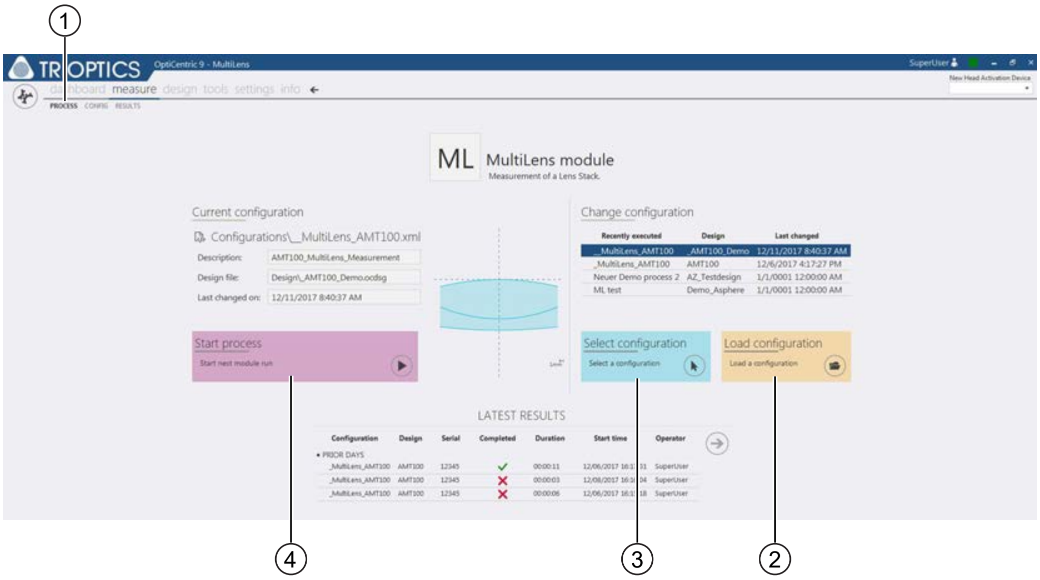
⇨ This completes the preparations for a MultiLens® measurement.

The following table shows an overview of the configuration steps required for a MultiLens® measurement:

Configuration step	**See section**
SYSTEM	*SYSTEM [▸ 60]*
GENERAL	*GENERAL [▸ 62]*
SAMPLE POSITION	*REFERENCE (SAMPLE POSITION) [▸ 63]*
MULTILENS	*MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS [▸ 66]*
GROUPS	*GROUPS [▸ 77]*
SURFACE ANALYSIS	*SURFACE ANALYSIS [▸ 79]*
GROUP ANALYSIS	*GROUP ANALYSIS [▸ 81]*

6.2 Performing a MultiLens® measurement

View A



View B

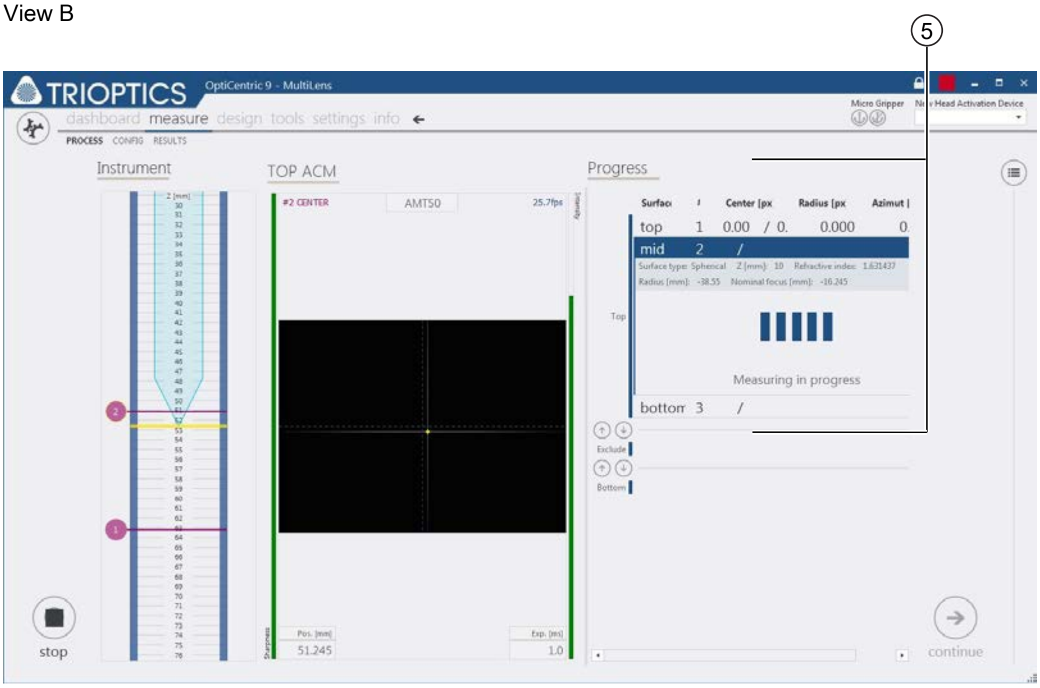


Fig. 96: Performing a MultiLens® measurement

1. Select the <PROCESS> (run process) view **(1)**.
   ⇨ The last loaded configuration files are displayed in the `Change configuration` section.
2. Select the desired configuration file and click <Select configuration> **(3)** to open this configuration file.
   or:
   Click `Load configuration` **(2)** to load a configuration file from a defined directory.
   ⇨ A preview of the optical design used is displayed in the center of the screen.
3. To start the measurement, click <Start process> **(4)**.
   ⇨ The measuring head moves to the positions to be measured one after the other (see view B). On the right side of the window there is a progress indicator **(6)** showing the currently measured surface.
   ⇨ When the measurement is complete, the <RESULTS> window opens.

NOTE

To cancel the measurement in case of danger, click on the ⏹ `stop` icon.

See also

Accessing measuring modules [▶ 21]

6.3 Interpreting measurement results

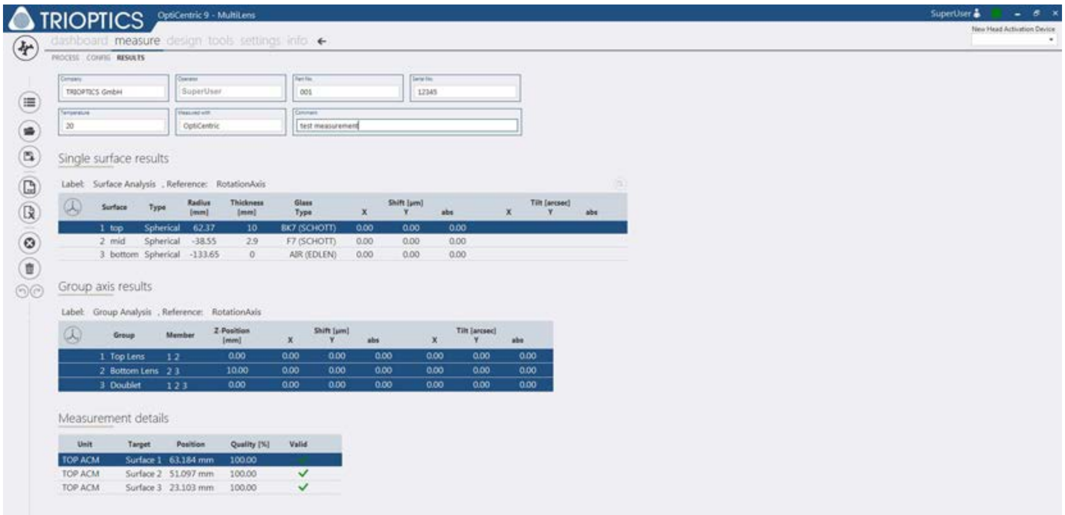


Fig. 97: Evaluate measurement, MULTILENS

When a MultiLens® measurement is complete, the <RESULTS> window opens.

Here, the measurement results of the individual surface analysis or the group analysis are summarized and displayed in list form.

In addition, a graphical representation is also possible.

Evaluate individual surface analysis

Fig. 98: Interpret measurement results: MULTILENS (individual surface analysis)

1. Click the `Show graphical analysis` button **(1)** to open the graphical representation for the individual surface analysis.
   ⇨ The position of the centers of curvature of the individual surfaces is displayed in three planes of the coordinate system.
   ⇨ Use the zoom options **(2)** to adjust the display.
2. Click `Export as *.pdf` to export the measurement results to a PDF file.
3. Click `Export as *.xslx` to export the measurement results to an Excel file.

Evaluate group analysis

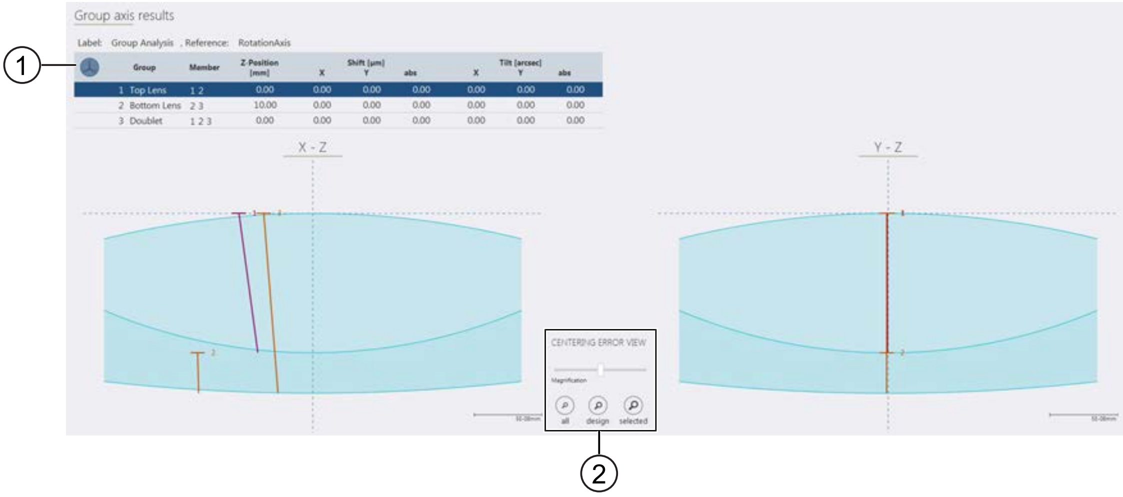


Fig. 99: Interpret measurement results: MULTILENS (group analysis)

1. Click the `Show graphical analysis` button **(1)** to open the graphical representation for the group analysis.
   ⇨ The position of the optical axes of the individual lenses and the entire optical system is displayed in the X-Z plane and in the Y-Z plane of the coordinate system.
   ⇨ Use the zoom options **(2)** to adjust the display.
2. Click `Export as *.pdf` to export the measurement results to a PDF file.
3. Click `Export as *.xslx` to export the measurement results to an Excel file.

7 The Centration module (CE)

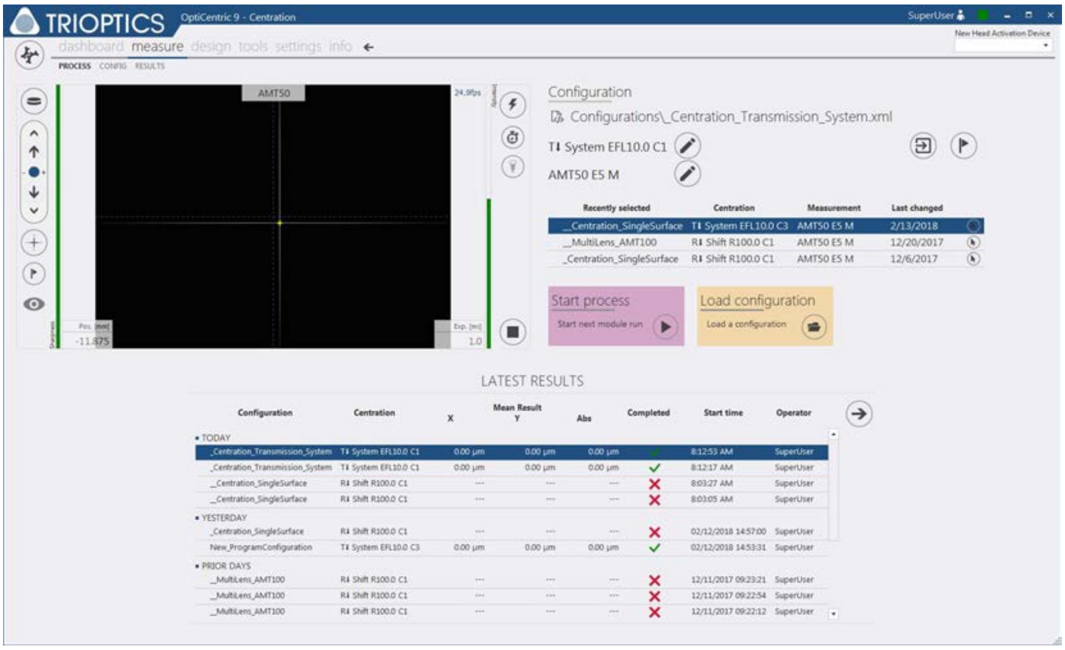


Fig. 100: The Centration module

The Centration module allows you to perform centration error measurements on single lenses both in reflection mode and in transmission mode.

The reference here is always the rotation axis. Depending on the configuration of your measurement system, this is either the edge of the lens (when using the lens rotation device), or the air bearing axis.

This section describes how to

- perform a centration error measurement in transmission or in reflection
- interpret the measurement results.

Centration error measurement in transmission

Use the centration error measurement in transmission mode if you want to determine the total centration error of multi-lens optical systems (centration error of the focus).

Centration error measurement in reflection

Use the centration error measurement in reflection mode if you want to measure the wobble of a plane surface or the centration error of a spherical (lens) surface.

7.1 Preparation

1. Perform the checks prior to operation as described in the Operator's Manual of your measurement system.
2. Switch on the measurement system as described in the Operator's Manual of your measurement system.
3. Place the sample in the center of the rotary air bearing or in the center of the tip-tilt table. To do this, proceed as described in the Operator's Manual of your measurement system.
4. Start the Centration module as described in *Accessing measuring modules [▸ 21]*.
5. Configure a measurement specification as described in *Configure a process [▸ 53]*.

⇨ This completes the preparations for a centration error measurement.

The following table shows an overview of the configuration steps required for a centration error measurement:

Configuration step	See section
SYSTEM	*SYSTEM [▸ 60]*
CENTRATION	*CENTRATION [▸ 108]*
SAMPLEPOSITION	*REFERENCE (SAMPLE POSITION) [▸ 63]*
MEASUREMENT	*MEASUREMENT [▸ 116]*

See also

- Creating a design file [▸ 43]

7.2 Perform centration error measurement

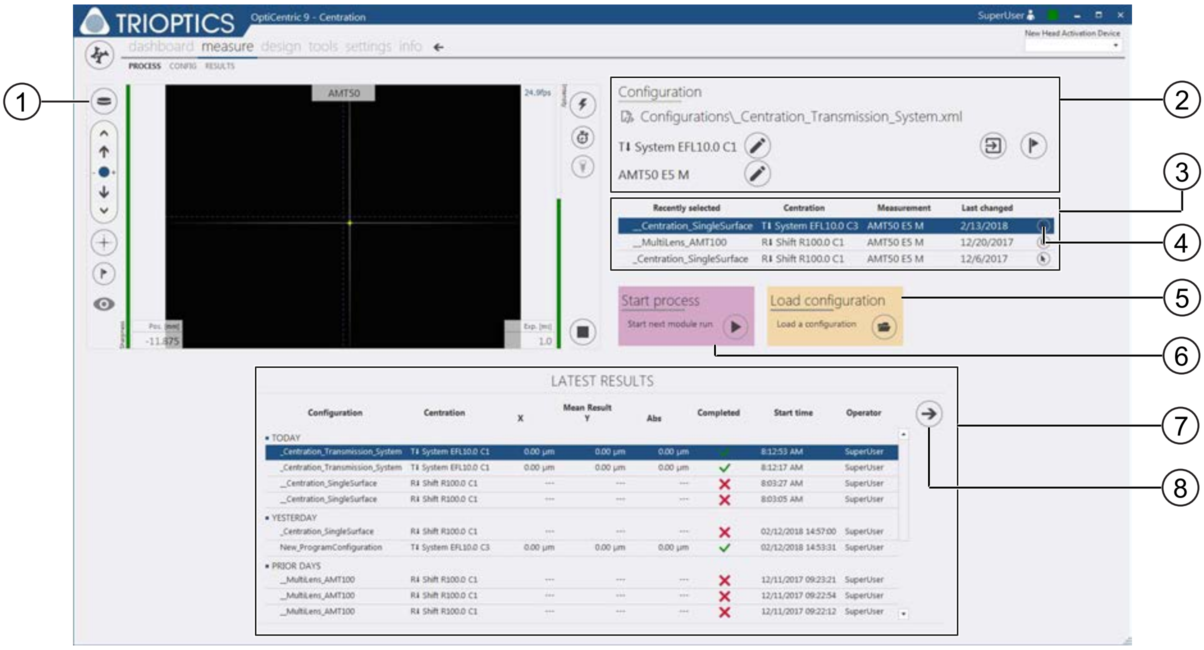


Fig. 101: Perform centration error measurement

1. Select the <PROCESS> (run process) view.
   ⇨ The last loaded configuration files are displayed in the `Configuration` section.
2. Select the desired configuration file and click the button (`Select configuration`) **(4)** to open this configuration file.
   or:
   Click `Load configuration` **(5)** to load a configuration file from a defined directory.
   ⇨ A summary of the configured parameters is displayed in the top part of the screen **(2)**.
3. If necessary, change the settings for the head lens **(1)**. To do this, follow the steps as described in *Changing head lenses [▸ 39]*.
4. Click the `Start process` button **(6)** to start the measurement.
   ⇨ The measurement is started with the currently set parameters.
   ⇨ The rotary bearing is rotated by 360°.
   ⇨ When the measurement is complete, a summary of the result is displayed in the `LATEST RESULTS` area **(7)**.
5. Select the desired entry and click the `Show result details` button **(8)**.
   ⇨ The result view opens.

NOTE

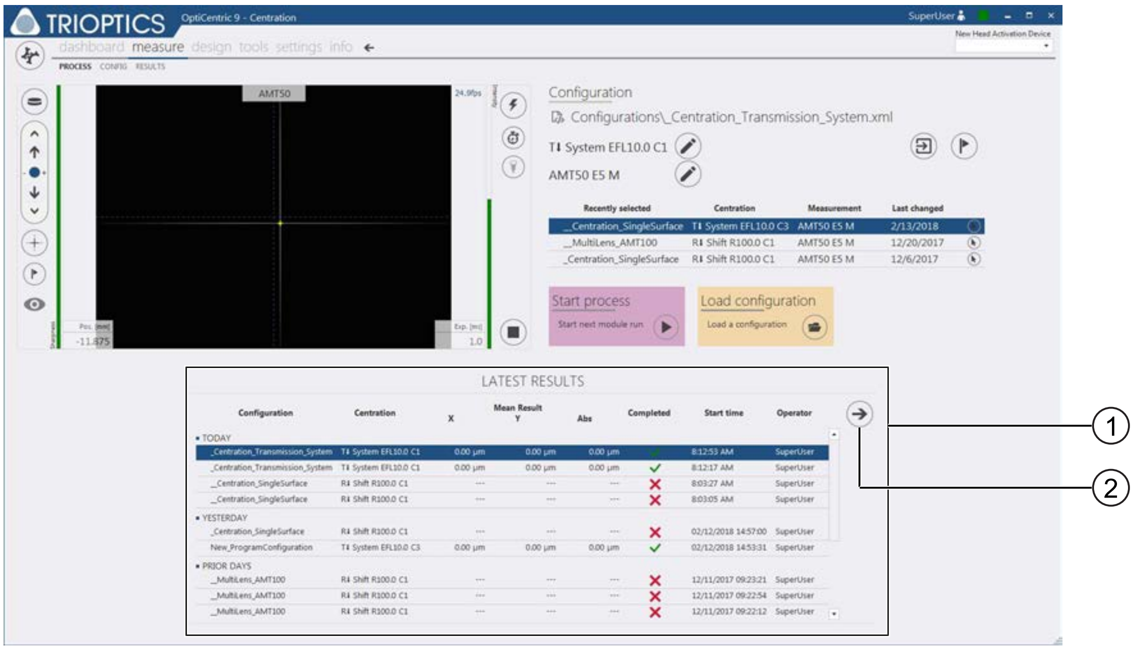
Click ■ `stop all tasks` to cancel the measurement in case of danger.

See also

Accessing measuring modules [▸ 21]

7.3 Interpreting measurement results

View A



View B

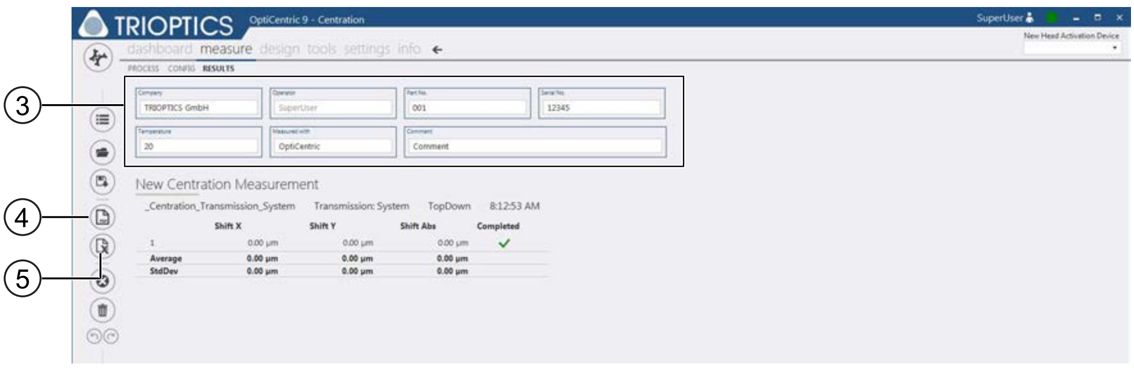


Fig. 102: Centration error measurement, interpreting measurement results

When a centration error measurement is complete, a summary of the result is displayed in the `LATEST RESULTS` area **(1)**.

1. Select the desired entry and click the ➔ `Show result details` button **(2)**.
   or:
   Select <`Centration`> <`measure`> <`RESULTS`>.
   - ⇨ The result view opens **(view B)**.
   - ⇨ The results of the last measurement are displayed.
2. In area **(3)**, enter the desired metadata for this measurement.
3. Click `Export as *.pdf` **(4)** to export the measurement results to a PDF file.
4. Click `Export as *.xslx` **(5)** to export the measurement results to an Excel file.

8 The Lens Alignment module (LA)

The Lens Alignment module allows you to build multi-lens optical systems. You can align lenses to an optical axis or to a mechanical axis and bond them to the mount (gluing), as well as align and bond lenses to each other (cementing).

As a reference axis you can select a mechanical axis, an optical axis or the rotation axis of the air bearing.

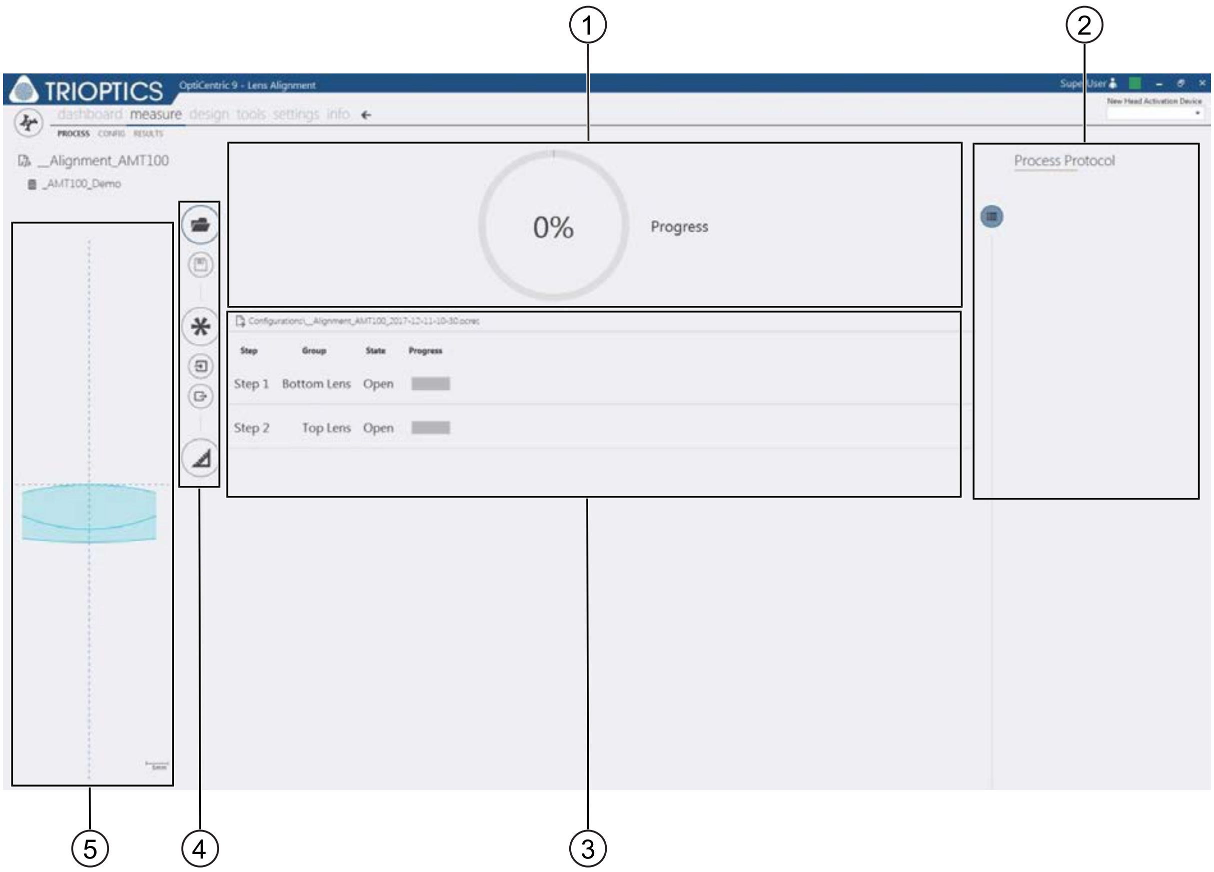


Fig. 103: Overview: The Lens Alignment module

On the upper left of the screen, you see the menu options `Process`, `Config`, and `Result`. This represents the selection of the modes in which you want to execute the bonding module.

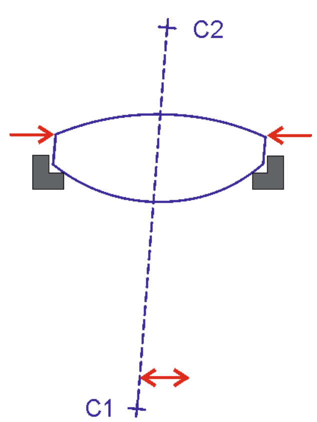
– To execute a bonding process, choose Process.
– To configure a bonding process, choose Config.
– To display and evaluate results, choose Result.

1	**Progress indicator for the bonding process**
2	**Process log**
	To show or hide the process log, click the icon.
3	**Information on the current configuration**
	If you have not yet loaded a configuration, this section is empty.
4	**Icon buttons**
	Load configurations Save configurations Create new configurations Import results Export results
5	**Preview of the lens design**
	The current or last loaded configuration is always shown. If you have not yet created or loaded a configuration, this field is empty.

The following sub-sections describe how to perform a lens alignment process and how to interpret the measurement results.

8.1 Alignment bonding process

Depending on the design of the measurement system and the alignment principle, there are different configuration options.



Actuators are available which can be configured differently depending on the equipment of the measurement system (lens aligner = mechanism for aligning the lens).

Once the position of the lens relative to the mount axis has been determined, the electronically controlled actuators are used to align the lens with the mount in the X and Y directions. The lens is shifted or tilted depending on the geometry of the sample.

After this, a dispensing unit applies adhesive to the lateral surface of the lens.

When a UV curing adhesive is used, the adhesive is afterwards cured through irradiation with UV light.

8.2 Preparation

1. Perform the checks prior to operation as described in the Operator's Manual of your measurement system.
2. Switch on the measurement system as described in the Operator's Manual of your measurement system.
3. Create a design file as described in *Creating a design file [▸ 43]*.
4. Place the sample in the center of the rotary air bearing or in the center of the tip-tilt table. To do this, proceed as described in the Operator's Manual of your measurement system.
5. Start the Lens Alignment module as described in *Accessing measuring modules [▸ 21]*.
6. Configure a Lens Alignment process as described in *Configure a process [▸ 53]*.

⇨ This completes the preparations for a Lens Alignment process.

The following table shows an overview of the configuration steps required for a Lens Alignment process:

Configuration step	See section
SYSTEM	*SYSTEM [▸ 60]*
GENERAL	*GENERAL [▸ 62]*
SAMPLE POSITION	*REFERENCE (SAMPLE POSITION) [▸ 63]*
GROUPS	*GROUPS [▸ 77]*
SEQUENCE	*SEQUENCE [▸ 82]*
STEP (X)*)	*STEP (options) [▸ 83]*
SAMPLEPOSITION*)	*SAMPLEPOSITION [▸ 85]*
USERAXIS*), **)	*USERAXIS [▸ 85]*
MULTILENS*)	*MULTILENS (Step) [▸ 86]*
GLUE APPLICATION*), **)	*GLUE APPLICATION [▸ 87]*
HOLE DETECTION*), **)	*HOLE DETECTION [▸ 90]*
ALIGNMENT*)	*ALIGNMENT [▸ 93]*
UV CURING*)	*UV CURING [▸ 105]*
ANALYSIS*)	*ANALYSIS (Step) [▸ 106]*
FINAL MULTILENS	*FINAL MULTILENS [▸ 107]*
FINAL SURFACE ANALYSIS	*FINAL SURFACE ANALYSIS [▸ 107]*
FINAL GROUP ANALYSIS	*FINAL GROUP ANALYSIS [▸ 107]*

*) **)	For each individual step Not relevant for cementing

8.3 Perform a lens alignment process

See also

The AutoStart and AutoContinue options [▸ 57]

8.3.1 Process wizard

NOTE

By default, the Lens Alignment process is supported by a wizard that guides you through the individual process steps in a predefined sequence.

Advanced users can override this default setting by configuring the `AutoStart` and `AutoContinue` options. The sequence of the process steps can then be selected by the user. (See *The AutoStart and AutoContinue options [▸ 57]*)

Calling process steps

View A

AS	☑	☑	☑	☑	☑	☑	☑
AC	☑	☑	☑	☑	☑	☑	☑

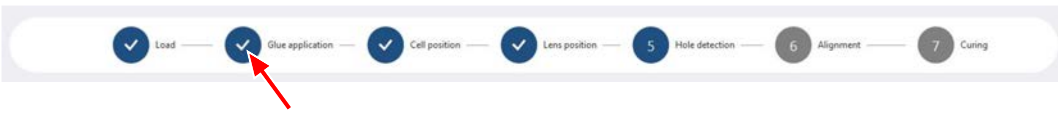
Example 1: AutoStart and AutoContinue options for a fully automatic process

View B

AS	☐	☐	☐	☐	☐	☐	☐
AC	☐	☐	☐	☐	☐	☐	☐

Example 2: AutoStart and AutoContinue options for a manual process

View C



AS	☑	☑	☐	☐	☑	☑	☐
AC	☐	☐	☑	☑	☑	☐	☑

Example 3: AutoStart and AutoContinue options for a semi-automatic process

AS = AutoStart
AC = AutoContinue

Fig. 104: Execute a lens alignment process: Navigation bar

– Click on the desired process step to open it (**view C**).

  Pay attention to the different behavior depending on the mouse button used:

  Left click

  The process step starts automatically if the `Autostart` option is selected for this step.

  Right click

  The process step is opened without starting it. This also applies if `Autostart` has been selected for this process step.

Jump between process steps

Jumping between process steps is only possible if the running process is interrupted (manual or semi-automatic execution of the process).

This is the case if:

- the `AutoContinue` option was not selected in a preceding process step
  or
- the `AutoStart` option was not selected in a subsequent process step.

Example 1: Fully automatic process

The `AutoStart` and `AutoContinue` options were selected for each process step (**view A**). The process is executed fully automatically.

Example 2: Manually controlled process

The `AutoStart` and `AutoContinue` options were not selected for any process step (**view B**). The individual process steps must be called and started manually.

Example 3: Semi-automatic process

The `AutoStart` and `AutoContinue` options were selected differently for the individual process steps (**view C**).

Some of the process steps must be called manually (e.g. `glue application`). In some cases they are also called and executed automatically (e.g. `hole detection`).

Repeating process steps

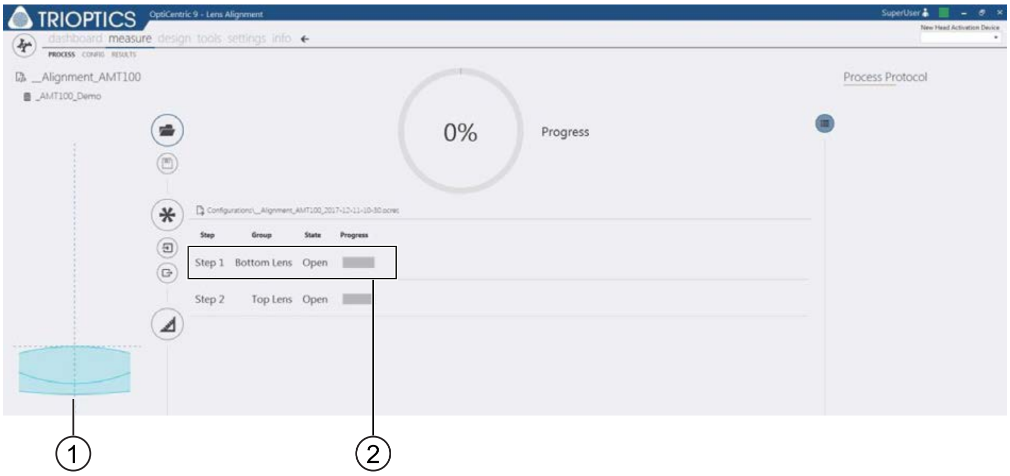
The status of the individual process steps (already performed/failed) is also saved. Later, the process can be continued as required.

NOTE

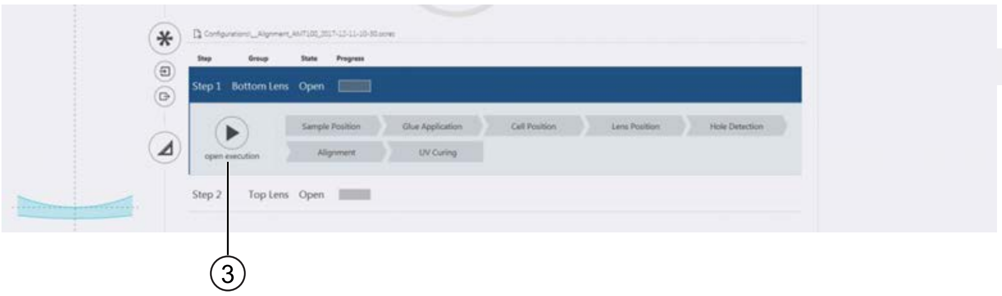
In this case no changes should be made to the system and/or the sample in the meantime.

8.3.2 Start process

View A



View B



View C

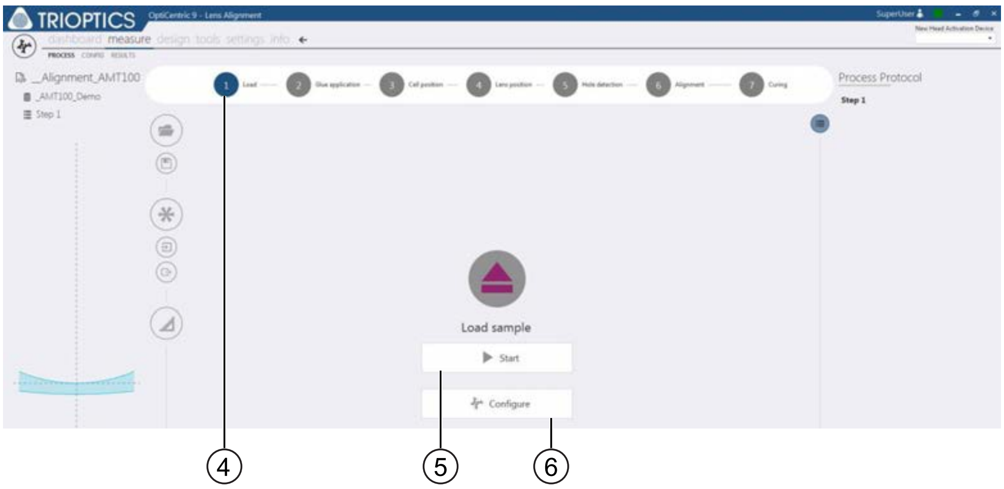
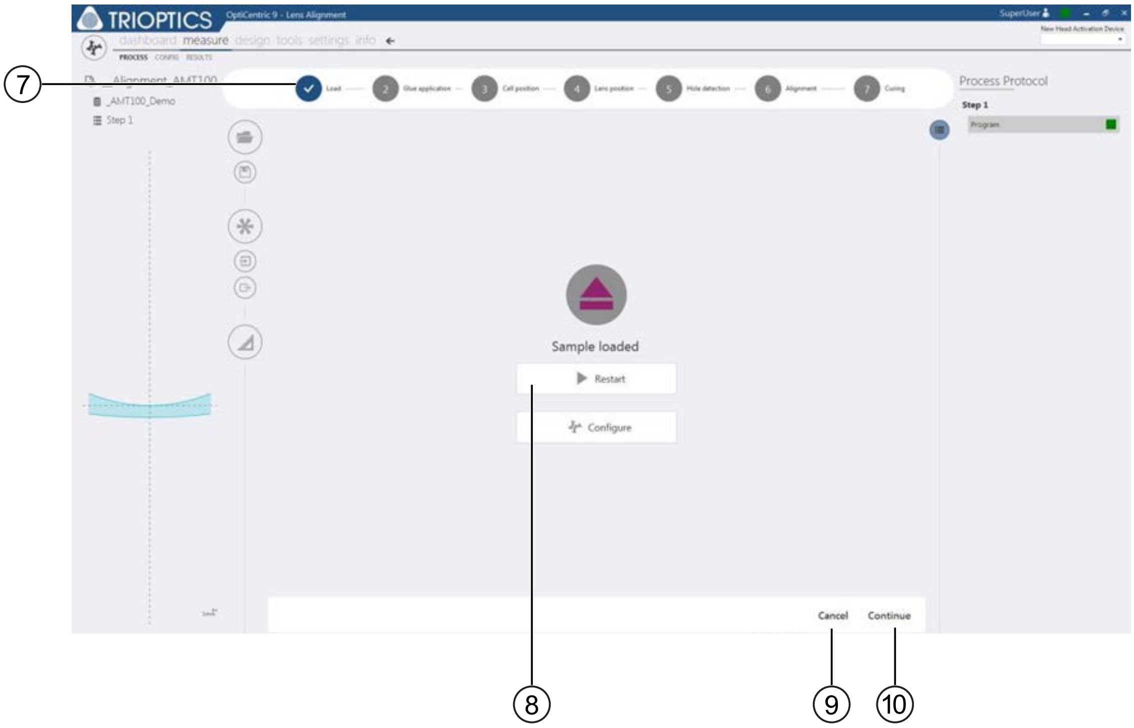


Fig. 105: Start the lens alignment process (part 1)

View D



View E

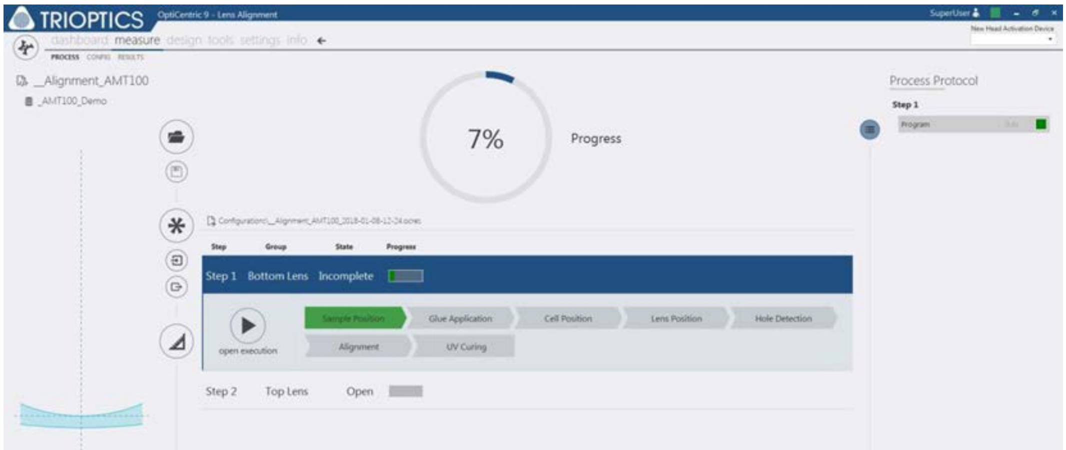


Fig. 106: Start the lens alignment process (part 2)

1. Select <Process>.
2. Click on `Load bonding configuration` and select a process file.
   ⇨ The design data is loaded. A preview of the optical design is displayed in the left part of the screen **(1)**.
   ⇨ A list of the configured steps is displayed in the middle part of the screen.

NOTE

You have the option to display a process log on the right side of the screen. The standard screen does not include the process log.

– Click on `Show/Hide protocol` to show the process protocol.

– Click on `Show/Hide protocol` again to hide the process log.

3. In the list, click on the step you wish to edit **(2)**.
   ⇨ The individual process steps are shown **(view B)**.
4. Click `open execution` **(3)** to begin the lens alignment process.
   ⇨ The wizard for performing the lens alignment process opens **(view C)**.
5. Follow the instructions in the wizard to execute the lens alignment process for the current step.
   Or:
   Click on the desired process step **(4)** to execute it.
6. Start the process step by clicking the `Start` button **(5)**.
   ⇨ If the process step was successfully completed, it is marked with a check mark in the process wizard **(7)**.
   ⇨ By clicking on the Restart button **(8)**, you can execute the process step again.
   ⇨ By clicking on the Cancel process button **(9)**, you can cancel the process step.
   The process progress achieved so far is displayed **(view E)**.
7. Select the `Continue` button **(10)** to call the next process step.
8. Proceed in the same manner for the remaining process steps.
9. When all process steps have been successfully completed, select the `Finish` button to finish editing this step.
10. Proceed in the same manner for the remaining steps.
11. When all steps have been successfully processed, select the `Finish Process` button to finish the process.

⇨ This completes the alignment and bonding of the individual steps.

8.3.3 Perform a final measurement

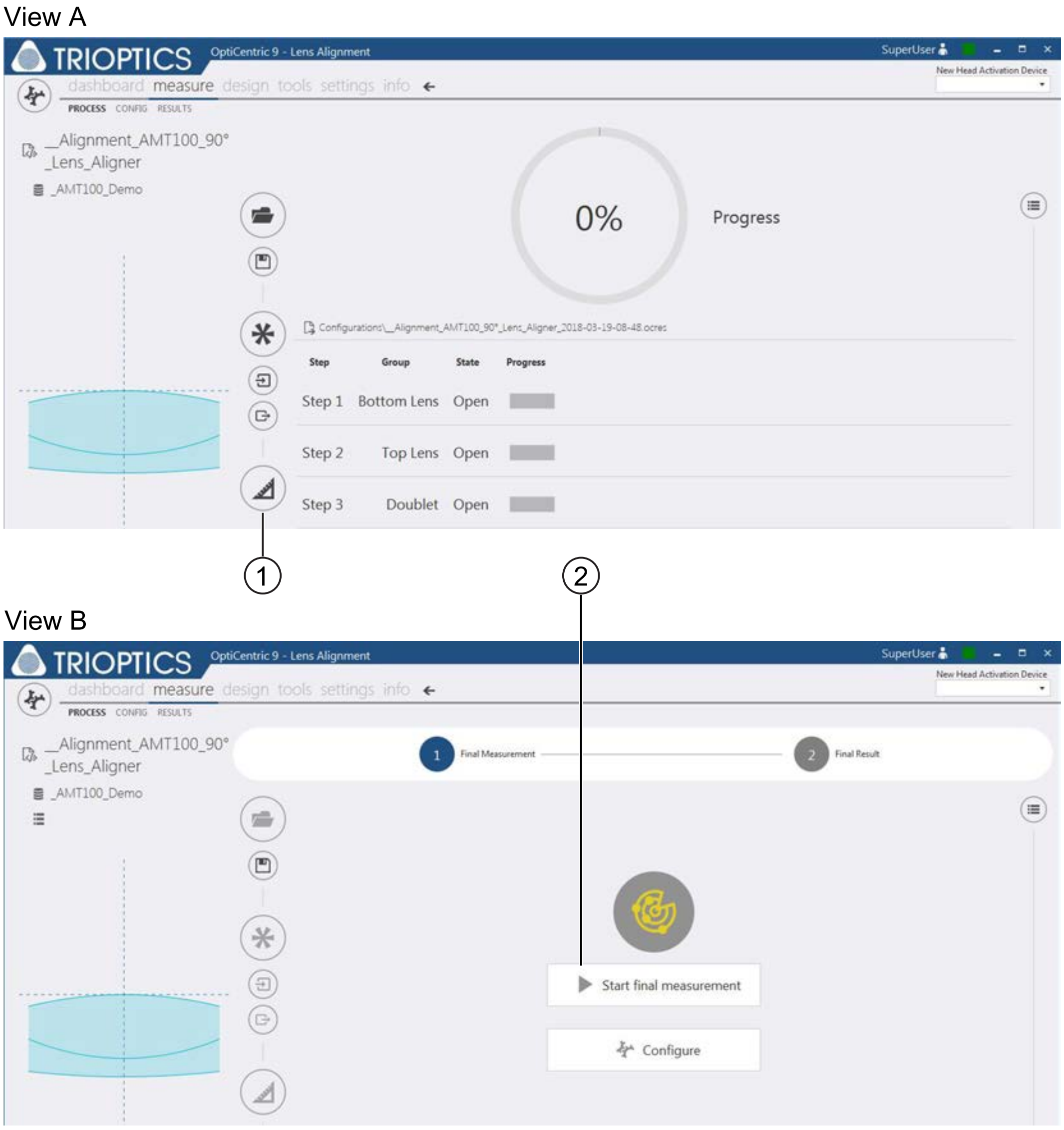


Fig. 107: Lens Alignment: FINAL MEASUREMENT (part 1)

View C

View D

View E

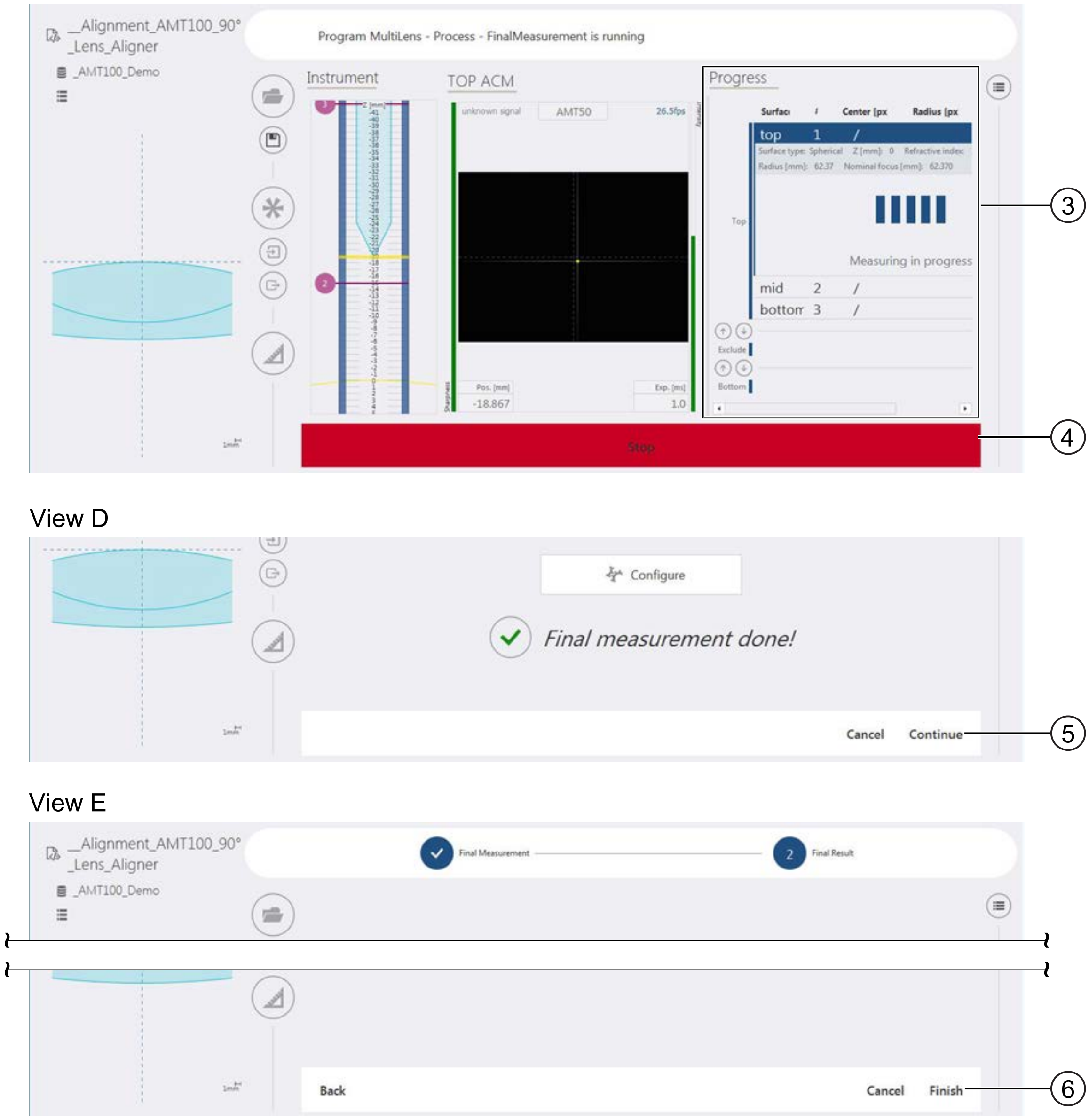


Fig. 108: Lens Alignment: FINAL MEASUREMENT (part 2)

When the processing of all steps has been successfully completed, the `Open Final Measurement` **(1)** button becomes active.

1. Select the `Open Final Measurement` button **(1)** to open the final measurement.
2. Click the `Start final measurement`button **(2)** to start the measurement.
   ⇨ The measuring head moves to the positions to be measured one after the other.
   ⇨ The progress of the measurement is displayed **(view C)**.
3. If necessary, click the `Stop` button **(4)** to stop the movement of the measuring head immediately in case of danger.
   ⇨ In this case, the measurement is aborted.
4. After a successfully completed measurement, the message `Final measurement done!` is displayed **(view D)**. Click `Continue` **(5)**.
   ⇨ The process wizard displays the status of the measurement (view E).
5. Click `Finish` **(6)** to complete the measurement.
6. This completes the lens alignment process.

8.4 Interpreting measurement results

After the lens alignment process is completed, the main view is displayed:

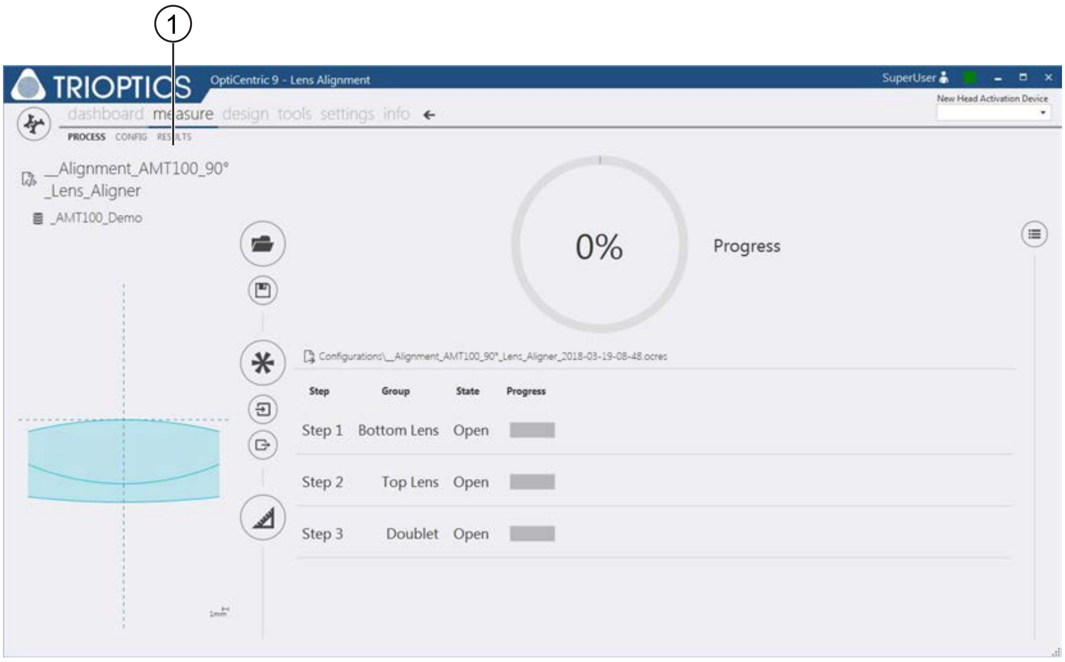


Fig. 109: Lens Alignment: FINAL MEASUREMENT ended

1. Open the `RESULTS` view **(1)** to access the evaluation of the measurement results.
   ⇨ The procedure for interpreting the measurement results is analogous to the evaluation of a Multi-Lens® measurement (see *Interpreting measurement results [▸ 128]*).

9 Settings

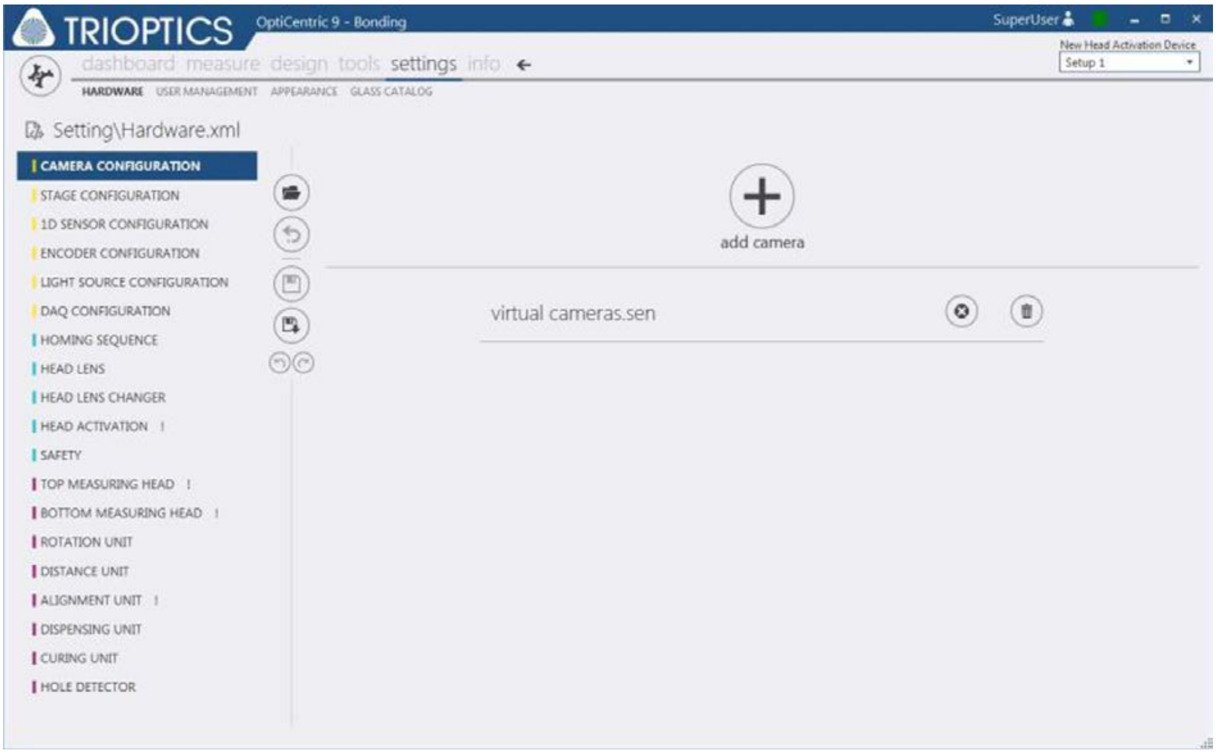
This section describes which settings you can make on your measurement system.

NOTE

Settings that you make here are basic device settings and affect all configuration files. Changing settings can result in pre-configured measurement processes no longer being able to be executed.

Only allow experienced users to make changes to settings, or only change settings in consultation with TRIOPTICS.

9.1 General view



Hardware settings at various levels are necessary to ensure that your measurement system works without error.

For a better differentiation, these levels are highlighted in color in the settings menu on the left and have the following meanings:

Yellow marking

The individual hardware components and the basic hardware configurations for these components are set here.

Blue marking

Basic settings for the software are made here. These settings refer to the functional units.

Purple marking

The functional units are defined here. These usually consist of several hardware components.

9.2 HARDWARE <HOMING SEQUENCE> view

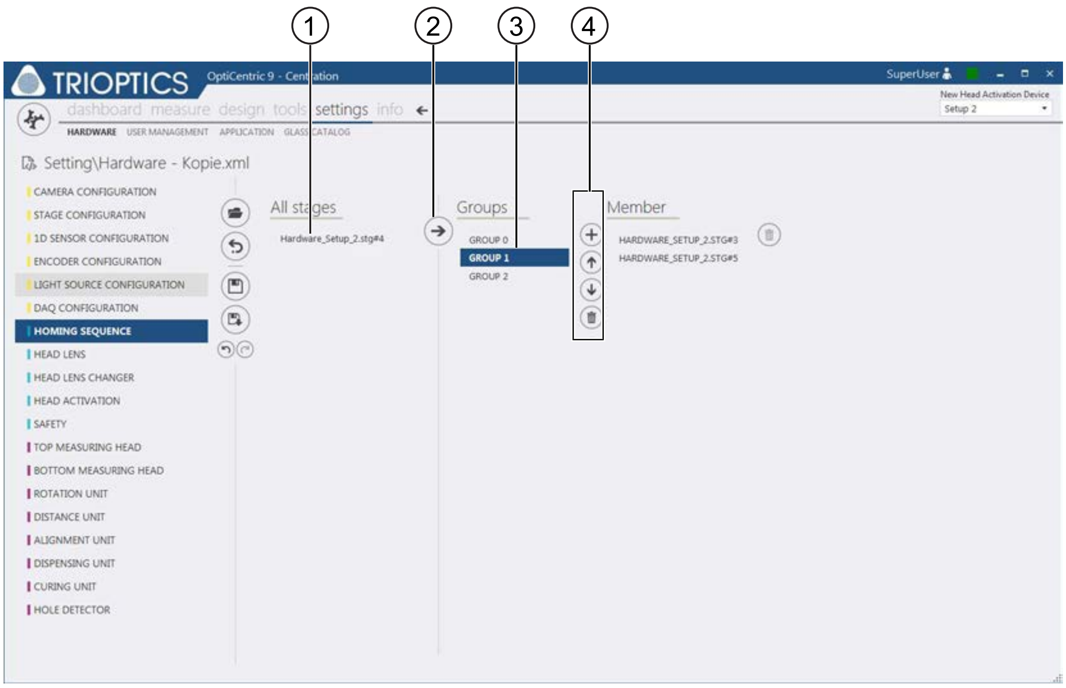


Fig. 110: HARDWARE settings, HOMING SEQUENCE view

This section describes how to set up the sequence for searching the zero points of the motorized axes.

Depending on the configuration of your measurement system, it may be useful not to reference all axes simultaneously, but to search for the zero point of the axes in a certain sequence.

Example: Measurement system with alignment unit
To avoid collisions, actuators should first move into a safe position before the air bearing rotates.

Individual axes that can be referenced at the same time are first grouped together. The sequence of the groups during the reference cycle is then determined.

1. Select the Add new item button in the editing toolbar **(4)**.
   ⇨ A new entry (a new group) is created in the Groups area **(3)**.
2. If necessary, create additional entries depending on how many groups of axes you want to define.
3. Select an entry in the list of groups.
4. In the All stages area, select the axis you want to assign to this group **(1)**.
5. Click add to group **(2)** to add this axis to the group.
6. To change the order of the groups, select the required entry in the Groups area.
7. Select the **move item up** button in the editing toolbar (4) to move the entry up in the list. The group is moved forward in the order.
   or:

   Select the **move item down** button in the editing toolbar (4) to move the entry down in the list. The group is moved back in the order.

9.3 HARDWARE <HEAD LENS> view

This section describes how to record head lenses and group them together. Later you can assign a group of head lenses to a lens changer.

1. In the menu bar, select `<settings> <HARDWARE> <HEAD LENS>`.
   ⇨ The following window opens:

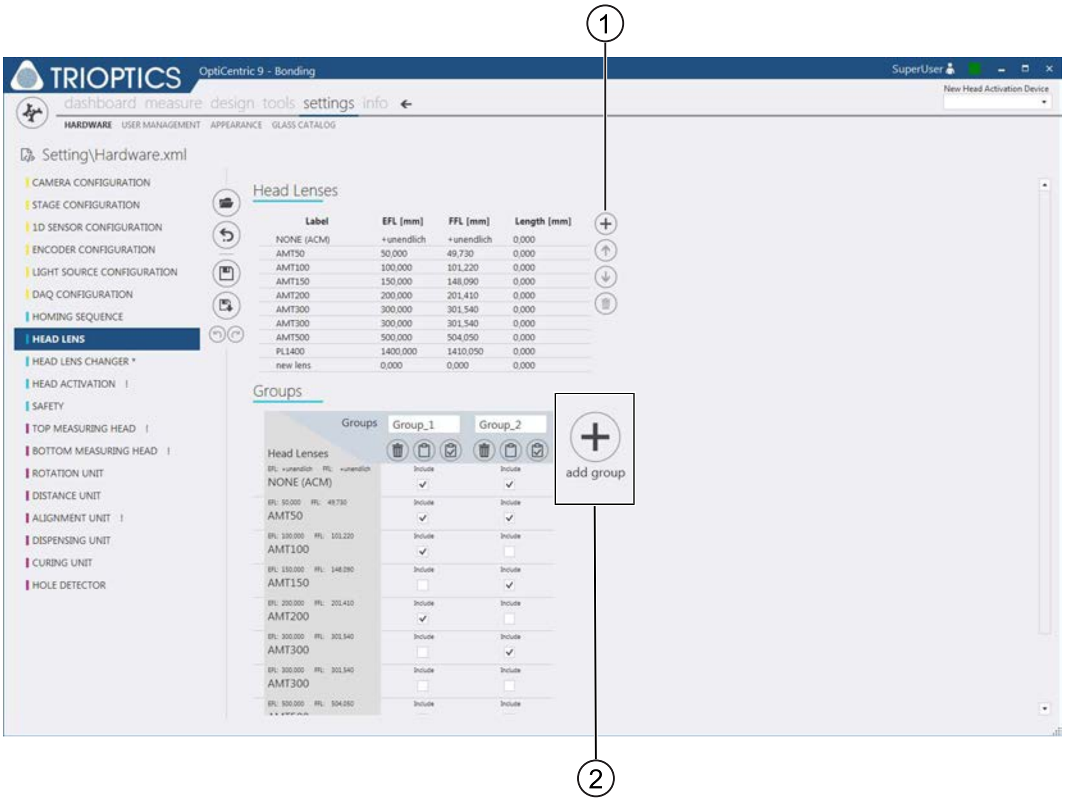


Fig. 111: Settings, record head lenses

2. Click `Add new head lens` **(1)** to record a new head lens.
   ⇨ A new row is created in the table.
3. Enter the following parameters:
   `Label`: Name of the head lens
   `EFL`: Effective Focal Length
   `FFL`: Flange Focal Length
   `Length`: Length of the head lens

NOTE

Before you assign head lenses to a lens changer, you must define groups of head lenses.

 OptiCentric® 9 Software Description

4. Select `add group` **(2)**.
5. Enter a name for the group in the `Groups` field.
6. In the list, select the head lenses that are to be assigned to this group.
7. Click on 💾 to save your entries.

9.4 HARDWARE view <HEAD LENS CHANGER (objective changer)

Depending on the configuration of your measurement system, different systems for changing the head lenses are available:

`manual change`	Change the head lenses manually
`manual turret`	Manual objective changer
`mini stepper turret`	Automatic objective changer (old design)
`stage turret`	Automatic objective changer

This chapter describes how to

- Recording head lenses with their parameters
- Setting up the different systems for changing objectives

– In the menu bar, select <`settings`> <`HARDWARE`> <`HEAD LENS Changer`>. The following window opens:

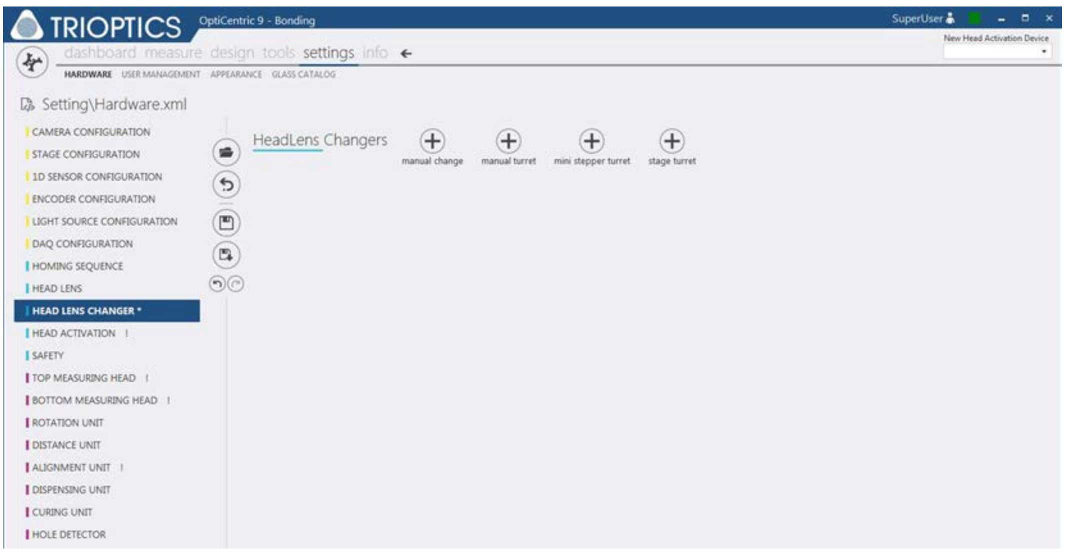


Fig. 112: Settings, objective changer

9.4.1 Setting up the manual change of the head lenses

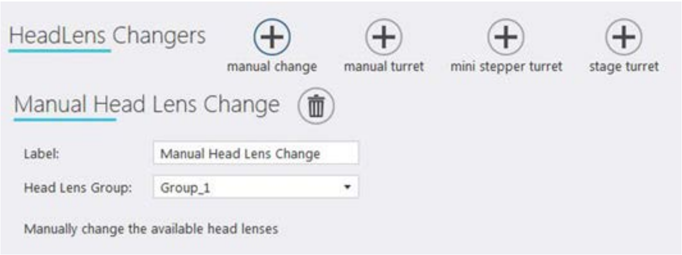


Fig. 113: Settings, setting up manual objective changer

1. Select `Add Manual Head Lens Change`.
2. Enter a name in the `Label` field.
3. Select the group of head lenses to be available for manual change.

9.4.2 Setting up manual objective changer

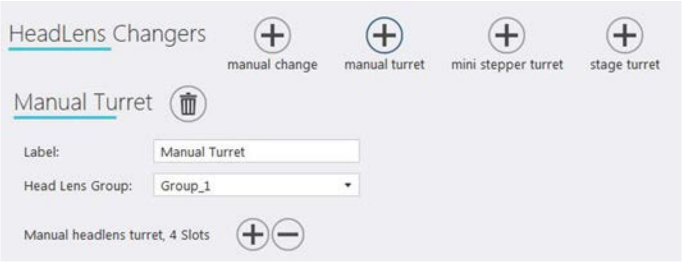


Fig. 114: Settings, setting up manual objective changer

1. Select `Add Manual Turret`.
2. Enter a name for the manual objective changer in the `Label` field.
3. In the `Head Lens Group` field, assign a group of head lenses to the manual objective changer which should be used to fill the objective changer.
4. Use the ⊕ / ⊖ `Add head lens slot` / `Remove head lens slot` buttons to set the number of slots that the objective changer has.

9.4.3 Setting up the mini stepper objective changer

The mini stepper objective changer is an older type of motorized objective changer.

To set up a mini stepper objective changer, proceed as follows:

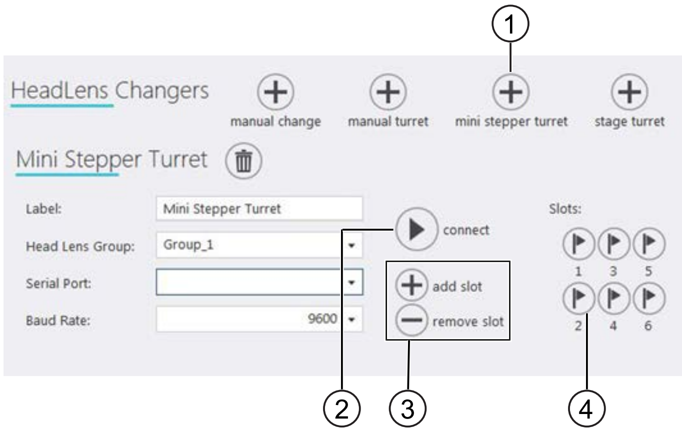


Fig. 115: Settings, Setting up the automatic objective changer (old design)

1. Select `Add MiniStepper Turret` **(1)**.
2. Enter a name for the objective changer in the `Label` field.
3. In the `Head Lens Group` field, assign a group of head lenses to the objective changer which should be used to fill the objective changer.
4. Use the `Add head lens slot` / `Remove head lens slot` buttons **(3)** to set the number of slots that the objective changer has.
5. In the `Serial Port` field, enter the port number used to control the objective changer.
6. In the `Baud Rate` field, enter the desired baud rate.
7. Make sure that the stage cable of the objective changer is not connected.
8. Click the `Connect head lens changer` button **(2)**.
9. The objective changer is now ready for operation.

NOTE

The assignment of the head lenses to a slot is determined during process configuration.

9.4.4 Setting up automatic objective changer

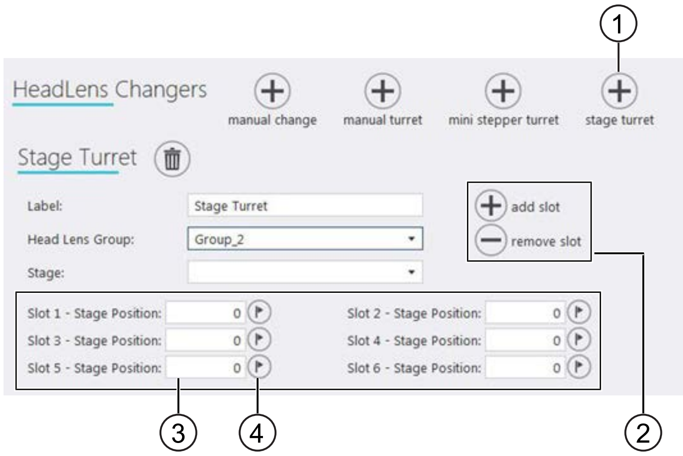


Fig. 116: Settings, setting up automatic objective changer

1. Select `Add Stage Turret` **(1)**.
2. Enter a name for the objective changer in the `Label` field.
3. In the `Head Lens Group` field, assign a group of head lenses to the objective changer which should be used to fill the objective changer.
   How to define groups of head lenses is described in the chapter.
4. In the `Stage` field, enter the port number used to control the objective changer.
5. Use the `Add head lens slot` / `Remove head lens slot` buttons **(2)** to set the number of slots that the objective changer has.
6. In the `Stage Position` field **(3)** enter a step value by which the objective changer is moved.
   ⇨ Experience has shown that an initial value for slot 1 of 7500 is reliable.
   ⇨ A value of 14100 is useful for the distance to the next slot.
7. Screw a head lens into slot 1 (recommended AMT 100).
8. Focus on the surface of the pre-centered surface.
9. Click on the `Move axis to this position` button **(4)** to bring slot 1 into the working position.
10. Check the position of the objective changer as described in chapter 8.2 "tools" menu <FIND CENTER>, page 133.
11. Make sure that the reticle is as close to the center of the camera window as possible.
12. If this is not the case, correct the step size in the `Stage Position` field.

13. Repeat these steps for the other slots. Always use the same head lens to do this.

NOTE

The assignment of the head lenses to a slot is determined during process configuration.

9.5 HARDWARE <TOP MEASURING HEAD> view

This section describes how to set up an additional measuring head as a hardware component.

NOTE

The description applies to the installation of both an upper and a lower measuring head.

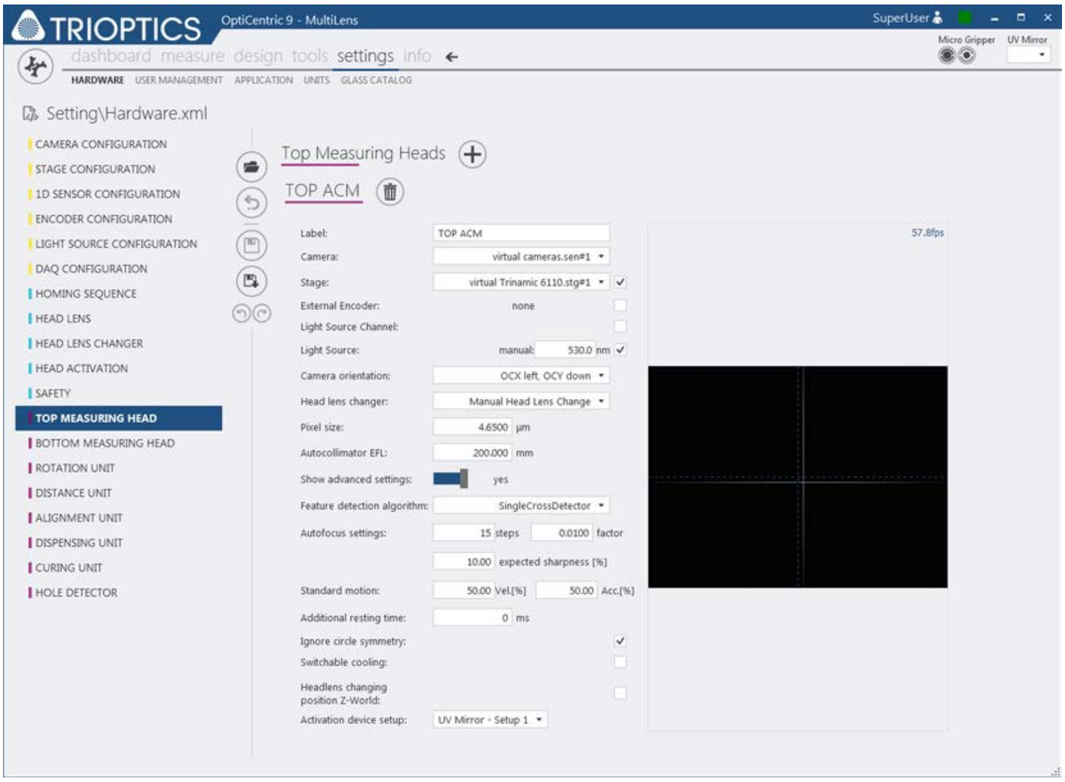


Fig. 117: HARDWARE settings, TOP MEASURING HEAD view

1. Select ⊕ `Add new measuring head`.
   ⇨ A new area for configuring the measuring head is created.
2. Set the following parameters for the measuring head:
   - `Label`: Enter a name for this measuring head. The measuring head can later be selected under this name in the various software menus.
   - `Camera`: Assign a camera.
   - `Stage`: Assign a positioning axis to the measuring head.
   - `External Encoder`:
   - `Light Source Channel`: Wavelength of the light source
   - `Camera orientation`: Orientation of the camera
   - `Head lens changer` (lens changer): Set the type of lens changer to be used with this measuring head.
   - `Pixel size`: Camera resolution
   - `Autocollimator EFL`: Effective focal length of the autocollimator used
3. Click `Save settings` to save the settings.

9.6 HARDWARE <BOTTOM MEASURING HEAD> view

The procedure for setting up a bottom measuring head is the same as for setting up a top measuring head (see *HARDWARE <TOP MEASURING HEAD> view [▸ 159]*).

9.7 HARDWARE <ROTATION UNIT> view

This section describes how to set up an additional rotation unit as a hardware component.

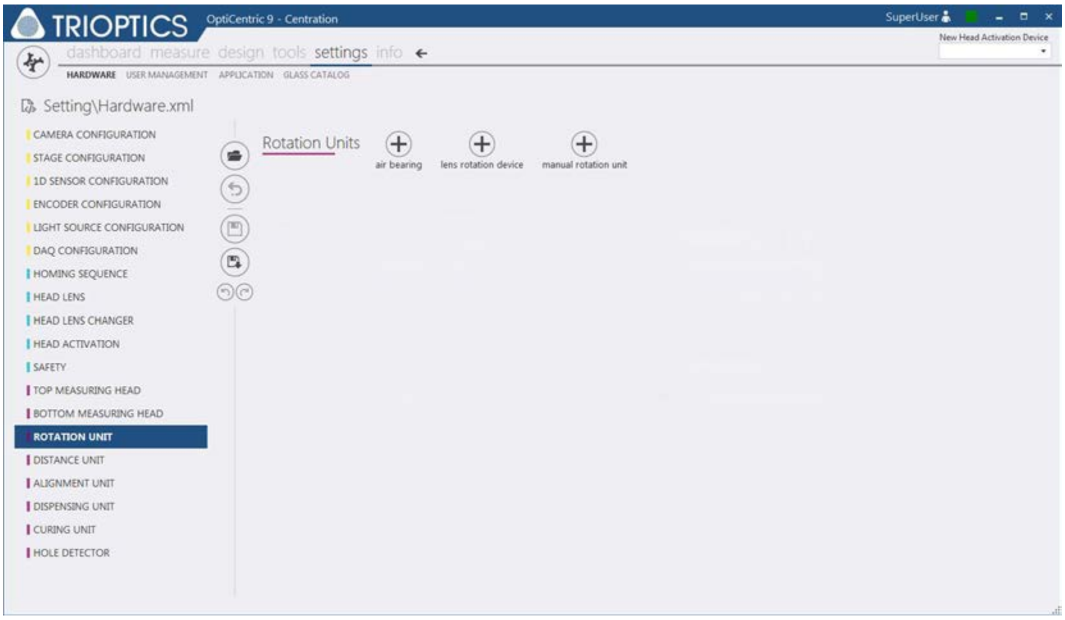


Fig. 118: HARDWARE settings, ROTATION UNITS view

Various systems are available as rotation devices. Which rotation device is actually available to you depends on the configuration of your measurement system.

Set up rotary air bearing

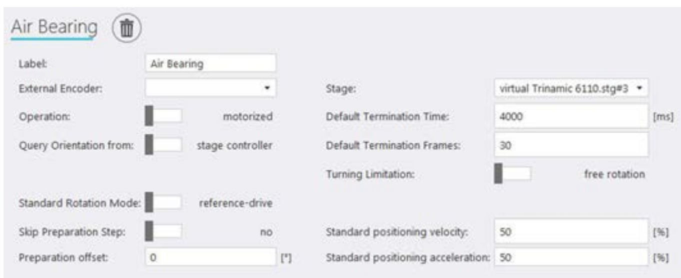


Fig. 119: HARDWARE settings, ROTATION UNITS view: Air Bearing

1. Select `Add air bearing` to set up a rotary air bearing as a hardware component.
   ⇨ An area for entering the parameters for the rotary air bearing is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the lens rotation device in this field. The lens rotation device can later be selected under this name in the various software menus.
   - `External Encoder`:

- `Operation`: The operating mode is set to `motor-ized` by default. Change the operating mode by clicking on the slide bar. In other words:
  : motorized operation is active
  : manual operation is active.
- `Query orientation from`
- `Standard Rotation Mode` The mode is set to `reference-drive` by default.
  Change the mode by clicking on the slide bar. In other words:
  : `reference-drive` is active
  : `positioning-drive` (rotate after target position) is active.
- `Skip Preparation Step`:
- `Preparation offset`:
- `Stage`:
- `Default Termination Time`:
- `Default Termination Frames`:
- `Turning Limitation`:
- `Turning Range`:
- `Standard positioning velocity`: In this field, enter the value with which the rotary air bearing is to be rotated by default when approaching certain positions. Indicated as a percentage of the maximum rotational speed.
- `Standard positioning acceleration`: In this field, enter the value with which the rotary air bearing is to be accelerated by default when approaching certain positions. Indicated as a percentage of the maximum rotational speed.

3. Click `Save settings` to save the settings.

Set up a lens rotation device

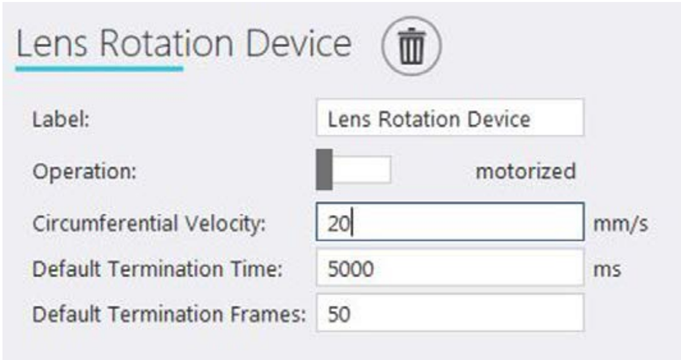


Fig. 120: HARDWARE settings, ROTATION UNITS view: Lens Rotation Device

1. Select `Add lens rotation device` to enter a lens rotation device as a hardware component.
   ⇨ An area for entering the parameters for the lens rotation device is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the lens rotation device in this field. The lens rotation device can later be selected under this name in the various software menus.
   - `Operation`: The operating mode is set to `motorized` by default. Change the operating mode by clicking on the slide bar. In other words:
     : motorized operation is active
     : manual operation is active.
   - `Circumferential Velocity` (average rotational speed):
   - `Default Termination Time` (default setting for time interval): In this field, enter the period of time after which the rotation process is finished.
   - `Default Termination Frames` (default setting for the number of steps): In this field, enter the number of steps after which the rotation process is finished.
3. Click `Save settings` to save the settings.

Set up manual rotation device

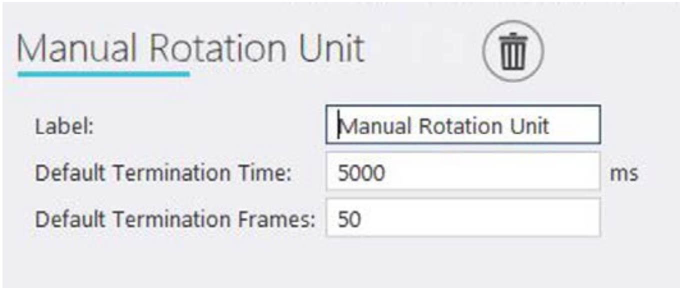


Fig. 121: HARDWARE settings, ROTATION UNITS view: Manual Rotation Unit

1. Select ⊕ `Add manual rotation unit` to enter a manual rotation device as a hardware component.
   ⇨ An area for entering the parameters for the manual rotation device is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the lens rotation device in this field. The lens rotation device can later be selected under this name in the various software menus.
   - `Default Termination Time` (default setting for time interval): In this field, enter the period of time after which the rotation process is finished.
   - `Default Termination Frames` (default setting for the number of steps): In this field, enter the number of steps after which the rotation process is finished.
3. Click `Save settings` to save the settings.

9.8 HARDWARE <DISTANCE UNIT> view

This section describes how to set up a distance sensor as a hardware component.

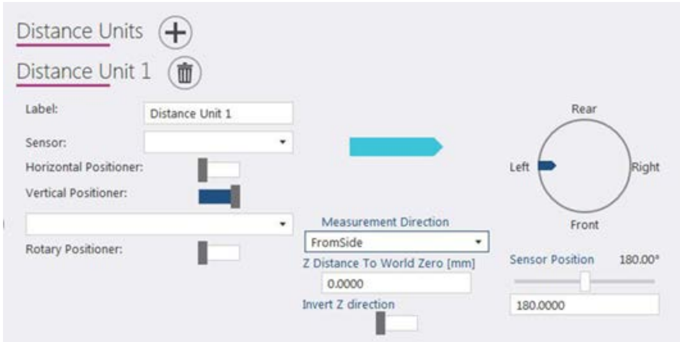


Fig. 122: HARDWARE settings, DISTANCE UNIT view

1. Select `Add new distance sensor` to set up a distance sensor as a hardware component.
   ⇨ An area for entering the parameters for the distance sensor is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the distance sensor in this field. The distance sensor can later be selected under this name in the various software menus.
   - `Sensor`: Select the sensor type used in this field.
   - `Horizontal Positioner` (horizontal positioning axis) / `Vertical Positioner` (vertical positioning axis): If the distance sensor is positioned by motor, activate the corresponding option by clicking on the slide bar. In other words:
     : The distance sensor is not positioned by motor in the horizontal / vertical direction.
     : The distance sensor is positioned by motor in the horizontal / vertical direction.
   - `Rotary Positioner` (azimuthal positioning axis): If the distance sensor is positioned by motor in the azimuthal direction, activate the option by clicking on the slide bar. In other words:
     : The distance sensor is not positioned by motor in the azimuthal direction.
     : The distance sensor is positioned by motor in the azimuthal direction.
3. Assign a Stage Controller positioning axis to each motorized axis.
4. Select the measurement direction in the `Measurement Direction` field.
   ⇨ The measuring direction is represented graphically by an arrow.

5. Enter the azimuth angle in the `Sensor Position` field.
   or:
   Adjust the angle using the scale.
6. Click `Save settings` to save the settings.

9.9 HARDWARE <ALIGNMENT UNIT> view

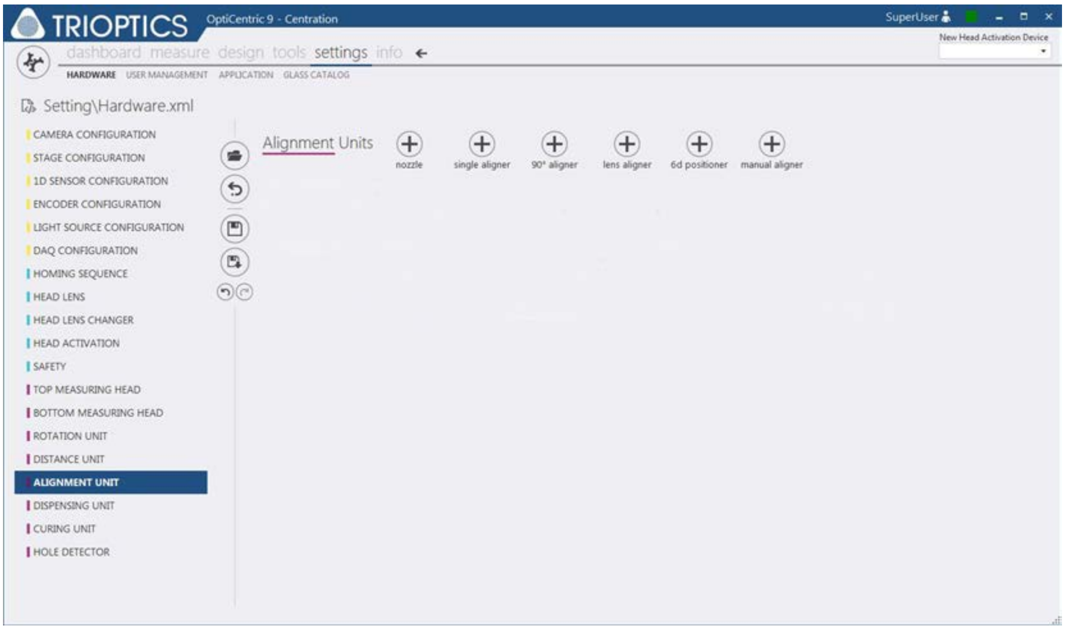


Fig. 123: Settings, ALIGNMENT UNIT view

Depending on the configuration of your measurement system, different systems for aligning lenses are available:

System	Alignment method
`Nozzle`	LensAlignment 2D Air
`Single aligner`	LensAlignment 2D Advanced
`90° Aligner`	LensAlignment 2D Standard
`Lens aligner`	LensAlignment 3D Bonding 3D
`6d Positioner`	LensAlignment 5D
`Manual Aligner`	Manual alignment

NOTE

Do not change system parameters!

All system settings in this register are preset at the factory and must not be changed without consulting TRIOPTICS.

9.10 HARDWARE <DISPENSING UNIT> view

This section describes how to set up a glue dispenser as a hardware component.

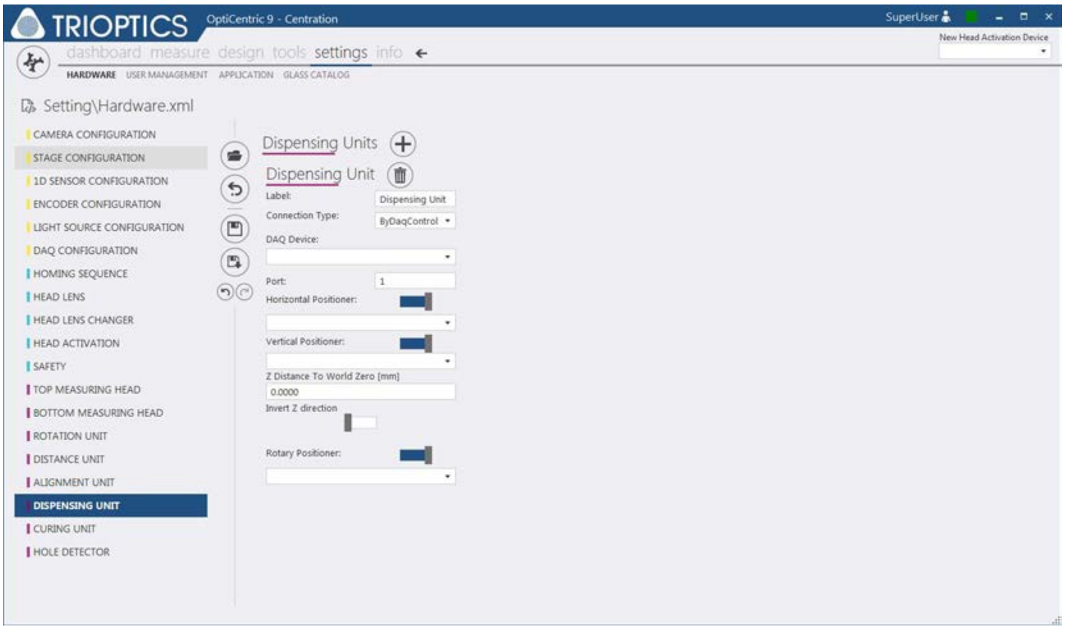


Fig. 124: HARDWARE settings, DISPENSING UNIT view

1. Select `Add new dispensing unit` to set up a glue dispenser as a hardware component.
   ⇨ An area for entering the parameters for the glue dispenser is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the glue dispenser in this field. The glue dispenser can later be selected under this name in the various software menus.
   - `Connection Type`: In this field, select the type of connection used to connect the glue dispenser to the measurement system.
   - `DAQ Device`:
   - `Port`: In this field, enter the port number via which the glue dispenser is connected to the measurement system.
   - `Horizontal Positioner` (horizontal positioning axis) / `Vertical Positioner` (vertical positioning axis): If the glue dispenser is positioned by motor, activate the corresponding option by clicking on the slide bar. In other words:
     : The glue dispenser is not positioned by motor in the horizontal / vertical direction.
     : The glue dispenser is positioned by motor in the horizontal / vertical direction.

- `Rotary Positioner` (azimuthal positioning axis): If the glue dispenser is positioned by motor in the azimuthal direction, activate the option by clicking on the slide bar. In other words:
  : The glue dispenser is not positioned by motor in the azimuthal direction.
  : The glue dispenser is positioned by motor in the azimuthal direction.

3. Assign a Stage Controller positioning axis to each motorized axis.
4. Click `Save settings` to save the settings.

9.11 HARDWARE <CURING UNIT> view

This section describes how to set up a UV lighting unit as a hardware component.

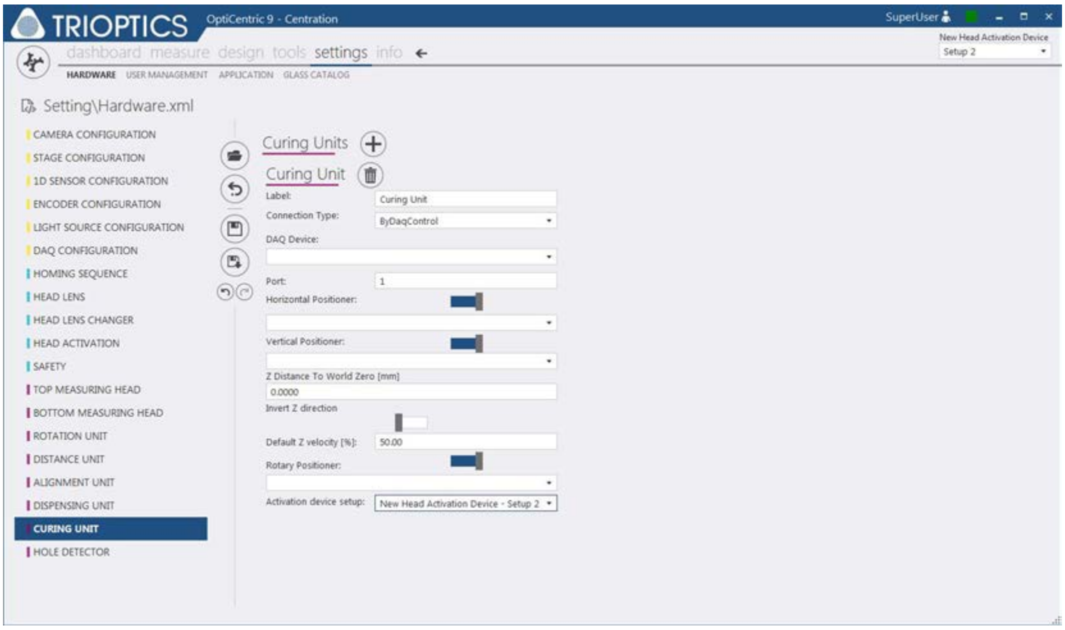


Fig. 125: HARDWARE settings, CURING UNIT view

1. Select `Add new curing unit` to set up a UV lighting unit as a hardware component.
   ⇨ An area for entering the parameters for the UV lighting unit is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the UV lighting unit in this field. The UV lighting unit can later be selected under this name in the various software menus.
   - `Connection Type`: In this field, select the type of connection used to connect the UV lighting unit to the measurement system.
   - `DAQ Device`:

- `Port`: In this field, enter the port number via which the UV lighting unit is connected to the measurement system.
- `Horizontal Positioner` (horizontal positioning axis) / `Vertical Positioner` (vertical positioning axis): If the UV lighting unit is positioned by motor, activate the corresponding option by clicking on the slide bar. In other words:

  : The UV lighting unit is not positioned by motor in the horizontal / vertical direction.

  : The UV lighting unit is positioned by motor in the horizontal / vertical direction.
- `Rotary Positioner` (azimuthal positioning axis): If the UV lighting unit is positioned by motor in the azimuthal direction, activate the option by clicking on the slide bar. In other words:

  : The UV lighting unit is not positioned by motor in the azimuthal direction.

  : The UV lighting unit is positioned by motor in the azimuthal direction.

3. Assign a Stage Controller positioning axis to each motorized axis.
4. Click `Save settings` to save the settings.

9.12 HARDWARE <HOLE DETECTOR> view

This section describes how to set up a hole detection sensor as a hardware component.

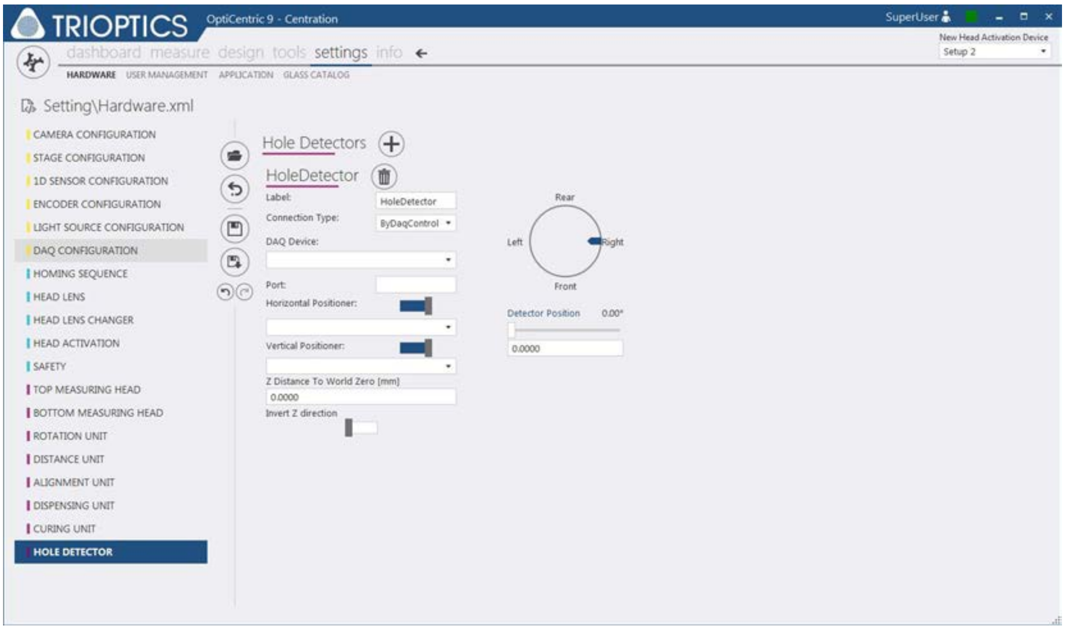


Fig. 126: HARDWARE settings, HOLE DETECTOR view

1. Select ⊕ `Add new hole detector` to set up a hole detection sensor as a hardware component.
   ⇨ An area for entering the parameters for the hole detection sensor is created.
2. Enter the following parameters:
   - `Label`: Enter a suitable name for the hole detection sensor in this field. The hole detection sensor can later be selected under this name in the various software menus.
   - `Connection Type`: In this field, select the type of connection used to connect the hole detection sensor to the measurement system.
   - `DAQ Device`:
   - `Port`: In this field, enter the port number via which the hole detection sensor is connected to the measurement system.
   - `Horizontal Positioner` (horizontal positioning axis) / `Vertical Positioner` (vertical positioning axis): If the hole detection sensor is positioned by motor, activate the corresponding option by clicking on the slide bar. In other words:
     : The hole detection sensor is not positioned by motor in the horizontal / vertical direction.
     : The hole detection sensor is positioned by motor in the horizontal / vertical direction.
   - `Detector Position` (azimuthal position of the hole detection sensor): Enter the azimuth angle in this field.
     or:
     Adjust the angle using the scale.
     The position of the hole detection sensor is displayed in the graphical view.
3. Assign a Stage Controller positioning axis to each motorized axis.
4. Click `Save settings` to save the settings.

9.13 USER MANAGEMENT

This section describes how to create user profiles and manage user rights.

9.13.1 Create user

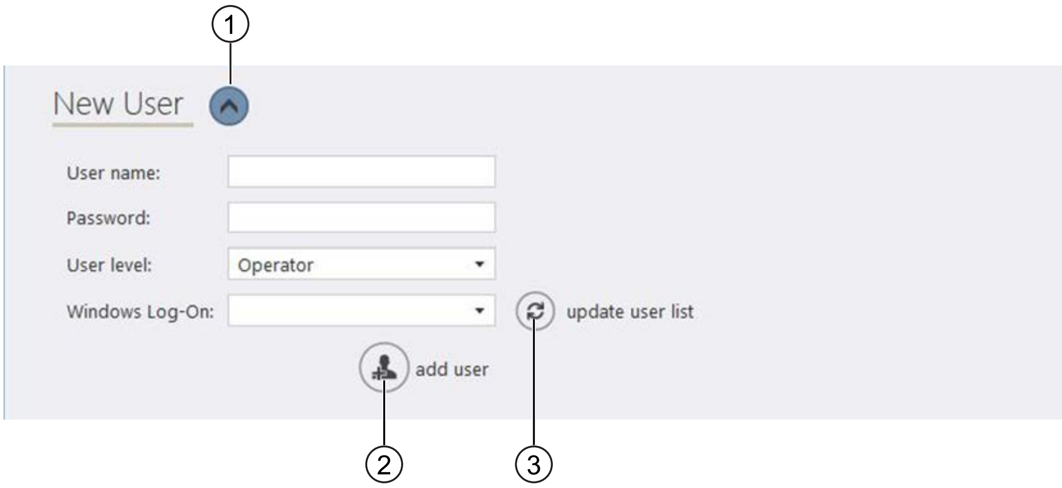


Fig. 127: User management: Create new user profile

1. If necessary, click `Log In` and log in as an administrator.
2. Select `show/hide new user` **(1)** to open the dialog for creating a new user profile.
3. Assign a user name and password to the user for whom you are creating the user account.
4. Assign a user level to the user account.
5. Select whether you want to use the Windows logon.

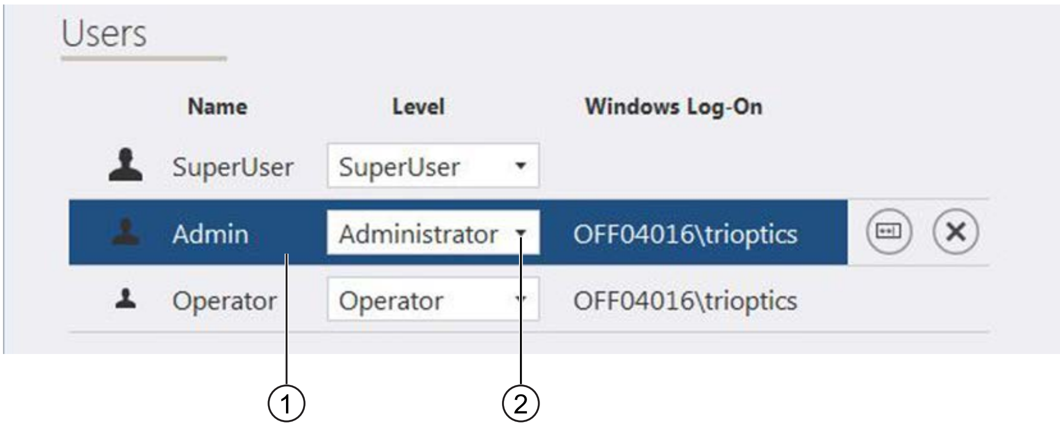
NOTE

If you select this option, you will be automatically logged in with your Windows authentication when the software starts.

6. Click on `add user` **(2)**.
7. Click `update user list` **(3)** to display the new user profile in the list of registered users.

⇨ The new user profile has now been created.

9.13.2 Assign user rights



1. If necessary, click `Log In` and log in as an administrator.
2. In the list, select the user for whom you want to change the user rights **(1)**.
3. In the Level area, select the user level that you want to assign to the user **(2)**.

⇨ This completes changing the user rights.

9.13.3 Change password

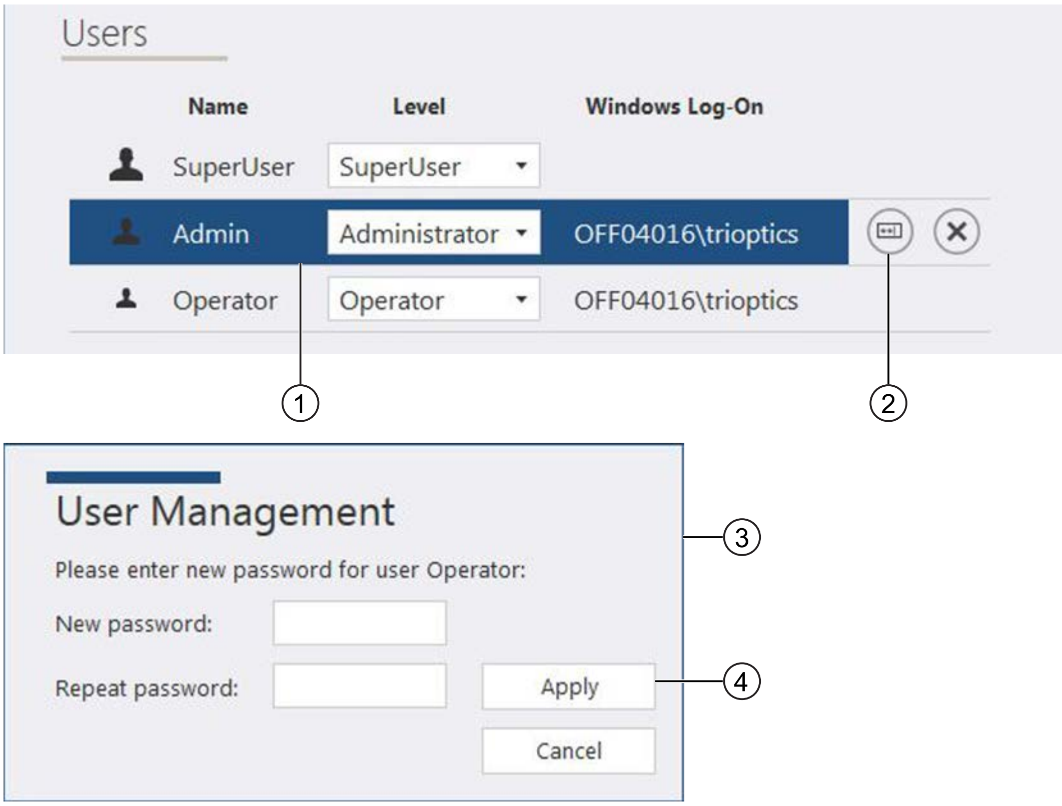


Fig. 128: User management: Change password

1. If necessary, click `Log In` and log in as an administrator.
2. In the list, select the user for whom you want to change the password **(1)**.
3. Select `change password` **(2)**.
4. The view for entering the password **(3)** opens:
   - `New password`: Enter the password.
   - `Repeat password`: Repeat the password.
5. Click <`Apply`> **(4)**.

⇨ The password has been changed.

9.14 Application (APPEARANCE)

This section describes how to set the display options that are applied each time the software is started.

During operation, you can change individual options manually (using keyboard shortcuts)

Language

In this area you can set the language in which the user interface is displayed by default.

NOTE

Which languages are available depends on your device configuration.

Color scheme

In this area, you can set the background color that is applied by default when the software starts.

You can choose between a light and dark background.

NOTE

A dark background is suitable if the measurement system is used in a darkened laboratory.

Full screen mode

In this area you can set the default mode in which your software is started.

You can choose between windowed mode and full screen mode.

Application Folders

In this area you can set the directories in which your data is stored by default.

You can manually select a different directory each time you save.

The following directories must be defined:

Directory	Type of data
Common data folder	
Tray folder	
Design folder	Design files
Calibration folder	
Process folder	Configuration files for measurement processes

Hotkeys

The available keyboard shortcuts are listed here.

For more information on the keyboard shortcuts available, see .

9.15 Glass catalog

This section describes how to create or change entries in the glass database.

9.15.1 Create a new glass type

If a glass type is not yet available in the glass catalog, you can add it as a new glass type. To do so, proceed as follows:

1. Select `<settings><GLASS CATALOG>` to open the glass database.
2. Select the `Add new glass type` button.
   ⇨ The following view is opened:

1. Enter a name for the glass type in the `Glass Type` field.
2. Assign a manufacturer and a dispersion equation to the glass type.
3. Click the Add button.
   ⇨ The new glass type is added to the catalog

9.15.2 Edit glass properties

You can change the properties of a glass type as follows:

1. Select <settings><GLASS CATALOG> to open the glass database.
2. Select the `Edit glass properties` button.
   ⇨ The following view is opened:

1. Change the required parameters.

9.15.3 Mark glass type as a favorite

You can mark frequently used glass types as favorites. Later, you can narrow down the drop-down list by activating the `Favorites only` option.

To mark a glass type as a favorite, proceed as follows:

1. Select <settings><GLASS CATALOG> to open the glass database.
2. Select the desired glass type in the drop-down list.
3. Click `Toggle favorite flag of selected glass type` to mark the glass type as a favorite.
   ⇨ The glass type is now displayed in the drop-down list with an asterisk **(2)**.

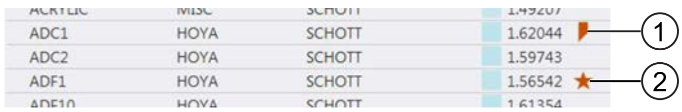


Fig. 129: Glass catalog, mark favorites and default

4. Click `Save catalog` to save these settings.

9.15.4 Set glass type as standard

You can set a glass type as the default. Later, you can assign this glass type to a surface in the optical design without further searching in the glass database.

To mark a glass type as default, proceed as follows:

Select `<settings><GLASS CATALOG>` to open the glass database.

Select the desired glass type in the drop-down list.

Click to accept the glass type as a default setting. The glass type is now displayed in the drop-down list with a red marking **(1)**.

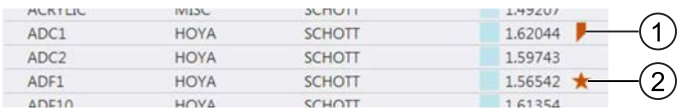


Fig. 130: Glass catalog, mark favorites and default

Click `save glass catalog` to save these settings.

9.15.5 Filters in the glass catalog

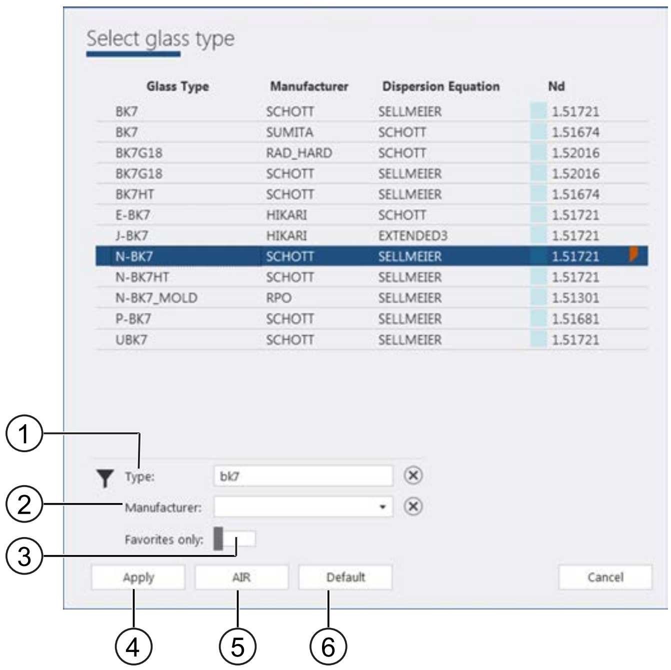


Fig. 131: Glass catalog, filters

If you want to assign a glass type to an optical surface when creating an optical design, first all glass types entered in the glass catalog are displayed. You can narrow down the selection using various filter functions.

Filtering by glass type

1. In the `Type` field **(1)**, you can filter by glass type name. Enter the full or partial glass type name into the search field.
   ⇨ When a partial entry is made, the system will automatically list all glass types the names of which include the entered string of characters.
2. Press **Enter** to start the search.
3. Select the desired entry.
4. To accept the selection, press **Enter** or select `Apply` **(4)**.

Filtering by manufacturer

1. In the `Manufacturer` field **(2)**, you can filter by manufacturer. To do so, enter the full or partial manufacturer name into the search field.
   ⇨ When a partial entry is made, the system will automatically list all manufacturers the names of which include the entered string of characters.
2. Press **Enter** to start the search.
3. Select the desired entry.
4. To accept the selection, press **Enter** or select `Apply` **(4)**.

Filtering by favorites

You can limit the selection by displaying only the glass types marked as favorites.

1. Activate the option `Favorites only` **(3)**.
2. Select the desired entry.
3. Press **Enter** or select **Apply** `(4)` to apply the selection.

Assigning the default glass type

You can assign the glass type defined as default in the glass database to a surface without searching.

– Select Default **(6)**, to assign the default glass type to the surface.

Refer to *Set glass type as standard [▸ 177]* for information on how to define a glass type as default.

Assigning a refractive index for air

If there is a gap between two lenses in a multi-lens optical system, this gap must be assigned the refractive index for air.

– Select `AIR` **(5)** to assign the refractive index for air to the surface.

10 TOOLS

The OptiCentric® 9 software offers various tools in order to be able to calibrate individual components of the measurement system.

NOTE

In addition to calibration, there are also tools for fast alignment of the sample to a reference axis. No storable configurations or measurement data are generated.

– Only use the process configuration within the measuring modules for measurement and production tasks.

10.1 FIND CENTER

This tool allows you to align the sample to the rotation axis independently of a measuring process. No measurement data is generated.

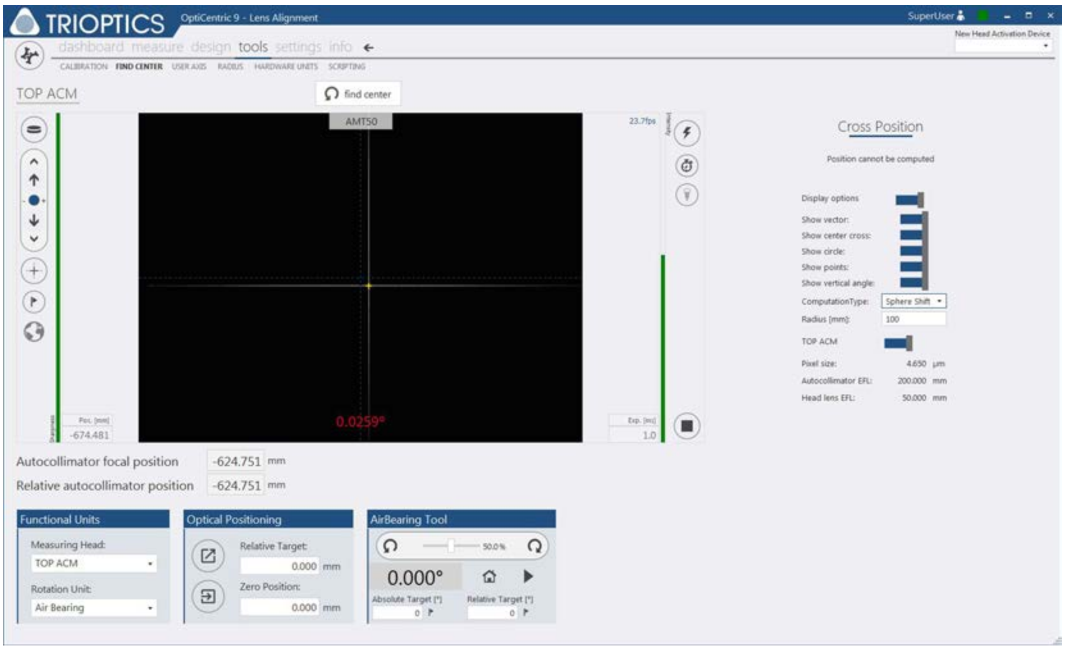


Fig. 132: Tools: Find Center

1. In the `Functional Units` area, select the hardware components used.
2. Focus on the surface of the sample. To do this, follow the steps as described in ......
3. Click `find center`.
4. The air bearing performs one rotation.
5. The impact circle is displayed in the camera window.
6. Align the sample to the axis rotation. To do this, proceed as described in the hardware manual of your measurement system.

10.2 CALIBRATION

This section describes the tools for calibrating the measurement system.

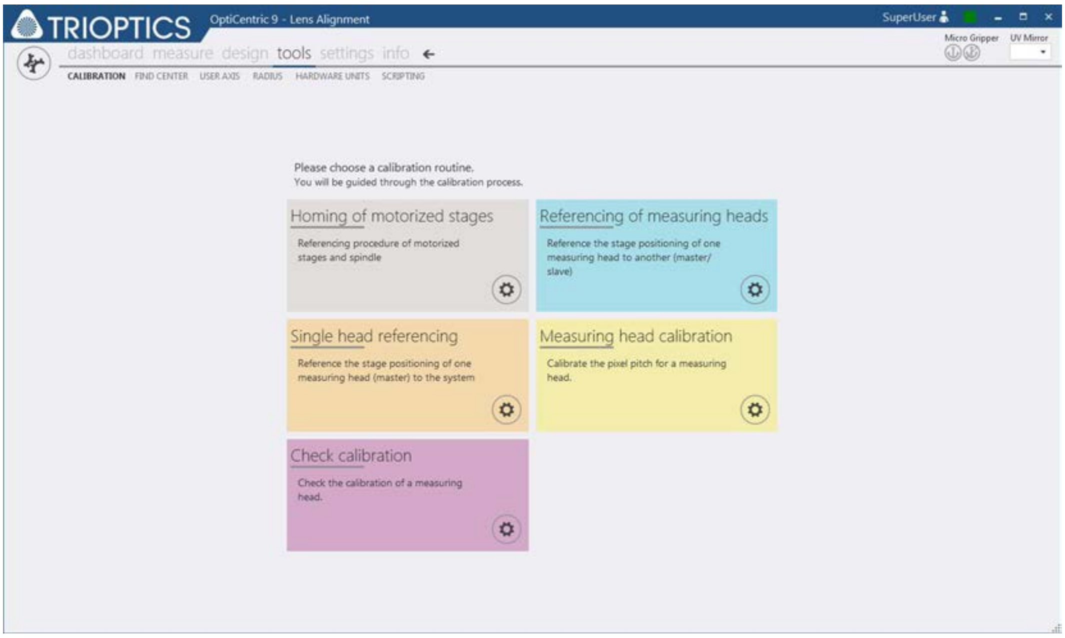


Fig. 133: Utility programs: Selection

Calibration of the measurement system should be carried out in the following order:

1	**Referencing of motorized stages** Referencing of the motorized axes Referencing of the axes must always be performed when the measurement system is switched on, after an emergency stop or, if necessary, after a reboot of the software.
2	**Measuring Head Calibration** Alignment of the camera to the optical axis In dual measurement systems, this step must be performed for both the upper and the lower measurement head.
3	**Check Calibration** Check the alignment of the camera to the optical axis.
4	**Single Head Referencing** Define the origin of the world coordinate system and reference the measuring head to the world coordinate system. In dual measurement systems, the first measurement head (master) is referenced here.
5	**Referencing of Measuring Heads** In dual measurement systems, reference the second measurement head (slave) to the world coordinate system. The requirement here is that the first measurement head (master) has already been referenced **(4)**.

10.2.1 Homing of motorized stages

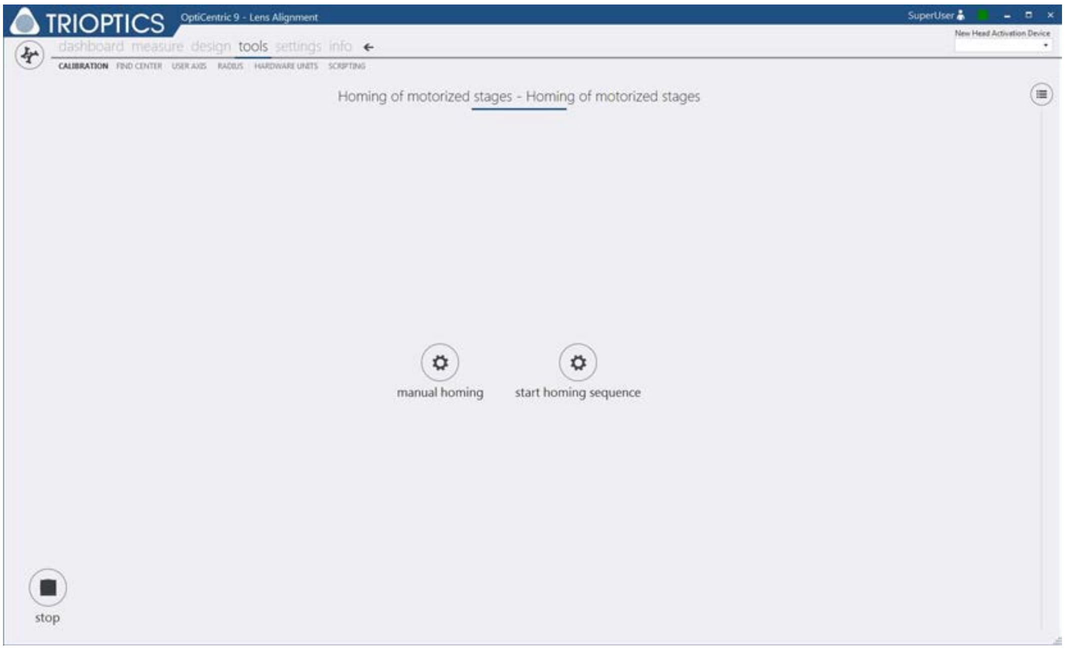


Fig. 134: Tools: Calibration, homing stages

This program allows you to start a reference cycle during operation.

The following options are available:

- Perform zero point search for all axes
- Perform zero point search for individual axes only

Zero point search for all axes

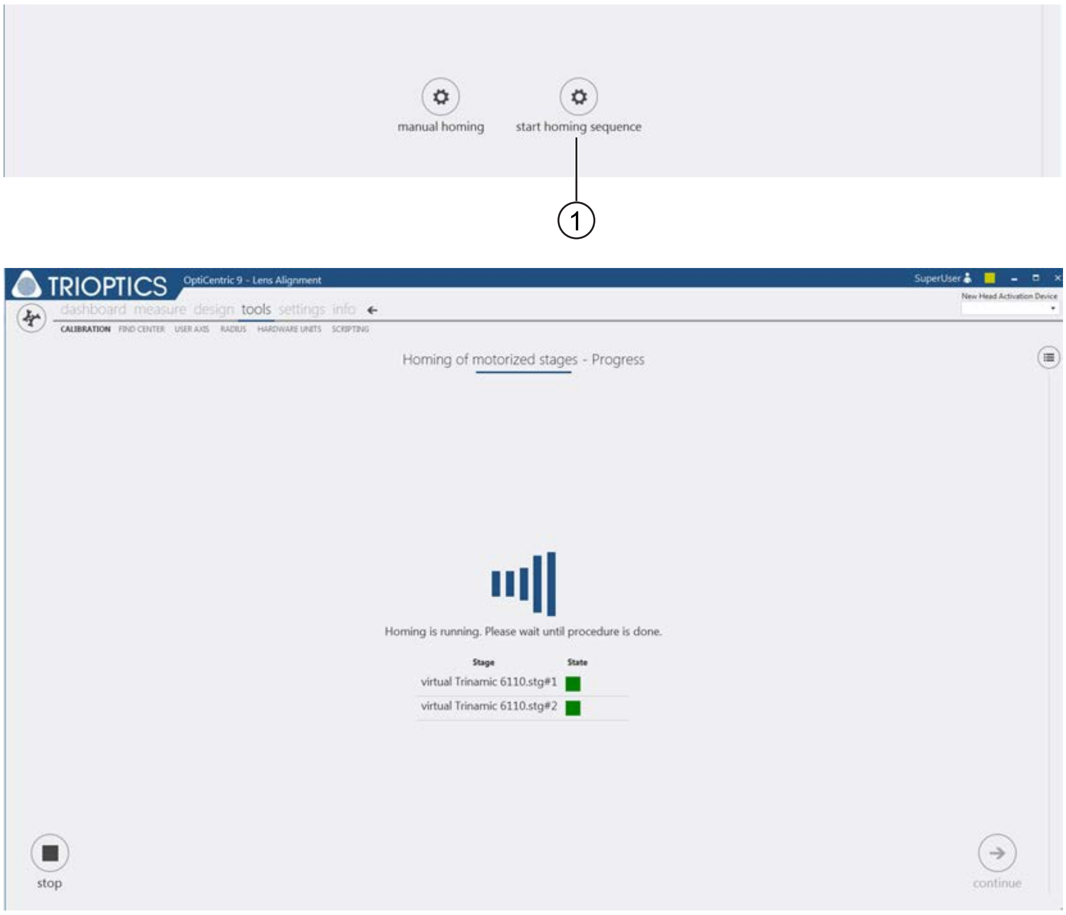


Fig. 135: Tools: Calibration, homing stages (all axes)

1. Select `start homing sequence` **(1)**.

⇨ The reference cycle starts as configured in the hardware settings.

⇨ When the zero point search is finished, a list of all motorized axes and their status is displayed. A successful zero point search is marked with the symbol.

Zero point search for individual axes

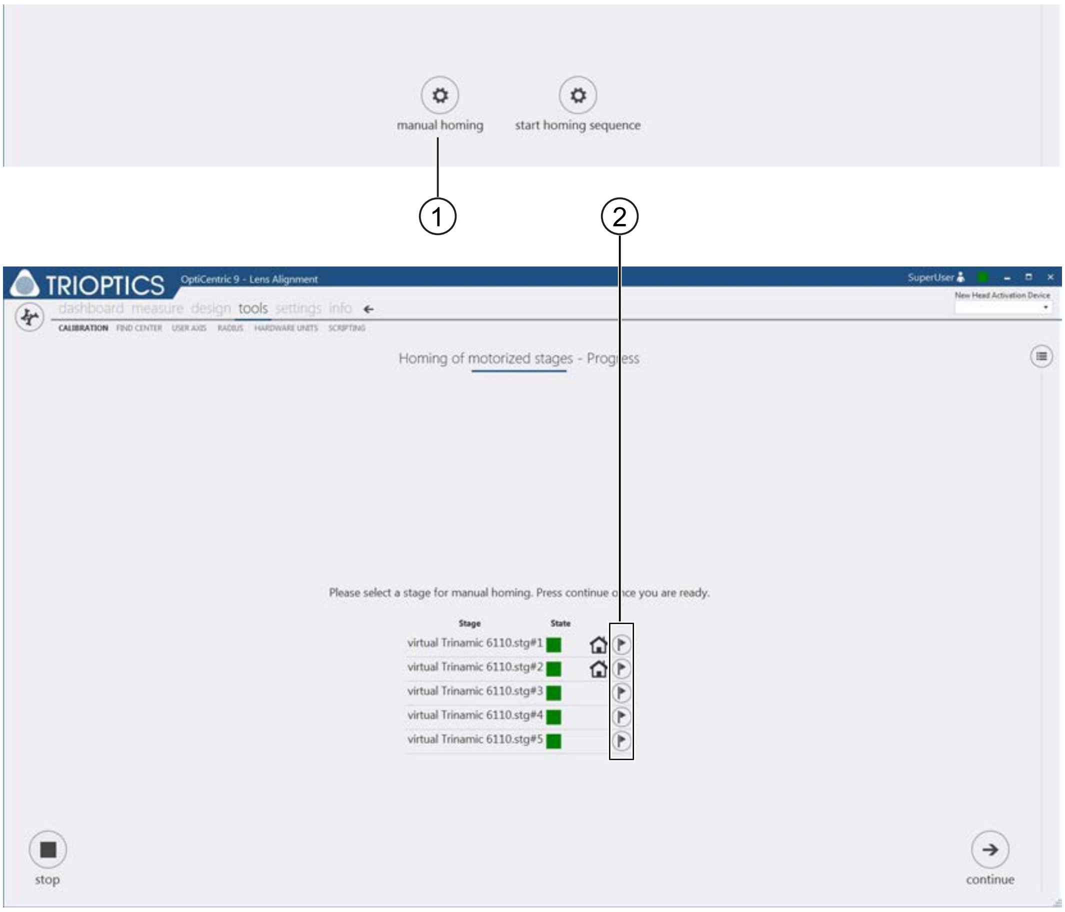


Fig. 136: Tools: Calibration, homing stages (manual)

During the setup phase, it may be necessary to reference individual axes, for example, if they have lost their position.

1. Select `manual homing` **(1)**.
   ⇨ A list of all motorized axes and their status is displayed.
2. Click `perform homing for this stage` **(2)** for the desired axis.
   ⇨ The zero point search for this axis starts.
   ⇨ When the zero point search has been successfully completed, the entry for the corresponding axis is marked with the symbol.

10.2.2 Measuring head calibration

This tool allows you to align the camera of a measuring head to the optical axis. In dual measurement systems, this step must be performed for each measuring head.

Required tool

- Reference wedge

NOTE

An incorrect head lens leads to incorrect calibration results and consequently to incorrect measurement results.

– Make sure that the actual focal length of the head lens (FFL) is the same as the nominal focal length.

– Only use calibrated head lenses to reference the measuring head in the world coordinate system.

NOTE

The wavelength of the light source used must be set correctly for each measuring head in the settings (<`Settings`> <`Hardware`>). Otherwise an incorrect refractive index is used for the material of the calibration wedge and the measurements are wrong.

– Make sure that the wavelength configured in the hardware settings of the measuring head matches the wavelength of the light source actually used.

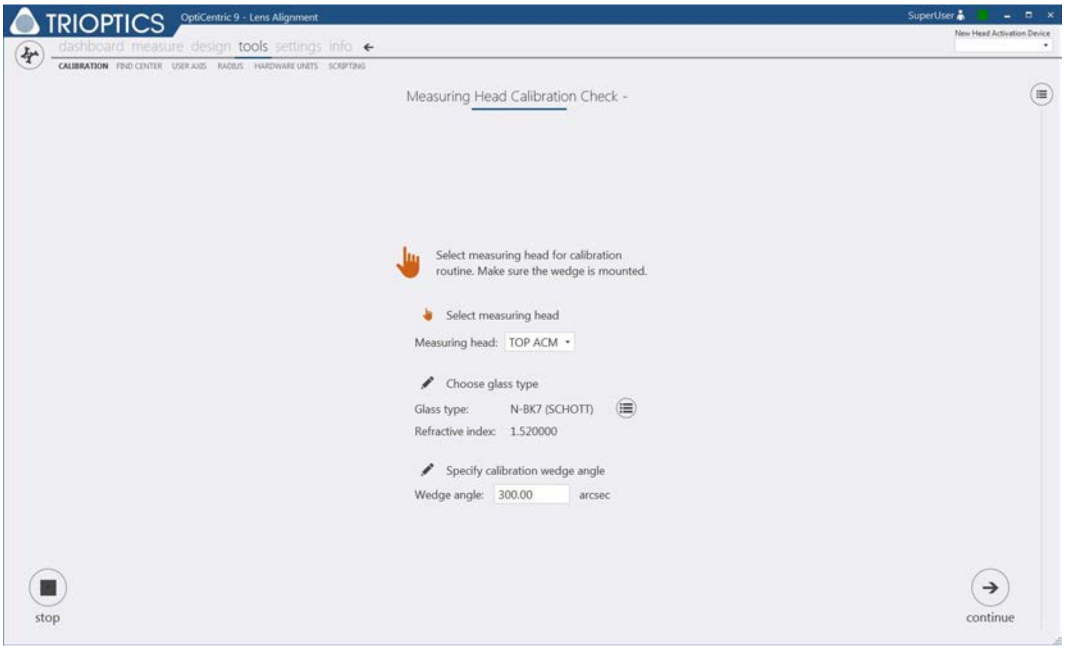


Fig. 137: Tools: Measuring Head Calibration Check

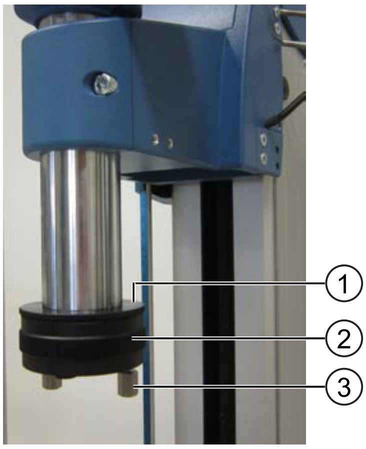
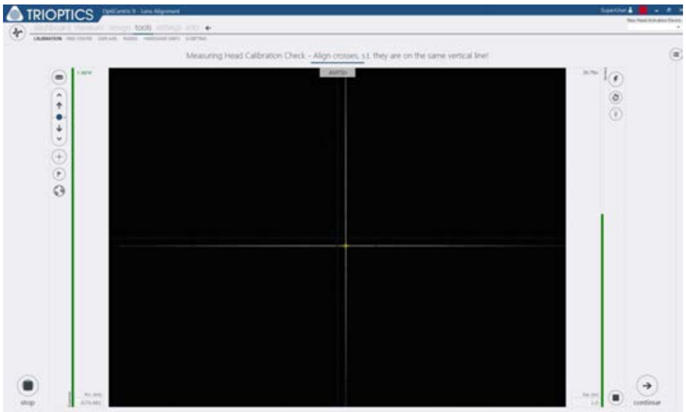


Fig. 138: Reference wedge

1. Remove the head lens from the collimator.
2. If you are using a lens changer:
   Move the lens changer to a position without head lens. Change the settings for the head lens to `NONE (ACM)`. To do this, follow the steps as described in *Changing head lenses [▸ 39]*.
3. Screw the calibration wedge **(1)** onto the collimator or into the slot of the lens changer.
4. Select <`Tools`> <`CALIBRATION`> <`Measuring Head Calibration`>.
5. Select the measuring head you want to check.
6. Enter the following values:
   - `Glass type`: Glass type (see calibration wedge specification)
     If the glass type displayed does not correspond to the glass type used: Click the `Change glass type` button to open the glass catalog.
   - `Wedge angle (arcsec)`: Wedge angle (refer to the specifications of the reference wedge)
   - `EFL Telescope`: nominal EFL of the autocollimator
7. Click `continue`.
   ⇨ In the camera window you can see a double cross, which consists of a reflection from the upper and a reflection from the lower surface of the calibration wedge.
   ⇨ The aim of this calibration is to superimpose both reflections in the horizontal and vertical direction (the camera looks at the optical axis).

View A



View B

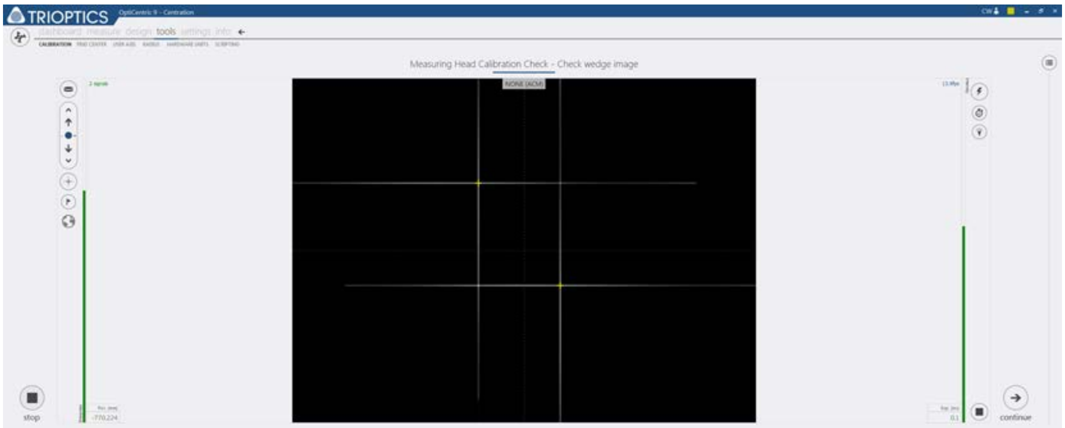


Fig. 139: Tools: Measuring head calibration check, check calibration (camera view)

8. Turn the X-Y adjusting screws of the calibration wedge **(3)** so that the lines of the two reflections lie horizontally in one plane.
9. Turn the calibration wedge by 90° using the knurled ring **(2)**.
10. Turn the X-Y adjusting screws of the calibration wedge (3) so that the lines of the two reflections lie vertically in one plane.
11. If necessary, correct the exposure time.
12. Click `Continue`.

    ⇨ The results of the calibration are displayed.

13. Click `Apply and return` to apply the calibration values.

    ⇨ The following message appears: "`The calibration values were updated.`".

⇨ This completes the calibration of the measuring head.

10.2.3 Check Calibration

This tool allows you to check the alignment described in *Measuring head calibration [▸ 185]* of the camera of a measuring head to the optical axis.

The two reflections of the calibration wedge are pulled apart horizontally and vertically so that a double cross can be seen in the camera window. The system measures the distance between the horizontal and vertical lines and from this calculates the wedge angle of the calibration wedge. The measured wedge angle must correspond to the specifications of the calibration wedge.

The values are known for a reference sample. The reference values are compared with the values determined with the measurement system.

To ensure proper functioning and consistent accuracy of the measurement system, TRIOPTICS recommends a regular performance check. In this way, changes to the measurement system can be detected over a longer period of time.

Required tool

- Calibration wedge
  or:
- Reference sample

Reference sample

You can obtain a reference sample from the measurement system manufacturer. This sample is especially certified and provides the same values under consistent measurement conditions.

However, you may also use your own sample for regular testing, for which you know the exact measurement values.

NOTE

In order to obtain consistent measurement results, the reference sample must always be stored under the same ambient conditions.

Test procedure

NOTE

An incorrect head lens leads to incorrect calibration results and consequently to incorrect measurement results.

– Make sure that the actual focal length of the head lens (FFL) is the same as the nominal focal length.
– Only use calibrated head lenses to reference the measuring head in the world coordinate system.

NOTE

The wavelength of the light source used must be set correctly for each measuring head in the settings (<`Settings`> <`Hardware`>). Otherwise an incorrect refractive index is used for the material of the calibration wedge and the measurements are wrong.

– Make sure that the wavelength configured in the hardware settings of the measuring head matches the wavelength of the light source actually used.

1. Remove the head lens from the collimator.
2. If you are using a lens changer:
   Move the lens changer to a position without head lens.
   Change the settings for the head lens to `NONE (ACM)`. To do this, follow the steps as described in *Changing head lenses [▸ 39]*.
3. Screw the calibration wedge **(1)** onto the collimator or into the slot of the lens changer.
4. Select <`tools`> <`CALIBRATION`> <`Check Calibration`>.

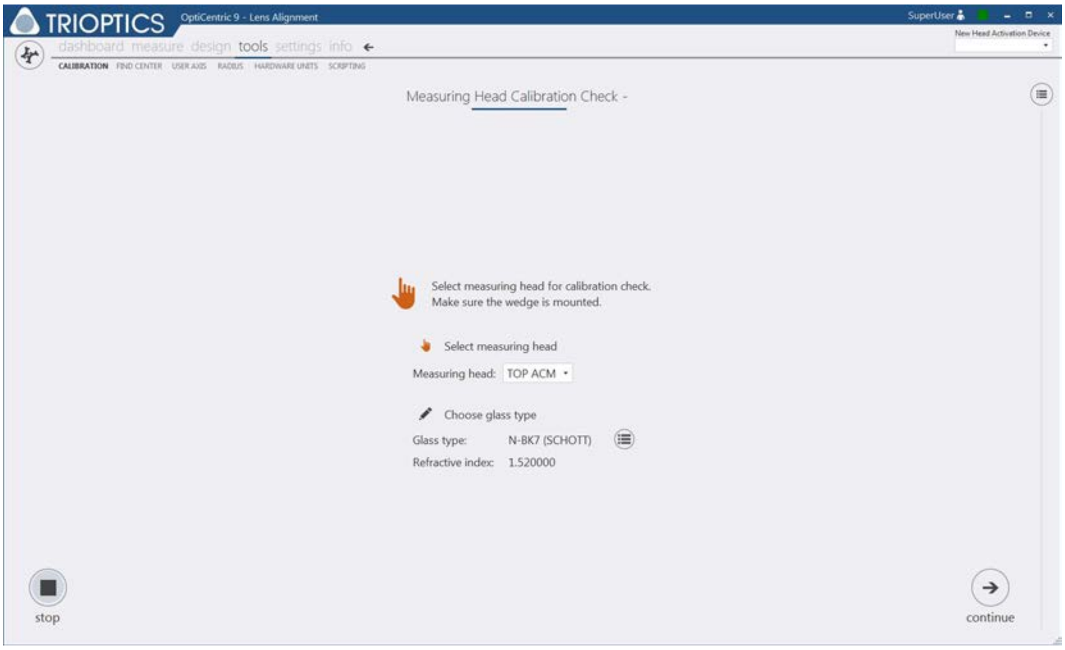


Fig. 140: Tools: Check calibration, select measuring head

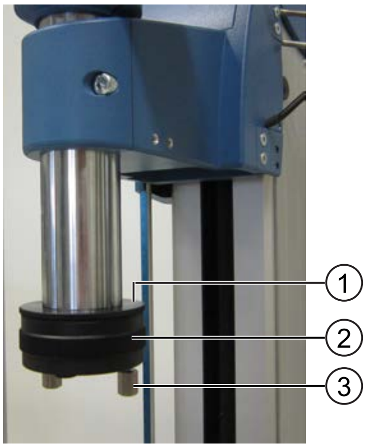
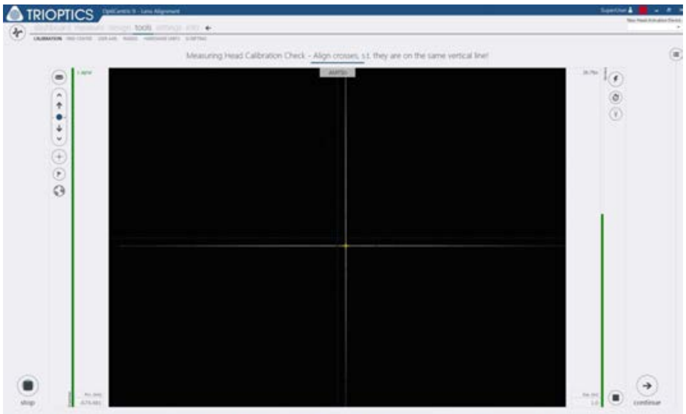


Fig. 141: Reference wedge

5. Under `Measuring head`, select the measuring head whose calibration you want to check.
6. In the `Choose glass type` area, set the glass type used (see specification of the calibration wedge).
7. Make sure that the wavelength configured in the hardware settings matches the wavelength of the light source actually used. If necessary, change the entry in the hardware settings (see *HARDWARE <TOP MEASURING HEAD> view [▸ 159]*).
8. Click the `continue` button.
   ⇨ A reticle is displayed in the camera window. Both reflections of the calibration wedge lie on top of each other (**view A**).

View A



View B

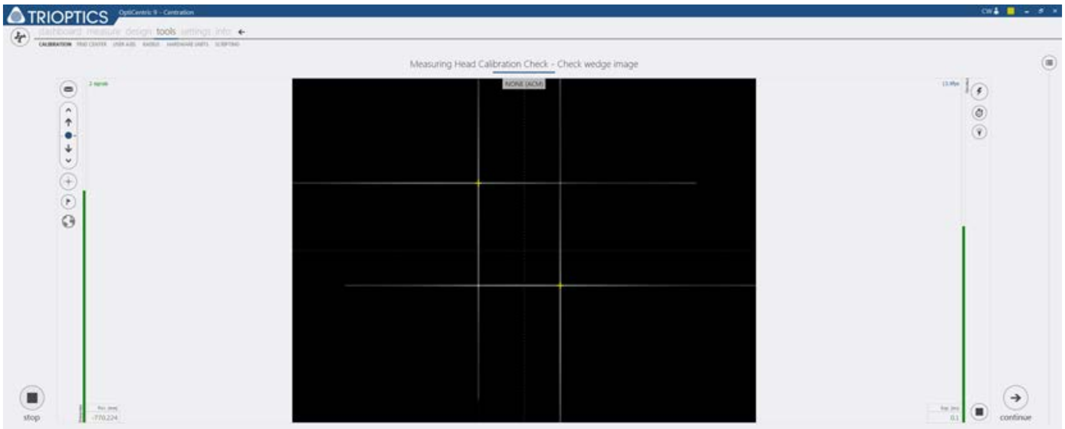


Fig. 142: Tools: Measuring head calibration check, check calibration (camera view)

9. Change the settings for the head lens to `NONE (ACM)`. To do this, follow the steps as described in *Changing head lenses [▸ 39]*.
10. Turn the X-Y adjusting screws **(3)** of the calibration wedge so that a double cross is visible in the camera window (**view B**).
    - ⇨ The double cross consists of a reflection from the upper and a reflection from the lower surface of the calibration wedge. The system calculates the wedge angle of the calibration wedge from the distance between the two crosses. This must correspond to the specifications of the calibration wedge.
11. Click the `continue` button.
    - ⇨ The wedge angle is measured.

Fig. 143: Check calibration, query

⇨ You are asked whether the measurement should be repeated.
In order to largely compensate for random errors in the measurement and to determine the standard deviation, we recommend to perform approx. 10 repetitions. Answer the query with `YES`.

12. In order to largely compensate for random errors during a measurement, we recommend performing at least 10 measurements. Answer the query with "`YES`".

13. To end the measuring procedure, answer the last query with "`No`".

⇨ An overview with the individual measurement results is displayed.

Fig. 144: Tools: Check calibration, results

⇨ You have the option of exporting the calibration results. The following formats are available:

14. Select `export csv` to export the calibration results to a *.csv file.
or:
Select `export pdf` to export the calibration results to a *.pdf file.
or:
Select `export xlsx` to export the calibration results to a *.xlsx file.

⇨ This completes the check of the measuring head calibration.

Deviations

1. Compare the measurement results with the specification of the calibration wedge or the reference values of the reference sample.

NOTE

The deviation should be less than 1 arcsec.

2. If you detect deviations, first check the ambient conditions and repeat the test procedure if necessary.

NOTE

If there are significant deviations in the measurement results, the measurement system must be calibrated.

A detailed description of the calibration process can be found in the software and measurement description.

Archiving

– Carefully check and archive the measurement results.
– Carefully store the printouts of the readings of the performance check.

10.2.4 Single head referencing

This tool allows you to reference the primary measuring head (master) to the world coordinate system (define the zero position for this measuring head).

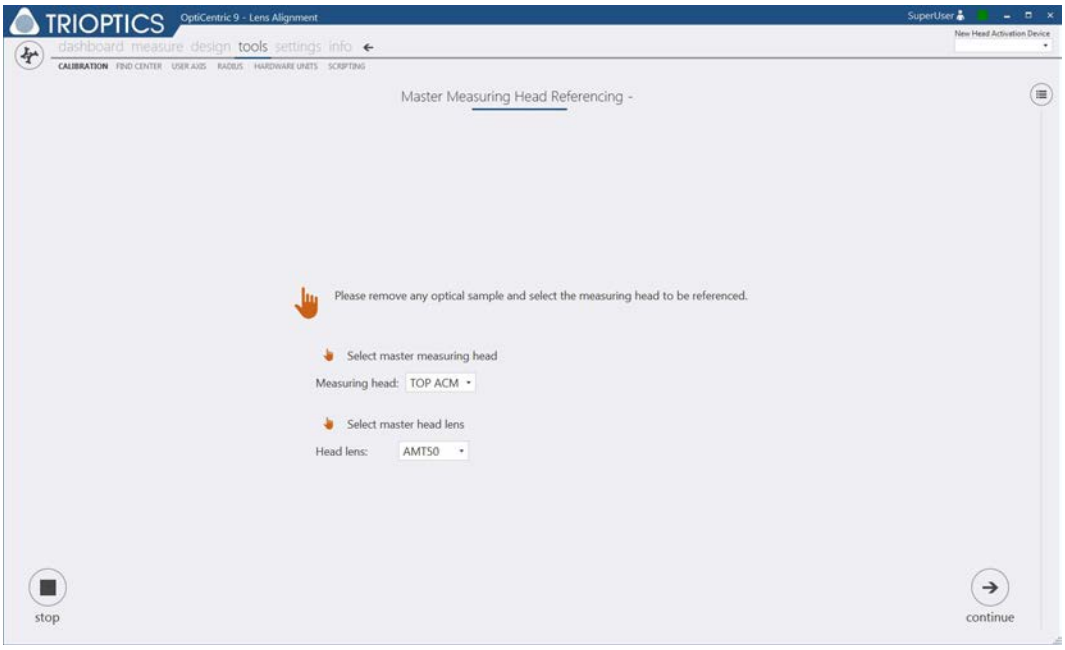


Fig. 145: Tools: Single Head Referencing, define primary measuring head

1. Select <`tools`> <`CALIBRATION`> <`Single head referencing`>
2. In the `Select master measuring head` area, select the measuring head that you want to reference as the primary measuring head.
3. In the `Select master head lens` area, select a suitable head lens.
   ⇨ With motorized lens changers, the lens changer moves to the change position and the head lens moves to the working position.

NOTE

An incorrect head lens leads to incorrect calibration results and consequently to incorrect measurement results.

– Make sure that the actual focal length of the head lens (FFL) is the same as the nominal focal length.
– Only use calibrated head lenses to reference the measuring head in the world coordinate system.

1. Select `Continue`.
2. Measure the position at which the measuring head is currently located.
   ⇨ The distance from the plane on which the zero point is to lie to the contact surface of the head lens is measured (corresponds to the flange of the collimator).
3. Enter the measured value. Note the preceding positive or negative sign.
4. Check the settings by focusing on the surface selected as the zero position.
   ⇨ The Z-coordinate "zero" must be displayed as the result.
   ⇨ When the referencing of the measuring head has been successfully completed, a summary with the determined positions is displayed.
5. Click `apply and return` to apply these positions.

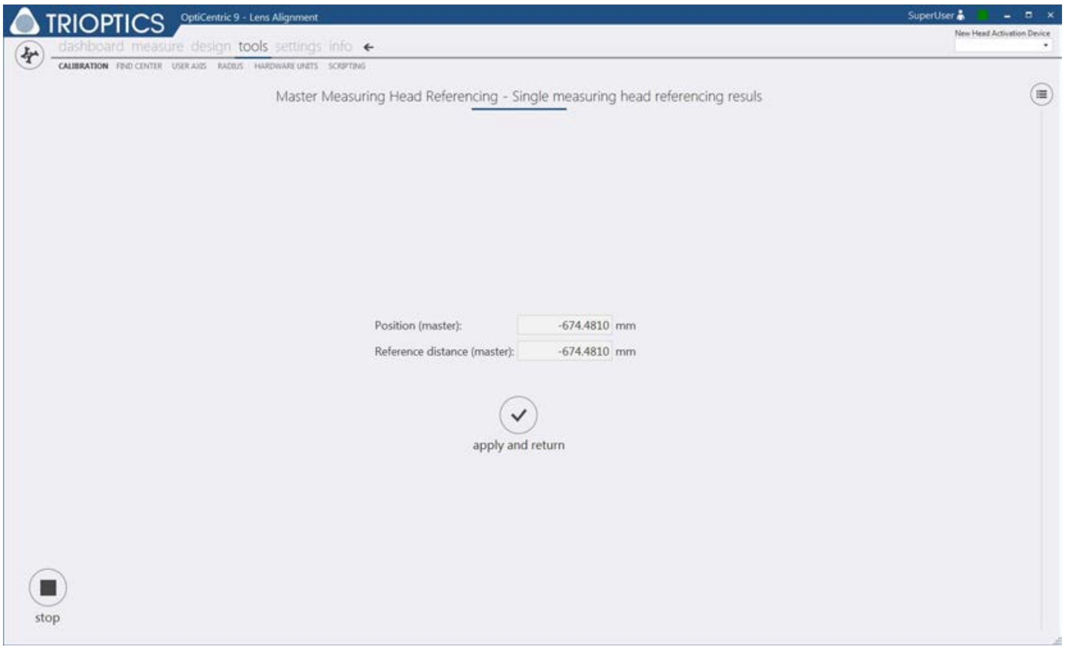


Fig. 146: Tools: Single Head Referencing, results

This completes the referencing of the primary measuring head.

10.2.5 Referencing of measuring heads

When using dual measurement systems, you can use this tool to set the positions of the measuring heads relative to each other. First, a primary measuring head (master) is defined and set to the global machine coordinate system ("World Coordinate System", see *The coordinate systems [▸ 26]*). The secondary measuring head (slave) is then referenced to the primary measuring head.

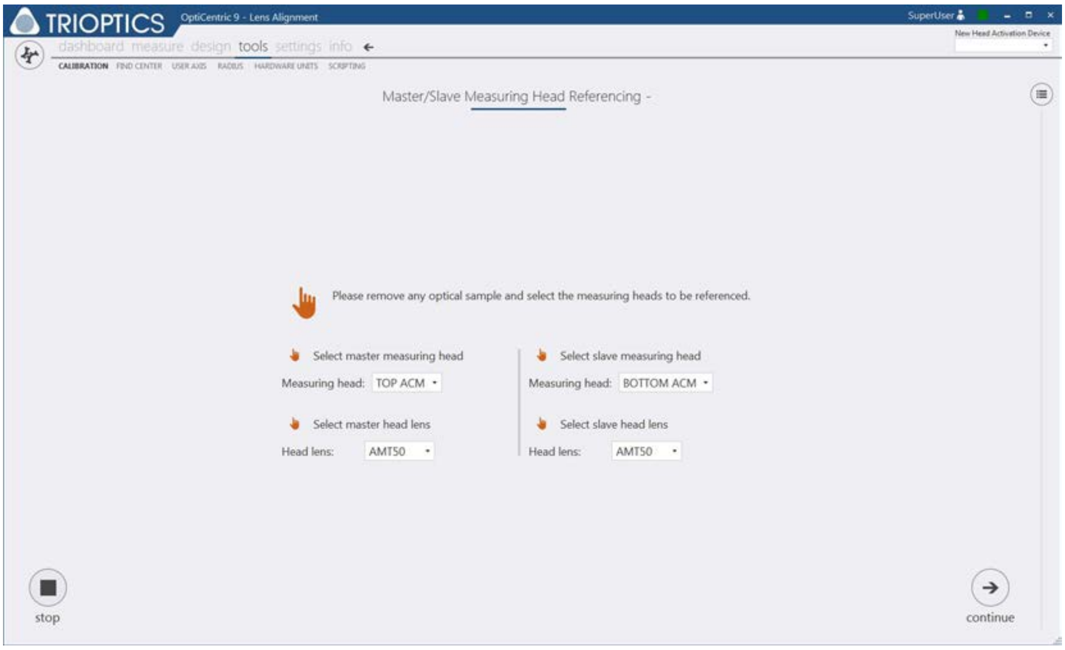


Fig. 147: Tools: Referencing Measuring Heads, define primary and secondary measuring head

Requirement:

✓ The primary measuring head has already been referenced (see *Single head referencing [▸ 194]*).

1. Select <tools> <CALIBRATION> <Referencing of measuring heads>
2. In the `Select master measuring head` area, select a primary measuring head (master) and assign a head lens in the `Head lens` field.
3. In the `Select slave measuring head` area, select a secondary measuring head (slave) and assign a head lens in the `Head lens` field.

NOTE

Incorrect head lenses lead to incorrect calibration results and consequently to incorrect measurement results.

- Make sure that the actual focal length of the head lenses (FFL) is the same as the nominal focal length.
- Only use calibrated head lenses to reference the primary and secondary measuring heads to each other.

4. Click ➔ continue.
   The following view is displayed:

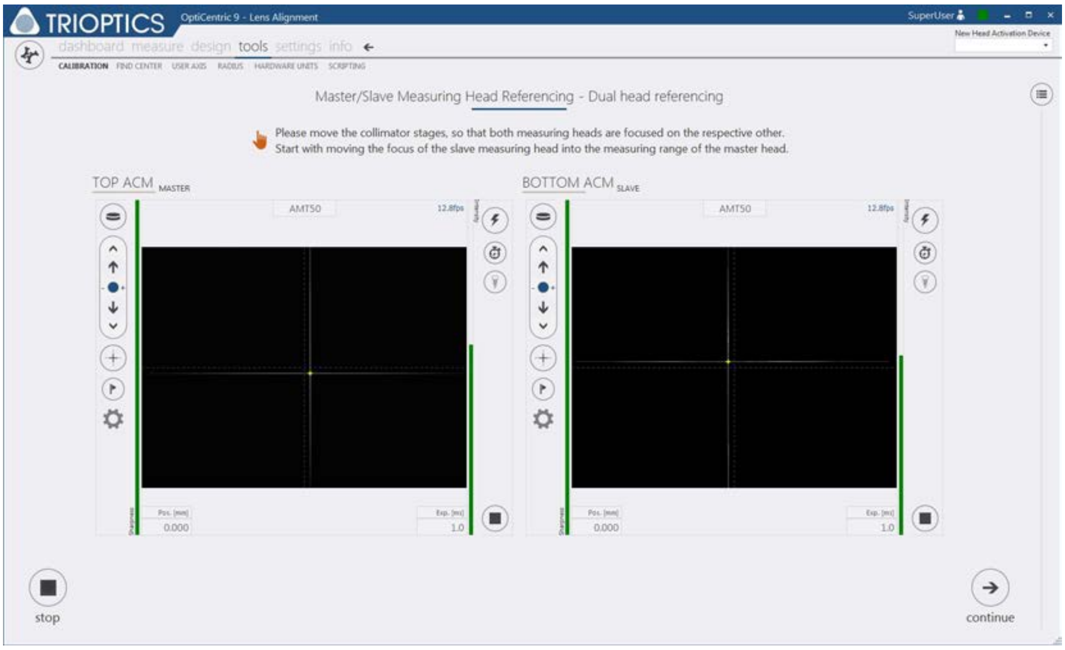


Fig. 148: Tools: Referencing Measuring Heads, reference measuring heads to each other (camera view)

5. Move the top measuring head (Master) down so that the focus is near the air bearing.
   or:
   Place a plane optic on the air bearing and focus with the top measuring head (master) on the surface of the plane optic.
   ⇨ You can check this position by holding a piece of paper in the beam path.
   ⇨ The reticle should now be clearly seen at the focus position.
6. If necessary, remove the plane optic.

7. Move the bottom measuring head (slave) upwards so that the reticle can be clearly seen in both camera windows and is as centered as possible. If necessary, correct the exposure settings by clicking the `Automatic shutter` button.

   ⇨ Each collimator images the reticle of the other collimator.

8. Check the settings by holding a piece of paper in the beam path.

   ⇨ The reticle on both sides of the piece of paper should now be clearly seen at the focus position.

9. Click `continue`.
   A summary with the determined positions for the primary and secondary measuring heads is displayed:

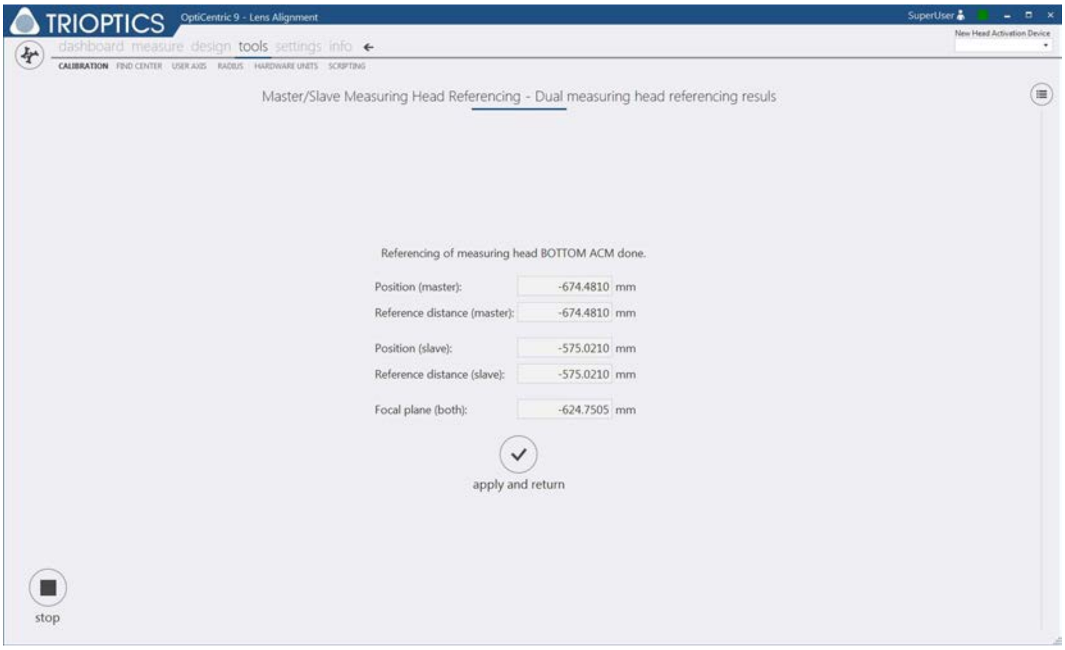


Fig. 149: Tools: Referencing Measuring Heads, results

10. Click `apply and return` to apply these positions.

⇨ This referenced the position of the secondary measuring head relative to the primary measuring head in the world coordinate system.

⇨ This completes the calibration of the measurement system.

10.3 USER AXIS

During the configuration of a measurement or production process, it may be necessary to know the position of the mechanical reference axis.

This tool allows you to determine the position of the mechanical reference axis without generating measurement results. This is used for rough pre-alignment of the sample and for setting up the measurement system.

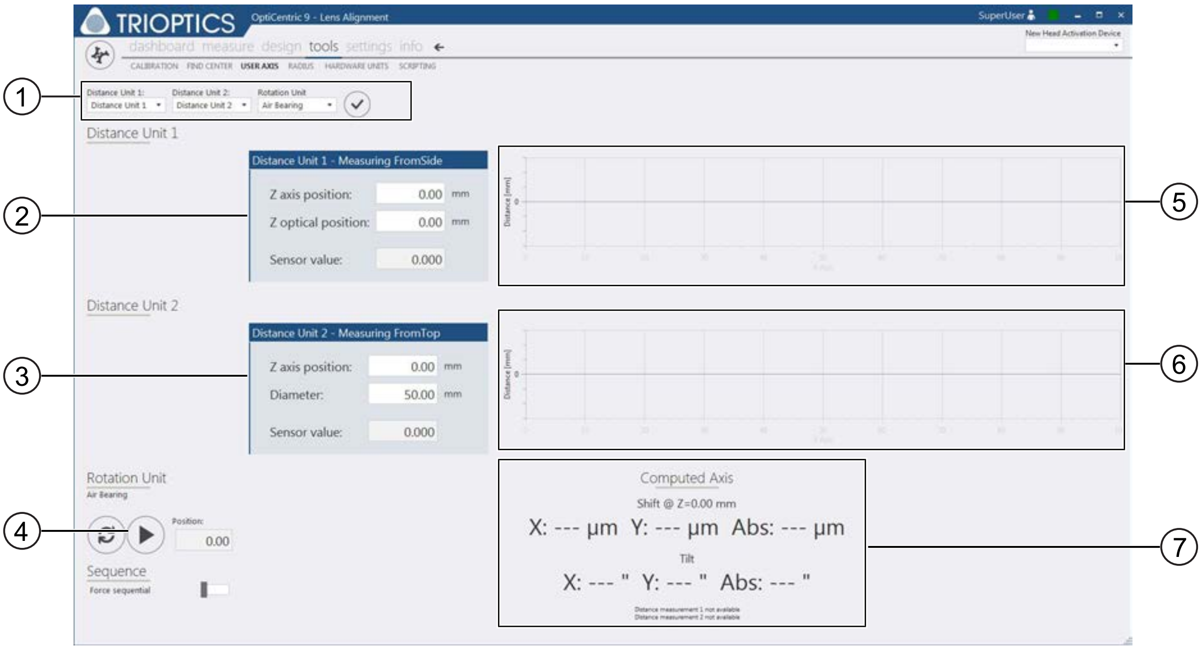


Fig. 150: Tools: User axis

1. Select <tools> <CALIBRATION> <USER AXIS>
2. Select the hardware components **(1)**.
3. Confirm your selection with ✓ reset tool using the selected equipment.
4. In the Distance Unit 1 area **(2)**, set the following parameters:
   - Z axis position: Z-position where the sensor is located.
   - Z optical position: Z-position of the sensor in relation to the lens vertex
5. In the Distance Unit 2 area **(3)**, set the following parameters:
   - Z axis position: Z-position where the sensor is located.
   - Diameter: Diameter at which the distance is measured.

6. Click ▶ `Measure User Axis` **(4)**.
   - ⇨ The air bearing performs a 360° rotation.
   - ⇨ The measured values are displayed for each sensor in the `Sensor value` field.
   - ⇨ The measured values are displayed graphically in the graphics area **(5)** and **(6)**.
   - ⇨ The lower part of the screen shows the results for the shift and tilt of the mechanical reference axis relative to the axis of rotation of the air bearing **(7)**.

NOTE

Two sensors are required to determine a defined mechanical axis. However, if only one sensor is installed, the second sensor is assumed to be "0". That means: It is assumed that the reference axis has no centration error in this spatial direction. This means that an axis can also be displayed / measured with just one sensor.

10.4 RADIUS

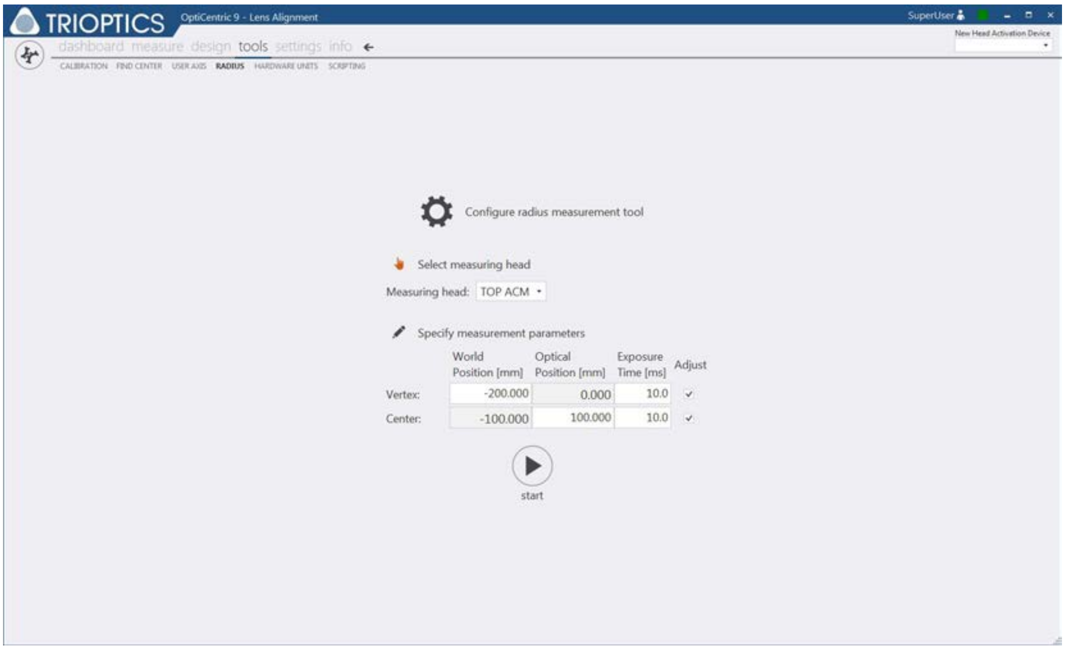


Fig. 151: Tools: Radius

This tool allows you to measure center thicknesses and air gaps of single lenses, plane optics and optical systems without contact.

In this measuring method, an autocollimator with head lens is used to focus on the sample surfaces ("Cats Eye Reflex") and read their position. The positions can be very precisely detected with the electronic autocollimator thanks to the auto focus function. The difference between two positions is proportional to the lens thickness.

NOTE

For a highly accurate measurement we recommend using OptiSurf®.

1. Enter the position for the lens vertex.
2. If necessary, enter the exposure time.
3. Click ▶ `Start radius measurement` to start the measurement.
   ⇨ When the measurement is complete, the result is displayed.

10.5 HARDWARE UNITS

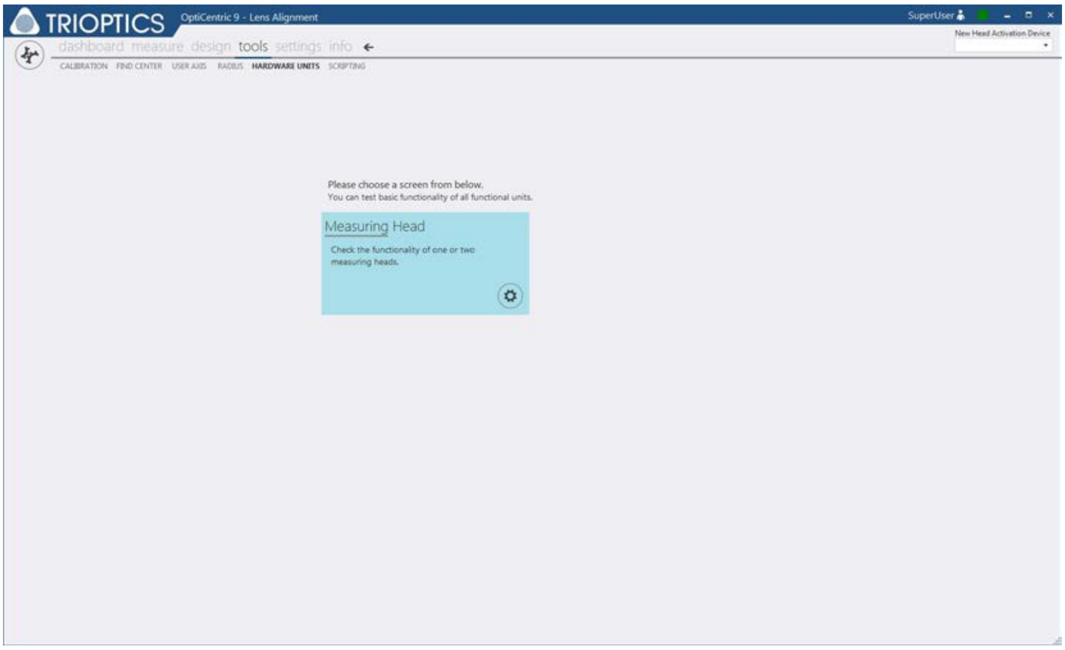


Fig. 152: Tools: Hardware Units

10.5.1 Measuring head

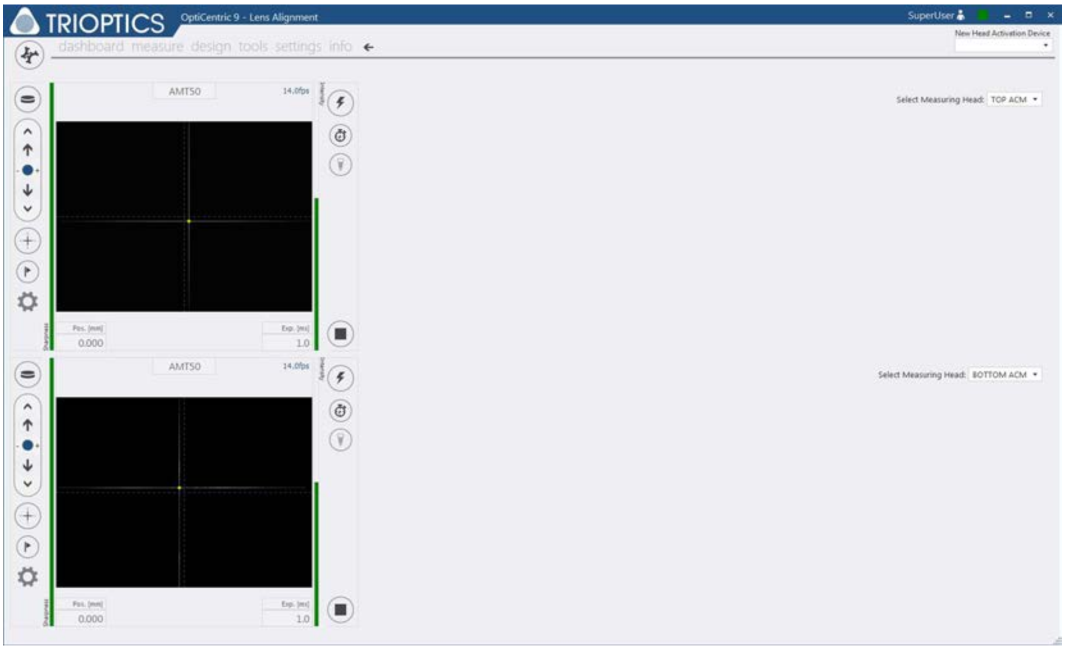


Fig. 153: Tools: Hardware Units, Measuring Head (performance check)

This tool allows you to align the images of the upper and lower measuring head to each other.

1. Select <`tools`> <`HARDWARE UNITS`> <`Measuring Head`>
   ⇨ The camera windows for the upper and lower measuring heads are displayed.
2. Select a suitable head lens for each measuring head.
3. Switch on the light source for the upper measuring head and switch off the light source for the lower measuring head.
4. Place a plane optic on the air bearing.
5. Use the upper measuring head to focus on the surface of the plane optic. To do this, follow the steps as described in *Manually focus on a surface [▸ 34]*.
   ⇨ The reticle should be clearly visible in the camera window and as centered as possible.
6. Move the lower measuring head until the reticle is clearly visible in the camera window.
7. If necessary, correct the centration of the camera images to each other.

10.6 SCRIPTING

11 Software

NOTE

Software version

This section demonstrates and explains the software version.

If you are using a different software version, what appears in the windows may differ from what you see on your device.

11.1 General displays and icons

11.1.1 General toolbar

The following toolbar can be found in many views:

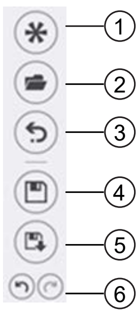


Fig. 154: Toolbar_General

1	**New** Opens the option to create a new file/form/set-ting, etc.
2	**Open** Opens an existing file
3	`Back` Resets the selection
4	`Save` Saves the file
5	`Save as` Saves the file under a new name.
6	**Reset / Restore** Resets or restores the last change.

11.1.2 Focus Finder

In the Focus Finder, the measuring head positions, the centers of curvature and the vertices of the optical surfaces along the Z-axis are displayed graphically.

This makes it easier to assign the image positions to an optical surface.

Graphical representation

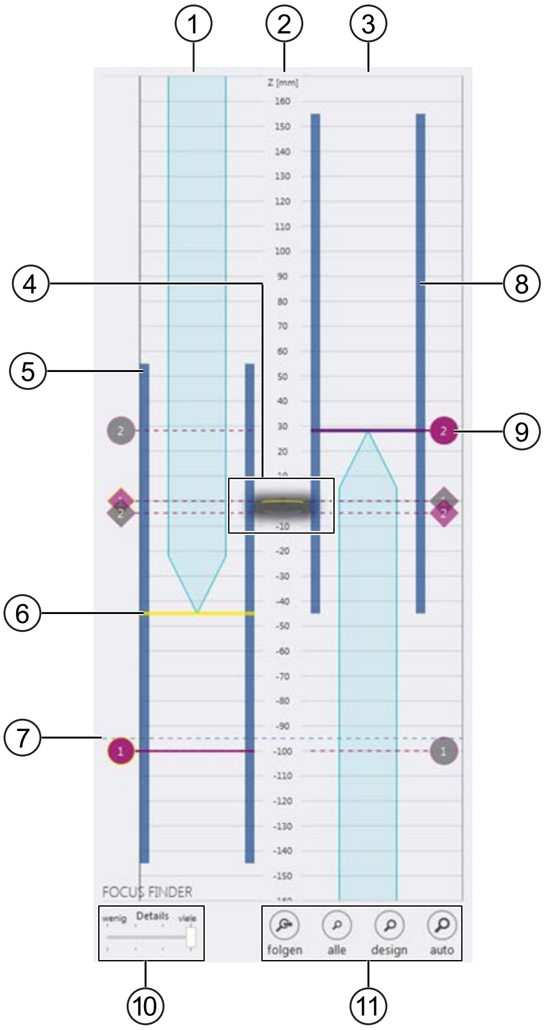


Fig. 155: Focus Finder

1	Display area for the upper measuring head
2	Scale for Z-axis
3	Display area for the lower measuring head
4	Schematic representation of the lens design The surface currently being studied is displayed in yellow.
5	Measuring range for the upper measuring axis.
6	Current position of the upper measuring head
7	Origin of the world coordinate system The origin of the world coordinate system is located on the measuring table.
8	Measuring range for the lower measuring axis.
9	Current position of the lower measuring head
10	Options for displaying the focus position For an explanation of the individual display options, see
11	Options for displaying the measuring axes For an explanation of the individual display options, see

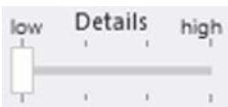
Display of focus positions

You can choose between four options for displaying the focus positions in the Focus Finder:

NOTE

NOTE

The positions for the surface currently being viewed are highlighted in red. The symbols for the remaining surfaces are displayed in gray.

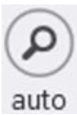
Position of the slider	Display option	Description
	Low	Only the actual focus points are displayed for the currently used measuring head
	Middle low	The calculated and the actual focus points are displayed for the currently used measuring head
	Middle high	The calculated and the actual focus points are also dis-played for the measuring heads not being used
	High	The calculated and the actual focus points are also dis-played for the measuring heads not being used

The vertices are also displayed

Symbol	Description	Explanation
	Circle with solid line	actual focus point
	Circle with dotted line	calculated focus point
	Diamond with dotted line	actual vertex
	Diamond with dotted line	calculated vertex

Display of the measuring axes

You can choose between four options for displaying the measuring axes in the Focus Finder:

Display option	**Description**	**Description**
	follow	
	all	
	design	
	auto	

11.1.3 Configuration wizard

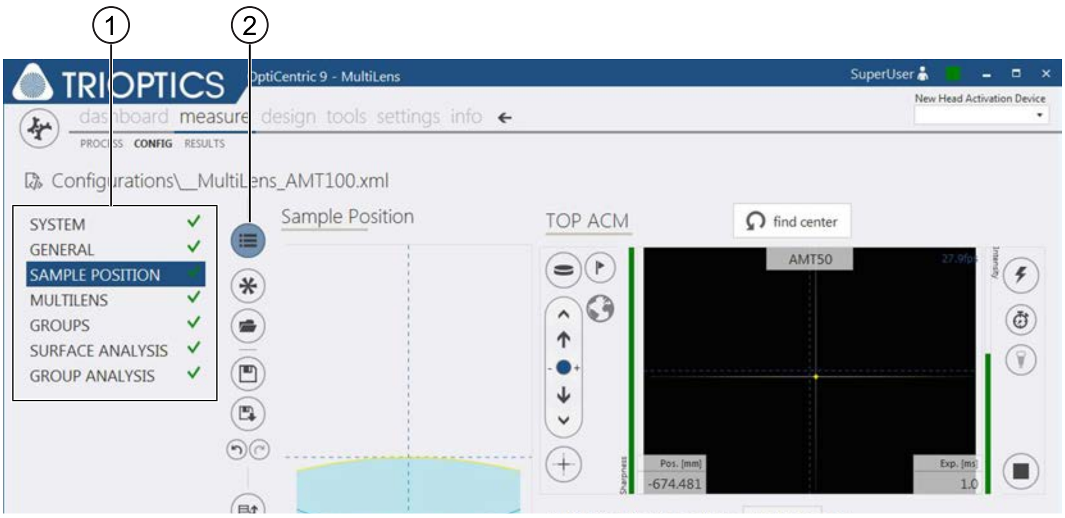


Fig. 156: Configuration wizard

The configuration wizard provides help with the configuration of measurement specifications.

The path view **(1)** can be shown or hidden on the far left of the screen. The current configuration step is highlighted.

The standard screen does not include the path view.

Click `Show configuration structure` **(2)** to show the path view.

Click `Show configuration structure` once more to hide the path view again.

11.1.4 Camera window

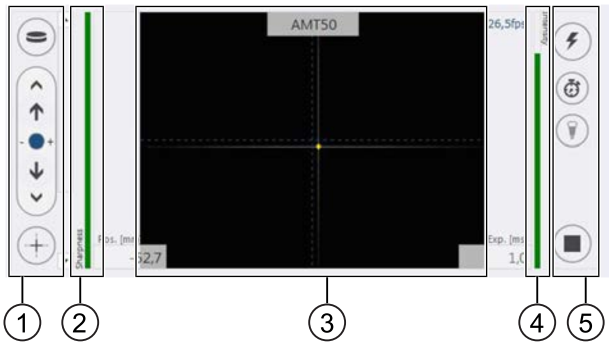


Fig. 157: Camera window

1	Measuring head control (see *General control of the measuring head [▸ 211]*)
2	Bar display: Sharpness
3	Live image from the camera
4	Bar display: Intensity
5	

Bar display: Intensity

The bar display shows the intensity of the light source in the area of interest (AOI).

The optimum intensity of the light source is reached when the bar is approximately in the middle. The bar is displayed in green if the saturation level is within the defined limits.

The bar is displayed in red if the saturation level is above or below the defined limits.

Bar display: Sharpness

The maximum sharpness is achieved with the best possible focus.

The bar is displayed in green if the value is within the defined limits.

The bar is displayed in red if the value is above or below the defined limits.

11.2 General control of the measuring head

This section describes the different ways to focus and to move to a specific position or a center of curvature.

The measuring head is moved using the arrow keys in the software.

The following functions are available to move the measuring head:

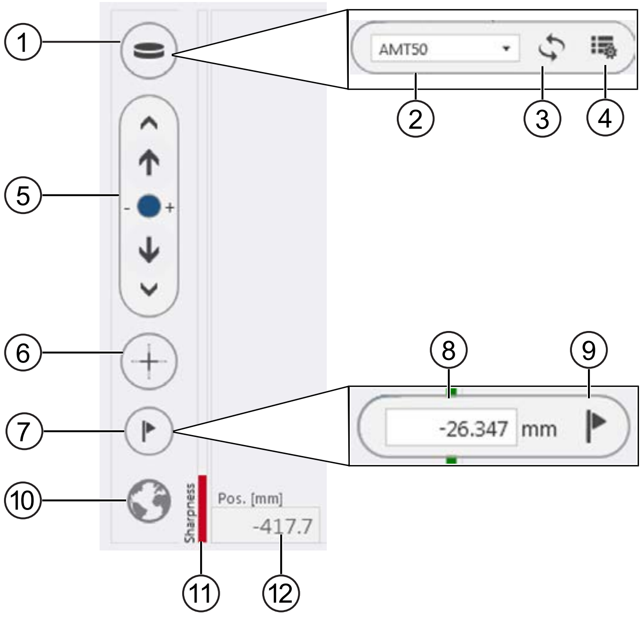


Fig. 158: Measuring head, general control

1	`Change Head Lens` Options for selecting the head lens When the button is pressed, the drop-down menu opens (nos 2-4).
2	Drop-down list of head lenses The head lens available are those which have been grouped together in the hardware settings and assigned to the lens changer used (see *HARDWARE <HEAD LENS> view [▸ 154]*).
3	`change head lens` When a motorized lens changer is used, the selected head lens is moved to its operating position. When using a manual lens changer, the user is prompted to mount the selected head lens.

4	Assign the head lens to a slot of the lens changer. This button is only available when using a motorized lens changer. You can choose from the head lenses that have been assigned to the currently used group of head lenses in the hardware settings (see *HARDWARE <HEAD LENS> view [▸ 154]*).
5	Options for moving the measuring head
	Move the measuring head quickly upwards
	Move the measuring head slowly upwards
	Adjust the basic speed for moving the measuring head
	Move the measuring head slowly downwards
	Move the measuring head quickly downwards
6	`Autofocus` The measuring head searches a defined area for the best image and then returns to this position.
7	`GoTo` function Opens the input field for entering the desired position
8	`GoTo` function, input field
9	`GoTo` When this button is pressed, the measuring head moves to the entered position (see **8**).
10	Coordinate system Show which coordinate system the displayed values refer to : World coordinate system : Visual coordinate system : Stage coordinate system
11	Sharpness bar display Green display: The focus criterion lies within the defined limits. Display red: The value is above or below the limit for the focus criterion.
12	Display of the current measuring head positions

11.3 General control of the axes

Each motorized travel unit (stage) has its own menu with which the respective positioning axis can be controlled (axis controller).

11.3.1 General functions for all axis controls

Set the parameters for moving the axes

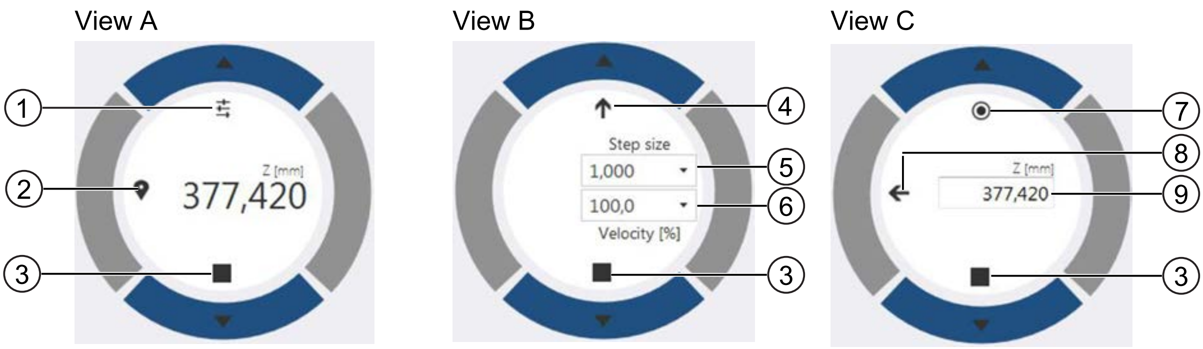


Fig. 159: Axis controller: general functions

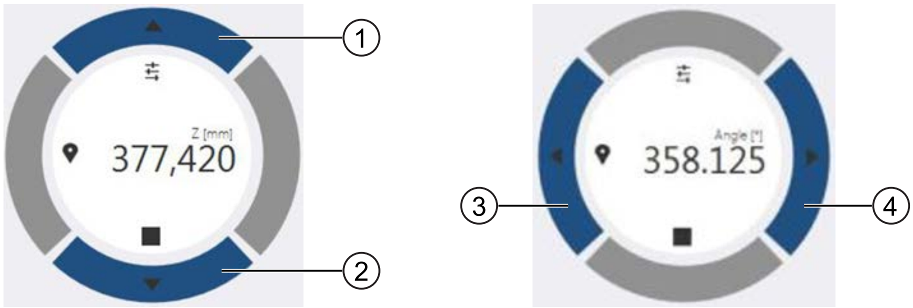
The following applies to all axis controllers:

1	`Change step and velocity settings`: Opens the menu for setting the travel speed **(view B)**.
2	`Switch to position mode` Opens the menu for entering the absolute position **(view C)**.
3	`Stop` Stops the movement of all axes.
4	`Back` Back to main view **(view A)**
5	`Step size for stepping moves` Input field for the step size • Linear movements: Input in [mm] • Rotation: Input in [°]
6	`Target velocity for all movements` Input field for the travel velocity Input in [%] of the preset maximum speed
7	`Move to target position` **Triggers the movement of the axis.**
8	`Back` Back to main view **(view A)**
9	Input field for the absolute position. • Linear movements: Input in [mm] • Rotation: Input in [°]

Functions for moving the axes (linear axis and rotation axis)

View A

View B



Linear axis (vertical)

Rotation axis (e.g. rotary air bearing)

Fig. 160: Axis controller: Linear axis and rotation axis

1	Move the linear axis upwards.
2	Move the linear axis downwards.
3	Rotation: Rotate to the left.
4	Rotation: Rotate to the right.

11.3.2 Axis controller for the actuators (120° Aligner and Single Aligner)

Axis controller for the actuators

This menu is used to control the actuators for aligning a lens or group of lenses.

NOTE

This axis controller is available when a 120° Aligner or a Single Aligner is used to align the lenses. In the case of the Single Aligner, the views for actuator 2 and actuator 3 as well as the view for all actuators are omitted.

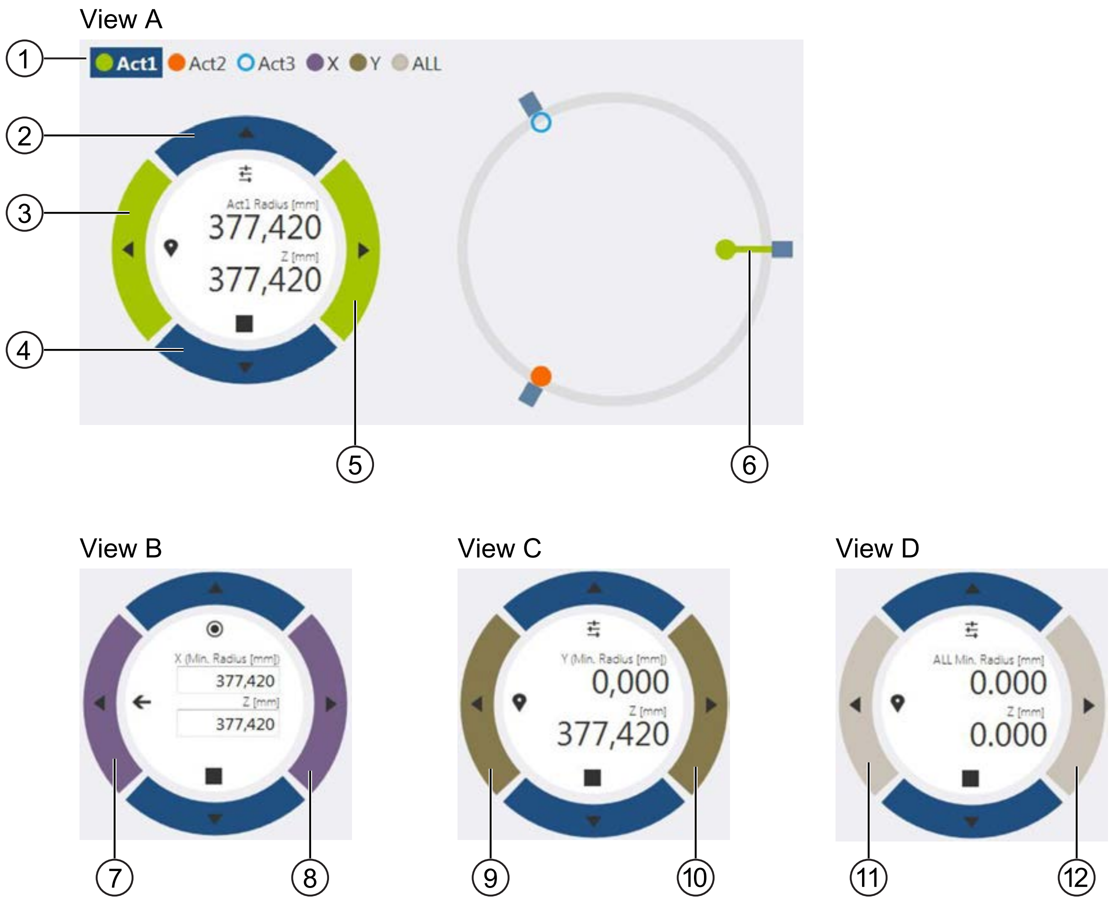


Fig. 161: Axis controller: Actuators

1	`Lens Aligner Settings` In the `Lens Aligner Settings` selection area **(1)** each actuator is marked with a different color. A graphical representation of the actuators next to the buttons for the axis controller provides a quick overview. This shows the actuators with the corresponding colors **(6)**. When you select an actuator the buttons for moving the actuators are also shown in the color of the selected actuator **(3)**, **(5)**. • `Act1`, `Act2`, `Act3`: Call axis controller for a single actuator. Changing the settings only affects the selected actuator. • `X`: Actuators are controlled in such a way that they are aligned in the X-direction • `Y`: Actuators are controlled in such a way that they are aligned in the Y-direction • `ALL`: All actuators are selected. Changing the settings affects all actuators.
2	Move actuator upwards in Z-direction
3	`Approach actuator, move to inside` The selected actuator is moved up to the sample.
4	Move actuator downwards in Z-direction

5	`Release actuator, move to outside` The selected actuator is moved away from the sample to its safe position (idle position).
6	Graphical representation of the selected actuator
7	`Approach actuator, move to inside` All actuators are moved up to the sample in such a way that the sample is aligned in the X-direction. This axis controller is only available if <**X**> is selected in the selection area `(1)`.
8	`Release actuator, move to outside` All actuators are moved away from the sample to their safe position (idle position).
9	`Approach actuator, move to inside` All actuators are moved up to the sample in such a way that the sample is aligned in the Y-direction. This axis controller is only available if <**Y**> is selected in the selection area `(1)`.
10	`Release actuator, move to outside` All actuators are moved away from the sample to their safe position (idle position).
11	`Approach actuator, move to inside` All actuators are moved up to the sample. This axis controller is only available if <**ALL**> is selected in the selection area `(1)`.
12	`Release actuator, move to outside` All actuators are moved away from the sample to their safe position (idle position).

CAUTION

Risk of material damage

If the actuators are motorized in the vertical direction (e.g. bonding frames), the vertical positioning axis can only be moved if all actuators on it are in a secured position.

In setup mode, it may be necessary to override this safety function.

– **Be very careful!**

CAUTION

Risk of material damage

If operated incorrectly (danger of confusing the buttons) there is danger of collision between the actuators and the sample.

– Make sure to use the `move to inside` **(7)**, **(9)** or `move to inside` **(8)**, **(10)** buttons, both for aligning in the X-direction and for aligning in the Y-direction.
– Never use the `step up` **(2)** or `step down` **(4) buttons for aligning in the Y-direction (view A)**.
– **Be very careful!**

11.3.3 Axis controller for 4D Aligner and 6D Aligner (Hexapod)

axis controller for 4D Aligner and 6D Aligner (Hexapod)

This menu is used to control the 4D Aligner or the 6D Aligner (Hexapod) to align a lens or group of lenses, depending on the configuration of the measurement system.

NOTE

This axis controller is available when a 4D Aligner or a 6D Aligner is used to align the lenses. In the case of the 4D Aligner, the buttons for Z-direction control are omitted.

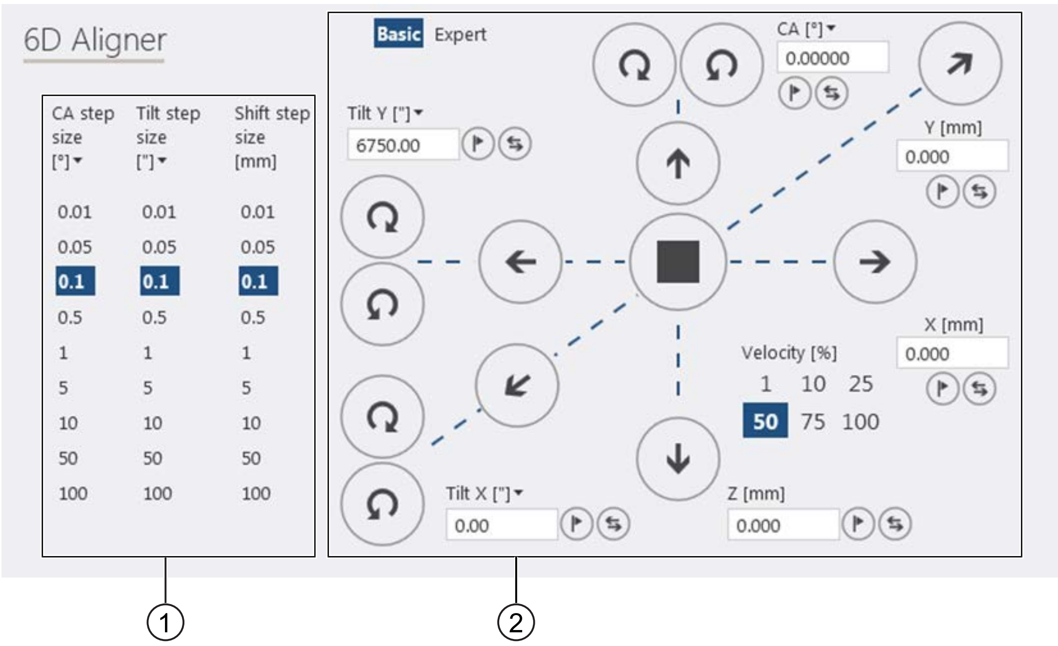


Fig. 162: Axis controller: 6D Aligner

1	Table of values Display of the current live values
2	Controller menu Further information can be found in the *Axis controller functions [▸ 218]* section.

Axis controller functions

The axis controller functions are identical for the X-, Y- and Z-axes. When rotating about an axis, however, a distinction is made between tilt and rotation. Tilt occurs with a rotary movement about the X- or Y-axis. Rotation about the Z-axis is called rotation. Additional information on the conventions is given in *The coordinate systems [26]*, *Conventions [27]*.

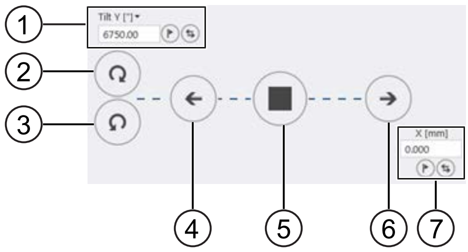


Fig. 163: Axis controller 6D / 4D Aligner, X-direction

1	**Basic settings for tilt / rotation**
	`Tilt Y`, `Tilt X`, `CA` (tilt / rotation) Input field for tilt or rotation. The value can be entered in the following units: • [rad] radians • [mrad] milliradians • [µrad] microradians • [°] degrees • ['] arcminutes • [''] arcseconds
	`Move (axis) to this position` The respective axis is tilted / rotated to the entered position.
	`Invert tilt / rotation (axis) direction for manual positioning button` The operating direction of the buttons **(2)** and **(3)** for manual tilting / rotating of an axis is inverted. : The inversion of the operating direction is activated. : The inversion of the operating direction is deactivated.
2	`Move in negative tilt / rotation (axis) direction` The respective axis is moved in such a way that the sample is tilted / rotated in the negative direction.
3	`Move in positive tilt / rotation (axis) direction` The respective axis is moved in such a way that the sample is tilted / rotated in the positive direction.

4	`Move in negative (axis) direction` The respective axis is moved in such a way that the sample is shifted in the negative direction.
5	`Stop any axis movement` Stops the movement of all axes.
6	`Move in positive (axis) direction` The respective axis is moved in such a way that the sample is shifted in the positive direction. **Important!** If the inversion of the operating direction (see point **1**) is activated, the sample is shifted in the negative direction.
7	**Basic settings for shift**
	`X [mm]`, `Y [mm]`, `Z[mm]` Input field for moving the sample along an axis.
	`Move (axis) to this position` The respective axis is moved to the entered position.
	`Invert (axis) direction for manual positioning button` The operating direction of the buttons **(4)** and **(6)** for manually moving an axis is inverted. : The inversion of the operating direction is activated. : The inversion of the operating direction is deactivated.

NOTE

If the inversion of the operating direction (see points **1** and **7**) is activated, the respective axis is moved against the direction indicated in the description.

11.4 Design editor

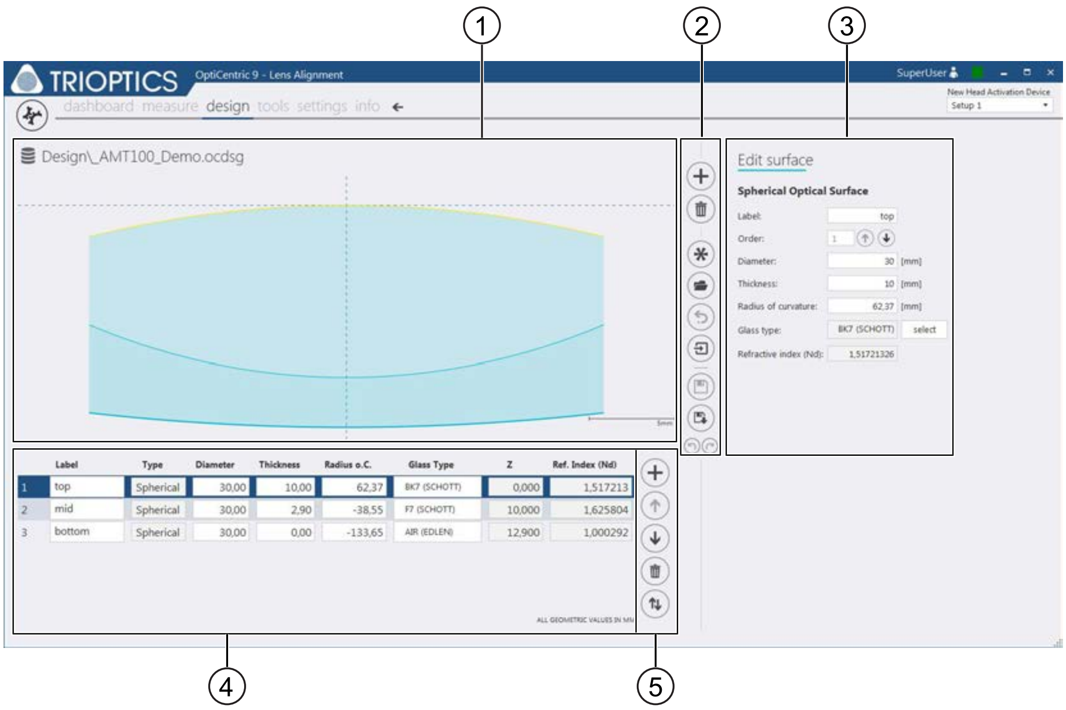


Fig. 164: Design editor

1	**Graphics window** This is a graphic representation of the optical design.
2	**Editing the optical design**
	`Add surface`: Opens the selection for a surface type • For more information on the optical surface types, see *Entering parameters for optical surfaces [▸ 47]*.
	`Delete surface`: Delete the selected surface from the design
	`New`: Creates a new design
	`Load`: Opens the dialog for loading an existing design file
	`Revert`: All changes to the optical design are undone without saving
	`Import`: Import a design file The following formats are available: • `*.ocdsg`: OptiCentric design file • `*.XXX`: ZEMAX design files • `*.dsx`: Design files (obsolete file type)
	`Save`: Save changes to the same design file
	`Save as`: Saves the design file under a new name

3	**Editing area** Different input and selection fields are available depending on the selected editing function. Further information can be found in the *Creating a design file [▸ 43]* section.
4	**Design table** Display of the optical design in tabular form. The parameters to be displayed can be defined in the Settings menu.
5	**Editing the design table** Toolbar for editing the design table. The parameters to be displayed can be defined in the Settings menu.
	`Add surface`: Creates a new row in the design table. A new surface is created in the graphics window.
	`Increase order` Moves the selected row of the design table up. The order of the surfaces in the optical design is changed.
	`Decrease order` Moves the selected row of the design table down. The order of the surfaces in the optical design is changed.
	`Delete surface`: The selected row is deleted from the design table. The changes are applied to the graphical view.
	`Flip design`: The order of the surfaces in the optical design is reversed.

11.5 Configure (CONFIG)

This section describes the functions and buttons of the individual configuration steps.

NOTE

The figures in the sections below show an example configuration of a measurement system. The display in individual windows may differ depending on the equipment of your measurement system.

11.5.1 <SYSTEM> view

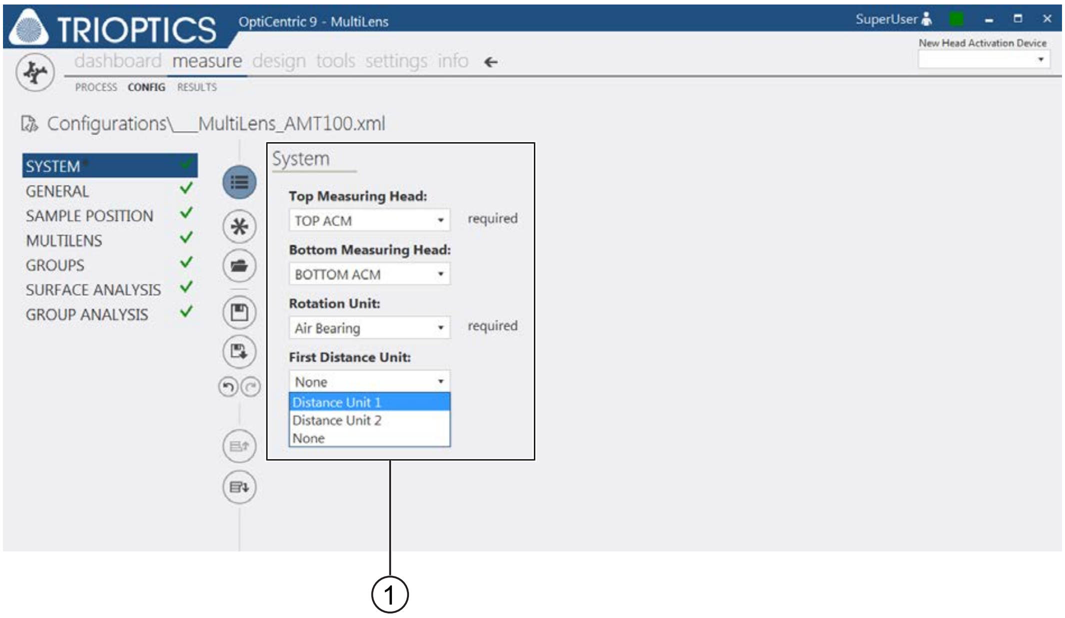
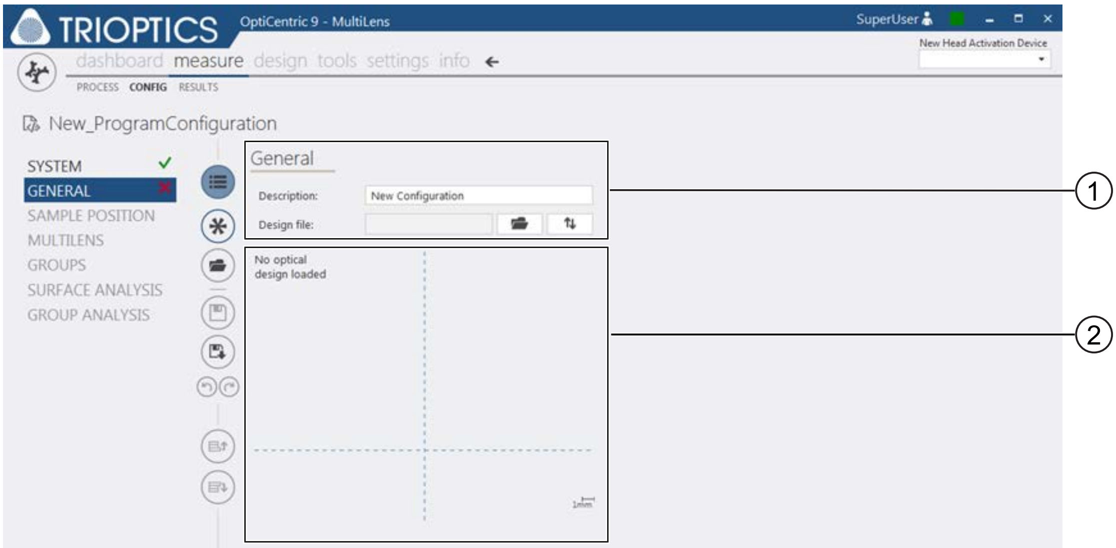


Fig. 165: Configure MultiLens® measurement: SYSTEM

1	**System** Here you assign the hardware configuration used to the functional units of the measurement system. The hardware configurations previously defined in the hardware settings are available for selection (see --- FEHLENDER LINK ---).
	`Top Measuring Head:` (upper measuring head)
	`Bottom Measuring Head:` (lower measuring head)
	`Rotation Unit:` (rotation device)
	`First Distance Unit:` (distance sensor 1)
	`Second Distance Unit:` (distance sensor 2)

11.5.2 <GENERAL> view

View A



View B

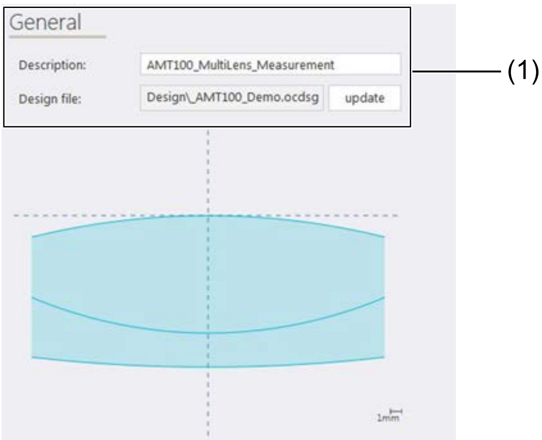


Fig. 166: Configure MultiLens® measurement: GENERAL

1	**General** Link the configuration file to a design file
	`Description`: Add a description for the measurement or production process. The description text is included in the certificates.
	`Design file` Select a design file from a defined directory.
	`Load design file`: Opens the directory where the design files are stored.
	`Load design file in inverted order`: Changes the design data for this process so that the sample can be measured or processed with the underside facing up.
	`update` button (see view B): Opens the directory for selecting a design file. A new configuration file is created. Previous entries will be lost!
2	**Graphics window** A preview of the selected optical design is displayed here.

11.5.3 REFERENCE view (SAMPLE POSITION)

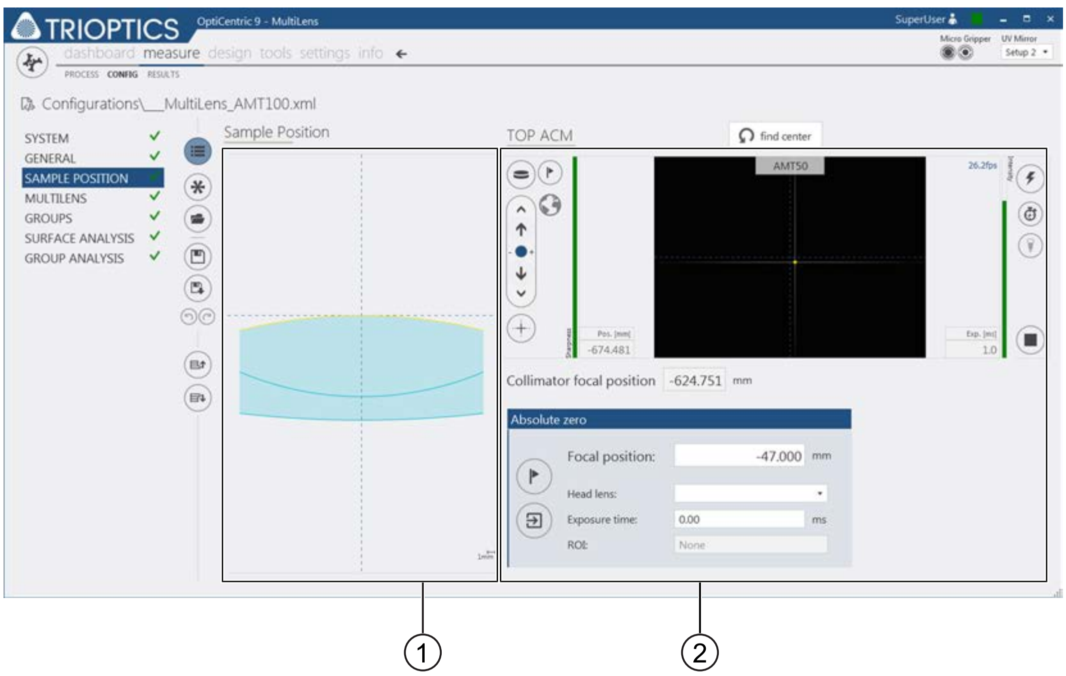
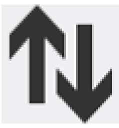
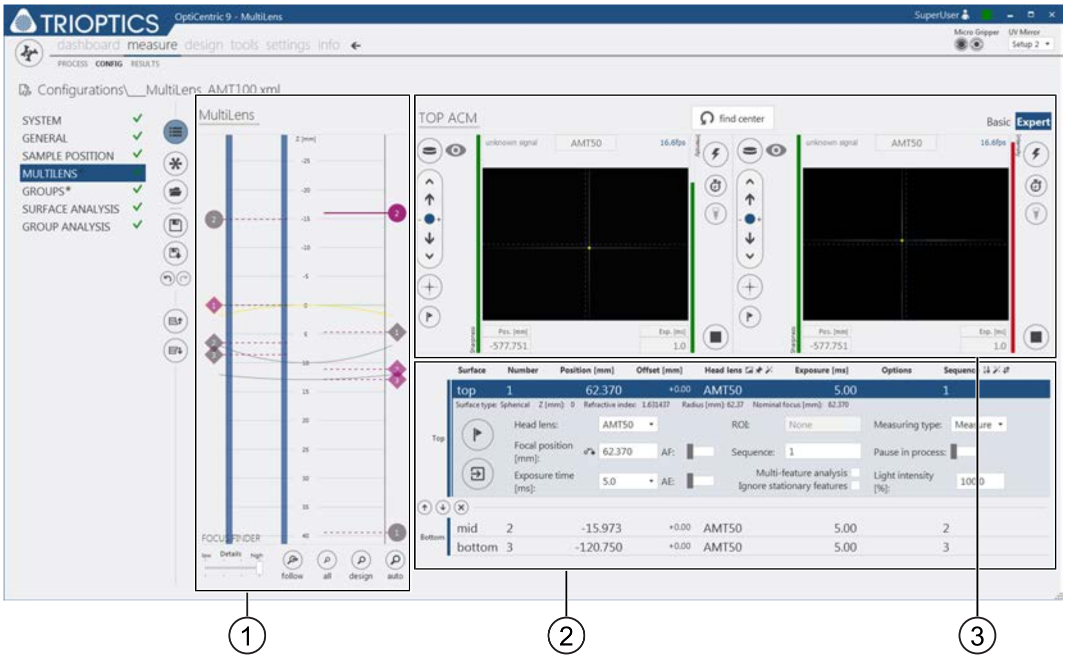


Fig. 167: Configure, Reference view (SAMPLE POSITION)

1	**General** Link the configuration file to a design file
	`Description`: Add a description for the measurement or production process. The description text is included in the certificates.
	`Design file` Select a design file from a defined directory.
	 `Load design file`: Opens the directory where the design files are stored.
	 `Load design file in inverted order`: Changes the design data for this process so that the sample can be measured or processed with the underside facing up.
	`update` button (see **view B**): Opens the directory for selecting a design file. A new configuration file is created. Previous entries will be lost!
2	**Optical reference** Determine the lens vertex as optical reference
	`Collimator focal position`: Displays the current Z-coordinate of the focal plane of the collimator.
	`Focal position`: Displays the position of the determined focal plane in relation to the lens vertex.
	`Head lens`: Selection of a suitable head lens. The head lenses previously assigned to the lens changer in the hardware settings are available for selection (see *HARDWARE view <HEAD LENS CHANGER (objective changer) [155]*).
	`Exposure time`: Displays the current exposure time. The value can be overwritten manually.
	`ROI (Region of Interest)` Area in which to search for the image of the reticle. You can define an area by clicking and holding the mouse button in the camera window and dragging a rectangle. After pressing the `Write measuring head values to configuration` button, the coordinates of the ROI are displayed in this field.
	`apply configuration to measuring head`: The current settings are adopted for the measuring head and set as new settings.
	`write measuring head values to configuration`: Applies the current settings on the measuring head as measurement parameters for the configuration.

11.5.4 <MULTILENS> view



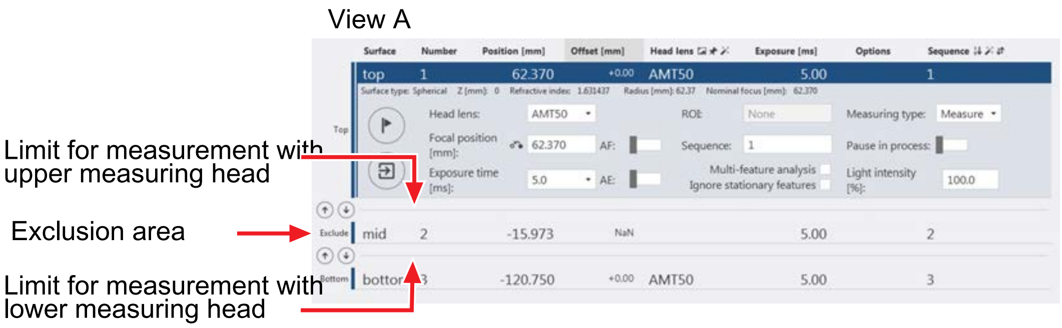


Fig. 168: Configure, MULTILENS view

1	**Focus Finder**
	For further information please refer to *Focus Finder [▸ 206]*.
2	**Define measurement parameters for the individual optical surfaces**
	`Open exclusion group`: Opens the dialog for determining the exclusion area. The exclusion area is formed by the respective border of the measurement with the upper measuring head and the measurement with the lower measuring head. You can exclude interior surfaces from the measurement. In this case, move the border of the upper measuring head to ensure that the surface to be excluded is below this border. Move the border of the lower measuring head to ensure that the surface to be excluded is above this border. (View A) `up`: More the border up. `down`: More the border down.
	`Head Lens`: Opens the list for selecting a head lens.
	`Focal position [mm]`: Displays the position of the determined focal plane in relation to the lens vertex.
	`Exposure time [ms]`: Shows the currently set exposure time. The value can be overwritten manually.
	`Reset focus position to nominal value`: Resets the value for the position of the focal plane to the calculated value
	`AF` (Autofocus): Perform automatic focus search before each measurement : Option is activated : Option is deactivated
	`AE` (Auto exposure): Perform automatic exposure adjustment before each measurement : Option is activated : Option is deactivated
	`ROI` (Region of Interest): Sub-area in the camera window in which to search for the image of the reticle. If no search area has been defined, the field is populated with NONE.
	`Sequence`: Determine the sequence in which the surfaces are measured (useful to avoid unnecessary movements of the measuring head).
	`Measuring type`: Define the measurement method for each surface. Options: • `Measure` • `Select` • `Select automatically` • `Select and grab` `For further information please refer to` *MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS [▸ 66]*.

	`Pause in Process`: Automatically stop the measurement process before measuring a surface (required if changes need to be made during measurement). : Option is activated : Option is deactivated
	`Multi-feature analysis`: If present, the software tracks several crosses in the camera image.
	`Ignore stationary features`: The software ignores non-moving crosses.
	`Light intensity`: Change settings for the intensity of the light source
	`apply configuration to measuring head`: The current settings are adopted for the measuring head and set as new settings.
	`write measuring head values to configuration`: Applies the current settings on the measuring head as measurement parameters for the configuration.
3	**Camera window** For further information please refer to *Camera window [210]*.

11.5.5 <GROUPS> view

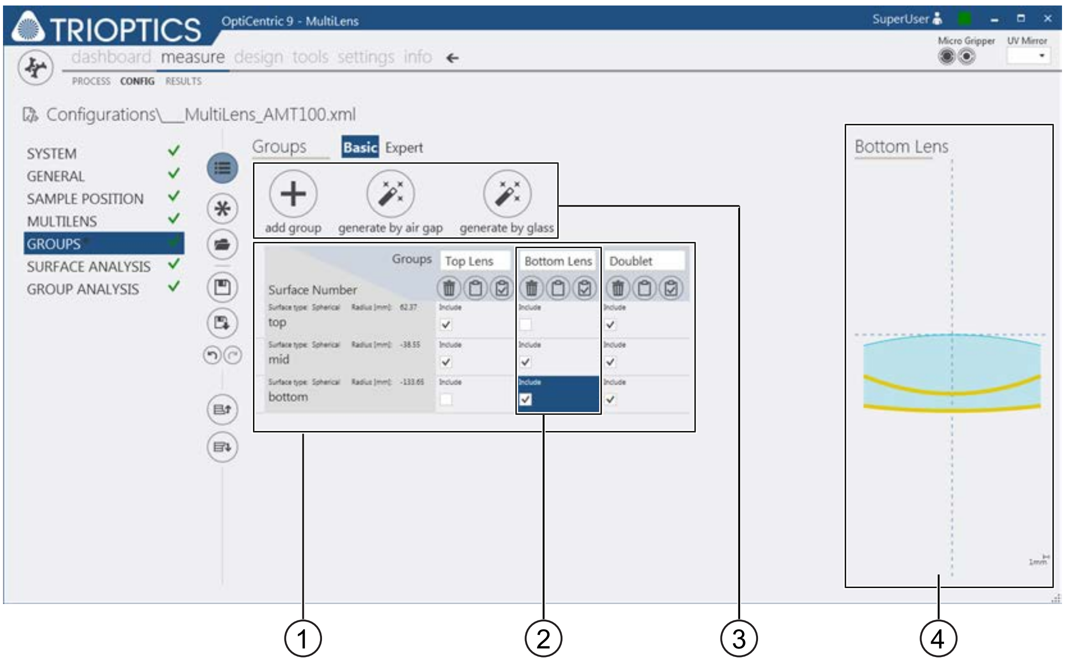


Fig. 169: Configure, GROUPS view

1	**Summary table** List of all optical surfaces and the groups defined from them
2	**Group** Editing area for a group of optical surfaces
	`Delete this group`: Deletes the entire group
	`Unselect all surfaces in this group`: Clears the selection for all surfaces in this group
	`Select all surfaces`: All optical surfaces are included in this group (useful when viewing a lens group, e.g. doublets)
	`Include`: Check the box if the optical surface is to be included in the group.
	`Weight`: This value indicates the proportion of an area to be included in the calculation of the overall centration error. The value "0" means that the area in question is not taken into account. For a fit there must be at least two surfaces with a weight > 0.
3	**Editing toolbar** Buttons to quickly create groups.
	`Add group`: Creates a new group to which no surfaces are yet assigned.
	`Generate by air gap`: Surfaces with no air gap between them are combined to form a group. Example: optical design consisting of several lenses with an air gap in between: One group is created for each lens. Example: optical design consisting of several lenses with no air gap in between (doublet): Only one group containing all optical surfaces is created.
	`Generate by glass`: Two consecutive surfaces are combined to form a group. Unless it has been assigned the refractive index for air, the lower boundary surface of a group is also the upper boundary surface of the next group. If a surface has been assigned the refractive index for air, the gap to the next surface is recognized as an empty space. In this case, no group is created from the two surfaces.

11.5.6 <SURFACE ANALYSIS> view

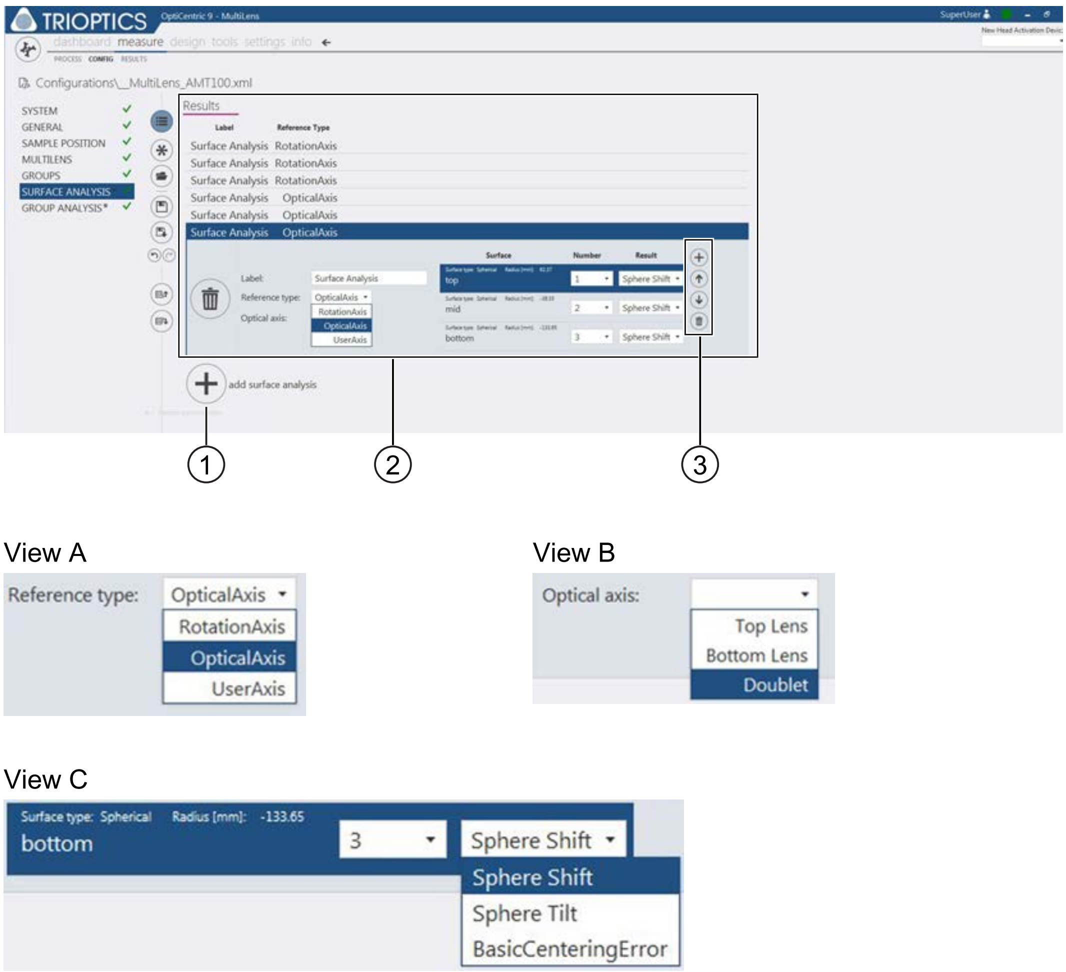


Fig. 170: Configure: SURFACE ANALYSIS view

1	Add a new surface analysis: Creates a new area for defining the parameters to be evaluated (see **2**)
2	**Surface analysis** Editing area for a group of optical surfaces
	Delete surface analysis: Deletes the selected surface analysis
	Label: Enter a name for the surface analysis here.
	Reference type: Set which reference type is used for the surface measurement. Options **(view A)**: • Rotation Axis: Axis of rotation of the air bearing • Optical Axis: Optical axis For multi-lens optical systems, which optical axis is to be used as a reference must be defined. • User Axis: Mechanical reference Corresponds to the lens mount axis
	Optical axis: If the optical axis was selected as the reference type, you must define here which optical axis is to be used as the reference. The optical axes of the (lens) groups defined in the Groups configuration step are available for selection **(view B)**.
	Surface: Indicates to which surface the respective analysis applies.
	Number: From the list, select the surface for which you want to create the analysis. The number corresponds to the number of the surface in the optical design.
	Result: From the list, select the result type that you want to evaluate. Options **(view C)**: • Sphere Shift: Spherical shift Indicates the shift of the respective center of curvature relative to the reference axis. • Sphere Tilt: Spherical tilt Indicates the tilt of the respective surface relative to the reference axis. • Basic Centering Error: Raw data for analysis purposes
3	**Editing toolbar** Buttons for editing the surface analysis.
	Add new item: Creates a new row in the table that does not yet contain any further parameters for the evaluation.
	Move item up Moves the selected row in the table up. The order of the output in the measurement certificate is changed.
	Move item down Moves the selected row in the table down. The order of the output in the measurement certificate is changed.
	Delete selected item The selected row is deleted from the table. This evaluation is then not output in the measurement certificate.

11.5.7 <GROUP ANALYSIS> view

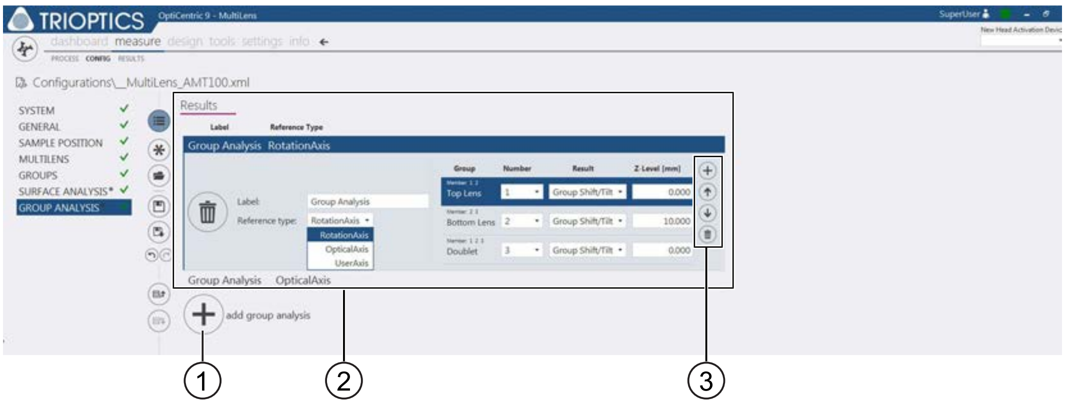


Fig. 171: Configure: GROUP ANALYSIS view

1	`Add a new group analysis`: Creates a new area for defining the parameters to be evaluated (see **2**)
2	**Surface analysis** Editing area for a group of optical surfaces
	`Delete group analysis`: Deletes the selected surface analysis
	`Label`: Enter a name for the group analysis here.
	`Reference type`: Set which reference type is used for the group analysis. Options: • `Rotation Axis`: Axis of rotation of the air bearing • `Optical Axis`: Optical axis For multi-lens optical systems, which optical axis is to be used as a reference must be defined. • `User Axis`: Mechanical reference Corresponds to the lens mount axis
	`Optical axis`: If the optical axis was selected as the reference type, you must define here which optical axis is to be used as the reference. The optical axes of the (lens) groups defined in the `Groups` configuration step are available for selection.
	`Group`: Indicates to which (lens) group the respective analysis applies.
	`Number`: From the list, select the group for which you want to create the analysis. The number corresponds to the sequence in which the groups were created in the `Groups` configuration step.

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	`Result`: From the list, select the result type that you want to evaluate. Options: • `Group Shift/Tilt`: Indicates the shift and tilt of the respective group relative to the reference axis.
	`Z-Level [mm]`: Enter the Z-position at which the shift of the group is to be evaluated.
3	**Editing toolbar** Buttons for editing the surface analysis.
	`Add new item`: Creates a new row in the table that does not yet contain any further parameters for the evaluation.
	`Move item up` Moves the selected row in the table up. The order of the output in the measurement certificate is changed.
	`Move item down` Moves the selected row in the table down. The order of the output in the measurement certificate is changed.
	`Remove selected item` The selected row is deleted from the table. This evaluation is then not output in the measurement certificate.

11.5.8 <CENTRATION> view

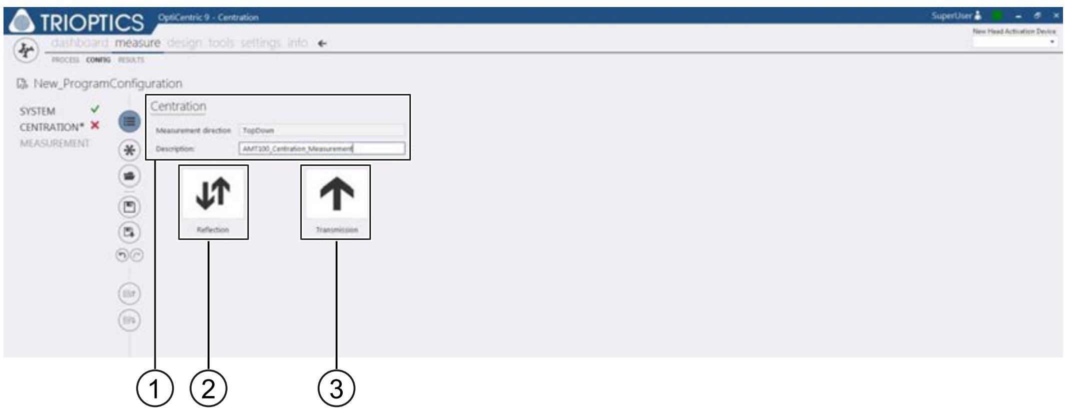
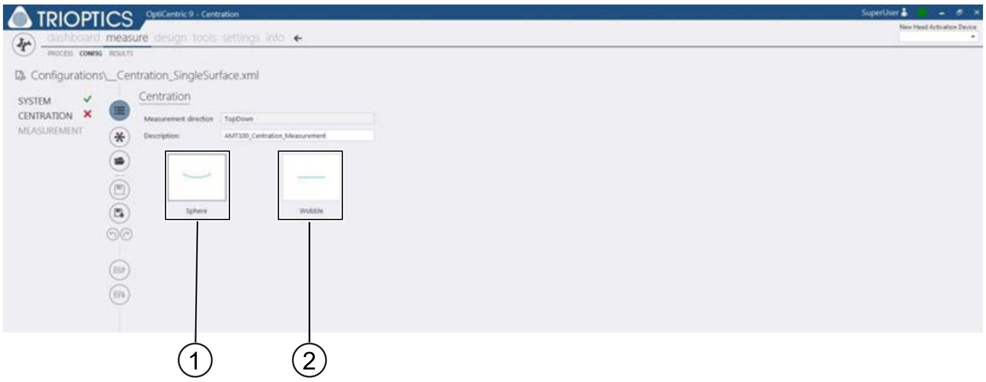


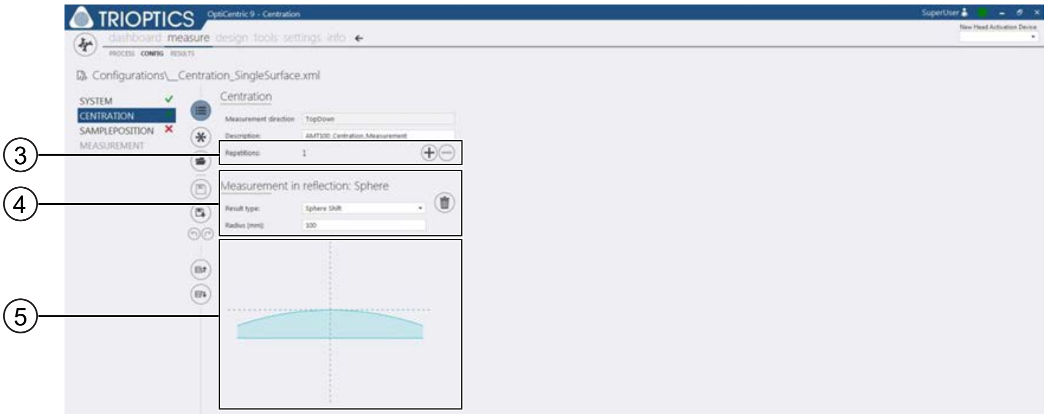
Fig. 172: Configure, CENTRATION view

1	**Centration** Determine parameters for a centration error measurement
	`Measurement direction`: Specify measurement direction This information is only required for dual measurement systems.
	`Description`: Enter a relevant description for the measurement process here. The description text is also output when exporting the measurement results.
2	`Reflection`: Select this button to configure a centration error measurement in reflection.
3	`Reflection`: Select this button to configure a centration error measurement in transmission.

Centration error measurement in reflection



View A: Spherical lens surface



View B: Plane surface

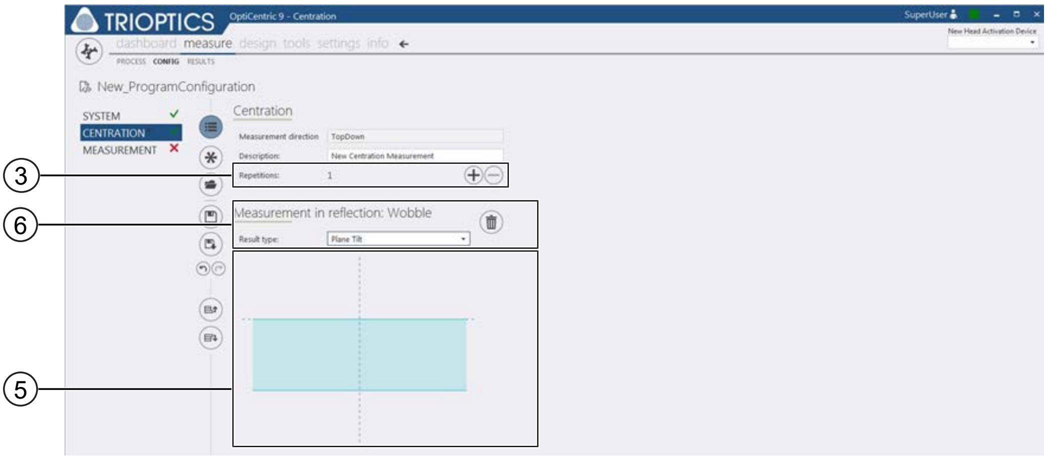
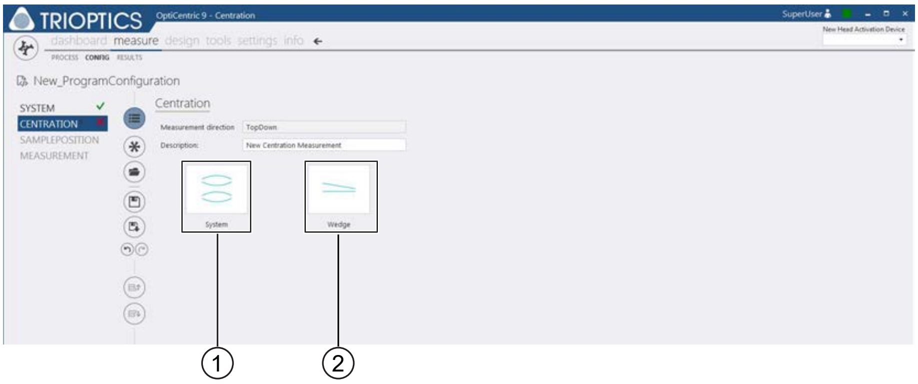


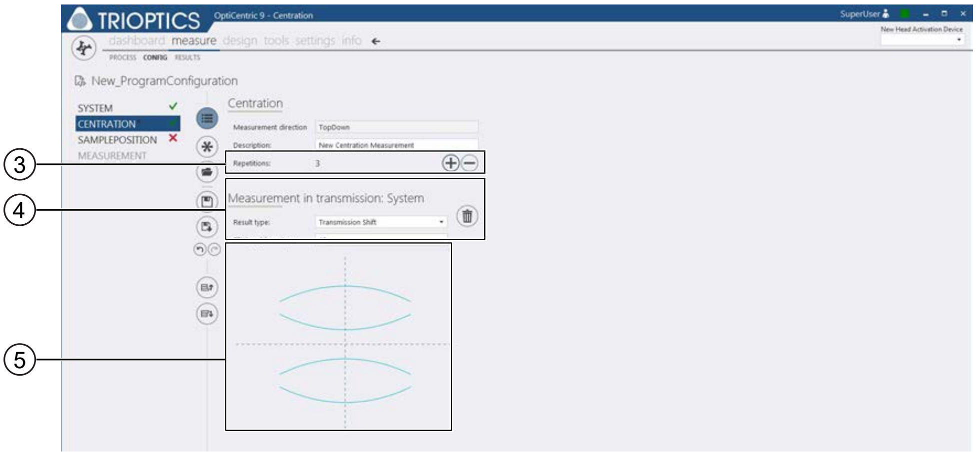
Fig. 173: Configure, CENTRATION Centration error measurement in reflection

1	Sphere: Select this button to configure a centration error measurement for a spherical lens surface.
2	Wobble: Select this button to configure a wobble measurement for a plane surface.
3	Repetitions: Enter the number of desired repetitions. The measurement result is calculated as the mean from the individual measurements. ⊕ Increase repetitions: Increase the number of repetitions by one. ⊖ Decrease repetitions: Decrease the number of repetitions by one.
4	Measurement in reflection: Sphere
	Result type: Specify the desired result type here. Options: • Sphere Shift: Shift of the center of curvature relative to the axis of rotation of the air bearing. • Sphere Tilt: Tilt of the optical axis relative to the axis of rotation of the air bearing.
	Radius [mm]: Radius of curvature of the uppermost sample surface
5	**Graphics window** Graphical representation of the sample design
6	Measurement in reflection: Wobble
	Result type: Specify the desired result type here. • Plane Tilt: Tilt of the plane surface relative to the axis of rotation of the air bearing.

Centration error measurement in transmission



View A: Spherical lens surface



View B: Plane surface

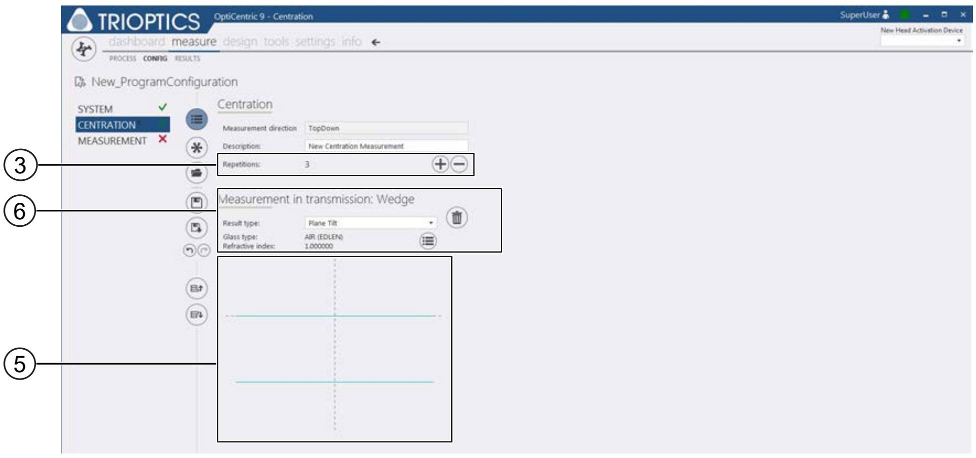


Fig. 174: Configure, CENTRATION Centration error measurement in transmission

1	System: Select this button to configure a measurement of the overall centration error for an optical system.	
2	Wobble: Select this button to configure a wedge angle measurement.	
3	Repetitions: Enter the number of desired repetitions. The measurement result is calculated as the mean from the individual measurements. ⊕ Increase repetitions: Increase the number of repetitions by one. ⊖ Decrease repetitions: Decrease the number of repetitions by one.	
4	Measurement in transmission: System	
	Result type: Specify the desired result type here. Options: • Transmission Shift: Shift of the focus of the entire optical system relative to the axis of rotation of the air bearing. • Transmission Tilt: Tilt of the optical axis of the entire optical system relative to the axis of rotation of the air bearing.	
	EFL [mm] from top: Effective focal length of the optical system	
5	**Graphics window** Graphical representation of the sample design	
6	Measurement in transmission: Wedge	
	Result type: Specify the desired result type here: • Plane Tilt: Tilt of the wedge surface relative to the axis of rotation of the air bearing.	
	Glass type: Enter the type of glass used here. Open the glass catalog to adjust the settings for the glass type.	
	Refractive Index: Refractive index The refractive index is automatically determined by the system based on the selected glass type and the wavelength of the light source used. Make sure that the wavelength configured in the hardware settings of the measuring head matches the wavelength of the light source actually used.	

11.5.9 <MEASUREMENT> view

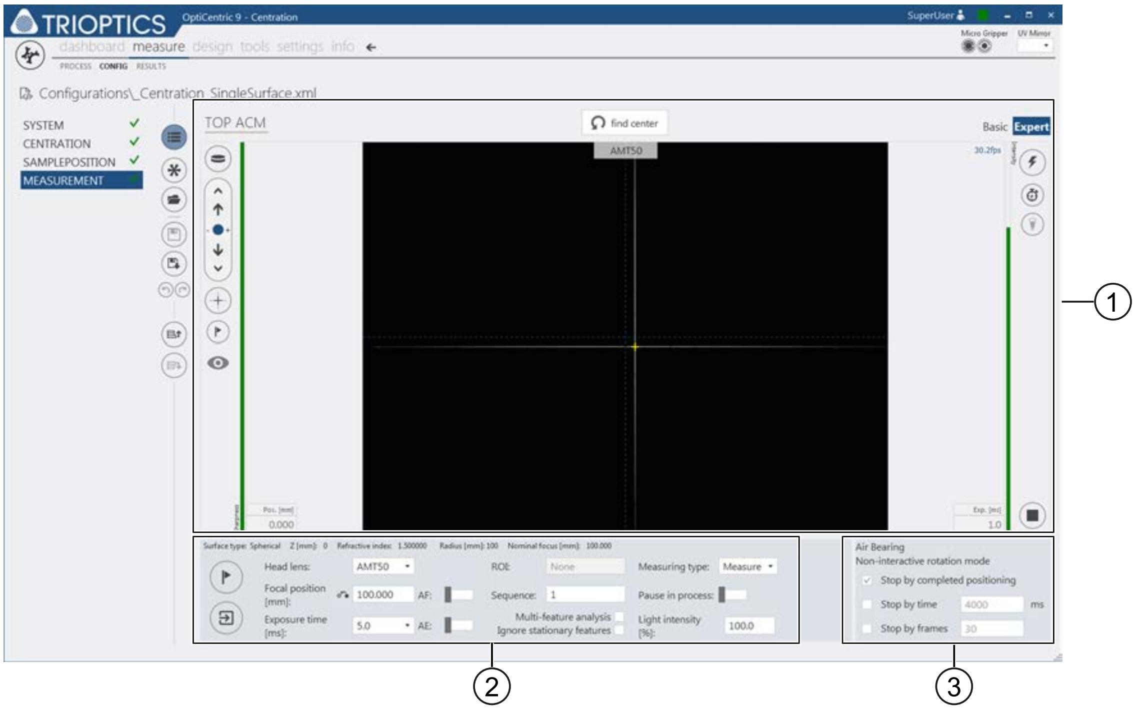
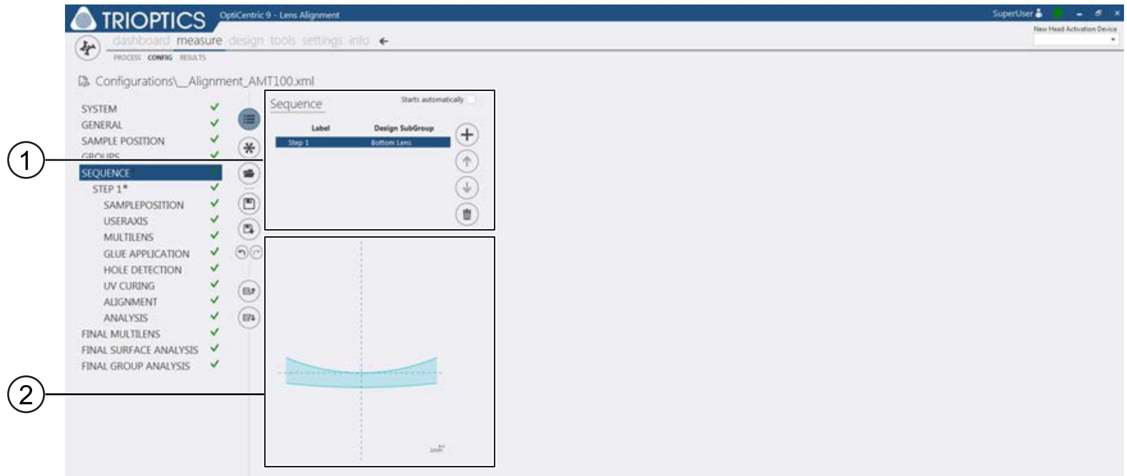


Fig. 175: Configure: MEASURE view

1	**Camera window** For further information please refer to *Camera window [210]*.
2	**Define measurement parameters for the centration error measurement**
	`apply configuration to measuring head`: The current settings are adopted for the measuring head and set as new settings.
	`write measuring head values to configuration`: Applies the current settings on the measuring head as measurement parameters for the configuration.
	`Head Lens`: Opens the list for selecting a head lens.
	`Focal position [mm]`: Displays the position of the determined focal plane in relation to the lens vertex.
	`Exposure time [ms]`: Shows the currently set exposure time. The value can be overwritten manually.
	`Reset focus position to nominal value`: Resets the value for the position of the focal plane to the calculated value
	`AF` (Autofocus): Perform automatic focus search before each measurement : Option is activated : Option is deactivated

	AE (Auto exposure): Perform automatic exposure adjustment before each measurement : Option is activated : Option is deactivated
	ROI (Region of Interest): Sub-area in the camera window in which to search for the image of the reticle. If no search area has been defined, the field is populated with NONE.
	Sequence: Determine the sequence in which the surfaces are measured (useful to avoid unnecessary movements of the measuring head).
	Measuring type: Define the measurement method for each surface. Options: • Measure • Select • Select automatically • Select and grab For further information please refer to *MULTILENS / MULTILENS [Sub-step] / FINAL MULTILENS [▸ 66]*.
	Pause in Process: Automatically stop the measurement process before measuring a surface (required if changes need to be made during measurement). : Option is activated : Option is deactivated
	Multi-feature analysis: If present, the software tracks several crosses in the camera image.
	Ignore stationary features: The software ignores non-moving crosses.
	Light intensity: Change settings for the intensity of the light source
3	**Air Bearing** Set options for the rotary air bearing
	Stop by completed positioning: The measurement stops after one complete revolution of the air bearing.
	Stop by time: The measurement stops after a defined time interval.
	Stop by frames: The measurement stops after a defined number of separate measuring points.

11.5.10 <SEQUENCE> view



View A

Fig. 176: Configure, SEQUENCE view

1	**Sequence**: Define the number of bonding steps required.
	`Label` The name is assigned automatically by the system.
	`Design SubGroup` The selected (lens) group for this processing step is displayed.
	`Add bonding step`: Opens the view for selecting a (lens) group to be processed in this step (view A) and creates a new row in the table. The (lens) groups previously defined in the GROUPS configuration step are available for selection.
	`Move step up` Moves the selected row in the table up. The order of processing is changed.
	`Move step down` Moves the selected row in the table down. The order of processing is changed.
	`Remove bonding step` The selected row is deleted from the table.

	`Starts automatically` If the `Start new bonding process` button is pressed in process mode, the processing of this step is started automatically.
2	**Graphics window** Shows a preview of the optical design for each processing step

11.5.11 <STEP> view

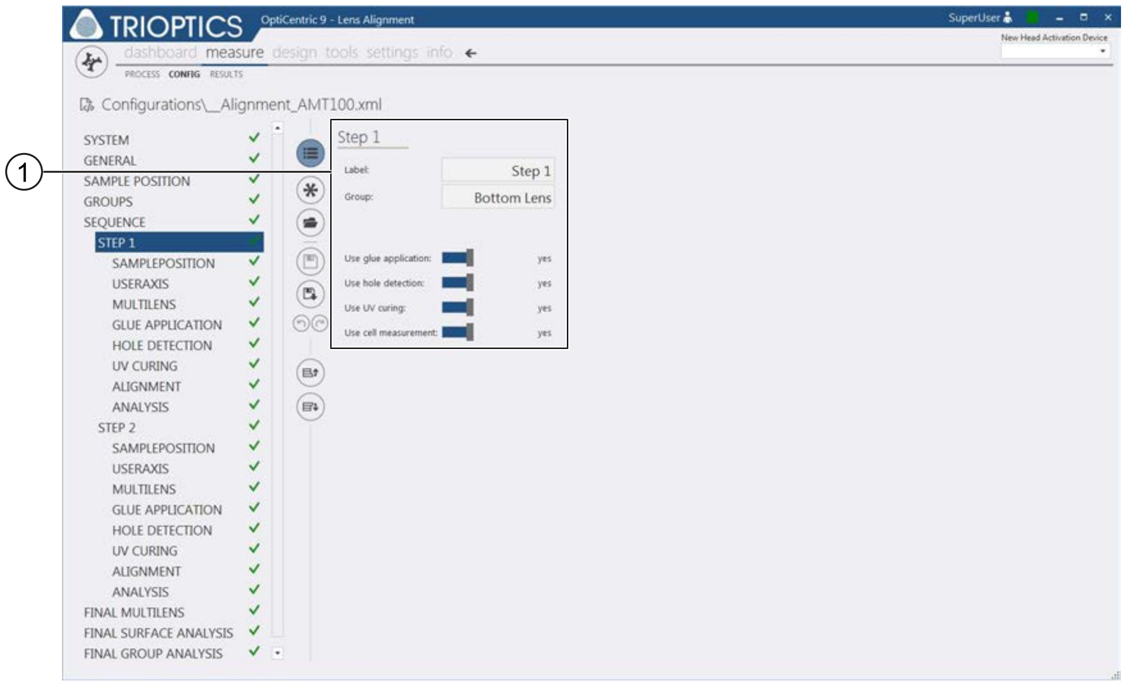


Fig. 177: Configure, STEP view

1	**Step** Define the application of individual options to the processing step
	`Label`: The name of the processing step is displayed.
	`Group`: The name of the (lens) group is displayed.
	`Use glue application`: Define use of the automatic glue dosing option
	`Use hole detection`:
	`Use UV curing`:
	`Use cell measurement`:
	Move the slider to the left to suspend the corresponding option. Move the slider to the right to apply the corresponding option.

11.5.12 <USERAXIS> view

<Teaching> tab

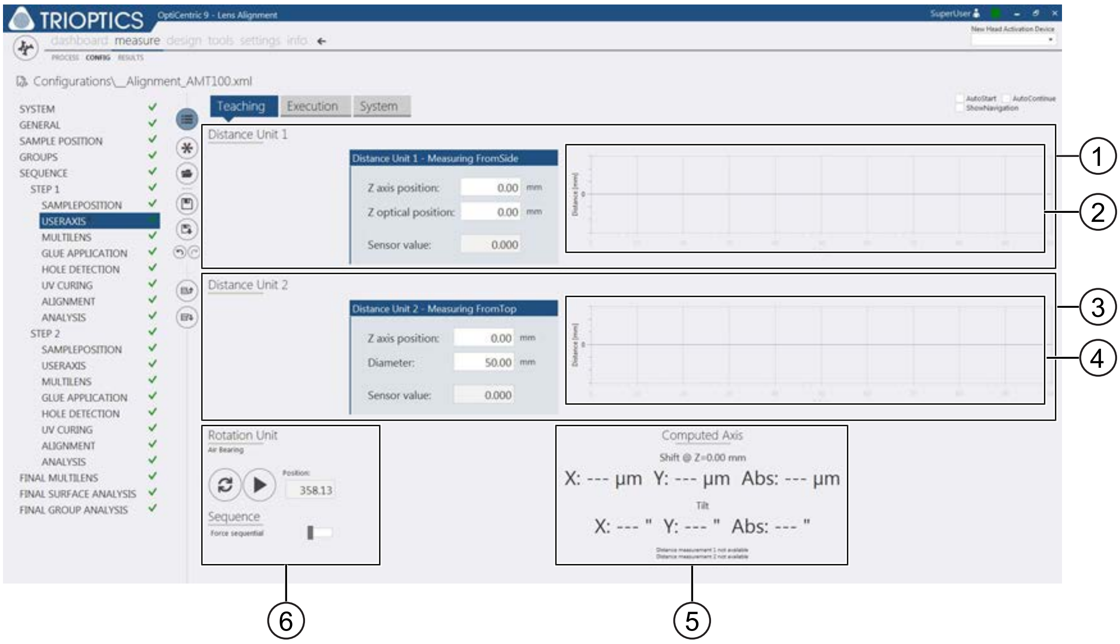


Fig. 178: Configure, USERAXIS view (Teaching)

1	**Distance Unit 1**: The current values for distance sensor 1 are displayed.
	`Z axis position` If the sensor is positioned by motor, the Z-coordinate of the positioning axis is displayed here.
	`Z optical position` The Z-coordinate of the optical sensor is displayed.
	`Sensor value` Displays the measured value
2	**Graphics window** The signal of sensor 1 is displayed graphically.
3	**Distance Unit 2**: The current values for distance sensor 1 are displayed.
	`Z axis position` If the sensor is positioned by motor, the Z-coordinate of the positioning axis is displayed here.
	`Diameter` Diameter at which the distance is measured.
	`Sensor value` Displays the measured value

4	**Graphics window** The signal of sensor 2 is displayed graphically.	
5	**Rotation Unit** Buttons for actuating the rotation device	
	Rotate airbearing: When this button is clicked, the air bearing performs one revolution.	
	Measure User Axis When this button is clicked, the distance sensors are activated. The shift and tilt of the mount relative to the reference axis is measured.	
6	**Computed Axis**	
	Shift: The shift of the mechanical axis relative to the axis of rotation of the air bearing at height Z is indicated.	
	Tilt: The tilt of the mechanical axis relative to the axis of rotation of the air bearing is indicated in the X- and Y-direction.	

<Execution> tab

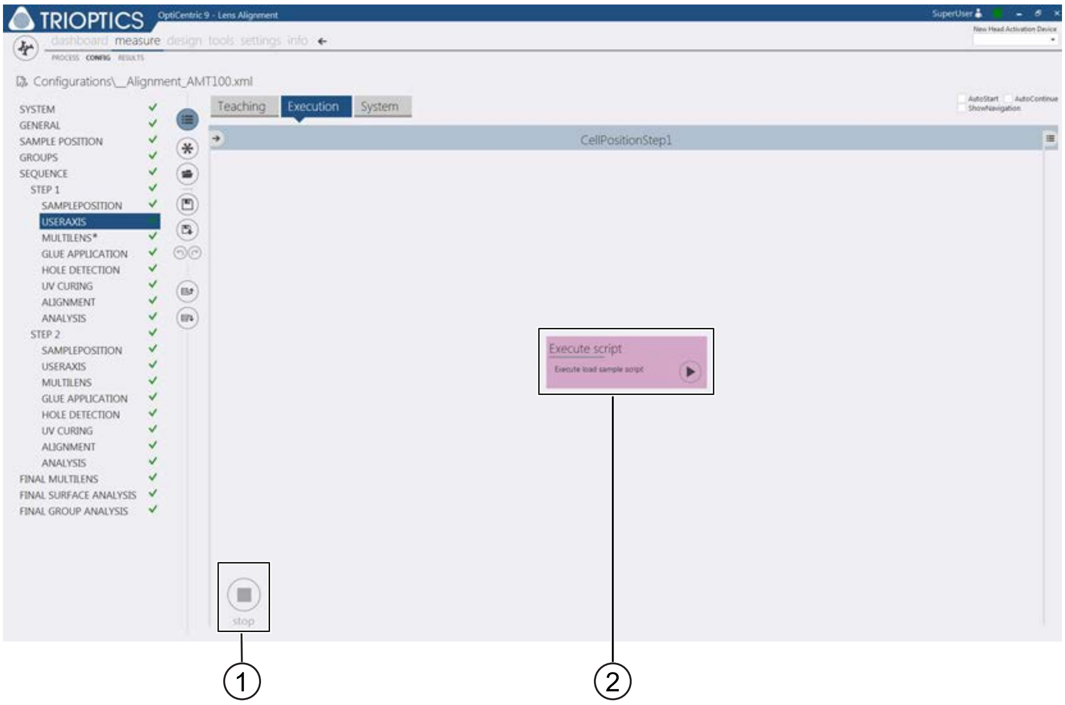


Fig. 179: Configure, USERAXIS view (Execution)

1	`Stop`: Stop the movement of all axes in an emergency.
2	`Execute Script` You can test the settings by clicking on this button.

11.5.13 <GLUE APPLICATION> view

<Teaching> tab

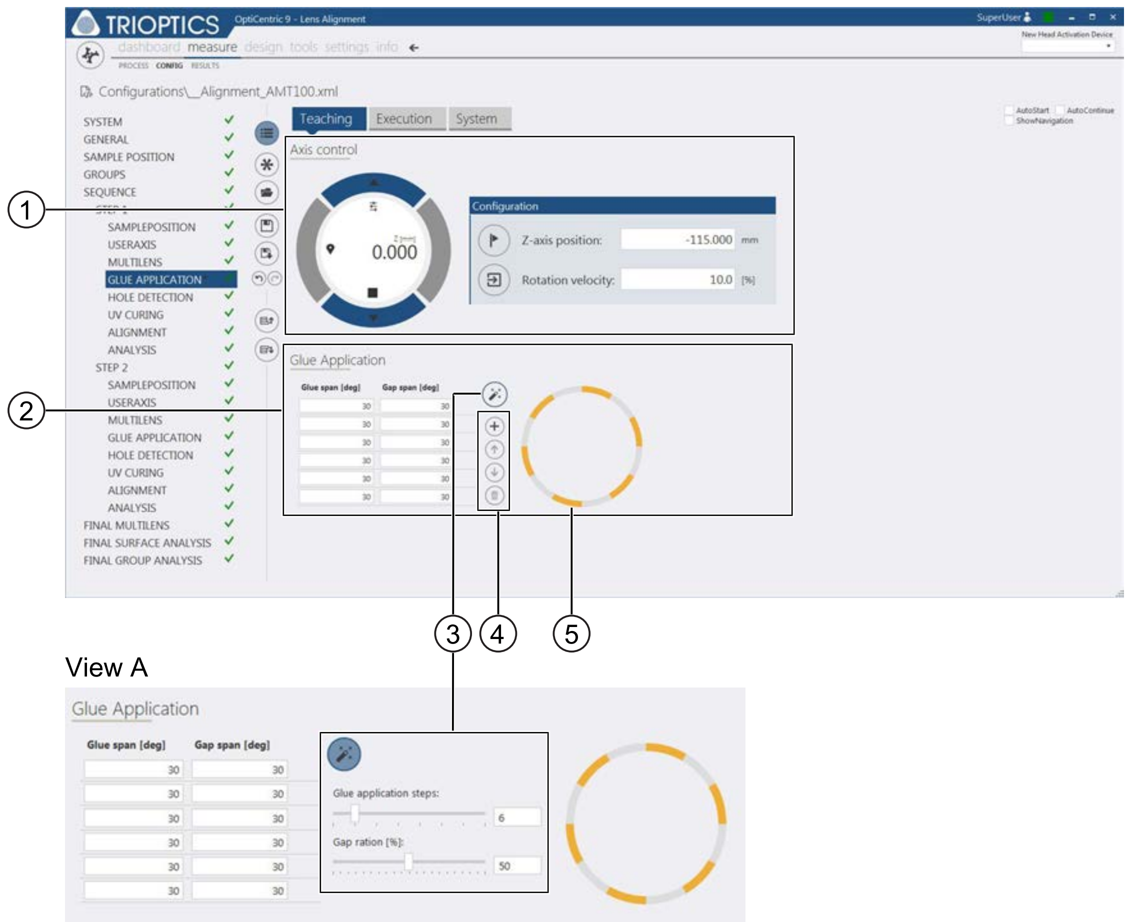


Fig. 180: Configure, GLUE APPLICATION view (Teaching)

1	**Axis control** If the glue dispenser is positioned by motor, the positioning axis can be controlled via these buttons (see *General control of the axes [▸ 213]*).
	`Z axis position` Shows the Z-coordinate of the positioning axis on which the glue dispenser is located.
	`Rotation velocity` Shows the rotational speed of the air bearing during glue application. The value can be overwritten manually (specified in % of the maximum rotational speed of the air bearing).
2	**Glue Application** Determine conditions for applying the glue
	`Glue span` Indicates the currently set width of the individual glue dots. The individual values can be overwritten manually. The glue pattern is changed. The changes are applied to the graphical view **(5)**.
	`Gap span` Indicates the currently set gap span between two glue dots. The individual values can be overwritten manually. The glue pattern is changed. The changes are applied to the graphical view **(5)**.
3	**Auto step mode**: Opens the area for automatic creation of the glue pattern
	`Glue application steps` Enter the desired number of glue applications to be performed during one revolution of the air bearing.
	`Gap ratio` A glue application consists of the glue dot and the gap span to the next glue dot. Use the slide bar to set the percentage ratio between the width of a glue dot and the gap span. A higher value increases the gap and makes the glue dot smaller.
4	**Edit glue patterns manually**
	`Add step` Add glue application
	`Increase order` Move the selected entry up in the table. The glue application is brought forward in the order. The changes are applied to the graphical view **(5)**.
	`Decrease order` Move the selected entry down in the table. The glue application is moved back in the order. The changes are applied to the graphical view **(5)**.
	`Remove step` Delete glue application
5	**Graphical representation of the glue pattern** The settings of the glue application are displayed graphically.

<Execution> tab

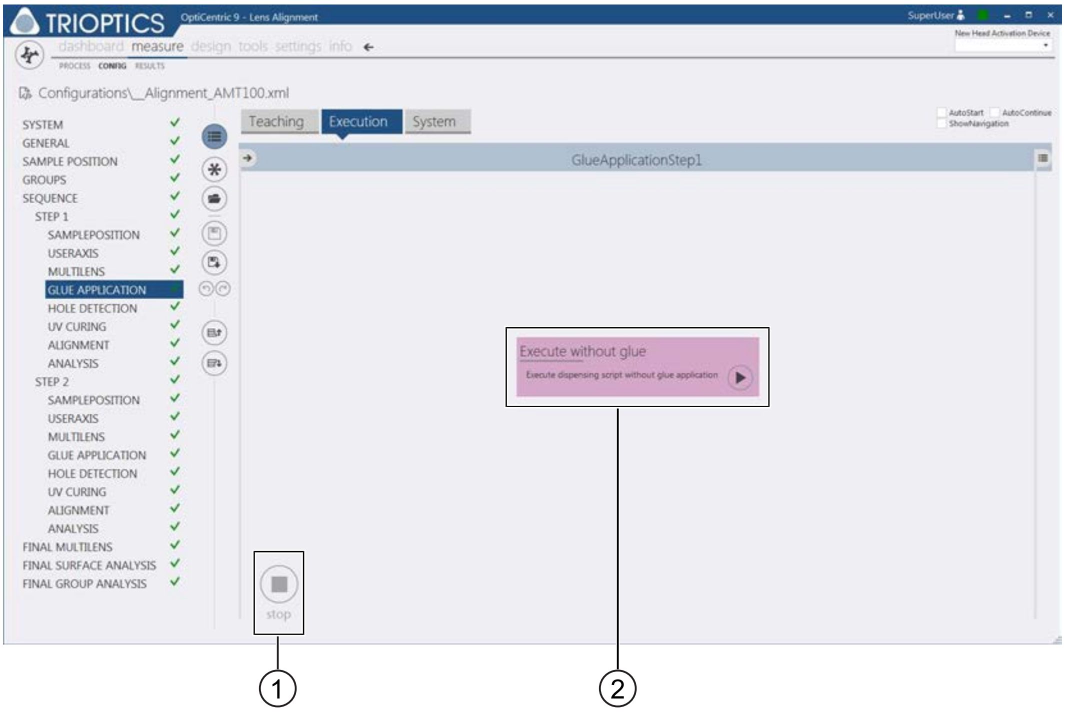


Fig. 181: Configure, GLUE APPLICATION view (Execution)

1	`Stop`: Stop the movement of all axes in an emergency.
2	`Execute Script` You can test the settings without applying any glue by clicking on this button.

11.5.14 <HOLE DETECTOR> view

<Teaching> tab

Fig. 182: Configure, HOLE DETECTION view (Teaching)

1	**Axis control** If the hole detection sensor is positioned by motor, the positioning axis can be controlled via these buttons (see *General control of the axes [▸ 213]*).	
2	**Configuration** Define conditions for the hole detection sensor	
	`Z axis position` Set Z-coordinate of the positioning axis on which the hole detection sensor is located.	
	`Rotation velocity` Shows the rotational speed of the air bearing during glue application. The value can be overwritten manually (specified in % of the maximum rotational speed of the air bearing).	
	`Positioning velocity` Set the speed at which the air bearing should rotate during hole detection. The value can be overwritten manually (specified in % of the maximum rotational speed of the air bearing).	
	`Start angle` Set the position of the air bearing at which the hole detection sensor starts the measurement. The value is displayed in the `Start angle` field and can be overwritten manually.	
	`Scanning range` To ensure that a hole is detected, the air bearing performs a rotation within the set range. The value can be overwritten manually.	
	`Filter size` Set the step width between two measuring points of the hole detection sensor	
	`Skip fine search` A fine search is performed after the hole is detected. This fine search can be skipped. Activate the `Skip fine search` option to skip the fine search. Option is deactivated Option is activated	
3	**Graphics window** The signal from the hole detection sensor is displayed graphically.	

<Execution> tab

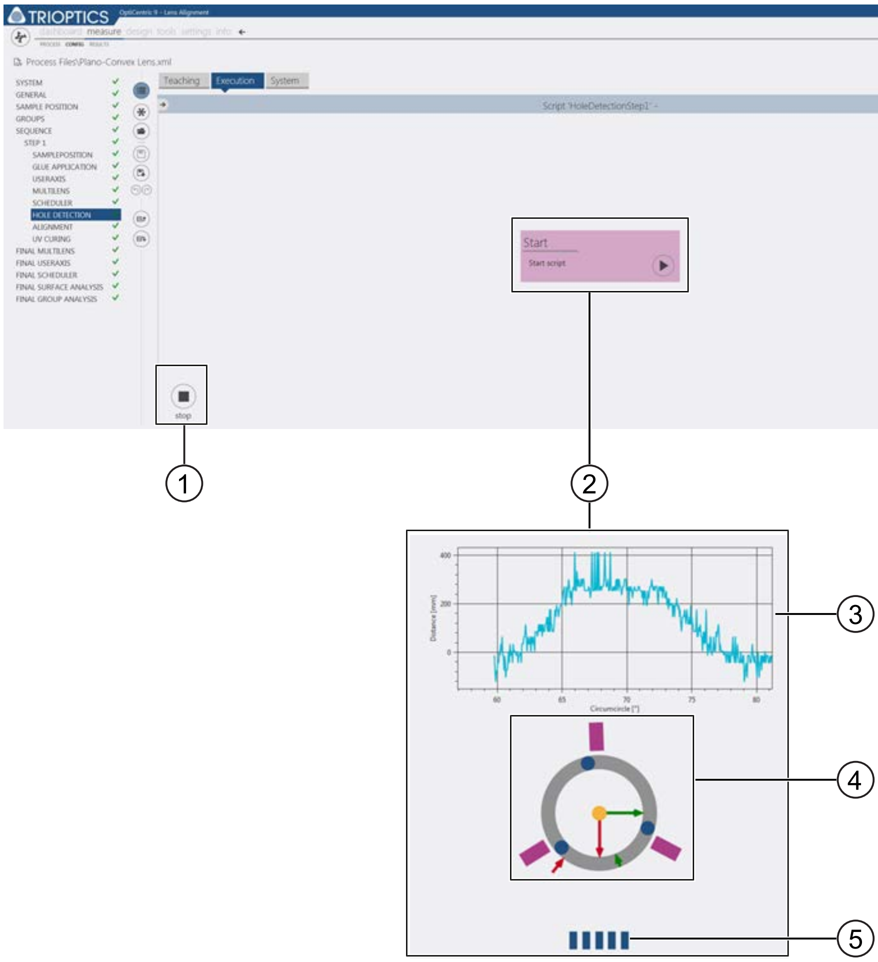


Fig. 183: Configure, HOLE DETECTION view (Execution)

1	`Stop`: Stop the movement of all axes in an emergency.
2	`Execute Script` You can test the settings of the hole detection sensor by clicking on this button.

11.5.15 <UV CURING> view

<Teaching> tab

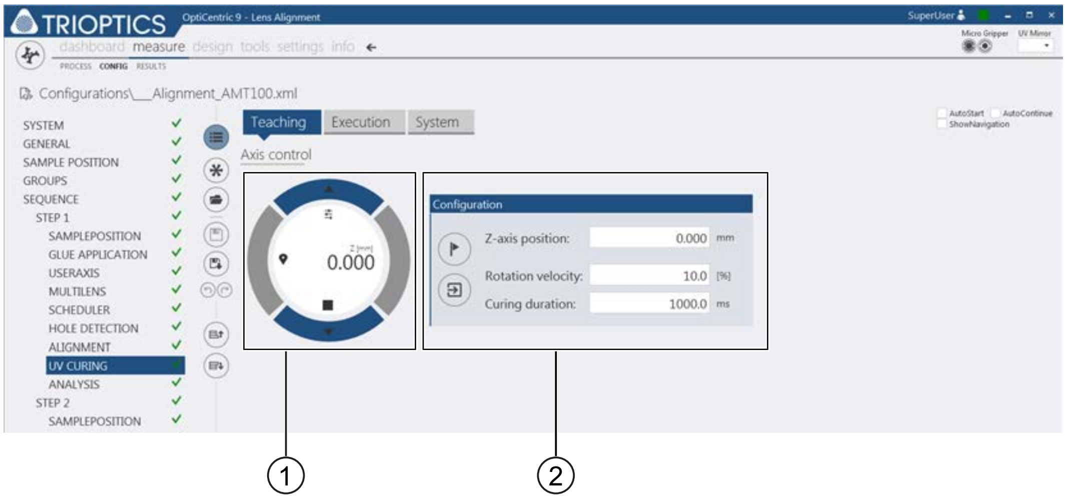


Fig. 184: Configure, UV CURING view (Teaching)

1	**Axis control** If the UV lighting unit is positioned by motor, the positioning axis can be controlled via these buttons (see *General control of the axes [213]*).
2	**Configuration** Define conditions for the UV lighting unit
	`Z axis position` Set Z-coordinate of the positioning axis on which the UV lighting unit is located. The value can be overwritten manually.
	`Rotation velocity` Shows the rotational speed of the air bearing during UV irradiation. The value can be overwritten manually (specified in % of the maximum rotational speed of the air bearing).
	`Curing duration` Set the duration of the UV irradiation.
	`apply configuration to curing unit` Apply the values of the current configuration to the UV lighting unit.
	`write curing unit values to configuration` Applies the current values of the UV lighting unit to the configuration.

<Execution> tab

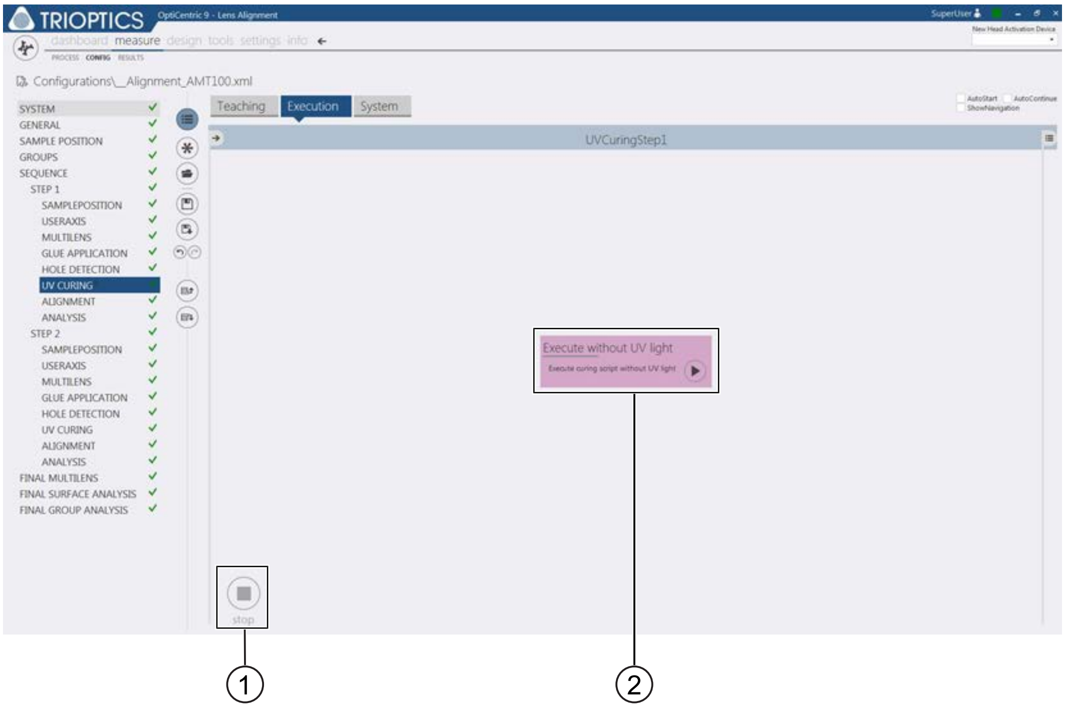


Fig. 185: Configure, UV CURING view (Execution)

1	`Stop`: Stop the movement of all axes in an emergency.
2	`Execute Script` You can test the settings of the UV lighting unit by clicking on this button.

11.5.16 <ALIGNMENT> view

<Teaching> tab

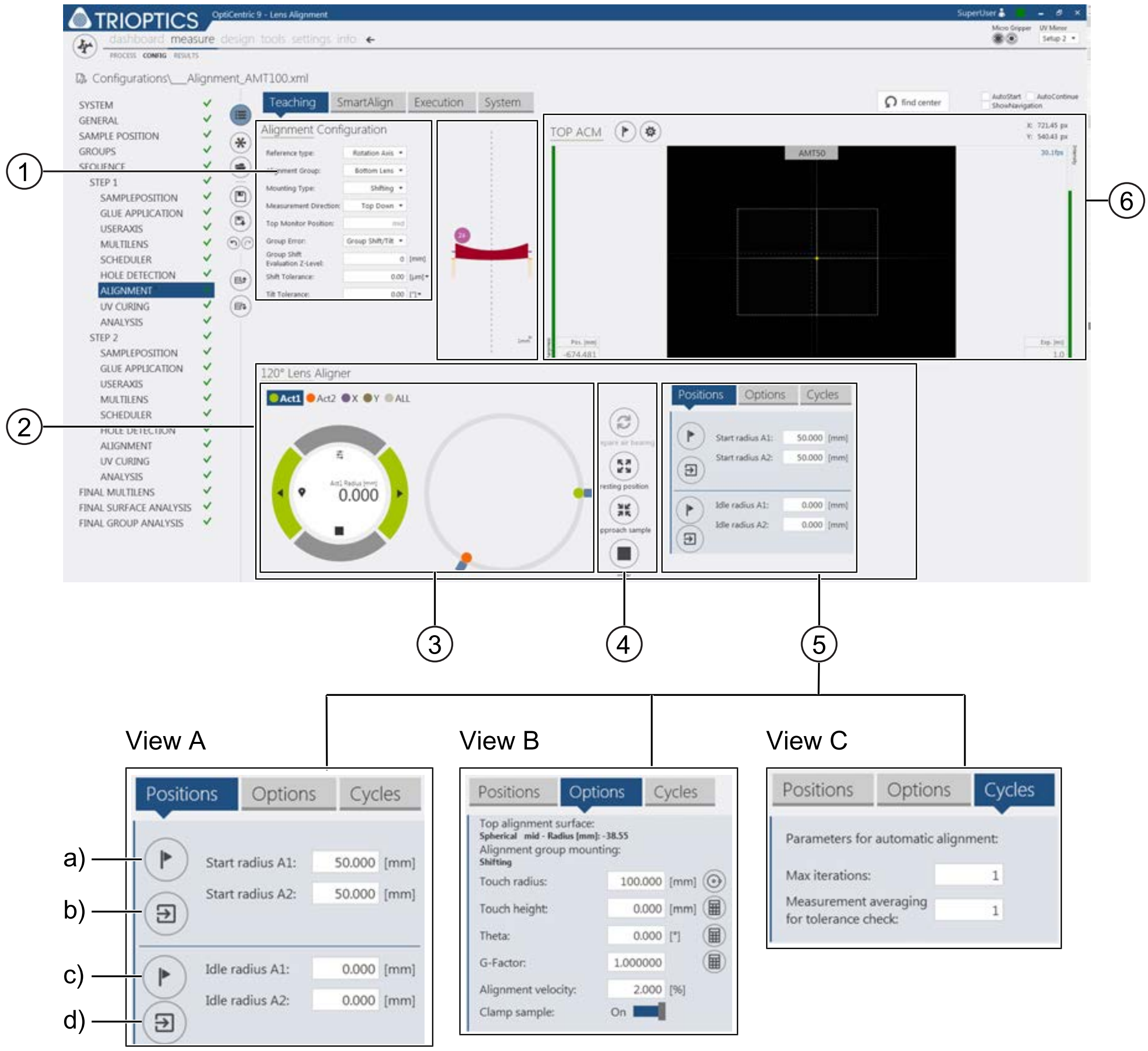


Fig. 186: Configure, ALIGNMENT view (Teaching)

1	**Smart Align Single Surface**: Set measuring head conditions for the current surface
	`Top monitor position` Set the Z-coordinate of the upper measuring head.
	`Alignment Error` Set the type of centration error.
	`Reference type` Select the reference axis to which you want to align. Options: • Rotation axis (rotation axis of the air bearing) • UserAxis (mechanical axis of the mount) • OpticalAxis (optical axis). If you selected the OpticalAxis option: In the `Optical axis` field, select which optical axis you want to use as the reference (view B).
	`Optical axis` Specify the optical axis to align to.
	`Alignment tolerance` Define tolerance limit for the centration error
2	**Lens Aligner Settings** Set conditions for the alignment unit (actuators).
3	**Axis control of the individual actuators** The positioning axis of the actuators can be controlled via these buttons (see *General control of the axes [▸ 213]*).
4	**Alignment unit control**
	`Prepare air bearing` The air bearing rotates so that the positioning needles can move towards the lens through the hole in the mount. This button is only active if the `Hole detection` configuration step was carried out before.
	`move all actuators to resting position`
	`move each actuator slowly towards sample` The individual actuators are slowly moved up to the sample. These values must be determined with `Approach actuator, move to inside` and checked carefully. **Be very careful!**
	`Stop all movements` The movement of all actuators is stopped.

5	**Positions** (see **view A**) The start positions and the safe positions for the individual actuators are defined here.
	a) `apply start radius and z-position to lens aligner` The positioning axis on which the actuators are located moves to the specified Z-position. The actuators move to the specified start position. These values must be determined with `Approach actuator, move to inside` and checked carefully. **Be very careful!**
	b) `write lens aligner start position to configuration` Apply the determined values for the start position of each actuator to the configuration.
	C) `apply idle position to lens aligner` The actuators return to their safe position (safe radius).
	d) `write lens aligner idle position to configuration` Apply the determined values for the safe position of each actuator to the configuration.
	`Start radius A1 / A2` Displays the value for each actuator that was determined as the start radius. The value can be overwritten manually.
	`Idle radius A1 / A2` Displays the value for each actuator that was determined as the safe radius. The value can be overwritten manually. The safe radius is the position of an actuator at which the positioning axis of the alignment unit can be moved without risk of collision, or at which the air bearing can rotate without risk of collision.

CAUTION

Risk of collision

The values for the start radius and the safe radius must be checked using the `move each actuator slowly towards sample` function **(4)**.

– **Be very careful!**

	Options (see **view B**) Here you define further options for the alignment.
	Touch radius The value corresponds to the radius at which the actuators touch the sample. set touch radius to top alignment surface border: Takes the optimum touch radius from the design data and enters the value in the input field. If necessary, the value can be overwritten manually.
	Touch height The value corresponds to the height (in optical coordinates) at which the actuators touch the sample. compute optimal touch height: Calculates the optimal height at which the actuators touch the sample and enters the value in the input field. If necessary, the value can be overwritten manually.
	Theta Angle of attack with which the actuators are moved up to the sample in order to achieve a greater effect in the correction of tilt errors. The value applies to all actuators and can be overwritten manually. compute optimal theta Calculates the optimum angle of attack and enters the value in the Theta field.
	G-Factor Ratio between the distance an actuator has actually covered and the actual movement of the center of curvature. A small G value means a large actuator travel distance. The G-factor must always be entered with the correct preceding sign. compute g-factor Calculates the G-factor and enters the value in the G-factor field.
	Alignment velocity Speed at which the actuators are moved during alignment (specified as % of the maximum travel speed of the actuators).
	Clamp sample activated: All actuators approach the sample at the same time and clamp it. The sample is then aligned by moving all actuators simultaneously. deactivated: The actuators are moved one after the other to the sample for alignment. The actuators that are not used are in a waiting position. It is necessary to define a distance by which the actuators move away from the start radius (Actuator backlash).
	Actuator backlash This field is only visible when the Clamp sample option is deactivated. Actuator backlash is the value by which the actuators move away from the start radius (waiting position). The value applies for all actuators. We recommend selecting a value of > 1 mm for Actuator backlash.
6	**Camera window** Displays the current camera image

<Execution> tab

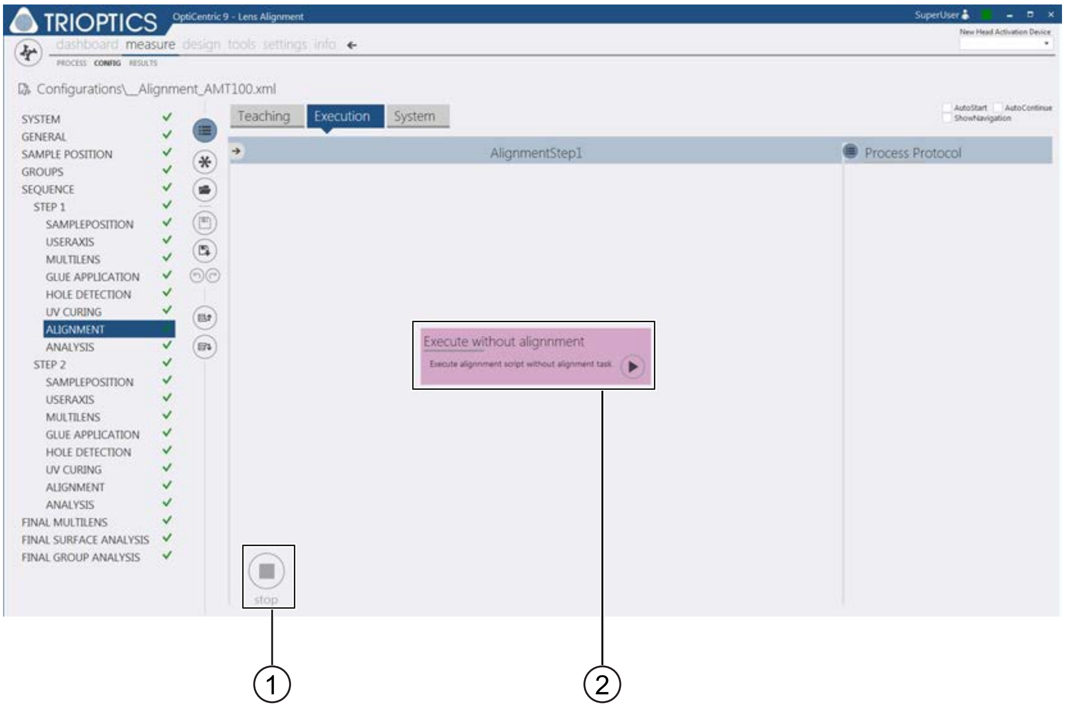


Fig. 187: Configure, ALIGNMENT view (Execution)

1	`Stop`: Stop the movement of all axes in an emergency.
2	`Execute Script` You can test the settings without performing an alignment by clicking on this button.

11.5.17 <ANALYSIS> view (Step)

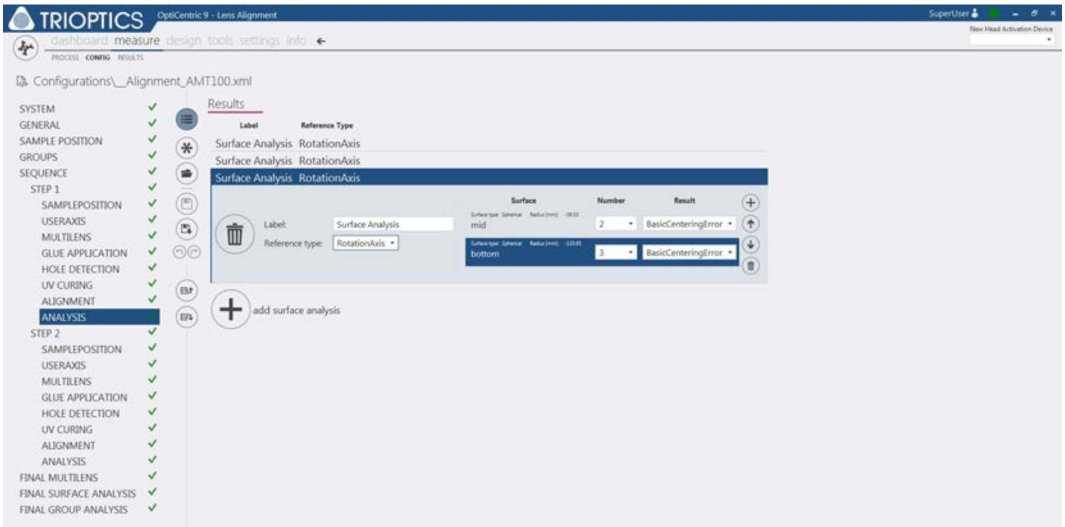


Fig. 188: Configure, ANALYSIS view (Step)

Here you can define a single surface analysis for all surfaces of the current (lens) group. The parameters correspond to those of the surface analysis in a MultiLens® process (see *<SURFACE ANALYSIS> view [▸ 230]*).

11.5.18 <FINAL MULTILENS> view

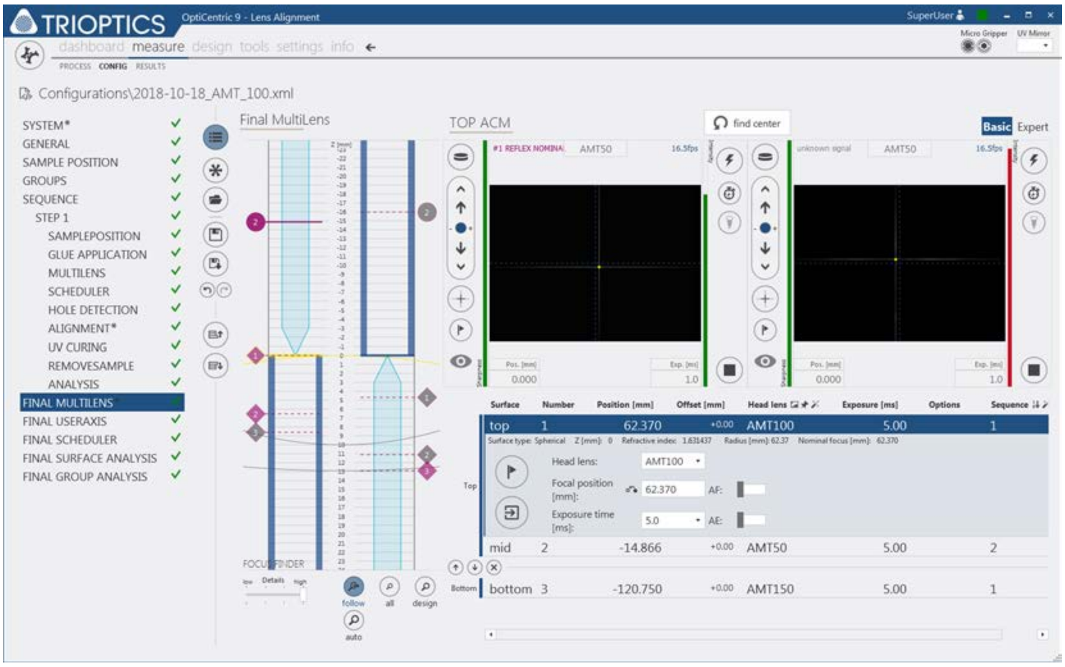


Fig. 189: Configure, FINAL MULTILENS view

Here you can define a final MultiLens® measurement for the entire optical system after the alignment process has been completed. The procedure corresponds to the MultiLens® configuration step (see *<MULTILENS> view [▸ 226]*).

11.5.19 <FINAL SURFACE ANALYSIS> view

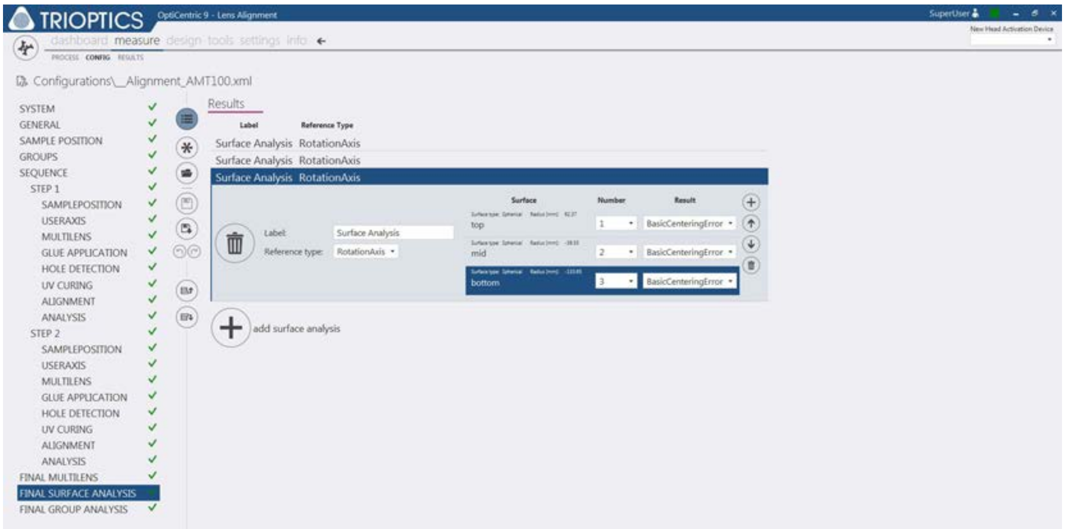


Fig. 190: Configure, <FINAL SURFACE ANALYSIS> view

Here you can define a single surface analysis for all surfaces of the entire optical system after the alignment process has been completed. The parameters correspond to those of the surface analysis in a MultiLens® process (see *<SURFACE ANALYSIS> view [▸ 230]*).

11.5.20 <FINAL GROUP ANALYSIS> view

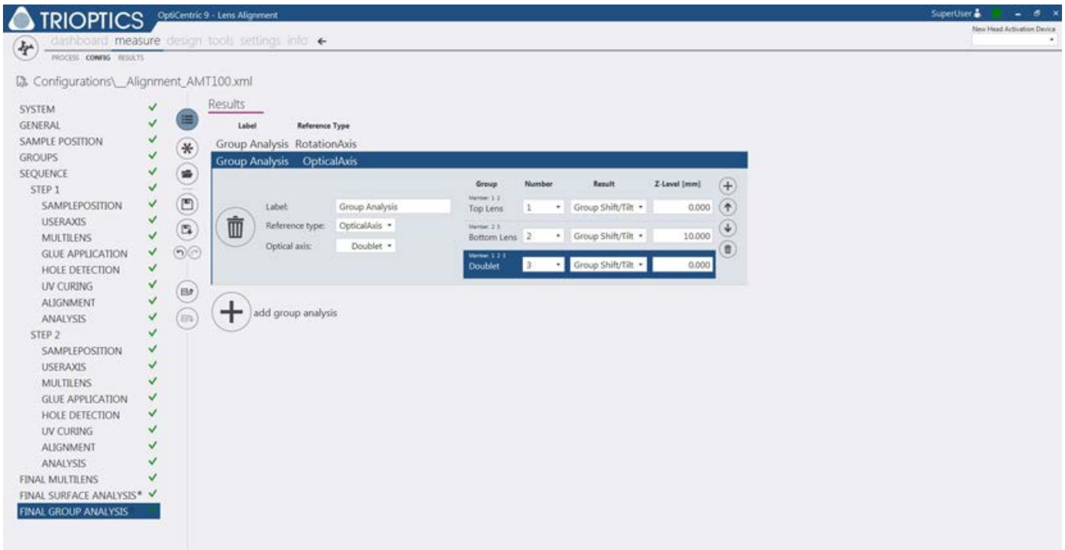


Fig. 191: Configure, <FINAL GROUP ANALYSIS> view

Here you can define a group analysis for all surfaces of the entire optical system after the alignment process has been completed. The parameters correspond to those of the group analysis in a MultiLens® process (see *<GROUP ANALYSIS> view [▸ 232]*).

11.6 Settings

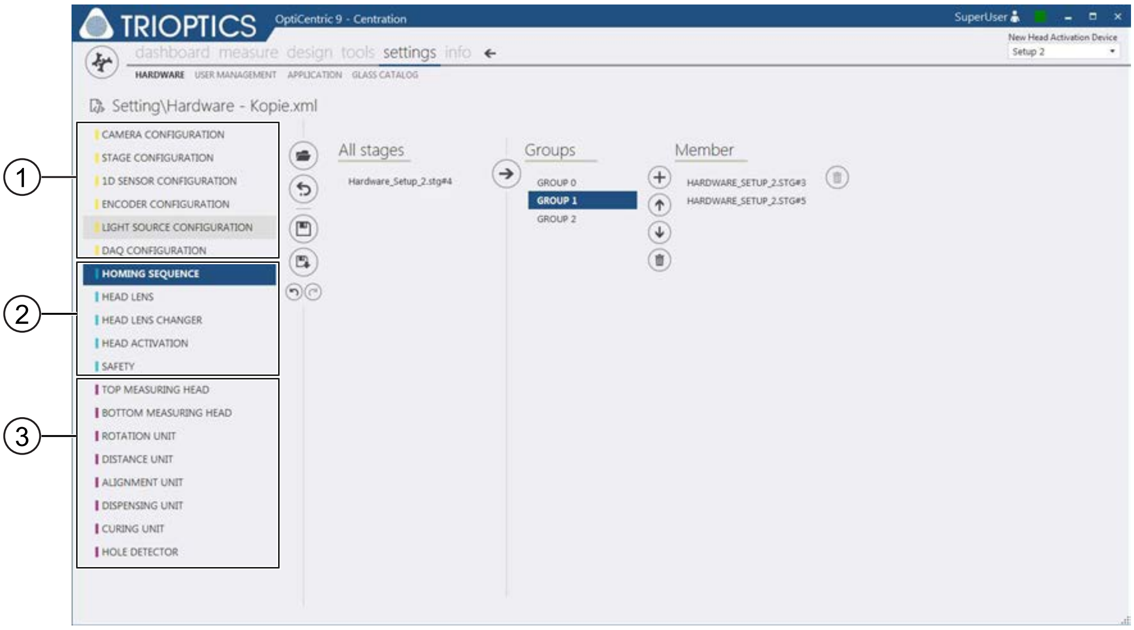


Fig. 192: Settings, HARDWARE menu

Hardware settings at various levels are necessary to ensure that your measurement system works without error.

For a better differentiation, these levels are highlighted in color in the settings menu and have the following meanings:

1	**Yellow marking** The individual hardware components and the basic hardware configurations for these components are set here.
2	**Blue marking** Basic settings for the software are made here. These settings refer to the functional units.
3	**Purple marking** The functional units are defined here. These usually consist of several hardware components.

NOTE

Settings in areas **(1)** and **(2)** are predominantly system parameters and must not be changed without consulting TRIOPTICS GmbH.

11.6.1 HARDWARE <HEAD LENS> view

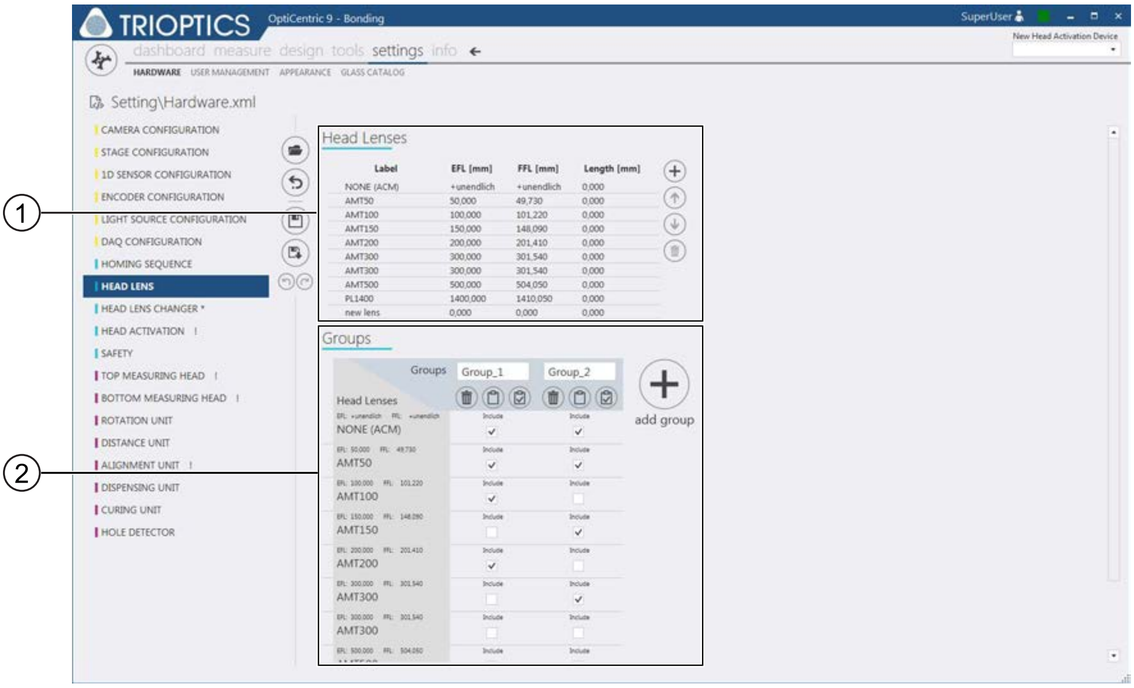


Fig. 193: Settings, HEAD LENS view

1	Head Lenses A list of the head lenses entered in the system is displayed in this area. You can edit the parameters for a head lens, add new head lenses, or remove entries from the list. Remove this Head Lens: Deletes the selected entry from the list.
	Label: Enter the name for the head lens.
	EFL [mm]: Enter the effective focal length of the head lens.
	FFL [mm]: Enter the flange focal length of the head lens.
	Length [mm]: Length of the head lens
	Add new head lens: Add a new head lens. A new row is created in the list.
	Move head lens up: Move head lens up in the list
	Move head lens down: Move head lens down in the list
	Remove selected head lens: Deletes the selected entry from the list

2	Groups You create groups of head lenses in this area. You can assign these to a lens changer later. A tabular summary of all groups is displayed. Add a new group: Creates a new column in the table. By selecting or deselecting the individual head lenses, these are added to or removed from the group. You can choose from all the head lenses that have been recorded in the Head Lenses area.
	Group: Enter the name for the group.
	Delete this Group: Delete the group
	Unselect all lenses in this group: The previous selection of head lens in this group is cleared.
	Select all lenses in this group: All available head lens are included in this group.

11.6.2 HARDWARE view <HEAD LENS CHANGER> (lens changer)

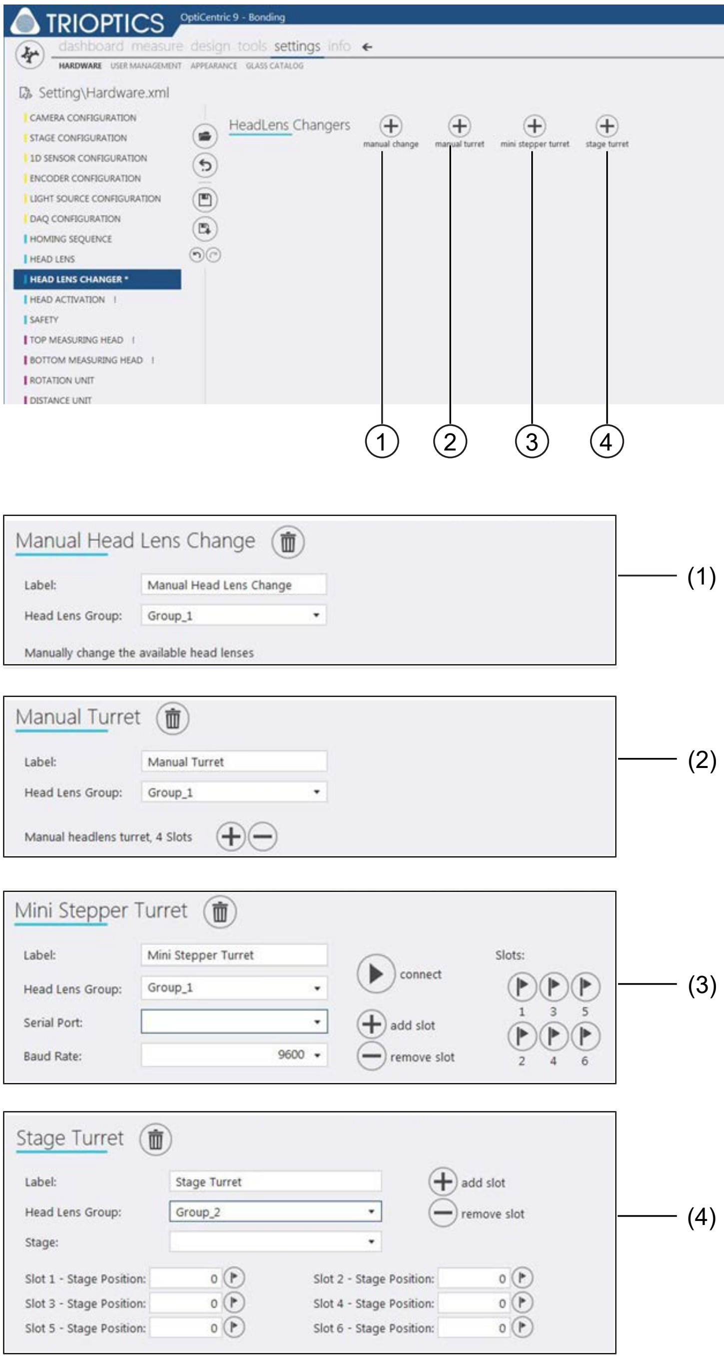


Fig. 194: Settings, HEAD LENS CHANGER view

1	`Manual Head Lens Change` For hardware configurations without a head lens changer you need a manual lens change in order to be able to choose between different head lenses later in the different software menus. `Remove this Head Lens Changer`: Deletes the manual lens change from the hardware settings.
	`Label`: Enter the name for the manual lens change
	`Head Lens Group`: Assign a group of head lenses to the manual lens change. The head lenses of this group can be selected later in the various software menus.
2	`Manual Turret` Add a manual head lens changer as a hardware component. `Remove this Head Lens Changer`: Deletes the manual lens changer from the hardware settings.
	`Label`: Enter the name for the manual lens changer
	`Head Lens Group`: Assign a group of head lenses to the manual lens changer. The head lenses of this group can be selected later in the various software menus.
	`Manual Head Lens Changer, Slots`: Enter the number of slots of the lens changer. `Add head lens slot`: Add a slot `Remove last head lens slot`: Remove the last slot
3	`Mini Stepper Turret` Add a motorized lens changer of the old design as a hardware component. `Remove this Head Lens Changer`: Deletes the motorized lens changer of the old design from the hardware settings.
	`Label`: Enter the name for the motorized lens changer
	`Head Lens Group`: Assign a group of head lenses to the motorized lens changer. The head lenses of this group can be selected later in the various software menus.
	`Serial Port`: Number of the serial interface via which the lens changer is connected to the measurement system.
	`Baud Rate`: Transfer rate Experience has shown that an initial value of 9600 has proved successful.
	`Connect head lens changer`: Connect the lens changer to the measurement system
	`Add head lens slot`: Add a slot
	`Remove last head lens slot`: Remove the last slot
	`Slots`: `Move stage to this position`: Move the positioning axis of the motorized lens changer to the relevant position.

4	`Stage Turret` Add a motorized lens changer as a hardware component. `Remove this Head Lens Changer`: Deletes the motorized lens changer from the hardware settings.
	`Label`: Enter the name for the motorized lens changer
	`Head Lens Group`: Assign a group of head lenses to the motorized lens changer. The head lenses of this group can be selected later in the various software menus.
	`Stage`: Enter the positioning axis that controls the motorized lens changer.
	`Add head lens slot`: Add a slot
	`Remove last head lens slot`: Remove the last slot
	`Slots - Stage Position`: The working positions for each slot are determined here. The individual positions are determined by the number of steps that the motor must move, starting from its zero position. These values are pre-configured when the measurement system is delivered. If necessary, you can adjust the values slightly. Enter the number of steps required for each slot position. `Move stage to this position`: Move the positioning axis of the motorized lens changer to the relevant position.

11.6.3 HARDWARE <HOMING SEQUENCE> view

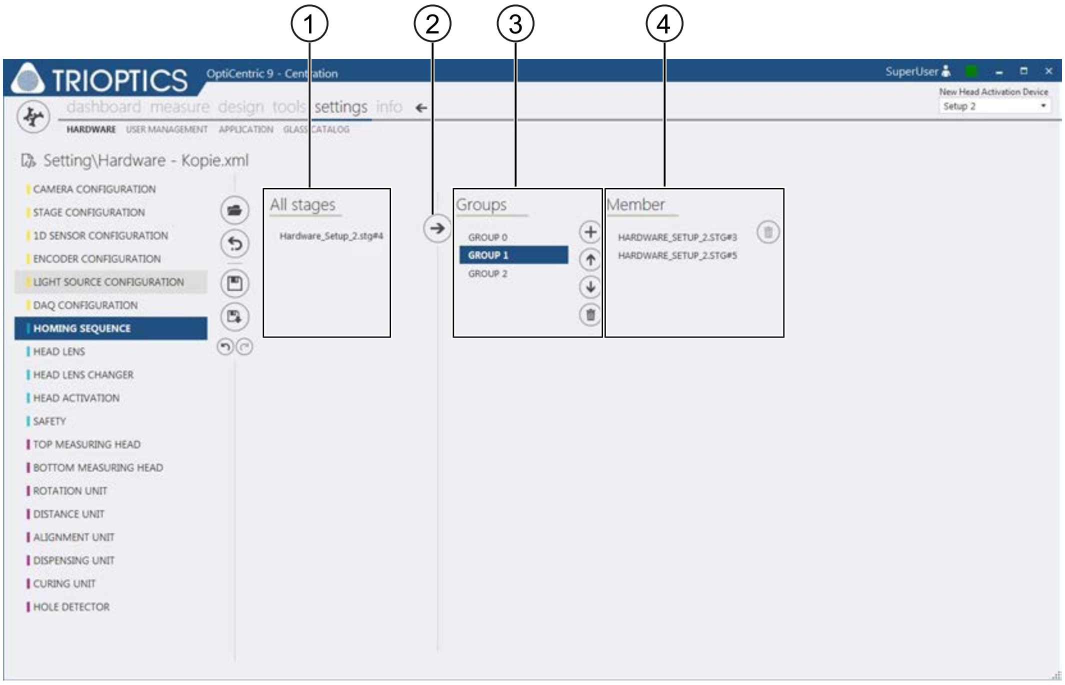


Fig. 195: Settings, HOMING SEQUENCE view

1	**All stages** This area displays a list of all available positioning axes. Positioning axes that have already been assigned to a group are displayed in the `Member` area **(4)**.
2	`Add to Group` To add a positioning axis to a group, select the desired group and then click the add to group button. The positioning axis is added to this group and displayed in the `Members` area **(4)** as part of this group.
3	**Groups** This area displays a list of the groups of positioning axes that have already been created. Select the desired entry to display the associated positioning axes.
	`Add new item`: Creates a new group.
	`Move item up`: Moves the selected group in the list up. The group is moved forward in the referencing sequence.
	`Move item down`: Moves the selected group in the list down. The group is moved back in the referencing sequence.
	`Remove selected item`: The group of positioning axes is deleted.
4	**Member** This area shows which positioning axes belong to a group.
	`Remove selected item`: A single positioning axis can be removed from the group. The positioning axis is then displayed again in the `All Stages` area **(1)**.

11.6.4 HARDWARE <TOP MEASURING HEAD> view

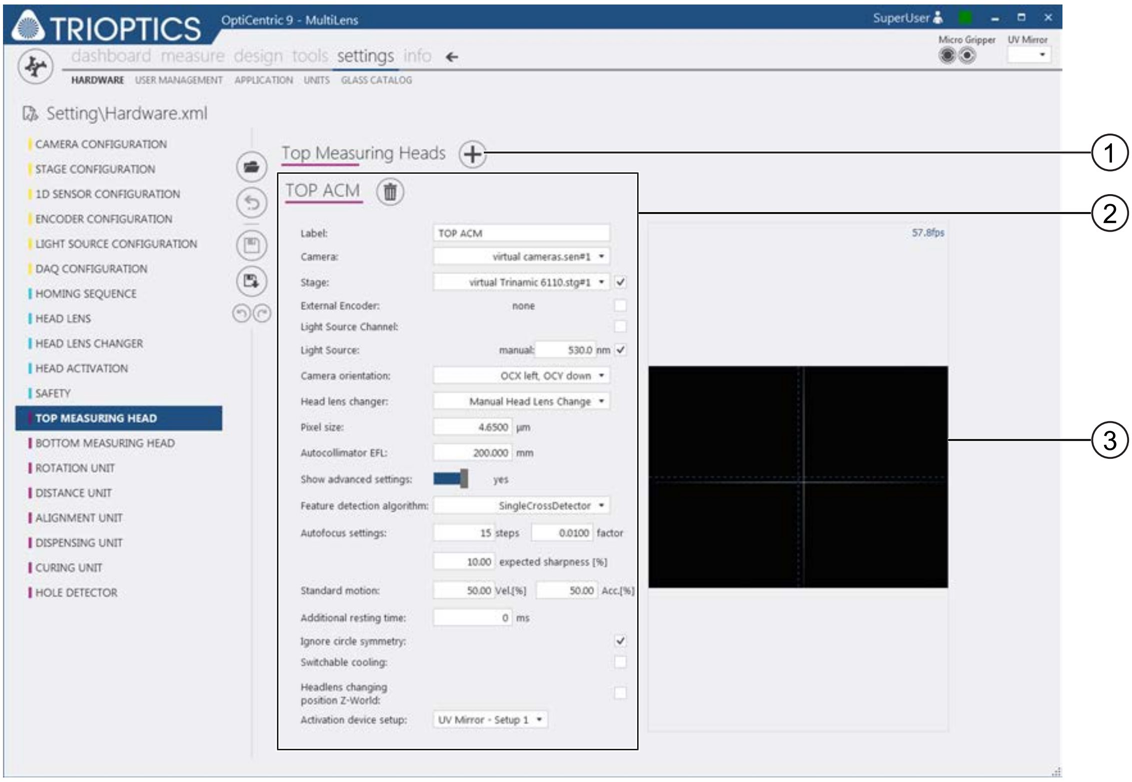


Fig. 196: Settings, TOP MEASURING HEAD view

1	**Top Measuring Heads** In this area you can define several upper measuring heads as hardware components. The measuring heads can be selected later in the various software menus.
	`Add new Measuring Head` A new area for configuring the measuring head is created **(2)**.
2	**Measuring Head** In this area you define the parameters for a measuring head.
	`Remove this measuring Head`: Deletes this measuring head as a hardware component from the hardware settings.
	`Label`: Enter a name for the measuring head here. The measuring head can later be selected under this name in the various software menus.
	`Camera`: Enter the type of camera used here. Which cameras are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.
	`Stage`: Enter the positioning axis that controls the measuring head.
	`External Encoder`: Check the box if the measuring head is controlled by an external encoder. In this case, select an encoder from the list. Which encoders are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.

	`Light Source Channel`: Enter the wavelength of the light source here, or check the box if the light source is controlled by an external control unit. In this case, select a light source from the list. Which light sources are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.
	`Camera Orientation`: Set the orientation of the camera here.
	`Head Lens Changer`: If the measuring head is equipped with a lens changer, select the corresponding lens changer from the list here. The lens changers previously defined in the hardware settings are available for selection (see *HARDWARE view <HEAD LENS CHANGER> (lens changer) [▸ 265]*).
	`Pixel size`: Resolution of the camera chip Distance between two pixels of the camera chip
	`Autocollimator EFL`: Effective focal length of the autocollimator
	`Show advanced settings`: Show advanced settings
	`Feature detection algorithm`:
	`Autofocus settings`: Autofocus settings • `steps`: Number of steps for an autofocus scan • `Factor`: Step size between the individual measuring points in an autofocus scan • `Expected sharpness [%]`: Lower limit for the autofocus criterion
	`Standard motion`: Basic speed and basic acceleration (in % of maximum speed / acceleration) for moving the measuring head axis
	`Additional resting time`: Time interval between moving the measuring head and starting the measurement
	`Ignore circle symmetry`:
	`Switchable cooling` For measurement systems with IR camera modules, the camera cooling can be switched off during a measurement.
	`Head Lens changing position Z-World`: Z-coordinate for the changing position of the lens changer (specified in world coordinates)
	`Activation device setup`: Select a pre-configured hardware setup for the measuring head
3	**Camera window**

11.6.5 HARDWARE <BOTTOM MEASURING HEAD> view

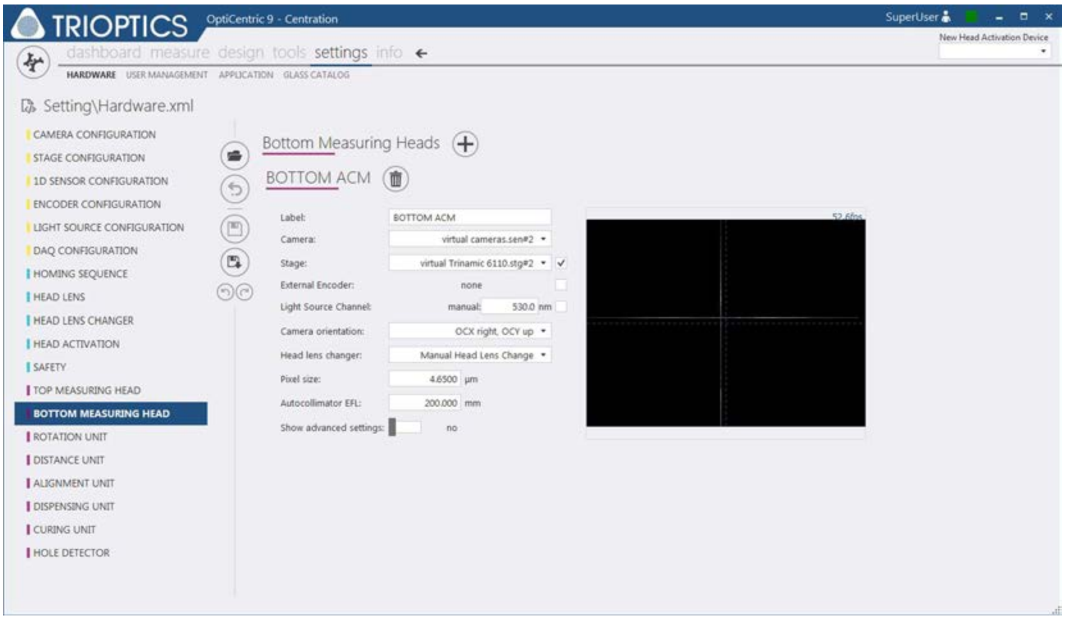


Fig. 197: Settings, BOTTOM MEASURING HEAD view

The procedure for setting up a bottom measuring head is the same as for setting up a top measuring head (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).

11.6.6 HARDWARE <ROTATION UNIT> view

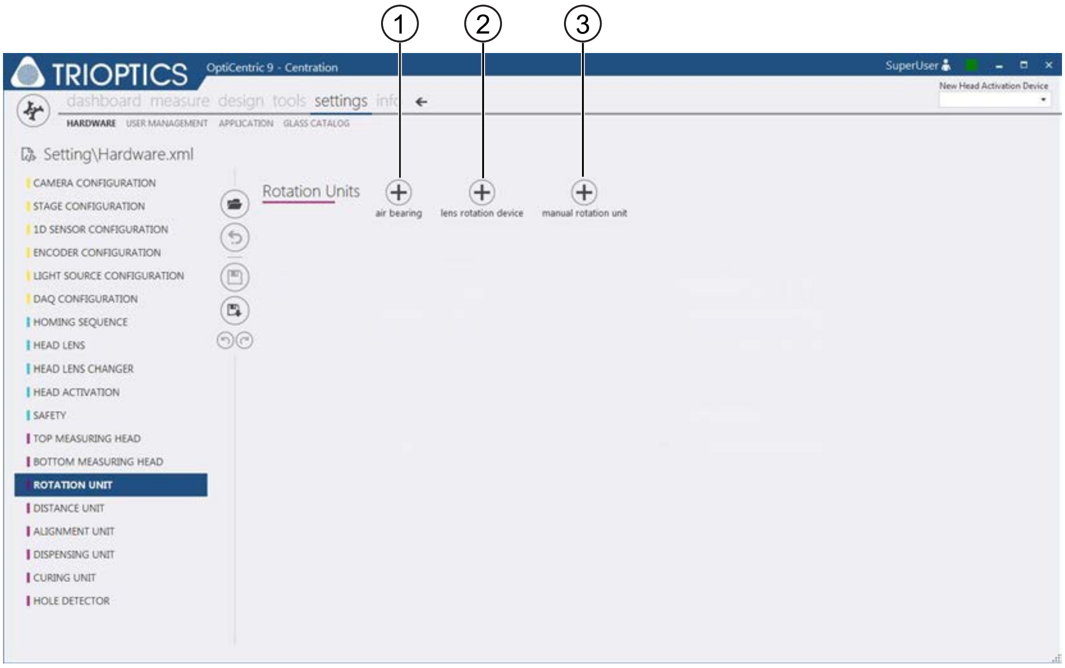


Fig. 198: Settings, ROTATION UNITS view

1	**Air Bearing** ⊕ `Add Air Bearing`: Add a rotary air bearing as a hardware component. A new area for configuring a rotary air bearing is created (see *Air Bearing [▸ 273]*).
2	**Lens Rotation Device** ⊕ `Add Lens Rotation Device`: Add a lens rotation device as a hardware component. A new area for configuring a lens rotation device is created (see *Lens Rotation Device [▸ 274]*).
3	**Manual Rotation Unit** ⊕ `Add Manual Rotation Unit`: Add a manual lens rotation device as a hardware component. A new area for configuring a manual lens rotation device is created (see *Manual Rotation Unit [▸ 275]*).

Air Bearing

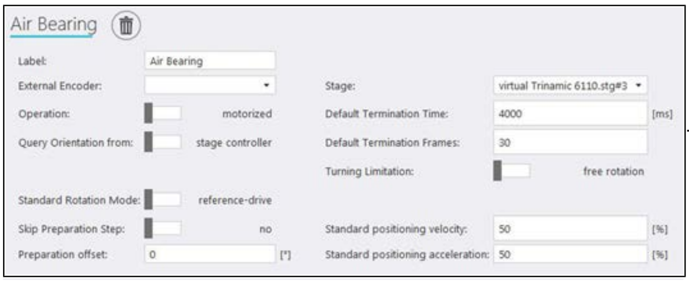
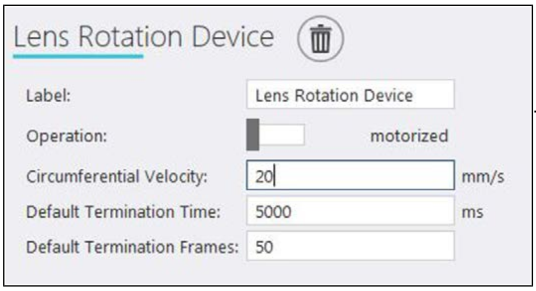


Fig. 199: Settings, ROTATION UNITS view: Air Bearing

(1)	`Remove this Rotation Unit`: Deletes the rotary air bearing as a hardware component from the hardware settings.
	`Label`: Enter a name for the rotary air bearing here. The rotary air bearing can later be selected under this name in the various software menus.
	External Encoder:
	Stage:
	`Operation`: The operating mode is set to `motorized` by default. Change the operating mode by clicking on the slide bar. `stage controller`: The rotary air bearing is motorized. `manual`: The rotary air bearing is operated manually.
	`Query orientation from` By default, the control unit of the motorized axes (stage controller) is set as the reference. Change the reference by clicking on the slide bar. `stage controller`: The rotary air bearing receives the reference from the control unit of the motorized axes (Stage Controller). `external encoder`: The rotary air bearing receives the reference from an external encoder.
	`Standard Rotation Mode`: The default rotation mode is reference-drive (rotate to reference position). Change the mode by clicking on the slide bar. `reference-drive`: The reference position is checked before each measurement. `positioning-drive`: Encoder values are used to move the air bearing to a certain position (the reference position is known).
	`Skip Preparation Step`: In some cases it may be necessary for the air bearing to perform a reference cycle prior to measurement. This option can be used to skip this reference cycle. `Skip Preparation Step – No`: A reference cycle of the air bearing is performed before each measurement. `Skip Preparation Step – Yes`: The reference cycle of the air bearing before a measurement is skipped.
	`Preparation offset`: Here you can set an offset of the zero position for the air bearing.

	Default Termination Time (default setting for time interval): In this field, enter the period of time after which the measurement is finished.
	Default Termination Frames (default setting for the number of steps): In this field, enter the number of measuring points after which the measurement is finished.
	Turning Limitation: Maximum range in which the air bearing moves (input in degrees [°])
	Standard positioning velocity: Standard speed (input in % of maximum speed)
	Standard positioning acceleration: Standard acceleration (input in % of maximum acceleration)

Lens Rotation Device

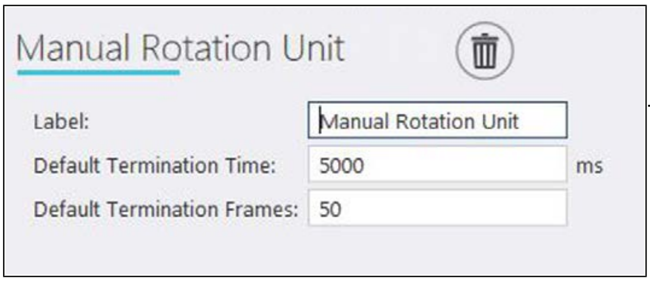


(2)

Fig. 200: Settings, ROTATION UNITS view: Lens Rotation Device

(2)	Remove this Rotation Unit: Deletes the lens rotation device as a hardware component from the hardware settings.
	Label: Enter a name for the lens rotation device here. The lens rotation device can later be selected under this name in the various software menus.
	Operation: The operating mode is set to motorized by default. Change the operating mode by clicking on the slide bar. motorized: The lens rotation device is motorized. manual: The lens rotation device is operated manually.
	Circumferential Velocity [mm/s]:
	Default Termination Time (default setting for time interval): In this field, enter the period of time after which the measurement is finished.
	Default Termination Frames (default setting for the number of steps): In this field, enter the number of measuring points after which the measurement is finished.

Manual Rotation Unit



(3)

Fig. 201: Settings, ROTATION UNITS view: Manual Rotation Unit

(3)	`Remove this Rotation Unit`: Deletes the manual lens rotation device as a hardware component from the hardware settings.
	`Label`: Enter a name for the manual lens rotation device here. The manual lens rotation device can later be selected under this name in the various software menus.
	`Default Termination Time` (default setting for time interval): In this field, enter the period of time after which the measurement is finished.
	`Default Termination Frames` (default setting for the number of steps): In this field, enter the number of measuring points after which the measurement is finished.

11.6.7 HARDWARE <DISTANCE UNIT> view

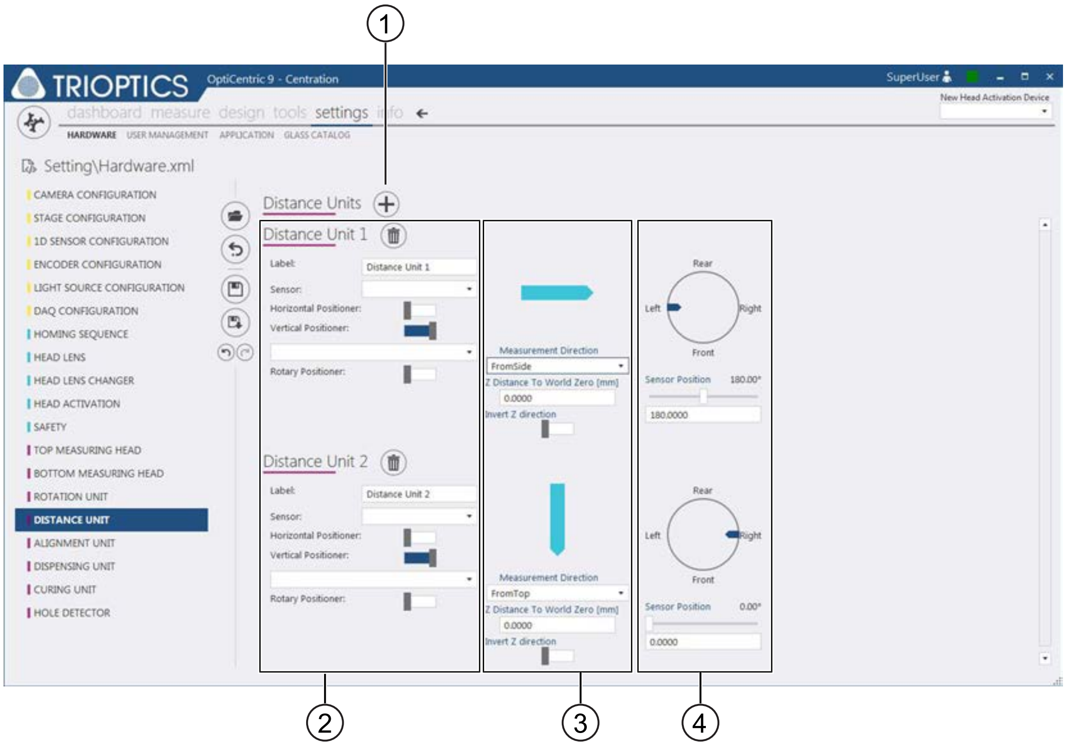


Fig. 202: Settings, DISTANCE UNIT view

1	**Distance Units** In this area you can define several distance sensors as hardware components. The distance sensors can be selected later in the various software menus.
	 `Add new Distance Unit`: A new area for configuring the distance sensor is created **(2)**.
2	**Distance Unit** In this area you can configure the parameters for a distance sensor.
	 `Remove this Distance Unit`: Deletes this distance sensor as a hardware component from the hardware settings.
	`Label`: Enter a name for the distance sensor here. The distance sensor can later be selected under this name in the various software menus.
	`Sensor`: Enter the type of sensor used here. Which sensors are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.

	`Horizontal Positioner`: Select this option if the distance sensor is to be positioned by motor in the horizontal direction. • `Use motorized horizontal positioner`: The option is deactivated. The distance sensor is positioned manually in the horizontal direction. • `Use motorized horizontal positioner`: The option is activated. The distance sensor is positioned by motor in the horizontal direction. In this case, enter the positioning axis via which the distance sensor is to be moved in the horizontal direction.
	`Vertical Positioner`: Select this option if the distance sensor is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The distance sensor is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The distance sensor is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the distance sensor is to be moved in the vertical direction.
	`Rotary Positioner`: Select this option if the distance sensor is to be positioned by motor in the azimuthal direction. • `Use motorized vertical positioner`: The option is deactivated. The distance sensor is positioned manually in the azimuthal direction. • `Use motorized vertical positioner`: The option is activated. The distance sensor is positioned by motor in the azimuthal direction. In this case, enter the positioning axis via which the distance sensor is to be moved in the azimuthal direction.
	`Invert Z direction`: Set the orientation of the Z-axis here.
3	`Measurement Direction`: Enter the measuring direction of the distance sensor in this field. The measuring direction is shown schematically in the graphics area. The following measuring directions are available, depending on the hardware configuration: • `FromSide`: Measurement from the side • `FromTop`: Measurement from the top • `FromBottom`: Measurement from the bottom • `Variable`: With this distance sensor it is possible to measure from the top and from the side. • `None`: The distance sensor is not used.
	`Z Distance to WorldZero [mm]`: Enter the Z-coordinate at which the distance sensor is in its zero position. This value is only required if the distance sensor is positioned in the Z-direction by motor.
	`Invert Z direction`: Set the orientation of the Z-axis here.
4	`Sensor Position` (azimuthal position of the distance sensor): Enter the azimuth angle in this field. **Or:** Adjust the angle using the scale. The position of the distance sensor is displayed in the graphical view.

11.6.8 HARDWARE <ALIGNMENT UNIT> view

NOTE

Do not change system parameters!

All system settings in this register are preset at the factory and must not be changed without consulting TRIOPTICS.

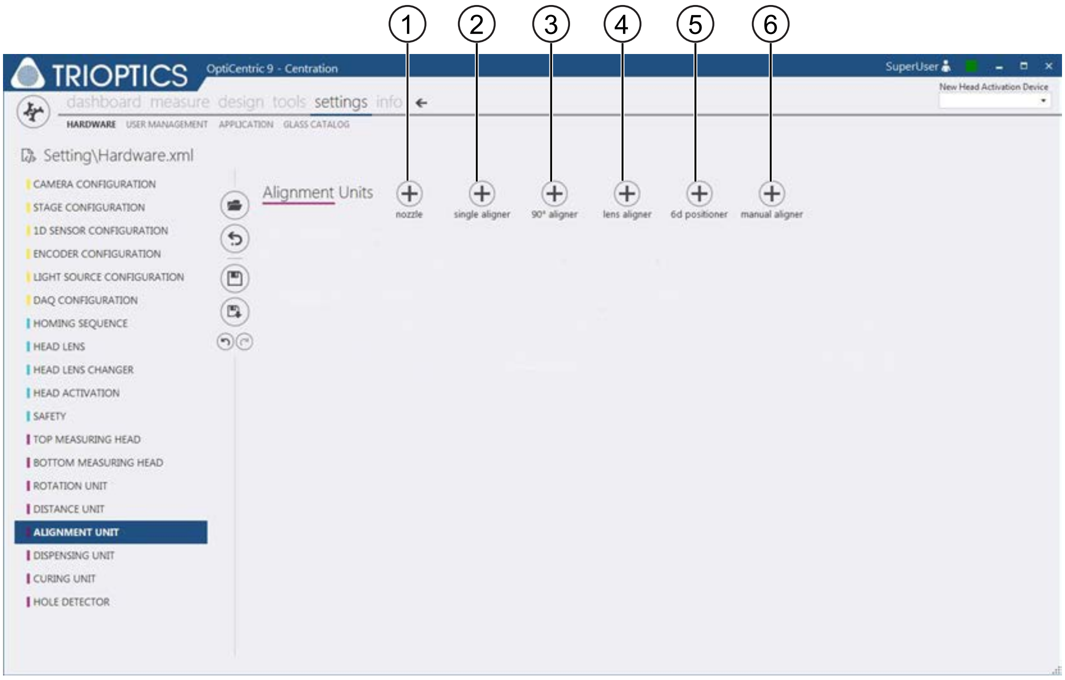


Fig. 203: Settings, ALIGNMENT UNIT view

1	**Nozzle** ⊕ `Add Nozzle`: Add a compressed air manipulator as a hardware component. A new area for configuring a compressed air manipulator is created (see *Nozzle [▸ 280]*).
2	**Single Aligner** ⊕ `Add Single Aligner`: Add a single manipulator as a hardware component. A new area for configuring a single manipulator is created (see *Single Aligner [▸ 281]*).
3	**90° Aligner** (X-Y manipulator) ⊕ `Add 90° Aligner`: Add an X-Y manipulator as a hardware component. A new area for configuring an X-Y manipulator is created (see *90° Aligner [▸ 282]*).

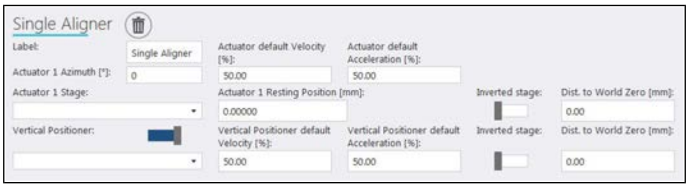
4	**Lens Aligner** (120° Aligner) `Add Lens Aligner`: Add a lens aligner as a hardware component. A new area for configuring a lens aligner is created (see *Lens Aligner [283]*).
5	**6D Positioner** (Hexapod) `Add 6D Positioner`: Add a hexapod as a hardware component. A new area for configuring a hexapod is created (see *6D Positioner [285]*).
6	**Manual Aligner** `Add Manual Aligner`: Add a manual alignment unit as a hardware component. A new area for configuring a manual alignment unit is created (see *Manual Aligner [286]*).

Nozzle

Fig. 204: Settings, ALIGNMENT UNIT view: Nozzle Aligner

(1)	`Remove this Nozzle Aligner`: Deletes this compressed air manipulator as a hardware component from the hardware settings.
	`Label`: Enter a name for the compressed air manipulator here. The compressed air manipulator can later be selected under this name in the various software menus.
	`Nozzle Azimuth [°]` (azimuthal position of the compressed air manipulator): Enter the azimuth angle in this field.
	`DAQ Device`: Select the control unit that controls the compressed air manipulator. Which control units are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.
	`DAQ port`: Enter the number of the serial interface via which the compressed air manipulator is connected to the measurement system.
	`Vertical Positioner`: Select this option if the compressed air manipulator is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The compressed air manipulator is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The compressed air manipulator is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the compressed air manipulator is to be moved in the vertical direction.
	`Vertical Positioner default velocity [%]`:
	`Vertical Positioner default acceleration [%]`:
	`Invert Z direction`: Set the orientation of the Z-axis here.
	`Z Distance to WorldZero [mm]`: Enter the Z-coordinate at which the compressed air manipulator is in its zero position.

Single Aligner

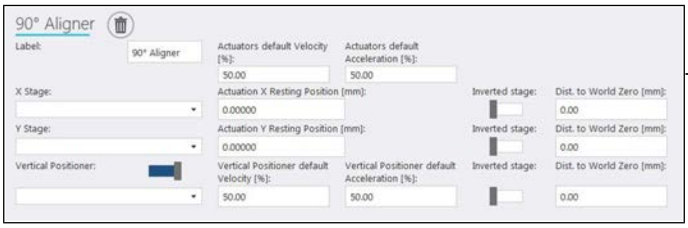


(2)

Fig. 205: Settings, ALIGNMENT UNIT view: Single Aligner

(2)	`Remove this Single Aligner`: Deletes this single aligner as a hardware component from the hardware settings.
	`Label`: Enter a name for the single aligner here. The single aligner can later be selected under this name in the various software menus.
	`Actuator1 Azimuth [°]` (azimuthal position of the single aligner): Enter the azimuth angle in this field.
	`Actuator1 Stage` (positioning axis of actuator 1): Select the positioning axis via which actuator 1 is to be moved.
	`Actuator 1 Resting Position [mm]`: Enter a safe position for actuator 1. The air bearing must be able to perform a full rotation without the actuator and sample colliding.
	`Inverted stage`: Set the orientation of the positioning axis for actuator 1 here.
	`Distance to World Zero [mm]`: Enter the coordinate at which actuator 1 is in its zero position.
	`Vertical Positioner`: Select this option if the single aligner is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The single aligner is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The single aligner is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the compressed air manipulator is to be moved in the vertical direction.
	`Vertical Positioner default velocity [%]:`
	`Vertical Positioner default acceleration [%]:`
	`Inverted stage`: Set the orientation of the positioning axis here.
	`Distance to World Zero [mm]`: Enter the coordinate at which the single aligner is in its zero position.

90 ° Aligner



(3)

Fig. 206: Settings, ALIGNMENT UNIT view: 90° Aligner

(3)	`Remove this 90° Aligner`: Deletes the 90° aligner as a hardware component from the hardware settings.
	`Label`: Enter a name for the 90° aligner here. The 90° aligner can later be selected under this name in the various software menus.
	`Actuators default velocity [%]:`
	`Actuators default acceleration [%]:`
	`X Stage` (positioning axis of the 90° aligner in the X-direction): Select the positioning axis via which the 90° aligner is to be moved in the X-direction.
	`Actuating X Resting Position [mm]`: Enter the safe position in the X-direction.
	`Inverted stage`: Set the orientation of the positioning axis in the X-direction here.
	`Distance to World Zero [mm]`: Enter the Z-coordinate at which the actuator is in its zero position.
	`Y Stage` (positioning axis of the 90° aligner in the Y-direction): Select the positioning axis via which the 90° aligner is to be moved in the Y-direction.
	`Actuating Y Resting Position [mm]`: Enter the safe position in the Y-direction.
	`Inverted stage`: Set the orientation of the positioning axis in the Y-direction here.
	`Distance to World Zero [mm]`: Enter the Z-coordinate at which the actuator is in its zero position.
	`Vertical Positioner`: Select this option if the 90° aligner is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The 90° aligner is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The 90° aligner is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the compressed air manipulator is to be moved in the vertical direction.

	`Vertical Positioner default velocity [%]:`
	`Vertical Positioner default acceleration [%]:`
	`Inverted stage`: Set the orientation of the vertical positioning axis here.
	`Distance to World Zero [mm]`: Enter the Z-coordinate at which the single aligner is in its zero position.

Lens Aligner

Fig. 207: Settings, ALIGNMENT UNIT view: Lens Aligner

(4)	🗑 `Remove this Lens Aligner`: Deletes the lens aligner as a hardware component from the hardware settings.
	`Label`: Enter a name for the lens aligner here. The lens aligner can later be selected under this name in the various software menus.
	`Actuator 1 Azimuth [°]` (azimuthal position of actuator 1): Enter the azimuth angle on which actuator 1 is placed in this field.
	`Actuator 1 Stage` (positioning axis of actuator 1): Select the positioning axis via which actuator 1 is to be moved.
	`Actuator 1 Resting Position [mm]`: Enter a safe position for actuator 1. The air bearing must be able to perform a full rotation without the actuator and sample colliding.
	`Inverted stage`: Set the orientation of the positioning axis for actuator 1 here.
	`Distance to World Zero [mm]`: Enter the coordinate at which actuator 1 is in its zero position.
	`Actuator 2 Stage` (positioning axis of actuator 2): Select the positioning axis via which actuator 2 is to be moved.
	`Actuator 2 Resting Position [mm]`: Enter a safe position for actuator 2. The air bearing must be able to perform a full rotation without the actuator and sample colliding.
	`Inverted stage`: Set the orientation of the positioning axis for actuator 2 here.
	`Distance to World Zero [mm]`: Enter the coordinate at which actuator 2 is in its zero position.

	Actuator 3 Stage (positioning axis of actuator 3): Select this option if actuator 3 is to be positioned by motor. • Use motorized passive actuator: The option is deactivated. Actuator 3 is mounted passively and cannot be moved. • Use motorized passive actuator: The option is activated. Actuator 3 is positioned by motor. In this case, select the positioning axis via which actuator 3 is to be moved.
	Actuator 3 Resting Position [mm]: Enter a safe position for actuator 3. The air bearing must be able to perform a full rotation without the actuator and sample colliding.
	Inverted stage: Set the orientation of the positioning axis for actuator 3 here.
	Distance to World Zero [mm]: Enter the coordinate at which actuator 3 is in its zero position.
	Actuators default velocity: The value applies for all actuators.
	Actuators default acceleration: The value applies for all actuators.
	Actuators rotate with sample: The setting applies for all actuators.
	Vertical Positioner: Select this option if the lens aligner is to be positioned by motor in the vertical direction. • Use motorized vertical positioner: The option is deactivated. The lens aligner is positioned manually in the vertical direction. • Use motorized vertical positioner: The option is activated. The lens aligner is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the compressed air manipulator is to be moved in the vertical direction.
	Vertical Positioner default velocity [%]:
	Vertical Positioner default acceleration [%]:
	Inverted stage: Set the orientation of the positioning axis here.
	Distance to World Zero [mm]: Enter the coordinate at which the single aligner is in its zero position.

6D Positioner (hexapod)

(5)

Fig. 208: Settings, ALIGNMENT UNIT view: 6D Positioner

(5)	`Remove this 6D Aligner`: Deletes the hexapod as a hardware component from the hardware settings.
	`Label`: Enter a name for the hexapod here. The hexapod can later be selected under this name in the various software menus.
	`Positioner default velocity`:
	`Positioner default acceleration`:
	`X Stage` (positioning axis in the X-direction): Select the positioning axis via which the sample is to be moved in the X-direction.
	`Inverted stage`: Set the orientation of the positioning axis in the X-direction here.
	`Y Stage` (positioning axis in the Y-direction): Select the positioning axis via which the sample is to be moved in the Y-direction.
	`Inverted stage`: Set the orientation of the positioning axis in the Y-direction here.
	`RotX Stage` (rotation axis in the X-direction): Select the positioning axis via which the sample is to be rotated in the X-direction.
	`Inverted stage`: Set the orientation of the rotation axis in the X-direction here.
	`RotY Stage` (rotation axis in the Y-direction): Select the positioning axis via which the sample is to be rotated in the Y-direction.
	`Inverted stage`: Set the orientation of the rotation axis in the Y-direction here.
	`Vertical Positioner`: Select this option if the hexapod is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The hexapod is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The hexapod is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the hexapod is to be moved in the vertical direction.
	`Vertical Positioner default velocity [%]`:
	`Vertical Positioner default acceleration [%]`:
	`Inverted stage`: Set the orientation of the positioning axis here.

	`Distance to World Zero [mm]`: Enter the coordinate at which the hexapod is in its zero position.
	`Lowermost Z-Position [mm]`: Lowest position in which the hexapod can be moved in the Z-direction.
	`Uppermost Z-Position [mm]`: Highest position in which the hexapod can be moved in the Z-direction.

Manual Aligner

(6)

Fig. 209: Settings, ALIGNMENT UNIT view: Manual Aligner

(6)	`Remove this Manual Aligner`: Deletes the manual aligner as a hardware component from the hardware settings.
	`Label`: Enter a name for the manual aligner here. The manual aligner can later be selected under this name in the various software menus.
	`Vertical Positioner`: Select this option if the manual aligner is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The manual aligner is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The manual aligner is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the manual aligner is to be moved in the vertical direction.
	`Vertical Positioner default velocity [%]:`
	`Vertical Positioner default acceleration [%]:`
	`Inverted stage`: Set the orientation of the positioning axis here.
	`Distance to World Zero [mm]`: Enter the coordinate at which the manual aligner is in its zero position.

11.6.9 HARDWARE <DISPENSING UNIT> view

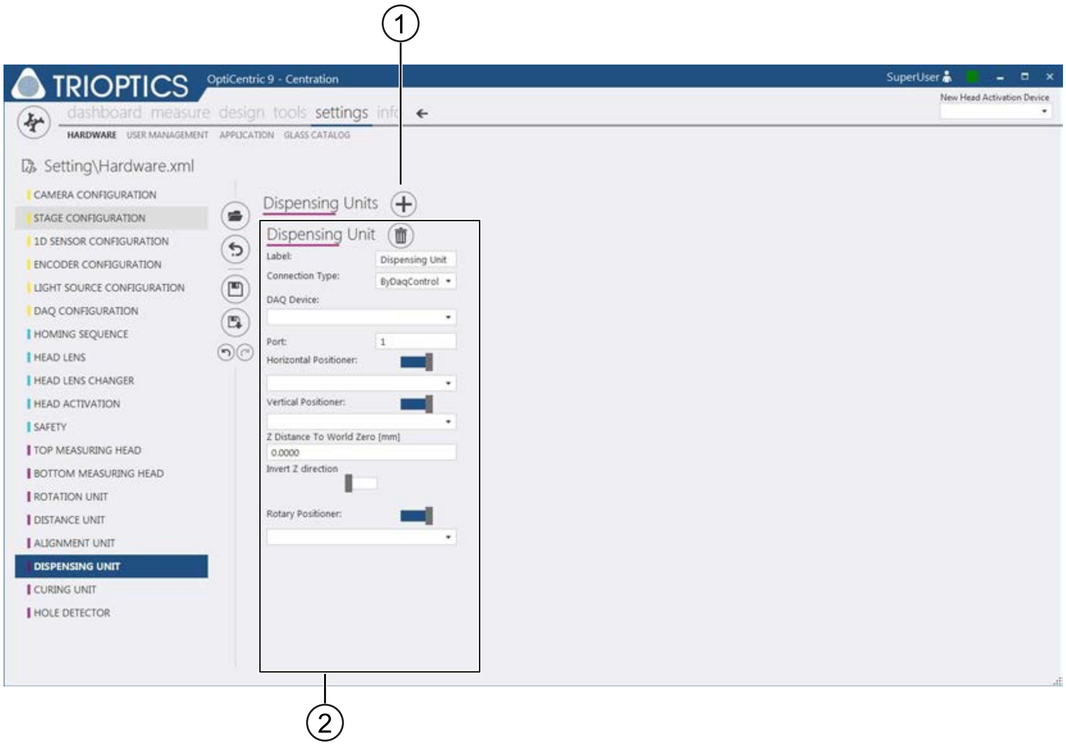


Fig. 210: Settings, DISPENSING UNIT view

1	**Dispensing Units** In this area you can define several glue dispensers as hardware components. The glue dispensers can be selected later in the various software menus.
	 `Add new Dispensing Unit:` A new area for configuring the distance sensor is created **(2)**.
2	**Dispensing Unit** In this area you can configure the parameters for a glue dispenser.
	 `Remove this Dispensing Unit`: Deletes this glue dispenser as a hardware component from the hardware settings.
	`Label`: Enter a name for the glue dispenser here. The glue dispenser can later be selected under this name in the various software menus.

	`Connection Type`: In this field, select how the glue dispenser is connected to the measurement system: • `ByDaqControl`: Connection via an external control unit. In this case, select the control unit and enter the serial port number that connects the control unit to the measurement system. • `ByStageIO`: Connection via an internal control unit. In this case, enter the positioning axis that controls the hole detection sensor. Which control units are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.
	`Horizontal Positioner`: Select this option if the glue dispenser is to be positioned by motor in the horizontal direction. • `Use motorized horizontal positioner`: The option is deactivated. The glue dispenser is positioned manually in the horizontal direction. • `Use motorized horizontal positioner`: The option is activated. The glue dispenser is positioned by motor in the horizontal direction. In this case, enter the positioning axis via which the glue dispenser is to be moved in the horizontal direction.
	`Vertical Positioner`: Select this option if the distance sensor is to be positioned by motor in the vertical direction. • `Use motorized vertical positioner`: The option is deactivated. The glue dispenser is positioned manually in the vertical direction. • `Use motorized vertical positioner`: The option is activated. The glue dispenser is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the glue dispenser is to be moved in the vertical direction.
	`Z Distance to WorldZero [mm]`: Enter the Z-coordinate at which the hole detection sensor is in its zero position.
	`Invert Z direction`: Set the orientation of the Z-axis here.
	`Rotary Positioner`: Select this option if the glue dispenser is to be positioned by motor in the azimuthal direction. • `Use motorized vertical positioner`: The option is deactivated. The glue dispenser is positioned manually in the azimuthal direction. • `Use motorized vertical positioner`: The option is activated. The glue dispenser is positioned by motor in the azimuthal direction. In this case, enter the positioning axis via which the glue dispenser is to be moved in the azimuthal direction.

11.6.10 HARDWARE <CURING UNIT> view

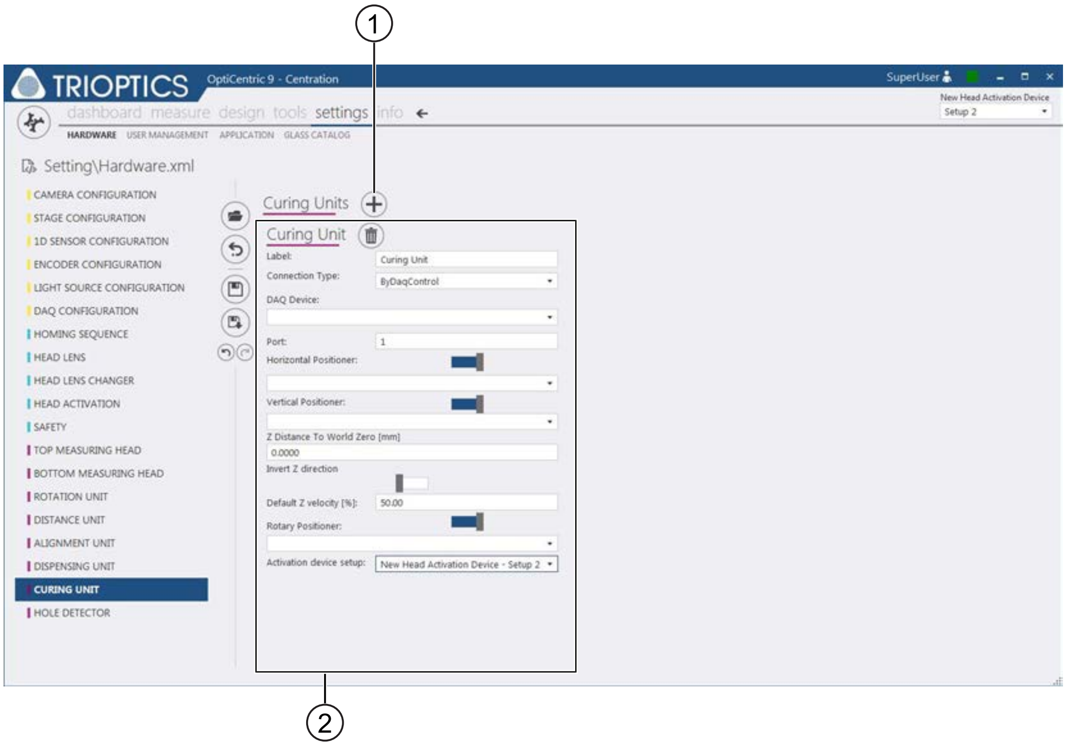


Fig. 211: Settings, CURING UNIT view

1	**Curing Units** In this area you can define several UV lighting units as hardware components. The UV lighting units can be selected later in the various software menus.
	 `Add new Curing Unit`: A new area for configuring the UV lighting unit is created **(2)**.
2	**Curing Unit** In this area you can configure the parameters for a UV lighting unit.
	 `Remove this Curing Unit`: Deletes this UV lighting unit as a hardware component from the hardware settings.
	`Label`: Enter a name for the UV lighting unit here. The UV lighting unit can later be selected under this name in the various software menus.

	Connection Type: In this field, select how the UV lighting unit is connected to the measurement system: • ByDaqControl: Connection via an external control unit. In this case, select the control unit and enter the serial port number that connects the control unit to the measurement system. • ByStageIO: Connection via an internal control unit. In this case, enter the positioning axis that controls the UV lighting unit. Which control units are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.
	Horizontal Positioner: Select this option if the UV lighting unit is to be positioned by motor in the horizontal direction. • Use motorized horizontal positioner: The option is deactivated. The UV lighting unit is positioned manually in the horizontal direction. • Use motorized horizontal positioner: The option is activated. The UV lighting unit is positioned by motor in the horizontal direction. In this case, enter the positioning axis via which the UV lighting unit is to be moved in the horizontal direction.
	Vertical Positioner: Select this option if the UV lighting unit is to be positioned by motor in the vertical direction. • Use motorized vertical positioner: The option is deactivated. The UV lighting unit is positioned manually in the vertical direction. • Use motorized vertical positioner: The option is activated. The UV lighting unit is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the UV lighting unit is to be moved in the vertical direction.
	Z Distance to WorldZero [mm]: Enter the Z-coordinate at which the UV lighting unit is in its zero position.
	Invert Z direction: Set the orientation of the Z-axis here.
	Rotary Positioner: Select this option if the UV lighting unit is to be positioned by motor in the azimuthal direction. • Use motorized vertical positioner: The option is deactivated. The UV lighting unit is positioned manually in the azimuthal direction. • Use motorized vertical positioner: The option is activated. The UV lighting unit is positioned by motor in the azimuthal direction. In this case, enter the positioning axis via which the UV lighting unit is to be moved in the azimuthal direction.
	Activation device setup: Select a pre-configured hardware setup for the measuring head

11.6.11 HARDWARE <HOLE DETECTOR> view

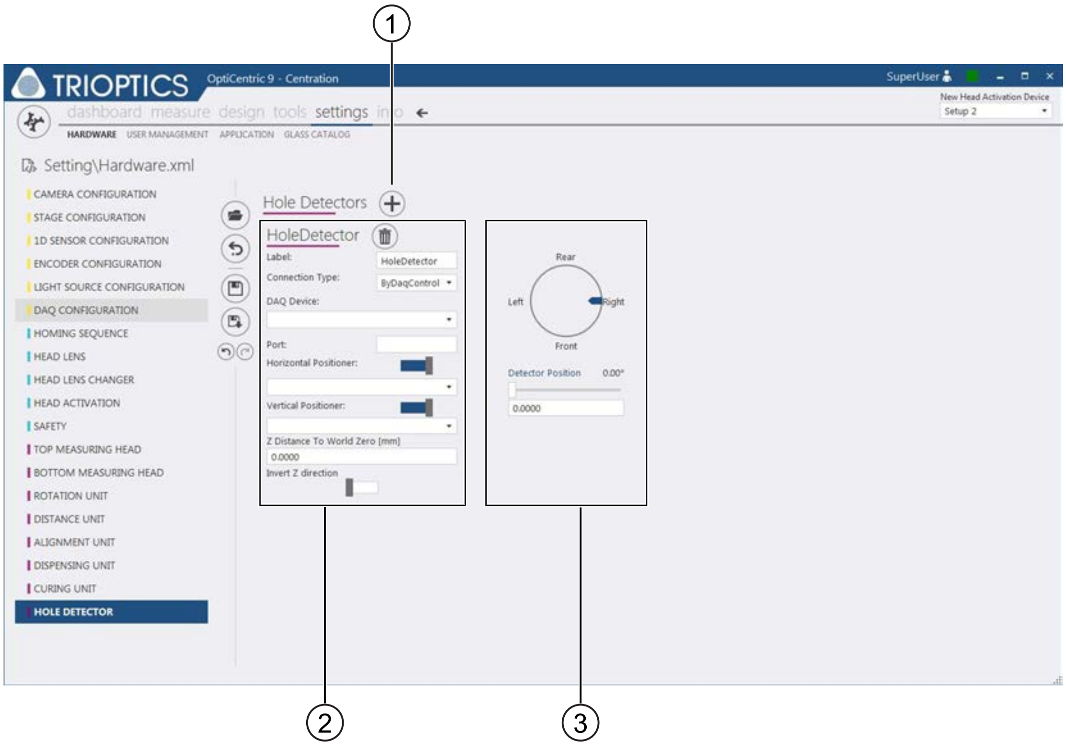


Fig. 212: Settings, HOLE DETECTOR view

<table>
<tr><td rowspan="2">1</td><td>Hole Detectors
In this area you can define several hole detection sensors as hardware compo-nents.
The hole detection sensors can be selected later in the various software menus.</td></tr>
<tr><td> <code>Add new Hole Detector</code>:
A new area for configuring the hole detection sensor is created (2).</td></tr>
<tr><td rowspan="3">2</td><td>Hole Detector
In this area you can configure the parameters for a hole detection sensor.</td></tr>
<tr><td> <code>Remove this measuring Head</code>: Deletes this hole detection sensor as a hardware component from the hardware settings.</td></tr>
<tr><td><code>Label</code>: Enter a name for the hole detection sensor here. The hole detection sensor can later be selected under this name in the various software menus.</td></tr>
</table>

	Connection Type: In this field, select how the hole detection sensor is connected to the measurement system: • ByDaqControl: Connection via an external control unit. In this case, select the control unit and enter the serial port number that connects the control unit to the measurement system. • ByStageIO: Connection via an internal control unit. In this case, enter the positioning axis that controls the hole detection sensor. Which control units are available for selection is pre-configured by the manufacturer upon delivery of the measurement system.
	Horizontal Positioner: Select this option if the hole detection sensor is to be positioned by motor in the horizontal direction. • Use motorized horizontal positioner: The option is deactivated. The hole detection sensor is not positioned by motor in the horizontal direction. • Use motorized horizontal positioner: The option is activated. The hole detection sensor is positioned by motor in the horizontal direction. In this case, enter the positioning axis via which the hole detection sensor is to be moved in the horizontal direction.
	Vertical Positioner: Select this option if the hole detection sensor is to be positioned by motor in the vertical direction. • Use motorized vertical positioner: The option is deactivated. The hole detection sensor is not positioned by motor in the vertical direction. • Use motorized vertical positioner: The option is activated. The hole detection sensor is positioned by motor in the vertical direction. In this case, enter the positioning axis via which the hole detection sensor is to be moved in the vertical direction.
	Z Distance to WorldZero [mm]: Enter the Z-coordinate at which the hole detection sensor is in its zero position.
	Invert Z direction: Set the orientation of the Z-axis here.
3	Detector Position (azimuthal position of the hole detection sensor): Enter the azimuth angle in this field. **Or:** Adjust the angle using the scale. The position of the hole detection sensor is displayed in the graphical view.

11.6.12 <settings> menu <USER MANAGEMENT>

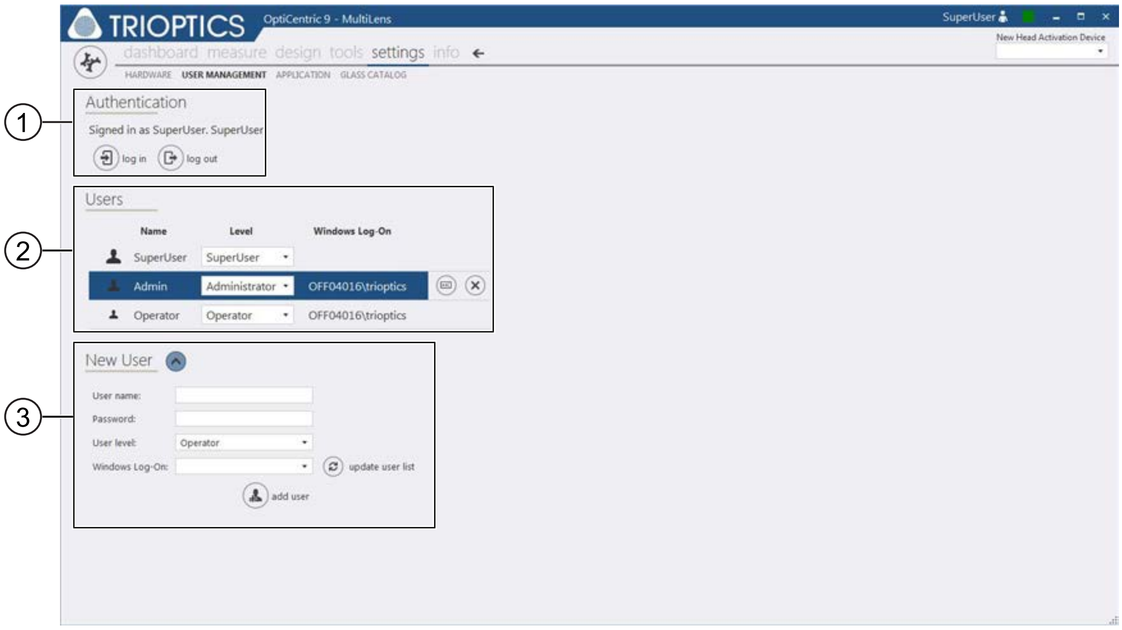


Fig. 213: Settings, user management

1	**Authentication** • Click on the `log in` button to log in. • Click on the `log out` button to log out.
2	**Users**: Shows a list of registered users and their permission levels. • `Name`: User name • `Level`: Permission level of the user • `Windows Log-on`: Display whether the user account has been linked to the Windows account (see also **3**). • `Change Password`: Opens the option to change the password. • `Remove user`: Deletes the user profile.

3	**New user** You can create a new user here. Available in the drop-down menu: • `Username`: Enter a user name • `Password`: Enter a password. • `Level`: Assign a permission level to the user. You can choose between: – `User`: Limited operating rights, measurements can be performed. Measurement parameters cannot be changed. – `Administrator`: Full operating rights. Measurement processes can be defined and changed. • `Windows Log-on`: If you enable Windows logon for the user, the user paired to the Windows account is automatically logged on when the software starts. • Click the `add user` button to add the user to the user list. • Click the `update user list` button to update the user list.

11.6.13 <settings> menu <APPLICATION>

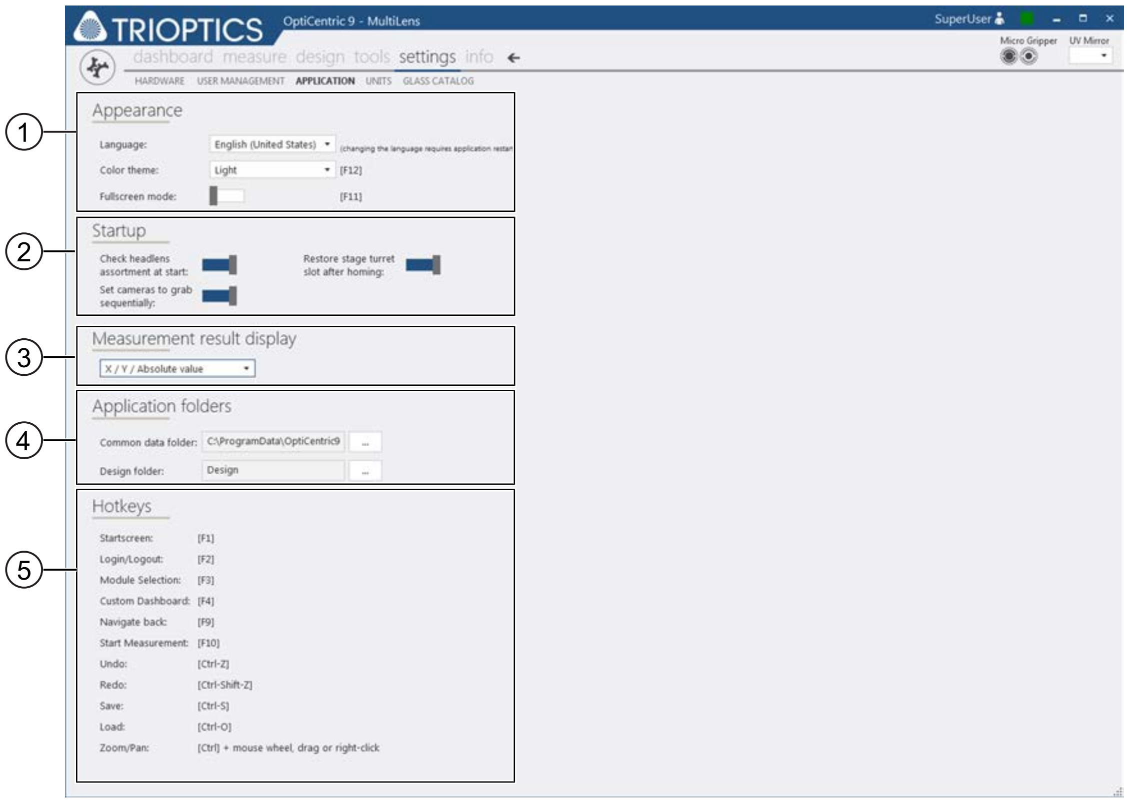


Fig. 214: Settings, application

1	**Appearance** You can define general settings for the program interface here.
	`Language`: Select the language of the user interface here. The following languages are currently available: • German (Germany) • English (USA) When changing this setting, the software must be restarted to display the software menus in the desired language.
	`Color theme`: You can switch the display between a light or dark background. Select the desired color scheme from the list or use the **F12** key to switch between a light or dark background.
	`Fullscreen mode`: • Activate this option to start the software in full screen mode.
2	**Startup** You can define processes here that are to be executed each time the software is started.
	`Check headlens assortment at start` The user is prompted to verify that mounted head lenses and the required hard-ware settings match. • Activate this option to display the query each time the software is started.
	`Restore stage turret slot after homing` What does this mean? • Activate this option to display the query each time the software is started.
	`Set cameras to grab sequentially` What does this mean? • Activate this option to display the query each time the software is started.
3	Measurement result display Here you can determine how the results are displayed. Options: • X/Y Absolute value • Absolute value only • Azimuth / Absolute value
4	**Application Folders** Here you define the directories in which the system files (design files, configuration files, result files) are to be stored by default.
	`Common Data folder`: Storage of general data
	`Design folder`: Storage of design data

5	**Hotkeys** The following hotkeys are currently available: **[F1]**: Open home screen **[F2]**: Log in/out **[F3]**: Generate service package **[F4]**: Open custom dashboard **[F9]**: Back **[F10]**: Start the measurement **[Ctrl-Z]**: Undo **[Ctrl-Shift-Z]**: Repeat **[Ctrl-S]**: Save **[Ctrl-O]**: Load **[Ctrl]**+mouse wheel, drag, right mouse button: Enlarge / move view

11.6.14 <settings> menu <GLASS CATALOG>

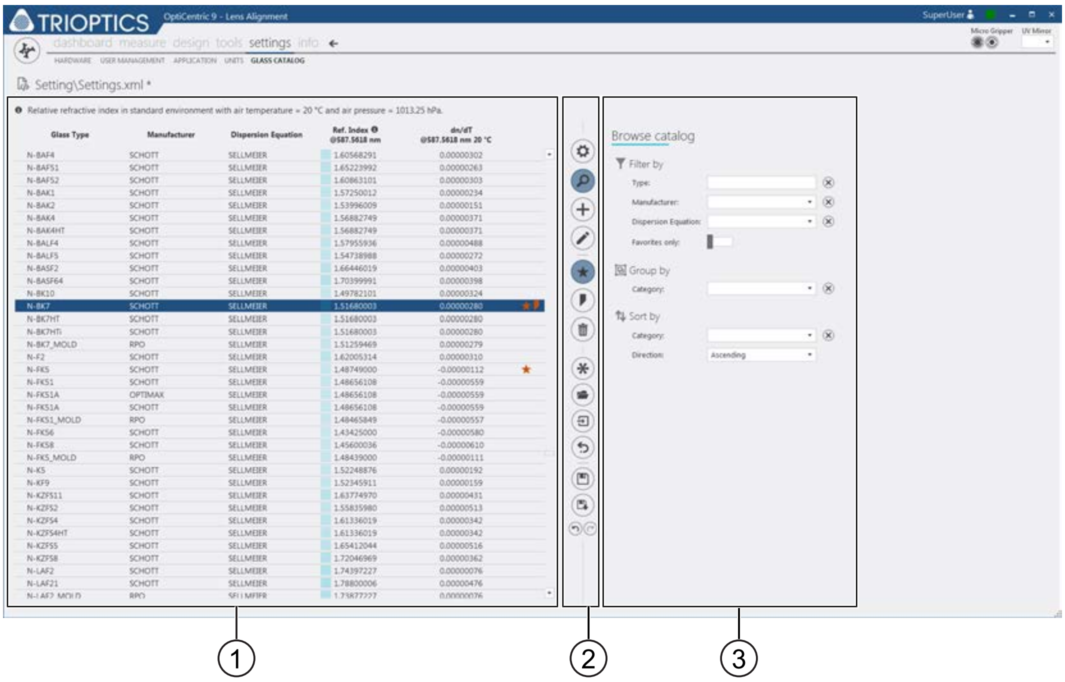


Fig. 215: Settings, glass catalog

 OptiCentric® 9 Software Description

1	**List of stored glass types**
2	**Edit list of stored glass types**
	`Configure catalog` Make general pre-settings for the search in the glass catalog
	`Find glass` Searches the glass database for the set criteria **(3)**
	`Add new glass type` Add a new glass type
	`Edit glass type` Opens the dialog for editing the glass properties: • `Manufacturer`: Enter the manufacturer name. • `Dispersion Equation`: Specify which equation is used to calculate the dispersion. • `Min Wavelength`: Enter the lower limit value for the wavelength range for which this type of glass is suitable. • `Max Wavelength`: Enter the upper limit value for the wavelength range for which this type of glass is suitable. • `Temperature`: Enter the temperature at which the refractive index was determined.
	`Toggle favorite flag of selected glass` Later, the drop-down list can be limited to favorites when assigning a glass type.
	`Set selected glass as default` Marks the selected glass type as the default glass type. Later, this glass type can be assigned to an optical surface without any further search.
	`Remove selected glass type` Removes the selected glass type from the catalog.
	`New catalog` Creates a new glass catalog
	`Load catalog` Load an existing glass catalog from a defined directory.
	`Import database` Imports the data from an existing glass database.
	`Revert catalog` Resets the glass catalog to the default settings.

	Save catalog Saves the changes in the glass catalog.
	Save catalog as Saves the glass catalog under a new name.
	Undo Undoes the last change.
	Redo Restores the last change.
3	**Filters in the glass catalog**
	Filter by: • Type: Filter list by glass type (if the input is incomplete, all glass types are listed whose names contain the entered character string). • Manufacturer: Filter list by manufacturer (if the input is incomplete, all glass types are listed whose manufacturer name contains the entered character string). • Dispersion Equation: When this option is selected, only glass types for which the refractive index was calculated according to the selected dispersion equation are displayed. • Favorites only: When this option is selected, only glass types that have previously been marked as favorites are displayed.
	Group by: Group filter results by • Category Options: Manufacturer; Equation type
	Sort by: Sort filter results by • Category: Options: – Glass type; – Manufacturer; – Equation type; – Refractive index • Direction: Options: – Ascending; – Descending

11.7 Tools

11.7.1 CALIBRATION view <Homing of motorized stages>

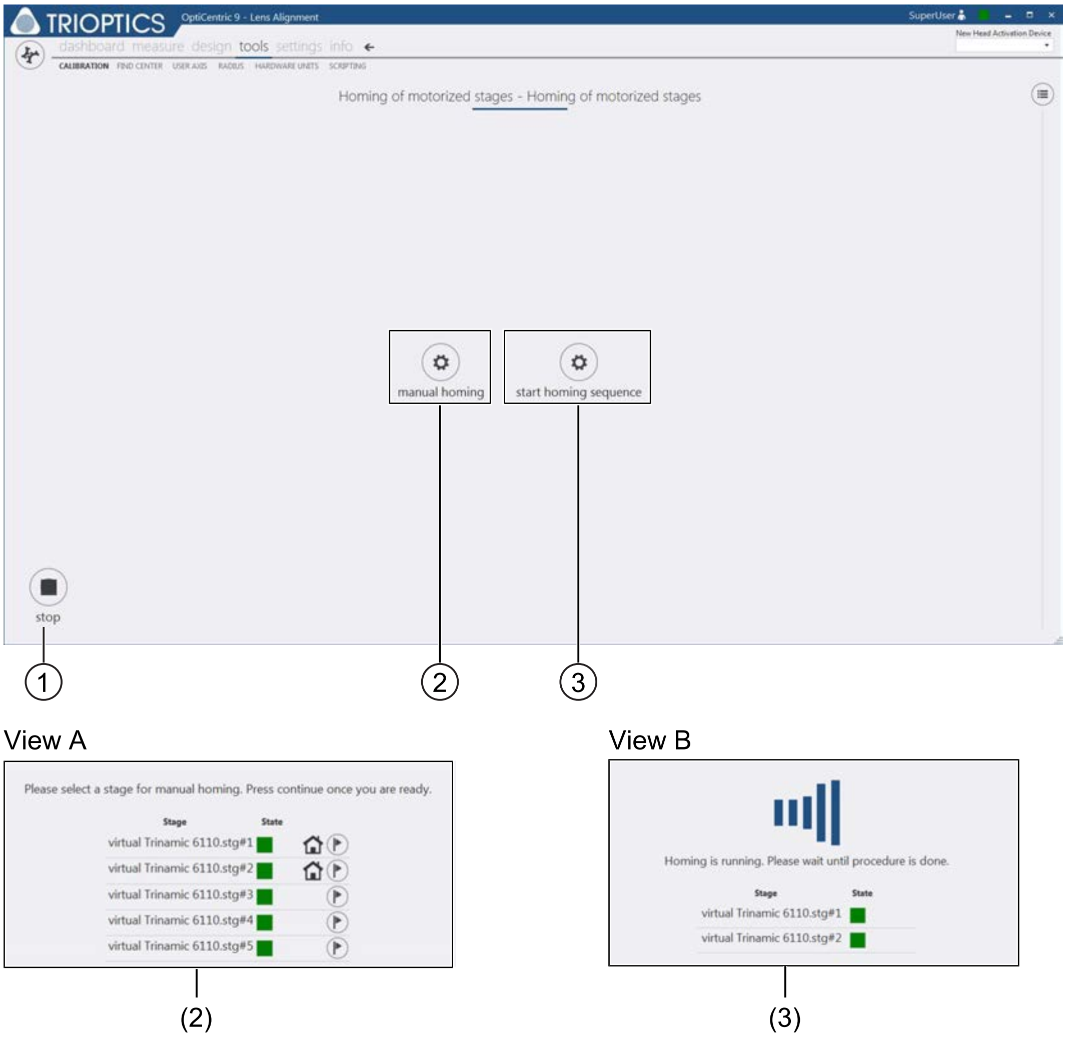


Fig. 216: Tools: Homing of motorized stages

1	`Stop`: Stops the movement of all axes. The reference cycle is aborted.
2	`Manual homing`: Opens the dialog for referencing individual axes (**view A**).
	`Stage`: A list of the available motorized axes is displayed.
	`State`: The status of the individual axes is displayed. Display red: The axis is not referenced. Display green: The axis has already been referenced.
	`Perform homing for this stage`: Starts the reference cycle for the selected axis.
	This symbol indicates that the reference cycle for the selected axis was successful.
3	`Start homing sequence`: Starts the zero point search for all axes (**view B**). The axes are referenced in the order defined in the hardware settings (see *HARDWARE <HOMING SEQUENCE> view [267]*).

11.7.2 CALIBRATION view <Referencing of measuring heads>

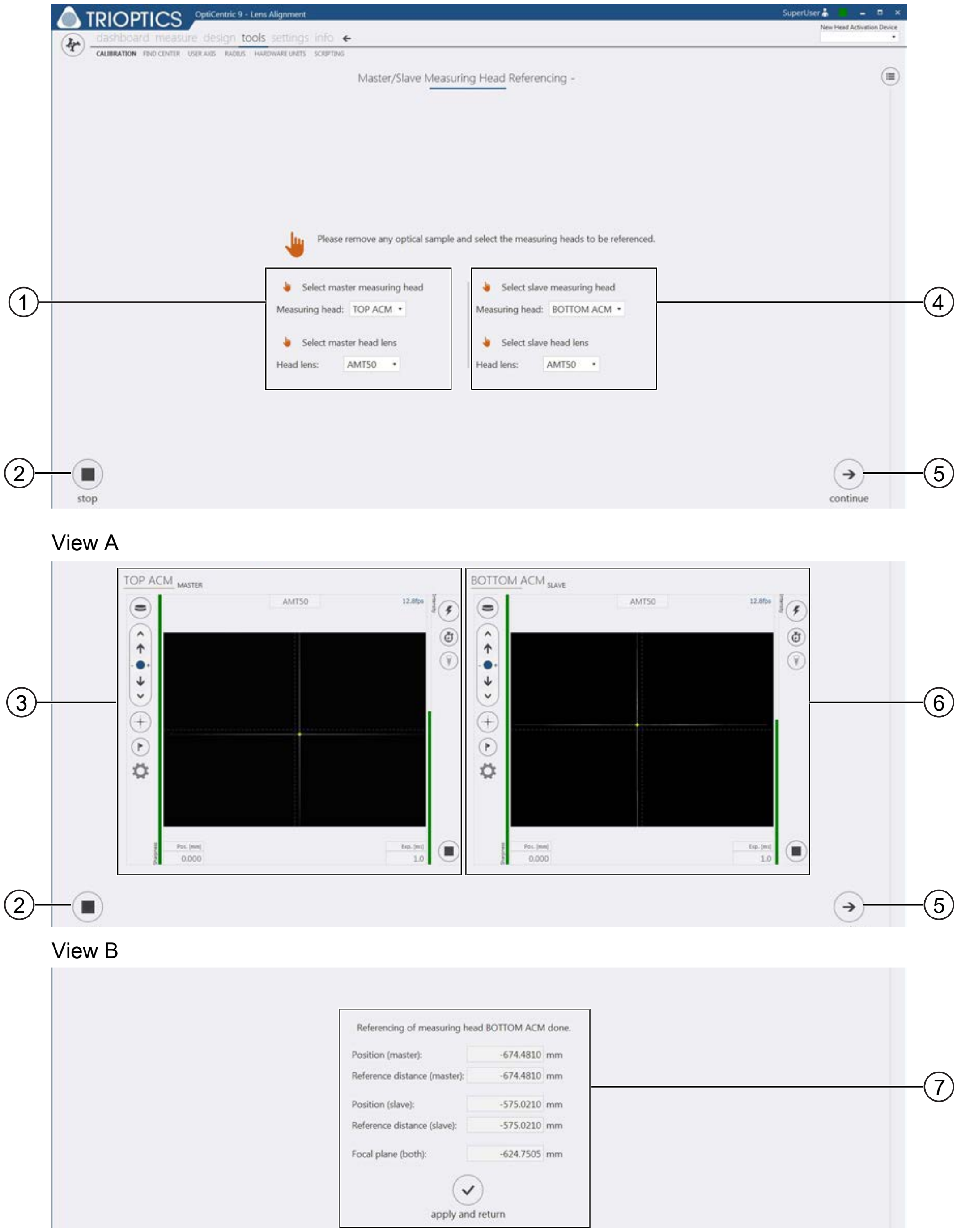


Fig. 217: Tools: Referencing of Measuring Heads

1	Select master measuring head: In dual measurement systems, a primary measuring head (master) must be determined which is referenced to the world coordinate system.
	Measuring head: Select a measuring head as the primary measuring head The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).
	Head Lens: Select a suitable head lens. The head lenses previously defined in the hardware settings are available for selection (see *HARDWARE <HEAD LENS> view [▸ 263]*).
2	Stop: Stops the movement of all axes. The referencing of the measuring heads to each other is aborted.
3	**Camera window**: Shows the camera image for the primary measuring head. Further information on the functions and buttons can be found in *Camera window [▸ 210]*.
4	Select slave measuring head: In dual measurement systems, a secondary measuring head (slave) must be determined which is referenced to the primary measuring head.
	Measuring head: Select a measuring head as the secondary measuring head The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).
	Head Lens: Select a suitable head lens. The head lenses previously defined in the hardware settings are available for selection (see *HARDWARE <HEAD LENS> view [▸ 263]*).
5	Continue: When you have made all the necessary settings in the current window, select this button to continue referencing the measuring heads.
6	**Camera window**: Shows the camera image for the secondary measuring head. Further information on the functions and buttons can be found in *Camera window [▸ 210]*.
7	Referencing of measuring head done: The results of the referencing are displayed.
	Position (Master): Position of the primary measuring head relative to the world coordinate system.
	Reference Distance (Master): Position of the primary measuring head relative to the world coordinate system
	Position (Slave): Position of the secondary measuring head relative to the world coordinate system.
	Reference Distance (Slave): Position of the secondary measuring head relative to the world coordinate system
	Focal plane (both): Position of the focal plane. The value applies for both measuring heads.
	apply and return: The measured values are applied to the settings. The tool is closed.

See also

HARDWARE <HOMING SEQUENCE> view [▸ 267]

11.7.3 CALIBRATION view <Single Head Referencing>

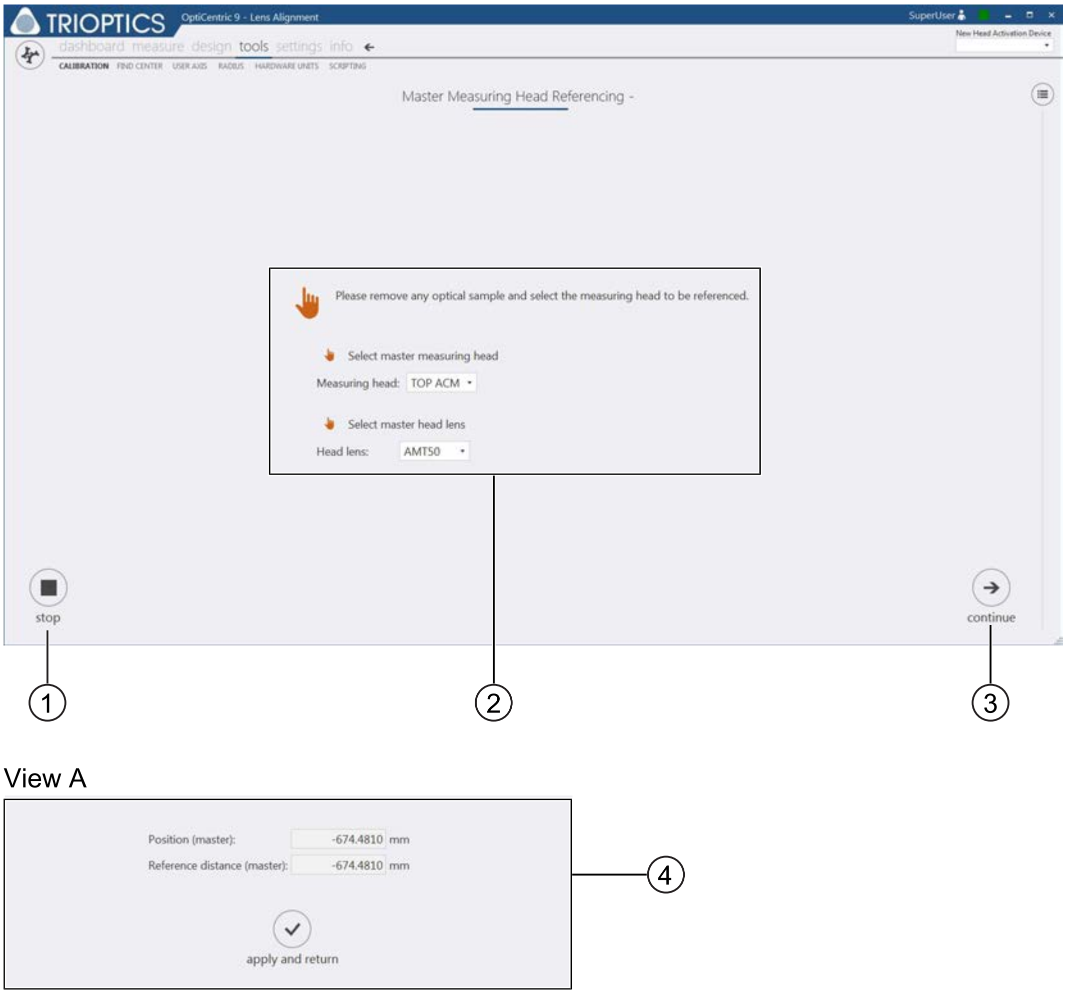


Fig. 218: Tools: Single Head Referencing

1	Stop: Stops the movement of all axes. The referencing of the measuring heads to each other is aborted.
2	Select master measuring head: In dual measurement systems, a primary measuring head (master) must be determined which is referenced to the world coordinate system.
	Measuring head: Select a measuring head as the primary measuring head The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).
	Head Lens: Select a suitable head lens. The head lenses previously defined in the hardware settings are available for selection (see *HARDWARE <HEAD LENS> view [▸ 263]*).
3	Continue: When you have made all the necessary settings in the current window, select this button to continue referencing the measuring head.
4	Master measuring head referencing done: The results of the referencing are displayed.
	Position (Master): Position of the primary measuring head relative to the world coordinate system.
	Reference Distance (Master): Position of the primary measuring head relative to the world coordinate system.
	apply and return: The measured values are applied to the settings. The tool is closed.

 OptiCentric® 9 Software Description

11.7.4 CALIBRATION view <Measuring Head Calibration>

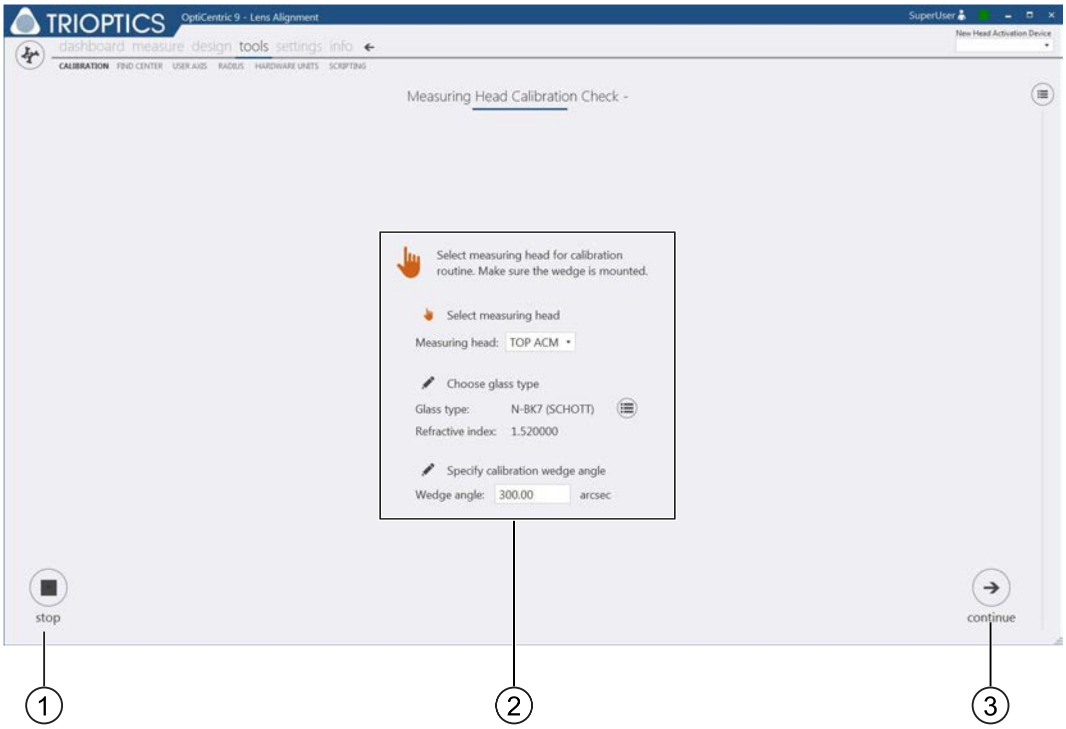


Fig. 219: Tools: Measuring head calibration

1	`Stop`: Stops the movement of all axes. The calibration of the measuring head is aborted.
2	`Select measuring head for calibration`: Select the measuring head you want to calibrate. The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [269]*).
	`Choose glass type`: Select the glass type used (see calibration wedge specifications).
	`Change glass type`: Select this button to open the glass catalog. Further information on the functions of the glass catalog can be found in *<settings> menu <GLASS CATALOG> [296]*.
	`Specify calibration wedge angle`: Enter the calibration wedge angle in this field (see calibration wedge specifications).
3	`Continue`: When you have made all the necessary settings in the current window, select this button to continue referencing the measuring head. The camera window is displayed, in which you can edit the settings for calibration of the measuring head. Further information on the functions and buttons of the camera window can be found in *Camera window [210]*.

11.7.5 CALIBRATION view <Measuring Head Calibration>

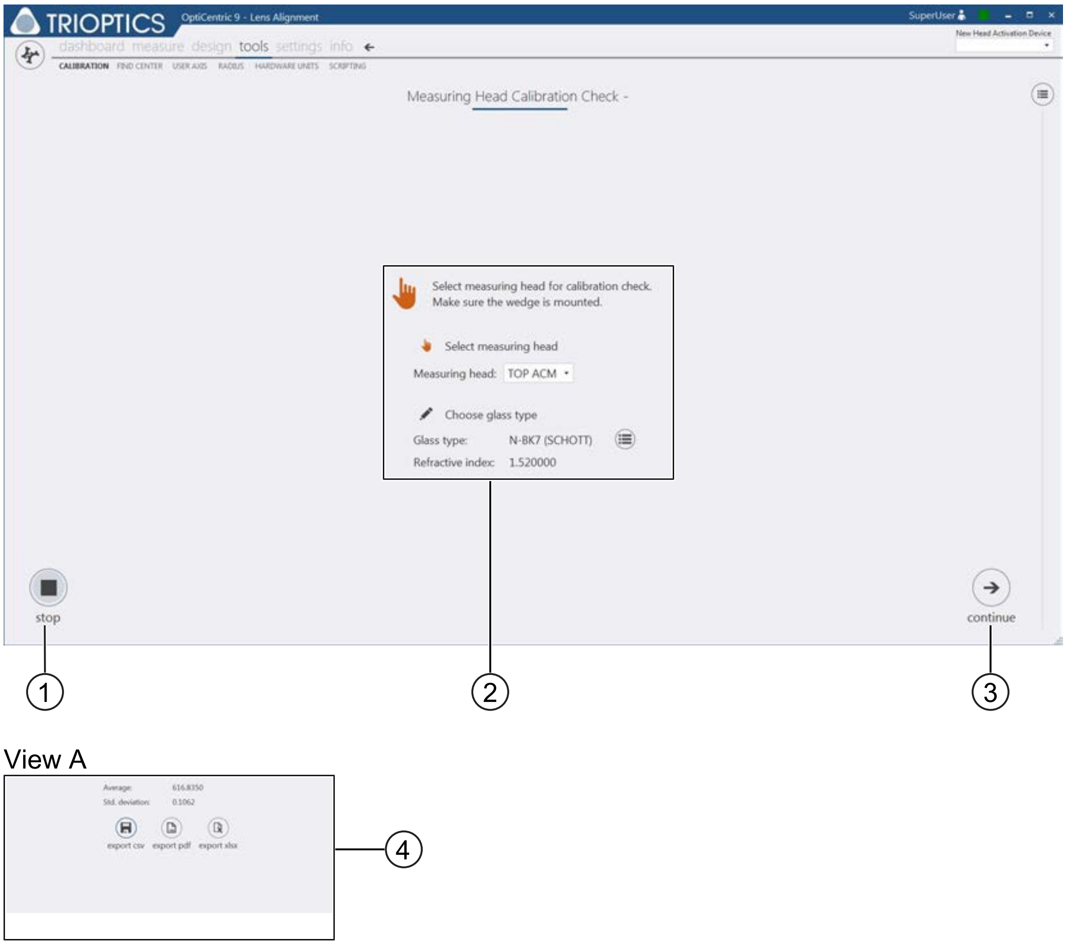


Fig. 220: Tools: Check Calibration

1	`Stop`: Stops the movement of all axes. The calibration check of the measuring head is aborted.
2	`Select measuring head for calibration`: Select the measuring head for which you want to check the calibration. The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).
	`Choose glass type`: Select the glass type used (see calibration wedge specifications).
	`Change glass type`: Select this button to open the glass catalog. Further information on the functions of the glass catalog can be found in *<settings> menu <GLASS CATALOG> [▸ 296]*.

3	Continue: When you have made all the necessary settings in the current window, select this button to continue checking the calibration of the measuring head. The camera window is displayed, in which you can edit the settings for calibration check of the measuring head. Further information on the functions and buttons of the camera window can be found in *Camera window [▶ 210]*.
4	Measuring Head Calibration Check – Results: The results of the calibration check are displayed.
	export results: Export the results of the calibration check to a *.xsls file.

11.7.6 FIND CENTER

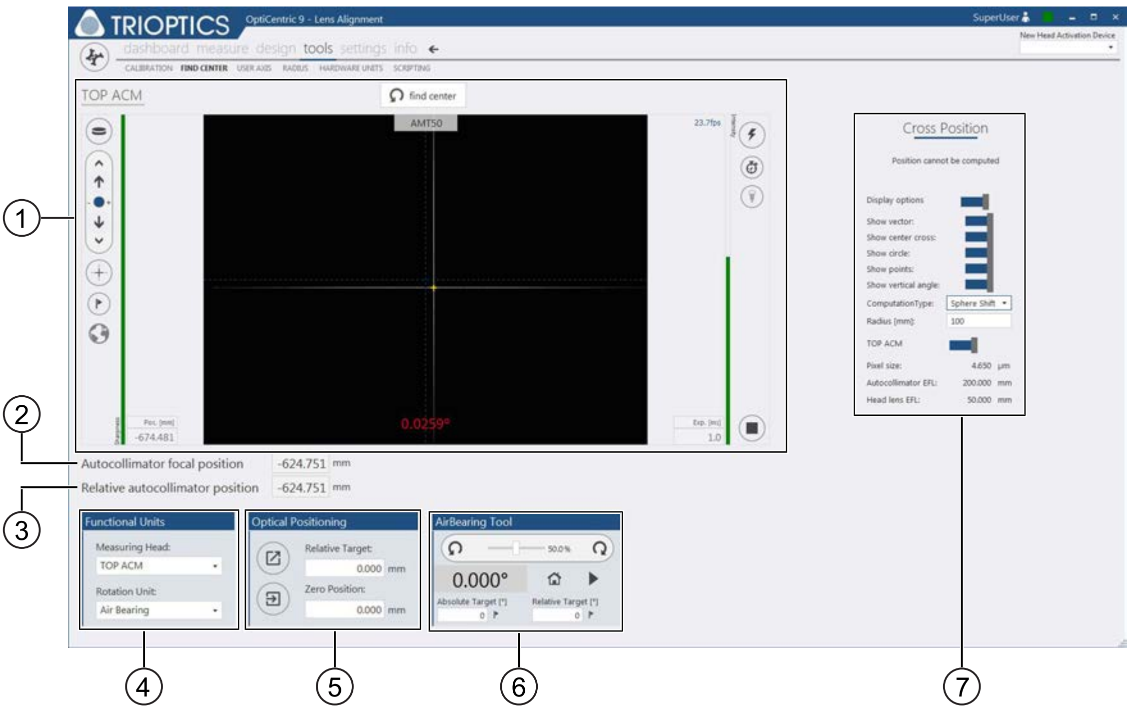


Fig. 221: Tools: FIND CENTER

1	**Camera window** Further information on the functions and buttons of the camera window can be found in *Camera window [▸ 210]*.
2	`Autocollimator focal position`: Shows the position of the autocollimator relative to the world coordinate system.
3	`Relative autocollimator position`: Shows the position of the autocollimator relative to the vertex of the sample.
4	`Functional units`: Define the active functional units in this area that you want to use for the FIND CENTER measurement.
	`Measuring head`: Select the measuring head for which you want to check the calibration. The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).
	`Rotation Unit`: Select the rotation device according to the hardware configuration of your measurement system. The rotation devices previously defined in the hardware settings are available for selection (see *HARDWARE <ROTATION UNIT> view [▸ 272]*).
5	`Optical positioning`: Positioning the measuring head in the visual coordinate system
	`Relative Target`: In this field you can enter a target position relative to the visual coordinate system. Use the `Move to relative position` function to move the measuring head to this position.
	`Zero Position`: This field shows the origin of the visual coordinate system relative to the world coordinate system. The value can be overwritten manually and set as a new origin.
	`Move to relative position`: Move the measuring head to the relative position (`relative target`).
	`set current collimator focal position as optical zero`: Set the current focus position of the autocollimator as the origin of the visual coordinate system.
6	`Air Bearing Tool`: Edit settings for the air bearing.
	`Rotate in negative direction`: Rotate air bearing in the negative direction.
	`Manual positioning velocity [%]`: Set the speed for the manual rotation of the air bearing (specified in % of the maximum rotation speed).
	`Rotate in positive direction`: Rotate air bearing in the positive direction.
	`Start reference drive`: Start reference cycle for the air bearing
	`Run in standard rotation mode`: Use default settings for air bearing rotation

	Absolute Target [°]: Move stage to absolute target:
	Relative Target [°]: Move stage to relative target:
7	Cross Position
	Display options: Select this option to set additional display options: • Show vector: Show the vector which shows the position of the centration error to the coordinate system. • Show center cross: Show the camera target cross • Show circle: Shows the tolerated centration error. • Show points: Shows the measuring points of the centration error measurement • Show vertical angle: Only for TRIOPTICS employees, for aligning the camera • Computation Type: Select which centration error is to be displayed (options: Sphere Shift, Sphere Tilt or Plane Tilt). • Radius [mm]:
	Measuring Head: Select this option to display the current measuring head settings.

11.7.7 USER AXIS

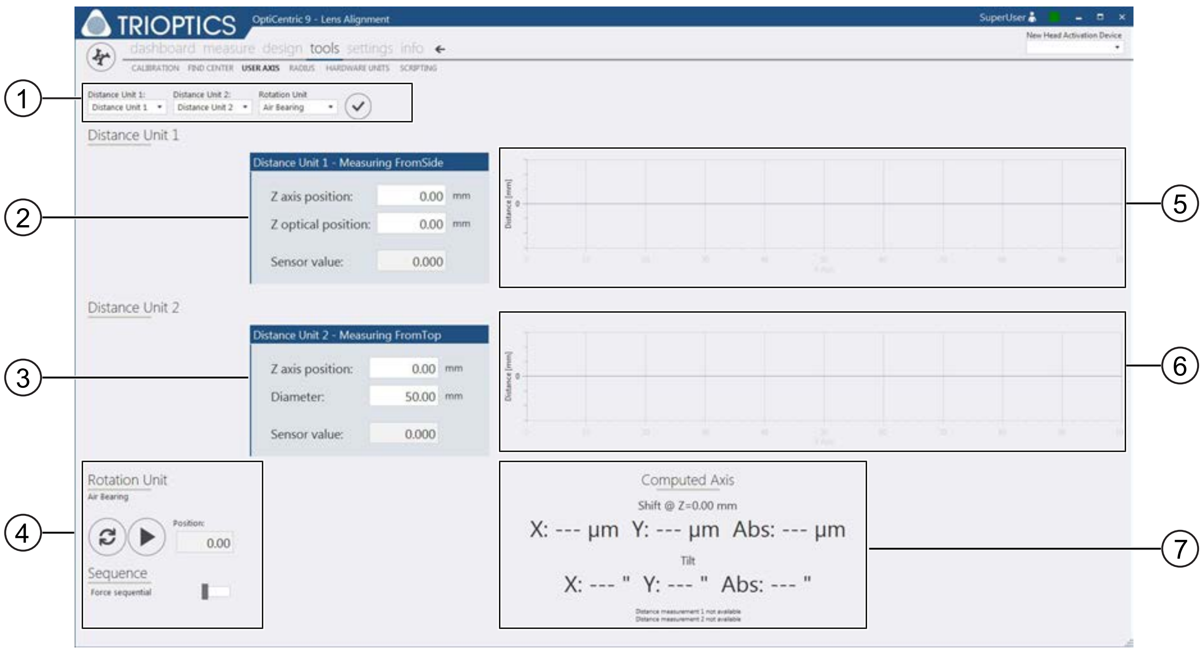


Fig. 222: Tools: User axis

1	**Hardware components** Select the hardware components currently used. The components previously configured in the hardware settings are available for selection. reset tool using the selected equipment: Starts the tool with the selected hardware components.
2	Distance unit 1: Shows the values of the first distance sensor.
	Z-axis position: Z-coordinate of the positioning axis on which the sensor is located.
	Z optical position: Z-coordinate of the optical sensor
	Sensor Value: Displays the measured value
3	Distance unit 2: Shows the values of the second distance sensor.
	Z-axis position: Z-coordinate of the positioning axis on which the sensor is located.
	Z optical position: Z-coordinate of the optical sensor
	Sensor Value: Displays the measured value
4	Rotation unit: Options for operating the rotation device.
	Rotate air bearing: Start rotation of the air bearing
	Measure user axis: Start measurement of the mechanical reference axis.
	Position: Current position of the air bearing
	Force sequential: Select this option if the measuring sensors are to be measured one after the other.
5	**Graphical area for distance sensor 1**: The signal of distance sensor 1 is displayed graphically.
6	**Graphical area for distance sensor 2**: The signal of distance sensor 2 is displayed graphically.
7	Computed axis: The coordinates of the determined mechanical reference axis are displayed.
	Shift: Shift of the mechanical reference axis relative to the axis of rotation of the air bearing at the height of the specified Z-coordinate.
	Tilt: Tilt of the mechanical reference axis relative to the axis of rotation of the air bearing.

11.7.8 RADIUS

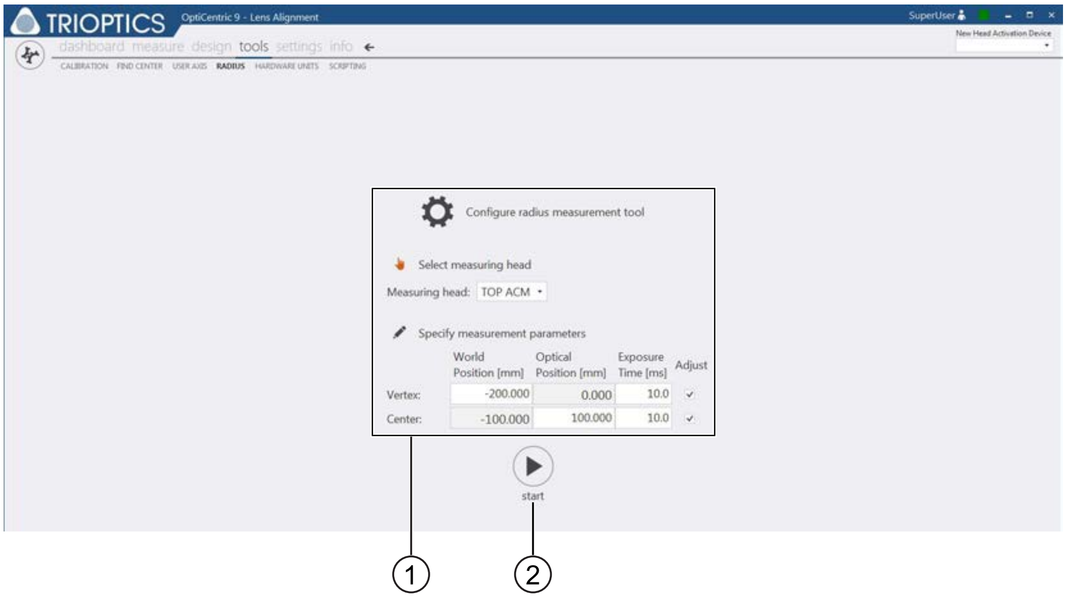


Fig. 223: Tools: Radius

1	`Configure radius measurement tool`: Tool for configuring the measurement of lens thicknesses and air gaps
	`Measuring head`: Select the measuring head you want to use for the measurement. The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [269]*).
	`Vertex`: Enter the position for the vertex in world coordinates.
	`Center` (radius of curvature): Enter the position for the center of curvature in visual coordinates.
2	`Start radius measurement`: Start the measurement

11.7.9 MEASURING HEAD

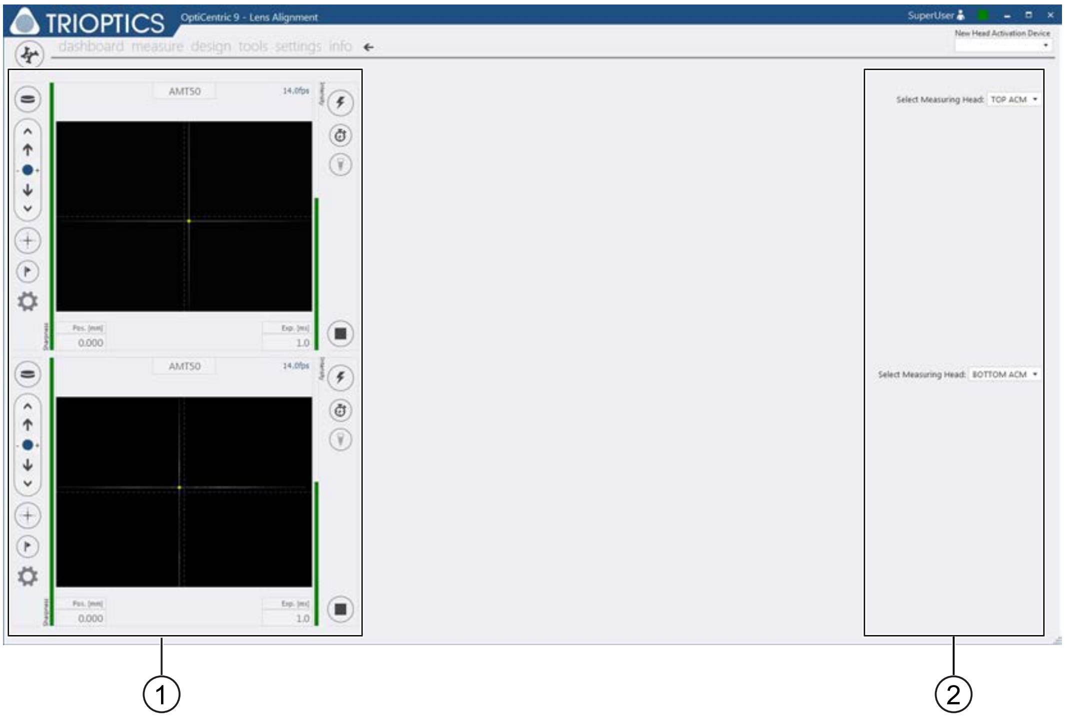


Fig. 224: Tools: Hardware Units, Measuring Head (performance check)

– Select `<tools> <HARDWARE UNITS> <Measuring Head>` to open this tool.

1	**Camera window**: The camera windows for the upper and lower measuring heads are displayed. Further information on the functions and buttons of the camera window can be found in *Camera window [▸ 210]*.
2	`Select measuring head`: Select the measuring head for the display. The measuring heads previously defined in the hardware settings are available for selection (see *HARDWARE <TOP MEASURING HEAD> view [▸ 269]*).

11.7.10 <tools> menu <SCRIPTING>

This area is reserved for employees of TRIOPTICS GmbH for installation and maintenance purposes.

11.8 Info

11.8.1 <info> view <STATUS LOG>

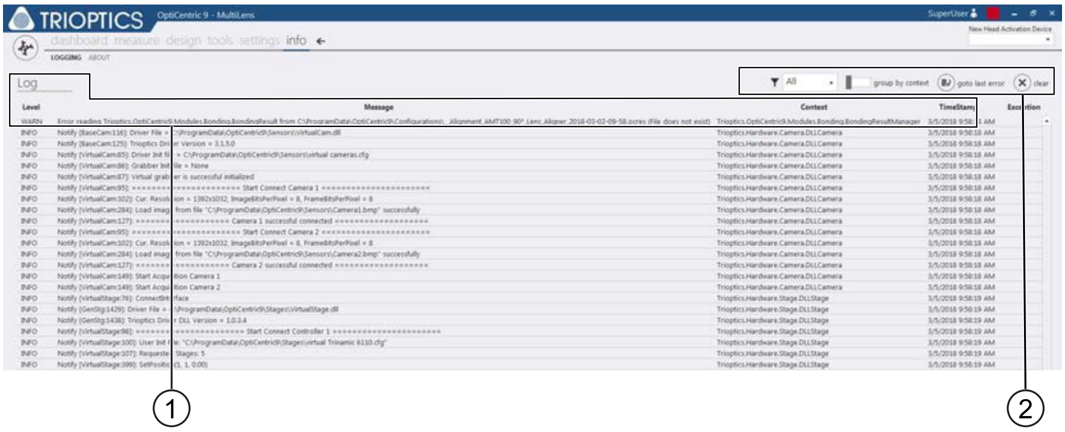


Fig. 225: Info, <LOGGING> view

1	**Log**
	`Level`: Information on the severity of the message (pure information or warning)
	`Message`: Content of the message
	`Context`: Origin of the message
	`Time Stamp`: Date and time of the message
	`Exception`: Display for an exception situation
2	Select filter to display only messages of a certain level.
	`Group by Context`: Activate this option to arrange the message according to its context.
	`goto last error`: Returns to the last error that occurred.
	`clear`: Clears the log display

11.8.2 ABOUT

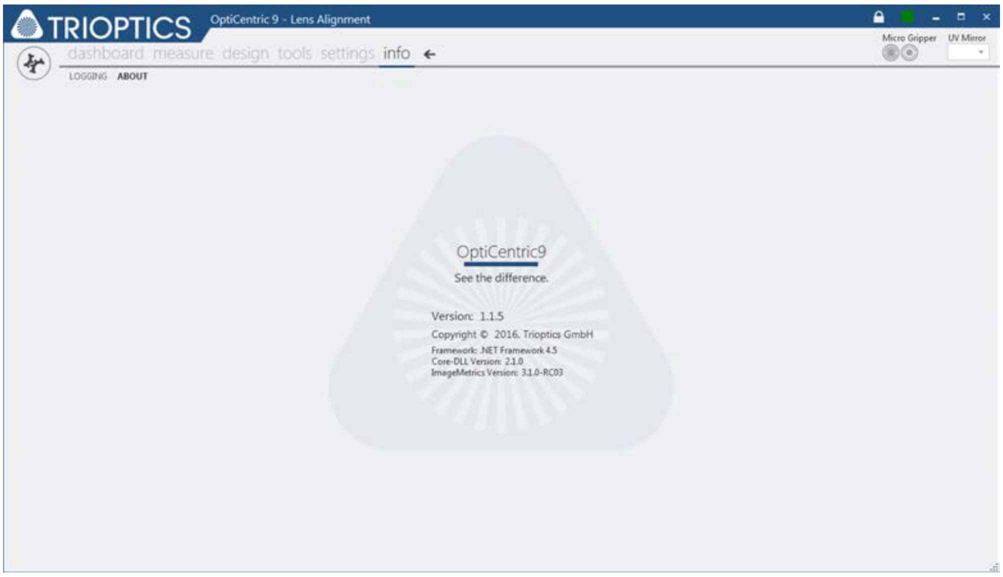


Fig. 226: INFO menu, <ABOUT> view

Shows the software information screen with version and copyright information.

Glossary

Alignment bonding

In alignment bonding, lenses are aligned to a mechanical axis or an optical axis and then bonded to the mount.

Alignment cementing

In alignment cementing, lenses are bonded together. Alignment cementing is a special case of alignment to the optical axis: - The lenses lie on each other without a gap - There is no mechanical reference axis (mount)

Reference wedge

The reference wedge is a plane-parallel surface with a known wedge error.

Index

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TRIOPTICS

TRIOPTICS GmbH·Optische Instrumente·Strandbaddamm 6·D-22880 Wedel / Germany
Phone: +49-4103 - 18006 - 0·Fax:+49-4103 - 18006 - 20
Email:info@trioptics.com·http://www.trioptics.com

97-082-002