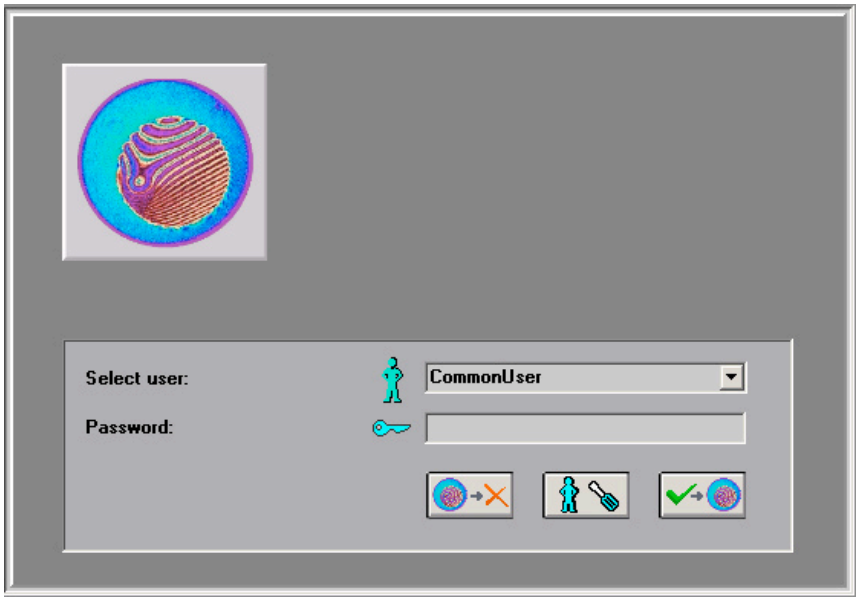
7 USERS



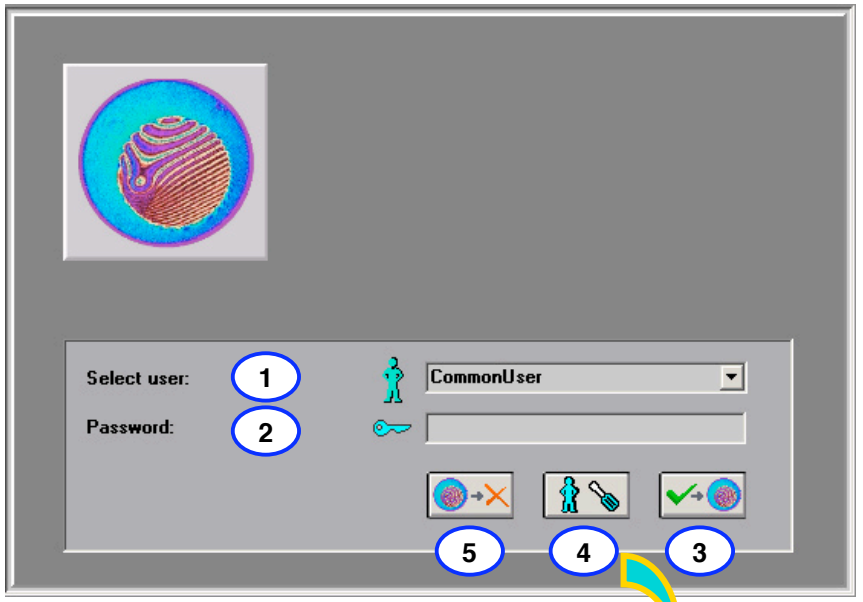
In this chapter :

- **Define Users with separate Setup files, folders, options, masks, history of folders and projects.**
- **Password protect the setup.**
- **Change User and load new setup.**

7.1 Login and password access - Users maintenance

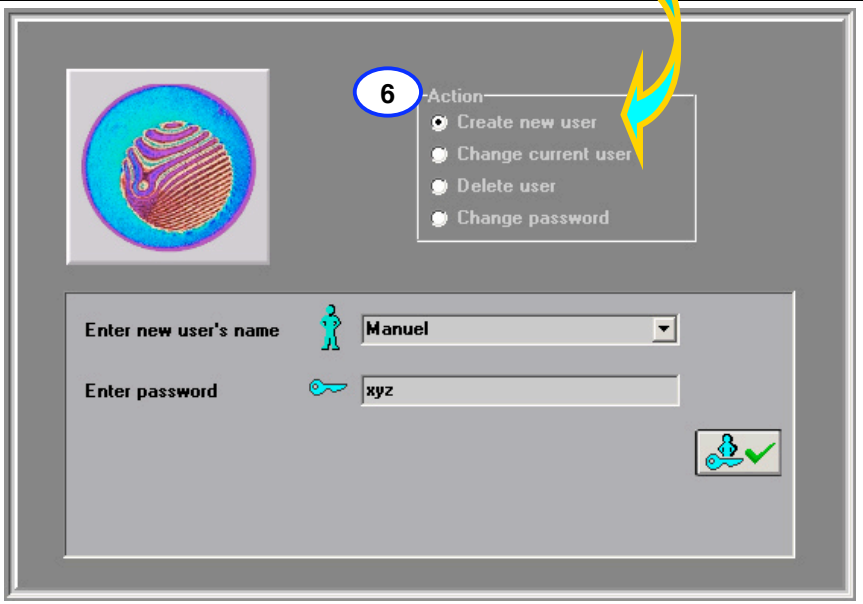
When ClaraLuna opens, log in under you user's name and password

1. Select existing user from list or Type user's name
2. Type password (if any)
3. Log in, or:
4. Access Users maintenance, or:
5. Exit ClaraLuna.



Access Users maintenance: choose action

- Create new user : enter User's name. Enter password (if any)
- Change current user: Select next user from list or Type next user's name + Enter next user's password (if any)
- Delete user (you need his password)
- Change password (you need current password)



7.2 User's personal folders and Setup

Creating a new User

1 creates his private Setup, Project Options and Masks folders.

2 **When modifying the General Setup,**

your personal setup file is saved to your Setup folder (with history of folders and projects, and Series of components).

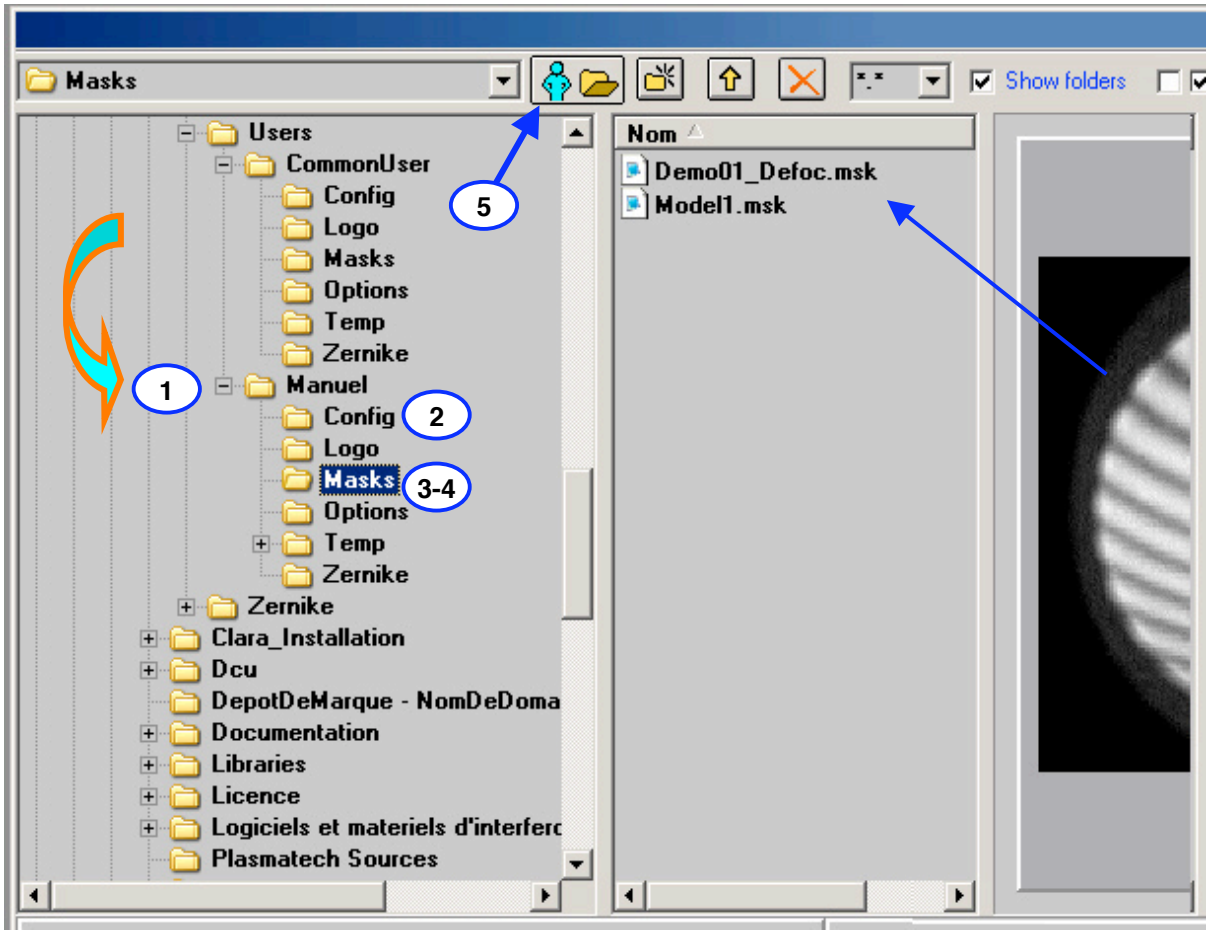
When creating a new Project,

3
- a copy of the Project Mask is saved to your personal Masks folder

4
- a copy of the Project Options files is saved to your personal Options folder

5 **Click button 'User's folder'**

to get back home from anywhere.



7.3 Access users maintenance from the General Setup

In the General Setup window,

1
2

- The current user's name is shown in edit (1).
- Click button (2) to open the Users Maintenance window.

In the Users Maintenance window,

3

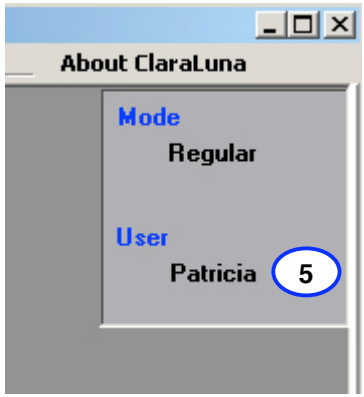
- create new user
- switch to next user
- delete user
- change password

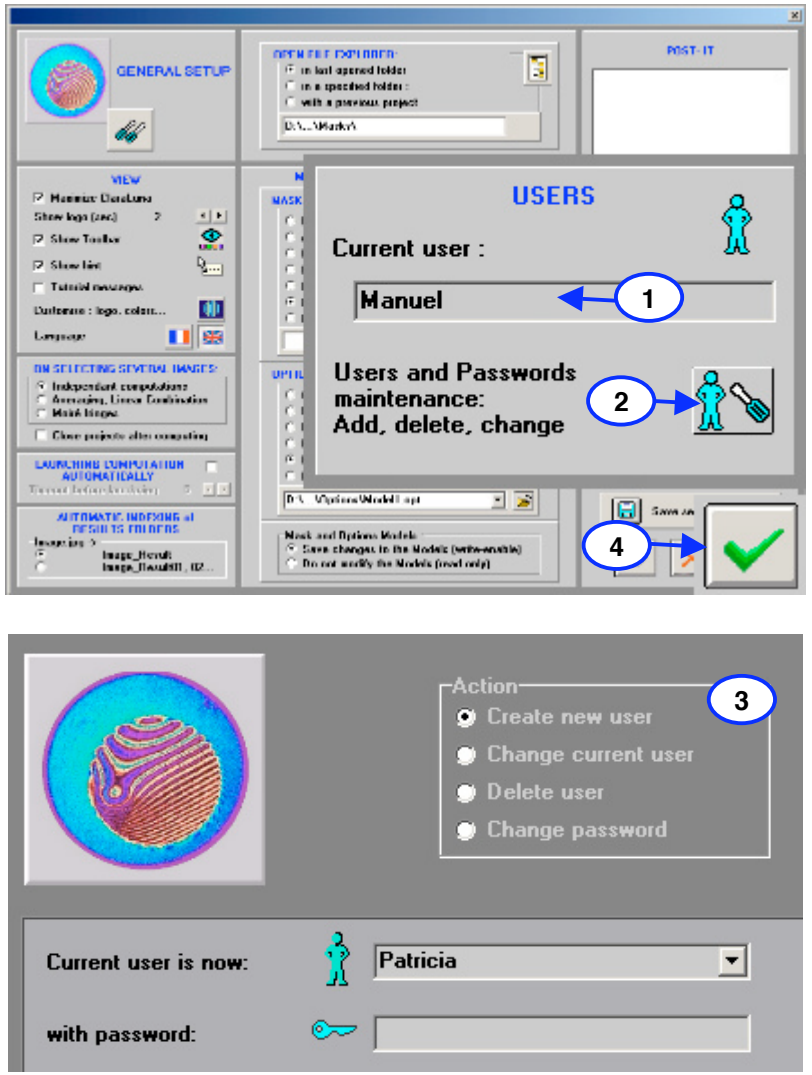
Back to general Setup window

4

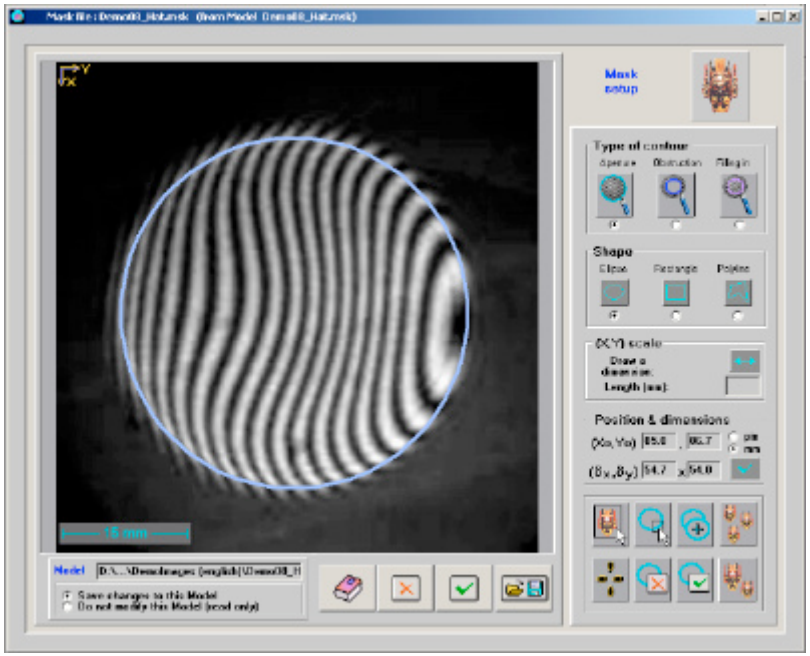
- If next user has logged in, the change will be taken into account only if closing the General Setup window by button (4),

5 **In the Main window status panel** the new user will be visible (5)





8 USING THE MASK EDITOR



In this chapter :

- **Define apertures, obstructions**
- **Set dimensions**
- **Save/load mask**

8.1 Mask Editor - Overview

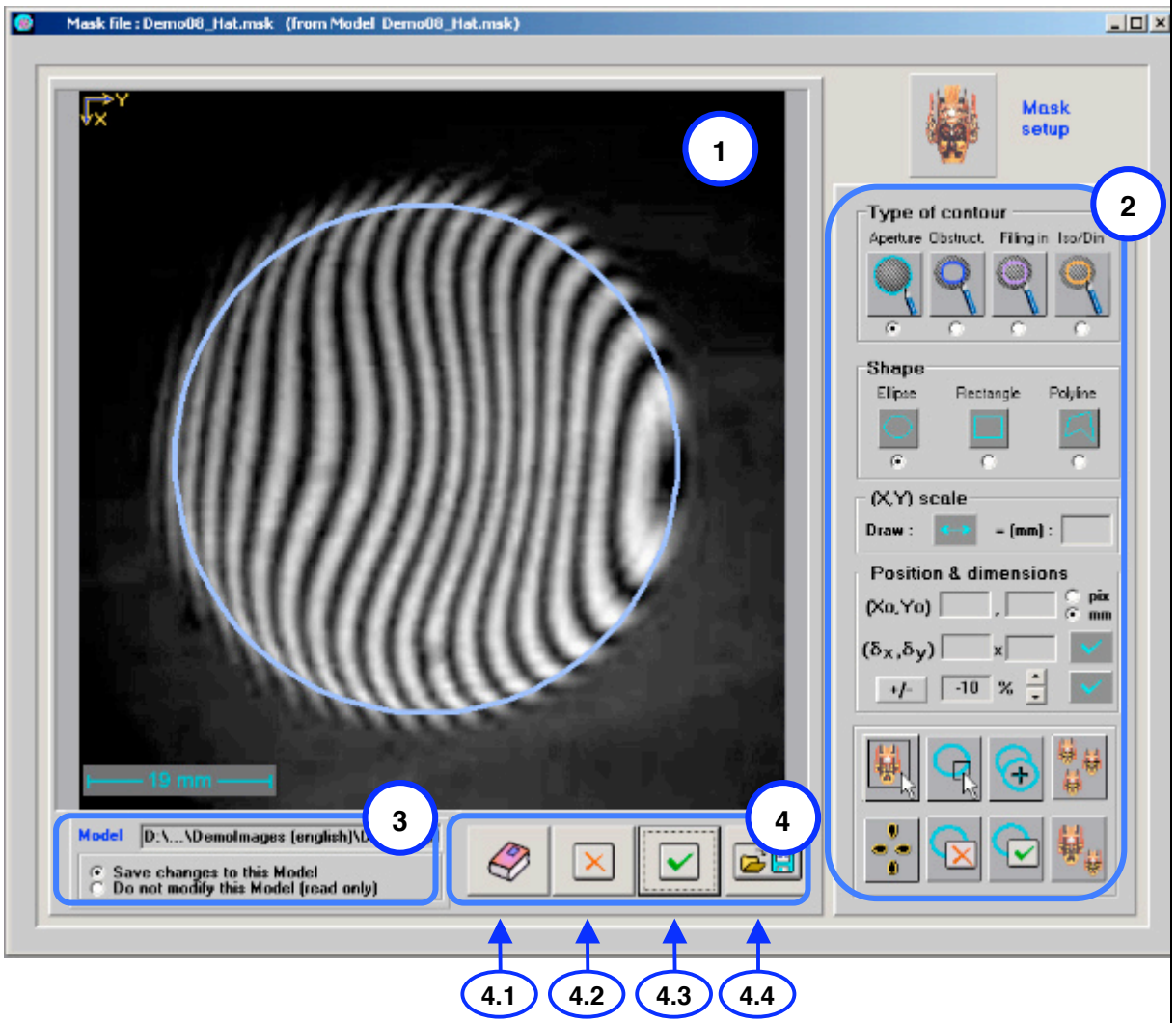
1 Graphic area

2 Contour editor

3 Model of Mask

4 Buttons for the mask :

- **4.1** Calls Help
- **4.2** Discards changes, closes window
- **4.3** Accepts changes, closes window
- **4.4** Opens File Manager with a Mask viewer, to save current mask and/or load a previousy saved mask for reusing with or without further editing



8.2 Mask Editor - Model of Mask

What is a Project Mask

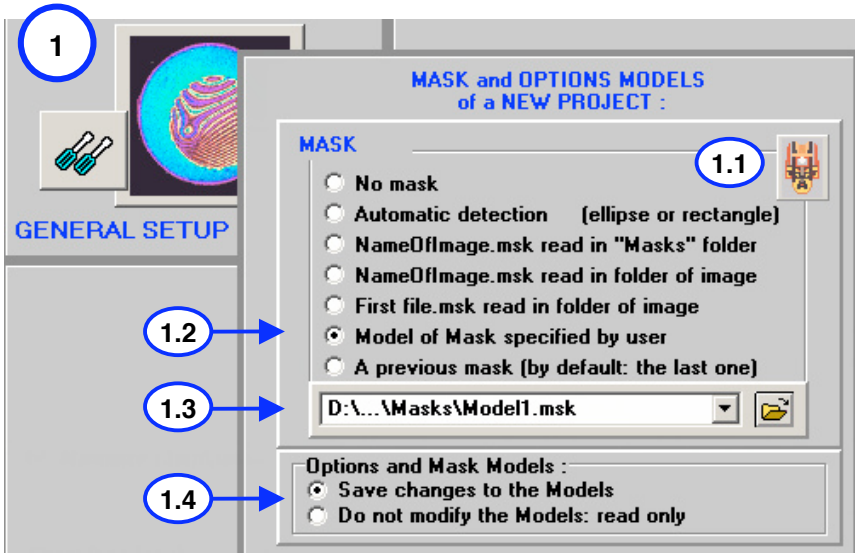
A Mask is a graphic object that defines the data/no data areas on the interferogram, as well as the "horizontal" XY scale. It needs to be carefully defined ; if not, aberrant wavefront reconstruction will result.

When computing a new Project, (for instance "Demo08_Hat.jpg"), a Mask file will be created with the same name and extension ".msk" ("Demo08_Hat.msk"). Two copies are done : one in the Project Results folder ("Demo08_Hat _Result"), another in the common folder "Masks" located in the ClaraLuna program folder. These two identical Mask files are created as soon as the "Launch" button is clicked (see Section 6 of this guide; see below : "Computing").

What is a Mask Model

Before launching the project, a Mask file is fed into the Project Mask, and prompted to the user for modification (if needed) and validation. This file is the Mask Model. It is similar to the Model of document in a word processor such as Word.

Note that the model can be the Mask file itself if it already exists and provided that the user makes this choice.



1 **Choosing a Mask Model in the General Setup window**

1.1 It is a matter of General Setup (1) to choose a Mask Model before creating projects. The chosen Mask Model (1.1) will be prompted to the user on opening a new project This has been described in Section 6.7 of this guide.

1.4 **Saving changes to the Model**

This model can be write-enabled "Save changes in this Options Model") or read-only "Do not modify...".

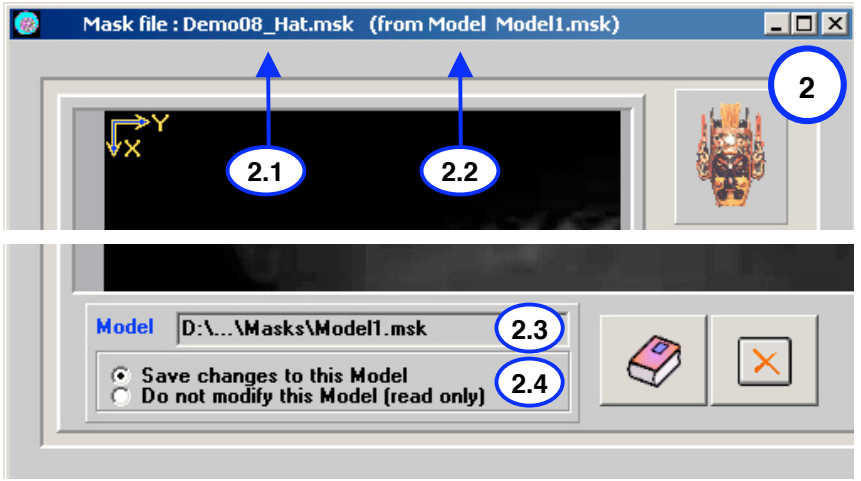
2 **How Mask file and Model appear in the Masks window**

1.2- 3 Consider the example of an user-defined Model (1.2 and 1.3)

2.1 The name and extension of the Project Mask file appear in the Mask window title bar (2.1) The Model previously chosen in the General Setup window (1.1) will appear, in the Project Mask window title bar (2.2) and in the box "Model" (2.3)

2.2- 3 The Model file name cannot be modified at this step.

2.4 The choice of the Model "Write-enabled" or "Read-only" property is recalled in (2.4) and can still be modified. However the modification will not change the General Setup Options and Mask "Read-only" property.



8.3 Mask Editor - Building a Mask - Contours

Building a mask : types of contours

A Mask is a defines the data (1) / no data (2-3) areas.

1 The "data" contours are called "**Apertures**" (1) : the valid data is inside. They are drawn in light blue.

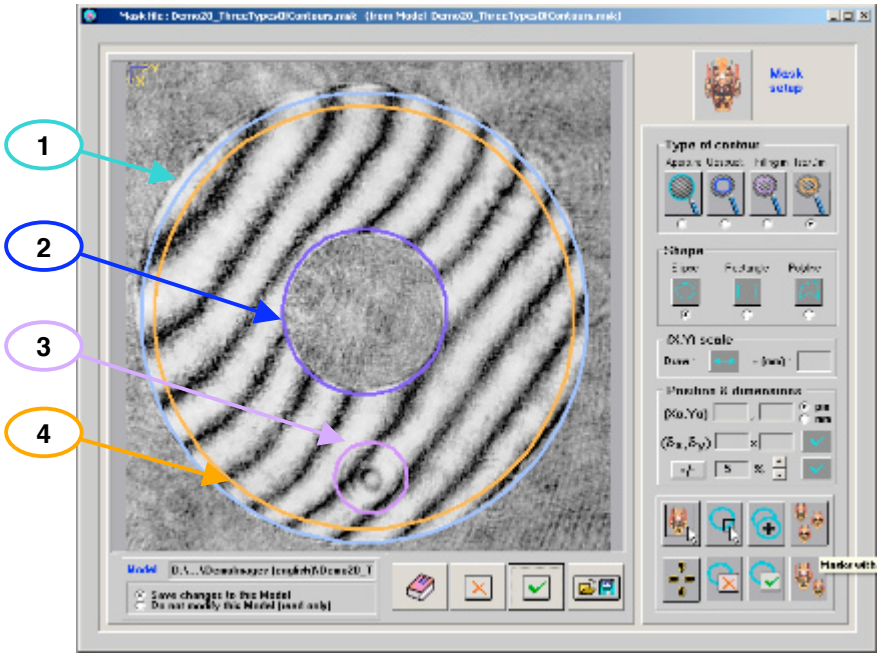
2 The "no data" contours are called "**Obstructions**" (2) : the inner data is discarded and a "hole" will result on the component surface (2'). They are drawn in dark blue.

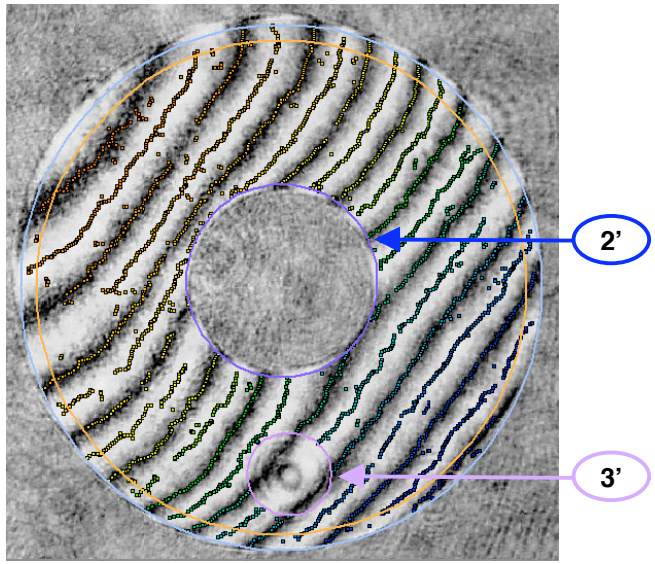
3 "**Filling in contours**" : the inner data is either missing or discarded. They are drawn in light purple. (3)

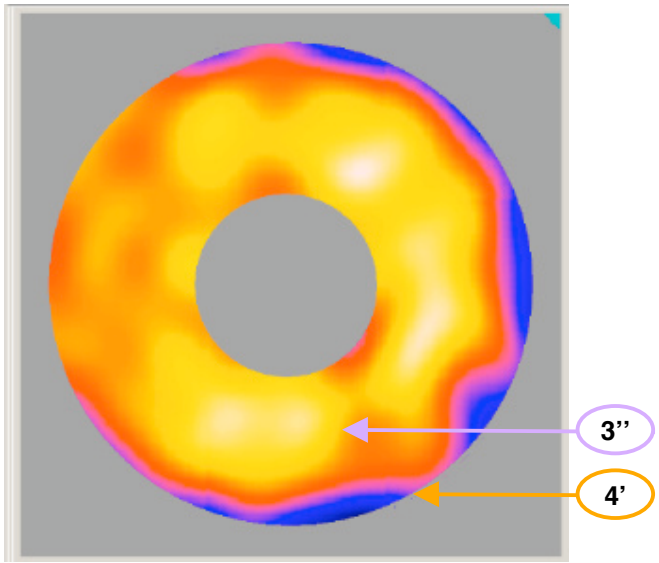
The purple "Filling-in" contour is a "no data area" as well (3'), but inside it the missing or discarded area will be reconstructed through a linear prediction, providing its most probable form with respect to the surrounding data: the hole is "filled in" (3'').

4 The **free aperture** (4) is defined within the orange contours.

Only the data contained within the orange contour is taken into account for computing ISO/DIN results. The final "no data area" is limited by the orange contour (4').







8.4 Mask Editor - Drawing contours (ellipse, rectangle)

Select a type of contour

1. Aperture : the valid data is inside
2. Obstruction : the inner data is discarded and a "hole" will result on the component surface
3. Filling in : the inner data is discarded and the hole will be "filled in", i.e. the missing area will be reconstructed by its most probable shape with respect to the surrounding data.
4. Free aperture contour : area for computing the ISO/DIN results

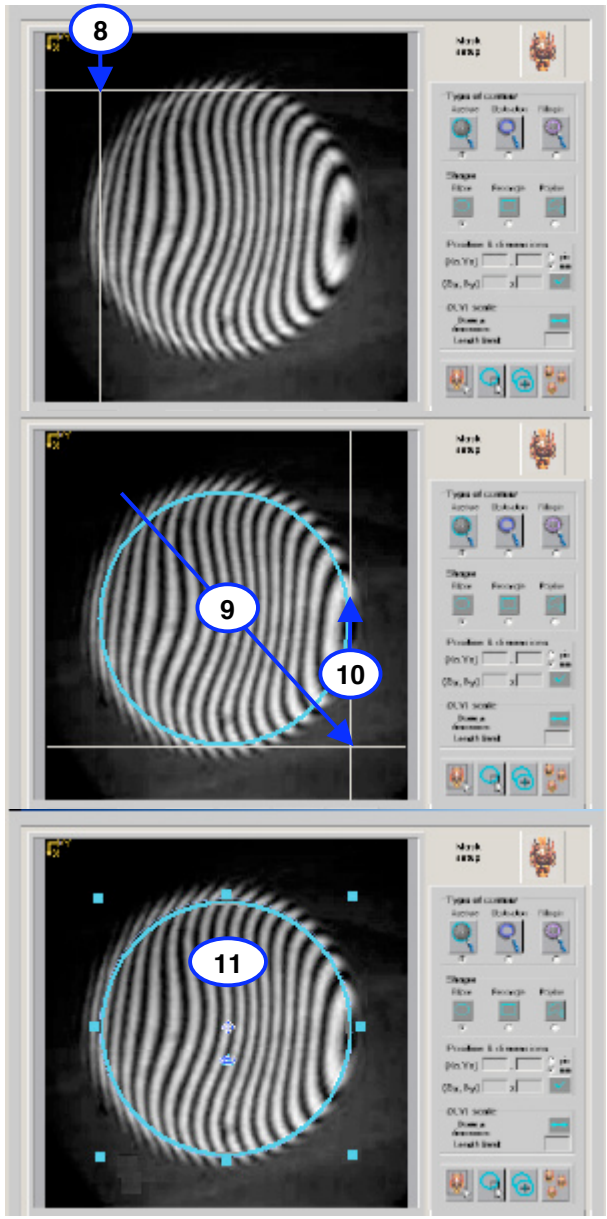
Select a shape

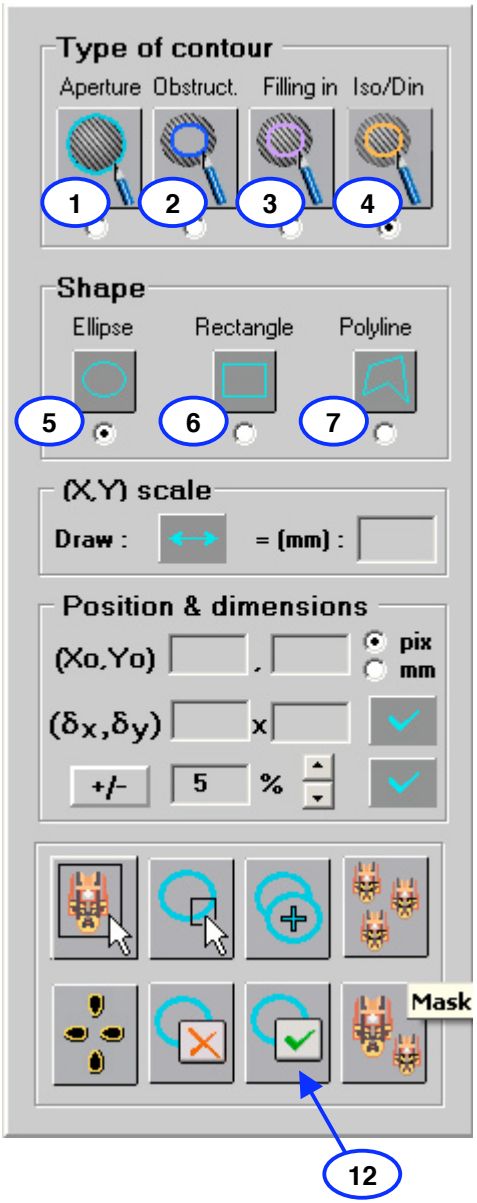
5. Ellipse
6. Rectangle
7. Polyline

Drawing an ellipse or a rectangle

8. Mouse down
9. Drag
10. Mouse up
11. The contour is defined and appears selected with handles, ready to be edited or validated.
12. Validate contour : click (12) or press Enter key.

.





8.5 Mask Editor - Drawing contours (polygons)

Drawing a polygon

1-3 **4-6** Draw each segment by sequence: Click down (1) - Drag (2) - Click up (3) ; then repeat (1-2-3) from end of previous segment.

In this case, you will see the "rubber band" segment being drawn.

Or :

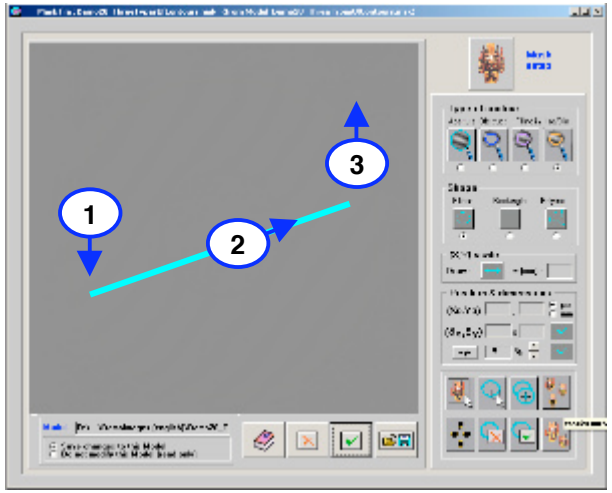
4-6 Draw each segment by sequence Click down and up (4) - Move (5) - Click down and up (6). In this case, you will not see the segment (4-6) before step 6.

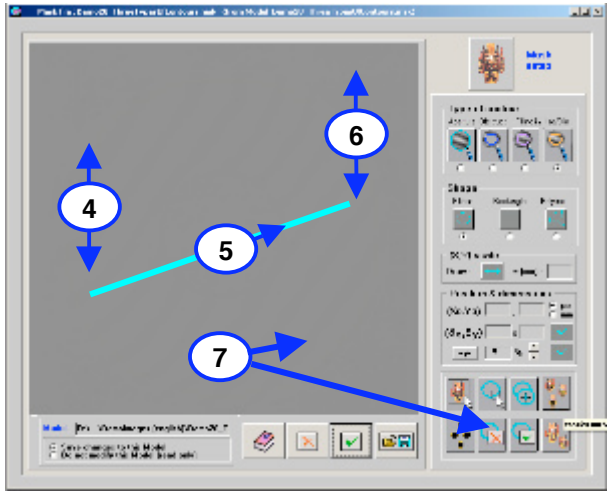
7 End contour by validating (7).

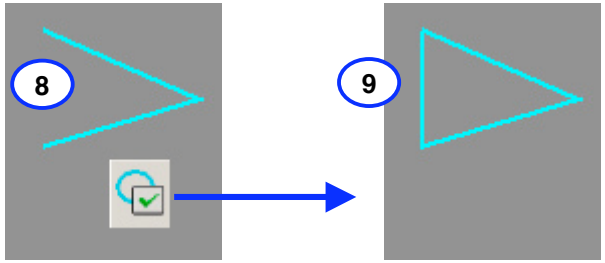
8-9 You can omit the last segment, it will be added automatically.

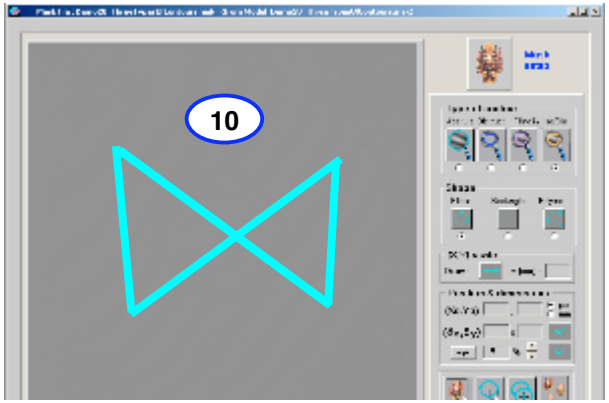
10 Crossed polygons are not permitted : you will be asked to redraw.

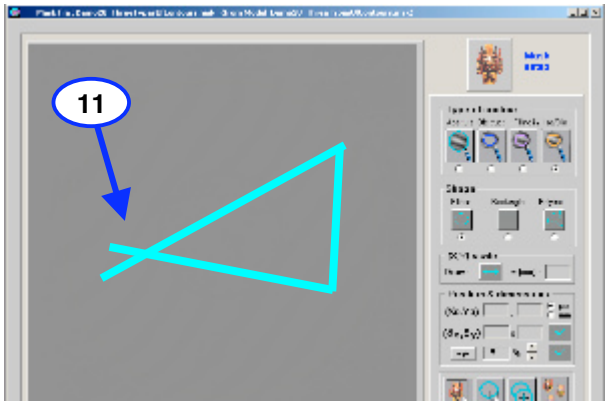
11 **12** However, a minor overlapping between first and last segment (11) will not raise an error message, and will automatically be corrected (12).

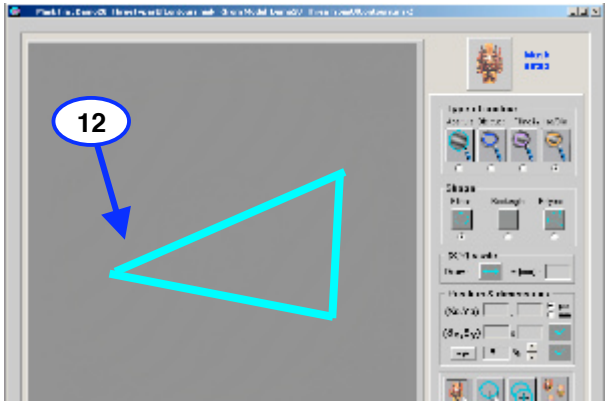












8.6 Mask Editor - Selecting contours for editing

Selecting a contour

1 Click selection tool (1)

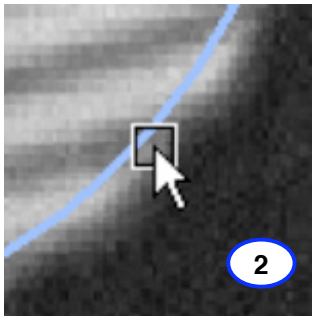
2 Go to graphic area, set square mouse cursor over a part of a non-selected contour. Click to select.

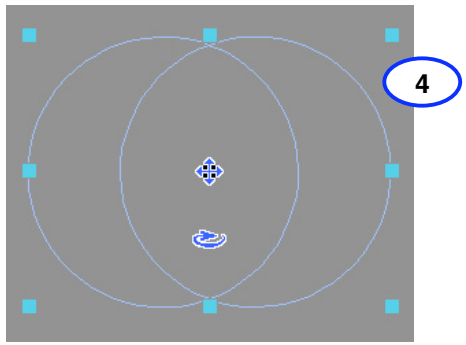
2-3 Unselect a selected contour by clicking it with the same tool (2), or by validating button (3).

4 Selecting more than one contour includes them in a common rectangle with handles.

5 Select all the coutours by clicking button (5).

To select all countours but one, click first button (1), then (5), then go to graphic area and unselect the contour you chose.



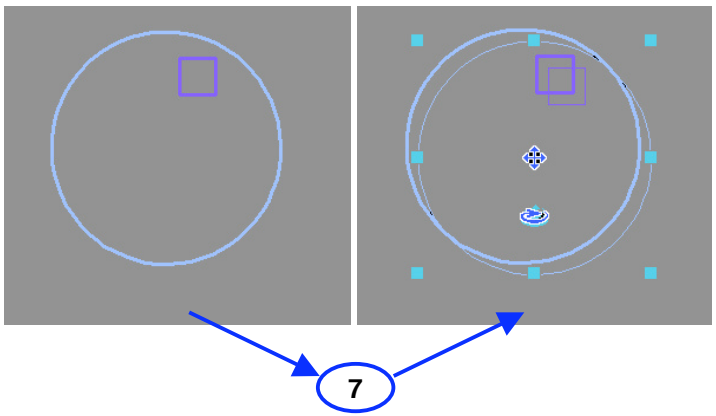


Editing selected contours

The following actions involve all the selected contours, treated as one single graphic element :

6
- Delete selected : caution, this operation cannot be canceled.

7
- Duplicate selection. The original contours get unselected, the copy gets selected. The copy is not shifted with respect to the original contour

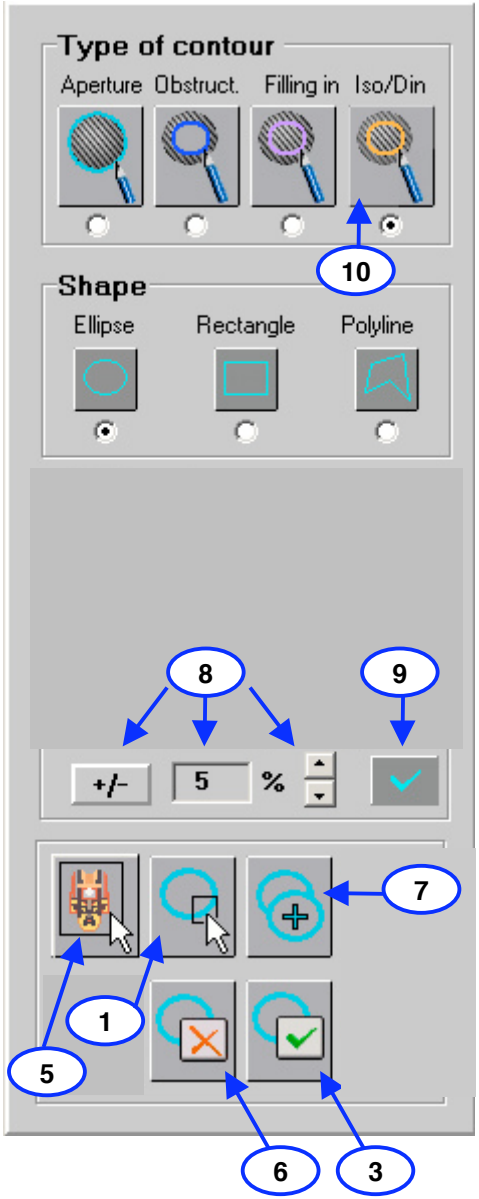


Reduce/enlarge selection by x%

8-9
- Enter x (+ or -) in (8)
- Apply by clicking (9)

Creating a free aperture contour = full aperture reduced by 10% :

- Select full aperture light blue contour
- Duplicate (7)
- Reduce (9)
- Change contour type (selection turns orange)



8.7 Mask Editor - Editing contours

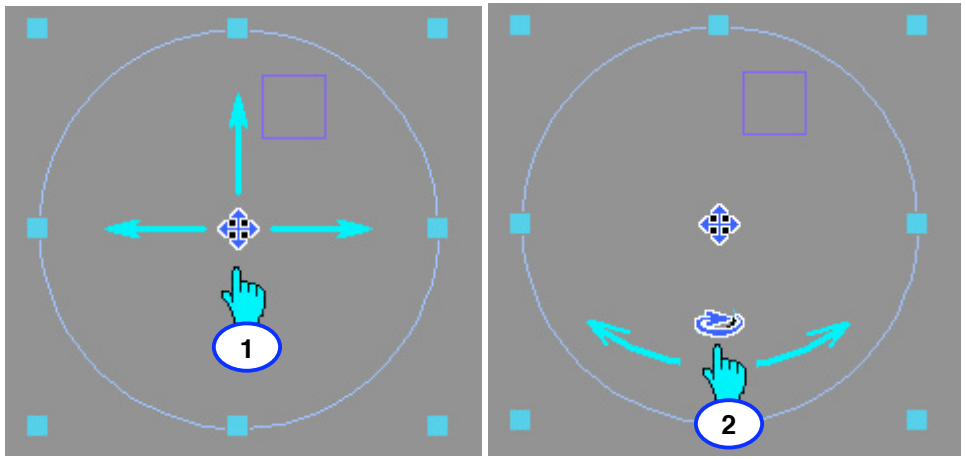
Editing selected contours

1

- Translate selection by clicking & draging central cross

2

- Rotate selection by click & drag circular arrow. The rotation center is the cross. Once the circular arrow has been clicked, you can drag along a radius to get away from the center before rotation; this gives you more precision.



Keyboard commands for editing selected contours

- Translate : arrows up, down, left, right.
- Expand/contract Key "+" and Key "-" on the numeric keypad.
- Rotate anticlockwise = Ctrl + Key "+"
- Rotate clockwise = Ctrl + Key "-"

  (+ and - on the numeric keypad).

  Note that the rotation is positive if X→Y, i.e. anticlockwise

Numeric Position and Dimensions of selected contours

3

When selecting contours, the position (X0, Y0) of the top left handle is shown in edit boxes (3).

4

The height (deltaX and width (deltaY) are in edit boxes (4). They are the dimensions of the envelope horizontal rectangle of the selection.

5

Axes (X,Y) are defined by icon (4) located in top left corner of image. Unlike Windows axes, ClaraLuna's axes are direct, and consistent with matrix order (row, column).

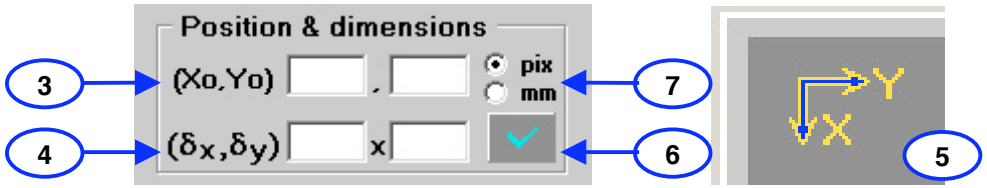
When moving selection, the position and dimensions vary accordingly in boxes (3-4).

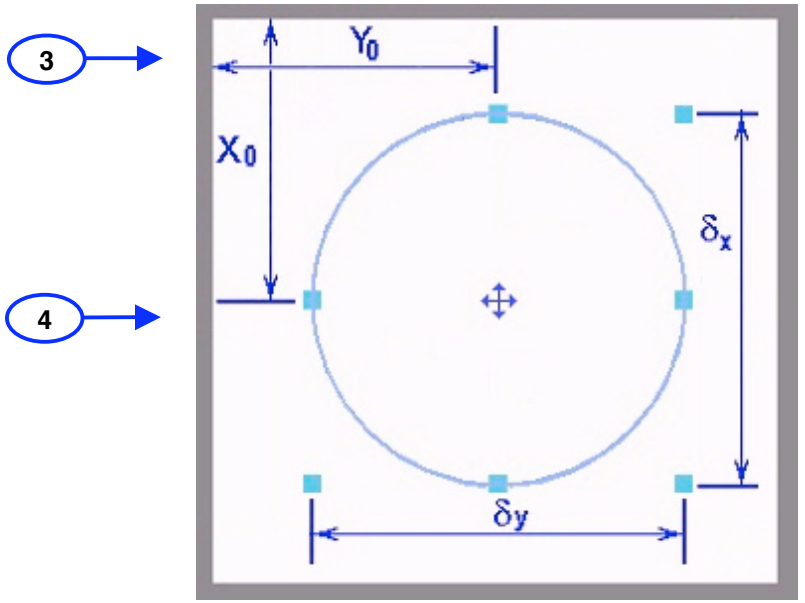
6

Conversely, if you type values in these boxes then validate button (6), the position and dimensions are updated. This makes it possible to define a mask with pixel precision.

7

The units of the boxes (3-4) are pixels or mm. Millimeters are available only after defining an (X,Y) scale : please read below.





8.8 Mask Editor - (X,Y) scale

Defining an (X,Y) Scale

The (x,y) scale defines the camera resolution in mm/pixel.

This scale is not connected to the ISO or DIN results, but it is of interest when considering the relative precision of the polished part.

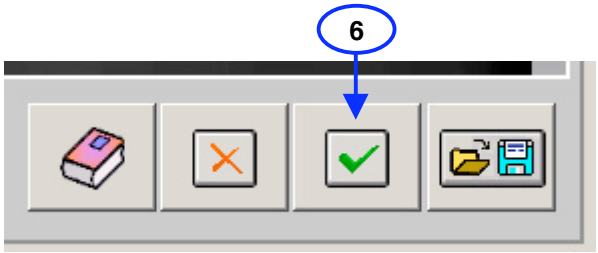
The scale is however necessary when expressing the slopes (gradients) of the surface.

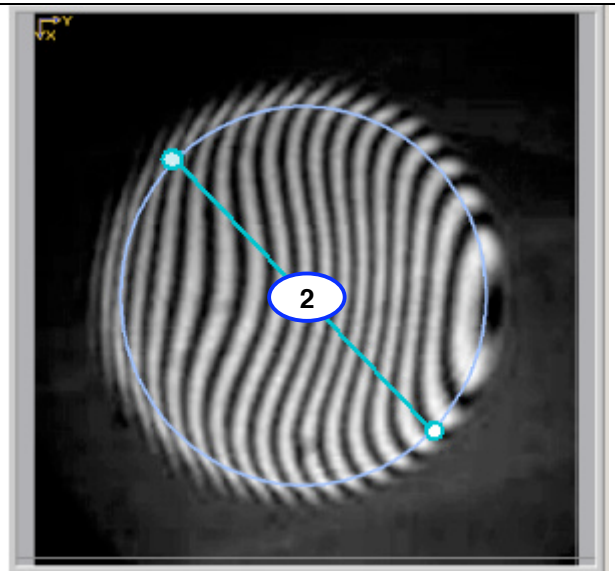
To define the scale :

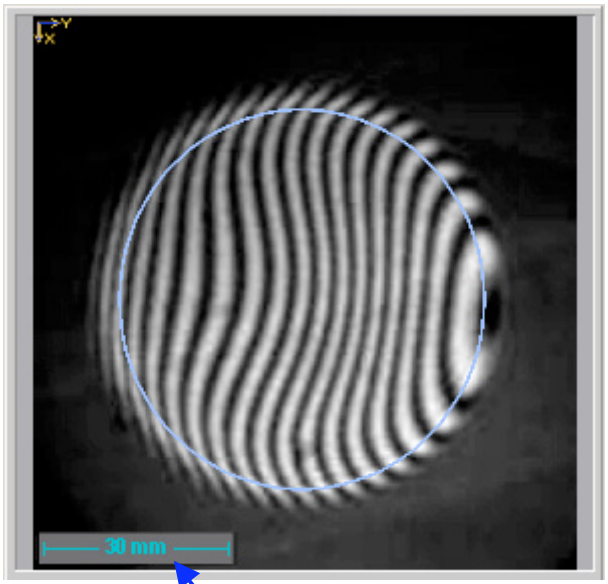
1. • Cilck button (1)
2. • Draw a segment on the image
3. • Write the length of that segment, in mm
4. • Validate button (4)
5. • A scale appears, usually with a length different from what you entered, but equivalent in terms of scale.

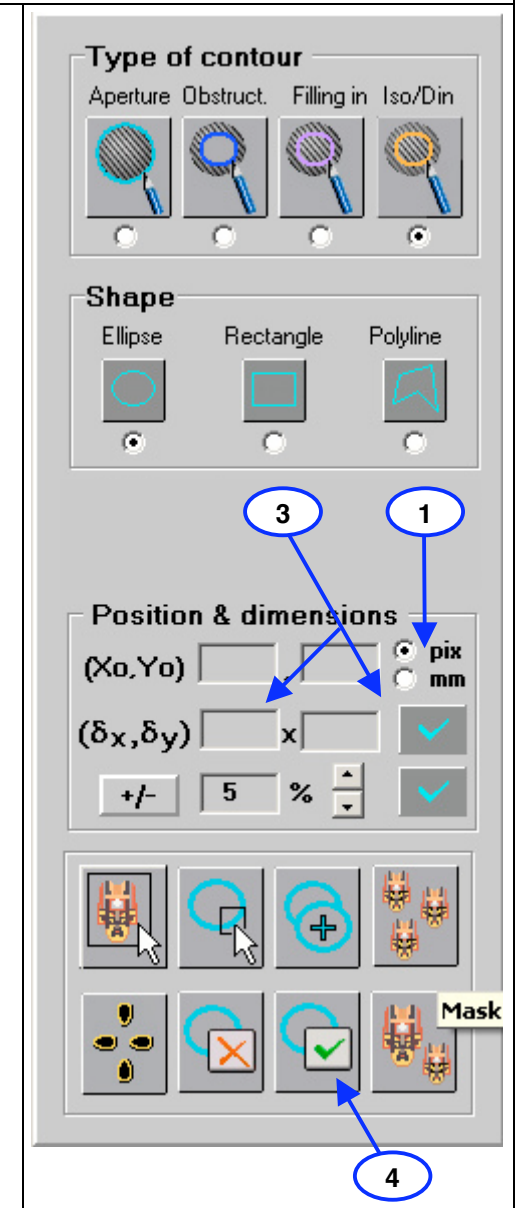
Validating the mask

6. Now the mask is ready. You can validate by button (6) at the bottom of the mask window.









8.9 Mask Editor - Master and Disciple Contours ("fiducials") - Enhanced version only

Adjusting a Disciple-Aperture to a Master-Aperture ("fiducials")

1-2 The issue is : Averaging, adding, subtracting, comparing wavefronts with different apertures.

3 Create a contour of any type, adjust it to the outer edge of the reference aperture, select it

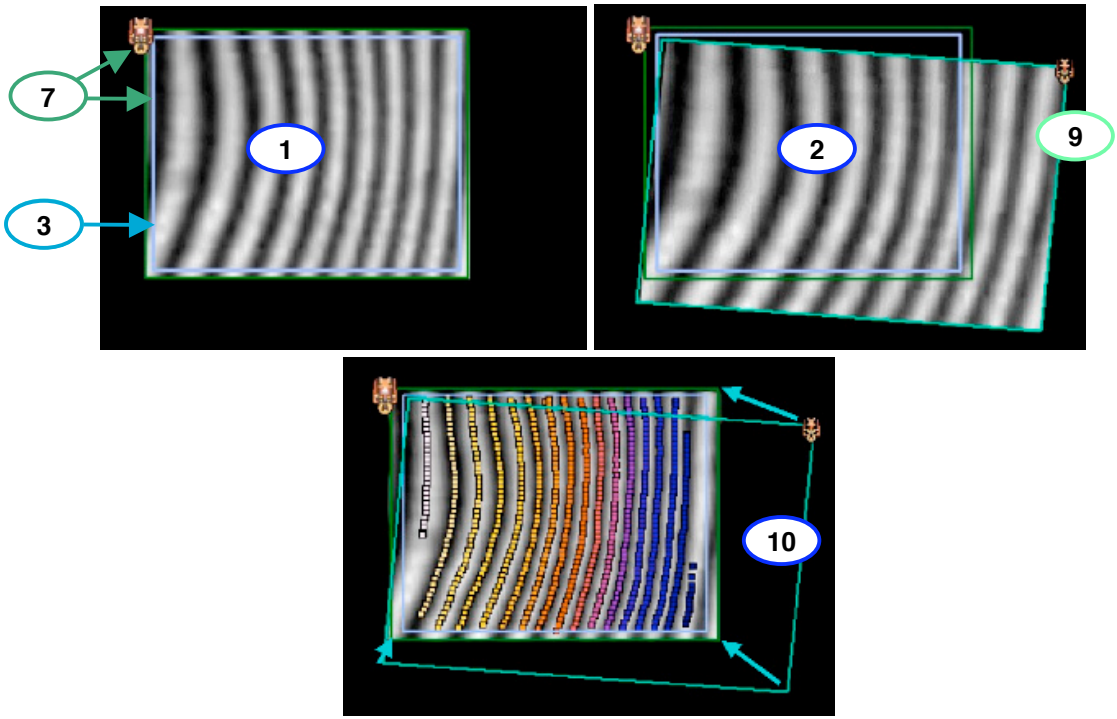
4-5 Click Special Contours button (4) : panel (5) shows up.

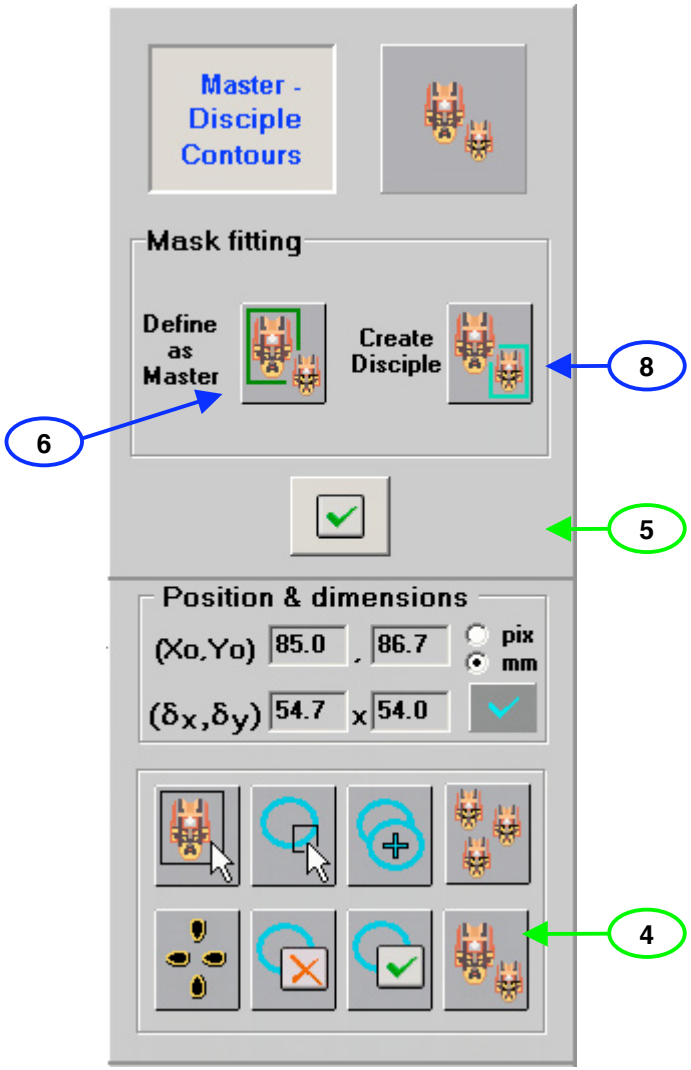
6 Click button (6) "Define as Master.

7 The contour turns to dark green with a Mask icon in the top left corner (7).

8-9 On the deformed and shifted aperture, open the previous Mask with the Master, and click button (8) "Create Disciple". A light green contour shows up with a smaller Mask icon in the top right corner (9). Adjust it to the outer edge of the deformed and shifted aperture. Validate the Mask

10 Before computing, the shifted and deformed interferogram (2) is stretched and shifted back, so that the Disciple Contour matches the Master





8.10 Creating QED 4-Spots Mask in the Mask Editor

In the Mask Editor, create a QED mask :

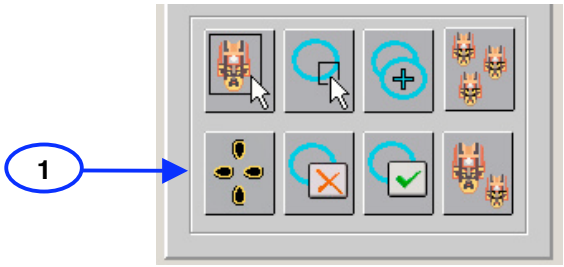
1-2 Click button (1) : panel (2) shows up.

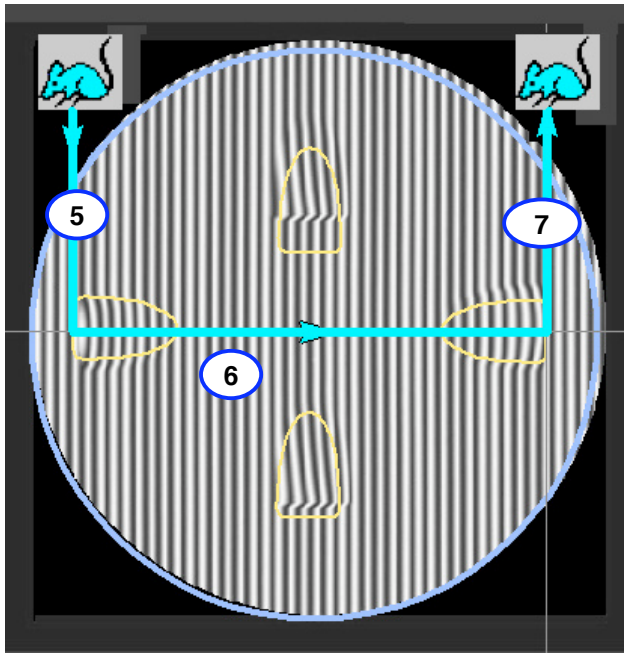
3 Image (3) defines the spots numbers and geometry

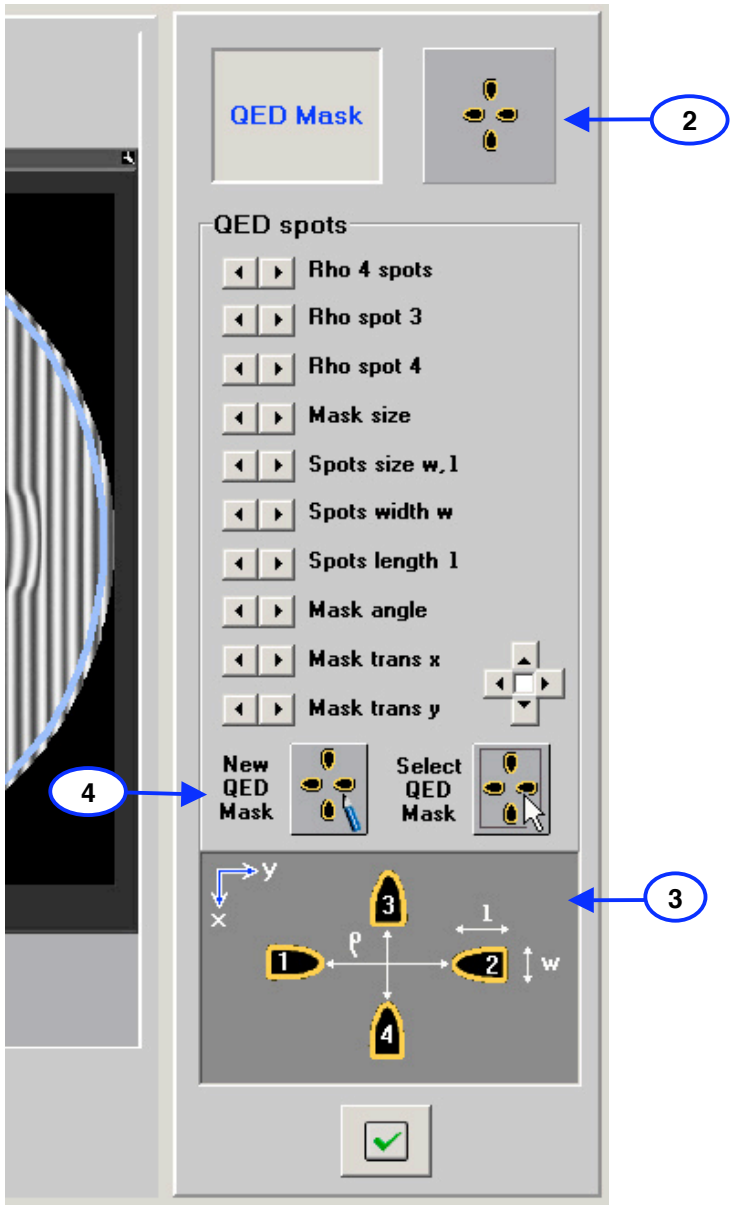
4 Click button "New QED mask"

5 On graph, click mouse down on end of Spot # 1.

6-7 Drag (5) and mouse up (6) on end of Spot # 2 to stretch a full 4-spots mask.







8.11 Adjusting the QED Mask

0 With respect to axes (x,y) and spots numbering of the QED mask defined by image (1), the controls (2) - (11) have the following actions : left arrow = decrease, right = increase

1 Adjust speed

2 Rho is the radius of a spot with respect to (wrt) the mask origin = intersection of axes (Spot1-Spot2) and (Spot3-Spot4). (2) controls the radii of the 4 spots at once.

3-4 (3) controls the radius of Spot3 alone - (4) controls the radius of Spot4 alone.

5 (5) does a global dilatation of the mask wrt to the origin. Keyboard shortcut : +/-

6 (6) controls dilatations of the 4 spots, each one wrt its own center (i.e. the size of the spots with rho = constant). Keyboard shortcut : Shift +/-

7 (7) controls the spots width, with rho = constant and length = constant

8 (8) controls the spots length, with rho = constant and width = constant

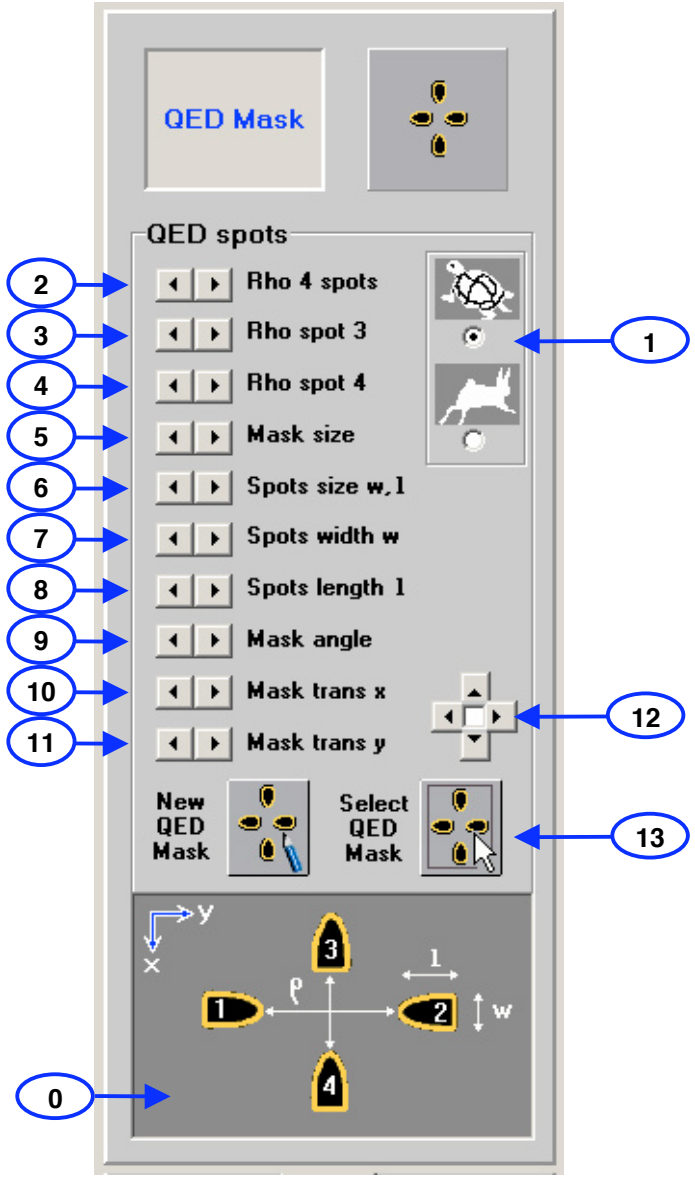
9 (9) rotates the 4 spots (as well as the spots axes (x,y)). Keyboard shortcut : Ctrl +/-

10 (10) translates thes 4 spots parallel to the mask axis y.

11 (11) translates thes 4 spots parallel to the mask axis x.

12 (12) translates thes 4 spots parallel to the Fringe image global axes (X,Y) "vertical and horizontal"). Keyboard shortcut : arrows.

13 (13) Selects all QED spots at once, for editing an existing mask.

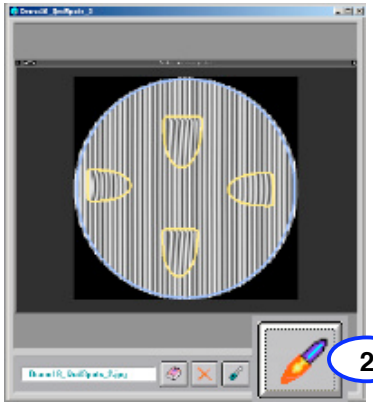


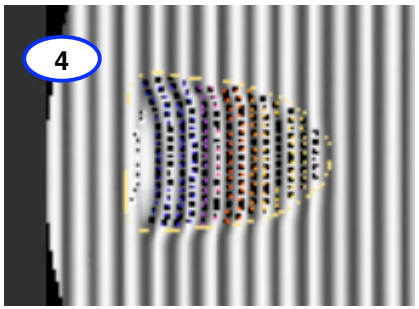
8.12 Launching and monitoring computation

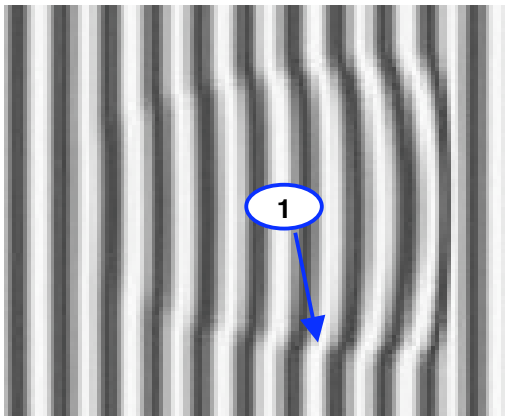
1 **A fair contour fitting** shows a contour line right on the sharp bends of the spot fringes. Note that the fit is done by the user : no further optimisation is performed.

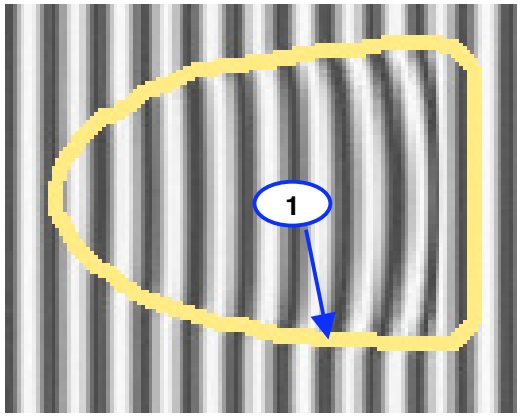
2 **Launch computation** when Mask is done.

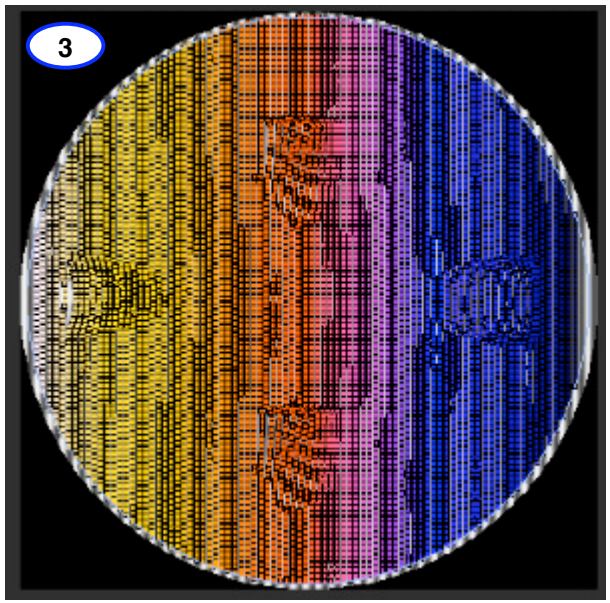
3-5 **The reconstruction process** needs about 1 mn. Some details of the spots detection can be monitored.

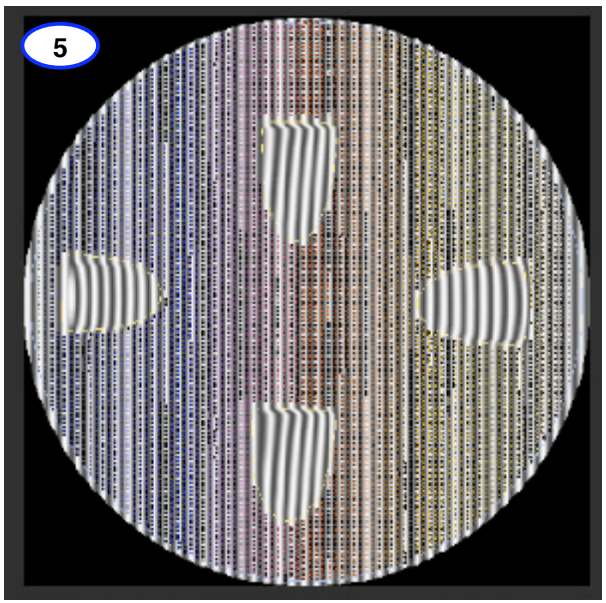




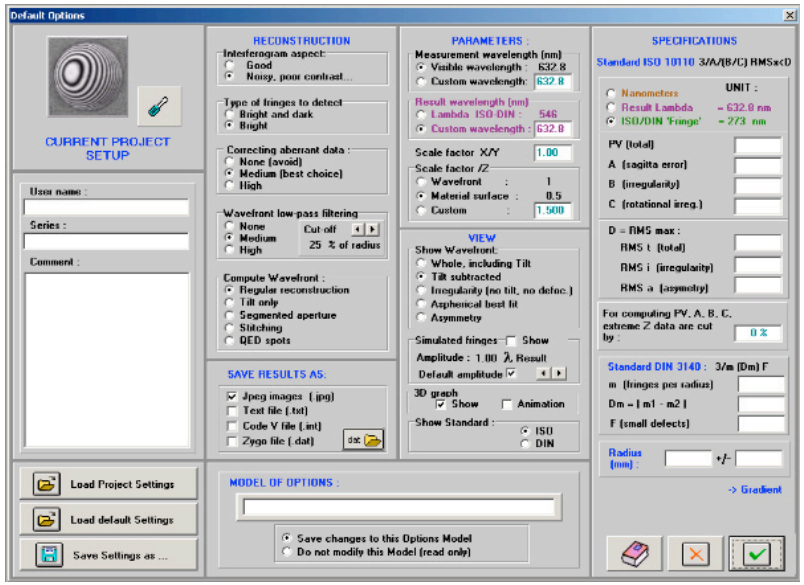








9 CONFIGURING THE PROJECT OPTIONS

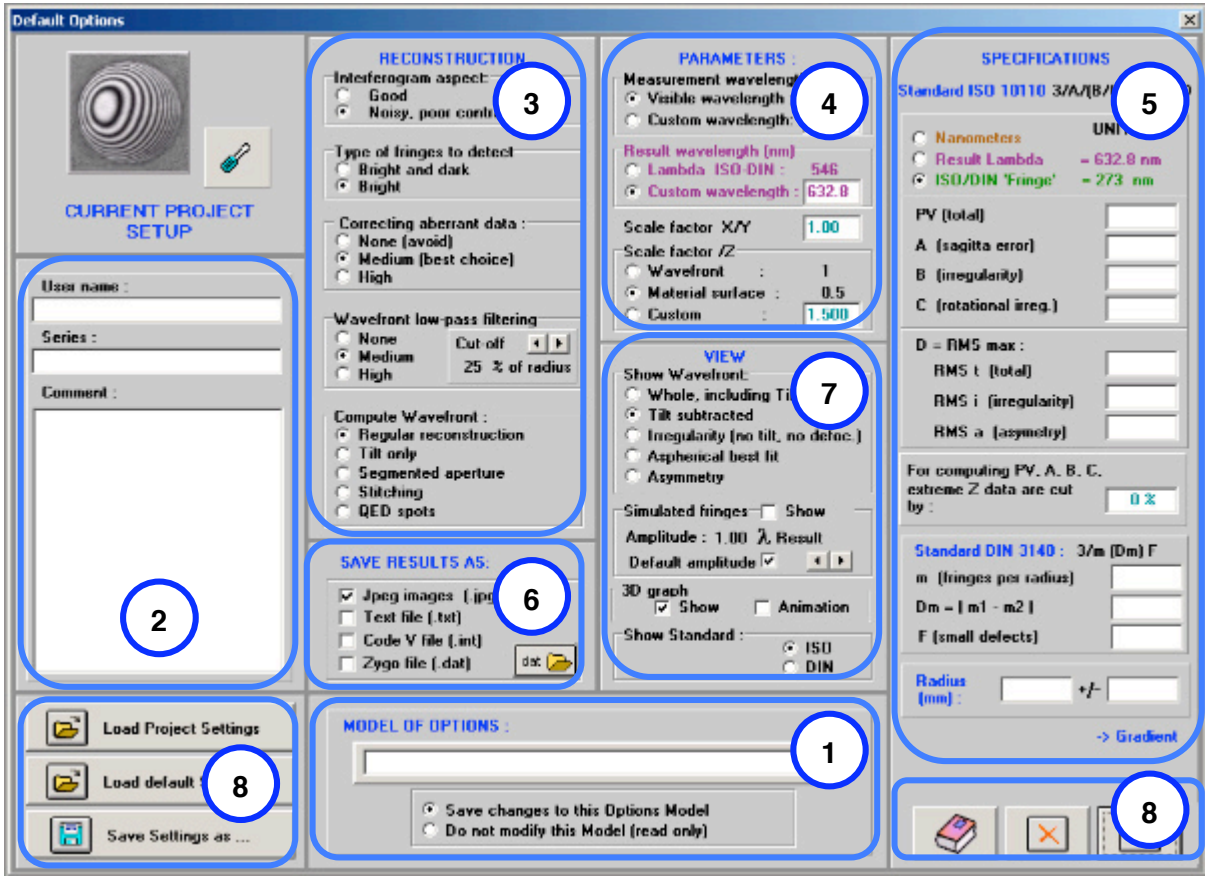


In this chapter :

- **Configure optical parameters of the data acquisition**
- **Enter ISO/DIN specifications**
- **Configure the display and files for results**
- **Save/load Options**

9.1 Project Options - Overview

1. Model file for the present Options
2. Memos (custom editors for User's name, Part series, Comments)
3. Reconstruction options : type of fringes, filtering.
4. Optical parameters of the data acquisition and results
5. ISO/DIN, radius of curvature and slopes specifications
6. Save options after computing
7. Options for displaying ISO/DIN results
8. Load /Save as, Validate, Cancel, Help



9.2 Project Options - Model of Options

What are Project Options

When computing a new Project, (for instance "Demo08_Hat.jpg"), an Options file will be created with the same name and extension ".opt" ("Demo08_Hat.opt"). Two copies are done : one in the Project Results folder ("Demo08_Hat _Result"), another in the common folder "Options" located in the ClaraLuna program folder. These two identical Options files are created as soon as the "Launch" button is clicked (see Section 6 of this guide; see below : "Computing").

What is an Options Model

Before launching the project, an Options file is fed into the Project Options, and prompted to the user for modification (if needed) and validation. This file is the Options Model. It is similar to the Model of document in a word processor such as Word.

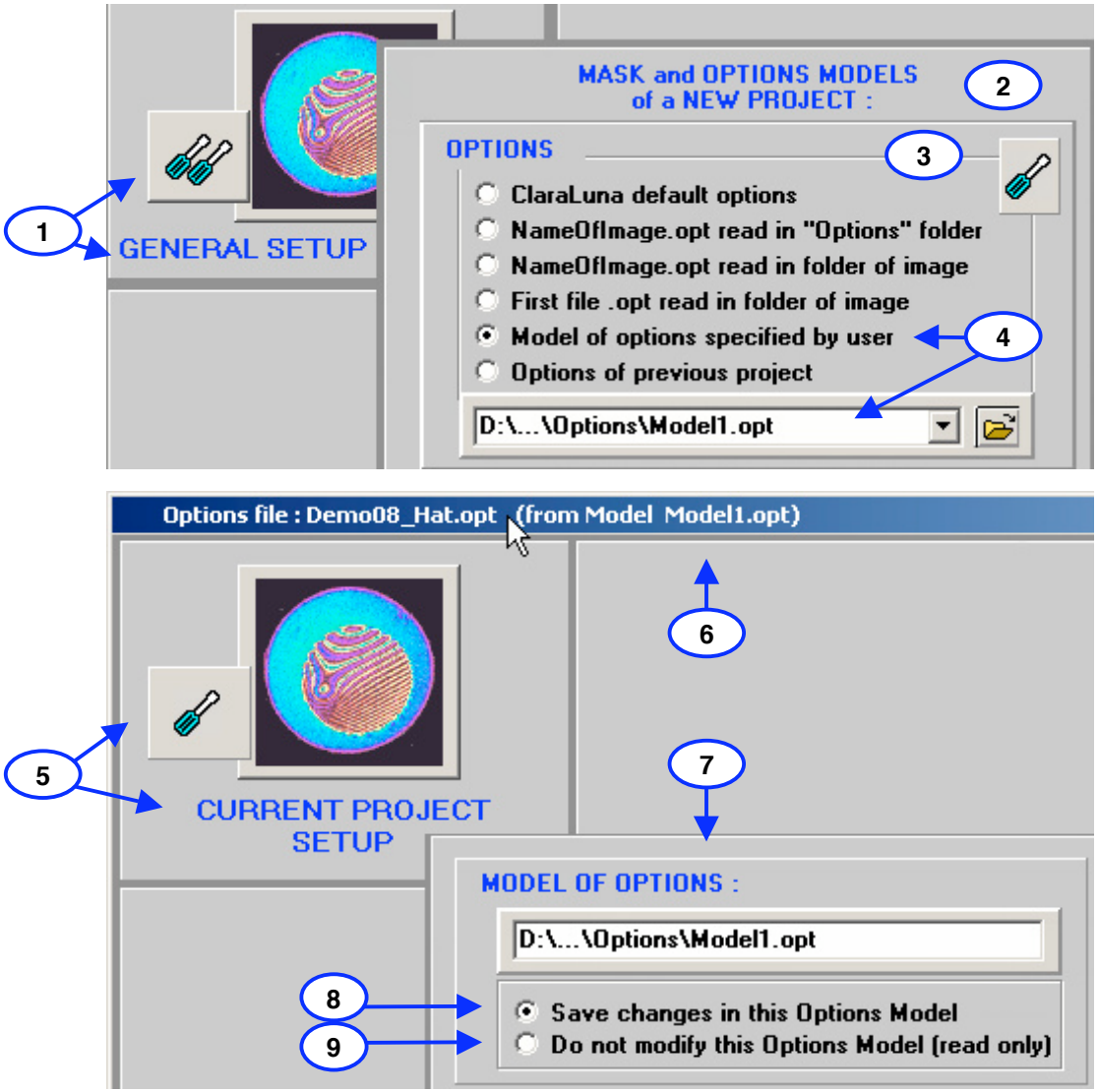
Note that the model can be the Options file itself if it already exists and provided that the user makes this choice.

1- 3 It is a matter of General Setup (1) to choose an Options Model on opening a new project (2), and has been described in Section 6.7 of this guide.

4 Consider the example of an user-defined model (4) :

5- 7 In the Project Options window (5), the chosen model appears in the title bar (6) and in the edit box "Model of Options" (7)

8- 9 This model can be write-enabled (click 8 : "Save changes in this Options Model") or read-only (click 9 : "Do not modify...").



9.3 Project Options - Memos - Reconstruction

(1-3) **Memos**

Enter : User's name (1), Part series (2), User-defined Comments (3)

Reconstruction:

(4) **Interferogram aspect** : Good (4.1) or Noisy, poor contrast (4.2). The second choice will trigger stronger image processings to compensate for the image noise, and force the use of bright fringes only (5.2)

Please note that poor quality interferograms result in low precision metrology ! The (4.2) option will neither turn a toad into a prince, nor a noisy image to a wavefront resolution of λ/100.

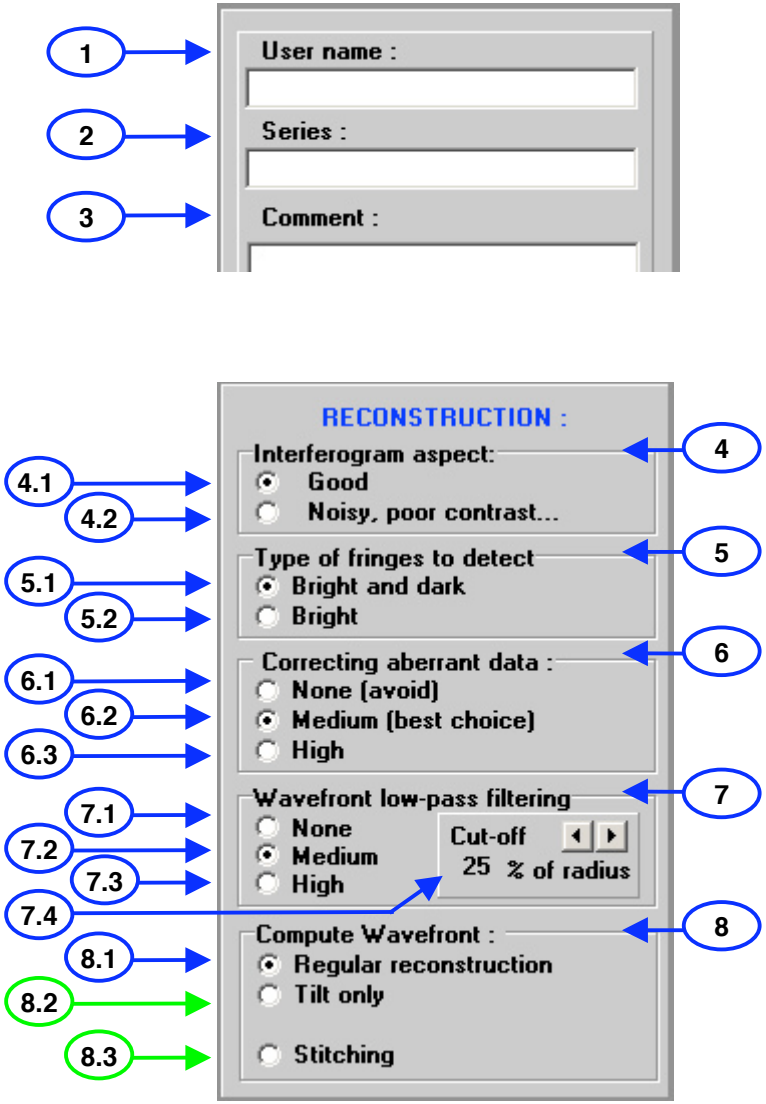
(5) **Type of fringes to detect** : Bright and dark (5.1) or Bright (5.2). Option (5.1) provides a double X,Y resolution, and should be chosen as long as the interferogram is neat. However, a single dark spot on a bright fringe connects two neighbour dark fringes : the reconstruction algorithm will produce a typically "folded" wavefront. In this case, change the (5) otion to (5.2) and recompute .

(6) **Correcting aberrant data** : ClaraLuna is fitted with a very powerful statistical algorithm for detecting and compensating for aberrant data, due to spots on the interferogram, or border effects in the fringes peaks and valleys. "Medium" (6.2) is the best choice. "High" (6.3) eliminates more suspicious data. "None" (6.1) desactivates this function: use (6.1) when a sharp feature on the surface is actual, and obviously not an artefact.

(7) **Wavefront low-pass filtering** : select in (7.4) a cut-off. Use with care. In doubt, use "Medium" = 25%.

(8) **Compute wavefront** :

- Regular reconstruction (8.1) is the normal way of using ClaraLuna. It provides the final Results window with the ISO/DIN specifications and results, and various graphs.
- Tilt only (8.2) should be used only for measuring angles on prisms.
- Stitching is a powerful function for treating interferograms with a huge number of fringes (several hundreds), leading to a high lateral (X,Y) resolution. The limit lies only in the camera resolution, since a minimum of 10 pixels per fringe is needed, i.e. from a bright fringe to the next bright fringe. These functions "Tilt only" and "Stitching" are available in the enhanced version of ClaraLuna only.



9.4 Project Options - Optical parameters

1 **Measurement wavelength :**

1.1 • Visible wavelength 632.8 nm

1.2 • Custom wavelength : enter the wavelength of the light source in nanometers.

2 **Result wavelength :**

2.1 • Lambda ISO-DIN : after computing, the Z scale of the wavefront deformation can be expressed in nanometers, or in "waves". A "wave" is the wavelength of any arbitrary light source, and can be chosen equal to, or different fron the actual light source of the interferometer. The ISO and DIN standards have chosen the green spectral line of mercury (546 nm).

2.2 • Custom wavelength: enter your choice, if different from 546 nm.

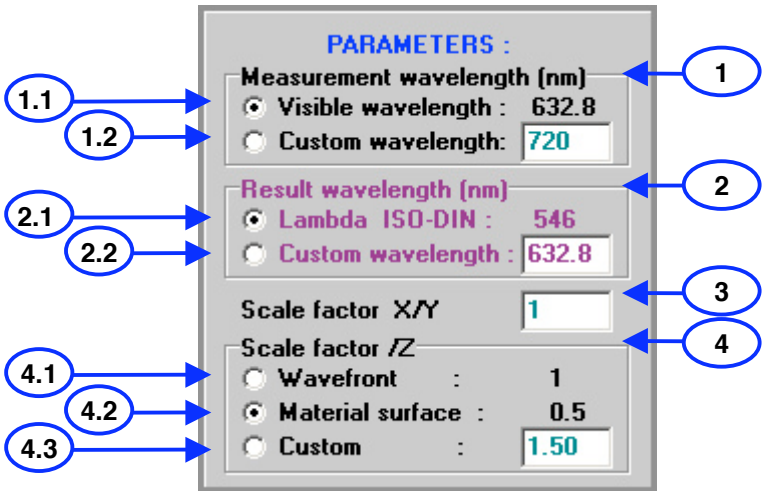
3 **Scale factor X/Y** : for (rare) cases in which the camera does not have square pixels.

4 **Scale factor /Z :**

4.1 • Wavefront : what is actually measured by interferometry is the deformation of the wavefront under test, with respect to a reference wavefront. If you want the actual wavefront deformation, enter "Wavefront" (Scale factor /Z = 1).

4.2 • Material surface : quite often, when polishing parts, the measured wavefront deformation is due to a reflexion on a material surface, and expresses twice the deformation of the material surface. In this case, check "0.5".

4.3 • Custom : in some cases, the measured wavefront comes from a more complex optical system. In this case, enter the coefficient by which the wavefront deformation has to be multiplied, to provide the suitable Z scale.



9.5 Project Options - ISO-DIN specifications

(1) **Syntax for ISO 10110 specifications : 3/A/(B/C) RMSx<D**

- "3" = code for Optical Form Tolerance'
- (1.1) "A" = Maximum permissible Sagitta error = Peak-to-Valley (PV) of Best Sphere
- (1.2) "B" = Maximum permissible PV of Irregularity
- (1.3) "C" = Maximum permissible PV of Rotationally Symmetric Irregularity
- (1.4) "D" : Maximum permissible value of RMS, in 3 cases : If "RMS x" is written
- RMS t : Complete wavefront
- RMS i : Irregularity
- RMS a : Asymmetry
- (1.0) "PV" = Maximum permissible Peak to Valley error of total Wavefront. The PV is not mentioned in the ISO syntax 3/A/(B/C) RMSx<D, but is defined in the ISO 10110.

(2) **Unit :**

Choose the unit for expressing the specifications. After entering values, clicking another unit will convert the values into the new unit.

- (2.1) Nanometers.
- (2.2) Results lambda, equal to the value entered in Section 9.4, (2). Changing the latter value will convert the specifications to the new unit.
- (2.3) ISO-DIN "fringe"=273 nm: the standard unit is a "fringe in the sense of ISO", equal to one half wavelength of the green spectral line of mercury (546 nm), i.e. 273 nm. This "one half" takes into account the usual metrology process involving a reflexion on a surface.

(3) **Syntax for DIN 3140 specifications: 3/m (Dm) F**

3/ is the code number for 'Optical components form tolerance'.

m = max (|m1| , |m2|) is the greatest number of fringes over a radius (tilt removed).

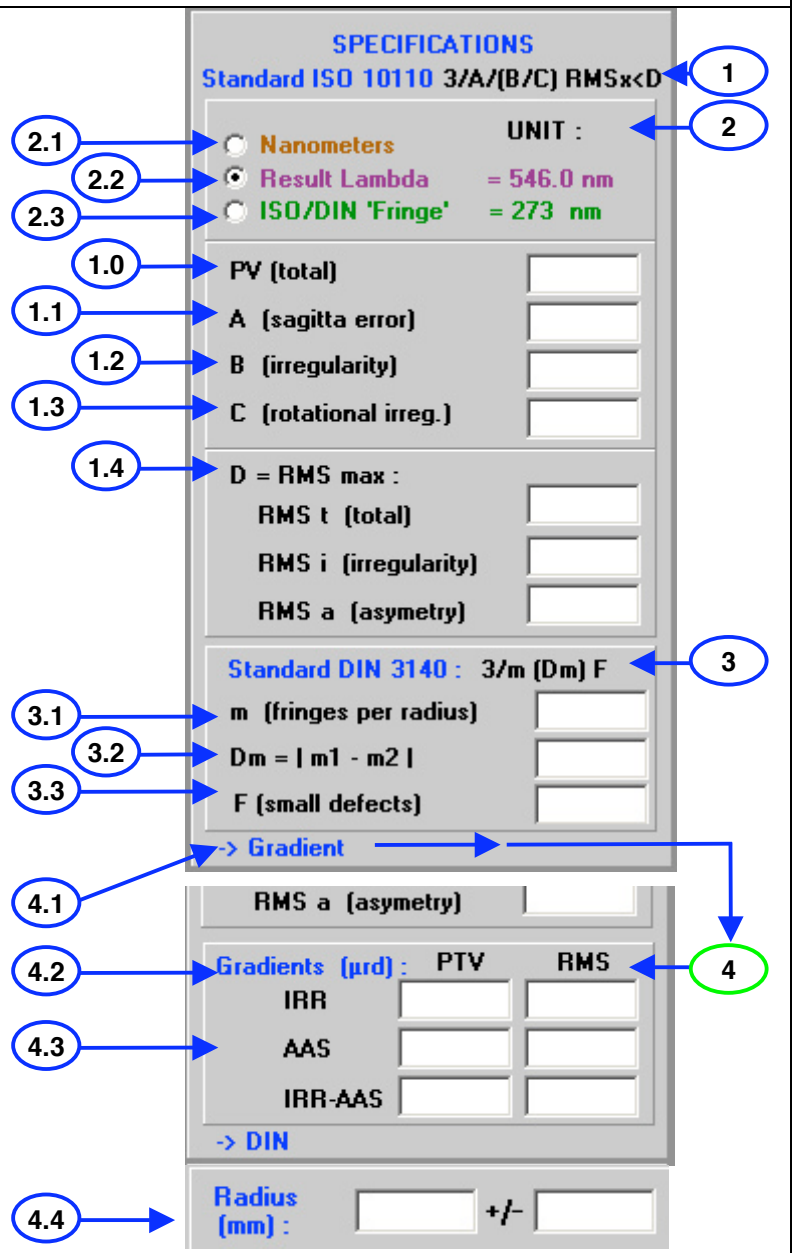
Dm = | m1 - m2 | expresses the large asymmetrical form errors.

F is the maximum permissible amplitude of small defects, i. e. local deviation of the fringe from a straight line.

Some specifications can be avoided : for instance 3/ 6 (-) -

(4) **Gradients / Radius of curvature**

Cilck (4.1) to show panel (4.2). Enter specifications for slopes (4.3)



9.6 Project Options - Saving Results - Saving / Loading Options

Save Results

(1) Select the outputs of the computation. These files will be created in the Project Results folder, created in the same folder than the interferogram.

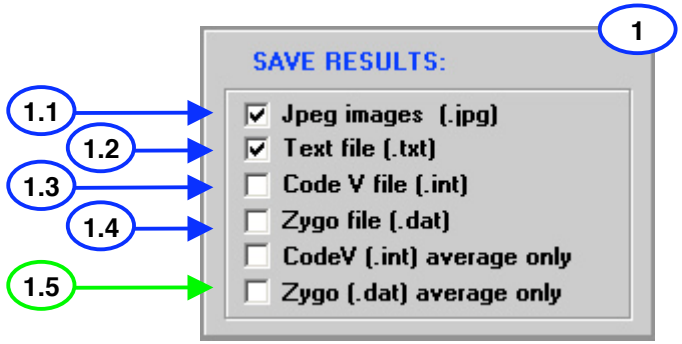
(1.1) • Jpeg images (.jpg) : screen dump of the ISO-DIN Results window

(1.2) • Text file (.txt) : contains a header with the basic parameters (input and output wavelengths, wavefront or surface, specifications vs results, Zernike coefficients)

(1.3) • Code V file (.int) : the reconstructed surface is mapped on an image with the same format as the original interferogram, written in native CodeV format. The significant parameters are saved in the file header, as well as the user's comments. Note that the text format is far from beeing compact : the files typically weigh 1 Mo, and take several seconds for saving to disk. Use with care, especially while automatically treating several images. Note that CodeV files can contain only one image, either fringes, or reconstructed surface.

(1.4) • Zygo format (.dat) is available as well for exporting reconstructed surfaces. Unlike CodeV format, Zygo .dat can hold one or more interferograms, and/or the reconstructed surface.

(1.5) • If the "Averaging" function is available (Enhanced version), the export can be limited to the average file. In this case, uncheck (1.3) or (1.4)



(2) ### Buttons Save/Load Options - Help - Cancel

(2.1) • Load Project settings : open an existing .opt file from a drive

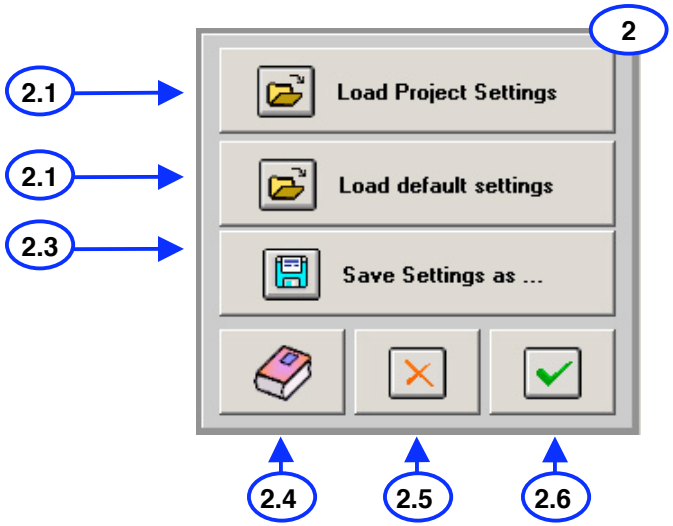
(2.2) • Load default settings : factory built-in default Options

(2.3) • Save settings as... : save the present Options to a .opt file

(2.4) • Help : opens the interactive popup help windows

(2.5) • Cancel : discards all changes you made since you opened the Options window

(2.6) • Accept : saves the Options shown on this window to the Project Options file whose name is visible in the window title bar. If the Options Model is write-enabled, the changes will be also saved into this Model.



9.7 Project Options - Viewing Results

1 Show Wavefront :

- Show Wavefront : Whole Including Tilt (1.1), Tilt Subtracted (1.2), Irregularity=Tilt And Focus Removed (1.3), Aspherical Best Fit (1.4), Asymmetry (1.5).
- The Selected Iso Component Of The Wavefront Will Be Shown In A Zoom Image, On The Results Window. It Is Easy To Swap To Another Component, But The New Choice Will Not Be Saved. The Next Project Launched With The Same Options Will First Show The Component Selected In (1.1) To (1.5)

2 Simulated Fringes

- "Show" (2.1) will show the reconstructed wavefront as if observed in an interferometer, with "simulated" or "synthetic" fringes. The simulated light source has wavelength equal to a fraction of the Result wavelength (2.2).
- Check "Default amplitude" to let the software choose, or :
- Uncheck "Default amplitude" and tune your custom amplitude by (2.3)

3 3d Graph

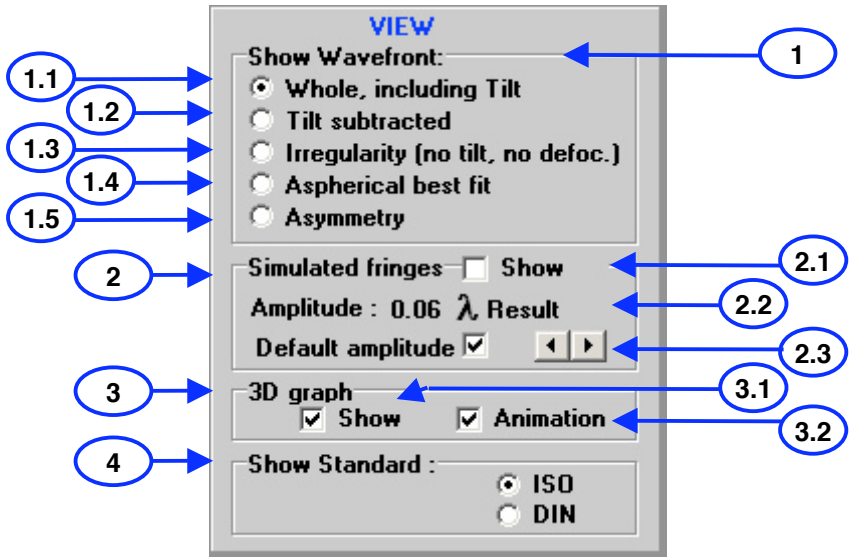
"Show" (3.1) will replace the Simulated Fringes by a 3d graph of the wavefront component visible in the zoom panel, chosen by (1) or modified by user action in the Results window.

"Animation" (3.2) continuously rotates the 3d graph. You can cancel this rotation in the Results window, and/or rotate the wavefront graph with the mouse.

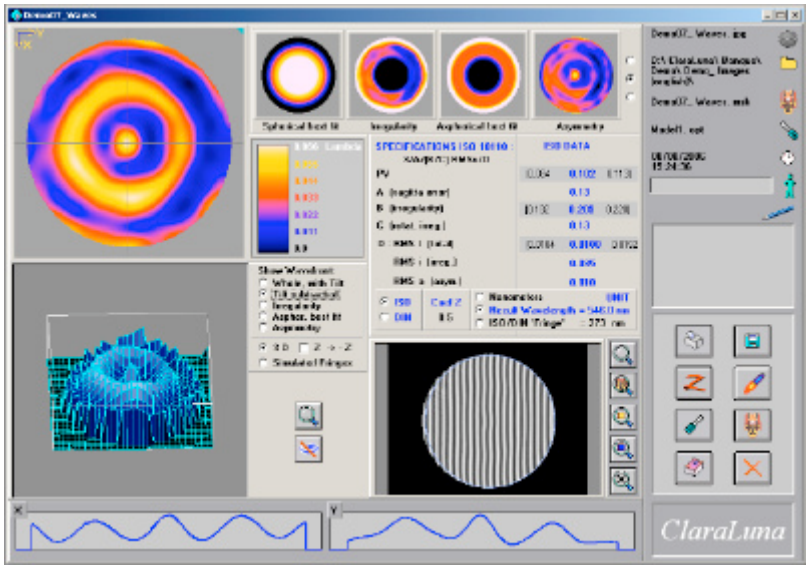
"Animation" is a greedy CPU consuming process. Avoid choosing it when computing several Projects in a row, and leaving their Results windows on the screen.

4 Show Standard

Select ISO or DIN. In the Results window, you may still change your mind and show the other standard.



10 THE ISO-DIN RESULTS WINDOW

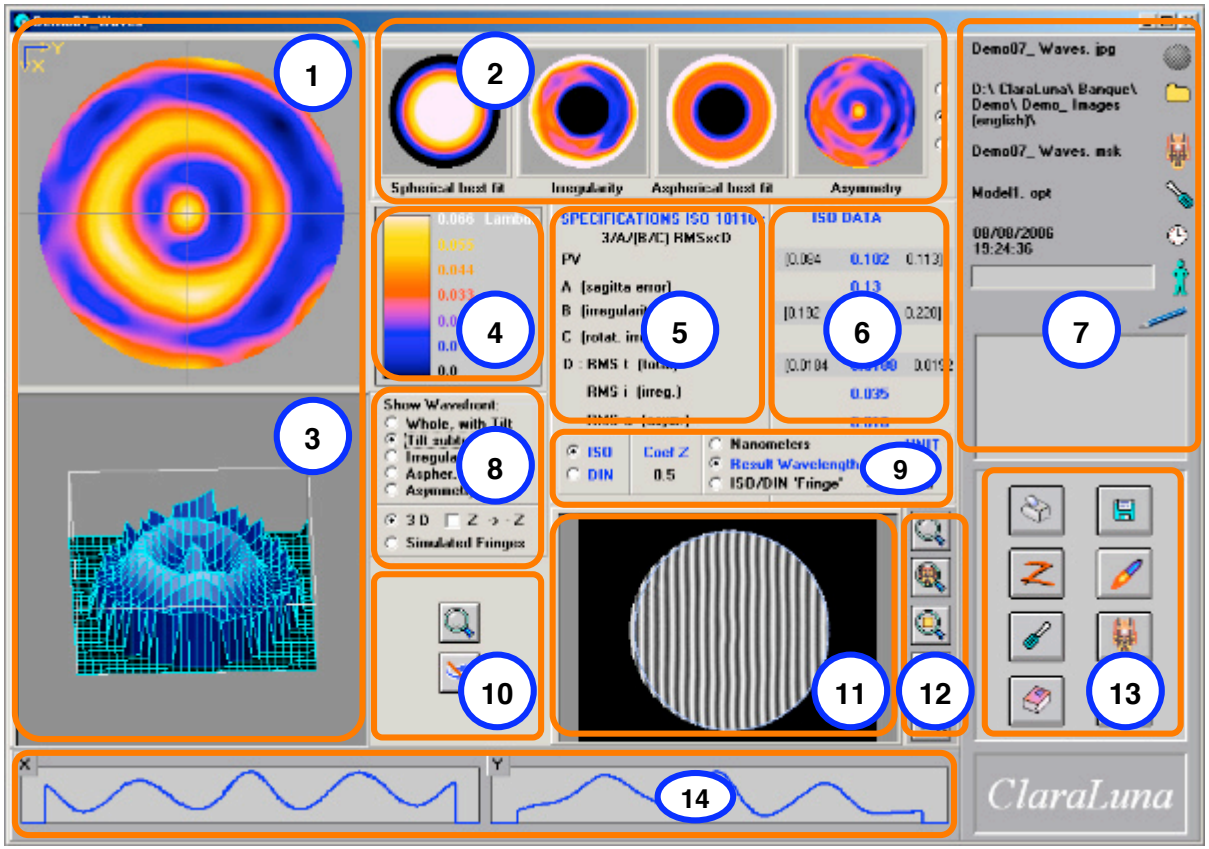


In this chapter :

- **Analyse the ISO-DIN results vs the specifications**
- **View various graphic displays for the ISO wavefront components**
- **Save screendumps and comments**
- **Modify Options and Mask**
- **Access Zernike and Slope analyses**

10.1 The ISO-DIN results window - Overview

1. 2D graph of the wavefront ISO components chosen in check box (8)
2. Thumbnails of ISO components
3. 3D graph (or synthetic fringes) of the wavefront ISO components chosen in checkbox (8)
4. Scale for graph (1)
5. ISO/din specifications
6. ISO/DIN results
7. Informations on the project
8. Checkbox for selecting the wavefront ISO component shown on graphs (1) and (4)
9. ISO/DIN selection. Unit selection for specifications and results
10. Controls for 3D or synthetic fringes graphs
11. Interferogram with its Mask
12. Various zoomings in interferogram
13. Window control buttons
14. Wavefront cross sections



10.2 The ISO-DIN results window - 2D - 3D graphs

1 Show wavefront

Select the ISO component to show on graphs (2) and (4)

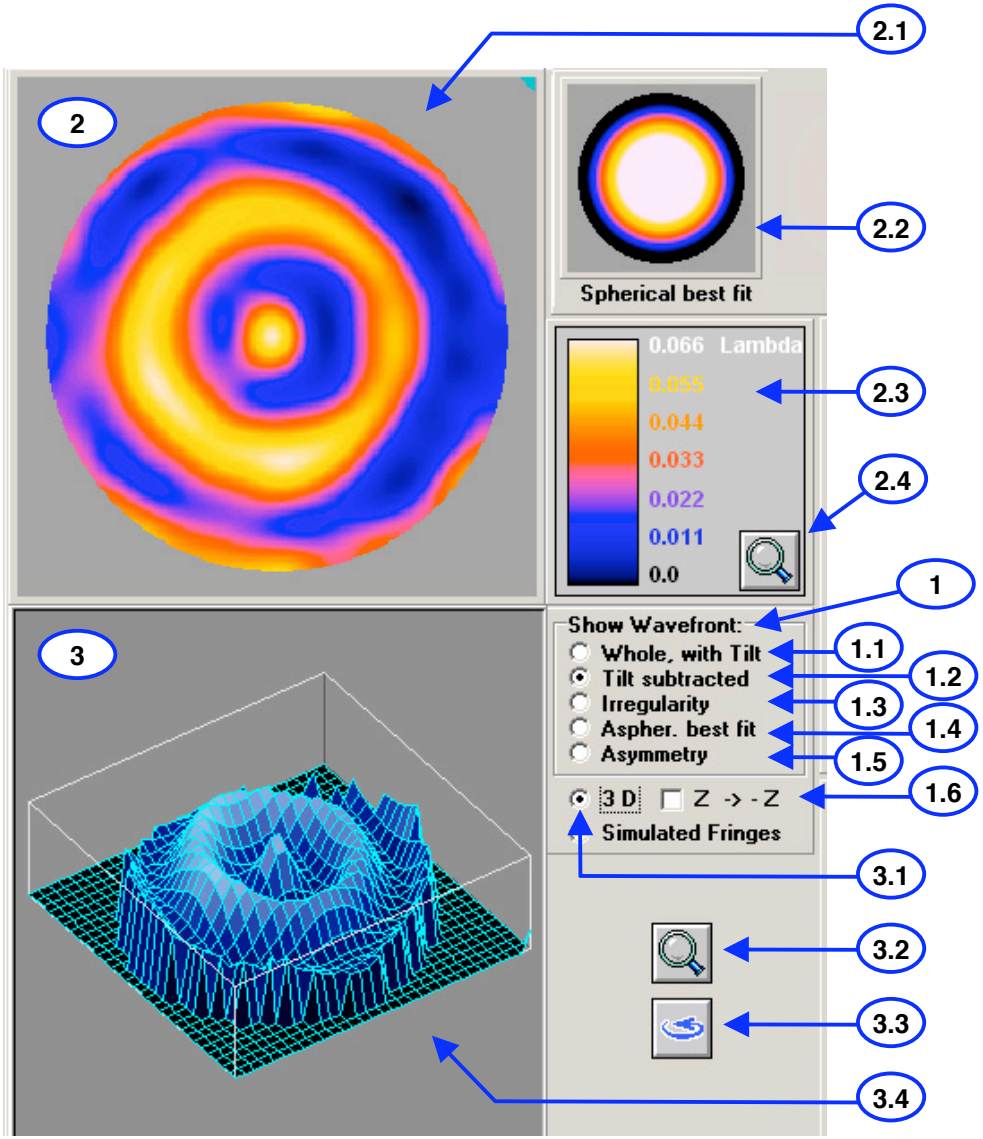
- 1.1 • Whole, with tilt = the actual wavefront as seen by the interferogram
- 1.2 • Tilt subtracted = the wavefront actual shape, independent from its position
- 1.3 • Irregularity = the component actual aberration, independent from tilt and focus (IRR)
- 1.4 • Aspherical symmetrical best fit = the rotationally symmetrical component of the irregularity (AAS)
- 1.5 • Asymmetry = the non rotationally symmetrical component of the irregularity (IRR-AAS)
- 1.6 • Z → -Z : Reverses Z axis for all graphs

2 2D graph

- 2.1 • 2D graph of the wavefront component selected in (1)
- 2.2 • Thumbnails for some of the ISO components
- 2.3 • Z scale for 2D graph. For selecting unit, see section 10.5
- 2.4 • Zoom 2D for wavefront selected in (1) and shown on (2)

3 3D graph

- 3.1 • Check (3.1) to show 3D
- 3.2 • Zoom 3D
- 3.3 • Enables/disables animation (rotation/vertical axis)
- 3.4 • 3D graph of the wavefront component selected in (1)



10.3 The ISO-DIN results window - Cross sections

1 Cross sections

1.1 Walk the mouse over the 2D top left graph : A reticle cursor is made of two axes X (1.1) and Y (1.2).

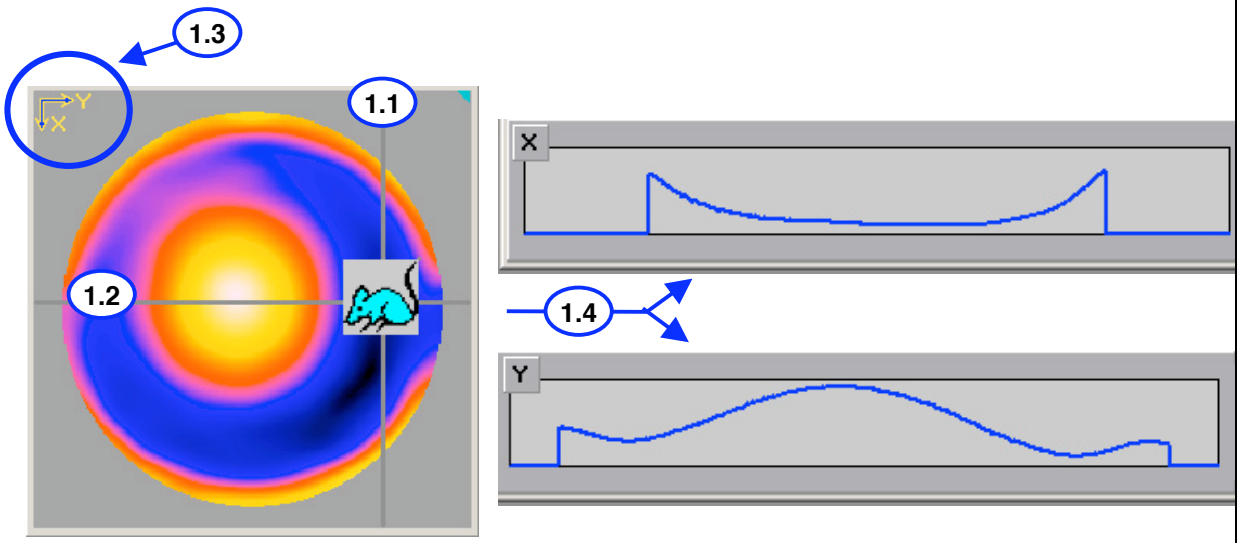
1.2

1.3 At the bottom of the window, the X and Y cross sections of the wavefront (or its ISO component shown on the graph) are visible. These sections vary while moving the reticle with the mouse.

1.4 The axes are defined at the upper left corner of the graph (1.3)

Click on a given point without moving the mouse, in order to freeze the reticle and free the mouse cursor, for saving the window or other purpose.

Come back on the graph and click again without moving the mouse for catching the reticle.

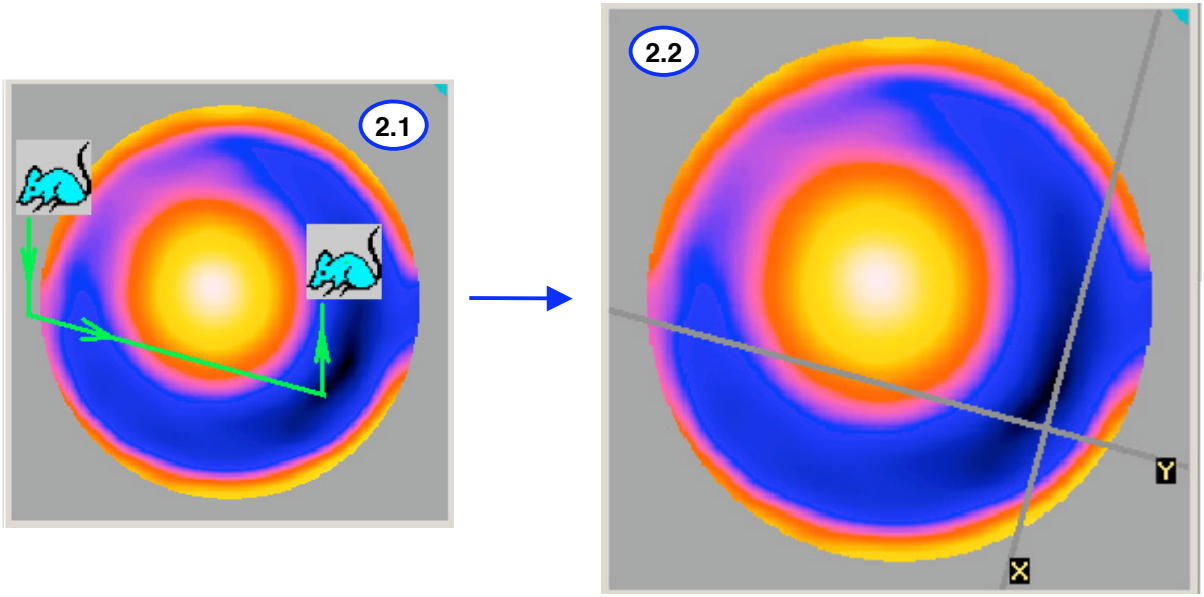


2 Rotating the reticle

2.1 Click on a point, keep mouse button down and drag along a given line, then let mouse button up.

2.2 The Y axis will be defined parallel to the line you just drew.

Press Shift key while drawing direction (2.1) to force an horizontal or vertical line, and come back to upright axes (1.3)



10.4 The ISO-DIN results window - Simulated (synthetic) fringes

(1) **The Simulated (or "synthetic") fringes** is a way of plotting a wavefront as if it was seen through an interferometer with wavelength Lambda (λ).

(2) **To show the Simulated fringes**, click (2)

(3) **Adjust λ** (from a bright fringe to the next bright fringe) with (3)

(4) **For adding a Simulated tilt**, click (4) to show arrows (5).

(5) **Adjust Simulated tilt** with arrows (5)

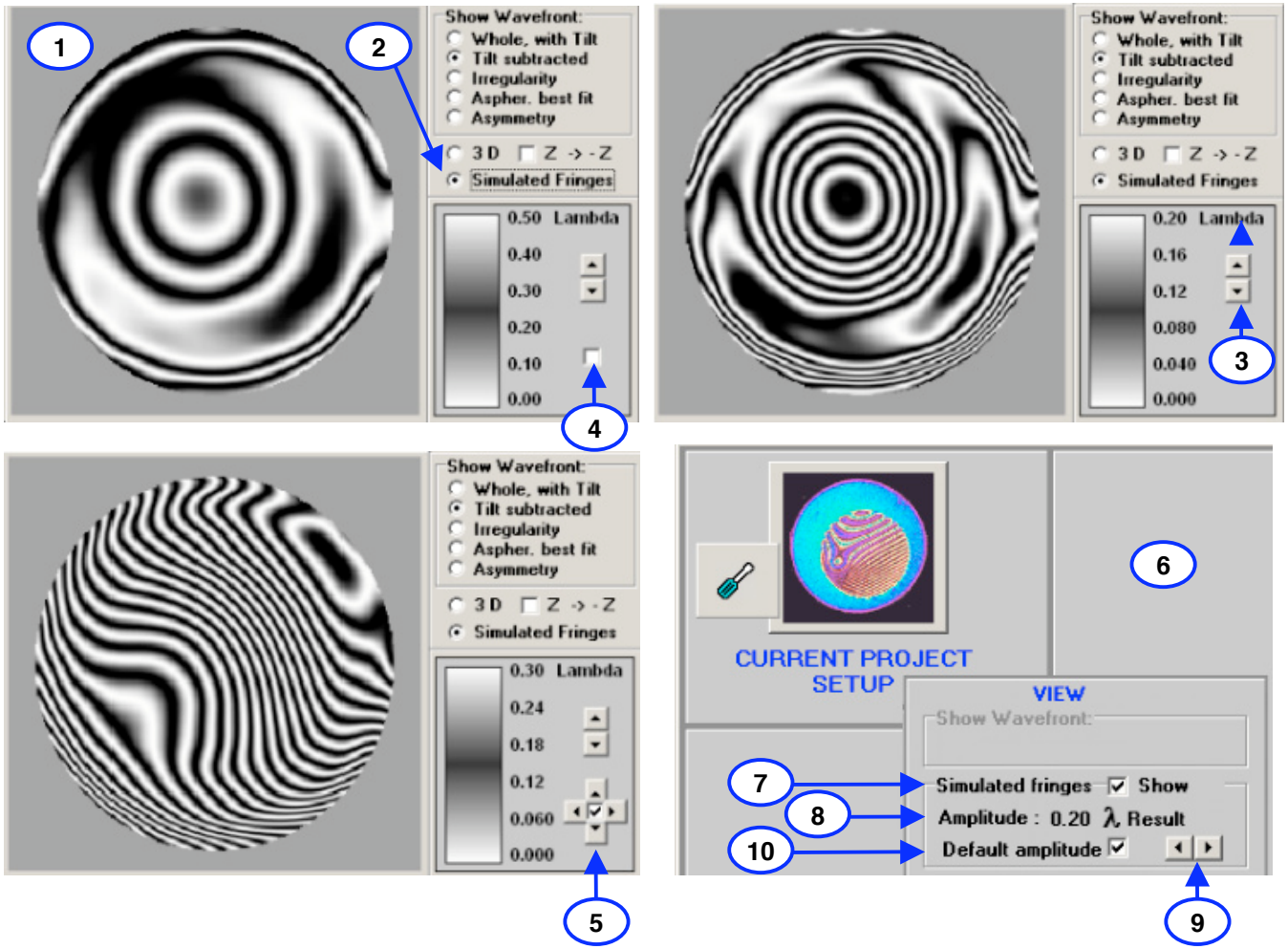
(6) **Preset the Simulated fringes options** in the Project Options window (and preferably in the Options Model) :

(7) • Show / hide Simulated fringes

(8) • Amplitude = Simulated λ, as a fraction of Result λ. (typically 546 or 273 nm for ISO).

(9) • Adjust with arrows (9)

(10) • Select Default amplitude = automatic Lambda, for a better looking number of fringes.

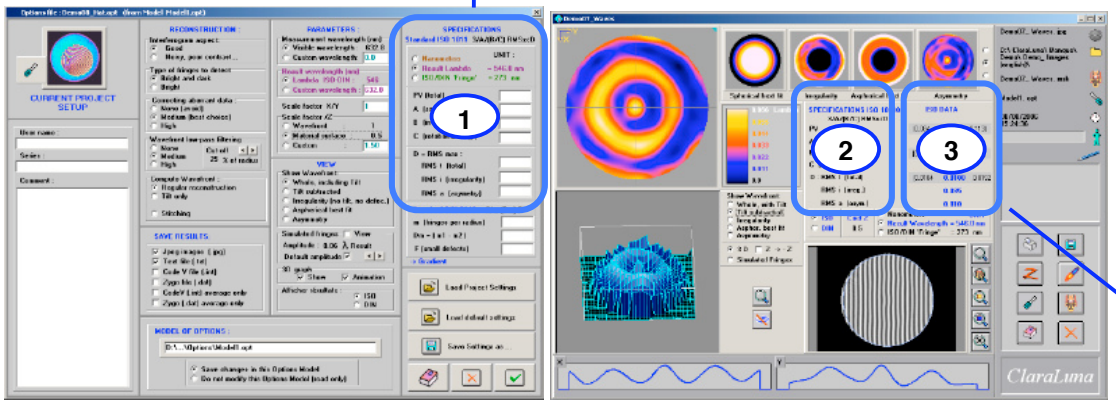


10.5 The ISO-DIN results window - ISO specifications and results

1- 2 **The ISO specifications** written in the Project Options window (1) are recalled in the Results window (2)

3 **The results** (3) are written against the specifications (2)

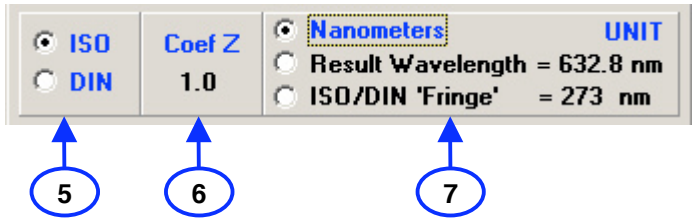
4 **For each result**, the related specification is in green if it is within tolerance, in red if not.

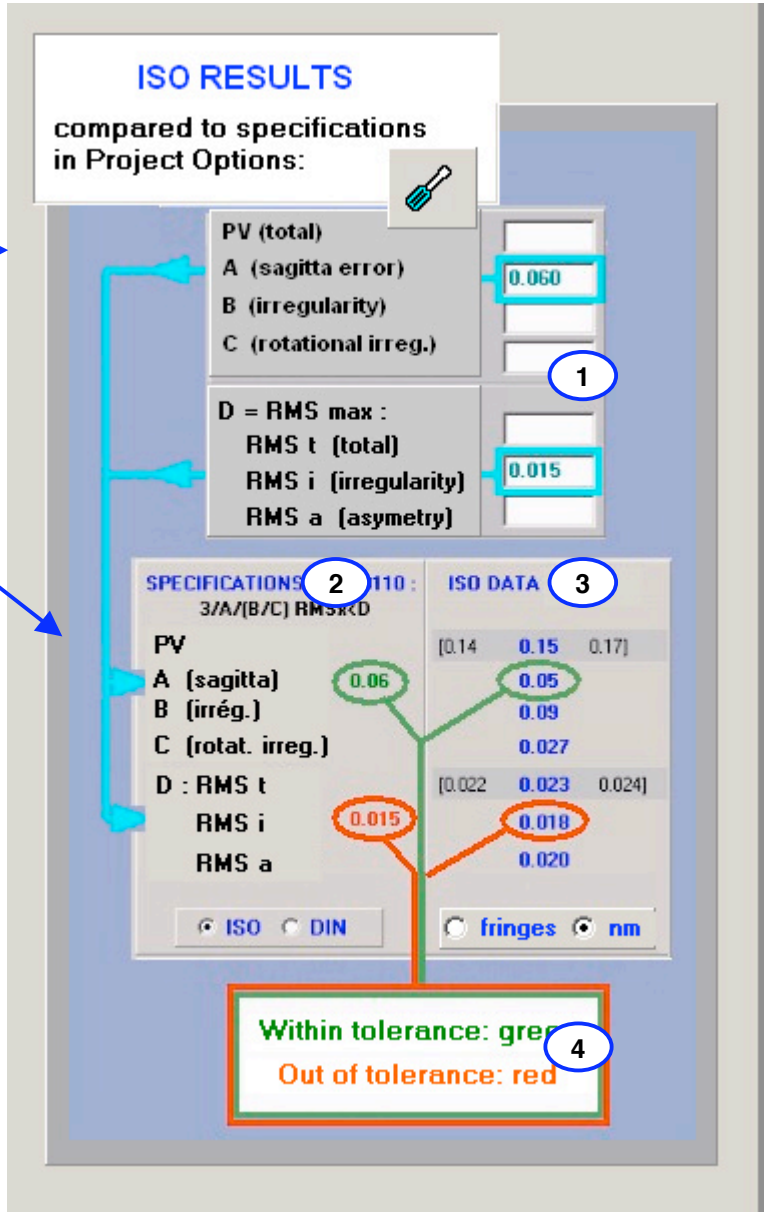


5 **For showing the ISO** panel, click (5)

6 **The "Coef Z"** recalls the choice "Scale Factor /Z" in the Project Options. See Section 9.4

7 **The unit first used** for the ISO data has been previously selected in the Project Options. See Section 9.5 (2). However you can swap from a unit to another.





10.6 The ISO-DIN results window - Advanced ISO results with confidence intervals

PV, IRR and RMSt have confidence intervals : [41 43 53] = [lower bound, expectation = most probable value, upper bound]

(1) **Spec < Expectation** : the part is considered out of tolerance with high probability

→ spec = red

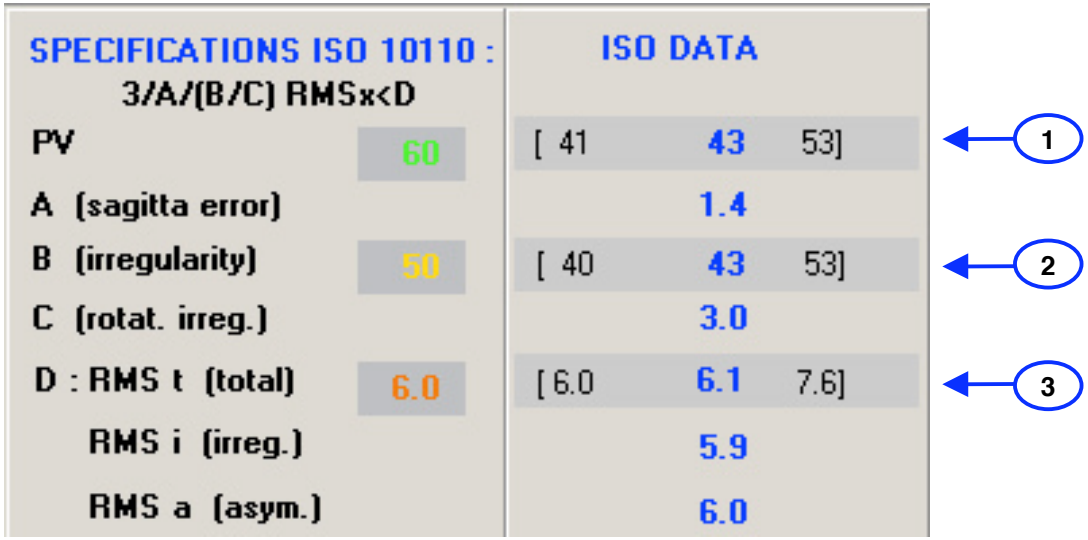
(2) **Expectation < Spec < Upper bound** : the part is considered acceptable, with a risk to be rejected by the reception controller, in particular if this person is very suspicious, and/or if the measurement conditions raise high uncertainty

→ spec = orange

(3) **Spec > Upper bound** : the part is considered as within tolerance with high probability

→ spec = green

The level of confidence in the results can be adjusted by the software administrator for making the colors (red-orange-red) more specification-sensitive : see Section Administrator Setup.



10.7 The ISO-DIN results window - DIN specifications and results

To show the DIN panel :

1
2

- click (1) in the Project Options window,
- or click (2) in the ISO/DIN Results window

3
4

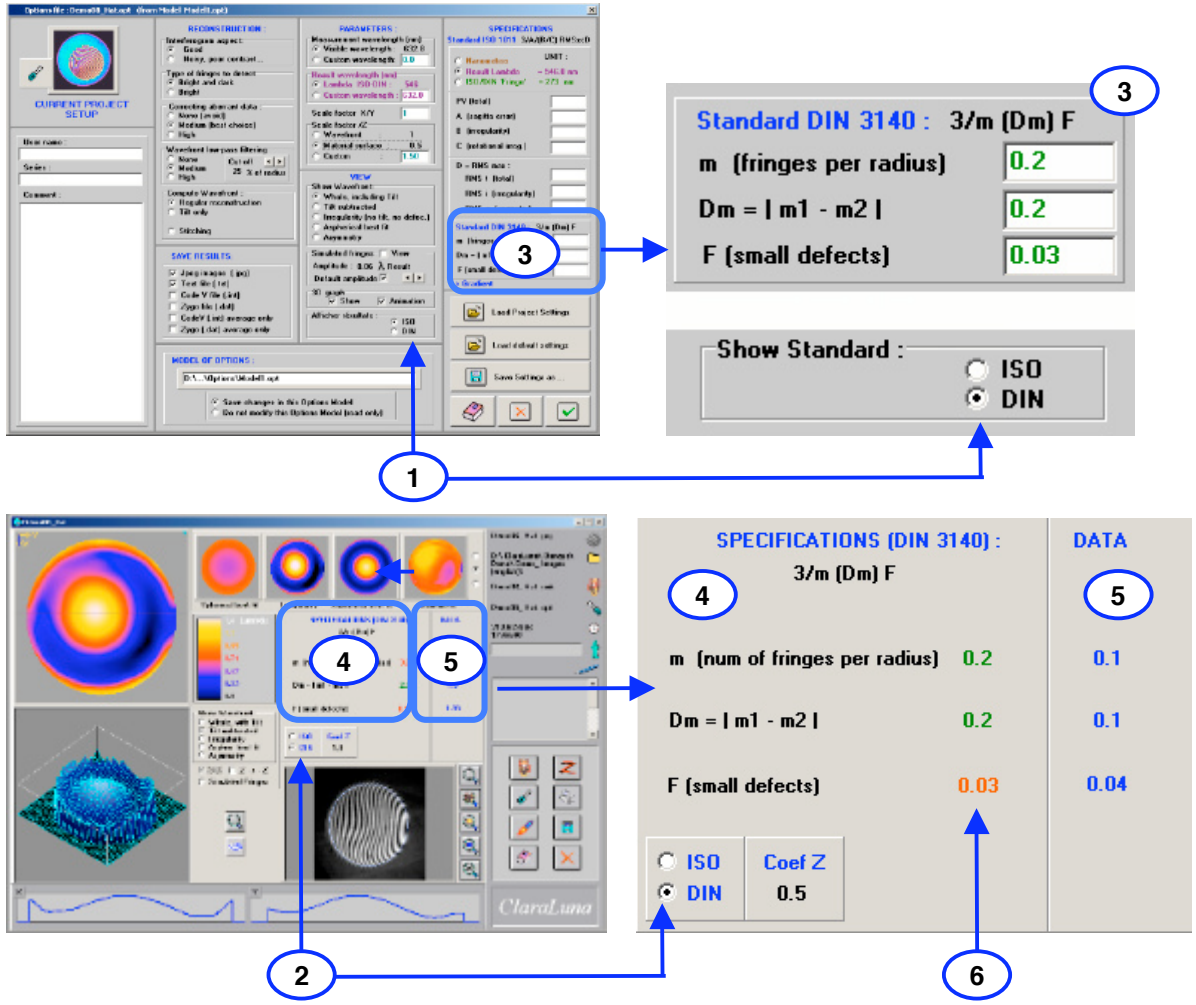
The DIN specifications written in the Project Options window (3) are recalled in the Results window (4)

5

The results (5) are written against the specifications (4)

6

For each result, the related specification is in green if it is larger than the data, in red if not.

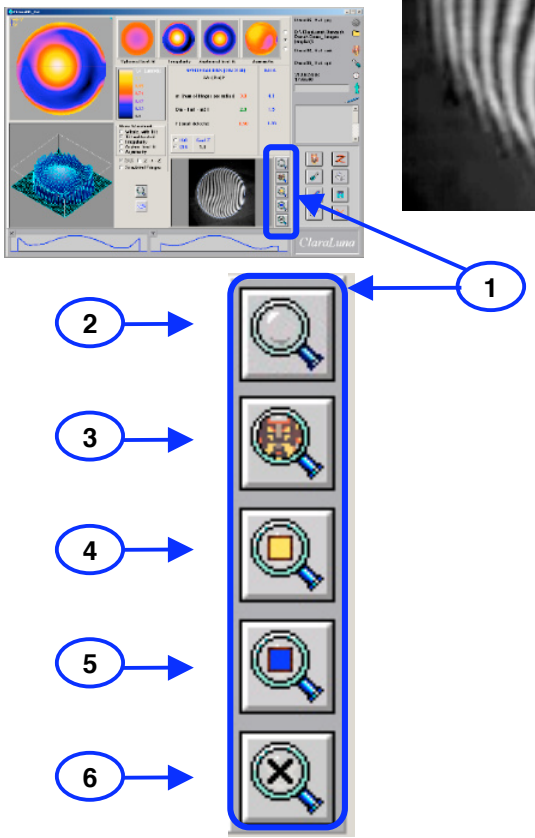


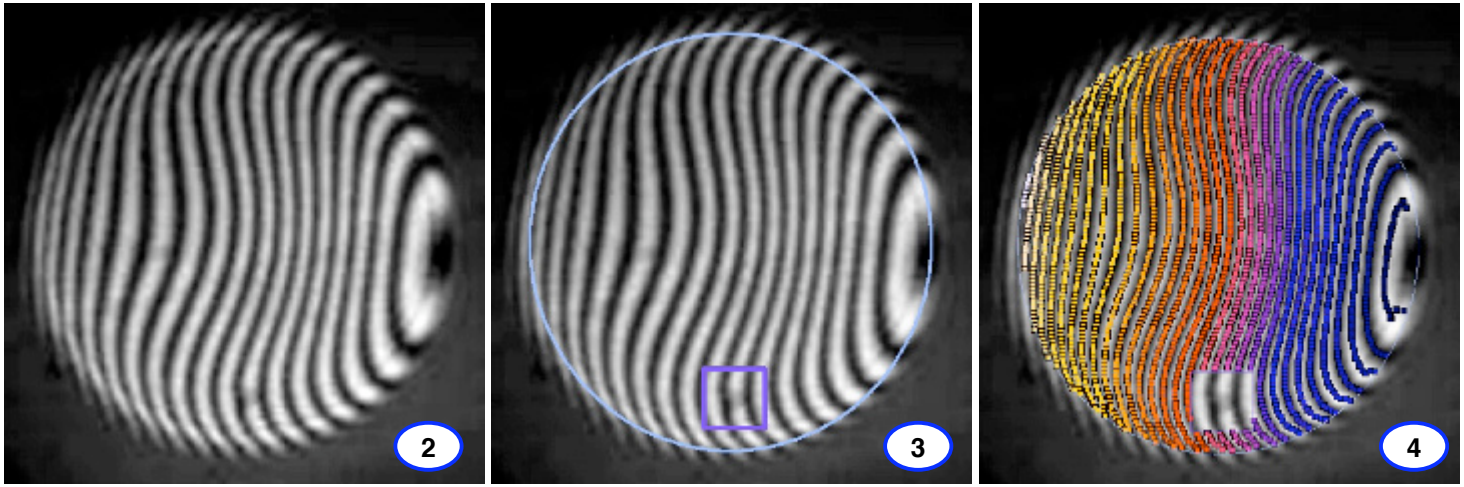
10.8 The ISO-DIN results window - Zooming

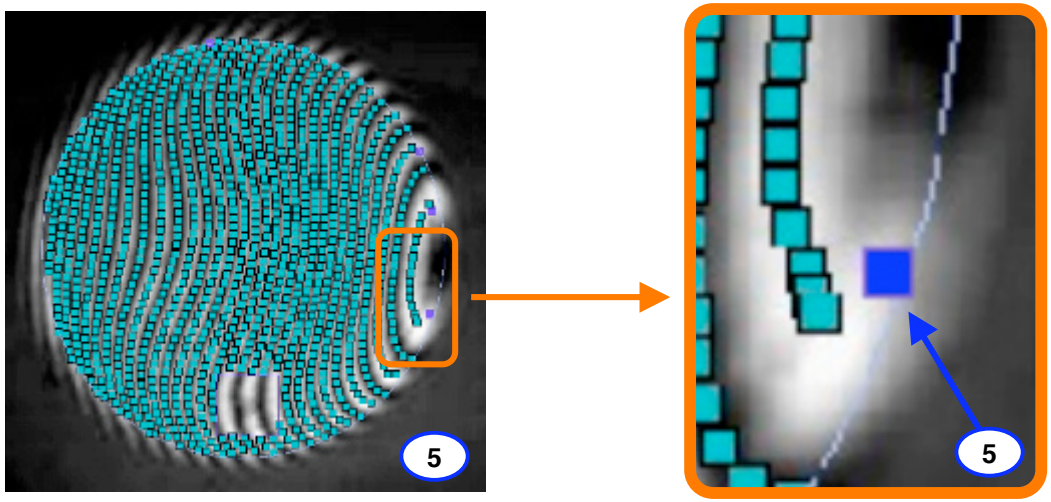
1
2
3
4
5
6

Zoom buttons

- Interferogram
- Interferogram with mask
- Fringe data with Z color scale
- Fringe data with corrected aberrant data (dark blue)
- Closes zoom window







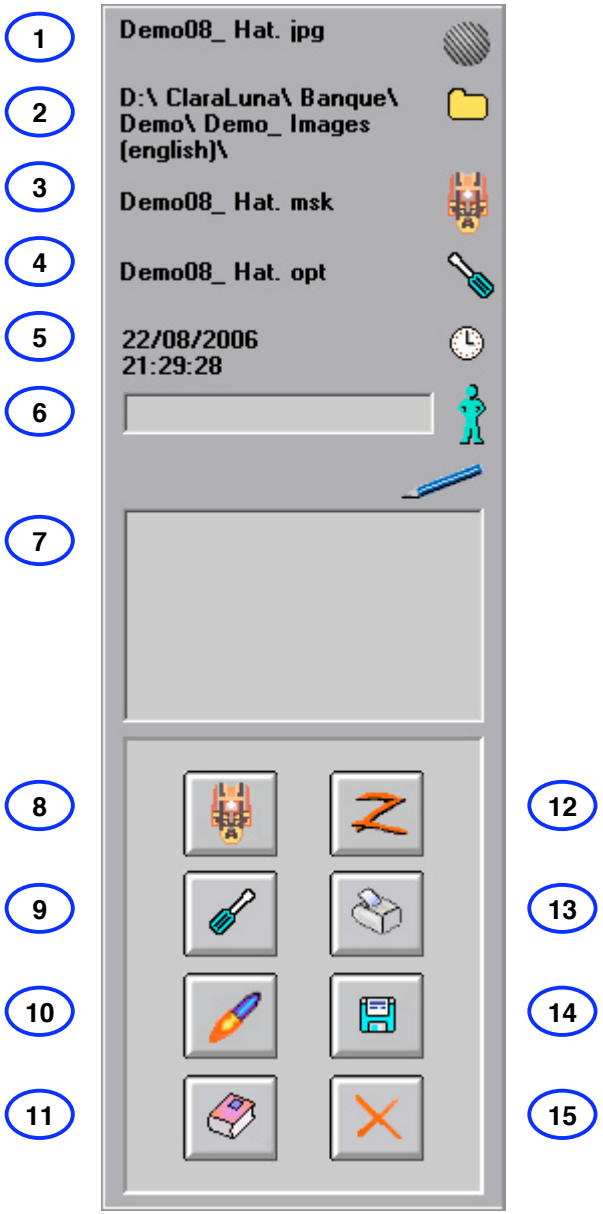
10.9 The ISO-DIN results window - Informations and Control buttons

Informations about the Project

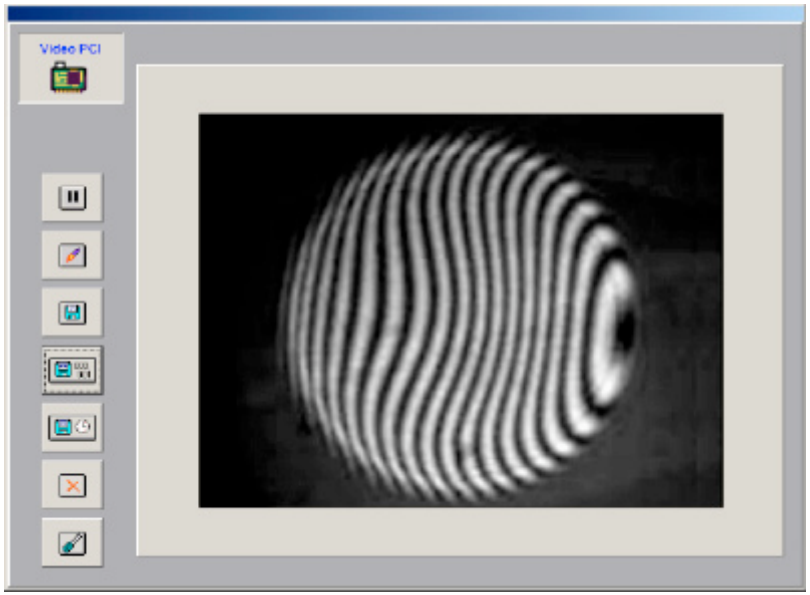
1. Name.Extension of interferogram
2. Folder of interferogram
3. Name of Mask file
4. Name of Options file
5. Date & Time
6. Name of User
7. User's comments (= copy of Comments in the Project Options, which can be modified here and saved to the Result file)

Control buttons

8. **Mask editor** : opens the Mask editor for checking and/or modifying the Mask file (3)
9. **Options editor** : opens the Options window for checking and/or modifying the Options file (4).
10. **Recompute** : clicking (10) will launch the computation anew using the Mask and Options files (3) and (4). If you have modified any of these files, the modifications will be taken into account. The same effect is obtained on the active Project ISO/DIN Results window, by clicking the identical icon on the toolbar at the bottom of ClaraLuna's main window.
11. **Help** : opens popup windows. Slowly walk the mouse on the area to comment
12. **Zernike** : Opens the Zernike analysis window as well as utility for exporting ISO components or any combination of the wavefront Zernike polynomials, to .INT or .DAT files.
13. **Print** : send the ISO-DIN results window to a printer (paper copy or print to a file, typically PDF)
14. **Save** : saves a JPG image of the window to the Project Results folder.
15. **Close** : Closes the window and saves the results to the Project Results folder, together with .INT or .DAT files of the complete wavefront (tilts removed), provided that you checked these options in the Project Options. Caution: saving to INT or DAT can be time consuming, up to several seconds per file. Use with care when treating a large number of files.



11 VIDEO FRAME GRABBING



In this chapter :

- **Acquire interferograms from a video camera**
- **Adjust the video signal**
- **Save and/or compute interferograms**

11.1 Video frame grabbing - Entering the Video window

1 **In ClaraLuna main window,** select menu File/ Acquire Video Image

or :

2 **Type keyboard shortcut** F11

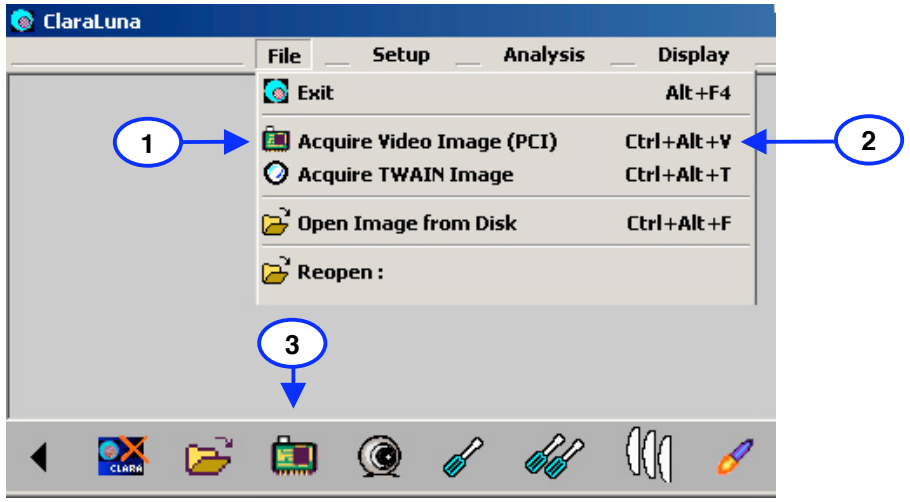
or :

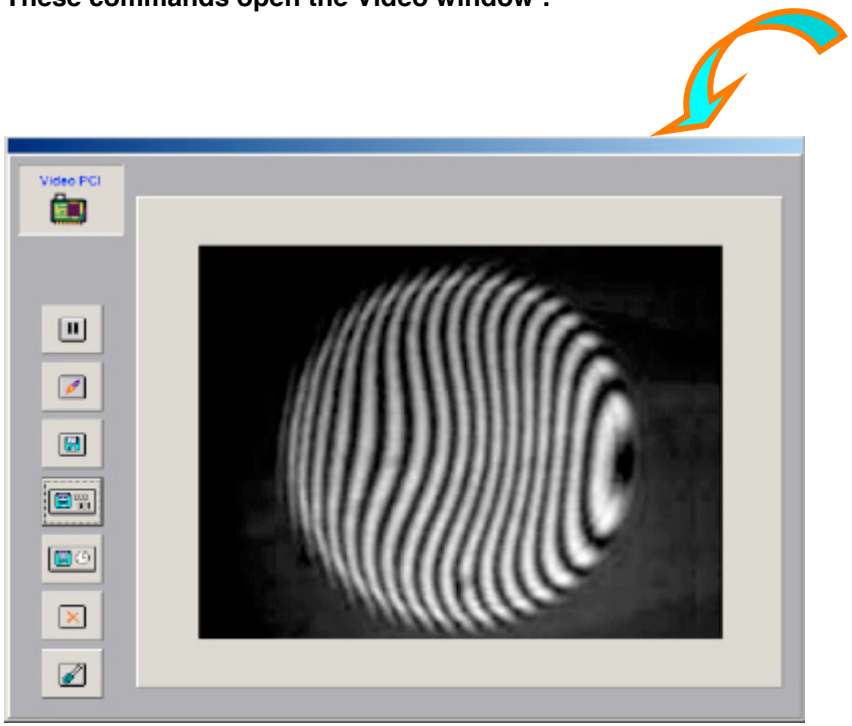
3 **In ClaraLuna main window,** click button (3) on toolbar -

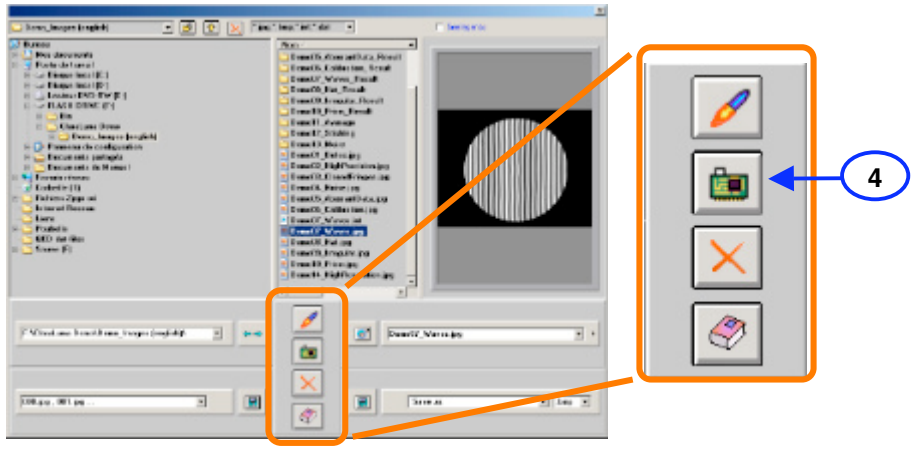
or :

4 **In ClaraLuna File Explorer,** click button (4)

These commands open the Video window :

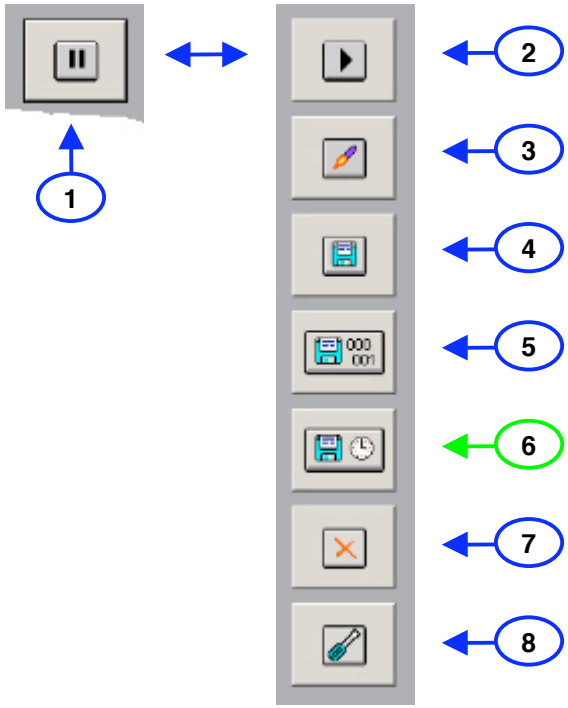






11.2 Video frame grabbing - Control buttons

1. Freeze video
2. Animate video
3. Compute video
4. Save video
5. Save video with automatic numbering
6. Save video sequence with programmed schedule (ClaraLuna enhanced version only)
7. Close window
8. Video setup

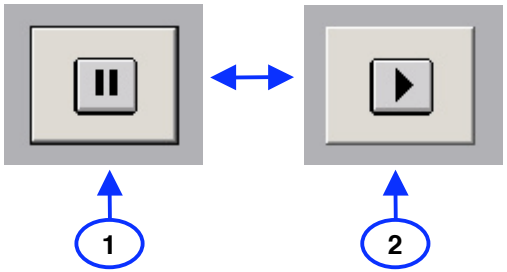


11.3 Video frame grabbing - Freeze / Animate video

The video can be "live", ie showing a real time moving image. In this case, button (1) is visible, (2) is hidden.
Or it can be "frozen", as a snapshot. In this case, button (2) is visible, (1) is hidden.

Clicking (1) freezes the image, hides button (1) and shows button (2).
Clicking (2) animates the image, shows button (1) and hides button (2).

Both the frozen image and the live image can be saved and/or computed



11.4 Video frame grabbing - Computing the displayed image

1 **Clicking button "Launch video" (1)** will :

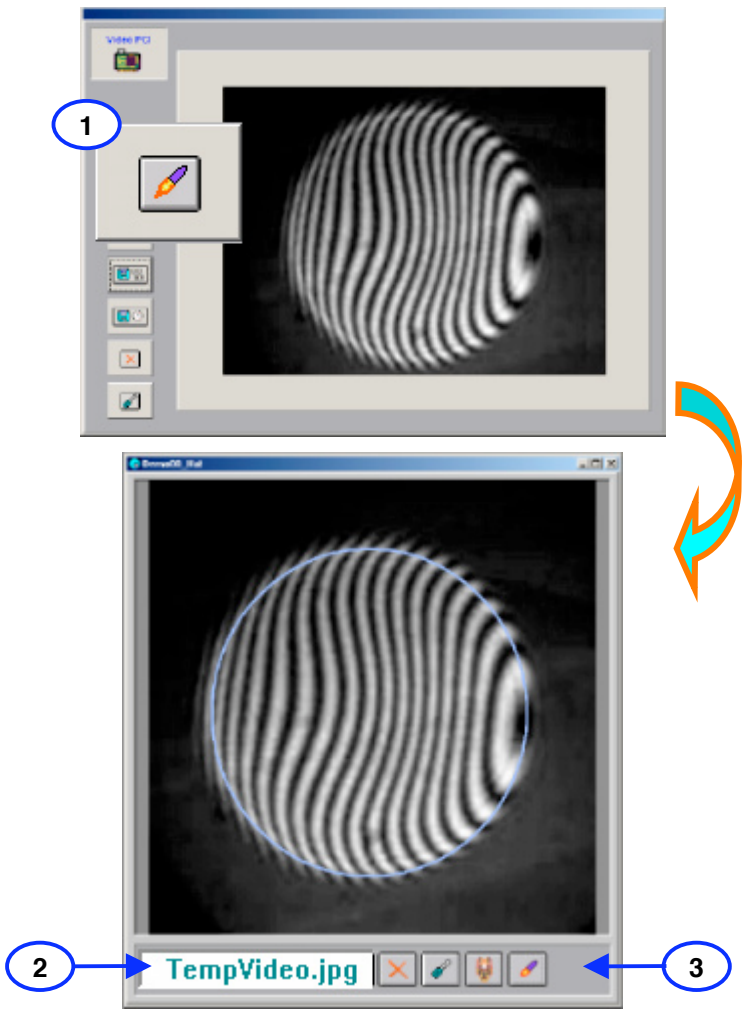
2
- save the displayed image as "TempVideo.jpg" located in the current folder (ie the folder preset in the General Setup for opening ClaraLuna File Explorer and opening a new Project (see Section 6.6)
- close the Video window

3
- launch computation for TempVideo.jpg with the Models of Options and Mask preset in the General Setup (see Section6.5)

For getting back to the Video window, you need to reopen it (see Section 11.1).

Saving after computing :

- Note that the next click on button (1) in the Video window will create another TempVideo.jpg replacing the previous one. For saving TempVideo.jpg, call ClaraLuna File Explorer and save this file to another name.
- Therefore, this command (1) is more suitable for a "Computing without saving" use.
- For a regular use, use the "Saving before computing" function (see next section).



11.5 Video frame grabbing - Saving and processing the displayed image

1 **Clicking button "Save video" (1)** will :

2
- save the displayed image as "TempVideo.jpg" located in the current folder (ie the folder preset in the General Setup for opening ClaraLuna File Explorer and opening a new Project (see Section 6.6)
- close the Video window

3
- open TempVideo.jpg in ClaraLuna File Explorer

From the File Explorer, you are free to :

4
- launch computation for TempVideo

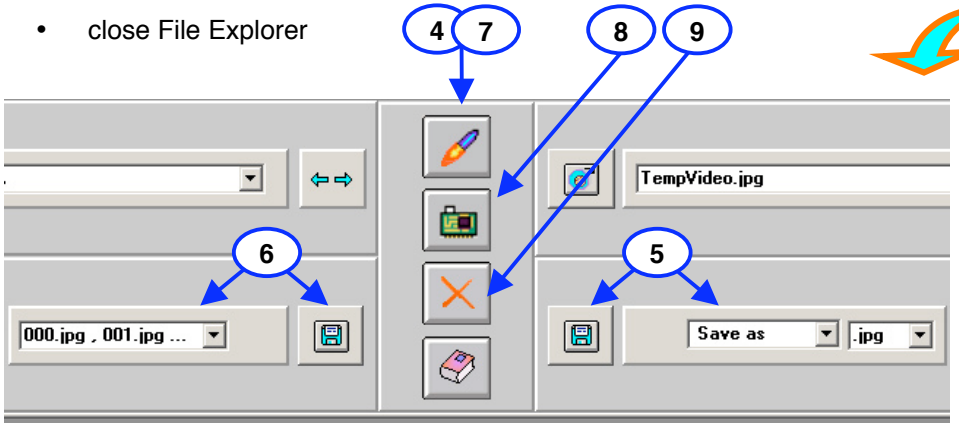
5
- save TempVideo as some other name

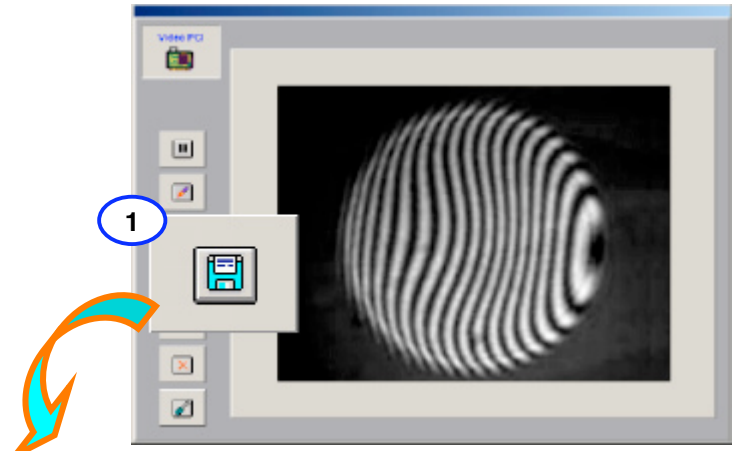
6
- save TempVideo with automatic naming/numbering

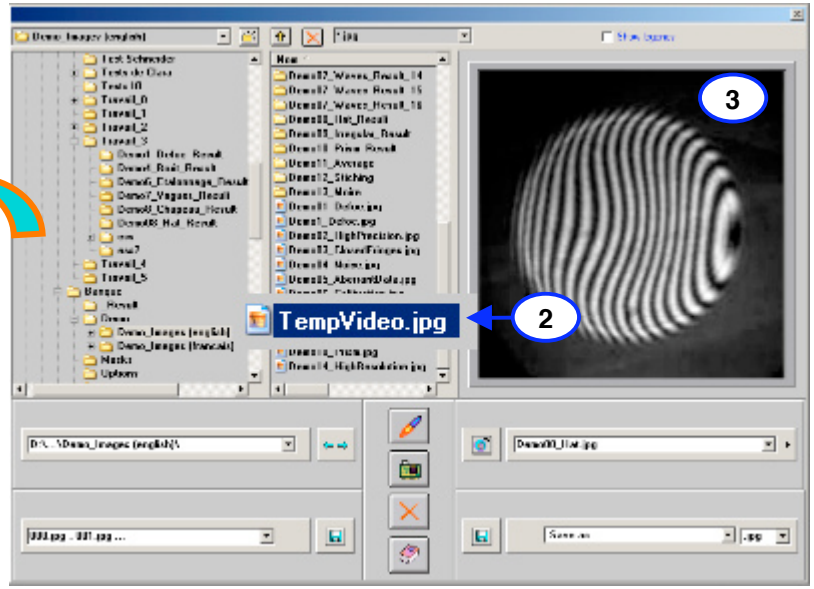
7
- compute "other name"

8
- close File Explorer and get back to Video window

9
- close File Explorer







11.6 Video frame grabbing - Saving the displayed image with automatic numbering

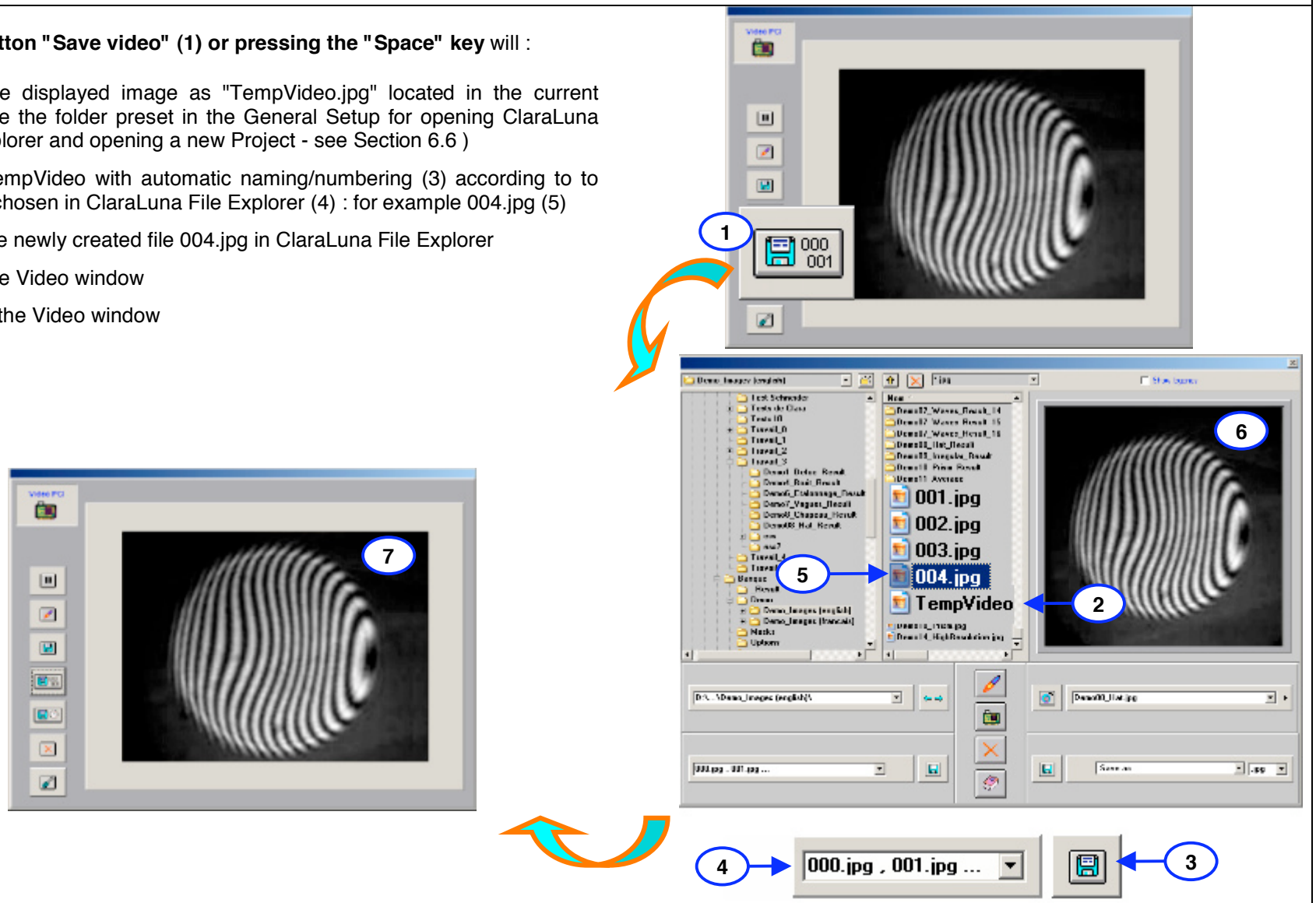
1 **Clicking button "Save video" (1) or pressing the "Space" key** will :

2
- save the displayed image as "TempVideo.jpg" located in the current folder (ie the folder preset in the General Setup for opening ClaraLuna File Explorer and opening a new Project - see Section 6.6)

3-5
- save TempVideo with automatic naming/numbering (3) according to to format chosen in ClaraLuna File Explorer (4) : for example 004.jpg (5)

6
- open the newly created file 004.jpg in ClaraLuna File Explorer
- close the Video window

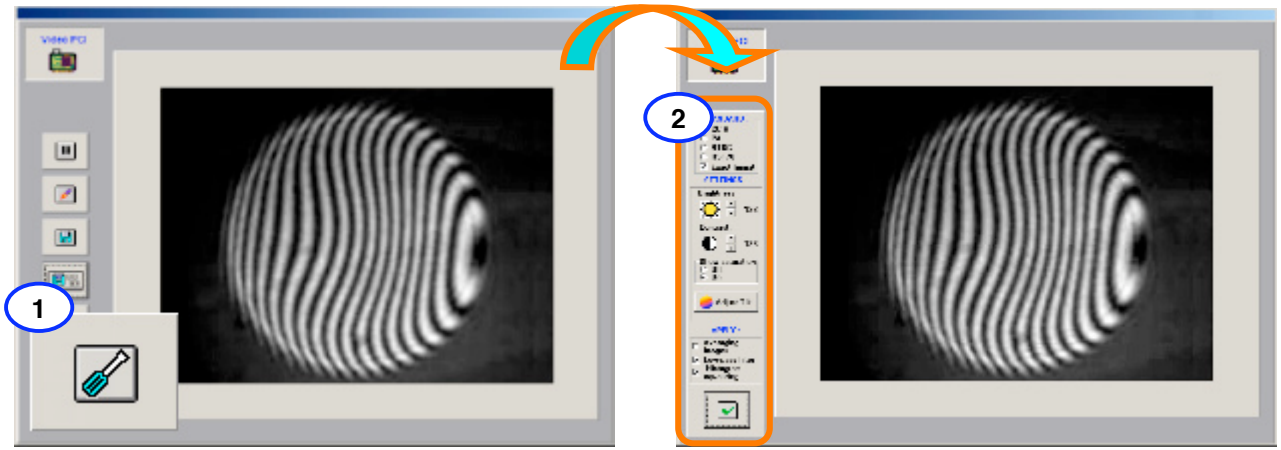
7
- reopen the Video window

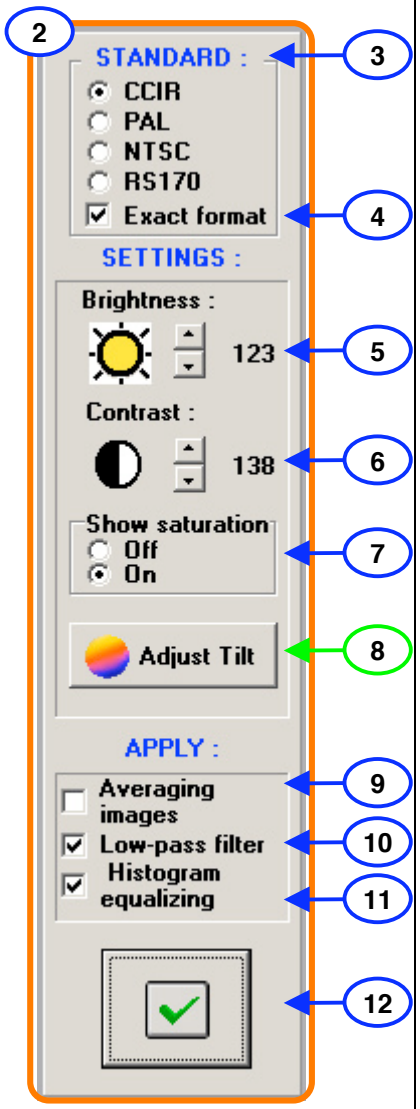


11.7 Video frame grabbing - Video setup

1
2

Clicking Video Setup button (1) will show Video Setup panel (2)





3 **Video standard** : select your camera output format If not in list, please contact vendor (page 2 of this document).

4 If the actual **format is unknown**, uncheck "Exact format". The video acquisition will allow similar yet different formats.

5 **Brightness** : click arrows to set between 0 (black) and 255 (white). First try medium (128)

6 **Contrast** : click arrows to set between 0 (smooth, no contrast) and 255 (hard, maximum contrast). First try medium (128)

7 **Show saturation** : if "on", the saturated bright zones of the image flickers in black, and the dark ones in white.If saturated, decrease contrast first. Then decrease brightness if bright zones are saturated, increase if dark zones are saturated. When no saturation shows up, turn to "off" in order to make the video more fluid.

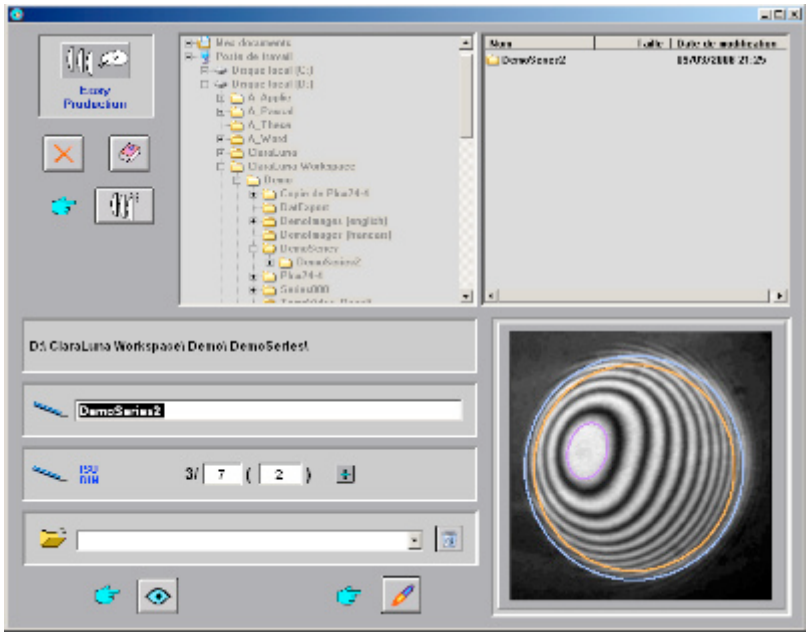
8 **Adjust tilt** (enhanced version only) : allows setting the component tilt for a first wavefront measurement, then set the exact opposite tilt for a second run, and finally average these two wavefronts. This approach compensates for aberrations due to the tilt (mainly astigmatism), and is relevant for high precision wavefronts -with a RMS form error cerca $\lambda/100$ -

9 **Averaging images** : If selected, grabs 10 video images in a row and averages them. Use this function if the video signal shows stationary random noise, such as vibrations. Do not use if the fringes slide slowly.

10 **Low-pass filter** : Slightly smoothes the interferogram with a filter radius of 2 pixels.

11 **Histogram equalizing** : usually stretches the dynamics of the image. Use in case of poor contrast. Note that this amplifies the high frequency noise.

12 EASY PRODUCTION MODE



In this chapter :

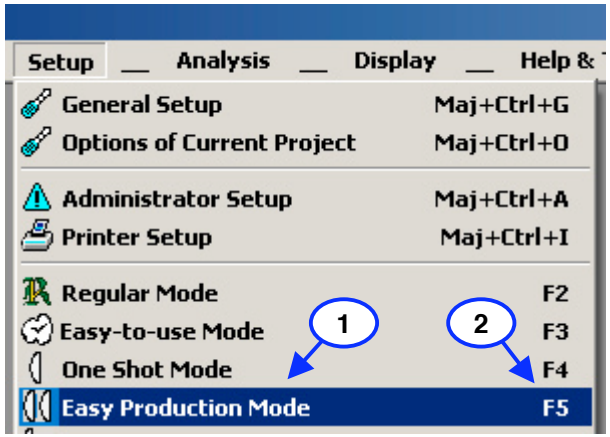
- **Easily create a host folder, a Model of Mask and a Model of Options for a Series of parts**
- **Load this data into the General Setup for a ready-to-go Series measurement**
- **Save/Retreive your Series data for future use. Edit series Control Reports with statistics**
- **Very easy to use, even by non-skilled or non-English reading users.**
- **Very pleasant to use (even for skilled or English-reading users...)**

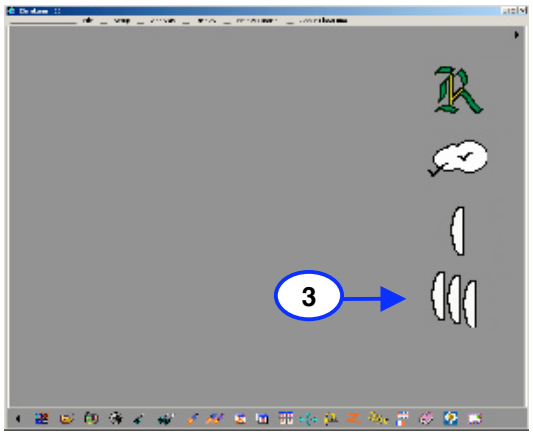
12.1 Easy production mode : Open Mode and create Host

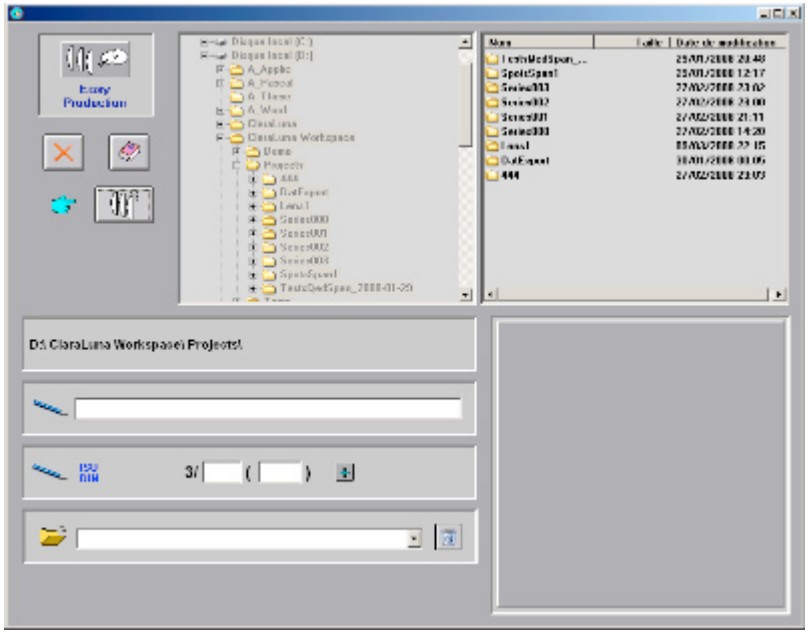
1-3

Enter the Production Mode :

- In ClaraLuna main window, menu Setup>Easy Production Mode -
- or press F5 ((2)
- or click icon on the right hand side of main window (3).







12.2 Easy production mode : Open Mode and create Host

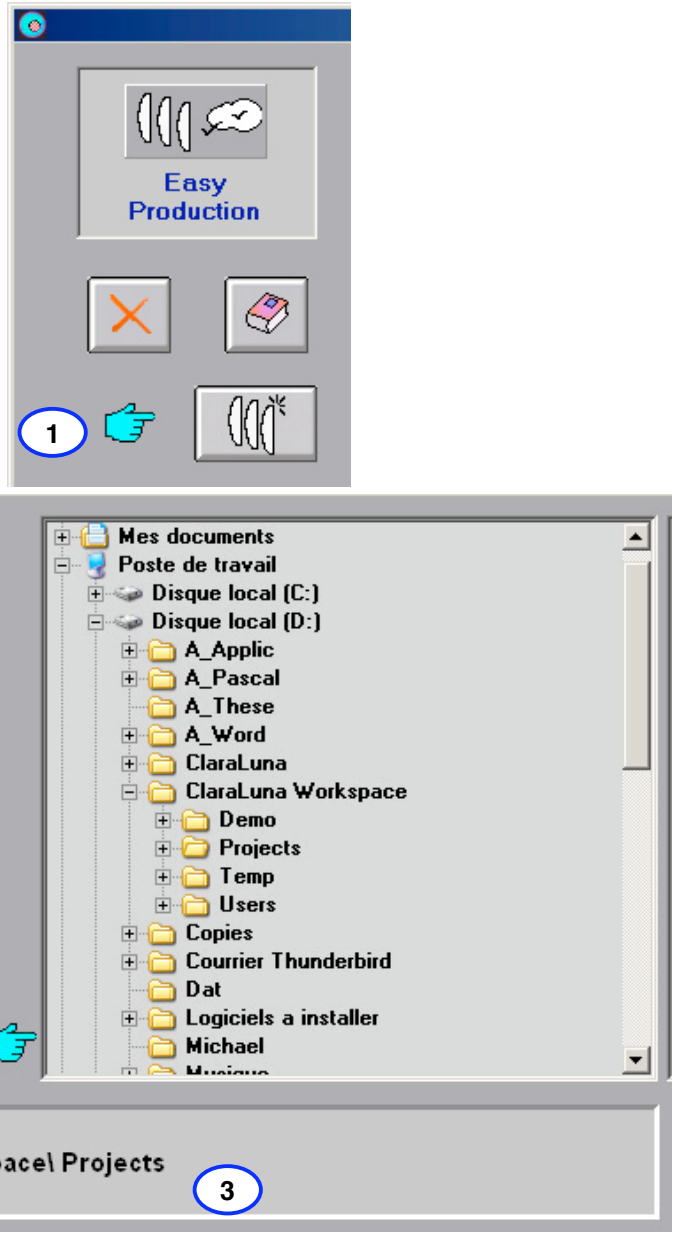
1 **In the Easy Production Mode** window, click button (4) “Create new series”

2 **Select a “Host folder”** ie a folder for holding the subfolder of the Series being created.

The default Host folder is ClaraLuna Workspace\Projects.

Click File Explorer to select.

3 The path of the chosen folder is shown below the File Explorer



12.3 Easy production mode : Enter specifications and grab Model image

1 **Enter Series name** : the Series subfolder gets created in the Host folder.

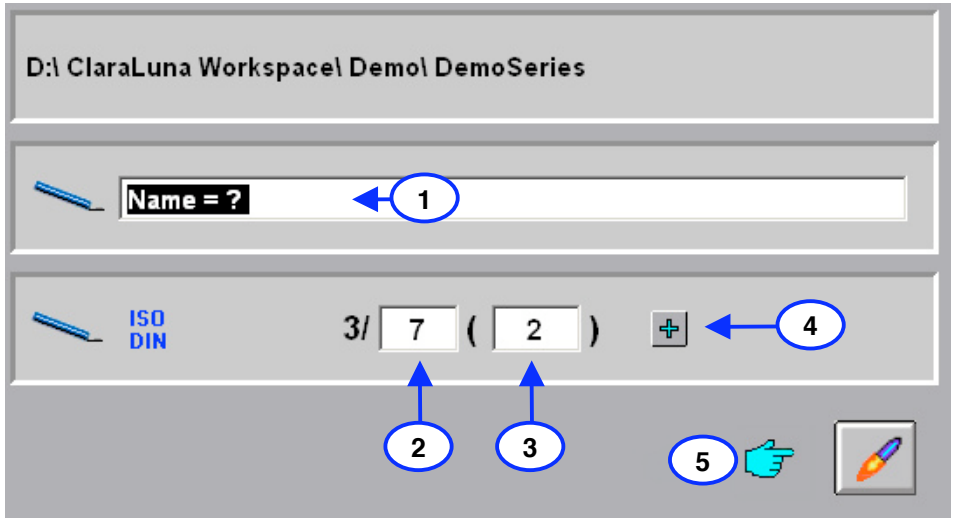
2 **Enter ISO A**

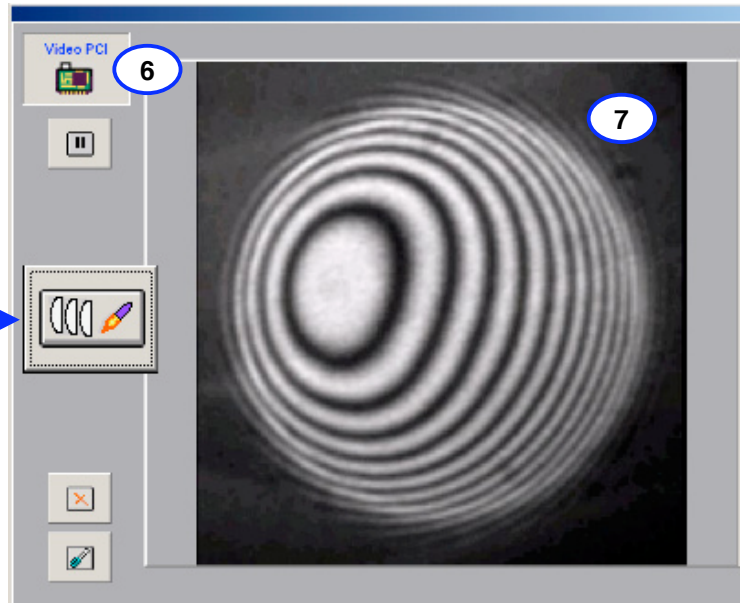
3 **Enter ISO B**

4 **If needed, call Options window for more specifications (ISO C, Rms, or DIN)**

5 **Launch**

The whole process can be done without clicking the mouse : just press Enter key after steps 1, 2, 3 for launching.





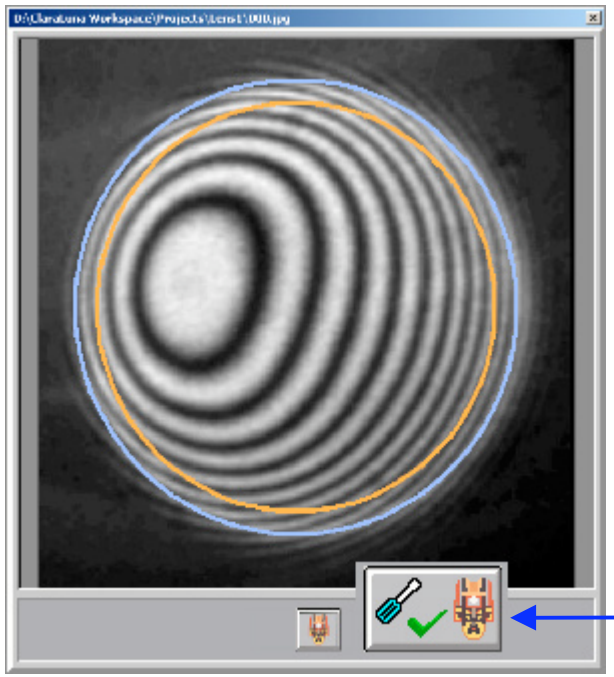
6 **The video window shows up**

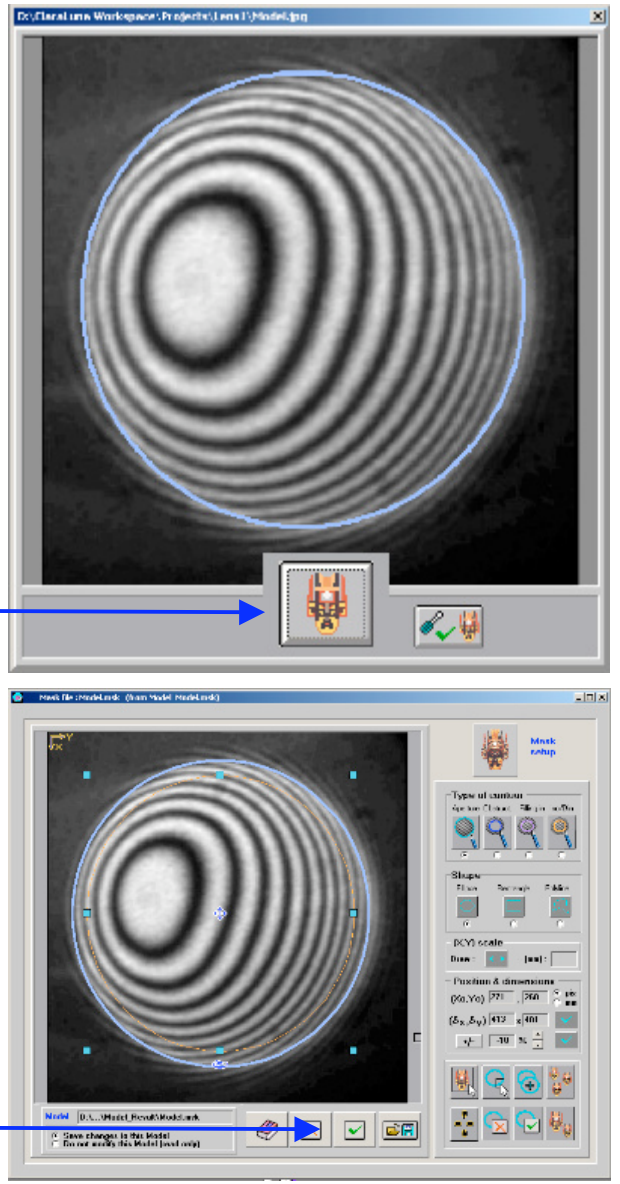
7 **Set fringes**

8 **Click button** or press Enter key

12.4 Easy production mode : Define Series Mask

1. **The grabbed image is loaded** with a default Mask
2. **Enter Mask editor**
3. **Edit the Mask**
4. **Close mask editor**
5. **Back to loaded image : accept**





12.5 Easy production mode : Computing - Results window

1 **The Model is created and renamed as part # 000.jpg**
Click (1) to launch

2 **Part 000.jpg is computed.**
The simplified ISO/DIN window shows up

3 • DIN specifications

4 • DIN results

5 • Basic information about the Series and the Part

6 • Full ISO specifications

7 • Full ISO results

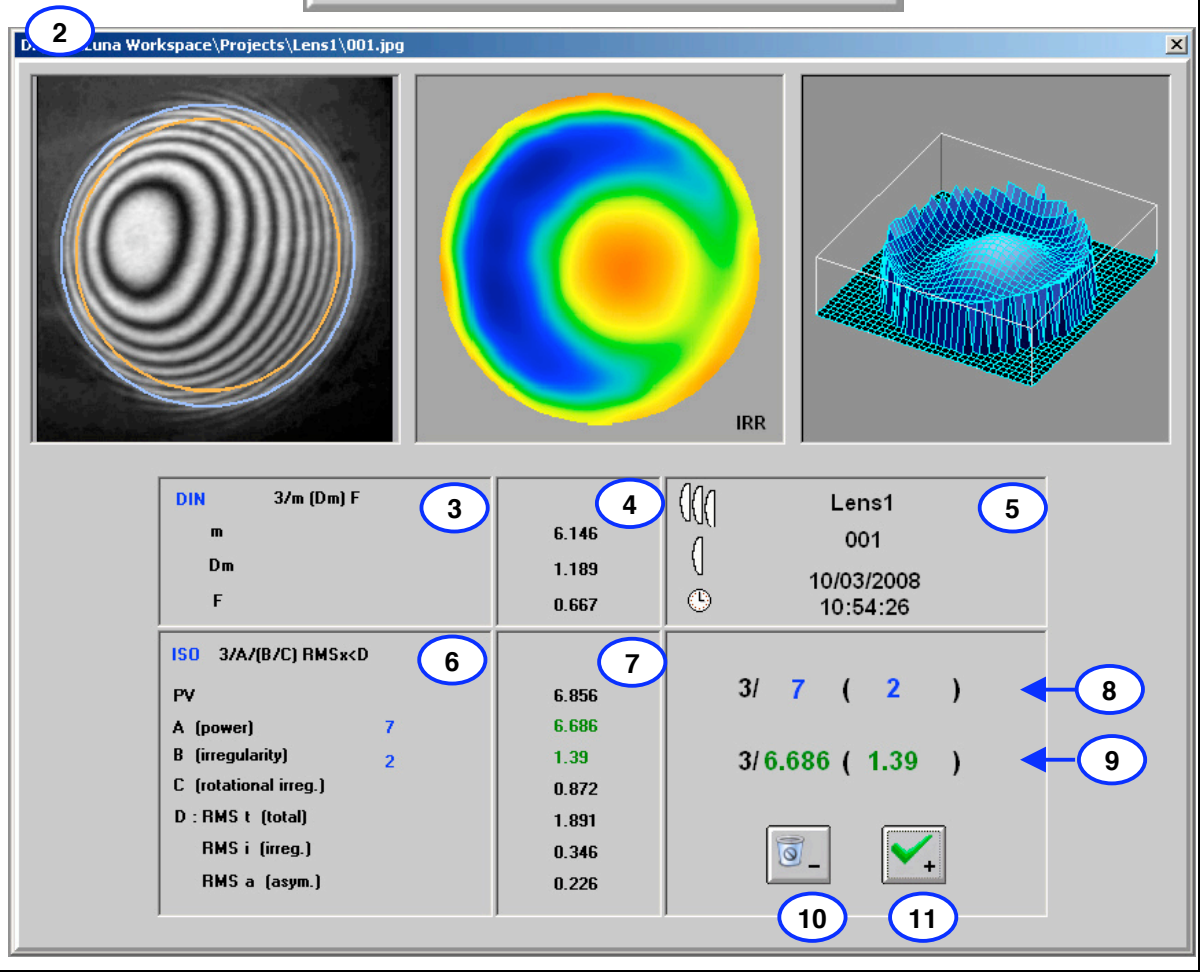
8 • ISO specifications A and B

9 • ISO A and B : green if tolerance is met, red if not

10 • "Trash/Minus" button (10) discards the Project from the Series, and deletes the interferogram image, closes the window, then reopens the Video window .

11 • "Tick/Plus" button (11) validates the part, includes its results into the Series data, closes the window, then reopens the Video window (15).

• If all is green, the "Tick/Plus" button (11) is selected : just press Enter key or Space bar to accept If not, "Trash/Minus" button (10)) is selected: just press Enter key or Space bar to discard the part



12.6 Easy production mode : See Series results

(1) **Grab and compute several images** then close video (1)

The Easy Production Mode window shows up

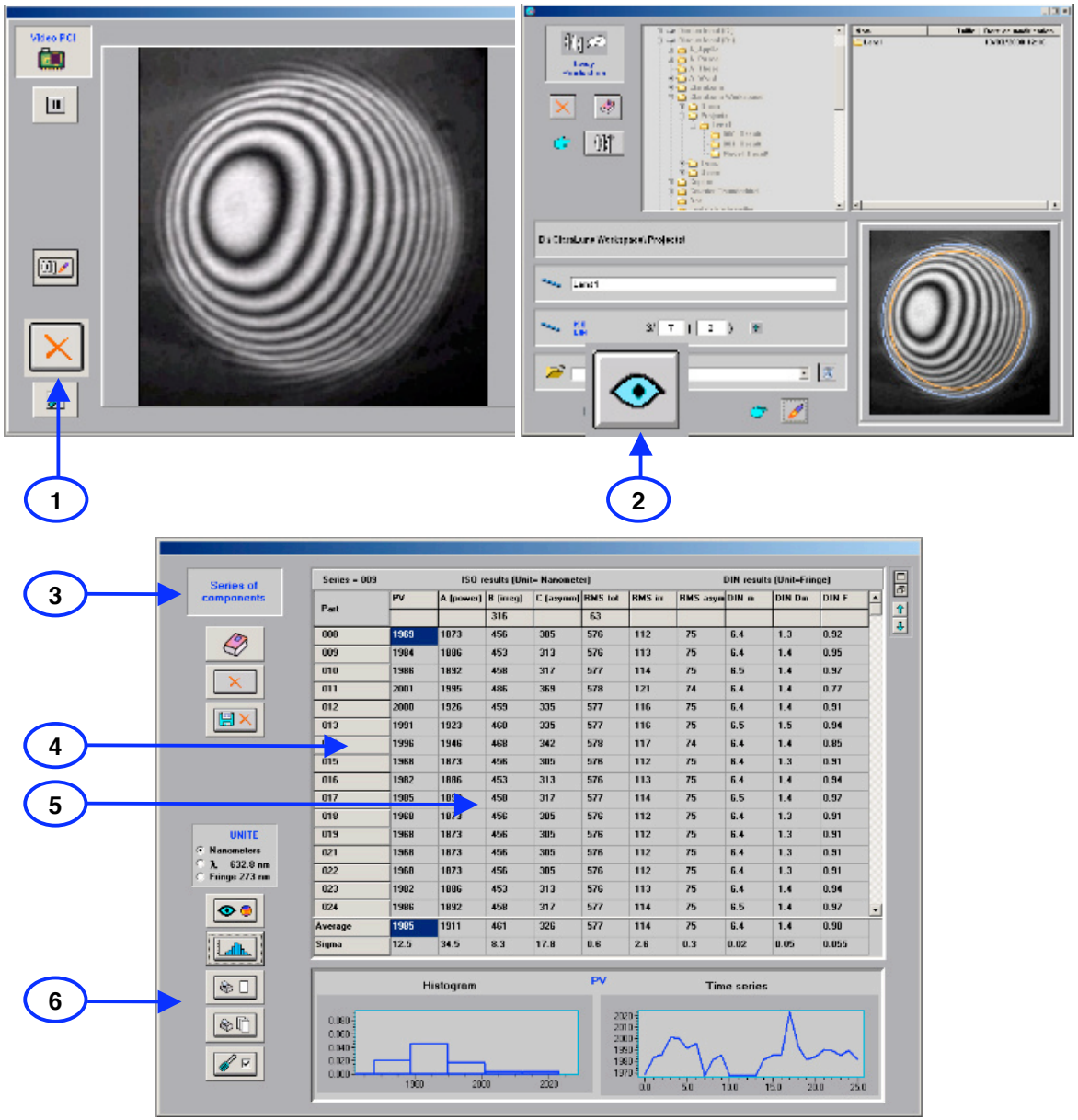
(2-3) Click “Eye” button (2) to open Series Result window (3)

(4) **Click part name (4) to recall part control report**

(5) **See Series ISO/DIN results versus part name.**

(6) **Print Series Control report**

For a detailed description of the Series Result window, please refer to Section 13.7 « Series of components - Series Results : seeing statistics, printing, editing. »



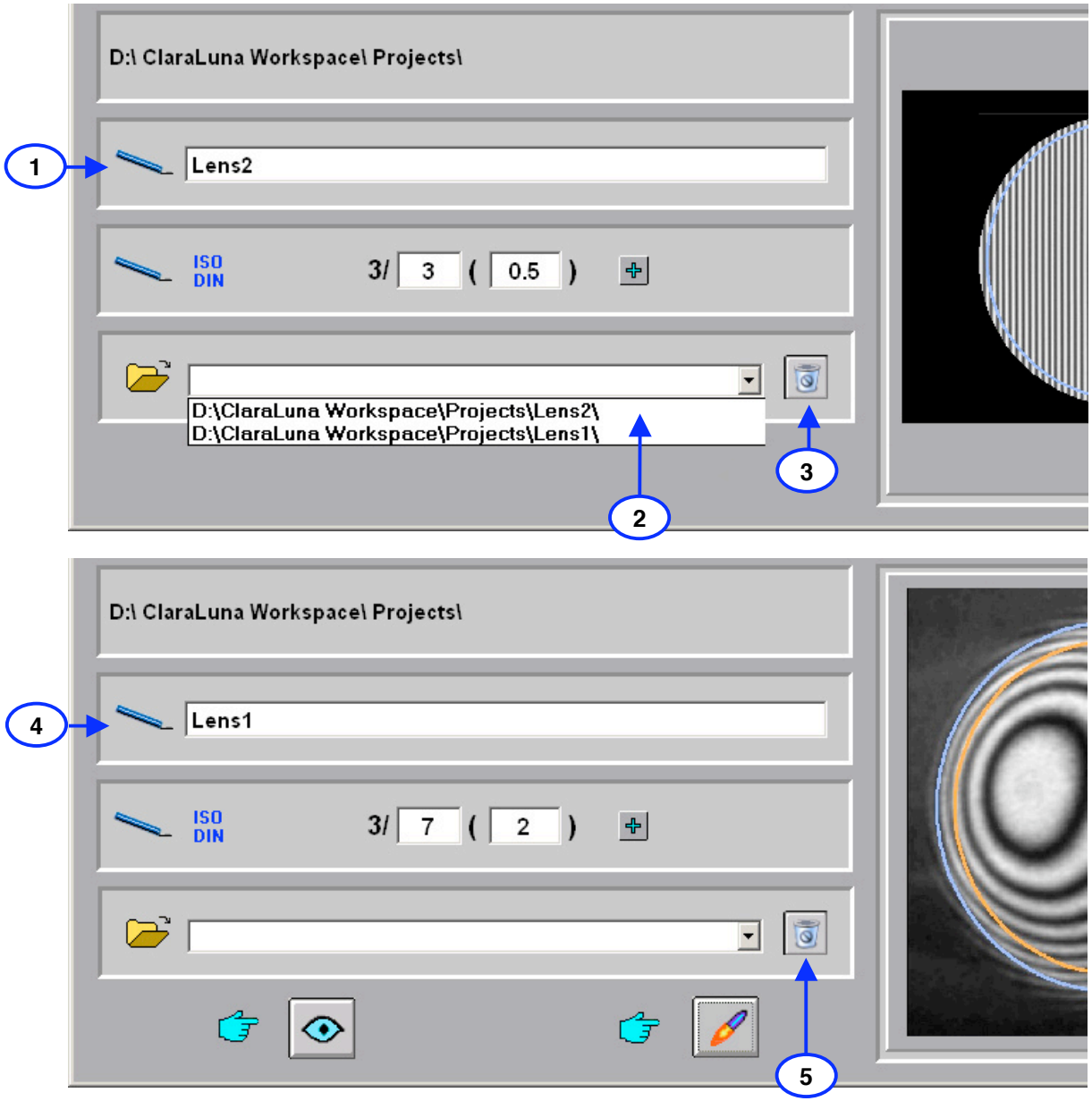
12.7 Easy production mode : Recall previous series - Delete Series

1 **Create other Series**

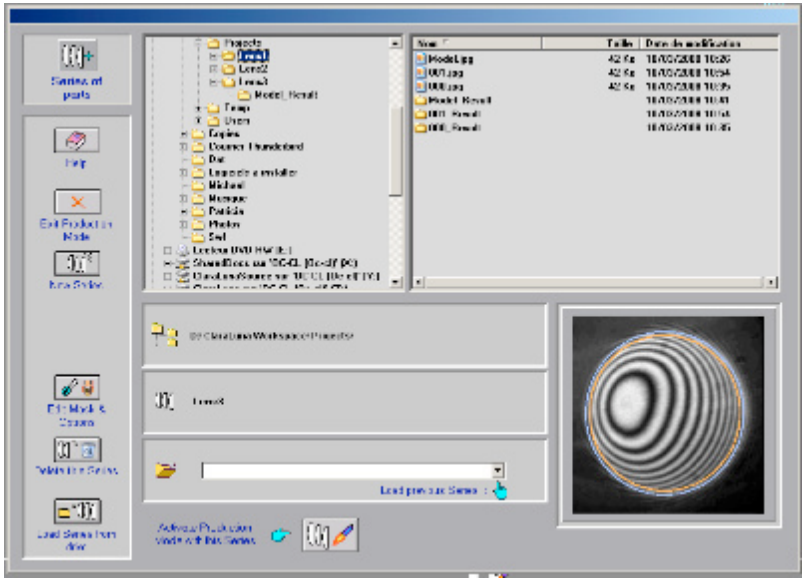
2-3 **To recall a previously created Series, open list (2) and select in the list (3)**

4 **The selected Series is reloaded**

5 **For deleting a Series,** first reload it, then click “Trash” button (5)



13 ADVANCED PRODUCTION MODE



In this chapter :

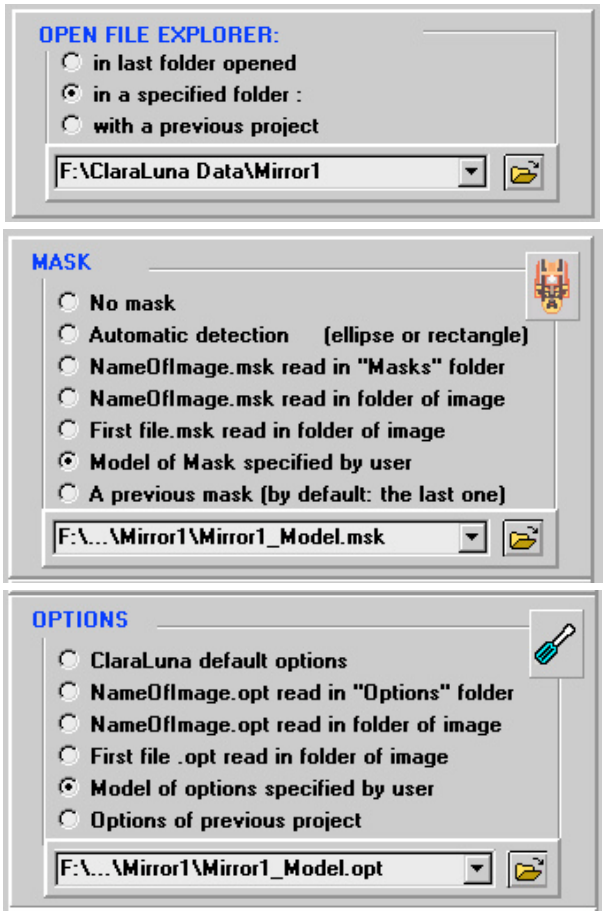
- **Create a host folder, a Model of Mask and a Model of Options for a Series of parts**
- **Load this data into the General Setup for a ready-to-go Series measurement**
- **Save/Retreive your Series data for future use.**

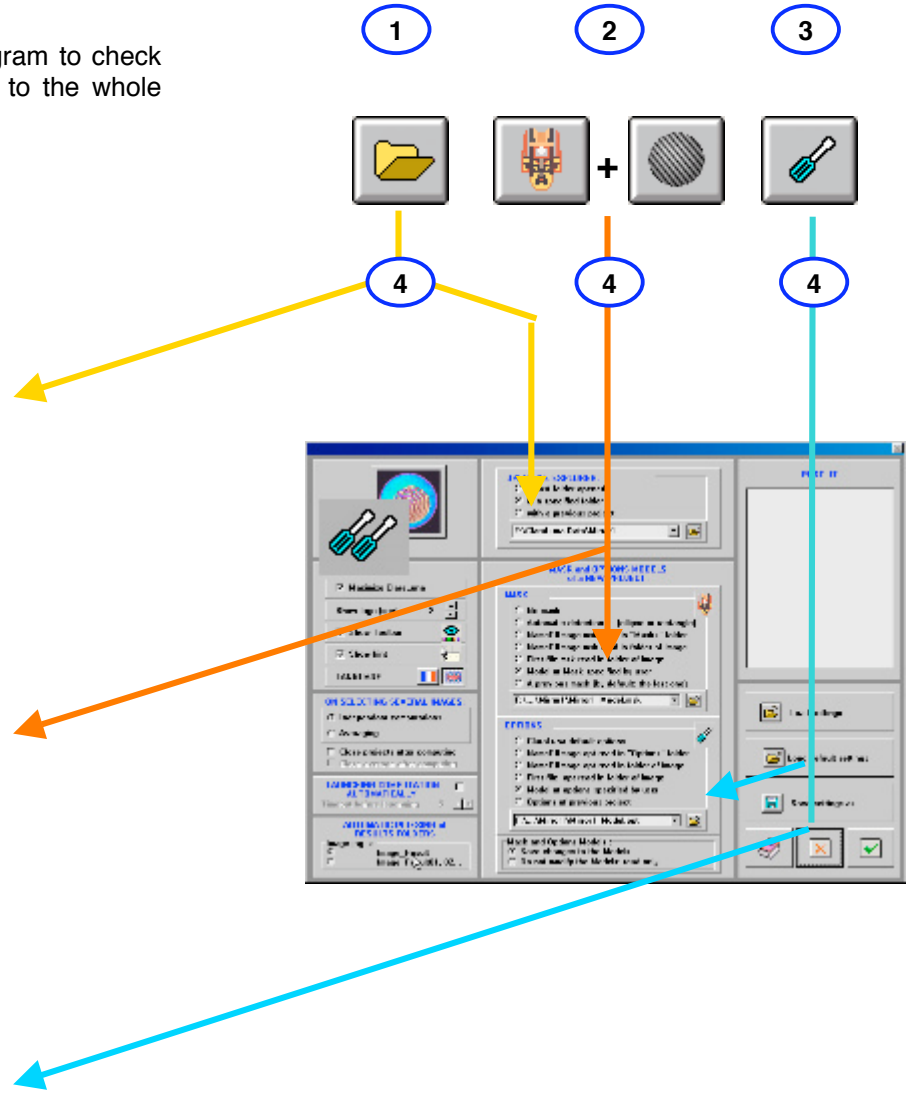
13.1 Advanced Production Mode - Purpose

For measuring a Series of parts, one needs to :

1
2
3
4

- **define a Host Folder that will** contain all the Series data
- **define a Model of Mask** (together with a model of interferogram to check that the Mask is nicely fitted to the fringes image) common to the whole Series.
- **define a Model of Options** common to the whole Series.
- **tell the General Setup** to use the previous as default.





13.2 Advanced Production Mode - Entering the Series window

1 **Enter the Advanced Production Mode** in ClaraLuna main window, menu Setup -

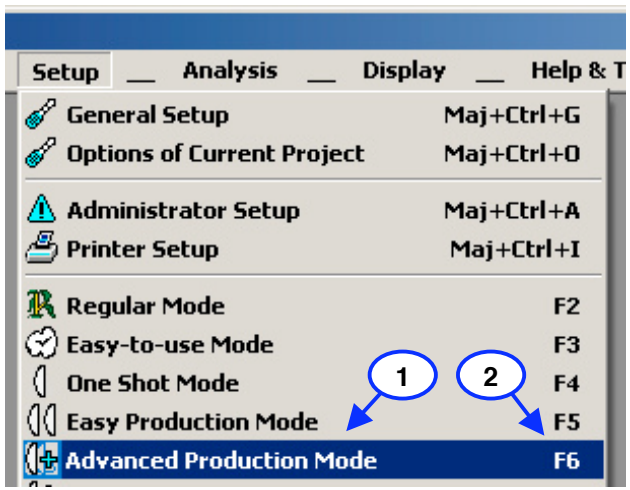
or :

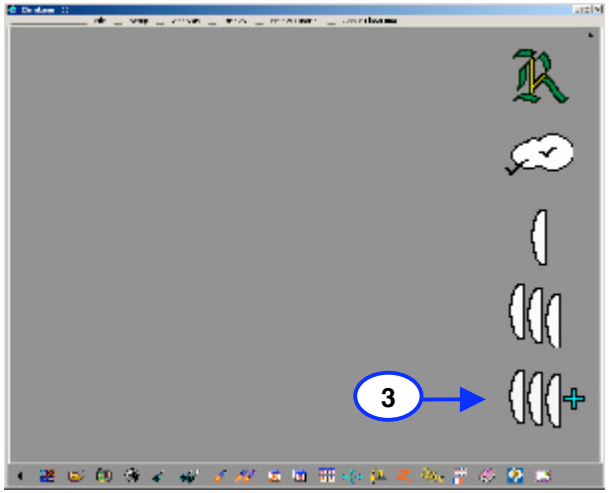
2 **Press F6**

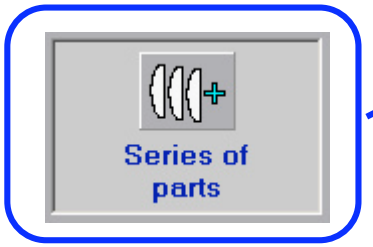
or :

3 **Click icon (3) on toolbar**, in ClaraLuna main window -

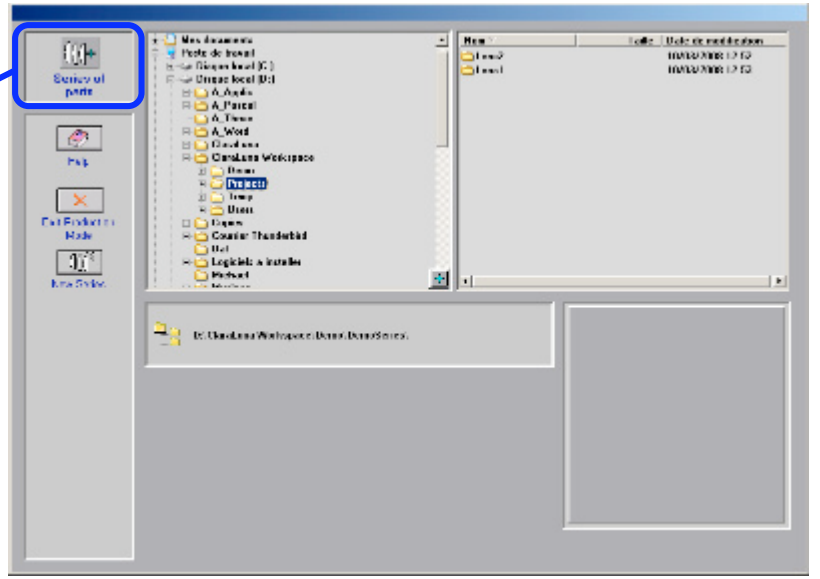
4 **These commands open the Series of Parts window**







4



13.3 Series of components - Creating a new Series - Folders

1 **To create a new Series**, click button (1)

2 **Select Host folder** in File Explorer (2)

The host folder will hold the new Series subfolder

3 **For full File Explorer** (history of visited folders, creating, deleting folders...) click “Plus” (3)

4 **The full path** of the selected host folder is shown

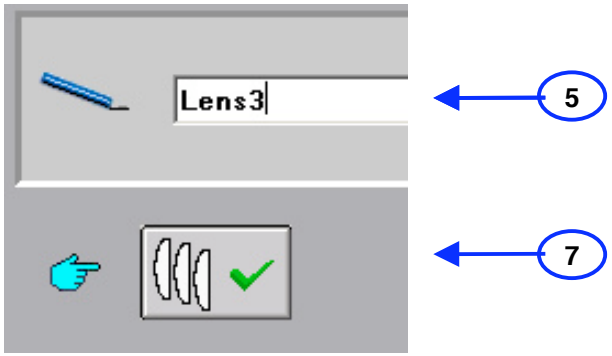
Enter name of new series

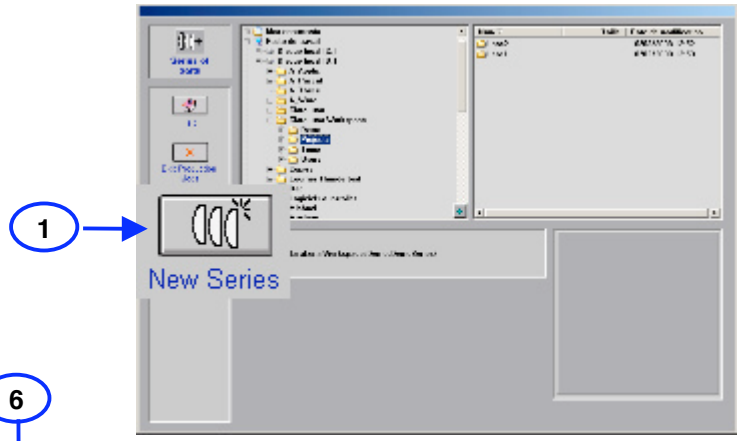
5-6 or

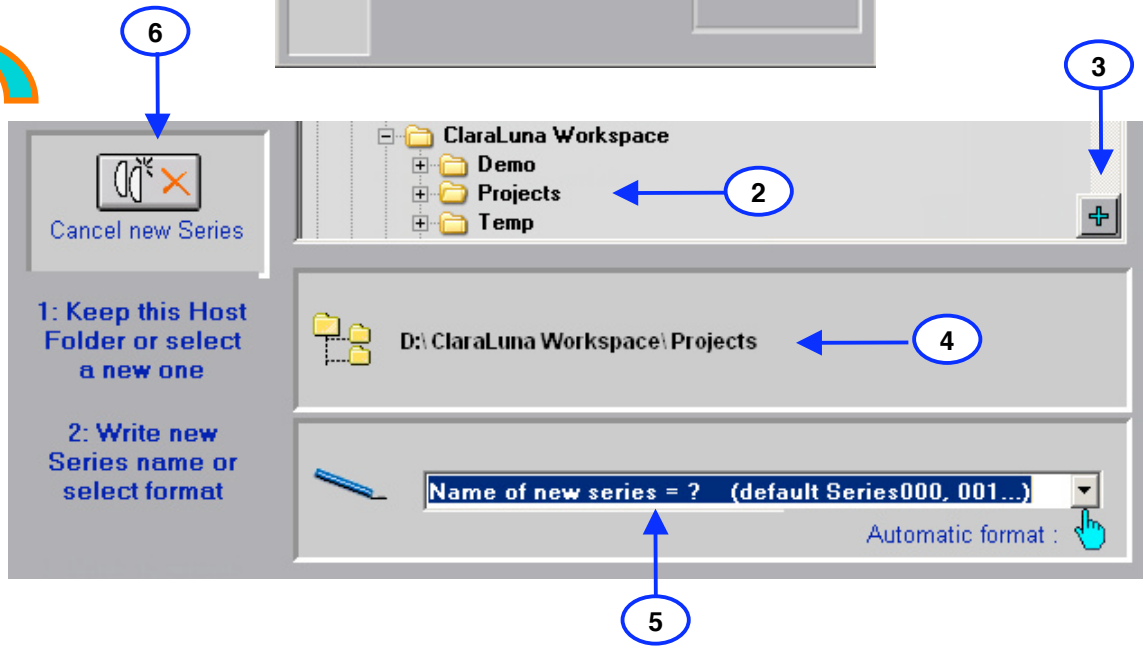
Select automatic format in list

7 **When done, click button (7)**

8 This action creates the new Series subfolder in the Host folder







13.4 Series of components - Creating a new Series - Model

0

The File Explorer shows up :

1-2
- Copy any interferogram into the Series subfolder (or create it through Video framegrabbing). Give it any name. TempVideo does well.

3
- Launch

4
- Adjust the Mask and the Options

5
- Accept

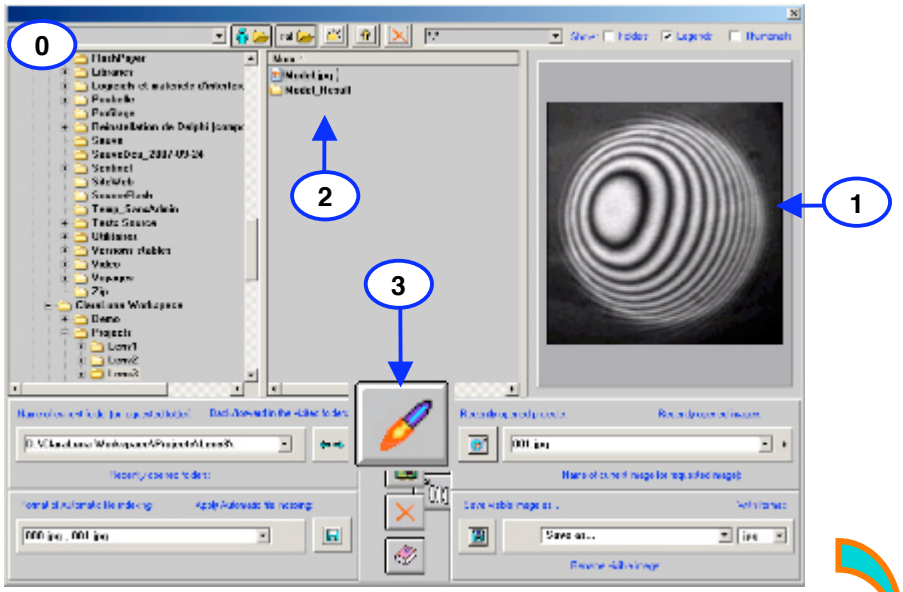
6

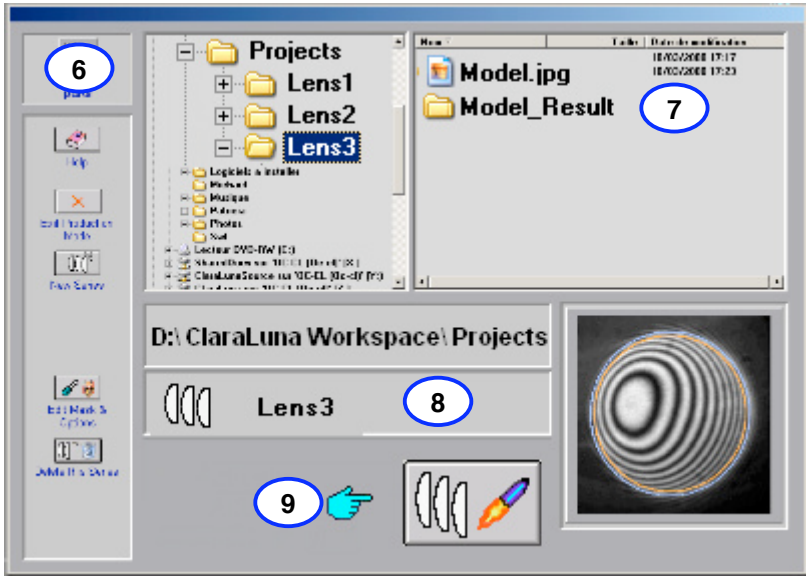
Now the Series window shows up :

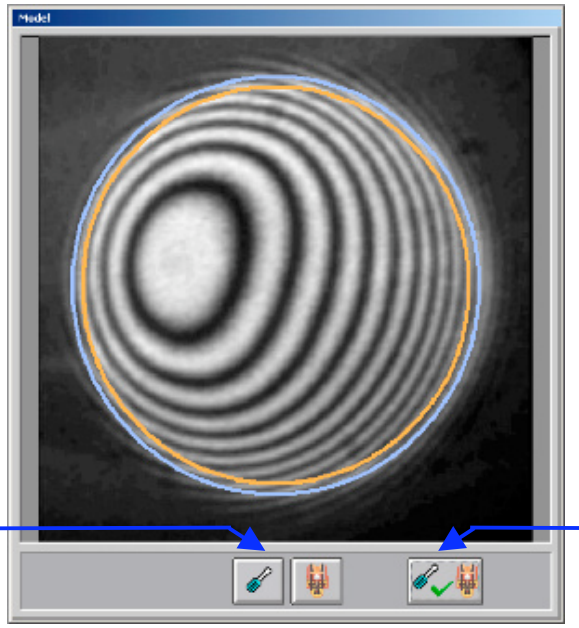
7
- The image has been renamed as Model, its Result folder contains the Mask and Options files

8
- The Serie is created and added to the list of Series

9
- Finally, activate this Series, i.e. load it into the General Setup just by clicking button (9)







13.5 Series of components - Using a Series in Production Mode (1)

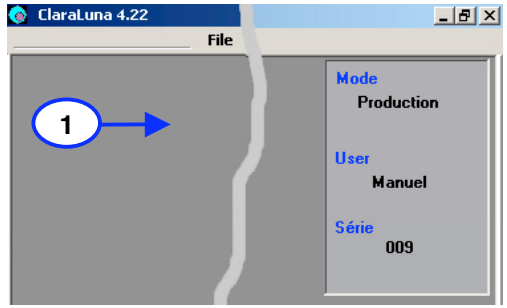
1 **After activating a Series** (see Section **Erreur! Source du renvoi introuvable.**, step 7), the Production Mode is on, visible in the Status panel (2) top right of Main window, together with Current User's name and Current Series

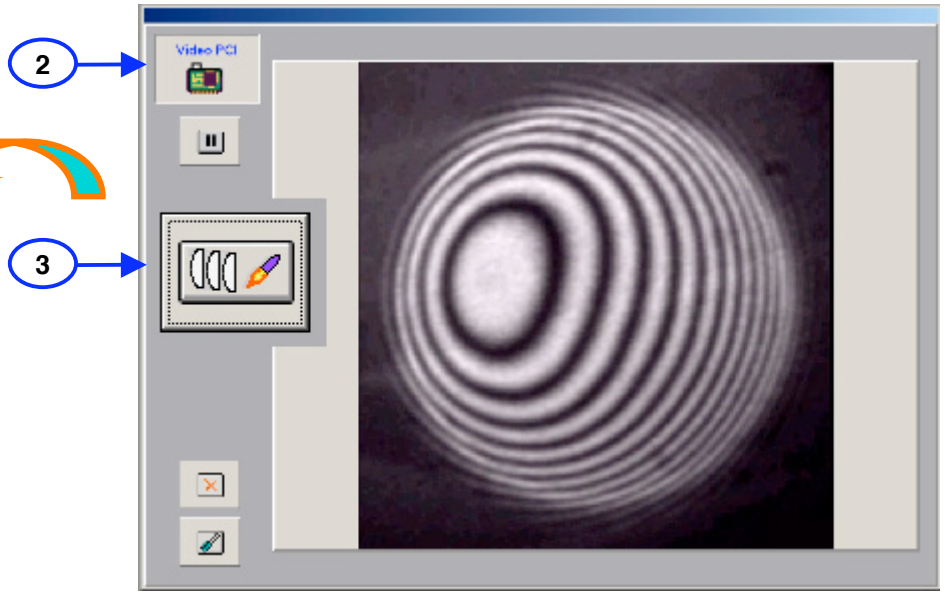
2 **Open the Video Window** (2) (see Section 11.1),

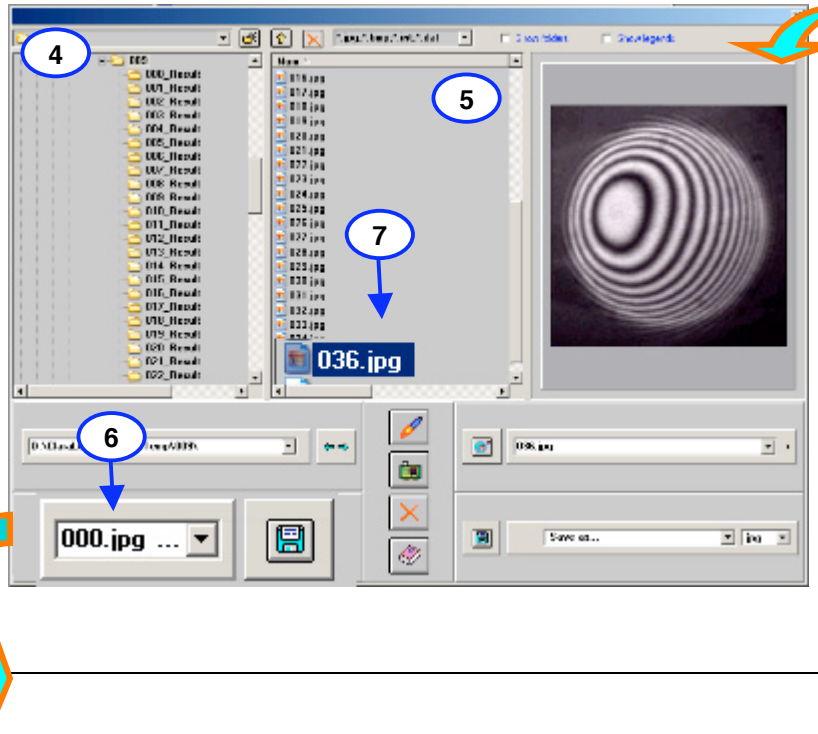
3 A new button shows up (3)

Clicking button (3) or pressing keyboard Space bar will automatically :

- **Open the File Explorer** (4) in the Series folder (5) with the current automatic numbering format (6) and save the new file (7), then close the File Explorer.







13.6 Series of components - Using a Series in Production Mode (2)

8

- **Then the Project computation window automatically gets open (8)**

9-10

- The new interferogram is prompted with the Series Mask and Options, which can be modified by clicking buttons (9) or (10).

11-12

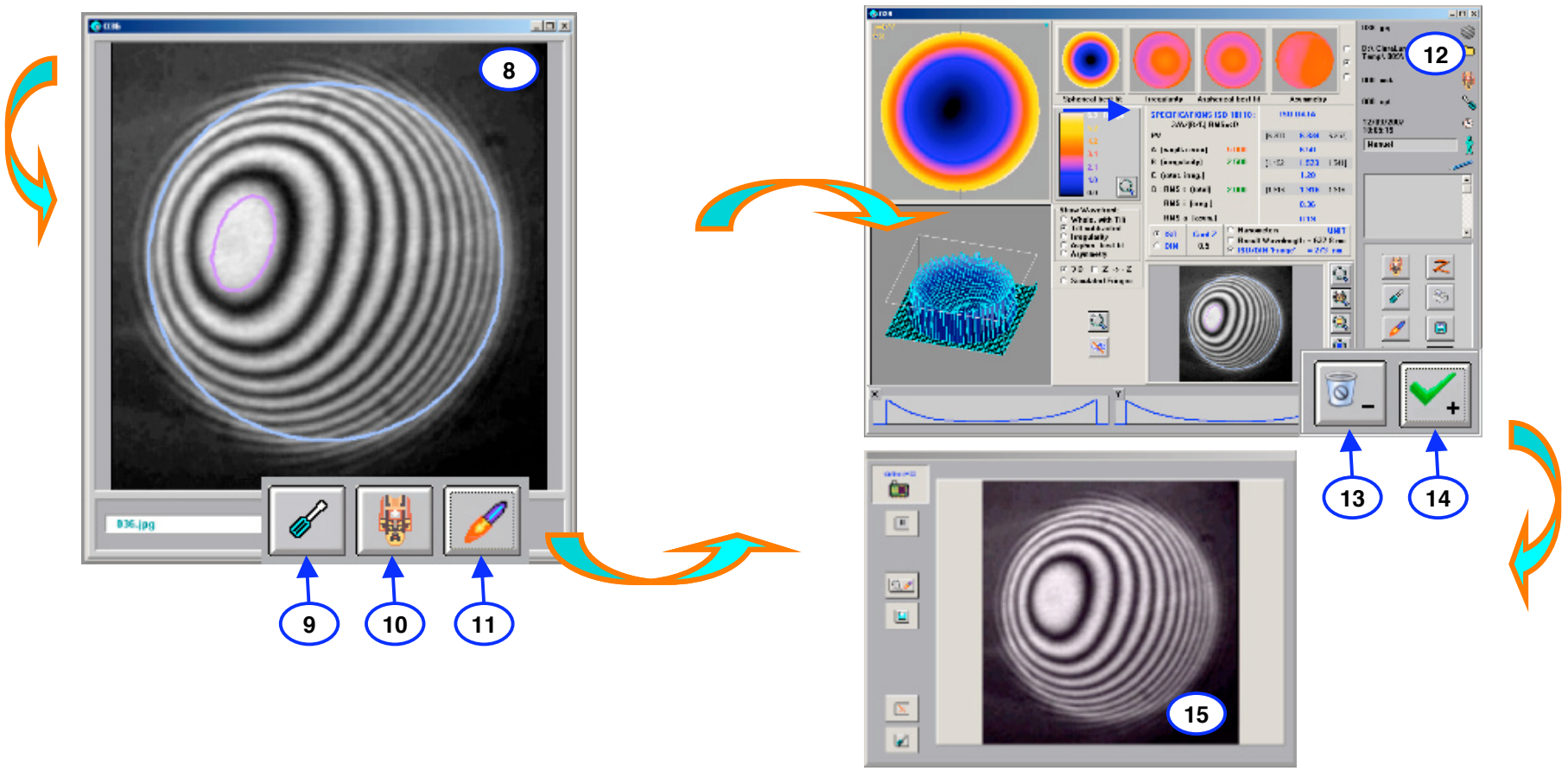
- Clicking button (11) launches the computation. Eventually the ISO/DIN results window show up (12)

13

- Two buttons specific to the Production Mode are shown bottom right of the ISO/DIN resullts window : "Trash/Minus" button (13) discards the Project from the Series, and deletes the interferogram image, closes the window, then reopens the Video window (15).

14-15

- "Tick/Plus" button (14) validates the part, includes its results into the Series data, closes the window, then reopens the Video window (15).

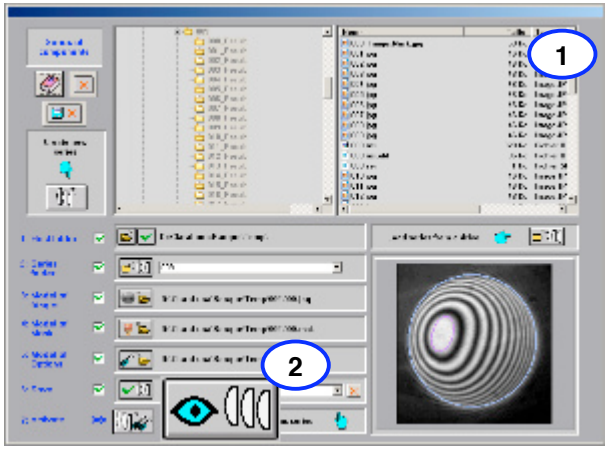


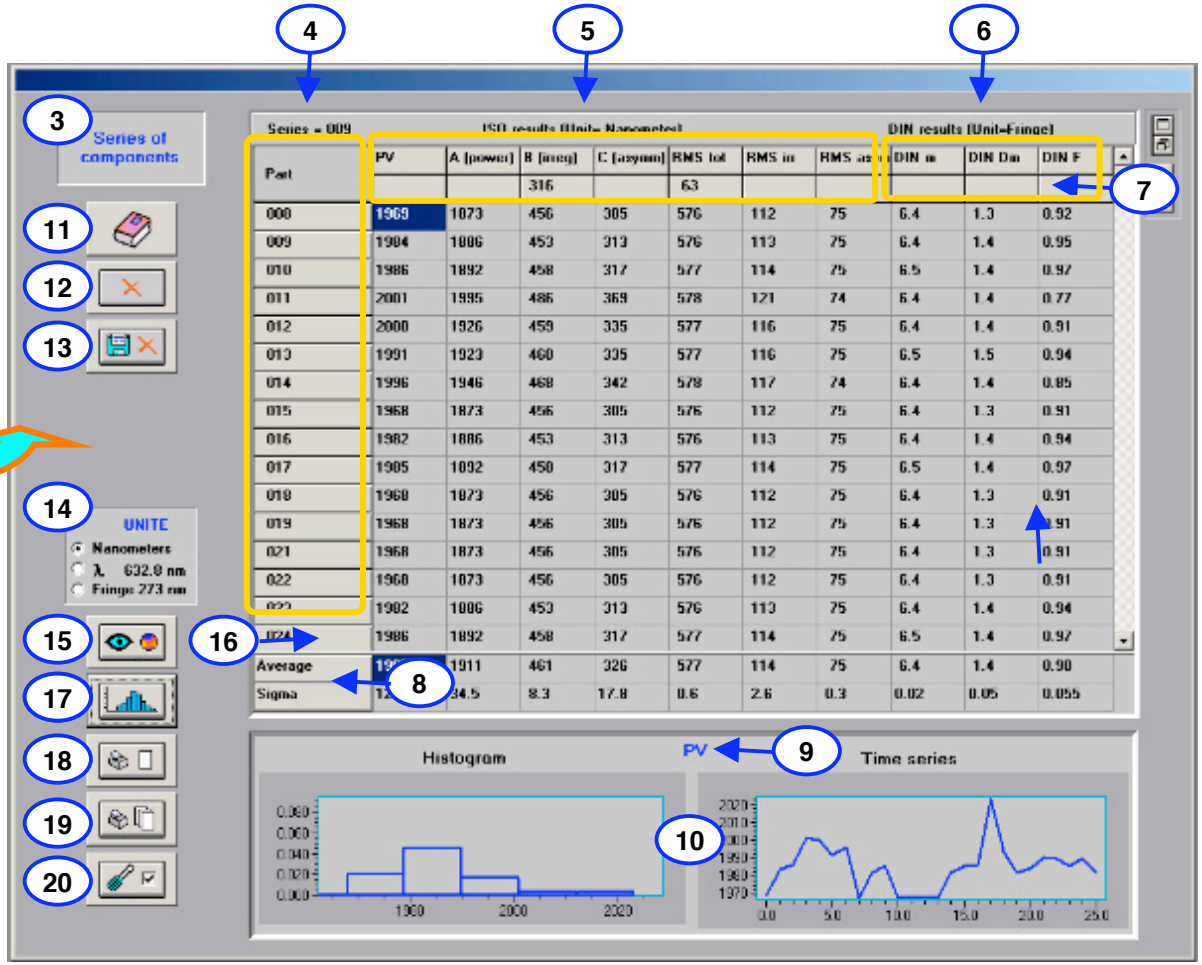
13.7 Series of components - Series Results : seeing statistics, printing, editing.

Showing Series results :

1 After validating a part, its results is included in the Series result dataset. Open this dataset window by reopening the Series window (1).

2-3 If the datset is not empty, the "See series" button (2) shows up: click it to open the Series dataset window (3)





4 Part name and/or number

5 ISO parameters (PV, A, B, C, Rms)

6 DIN parameters or Date/User data

7 ISO/DIN Specifications

8 Average and Standard deviation per column

9 Parameter selected by clicking its column

10 Histogram and time series per column

11 Help

12 Quit and discard changes

13 Quit and save changes

14 Choose unit (nm, λ or fringe)

15 16 Show parts control reports (15), or click (16)

17 Show graphs (10)

18 Print current page

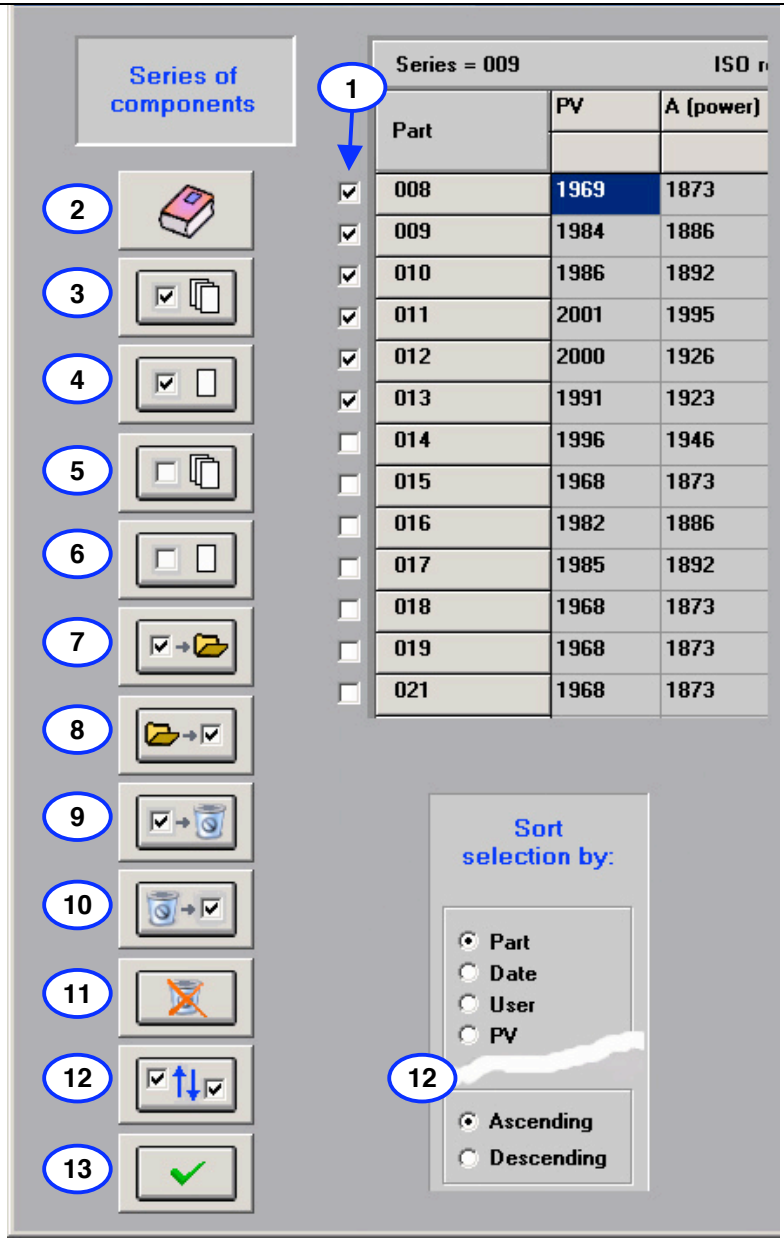
19 Print all pages

20 Show edit window for results : deleting, writing to/from a file, sorting.

13.8 Series of components - Editing results data

The controls in this panel make it possible to edit the Series Results dataset :

1. Select parts one by one by clicking box. Select a sequence (for instance 008...013) by first clicking 008, then press Shift and click 013.
2. Help
3. Select all pages (i.e. all parts in the dataset, even hidden ones)
4. Select current page
5. Deselect all pages
6. Deselect current page
7. Write selection to a file. The prompted folder is the Series folder, but you can browse.
8. Read previously saved results from a file. The read data is imported in the list after the last checked box, and at the top of list if none is selected.
9. Delete selected (i.e. send it to Series trash bin, which is a ".old" file in the Series folder. Note that it is different from Windows trash)
10. Retrieve all data from Series trash bin, with same rule for insertion position than (8).
11. Empty Series trash bin. This action cannot be cancelled
12. Sort selected data by : Part name or number/Date/User/ PV/A/B/C/Rms t/Rms i/Rms a/Din m/Din Dm/Din F
13. Close Edit panel



13.9 Series of components - Tools

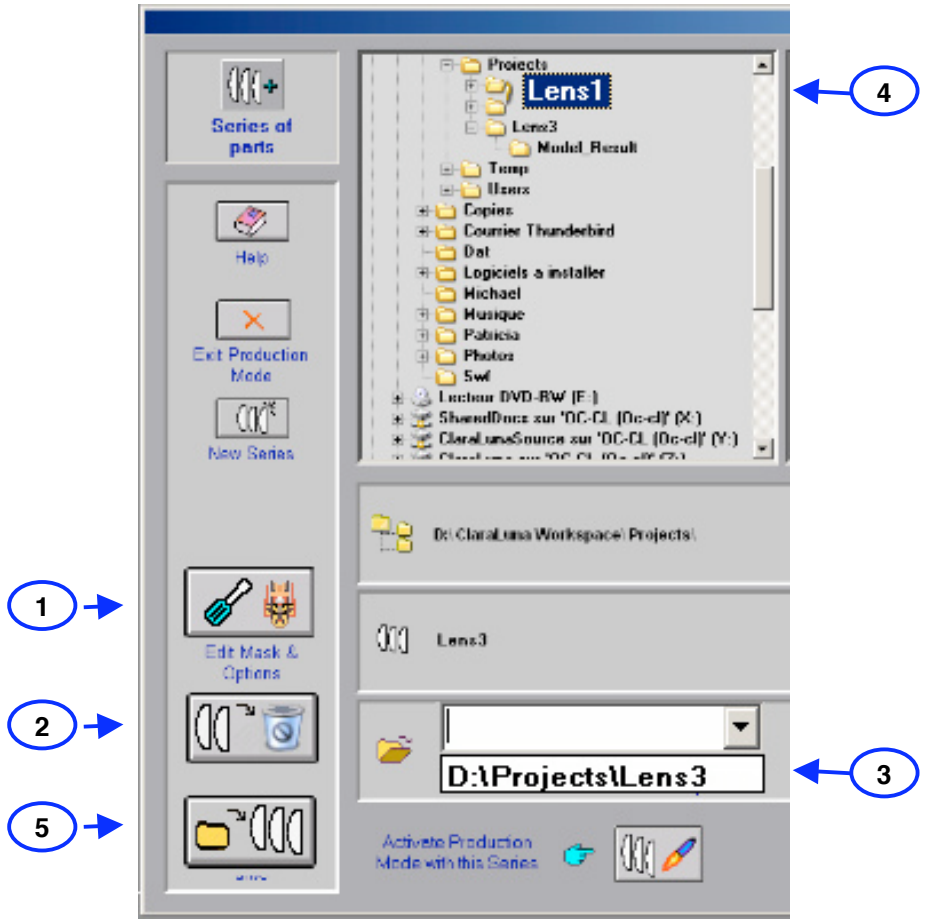
(1) **Edit the Mask and Options of current Series** (the one that is presently loaded) by clicking button (1)

(2) **Delete the current Series** (the one that is presently loaded) by clicking button (2). This will remove the Series from list (3), and delete all the Series data and folder from the disk : use with care.

(3) **Load a previously created Series** by selecting it in the Series list (3). For loading a previous, Series, do not delete the current one.

Loading in the Series list a Series available on a drive

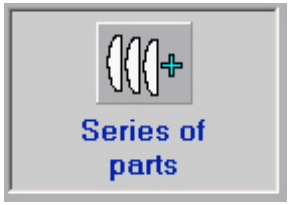
- Suppose that a given Series does not exist in the list (3)
- (4) but is available on a drive (4) : for example in the folder "Lens1"
- then button (5) is visible when selecting the folder "Lens1" in the File Explorer.
- (5) By clicking button (5), you will load the Series "Lens1" into the window and add it to the list (3).
- This allows to move, save, copy a folder that contains a Series, and then make it available for the current User's. (Since the Series are personal data of each User, this "Load from disk" procedure allows sharing Series between Users).

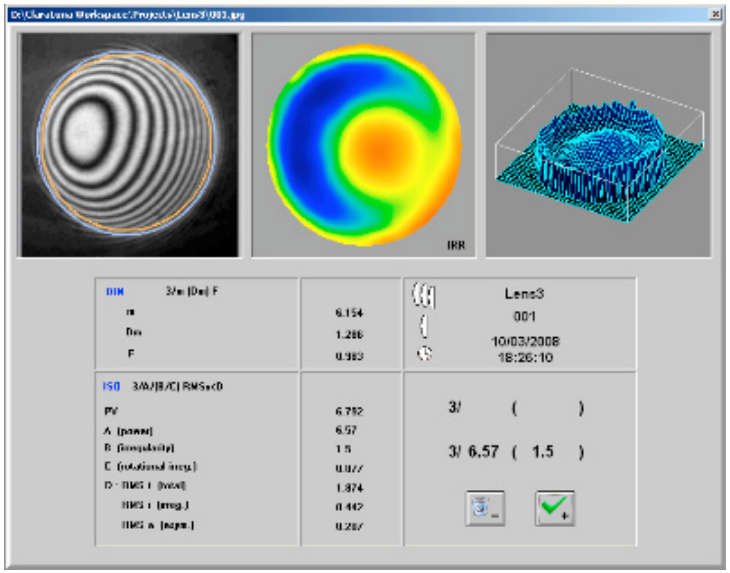


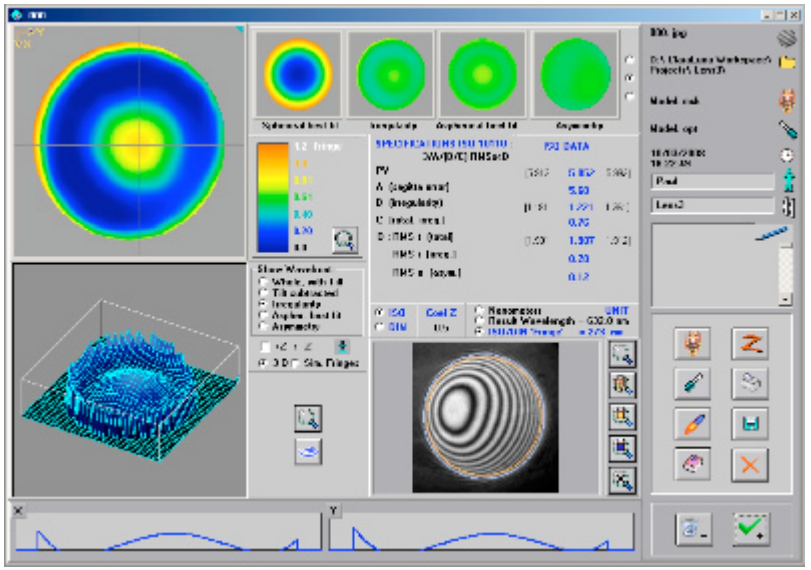
13.10 Series of components - Sharing Series between Production Modes

Series created from one of the Production Modes (Easy / Advanced) are compatible with the other one.

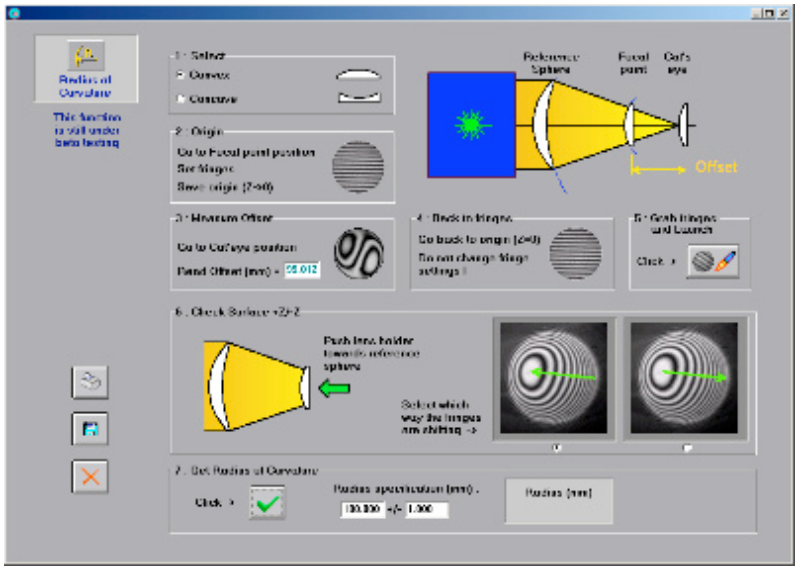
These Series can be used as well in the Video Sequence Mode (programmable time Series) and in driving QED-MRF.







14 RADIUS OF CURVATURE



In this chapter :

- **Measure Radius of Curvature for a single part**
- **Measure Radius of Curvature in Production Mode**

14.1 Radius of Curvature for a single part : Enter bench settings

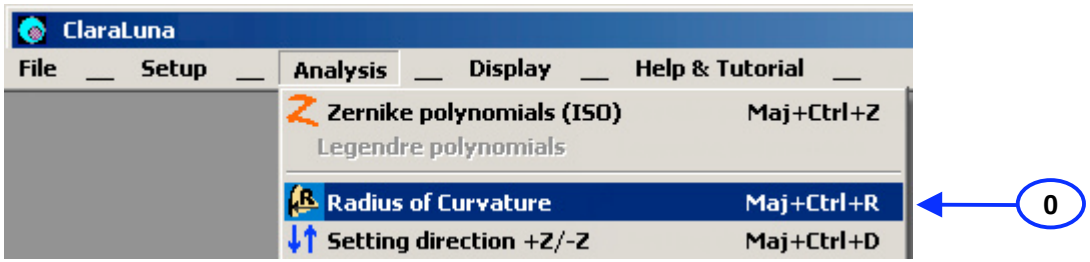
0

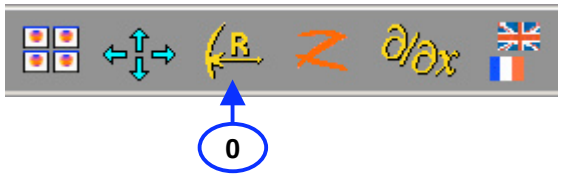
Enter Radius of Curvature window:

- from ClaraLuna main window, menu Analysis
- from Main window toolbar

The radius measurement process needs to compute the part only after some settings.

If a part has already been computed, you need to compute it again.





1

Follow instructions and finally click Launch button

- Select part shape (the sign of the radius changes according to the type convex/concave)
- Make sure the optical axes of the component and the interferometer are adjusted

2

- Set fringes. It is better to adjust the focus and tilt so as to get close to a flat fringe, then set tilt to make fringes. Save origin (Z→0) on the translation scale of the interferometer bench.

3

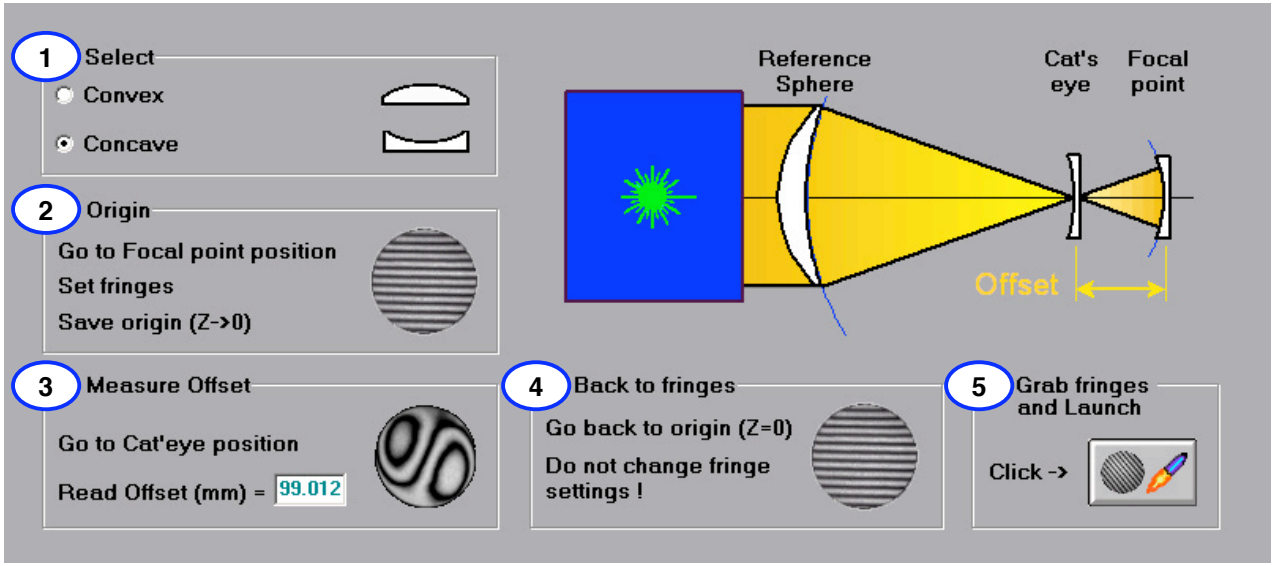
- Go to cat'eye position. Read offset on the translation scale and enter it in edit box (3).

4

- Go back to origin Z=0, without changing the focus settings. This includes not changing the part holder tilt, since this operation usually rotates the part with respect to a lateral axis; thus modifying the focus as well.

5

- Click Launch button (5) to first grab fringe image, then compute it.



14.2 Radius of Curvature for a single part : Enter part settings

1 **The project window shows up**

2 **Call Options**

3 **Enter theoretical radius**

Enter radius tolerance :

4 • **either ISO A specification** (if any)

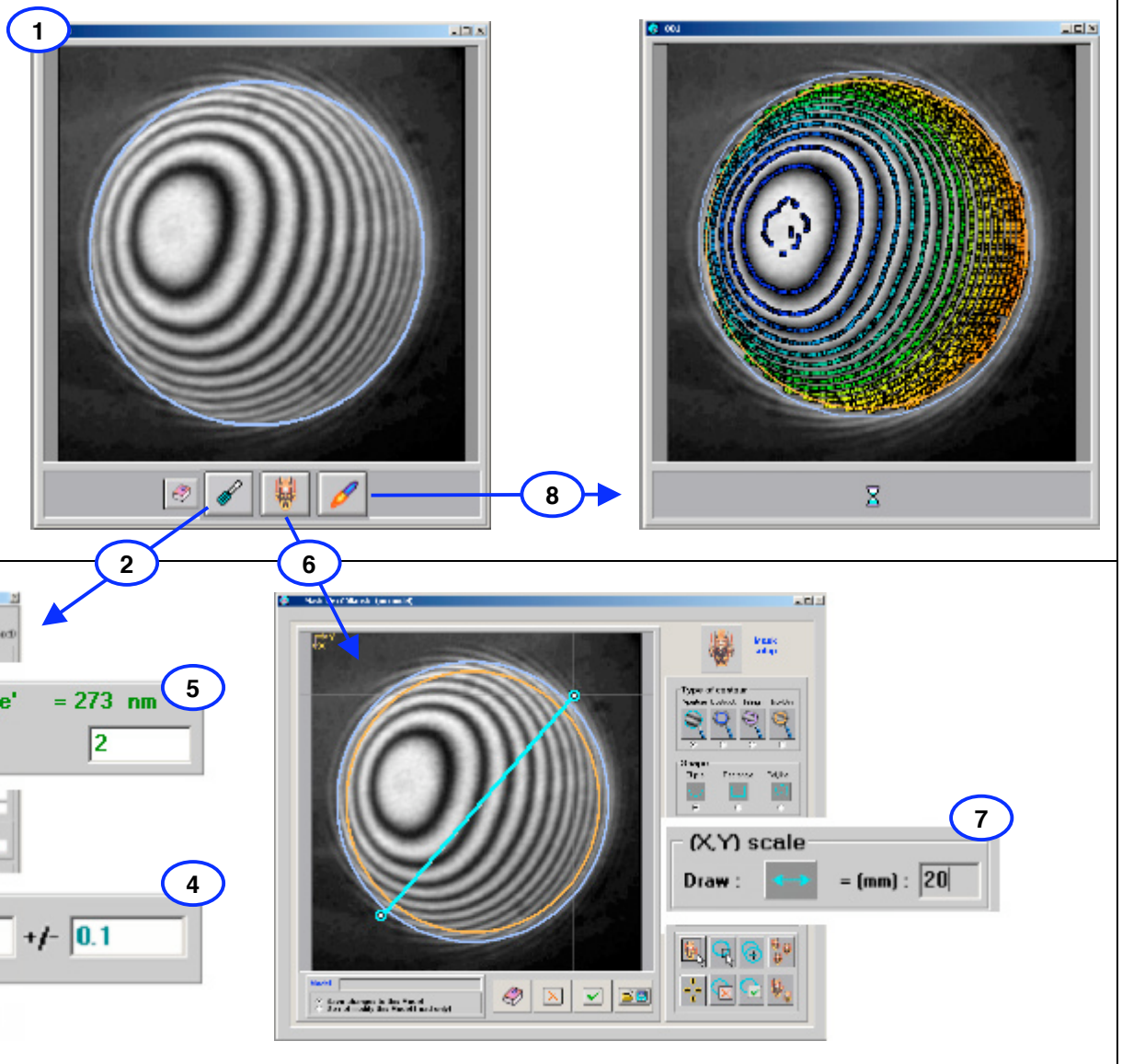
5 • **or Radius tolerance**(if any)

• **but not both** since these two parameters are linked by an equation that involves the aperture radius.

6 **Call Mask editor,**

7 **Adjust mask and enter (X,Y) scale (necessary)**

8 **Compute**



14.3 Radius of Curvature for a single part : Computing

(1) **Check result window and click mouse**

(2) **The Radius window shows up**

(3) **Follow instructions from step 6 : « Checking surface orientation +Z/-Z »**

Unlike phase-shifting interferometry, static fringes interferometry cannot decide whether the reconstructed surface is oriented towards +Z or -Z. Thus the operator needs to add this information by manually shifting the phase : pushing slightly the lens holder towards the interferometer and telling the software in which direction the fringes are moving.

(3) **The specifications are recalled here.** You can still check/modifiy the theoretical radius.

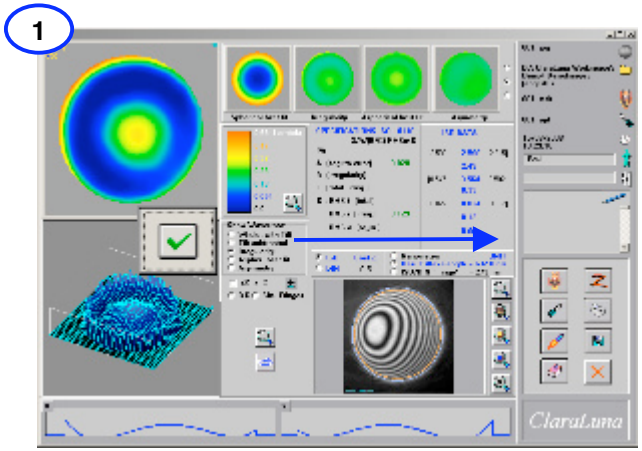
(4) If the tolerance (4) was defined as « R+/-tolerance », it can be modified as well. If tolerance was defined as ISO A, this is recalled by (5) and this parameter cannot be modified here.

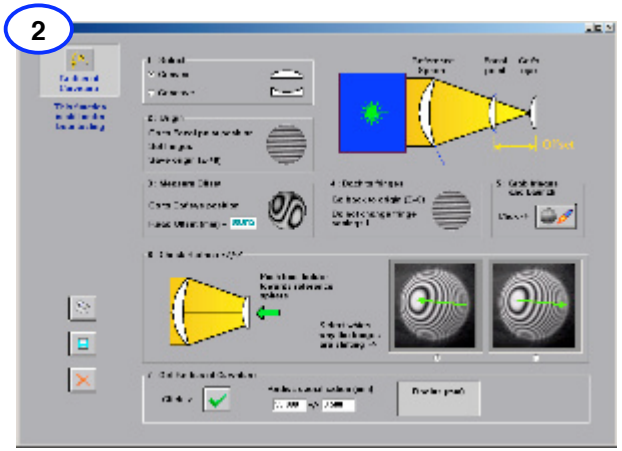
(5)

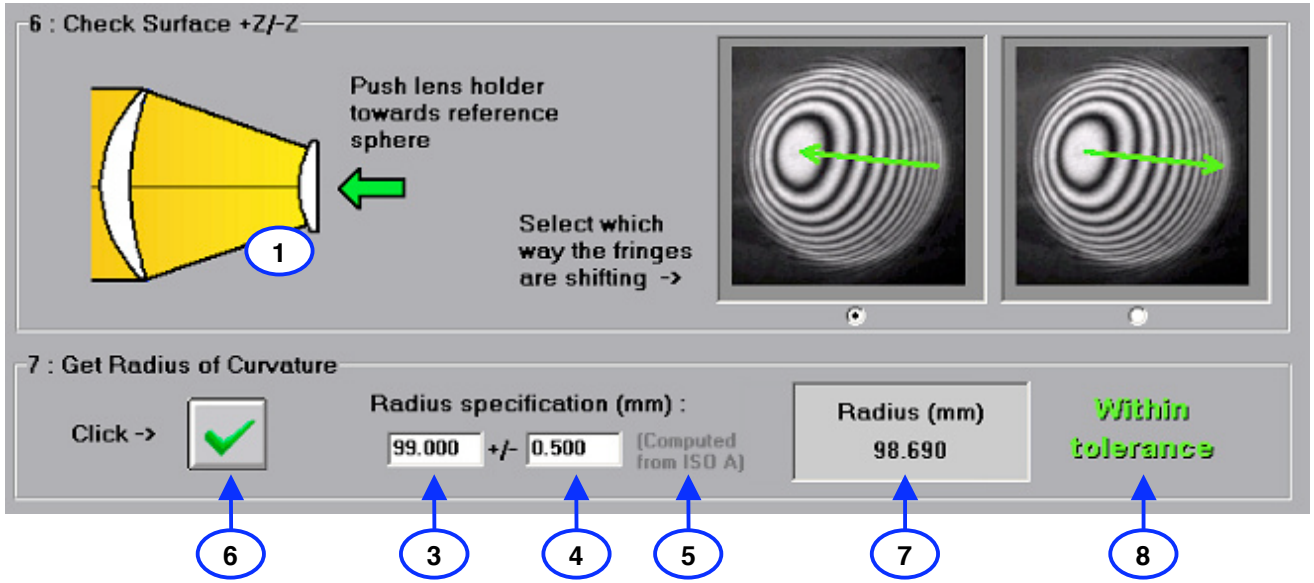
(6) **Click for computing radius.**

(7) **The part radius is shown here**

(8) **and whether the tolerance is met (green) or not (red).**





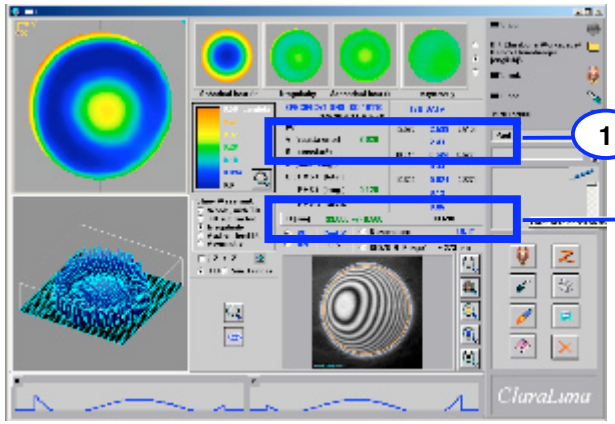


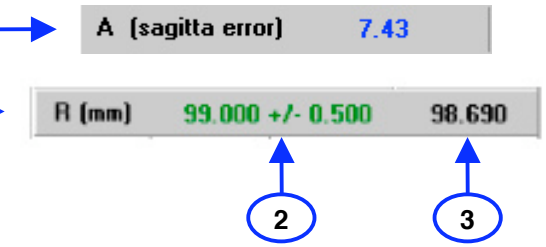
14.4 Radius of Curvature for a single part : Results in ISO/DIN window

(1) **Recall** that the value of ISO A (« power » or « sagitta error » or « SAG ») is the Peak to Valley of the best sphere that fits the wavefront under test, when the reference wavefront has the theoretical Radius of Curvature

Now, this ISO A value is updated on the control report...

(2-3) **and the Radius of Curvature specifications (2) and results (3) are shown**





14.5 Radius of Curvature in Production Mode : Loading series

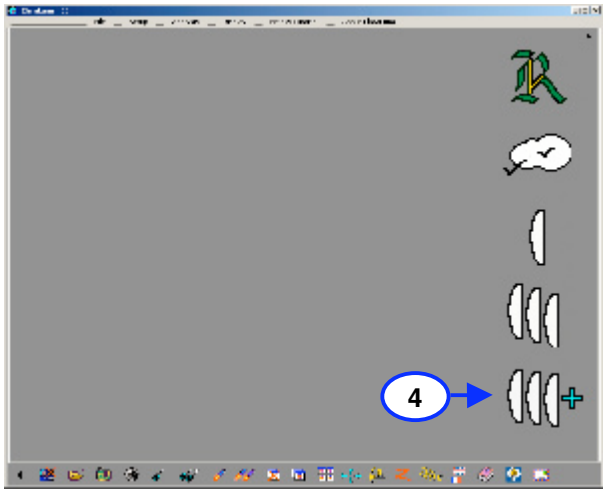
For measuring the Radius of Curvature in Production Mode roceed as in Section 13 :

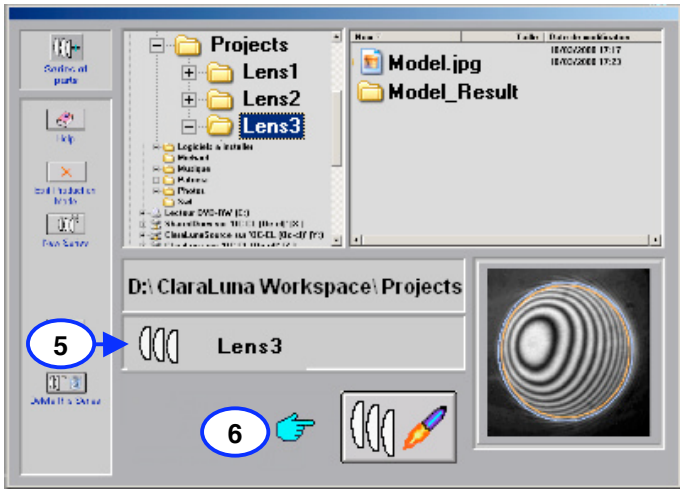
(4) **Enter Advanced Production Mode**

(5) **Create new Series or reload previous Series**

(6) **Activate as current Series**

This closes the Advanced Production Mode window, ready for grabbing images and computing in Production Mode





14.6 Radius of Curvature in Production Mode : Computing - Series control report

From ClaraLuna main window, **proceed just as described** in Sections 14.1 to 14.4 :

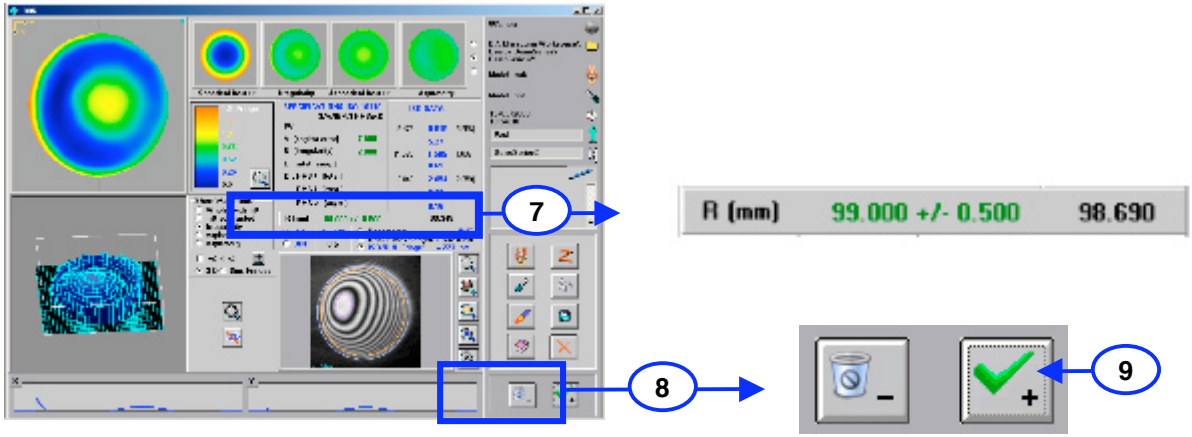
- **call** Radius of Curvature 
- **grab** fringe image from video window
- **compute** without modifying Options and Mask (they are supposed to be definied for the whole Series)

7 8

- finally the **ISO/DIN results window** shows with the Radius of Curvature data (7), together with the Plus/Minus buttons (8) typical of the Production Modes.

9 10

- clicking Plus button (9) includes this part in the Series result control report (11) - see Section 13.7



11

- the Radii of Curvature are listed in the last column.