Struers
Ensuring Certainty

StructureExpert Weld-6
StructureExpert Weld-12

Version 3.30

Instruction Manual

Original Instructions

CE

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1 About this manual

CAUTION
Struers equipment must only be used in connection with and as described in the Instruction Manual supplied with the equipment.

Note
Read the Instruction Manual carefully before use.

Note
If you want to view specific information in detail, see the online version of this manual.

2 About StructureExpert Weld-6/-12

StructureExpert Weld is an imaging tool designed for weld bead control.

Features:

- inverted optical system
- built-in digital camera
- automatic lighting
- focus
- calibration with set magnification
- software-controlled magnification adjustment
- StructureExpert Weld-6: internal light system with 4 ramps of LED that can be controlled simultaneously or individually
- StructureExpert Weld-12: ring light system and optional coaxial illumination

StructureExpert Weld-6

Field of view from ~ 82 to 1.8 mm (~ 3.2" to ~ 0.07")

Equivalent to ~ 2.5x - ~ 120x optical magnification

StructureExpert Weld-12

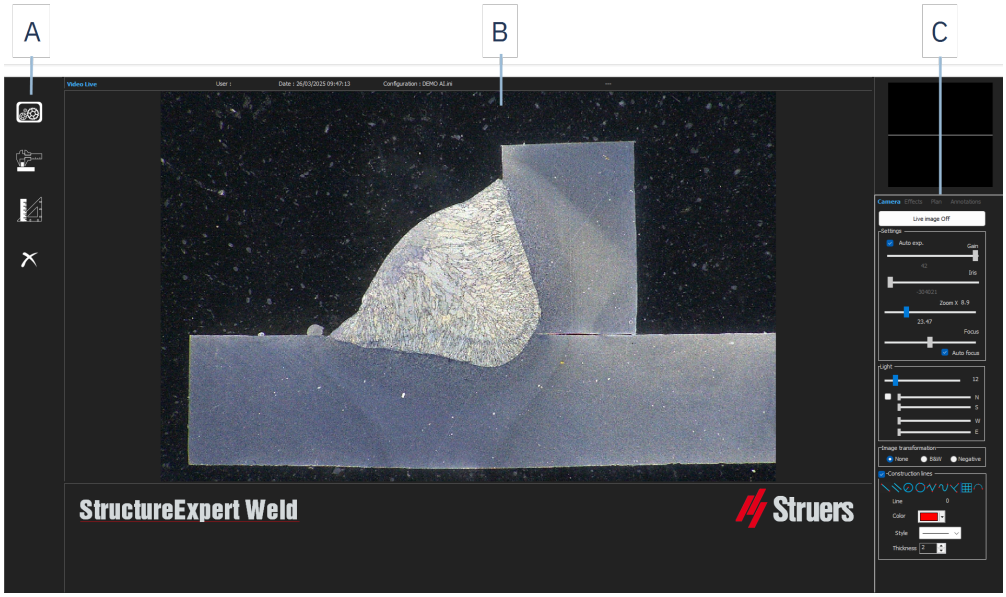
Field of view from ~ 7.7 to ~ 0.71 mm (~ 0.3" to ~ 0.03")

Equivalent to ~ 20x - ~ 240x magnification

3 Installation

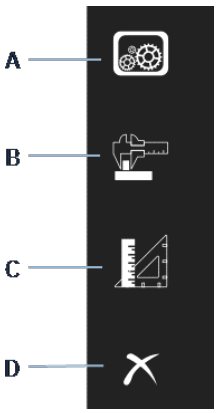
Hint
To install the hardware and software, see the separate Installation Manual that comes with the system for your machine.

4 The display



A Menu panel
B Main view (camera view)
C Control panel

4.1 The menu panel



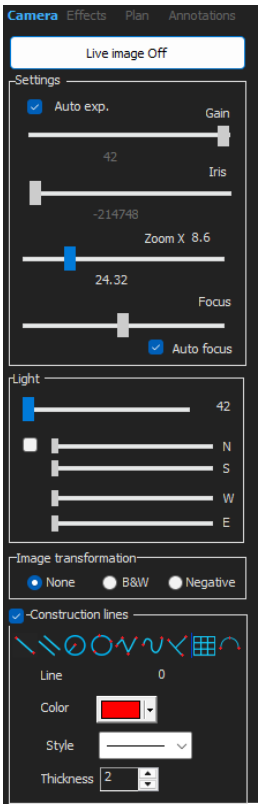
A	**Administration**	**C**	**General Measurements**
B	**Weld Bead Measurements**	**D**	**Exit**

4.2 The main view (camera view)

The main window shows the image you wish to work with. This is where you can see the effects of and work with the settings in the control panel.

4.3 The control panel – overview

Use the control panel to manipulate the image you have taken. See also Control panel ►9.



- **Live image Off/Live On**

  Toggle the button to display the image as live or frozen.

  During live mode, the control panel switches from shaded to active. You can only perform measurements when **Live image Off** is activated.

- **Camera**

  Click this tab to access to the camera controls.

- **Effects**

  Click this tab to access the effects settings.

- **Plan**

  Click this tab to display the drawing associated to the selected weld.

- **Annotations**

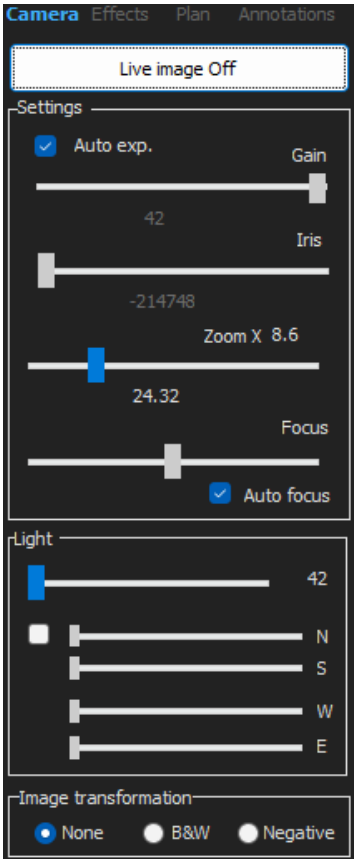
  Click this tab to add texts and arrows to the image. See Add text and arrows ►64.

4.4 Control panel

4.4.1 The tab Camera

When the camera switches on in **Live On** mode, the control panel becomes active and you can access the camera controls.

Settings



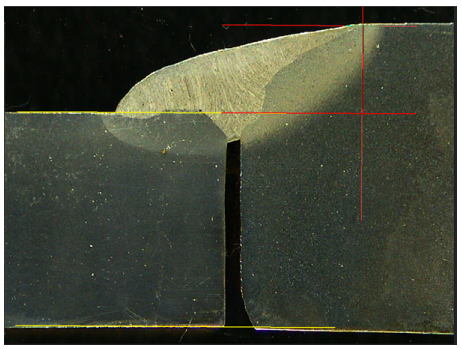
Auto exp.	Automatic camera brightness adjustment.
Gain	Electronic camera sensitivity.
Iris	Zoom aperture. Decrease the aperture to increase the depth of the field range.
Zoom	Global magnification.
Focus	Manual focusing of the image.
Auto focus	Automatic focusing of the image.

Light	The lighting system is controlled from the software. Use the slider to adjust the light intensity. *For StructureExpert Weld-6:* To use the 4 sliders under the top slider, check off the checkbox. Use the 4 sliders to adjust the light intensity individually for each of the 4 segments, from 0 (no light) to full intensity. The units denote the 4 main compass directions: **N(orth)**, **S(outh)**, **W(est)**, **E(ast)**. *For StructureExpert Weld-12:* The lighting system is a ring light, and coaxial illumination is optional.

Image transformation

None	No color
B&W	Black and white image
Negative	Inverted contrast.

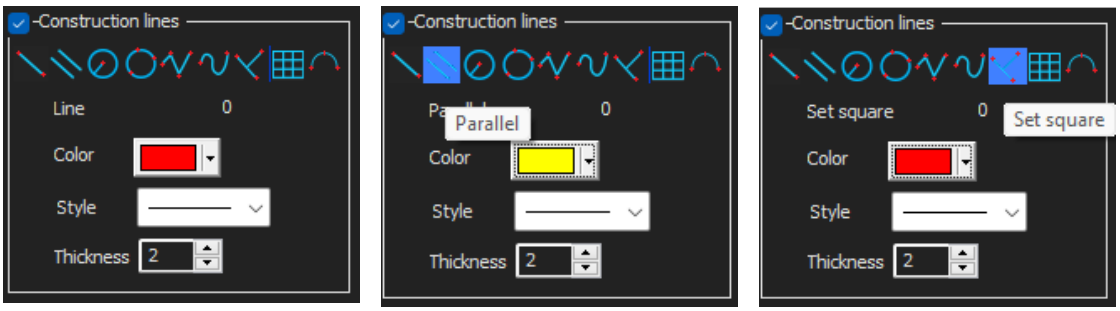
Construction lines



To facilitate the measurement process, you can add construction lines on the live image and on the captured image.

Select one of the construction lines and draw on the live or captured image.

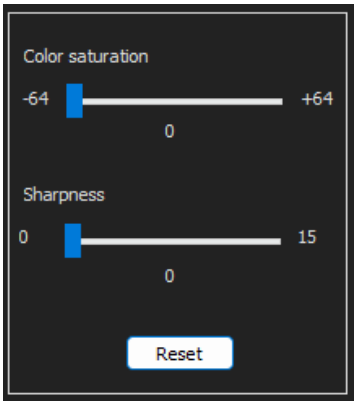
To do so, click the icon you wish to adjust and change the settings. If needed, repeat the process for all icons.



4.4.2 The tab Effects

This tab is only active if the camera is in **Live On** mode.

Color saturation



For adjusting color intensity.

-64: No color

+ 64 : High intensity color

Sharpness

For adjusting the detail level in the image.

Default value: 7

Reset

For resetting values to the default values.

Associate Zoom/Weld Bead / **Dissociate Zoom/Weld Bead**

You can associate an ideal zoom factor for each weld bead. Each time you select a weld bead, the camera zoom will move to the recorded position.

This setting requires system administrator rights.

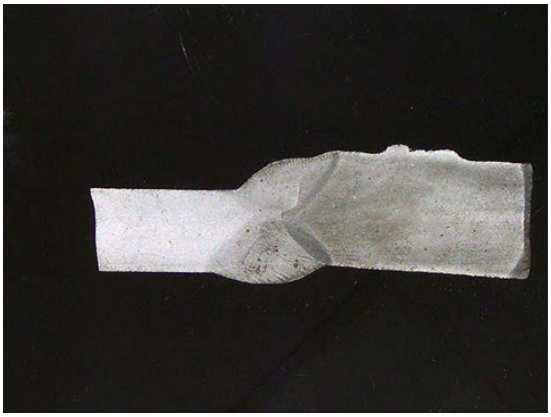
Associate graphic overlay / **Dissociate graphic overlay**

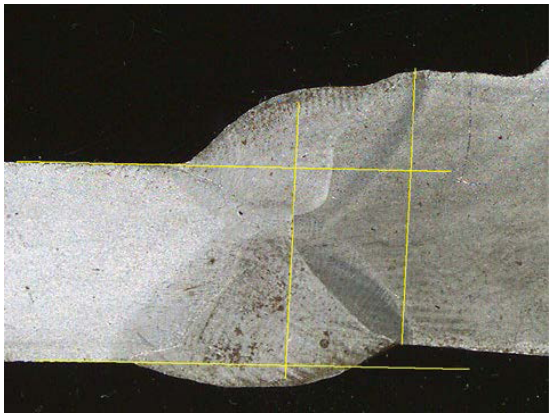
When a zoom is set for a weld bead, this button is active.

You can save the construction lines for a weld bead. When the weld bead is recalled for measurement, the zoom moves to the correct position and the saved construction lines is displayed.

This setting requires system administrator rights.

Defined zoom position with saved overlays:





Rotating an image

After image capture, you can mirror the image in order to have an image orientation similar to the real sample.

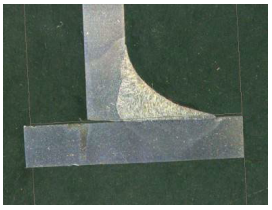
Rotate image

None

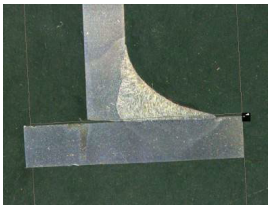
Mirror vertical

Mirror horizontal

1. Right-click on the image.

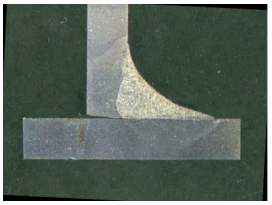


2. Select **Rotate image**.



3. Define the horizontal axis and release the mouse.

   The image is now horizontal.



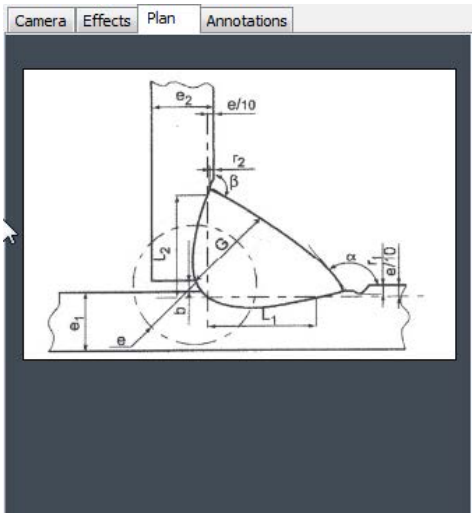
Leds mode eco

When the checkbox is checked: When an image is captured, the light is switched off.

When the checkbox is not checked: The light is always switched on.

4.4.3 The tab Plan

You can display the drawing associated to the selected weld: Click once on the drawing to re-size it.



4.4.4 The tab Annotations

See also Add text and arrows ►64

4.5 Menu for the administration mode

The application interface is easy to navigate, and repetitive tasks can be configured for quick handling.

In **Administration** mode, you can define passwords, create and manage operators and measurement tools.

1. Click **Administration** in the menu panel.
2. The default password to access this mode is "**admin**".

3. The following functions are available:

A **General Description**: Defining general settings of the software related to specific customers. Extra measurement definitions. Accuracy.

B **New Part**: Completely defining specific parts with all weld beads.

C **Modify Part**: Modifying any weld bead from a part.

D **New Operator**: Creating new operator.

E **Operator Management**:

– Managing passwords (adding, deleting, modifying).

– Managining operators (adding, deleting, modifying).

F **Calibrate**: Setting up automatic calibration procedures.

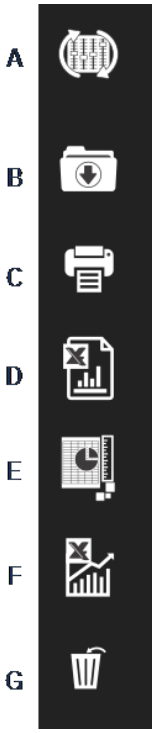
G **Back**: Exiting administrator mode.

H View the serial number of the equipment, the software version, and the activated options.

4.6 Menu for the measurement mode

1. Click **Weld Bead Measurements**.

2. The following functions are available:

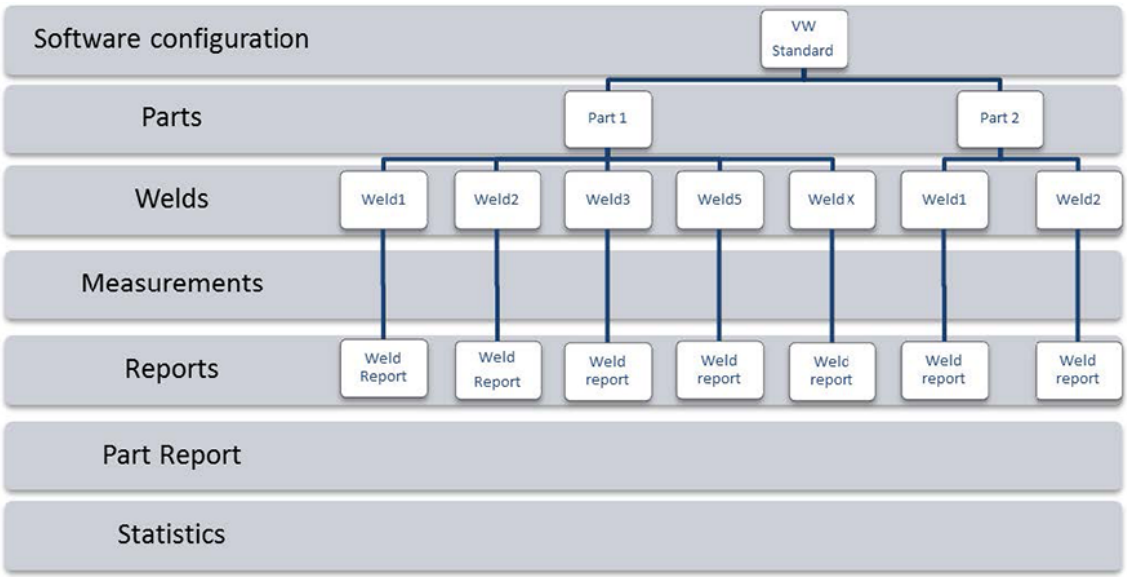


A Change Configuration
B Save Results
C Print Weld Report
D Excel Report
E DataView
F Monitoring
G Reset

5 Configure the software

The first step in configuring the software is to create one or several software configurations according to the required specifications.

For instance, one configuration must be in compliance with the standards of one customer, another configuration must be in compliance with the standards of another customer, etc.



5.1 Create a new software configuration

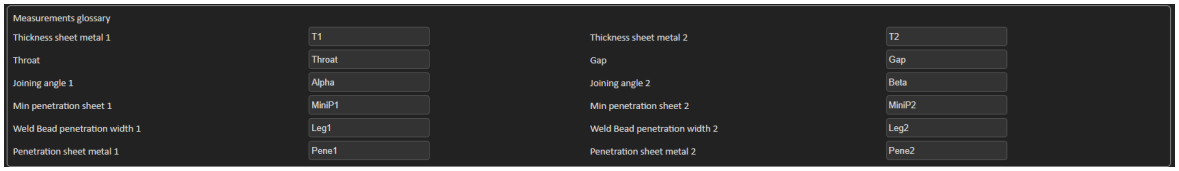
The default software configuration is: **Welding_config**.

Define free fields

Seven free fields are available. The title of each free field must be defined.

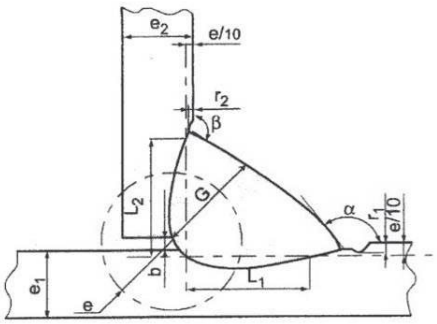
These free fields will be used later to add information about each weld.

Define measurements



There are 12 default measurements in the software, which represent the most common weld measurements.

You can change each measurement title in the **Measurements glossary** (Measurements glossary) area so as to be in compliance with the required standards.

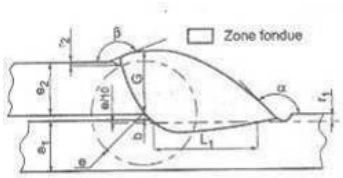


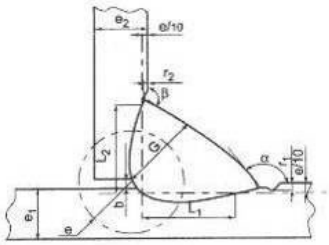
Extra measurements

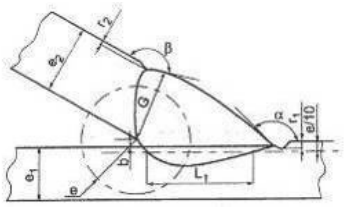
You can create extra measurements, if needed, in the **Enter extra measurement number** area.

The goal is to create all the measurements that will make it possible to process all the samples.

For instance, enough measurements have been created so that the following samples can be processed.

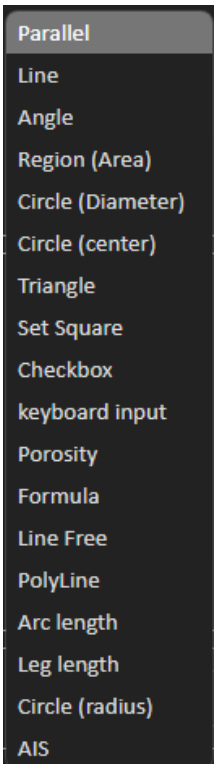






You can add an unlimited number of extra measurements.

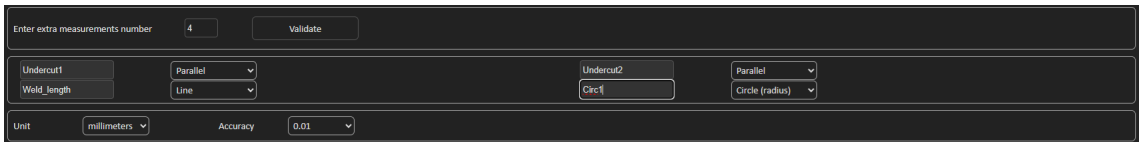
Each new measurement can be defined as follows:



Title	Description
Parallel	The distance between 2 lines
Line	The length of a straight line
Angle	In degrees
Region (Area)	Surface
Circle (Diameter)	Of a 3-points formed circle
Radius	Of a circle formed from its center (the circle is removed after the mouse is released)
Triangle	The height of a triangle
Set square	The height of a set square
Checkbox	For creating a check box
Keyboard input	For creating a keyboard input in the measurement table
Porosity	For evaluating the porosity in % inside a weld
Formula	For creating a measurement which is the result of a calculation between two or several measurements
Line free	The length of a manually drawn line
Polyline	The length of a broken line
Arc length	The length of an arc circle
Leg length	The measurement between 2 points
Circle (radius)	Of a circle formed from its center (the circle is shown after the mouse is released)
AIS	Not implemented (Automatic Image Segmentation)

For more information about measurements, see Measurement tools ►39.

- Add the number of the extra measurement.



Optional comments

In the **Optional comments** area you can add information about the weld in three **Title** fields. E.g. serial number, fabrication date, etc.

These three fields are very important if you wish to sort results after the measurement process :For instance according to data sorting, report creation, statistics, etc.

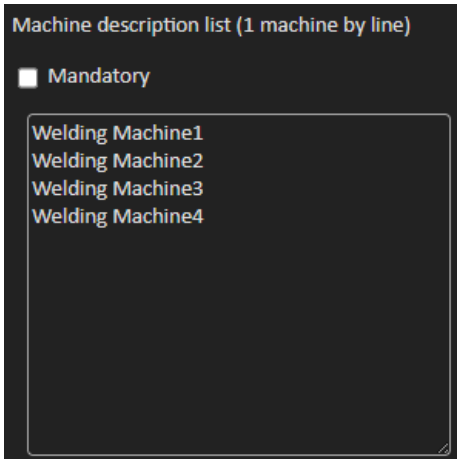
Each **Title** field creates an information area to be filled in during the measurement process.

The first comment field, often defined as the batch number is a sorting key, enabling to create a report using for instance this batch number.

If you wish to set a field as mandatory, check off the **Mandatory** checkbox. During the measurement process, results cannot be saved until the field is filled in.

Machine description list

In the **Machine description list** area you can enter the name of each welding machine, or each welding fixture, etc....



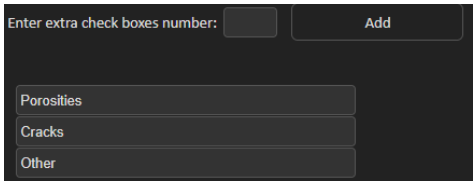
You can use this area used as a sorting key when you create a report.

If you wish to set a field as mandatory, check off the **Mandatory** checkbox. During the measurement process, results cannot be saved until the field is filled in.

Checkboxes for visual defects

In the **Enter extra check box number** area you can specify weld bead quality by making a visual check of the samples.

You can define an unlimited number of defects which must be verified during the measurement process: Porosity, cracks, etc...



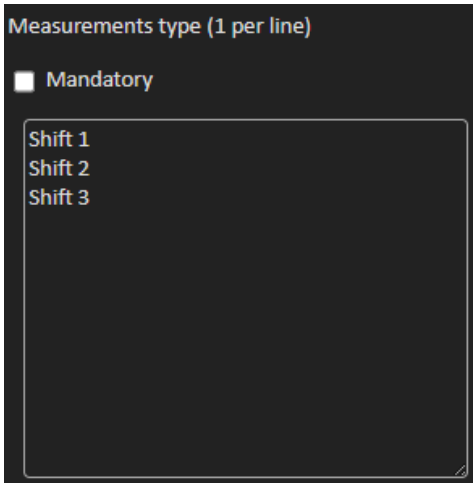
During the measurement process if a visual defect is activated, automatically the associated weld will be considered as NON CONFORM in the software, reports, etc.

If you wish to set a field as mandatory, check off the **Mandatory** checkbox. During the measurement process, results cannot be saved until the field is filled in.

Measurements type

The measurement type is an important sorting key for report editing.

You can identify each measurement series: Shift 1, Shift 2, Series 1, Series 2, Prototype, Production start, etc.



If you wish to set a field as mandatory, check off the **Mandatory** checkbox. During the measurement process, results cannot be saved until the field is filled in.

Save a configuration

Note
Do not copy/paste data from one configuration to another, as it will create a range of software issues.

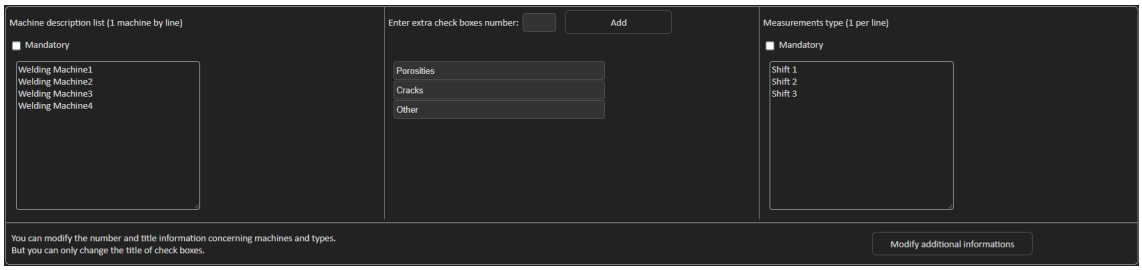
Note
A saved configuration cannot be modified. It must be saved under a different name.

When you have defined the new configuration, click the **Save Config** button to save the configuration.

Use the drop-down list to select the desired configuration.

Modify a configuration

You can modify the configuration in the areas shown.



For checkboxes only the titles can be modified, not the number of checkboxes.

Make the required changes and click on **Modify additional information**.

6 Launch the software

- To launch the software, click the icon on the desktop.

7 Create parts and welds

Create a part

1. Click **New Part**.

2. Enter the part name in the **Enter new part identification** field.
3. Click **Validate**.

Create or modify a weld bead

Usually, for a complex part with many welds there are " x master" welds which are repeated x times on the part. We therefore recommend that you create these master welds and change their names to create other welds having the same characteristics.

When the part is created, a configuration table is shown.

1. Identify the weld bead and, if needed, the free fields attached to the weld bead.

   The only mandatory field is **Weld bead identification**, where figures and letters are allowed.

   Other fields are optional fields.

> **Note**
> The weld name must not start with 0 (0 is automatically removed by the software if used as first character).

The classification of weld names is done alphanumerically, so in order to prevent sorting issues in the software as well as in the reports, we recommend that you prefix the weld names with the following system of digits.

_001

_002

_003

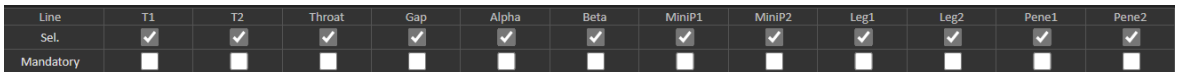
_012

_111

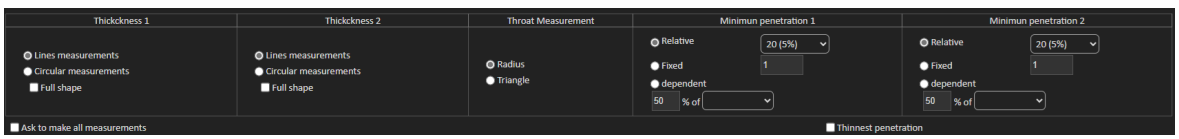
_223

_.....

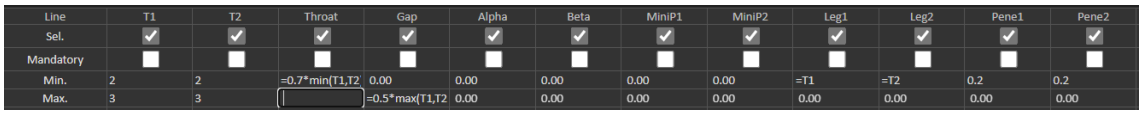
2. Click all the measurements required for the weld bead.



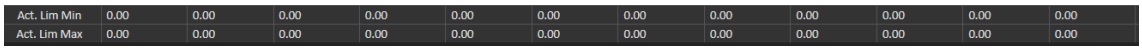
3. Check off the **Mandatory** checkboxes, as needed.
4. Select drawing options **Thickness 1**, **Thickness 2**, **Throat Measurement**.



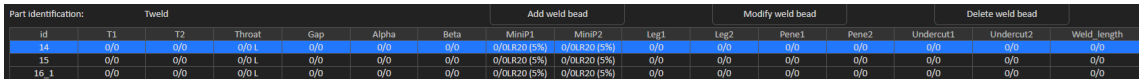
5. Enter the acceptance criteria, if needed.



6. If the option “Min & Max Action Limit” module has been purchased with the system, you also have access to the Action Limit Mininimum and Action Limit Maximum fields **Act. Lim Min** and **Act. Lim Max**.



7. Click on **Add weld bead**.



Or

8. Select an existing weld bead in the list. Modify it as requested. Apply a new name. Click on **Add weld bead**. A new weld bead is defined.

Or

9. Select an existing weld bead in the list. Modify it as requested. Click on **Modify weld bead**.

Deleting a weld bead

1. To delete a weld bead, select an existing weld bead in the list. Click on **Delete weld bead**.

The minimum penetration depth feature

The following measurements names are used as an example:

R1/**R2**: Minimum penetration line

L1/**L2**: Metal sheet thickness

PS1/**PS2**: Penetration of the weld into the metal sheet

R1 and **R2** lines are automatically drawn while drawing **L1** and **L2**.

Value relative to plate thickness

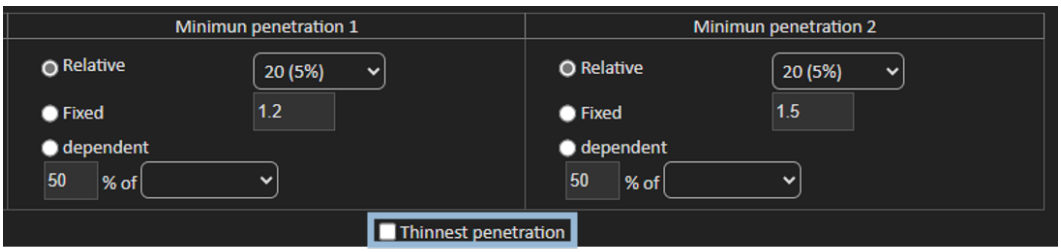
R1 and **R2** are defined as a fraction of metal sheet thickness.

R1 and **R2** are defined by L/n of L1 and L2 (usually 1/7th or 1/10th).

R1 and **R2** can also be defined as the smallest computed value between the two metal sheets thickness.

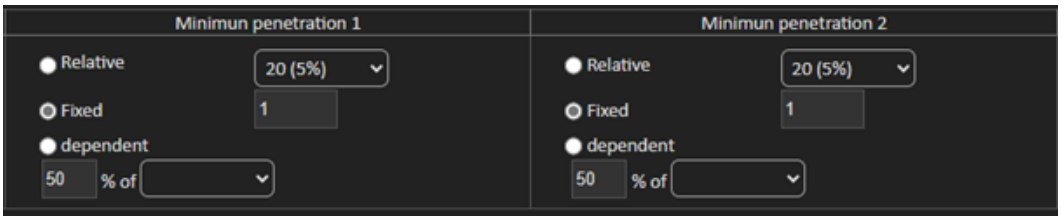
When you use this feature, measure **L1** and **PS1**, and immediately afterwards **L2** and **PS2**. Finally, click on the **Min** icon to display a penetration depth equal to the thinner value. Complete the job for the other measurements (penetration width, angles, etc.).

- Check off the checkbox **Thinnest penetration**.



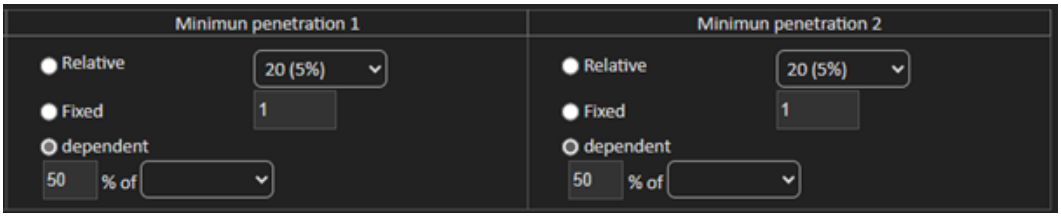
Fixed value

R1 and **R2** can also be defined by a fixed value.



Dependent value for penetration with effective width

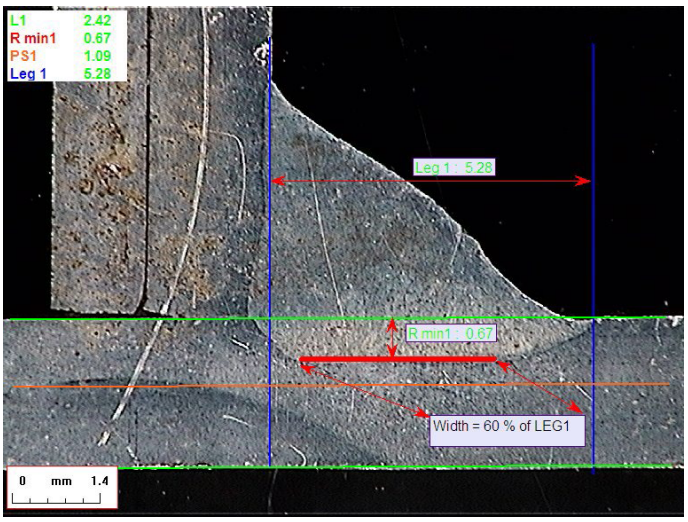
Flat metal sheet or circular metal sheet)



Procedure - while creating a weld

1. For minimum penetration, enable the item **dependent**, and select from the drop-down menu for extra measurements. In our example below called **LEG1**.
2. Measure **LEG1**.
3. Draw the **L1** line and adjust the **PS1** line.
4. The software will automatically draw the **R1** line with a length of 60% of the **LEG1**measurement.
5. Move the **R1** line inside the weld as deep as possible.
6. The **R1** measurement result is the distance between the **R1** line and the surface.

In the graphic, the main measurement is shown as **Rmin1**.

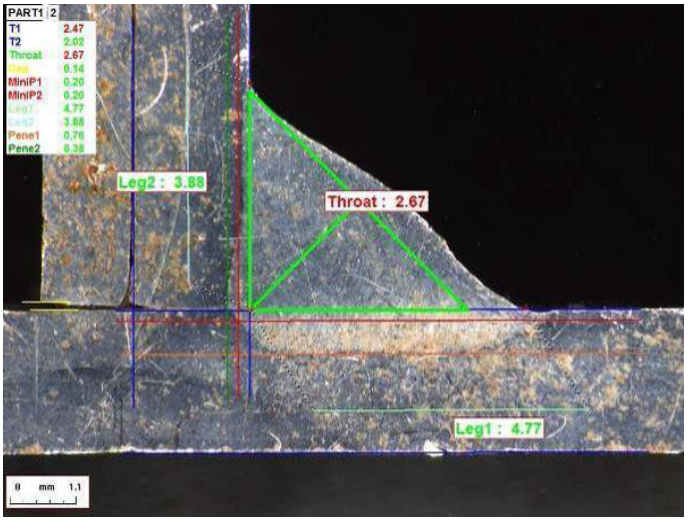


Metal sheet thickness

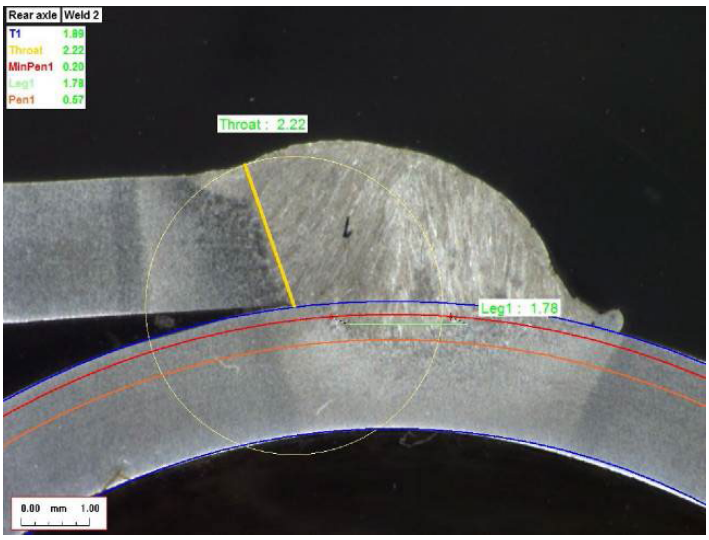
3 options are available for thickness measurement:

- Line measurements
- Circular measurements
- Circular measurements with full shape

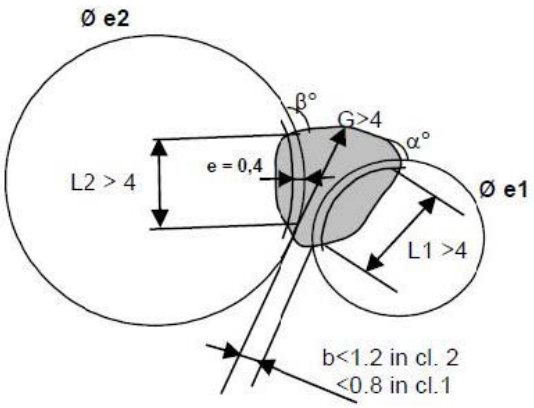
Line measurements: When the metal sheets are flat.



Circular measurements: When the metal sheets are circular.



Circular measurements with full shape: Metal sheet and a full rod.



When you define the measurements of the rod, do the following:

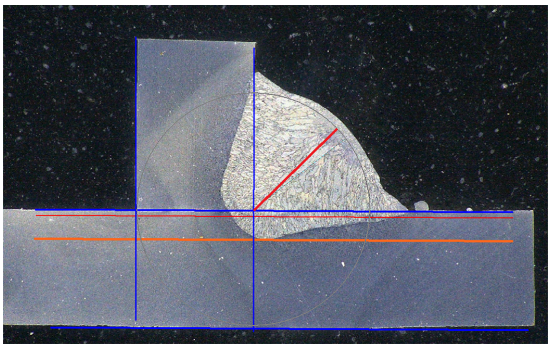
1. Enable **Circular measurements**.
2. Check off the checkbox **Full shape** (Full shape) (below thickness 1 or 2).
3. Enable **Fixed** (below penetration 1 or 2).
4. Define the penetration in mm.

   When you measure the part, the rod edge must be defined with 3 points (perimeter). The software automatically draws up to 3 concentric circles (the edge, the minimum penetration and the real penetration which has to be adjusted). The 3 circles have the same center.

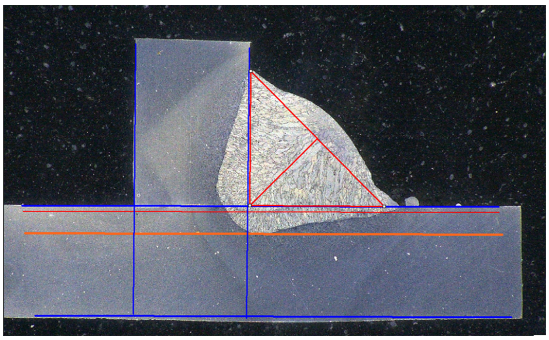
Throat measurement

2 options are available for throat measurement:

For more details, see Line (in fact circle) ►44 and Triangle (isosceles rectangular triangle) ►44.



Radius measurement



Triangle measurement

Acceptance criteria

In the software you can control measurements according to acceptance criteria.

Measurements results will appear in:

Green:	Inside the acceptance criteria /without acceptance criteria
Red:	Outside the acceptance criteria

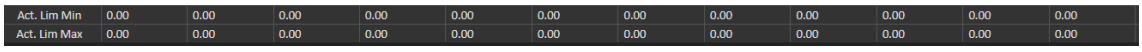
Acceptance criteria can be defined with a maximum or minimum value or both.

Fixed acceptance criteria

When you create a new weld, you can enter your acceptance criteria in **Min.** or **Max.**.

- You can enter a mininum and a maximum value, or only a minimum or a maximum value.

  If you do not enter acceptance criteria, measurement values will always be shown in green.



Acceptance criteria with formulas

Acceptance criteria can also be defined through formulas.

Note
Failure to follow these instructions may cause errors in processing results in the backup files as well as in Excel reports and statistics.

Formulas must start with the character '=' (equal to).

Allowed arithmetic operators:	+ - * /
Mathematical factors:	Example: Use a decimal point (.), not comma (,) as in 0.7

Allowed mathematical functions:

Min (minimum of 2 values) – see table below.

Max (maximum of 2 values) – see table below.

Sqrt (square root), labelled as =sqrt(l1)

Calc (calculation), =0.7*calc(t1+t2+t3)

Pow (power of), labelled as =pow(x,y) Example =pow(l1,2) to define the square of L1

Cos (cosinus of)

Sin (sinus of)

Formulas must refer to the name of the measurements.

Note
Do not use spaces and special characters in measurements names.

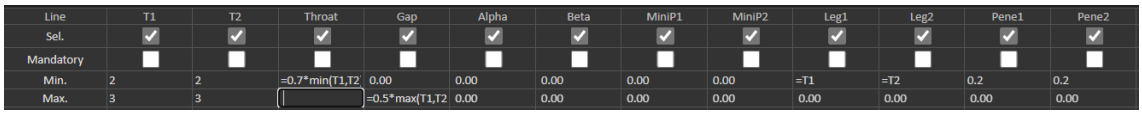
Example: =0.7*min(L1,L2).

- Min (minimum of 2 values)
  - Calculation of min value between L1 and L2
  - Calculated min value is multiplied by 0.7 (70%)
- The 2 measurements to be compared must be separated with **,** (comma)
- Parentheses must enclose values of the function if there is more than one measurement to be compared. When there is just one measurement, do not use parentheses Example: 0.5*L1

Note
Failure to follow these instructions may cause errors in processing results in the backup files as well as in Excel reports and statistics.

VW STANDARD	StructureExpert Weld FORMULA	
A ≥ 0.7 Tmin	A Min Value	=0.7*min(T1,T2)
B ≥ Tmin	B Min Value	=min(T1,T2)
H ≥ Tmin	H Min Value	=0.25*min(T1,T2)
H ≤ 0.5Tmin	H Max Value	=0.5*max(T1,T2)
B ≤ 0.3T1	B Max Value	=0.3*T1
B ≤ 0.3T2	B Max Value	=0.3*T2

FIAT STANDARD	StructureExpert Weld FORMULA	
LP1 ≥ 60% T1	LP1 Min Value	=0.6*T1
PS1 ≥15 % T1	PS1 Min Value	=0.15*T1



Line	T1	T2	Throat	Gap	Alpha	Beta	MiniP1	MiniP2	Leg1	Leg2	Pene1	Pene2
Sel.	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Mandatory	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Min.	2	2	=0.7*min(T1,T2	0.00	0.00	0.00	0.00	0.00	=T1	=T2	0.2	0.2
Max.	3	3		=0.5*max(T1,T2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Any subsequent modifications in the acceptance criteria will have implications on the use of Excel files for statistical purposes.

We recommend 2 solutions:

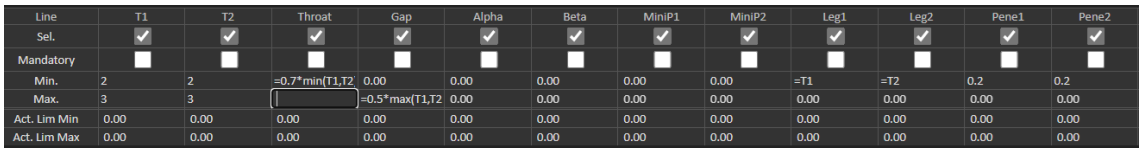
1. Modify the whole Excel file for a dedicated part/weld bead couple, so that the new statistics include the modifications .
2. Copy the whole part/weld bead file into a new empty configuration file. The modifications will be applied only to future measurements.

Min & Max Action Limit

If the Min & Max Action Limit Module has been purchased with the system, additional settings are available.

Act. Lim Min

Act. Lim Max.



Line	T1	T2	Throat	Gap	Alpha	Beta	MiniP1	MiniP2	Leg1	Leg2	Pene1	Pene2
Sel.	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Mandatory	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Min.	2	2	=0.7*min(T1,T2	0.00	0.00	0.00	0.00	0.00	=T1	=T2	0.2	0.2
Max.	3	3		=0.5*max(T1,T2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Act. Lim Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Act. Lim Max	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The same rules apply for the definition of values: Fixed values, formulas etc....see previous section.

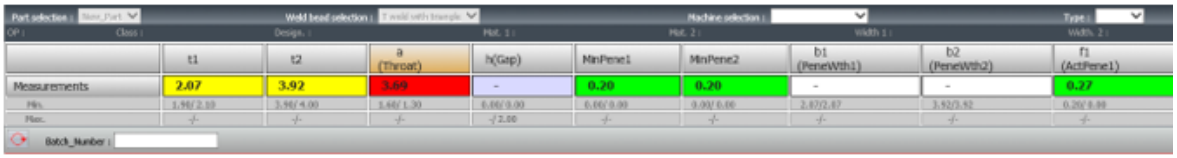
With minimum and maximum acceptance criteria, measurement results will appear in:

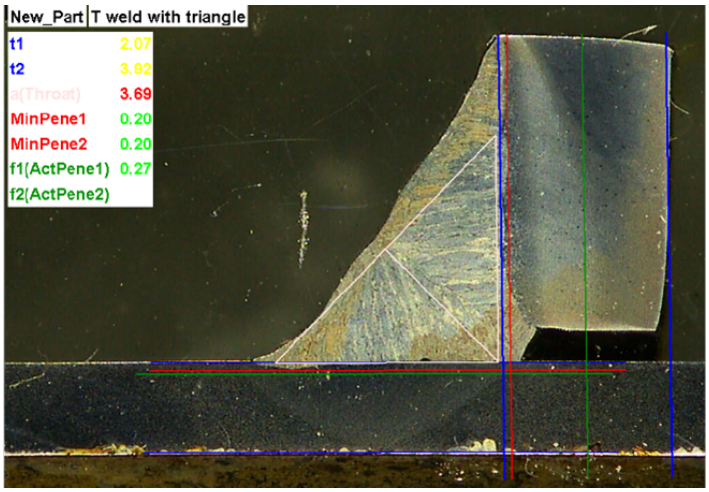
Green:	Inside the acceptance criteria /without acceptance criteria
Red:	Outside the acceptance criteria

With the Min & Max Action Limit Module measurements results will appear in yellow if they are :

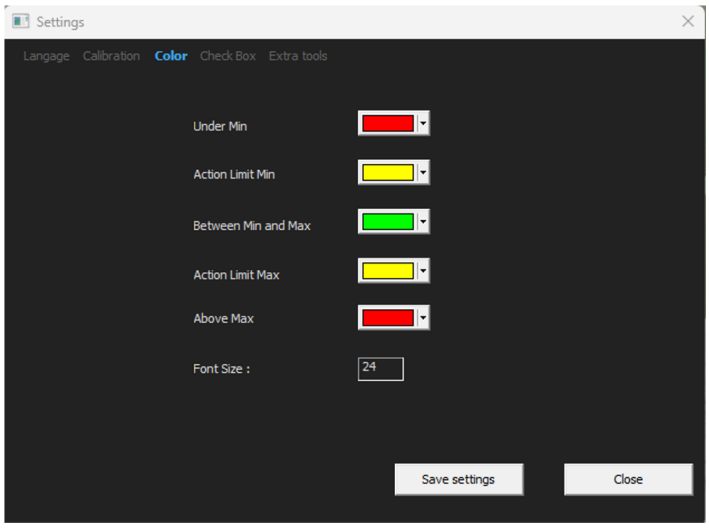
Between : **Min.** value/**Act. Lim Min**

Between : **Max.** value/**Act. Lim Max**





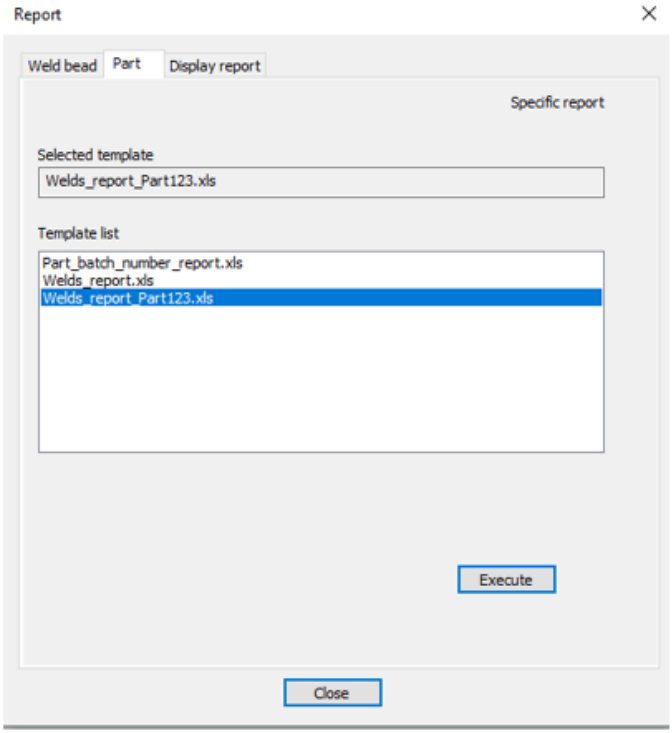
- To change these colors, use thefile Settings.exe in the installation folder of the software.



With the Min & Max Action Limit Module, additional reports are available in the software:

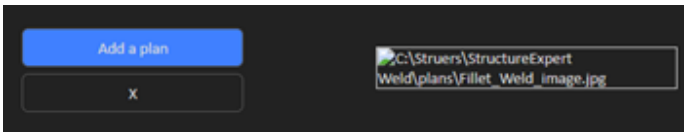
- Part_batch_number_report.xls
- Welds_report.xls

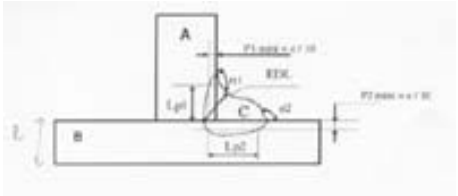
These are two spefic reports where yellow is taken into account. If other reports are used, only red and green are taken into account.



Associate a plan to a weld bead

You can add a schematic with each weld bead to a measurement. The image must be in the .jpg format, preferably with a width of 200-pixels.





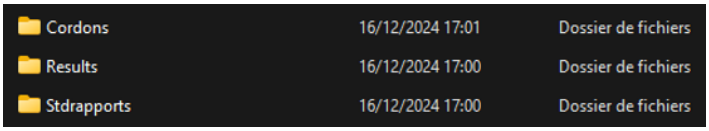
In the measurement part, this image will be shown under the tab **Plan**.

8 Modify parts and welds

Remove a part from your configuration

1. Close the software SEW 6 or 12.
2. Go to the software folder in the Windows Explorer, for instance "C:\Struers\StructureExpert Weld-6 v3 30".
3. Go to the folder by the same name as your configuration, for example "C:\Struers\StructureExpert Weld-6 v3 30\Your_own_config".

4. Open the directory, and you will find 3 folders:



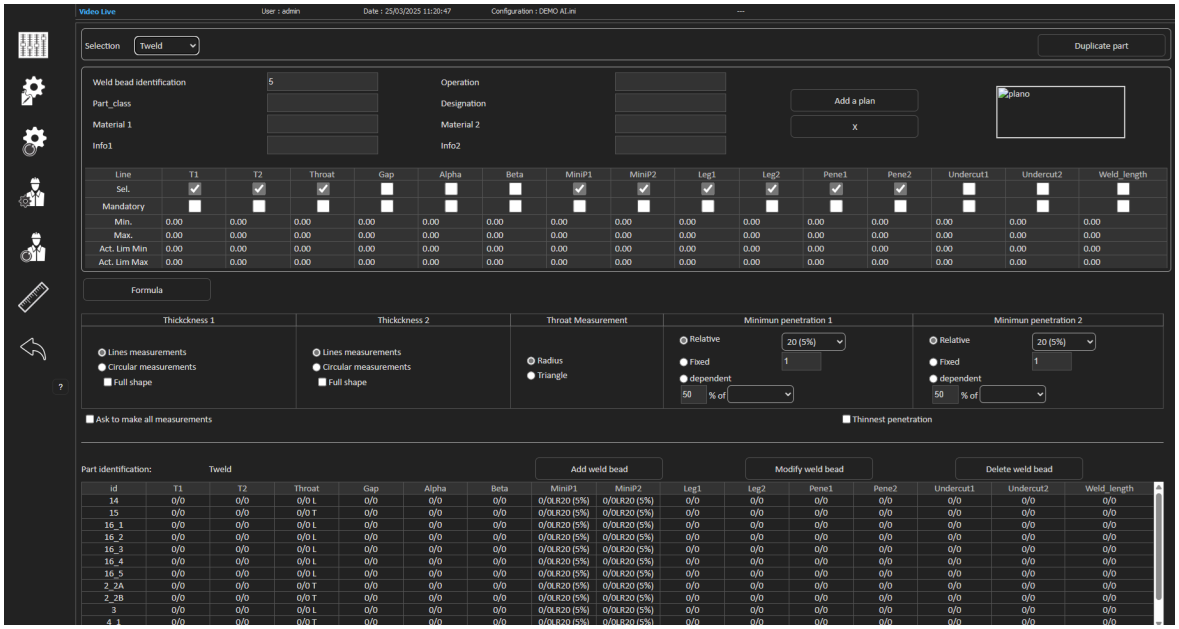
5. Open Cordons to see all the parts.

6. To delete one of the parts, tick off the part to delete and right-click on Remove to trash.

If you are not sure, it is better to use Cut and move the file to another folder. If you move it to the Cordons folder, you can use the part in the future

Add new part

1. Click **New Part**.



Add a weld bead

See the procedure for creating a weld bead.

Modifying a weld bead

1. Select an existing weld bead in the above table
2. Make the changes.
3. Click on **Modify weld bead**.

The changes in minimum and maximum acceptance criteria for weld bead that already have a results file will have consequences for statistics. The software will prompt you to change the minimum and maximum in the results file or not, and in this case recommends creating a new configuration.

Deleting a weld bead

Select an existing Weld bead in the above table and click on **Delete weld bead**.

9 Duplicate a part

1. To duplicate a part, select the part to duplicate.
2. Click **Duplicate part**.
3. Enter the name of the new part.

Note
Only the part is renamed, not the weld beads.

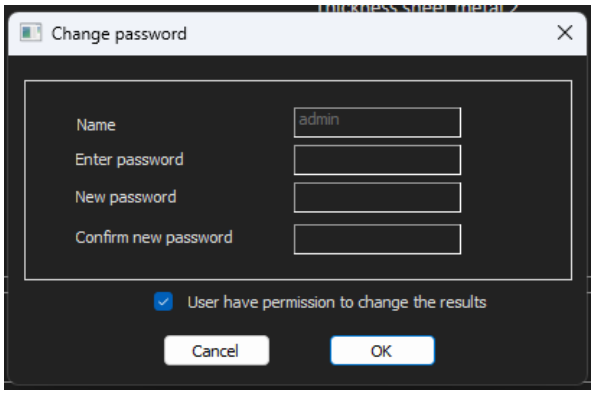
10 Create and manage operators

Each operator needs a log-in and a password to have access to the measurement part.

Create an operator

1. Click **New Operator**.

2. Enter the name of the operator in the **Name** field.



3. Enter the password of the operator in the **Enter new password** field.
4. Confirm the password in the **Confirm new password** (Confirm new password) field.
5. If you wish to grant the operator access to remove measurements and redo measurements in the dataview module, check off the checkbox **User to have permission to change the results files**. See also The DataView module (option) ►88

Modify an operator's access rights

1. Click **Operator Management**.

2. Select the operator from the **Operator list** drop-down list.
3. Click **Modify**.

4. To change the operator's password, enter the current password of the operator in the **Enter password** field.
5. Enter the new password of the operator in the **New password** field.
6. Confirm the password in the **Confirm new password** field.
7. If there is a check mark in the box **User have permission to change the results files**, the operator is authorized to remove measurements and to redo measurements in the dataview module. See The DataView module (option) ►88.

Delete an operator

1. Click **Operator Management**.

2. Select the operator from the **Operator list** drop-down list.
3. Click **Delete**.

11 Calibration

The system includes a step-by-step motorized optical zoom. This optic is controlled by the software.

The calibration stage provided with the system is as follows:

StructureExpert Weld-6	50 mm long with 1 mm divisions
StructureExpert Weld-12	10 mm long with 0.2 mm divisions

The software automatically calculates the calibration for each zoom position.

StructureExpert Weld-6	Zoom range covers a field of view (FOV) from 82 mm to 1.8 mm
StructureExpert Weld-12	Zoom range covers a field of view (FOV) from 7.6 mm to 0.7 mm

The software must be calibrated by the administrator after installation of the hardware and software.

1. Adjust the camera zoom to its highest magnification.

2. Place the calibration stage in order to have the drawings in the vertical direction.

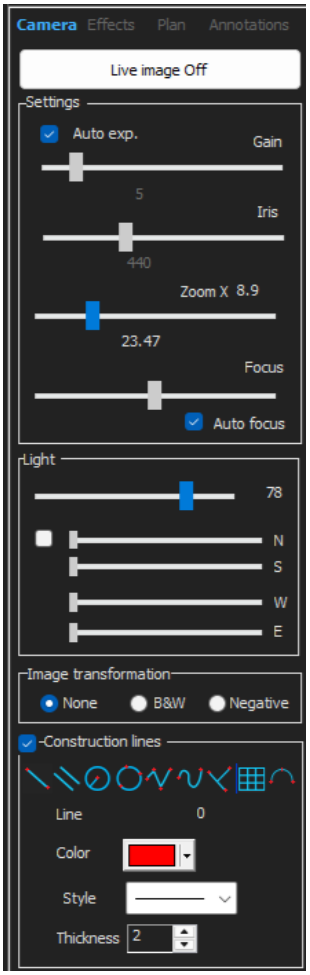
3. Adjust light and camera settings to have a good contrast between the micrometer background and black lines, or activate the auto exposure feature.

   To ease the automatic calibration, adjust the light almost at the maximum and select the setting **Auto exp.**

   If you turn on the light at 2/3 of the maximum, the iris turn closed and the depth of view increases.

4. Make sure that the focus is correct. When you have done so, uncheck the autofocus feature.

5. Adjust the camera zoom to its lowest magnification.



6. Click the icon **Calibrate**.

7. Select **OK**.

FOV (Field Of View)

Detection of vertical black bars and drawing of green lines along the detected black lines are carried out automatically. The software automatically repeats the calibration process on all zoom ranges.

If the automatic detection is not correct (each full vertical bar must be detected) a message is shown.

Modify the camera settings and/or the light conditions to ensure a better contrast, and return to the icon **Calibrate** (the bars must appear as dark black without clearer edges or holes). **B&W** conditions are recommended. See Control panel ►9.

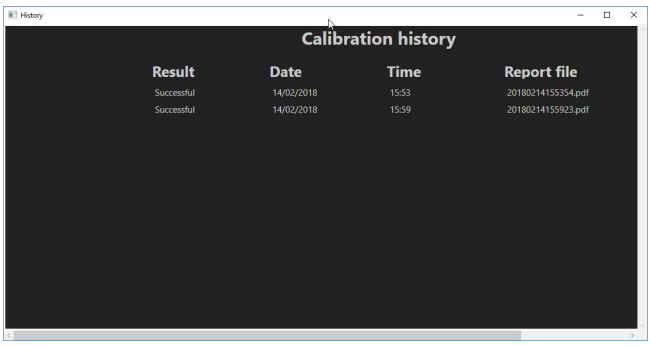
Note
For StructureExpert Weld-12 systems, additional steps are required before calibration of the system. See the document “Optimising Settings WeldingExpert-11.pdf”.

11.1 Calibration reports and calibration

The **CalibrationHistory.exe** tool is located in the installation folder of the software.

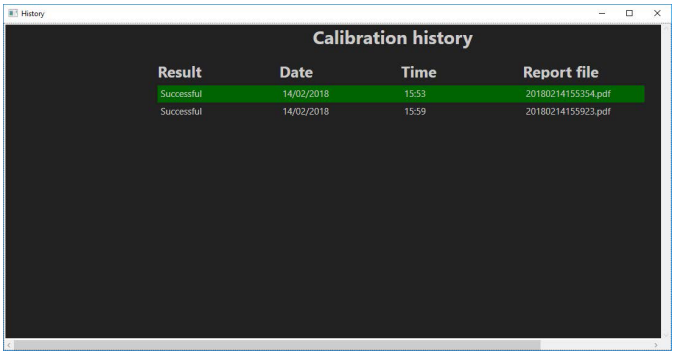
To view calibration reports:

1. Execute the file **CalibrationHistory.exe**.

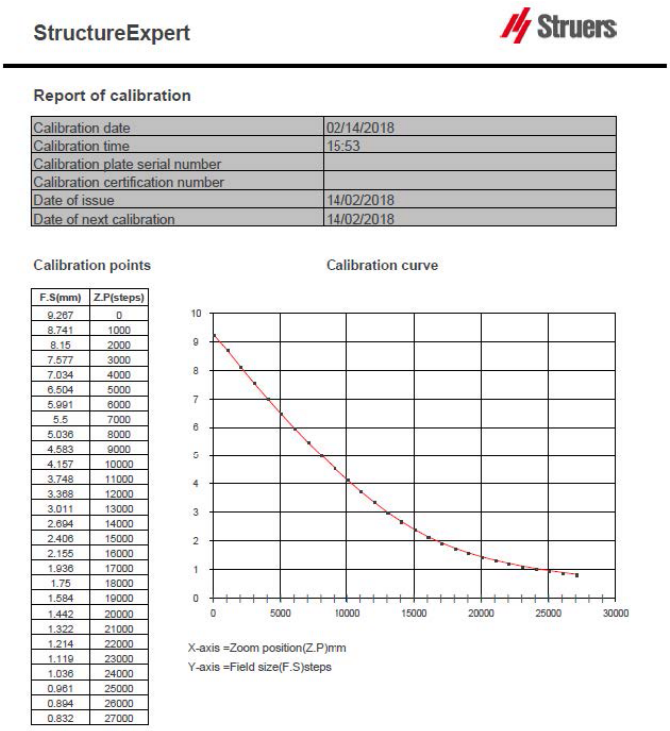


All the calibrations attempts (successful or failed) can be reviewed.

2. Open a calibration report.



3. Double-click on the line to open the calibration report

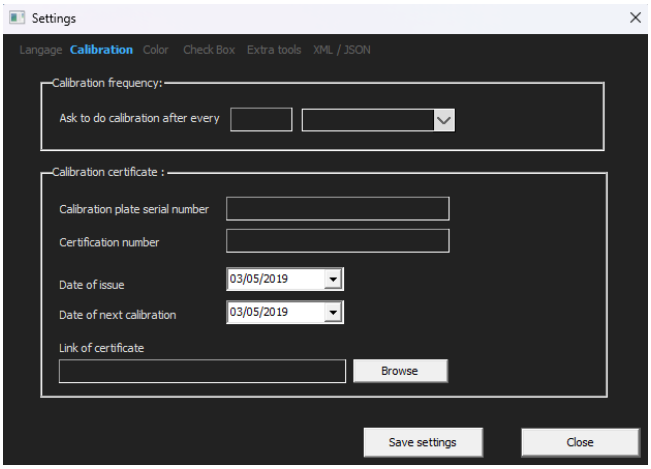


Adding additional information to the calibration report

You can add additional information to the calibration report (e.g. calibration plate, certificate number, etc.).

1. In the installation folder of the system, launch **Settings.exe**.

2. Click the tab **Calibration** to add information.



Calibration frequency

If needed, set the calibration frequency in the fields **Calibration frequency**.

If the calibration has expired, you will be prompted to recalibrate the system.

Exiting administrator mode

1. Click **Back** to exit administrator mode.

12 Measurement tools

Hint
To draw a perfect horizontal or vertical line press the **Shift** key on the keyboard when you draw the line.

Hint
Measurements can be modified using the white handles of drawings.

Hint
A click outside of the measurement area allows selection of another measurement tool.

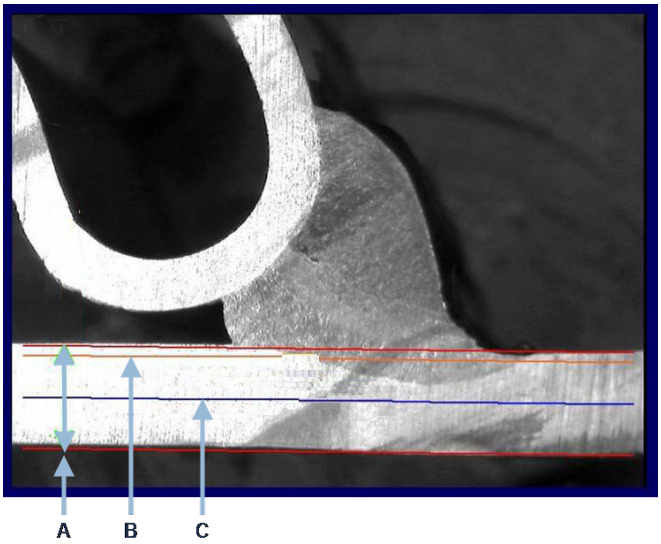
Hint
The label of a measurement appears near the first "point" we choose on the image. You do no have to move the labels on the screen but it is possible to move them as you wish.

12.1 Parallel lines with multiple measurements

1. Click the **L1** title in the datasheet (Metal sheet thickness 1).
2. In the image:
   - Click on the first point.
   - Move the mouse to the other extremity of the metal sheet.
   - Release the mouse: The line is drawn.

   Depending on the selected measurement type, several lines are drawn (from 2 to 4).

   The most shifted line must be moved to measure the thickness of the metal sheet.



A	Thickness	**C**	Minimum penetration depth
B	Penetration depth		

If a value for **Minimum penetration depth** has been selected in the weld bead setting, the line is shown automatically (from 1/10th to 1/2 of the metal sheet thickness). This line cannot be moved by the user.

If the penetration depth has been selected, the line is shown automatically. The line must be moved by the user to measure the real penetration into the metal sheet. The lines to measure metal thickness cannot be moved.

Redoing a measurement

To redo a measurement, click on the measurement title in the table. All the measurements lines and results are removed.

12.2 Single parallel lines

Measurement of the gap (b) and additional measurements

1. Click on the first point.
2. Move the mouse to the other extremity.
3. Release the mouse: The line is drawing just as the opposite line.
4. Move the lines to make the correct measurement (space adjustment).

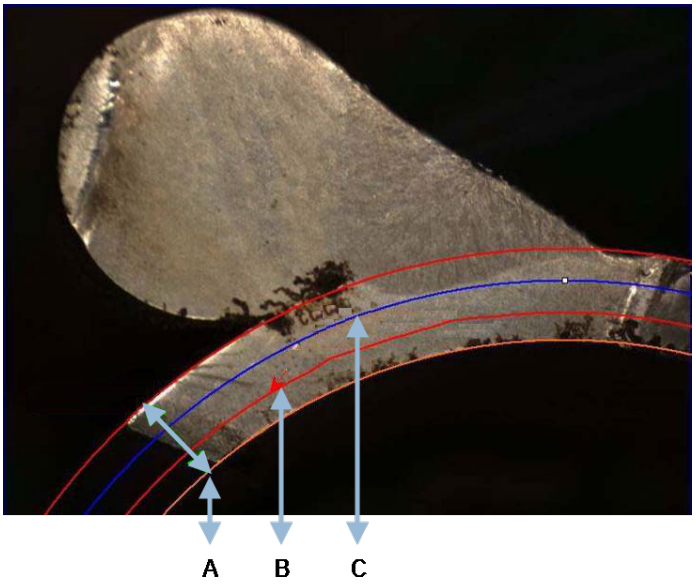
12.3 Single line

Measurement of the throat and additional measurements

1. Click on the first point.
2. Move the mouse to the other extremity.
3. Release the mouse.

12.4 Concentric circles

1. Click the **L1** title in the datasheet (Metal sheet thickness 1).
2. In the image:
   - Click 3 points around the external perimeter of the metal sheet: The first circle is drawn. Depending on the setting, a set of 2 to 4 circles is drawn.
   - Select the white handle and move the circle to define the metal sheet thickness.
   - Select the white handle and move the circle to define the real penetration.



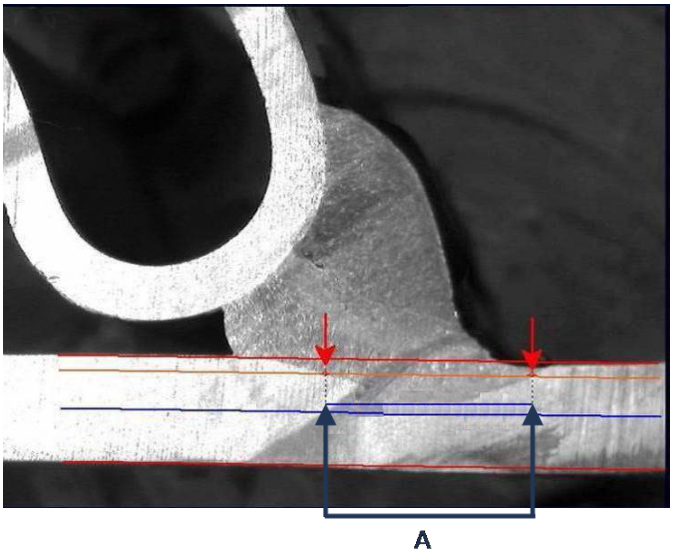
A	Thickness	**C**	Minimum penetration
B	Penetration		

If a value for **Minimum penetration depth** has been selected in the weld bead setting, the corresponding circle is shown automatically (from 1/10th to 1/2 of the metal sheet thickness). This circle cannot be moved by the user.

If a value for **Penetration measurement** has been selected, the circle is shown automatically. The circle must be moved by the user to measure the real penetration into the metal sheet. The circle for measuring metal thickness cannot be moved.

12.5 Penetration width

1. Click the **L1** title in the datasheet. The penetration width is generally measured at the level of the minimum penetration depth.
2. In the image:
   - Successively click 2 points marking the intersection between the line of minimum penetration depth and penetration area. A line is shown. The measurement is shown immediately.
   - Click on the line and move it to obtain a better presentation.



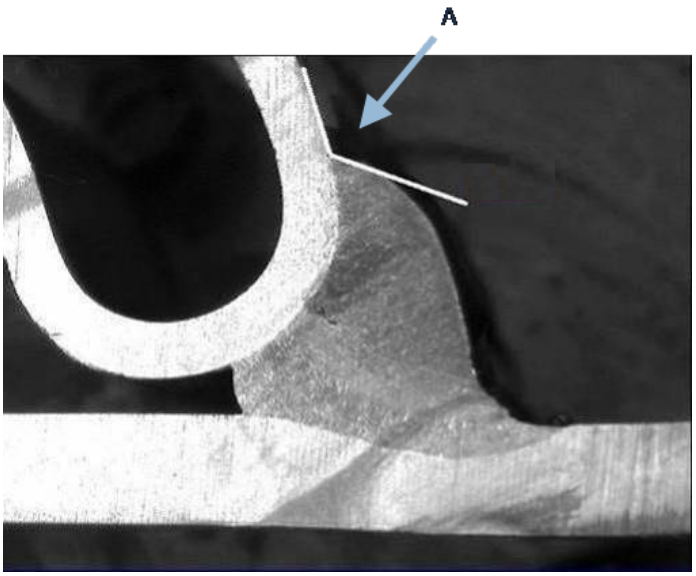
A	Width penetration

12.6 Penetration – effective width

For detailed information, see Penetration – Effective width in Create parts and welds ►21

12.7 Joining angle

1. Click the **Alpha** or **Beta** title in the data sheet to select the measurement.
2. In the image:
   - Click on the vertex of the angle.
   - Move the mouse to draw the first side and mouse-click.
   - Move the mouse to the other side and mouse-click. 3 white handles are shown on the drawing.
   - If needed, adjust the angle.



A 127.15°

12.8 Throat (inscribed circle)

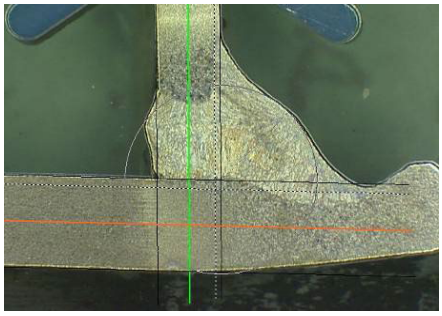
This is usually denoted as **G**.

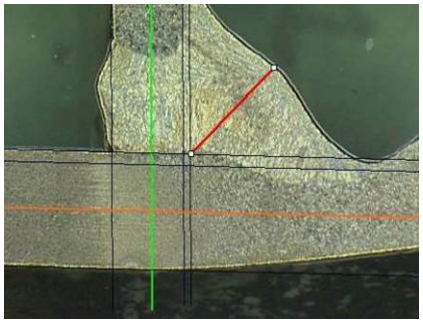
1. In administrator mode, select the drawing type from the weld bead definition page.
2. Enable either **Radius** or **Triangle**.

12.9 Line (in fact circle)

The measurement is the maximum radius of the inscribed circle inside the weld.

1. Click the intersection point between the two plates.
2. Extend the circle radius to get the full inscribed circle.
3. Release the mouse.
4. In the final drawing the throat is indicated by a straight line.



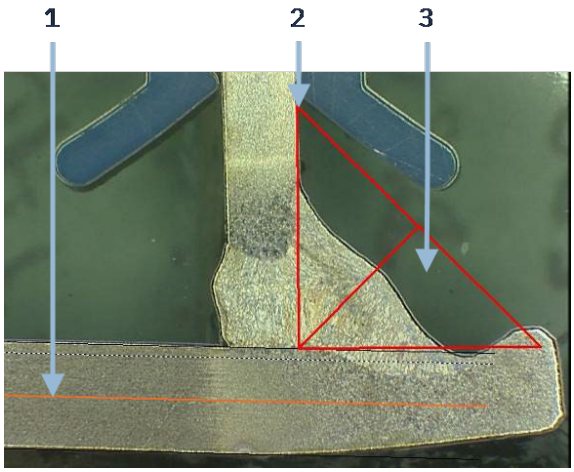


12.10 Triangle (isosceles rectangular triangle)

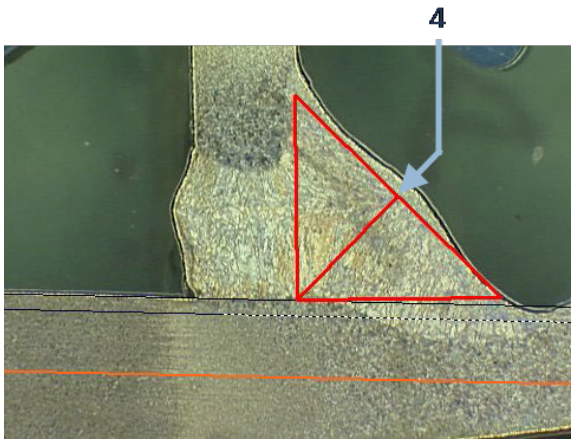
The measurement consists of the height of the maximum inscribed isosceles rectangular triangle.

We recommend that you follow the steps (1, 2 and 3) as shown in the following.

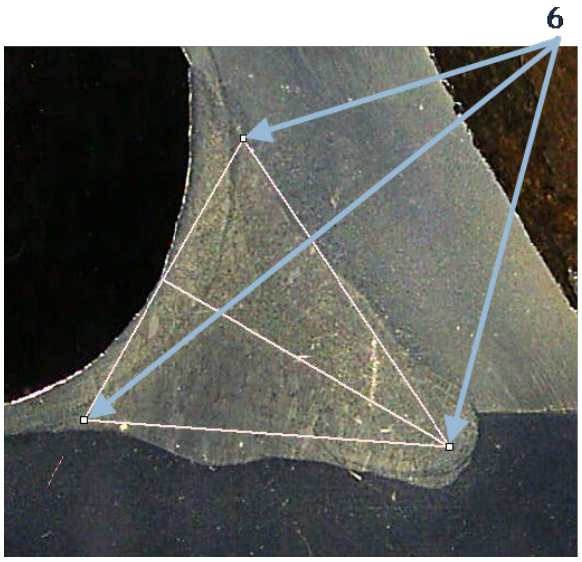
1. Draw the edge of this piece.
2. Draw the triangle by starting with the upper point. Extend the point to the edge and finally release the mouse at the top.
3. Adjust the height to inscribe the triangle to the throat.

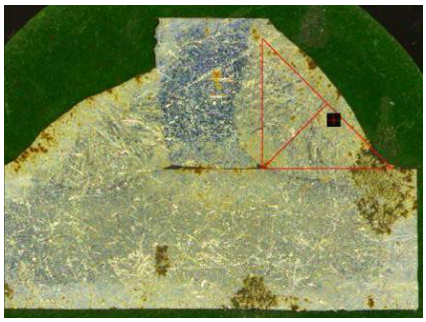


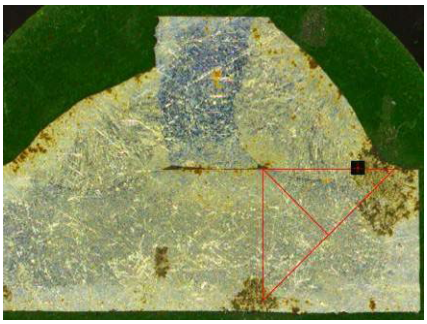
4. Adjust the triangle height. The measurement consists of the height of the triangle.
5. Select the bottom line to adjust the height.

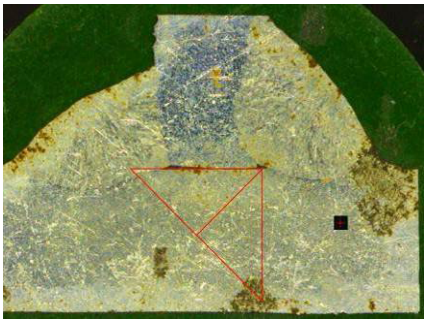


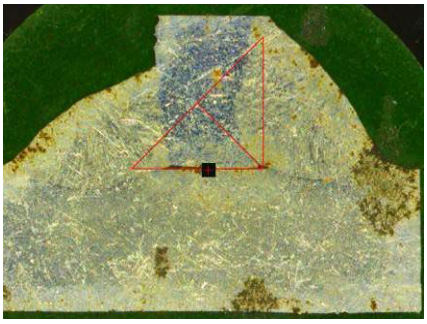
6. If needed, use the 3 white handles to orientate the triangle when metal sheets are not 90°.
7. Use the **Tab** key to turn the triangle left/right/up/down.









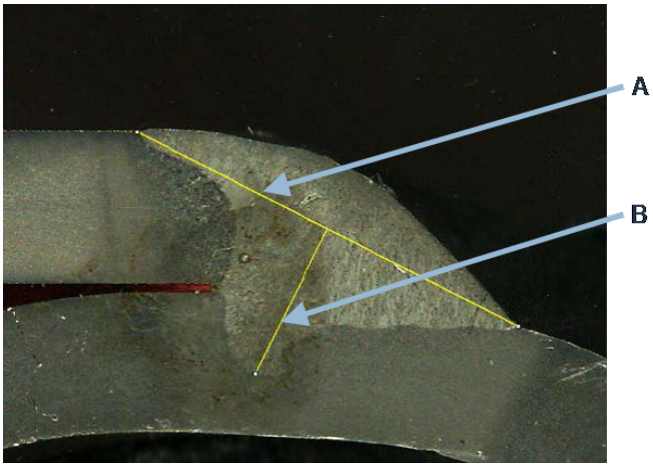


12.11 Set square

To measure the length of a line perpendicular to a reference line, do as follows.

1. Select the measurement.

2. Click and hold the mouse in the image to draw the reference line.



A Reference line

B Measurement line

3. Release the mouse to display the reference line.
4. Double-click to draw the measurement line.

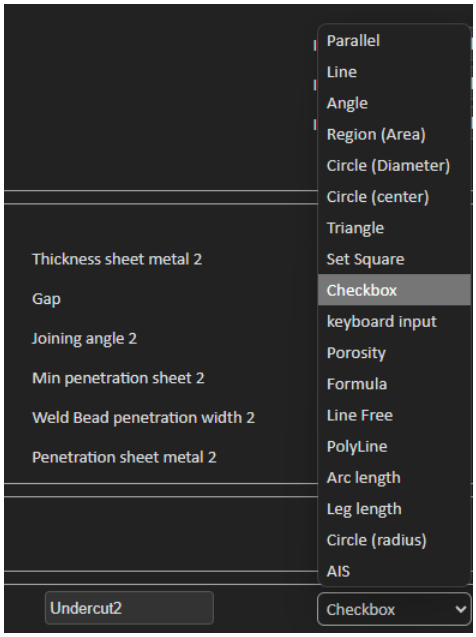
12.12 Checkbox

Visual check of weld bead

Some welding standards do not require geometrical evaluation of the weld but only a visual inspection to see if the weld is correct or incorrect.

To facilitate this kind of inspection, a tool is implemented into the software.

When a new software configuration is created, the new tool, **Checkbox**, is available from the drop-down list.

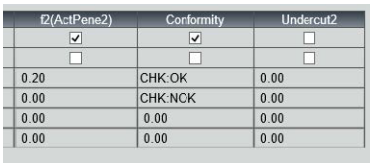


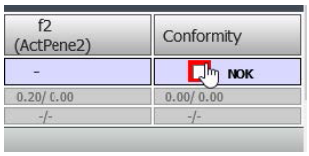
To evaluate a weld, create one checkbox.

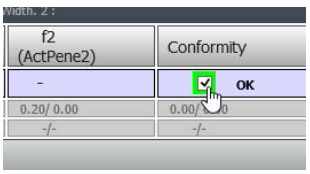
- If the checkbox is unchecked, the weld is incorrect – the result is shown in RED
- If the checkbox is checked, the weld is correct – the result is shown in GREEN

Changing the colors of the text

If needed, you can change the displayed text, which appears when welds are correct or incorrect, by using **Settings.exe** in the installation folder of the software.



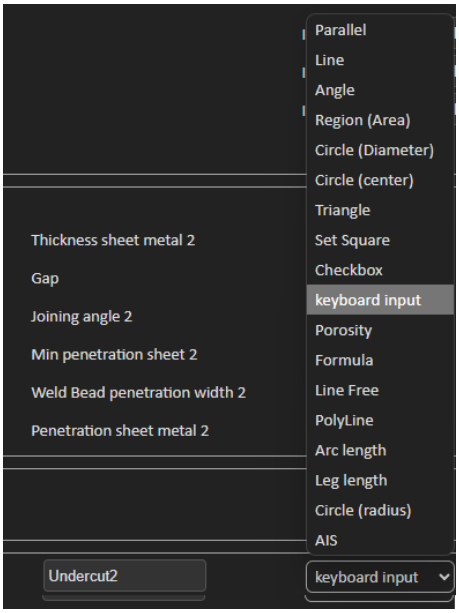




12.13 Keyboard input

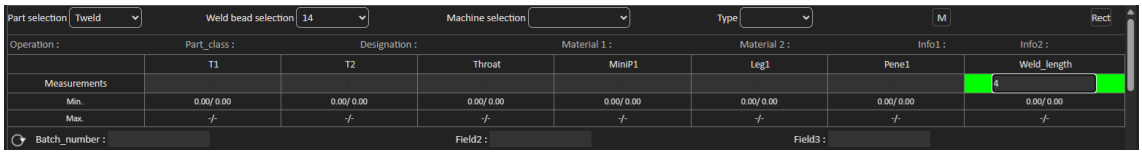
You can use the keyboard to enter numerical values inside the measurement table.

1. In the **Enter extra measurements number**, select **Keyboard input**.



2. When you are making a measurement, you can now enter numeric values.

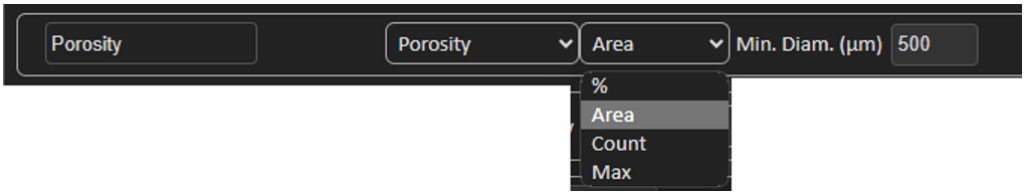
   Use a decimal point (.) - not a comma (,).



12.14 Porosity

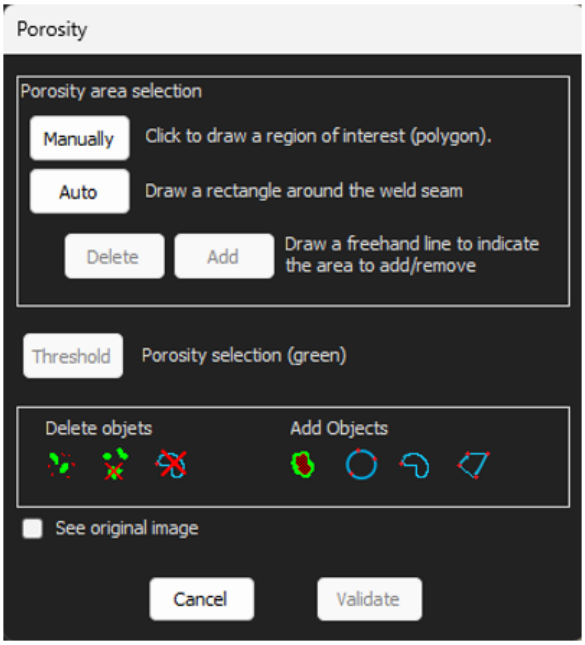
With the porosity measurement tool, you can do the following measurements:

- % of porosities in the weld (in %)
- **Area** of porosities in the weld (in mm^2)
- **Count**, i.e. number of porosities in the weld
- **Max**, i.e. size of the biggest pore in the weld (in mm)



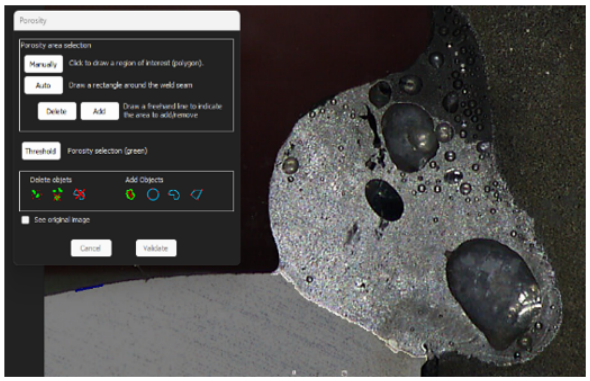
You can also use a size filter to only consider the pores up to a certain size.

12.14.1 Step-by-step porosity measurement

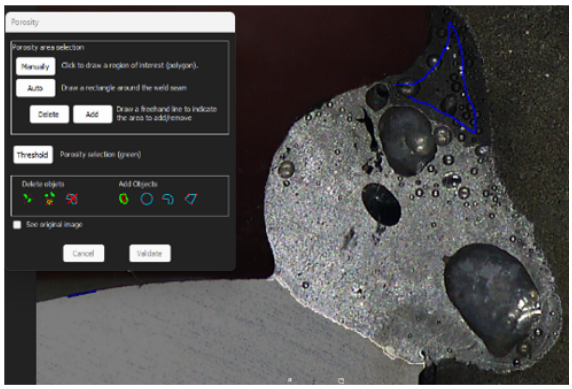


Manually

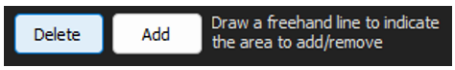
Do manual corrections to detect the entire weld seam if the contrast between the weld and the base material is too low.



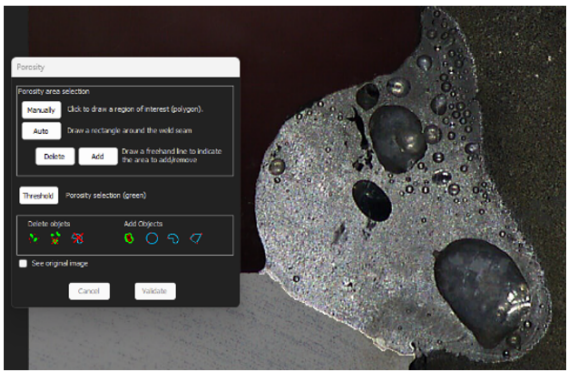
1. Draw the weld contour manually.



2. The **Delete** and **Add** buttons allow you to manually adjust the weld seam detection.



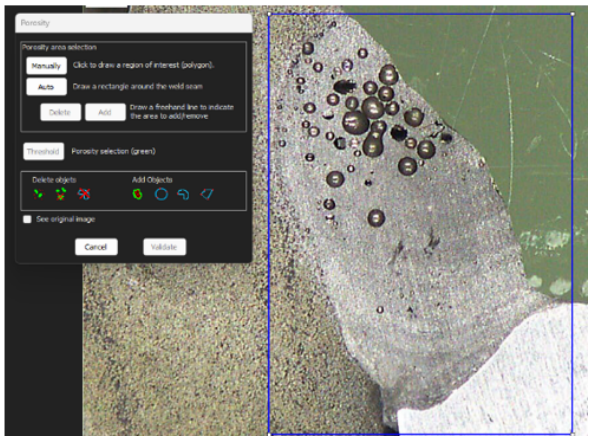
3. Double click to close the polygon.



Auto

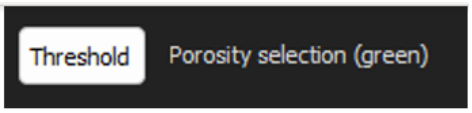
Detect the weld seam automatically if the contrast between the weld seam and the base material is good.

- Draw a rectangle around the weld seam.



Threshold – porosity selection

1. Click the **Threshold** button.



2. Manually adjust the detection slider to colorize the porosities in green.

3. When the thresholding levels are set, click the **Validate** button.

Manual corrections – porosity

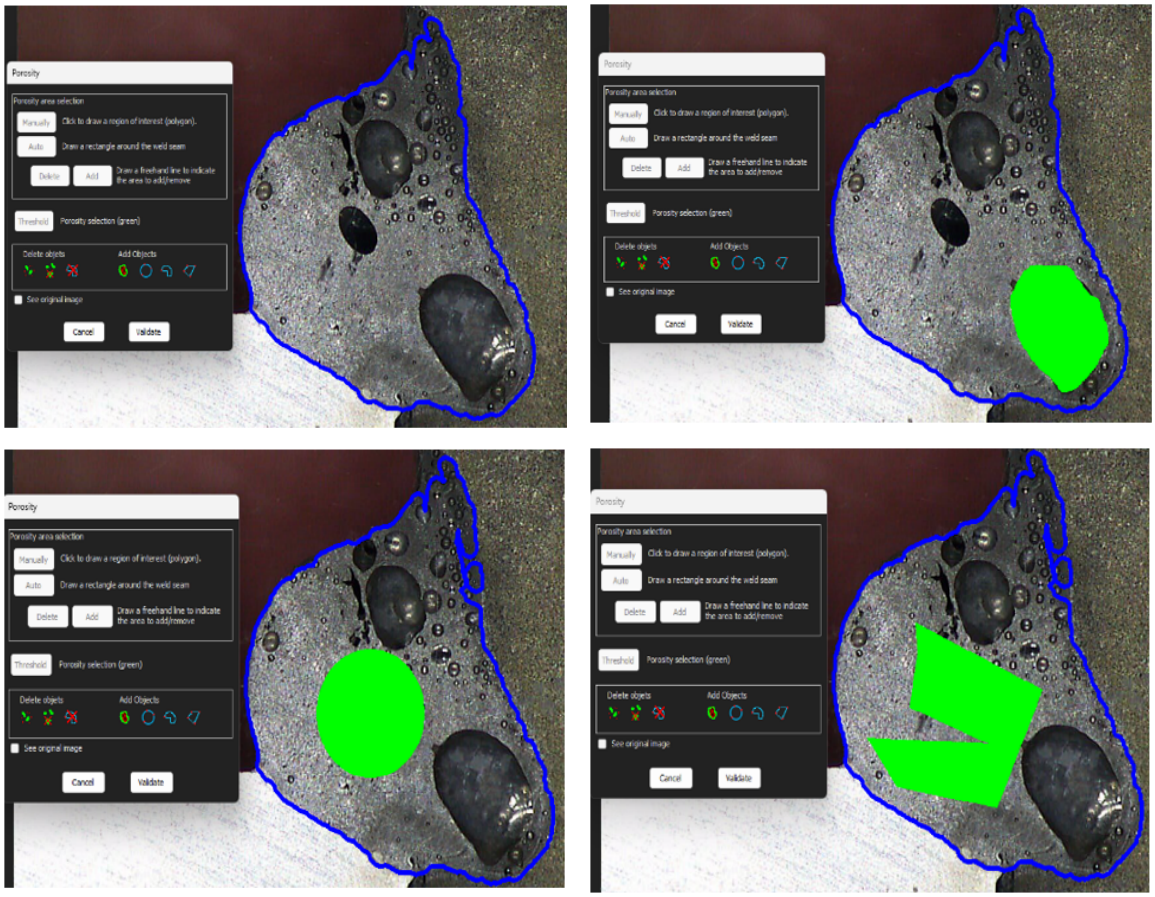
The menu Delete objects

- Apply minimum filter size: Delete all pores lower to a certain diameter according to configuration settings.
- Manual cleaning: Click on the icon, and click on the object to delete.
- Area: Delete all objects inside a traced area.

The menu Add Objects

- Fill holes: Fill the holes in all unopened objects, if an object is open, the hole is not filled.

- 3 points circle/Freeline/Polygon: To manually create an object (pore) inside the weld seam area.



12.15 Formula

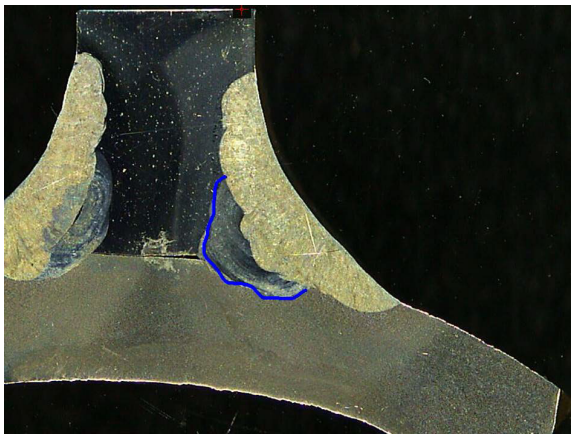
Use a formula to create a new “measurement” which is the result of a calculation between two or several other measurements.

Example

For more information about the use of formulas, see Acceptance criteria with formulas in section Create parts and welds ►21.

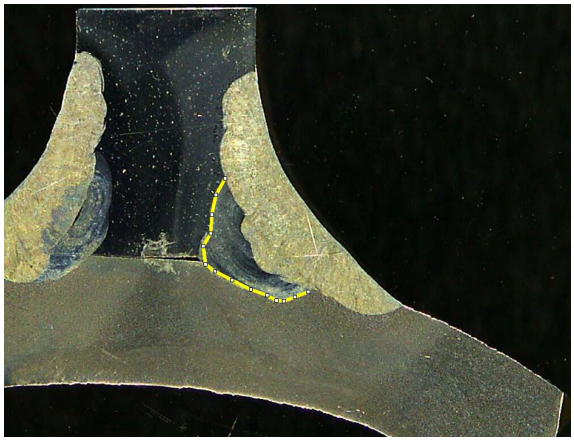
12.16 Line free

1. Draw a free line on the image to measure the length of the line.



12.17 Poly line

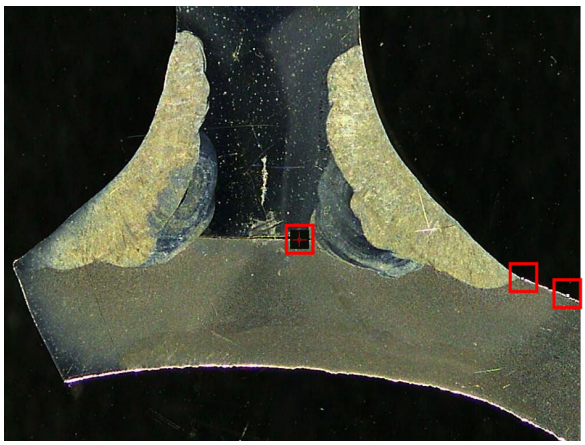
1. Draw a poly line on the image to measure the length of the line.
2. Click on the mouse to change the shape of the line.



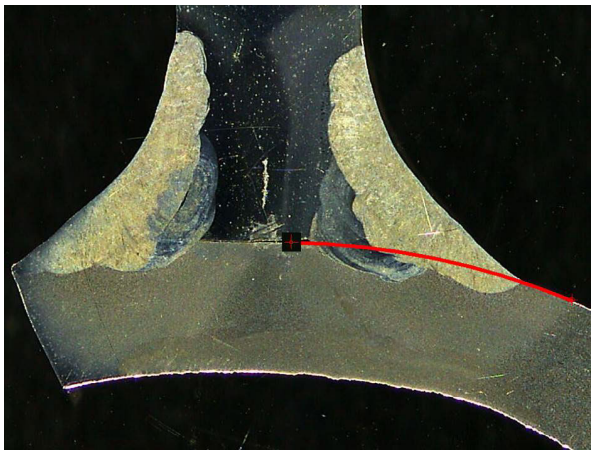
12.18 Arc length

You can measure the length of an arc.

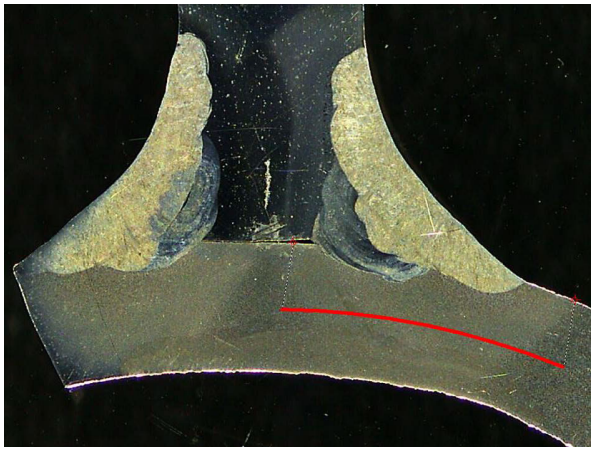
1. Click 3 points to define the circle arc.



The arc is drawn when you set the last point.



2. If needed, move the line.

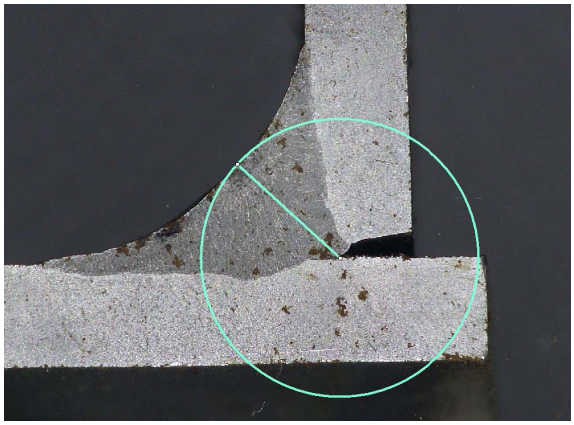


12.19 Leg length

See Penetration width ►42.

12.20 Circle radius

The measurement of a circle radius is shown with the circle after the measurement.



13 Weld bead measurements

Weld bead measurements is the main mode. Authorized users can measure the parts based on the settings defined by the administrator, in order to compare the results with the acceptance criteria.

Only the defined measurements are shown for a selected part and weld bead.

1. Select **Weld Bead Measurements**.

2. In the **Operator**, select an operator.
3. In the **Password** field, enter the password.

Measurement order

Except for special cases, measurements must be done in a logical order:

L1, PS1

L2, PS2

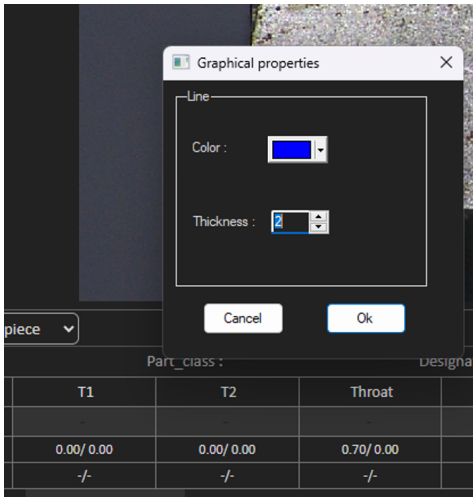
LP1, LP2

Alpha and Beta...

13.1 Drawing properties

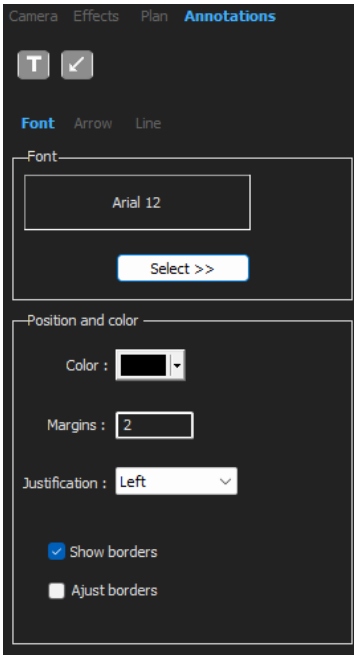
Change the color and thickness of each drawing tool

1. Right-click on the name of the measurement label tool, for instance **T2**.
2. The **Graphical properties** window is shown.

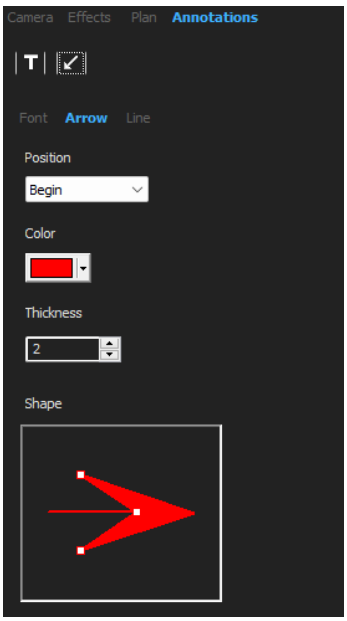


Change the size of the label and graphical modification

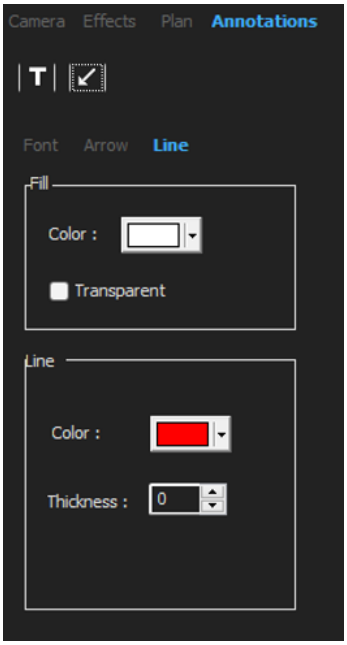
1. Go to "Annotations"
2. To change the font, choose Font and make your adjustments.



3. To change the arrow, choose **Arrow** and make your adjustments.



4. To change the line, choose **Line** and make your adjustments.



14 Step-by-step measurement training

Make sure that the correct configuration is selected:

- Select a part ►60

- Select a weld bead ►60
- Select a machine ►61
- Select the measurement type ►61(option)
- Capturing an image ►62
- Camera and light settings ►62 (option)
- Image size ►62
- Weld bead measurement with predefined template ►63
- Additional information ►63
- Add comments and check boxes ►63
- Add text and arrows ►64
- Add measurement results to the image ►65.
- Save the results ►67

Measurement order

Except for special cases, measurements must be done in a logical order:

L1, PS1

L2, PS2

LP1

LP2

Alpha 1 and 2

Throat, etc.

Gap, undercut, etc.

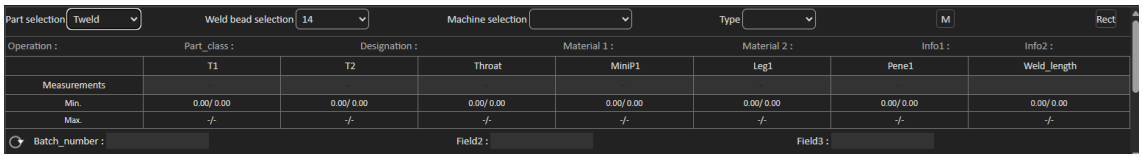
14.1 Select a part

- Select the part from the drop-down menu.

14.2 Select a weld bead

- Select the weld bead you wish to measure from the drop-down menu.

The data related to the selected weld bead is shown at the bottom of the screen.

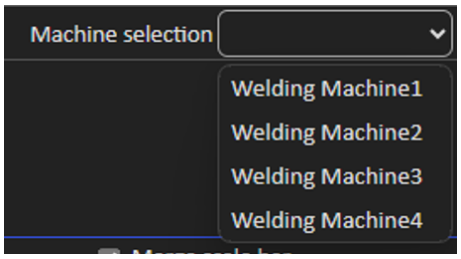


14.3 Select a machine

Selecting the welding machine is important for tracking data.

1. Select the welding machine from the drop-down menu.

2. If several welding machines are available, you can assign a machine to a weld bead: Click on the drop-down menu and select the right name of the machine.



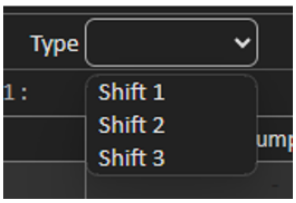
Hint
You can rename the machine in your configuration.

Note
The Excel report can present data sorted according to the selected welding machine.

14.4 Select the measurement type

Selecting the measurement type is important for tracking data.

1. Select the measurement type from the drop-down menu.



The different types of measurement are defined with the general description setting. They enable you to sort the data depending of the type (ex. production, development, audit).

Note
The Excel report can present data sorted according to the selected welding machine.

14.5 Capturing an image

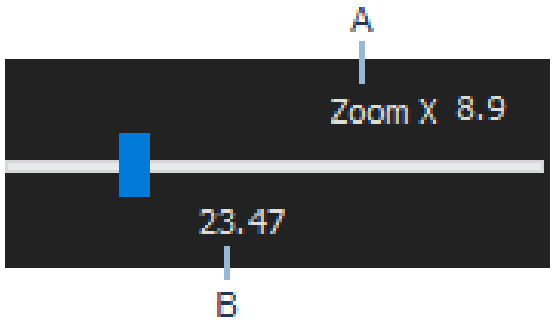
1. Click **Live On**.

   This activates the live image, and the camera settings become available.
2. Click **Live image Off** to capture the image.
3. When you switch to **Live On**, you are prompted to save the results.

   If you save the results, the result table is cleared.

14.6 Camera and light settings

1. Adjust the camera or light settings to have a clear and contrasted image of the weld bead.



A	Magnification value calculated on a 23” screen with a resolution of 1920*1080. A tolerance should be considered.	**B**	Field Of View (mm or inches).

14.7 Image size

Use function key **F2** to toggle between **Fit to window** or **100% resolution image**.

This software includes a mega pixel resolution. Most PC/LCD screens do not offer sufficient resolution to display such a resolution.

When you are using**Fit to window**, we recommend that you use the zoom area in order to obtain a more accurate measurement.

Note
Use function key **F5** to save an image outside the results folder of this software. Click on the image and press **F5**.
If we do this after having clicked on **Save result**, the saved image is saved with all the measurements merged on this image.

14.8 Weld bead measurement with predefined template

Measurements must be done in a specific, hierarchical order: thickness measurement (space between two lines or circles), penetration, etc.

- Measurement results are shown in the table
- Out-of-range measurements are shown in red in the table
- Use the Shift keyboard key to draw a straight line

14.9 Additional information

The administrator can create a maximum of 3 areas of additional information that must be filled in, for instance:

- Batch number
- Serial number of the part
- Manufacturing date
- Etc.

For reporting, these 3 areas are important if you wish to sort results after the measurement process, for instance according to data sorting, report creation, statistics, etc.

14.10 Add comments and check boxes

Before you save the results, you can add comments about the weld bead.

You can also use check boxes, as defined by the administrator, to characterize a default on the weld bead:

- Porosities
- Cracks
- Etc.

Comments and check boxes are shown in the report and in the Excel spreadsheet.

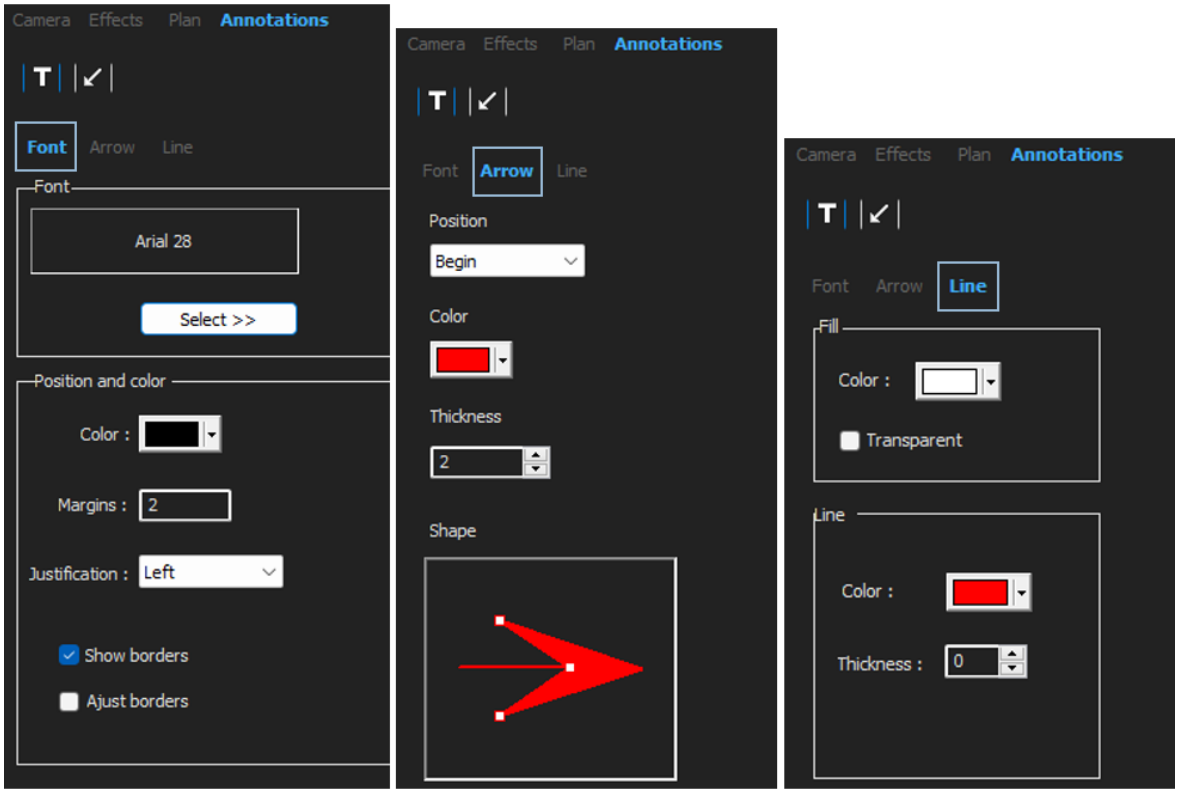
14.11 Add text and arrows

The panel on the right side of the screen displays the tab **Camera** as well as the tab **Annotations**.

You can always move, change, or delete a graphical overlay.

Before annotation you must configure colors and font size.

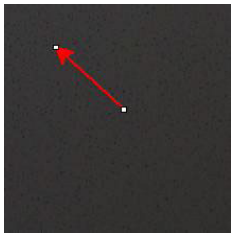
1. Select the tab **Annotations**.
2. To configure font, arrows and line definitions, select the tab **Font**, the tab **Arrow**, and the tab **Line**.



Arrows

1. To insert an arrow, click the arrow icon.
2. Then click on the image.

3. To change or move an arrow, use the handles.



Text

1. To insert a text, click the text icon. The text will be placed in a text frame.

2. To position the text frame, click in the image at the desired position and hold the left mouse key, while you move the mouse to draw a rectangle.
3. When you release the mouse, you can write the text at the position of the blinking cursor.
4. To move a text area, select it and drop it in the desired position.
5. To change a text, press the Ctrl key on the keyboard and click in the text frame.

These properties also apply to measurement labels on the images. See also.Add measurement results to the image ►65 It also applies to measurement labels that you can modify their size.

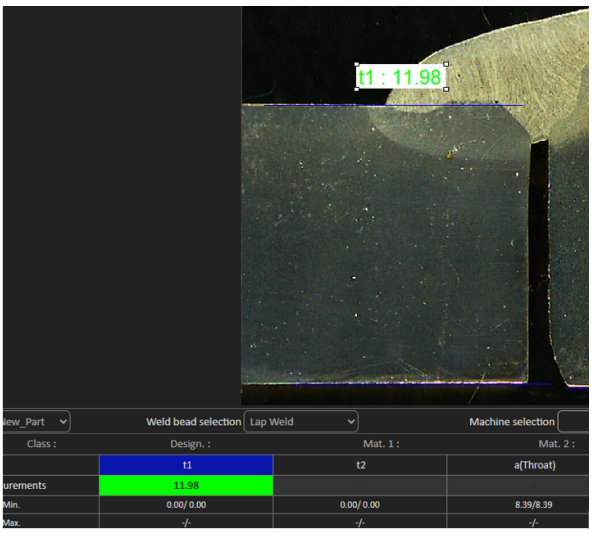
14.12 Add measurement results to the image

You can manually add a selected measurement exactly where it is required in the image. Click on the measurement result, and a label will be displayed in the image with the measurement result.

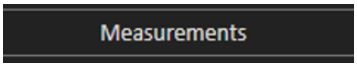
The text color depends on the acceptance criteria (red or green).

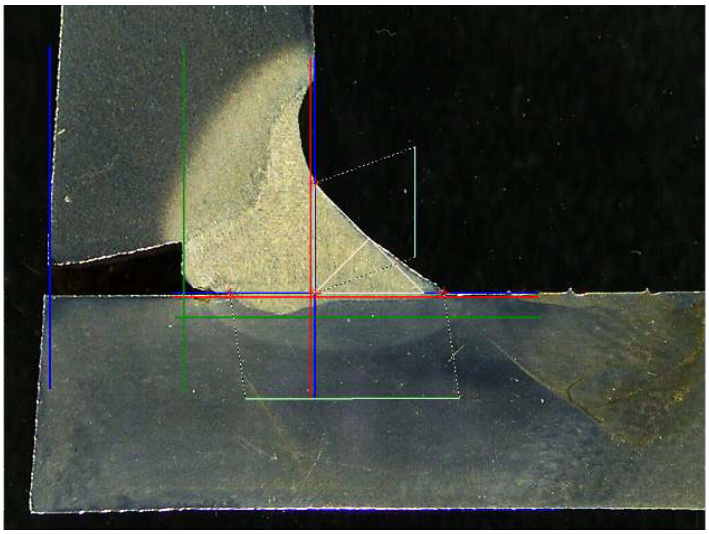
The background color depends on the general setting.

1. When you move the cursor of the mouse over the results section, it changes from a standard cursor to a closed hand. At this point, you can read the measurement and its header in the image by clicking the corresponding measurement field.

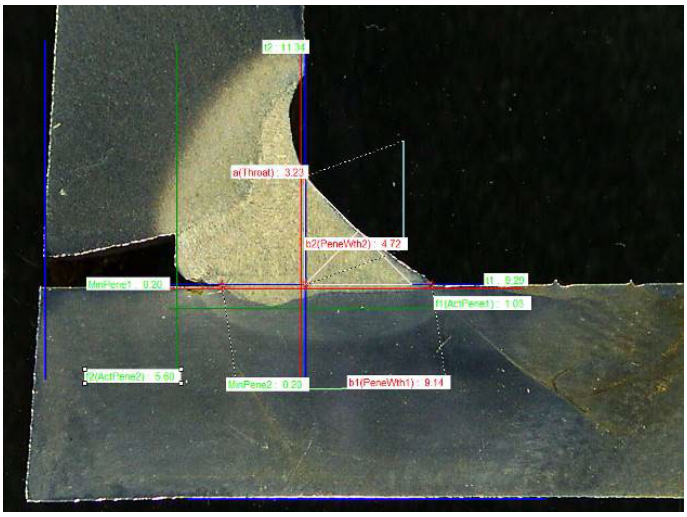


2. Adjust the position by dragging and dropping the item.
3. You can add all measurements automatically on the image by clicking the **Measurements** button.



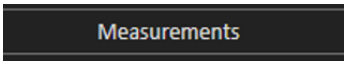


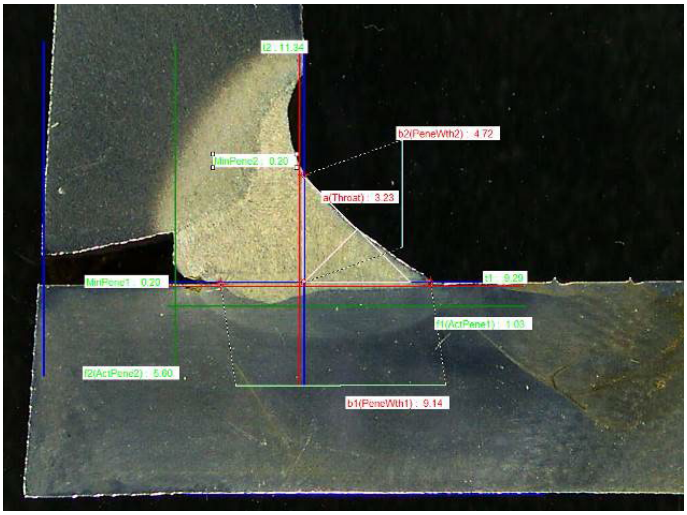
4. All the measurement labels are shown on the image (the default position is the first clicked point).



5. You can automatically add all measurement labels on the image by clicking the button **Measurements**.

   The label is placed where the user starts to draw the tool (parrallel, line...).





14.13 Save the results

When you have completed the measurements, save the measurement results. The data will be available for use for statistics.

1. Select **Save Results**.

Before saving the results, these options can be selected:

- **Merge drawings**
- **Merge measurements**
- **Merge scale bar**
- **Merge construction lines and texts**

Merge drawings

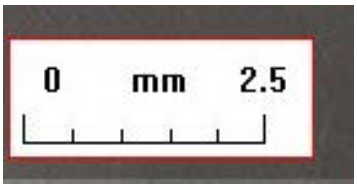
All the measurements drawings will be merged in the image.

Merge measurements

A measurement table is shown in the upper left corner of the image as well as the part name and the weld name.

Merge scale bar

A scale is merged automatically in the bottom left corner of the image. Scale bar length and graphical properties cannot be adjusted.



Merge connstruction lines and texts

When you merge the measurements, each measurement titles is shown in the same color as those defined for the drawings. In addition, measurement values will be colored according to the acceptance criteria:

- Green: Inside range
- Red: Out of range

15 Result files

All measurements results and images are saved in a dedicated folder.

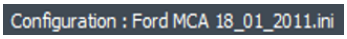
For each software configuration, a result folder is created including:

- Part settings
- Weld bead settings
- Result files
- Images
- Etc.

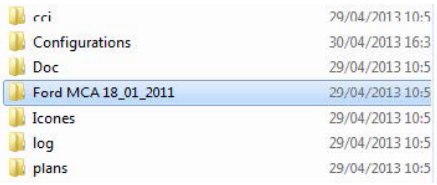
Per default these result folders are created in the **C:\Struers\StructureExpert Weld-6** or **C:\Struers\StructureExpert Weld-12** folder.

If you wish to change the default saving path, see Appendix 1: Change network saving path ► 102

Software configuration

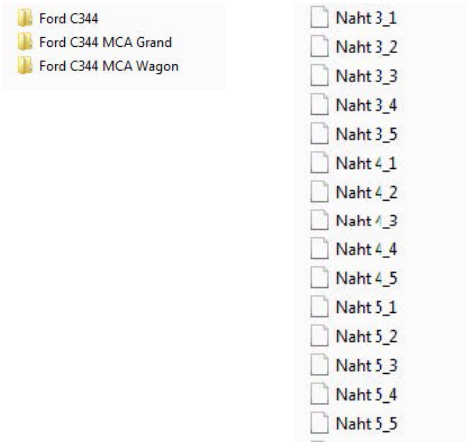


The installation folder



The configuration folder

The **Cordons** folder contains all the settings for parts and welds.



The Results folder

The **Results** folder contains all the measurement results and images.

- For each weld a folder is created where all the images will be saved.
- For each weld an Excel file is created where all the results will be saved.

Each folder and file is identified as follows: Part name_Weld name

Note
Manual changes are not allowed in the images folder or the Excel files results. Changes which are done incorrectly can prevent creation of the report.

To access results files changes,see The DataView module (option) ►88.

16 Reports

16.1 Generate an HTML report

Use this function to print the results to an HTML page.

To access this function, click **Print Weld Report**.

The HTML template is fixed and cannot be changed.

If a PDF generator is available on the PC, you can save the report as a .PDF file.

Change the logo in an HTML report

To add your own logo to the HTML report:

1. Go to **... \Welding\Reports\En\Xml\HTMLBead** (**En** = the language folder).
2. Replace the logo.jpg file with your own logo file using the same name.

16.2 Generate an Excel report

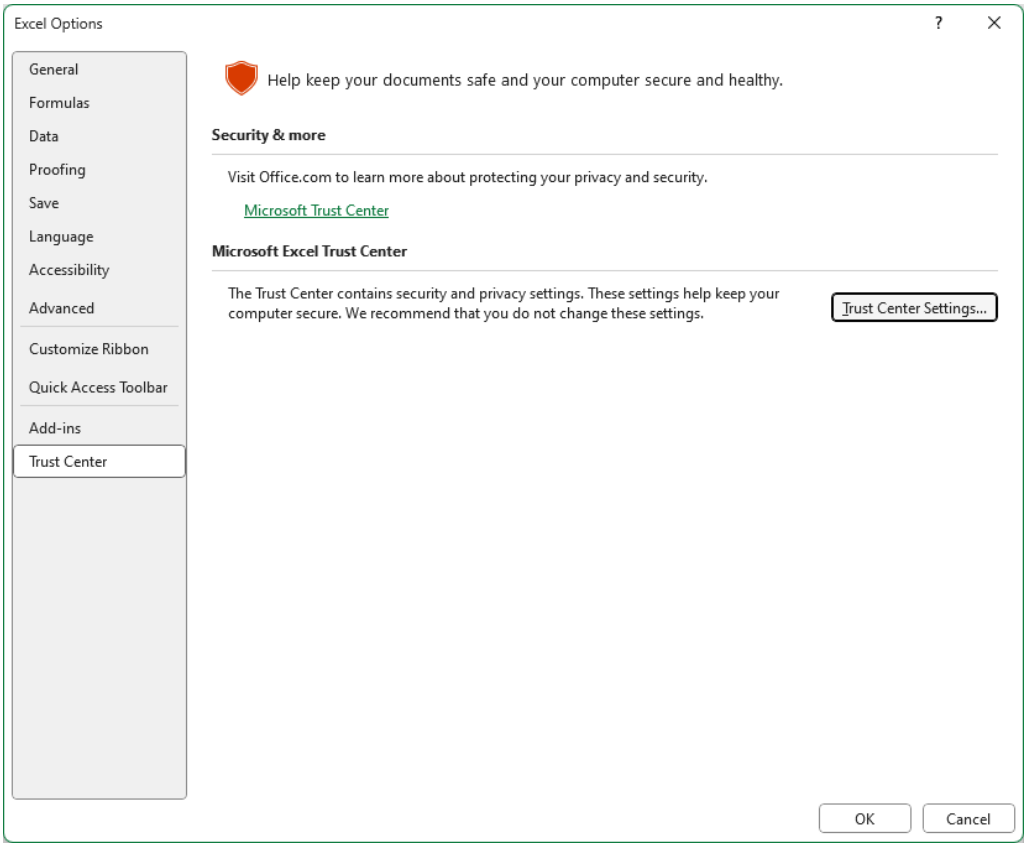
Use this function to print the results to an Excel file.

1. To access this function, click **Excel Report**.

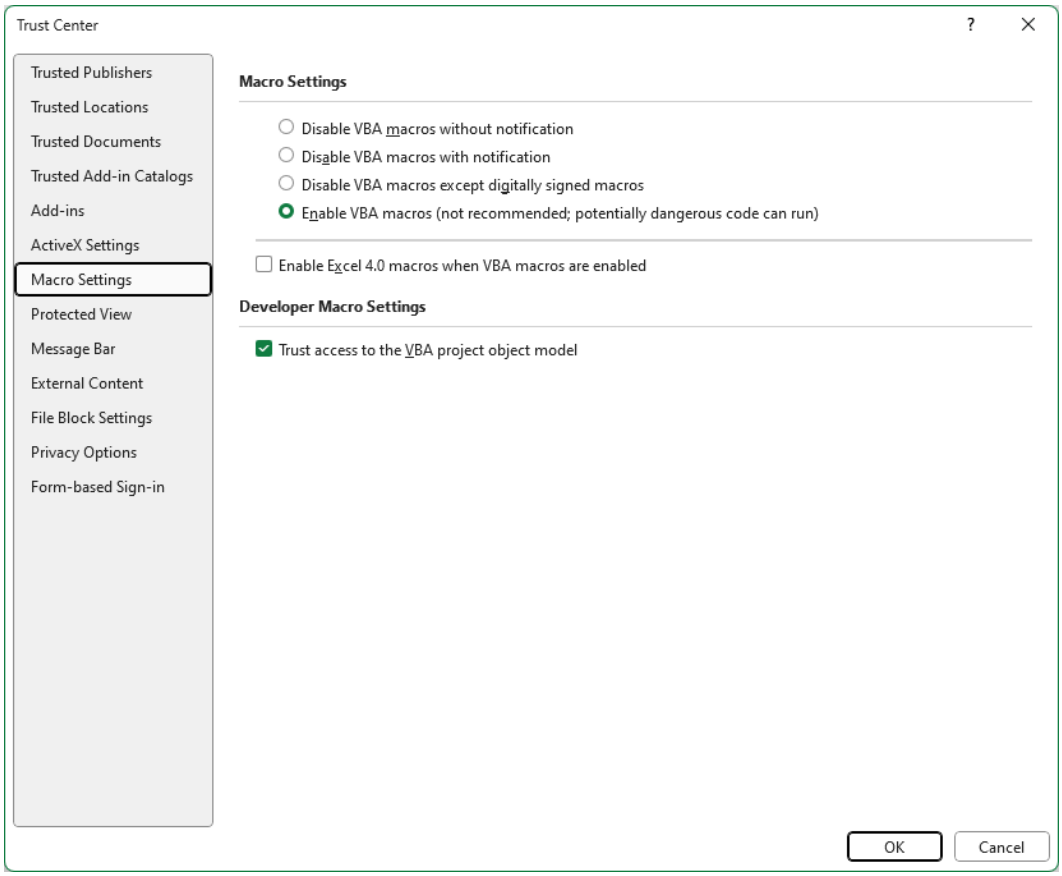
Authorizing Excel macros

To be able to use Excel reports, you must change an Excel option.

1. Select **File** > **Options** > **Trust Center**.



2. Select **Trust Center Settings**.
3. Select **Macro settings**.

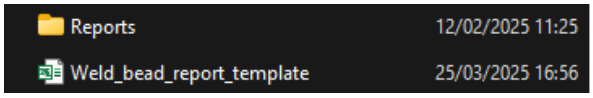


4. Check off the check box **Trust access to the VBA project object model**.

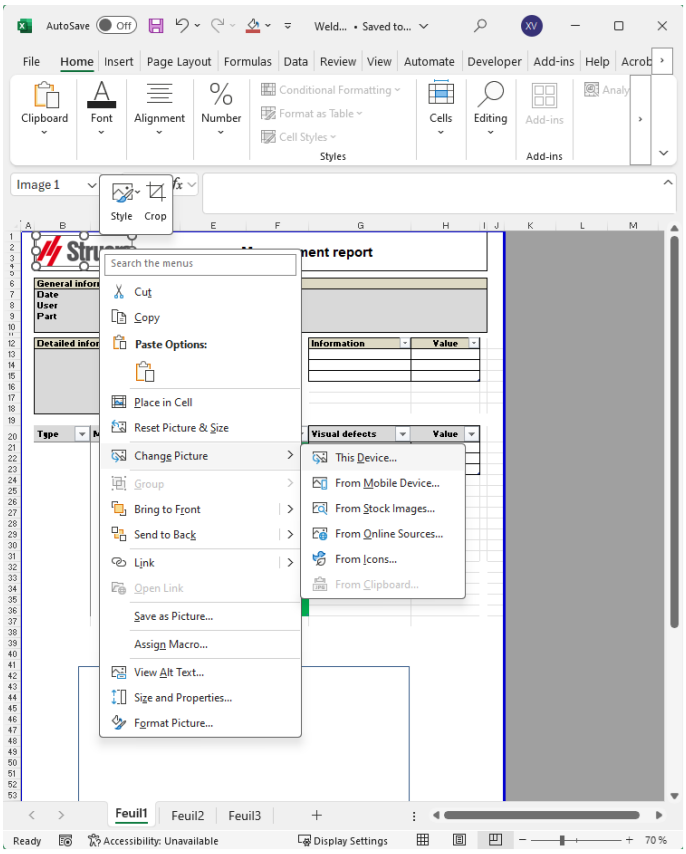
Change the logo in an Excel report

To add your own logo to the Excel report:

1. Go to C:\Struers\StructureExpert Weld\Welding\Reports\En\Xml\ExcelBead (**En** = the language folder).
2. Open the file **Weld_bead_report_template**.



3. Right-click on the Struers logo, then select **Change Picture**, choose **This device**, and finally open your own logo from your computer.
4. Record this new file under the same name, and your next report will be with your own logo.



16.3 Generate a weld bead report

Use this function to generate a weld bead report.

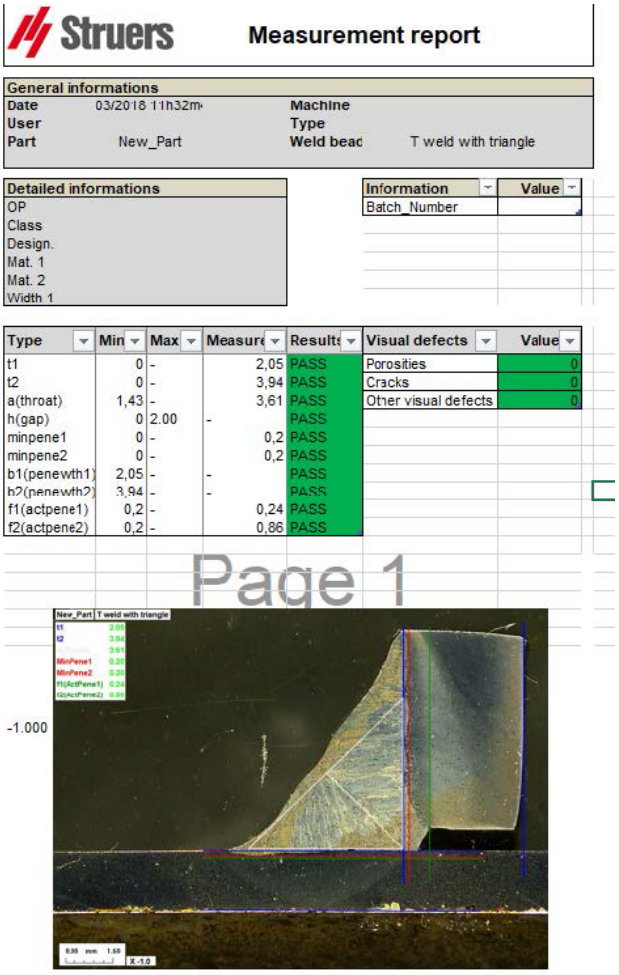
1. To access this function, click **Excel Report**.

2. Click the tab **Weld bead** to print the results of the active weld bead.

   This feature requires Excel 2003 Professional Edition or better.

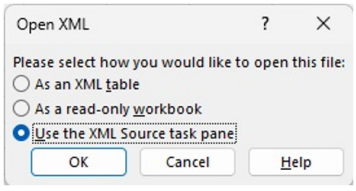
3. Select the template you wish to use.
4. Click **OK**.

   All the results are automatically updated in the selected template.



16.4 Work with Excel and weld bead report templates

1. Launch Excel.

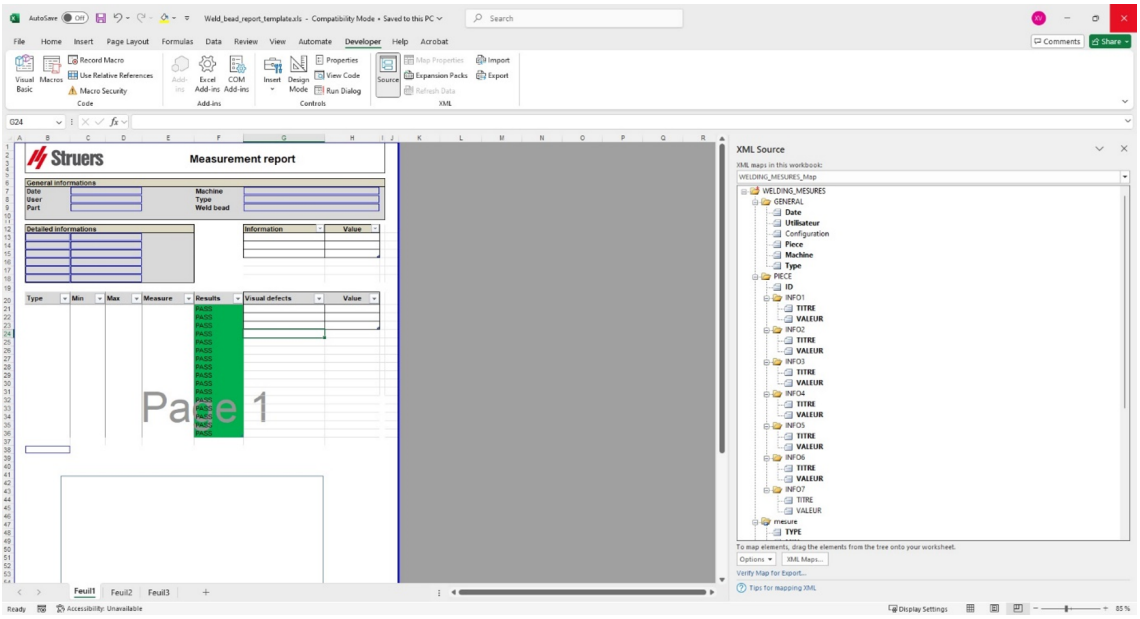


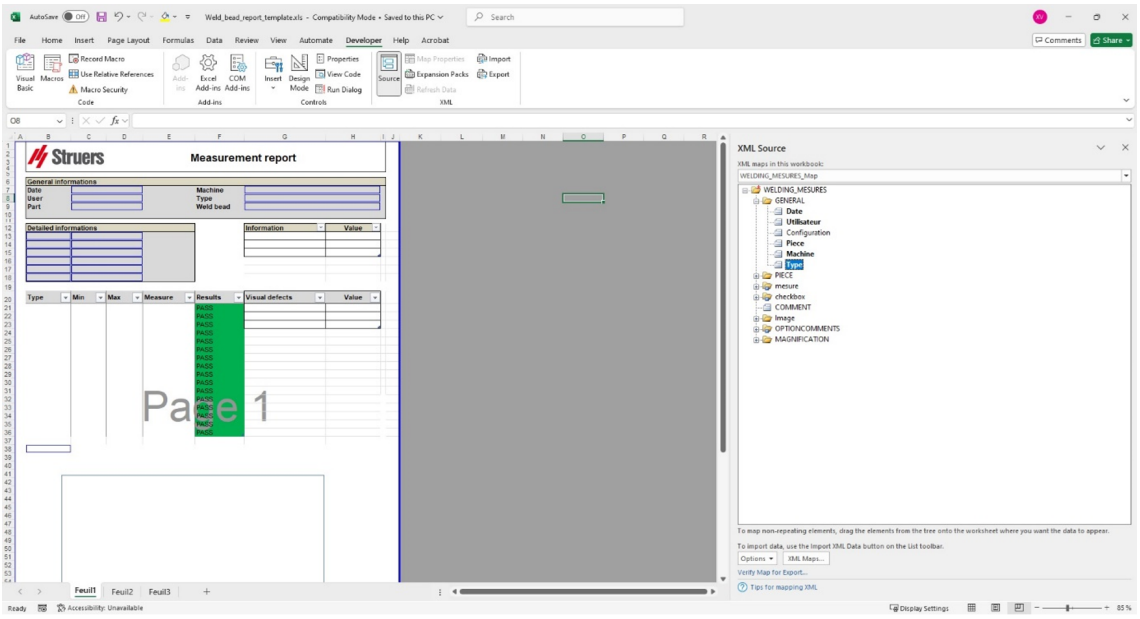
2. Click the tab **Developer** to access the XML source.
3. In Excel, select **File**) > **Option** > **Customize the ribbon** > **Check Developer**.
4. Click on the source.

XML Mapping

1. Click **Add**.
2. Browse to go to ...**\Welding\Reports\En\Xml\HTMLBead\data.xml**, where En denotes the English language folder.
3. Click **OK**.

4. Drag and drop the XML information from the list into the Excel spread sheet in order to build the desired template.





5. When the template is ready, save it in the following folder:

   ... \Welding\Report\En\XML\Excel bead/ xxxx

   The new template is now shown in the selection window with its own name.

16.5 Generate a part report

A complete part report generator is included in the software. The template has been designed to cover most requirements. The template cannot be changed.

2 templates are provided:

- **Part_batch_number_report.xls**
- **Weld_report.xls**

1. To access this function, click **Excel Report**.

2. Click the tab **Part** to access this feature.

   This feature requires Excel 2003 Professional Edition or better.

3. Select the template you wish to use.
4. Click **Execute**.

Additional templates

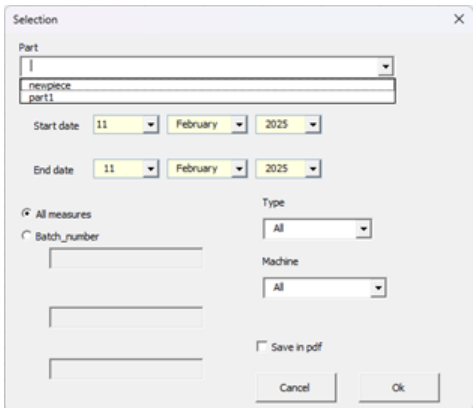
If the Min & Max Action Limit Module is included in the software, 2 additional templates are available:

- **Part_batch_number_report_ActL.xls**
- **Welds_report_ActL.xls**

Operation

Note
The module **Report Generator** is required to create customized reports.

1. Select your part and the filters.

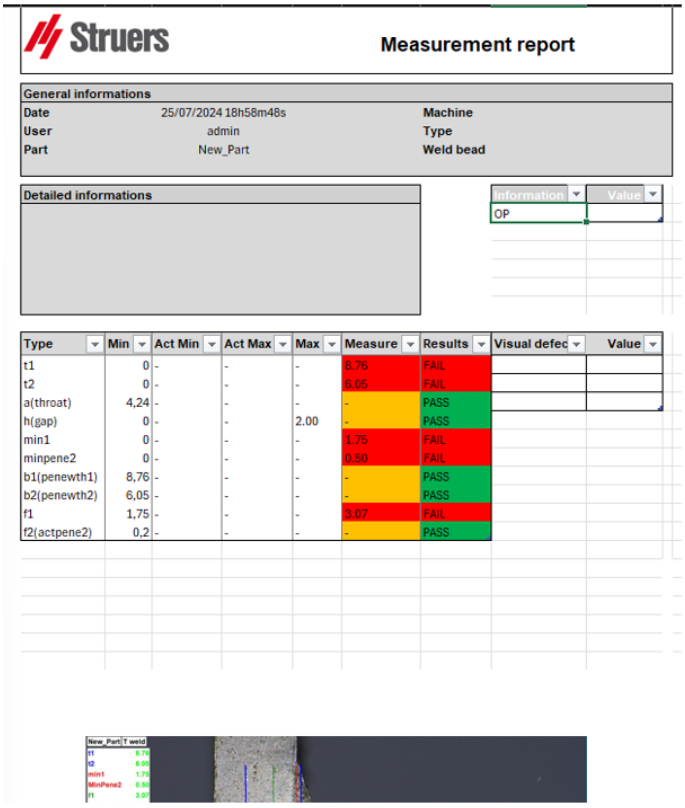


2. Click **OK**.

The report is separated in 2 sections (tabs):

First section Synopsis of all the measured values and check boxes

Second section Images of all the measured weld beads with measures and comments



Struers

Measurement report

General informations

Date	25/07/2024 18h58m48s	Machine	
User	admin	Type	
Part	New_Part	Weld bead	

Detailed informations

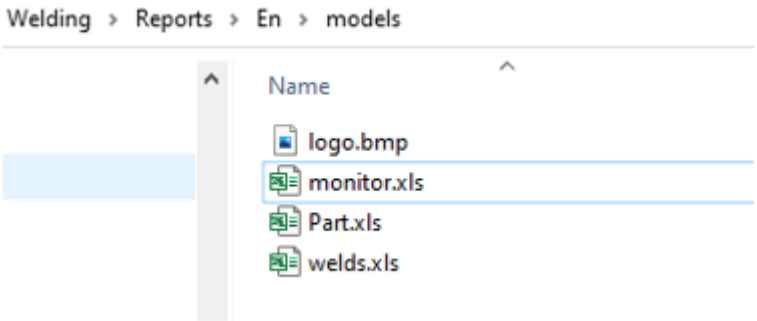
Information	Value
OP	

Type	Min	Act Min	Act Max	Max	Measure	Results	Visual defec	Value
t1	0	-	-	-	8.76	FAIL		
t2	0	-	-	-	6.05	FAIL		
a(throat)	4,24	-	-	-	-	PASS		
h(gap)	0	-	-	2.00	-	PASS		
min1	0	-	-	-	1.75	FAIL		
minpene2	0	-	-	-	0.50	FAIL		
b1(penewth1)	8,76	-	-	-	-	PASS		
b2(penewth2)	6,05	-	-	-	-	PASS		
f1	1,75	-	-	-	3.07	FAIL		
f2(actpene2)	0,2	-	-	-	-	PASS		

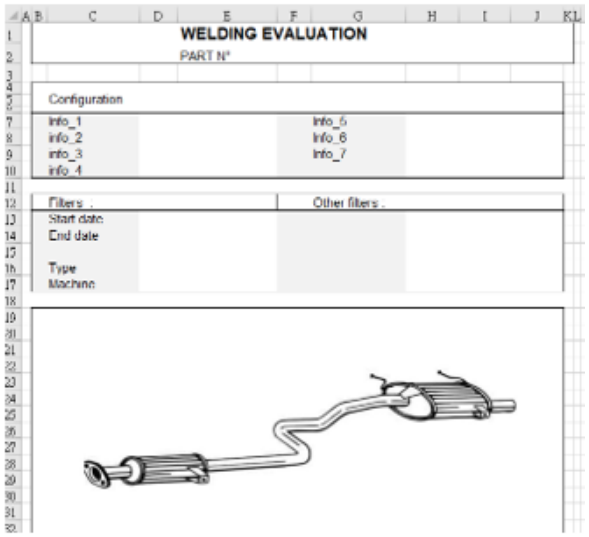
16.6 Modify a weld bead report

Note that this section is not about the part report that includes several beads.

1. Depending on your selected language, open the XLS file in the language folder. **En** is for English, **Sp** is for Spanish, and **Fr** is for French.
   Open "welds.xls" located in \Welding\Reports\En\models.

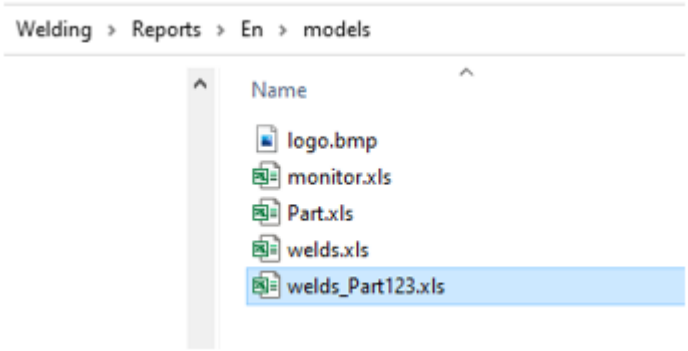


2. Import the image you want on the first page.

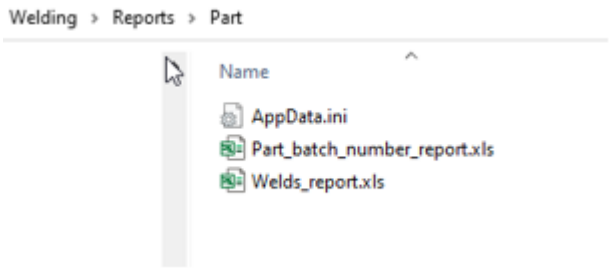


Note
Do not modify anything else on the report.

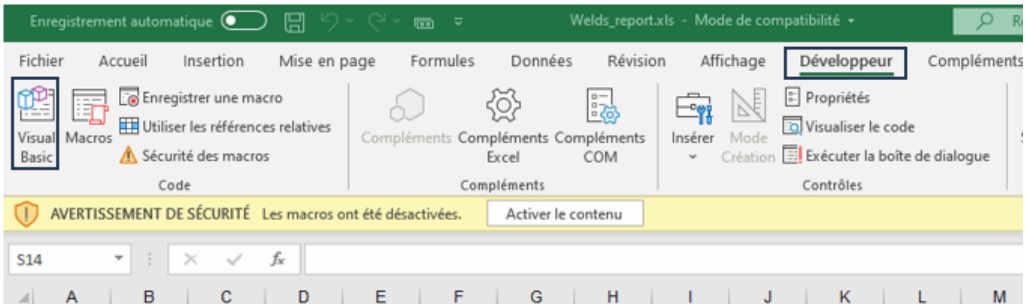
3. Save the file in the same path with a new name, in this example "welds_Part123.xls".



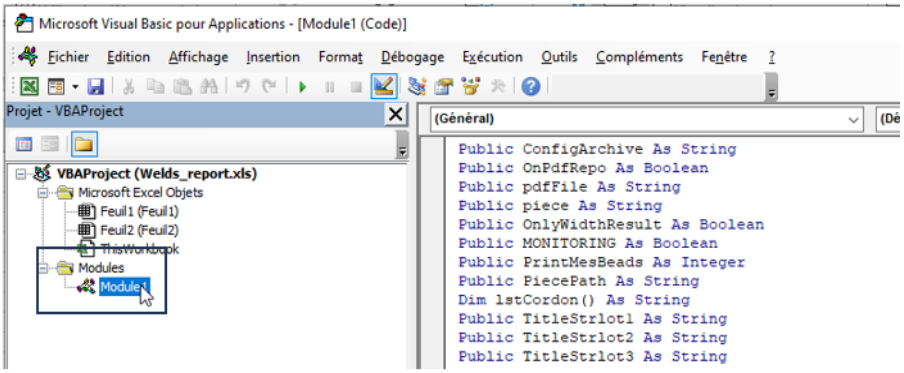
4. Open the report.



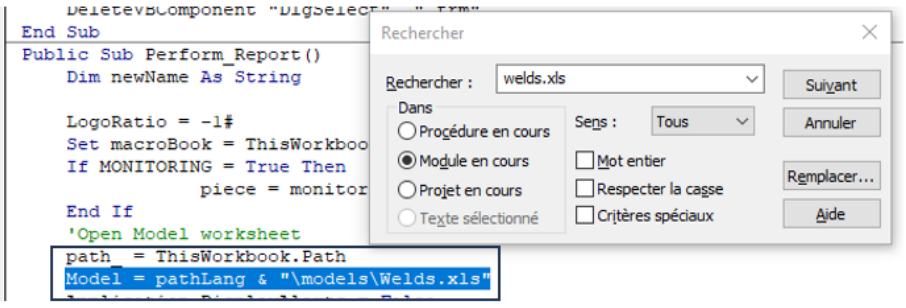
5. Go to the tab **Developer**. (Make sure that it is activated in your Exel settings).



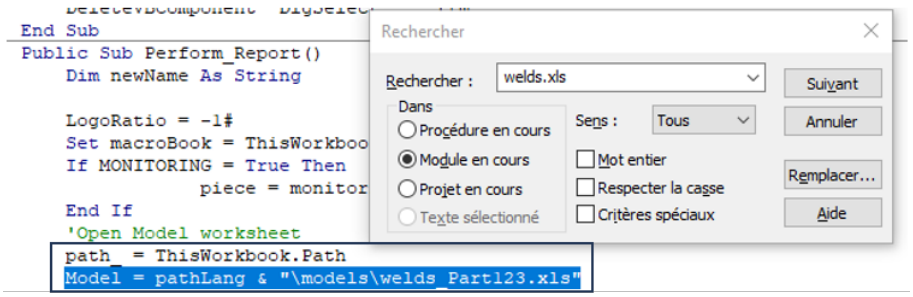
6. Click on **Visual Basic**.
7. Click on **Module 1**.



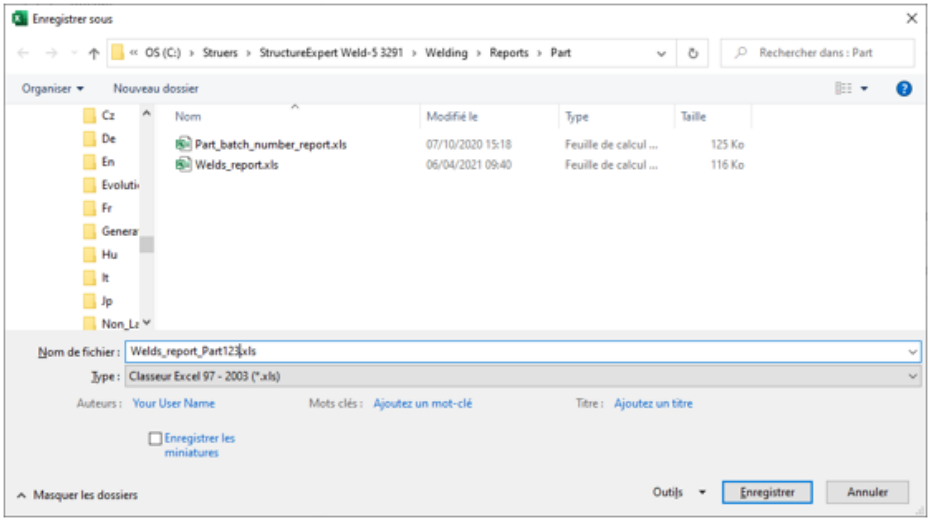
8. Click CTRL + F to find "welds.xls".



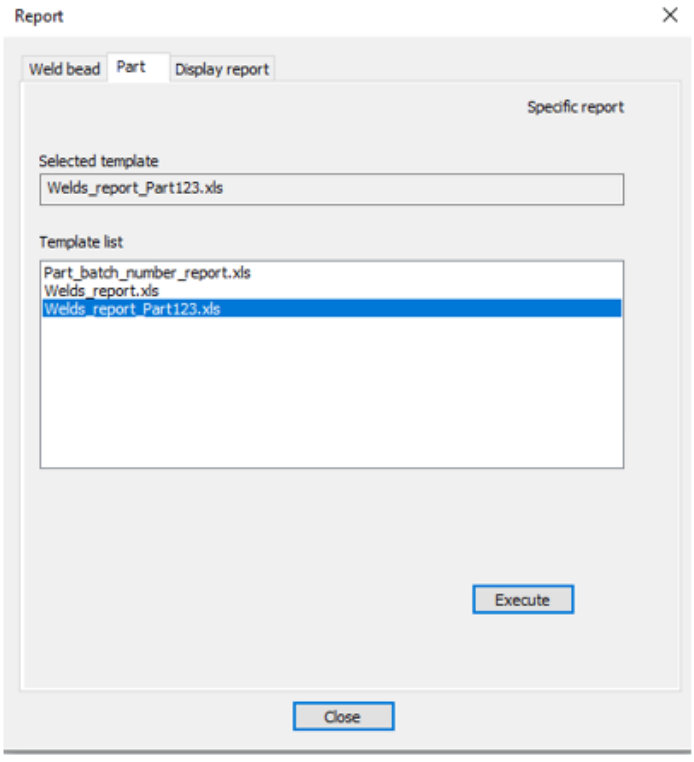
9. Rename til file "Welds.xls" to the name you defined previously.



10. Close the window **Visual Basic**.
11. Save the Excel file in a new name, e.g. "Welds_report_Part123.xls".



12. The new report is now available in the software interface.



13. Run the report as normal.

16.7 View a part report

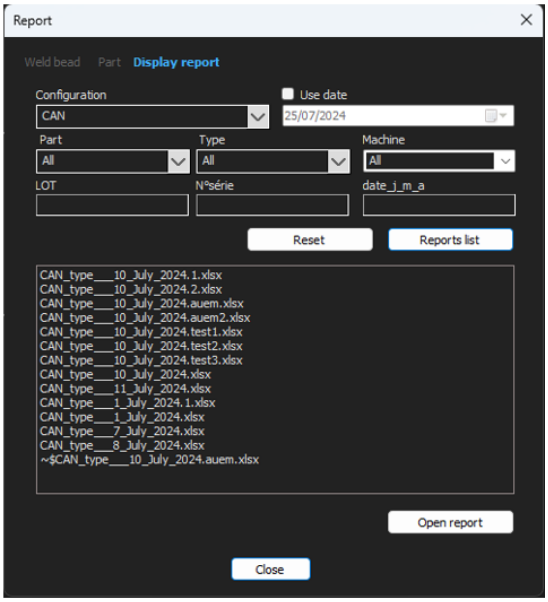
1. To access this function, click **Excel Report**.

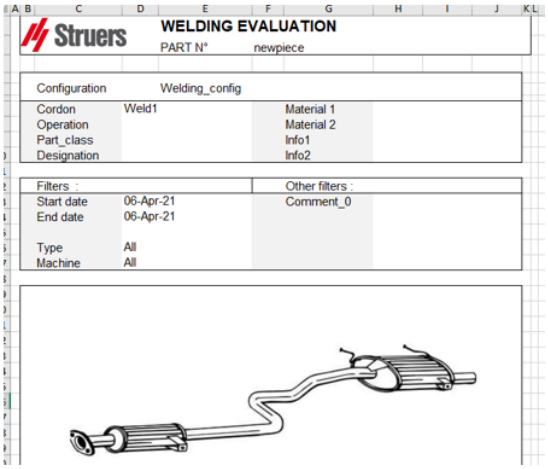
2. Click the tab **Display report** to access this feature.

   To view a particular report, you can sort it according to **Date**, **Type**, **Part**, and **Machine**.

3. Click **Reports list** to select a report.

4. Click **Open report**.





16.8 Monitoring and process tracking

Monitoring and process tracking is an optional feature.

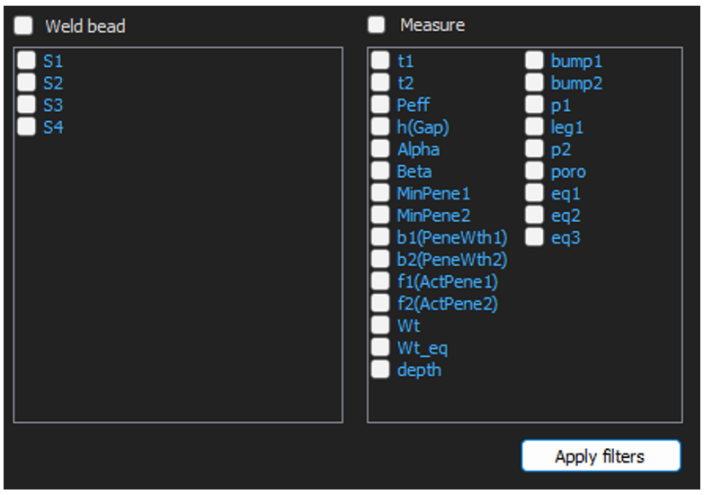
Use this option to follow the progress of measurements on one or several weld beads during a period of time.

1. To access this function, click **Monitoring**.

   You can use all filters to sort your results.

Part selection

1. In the field **Part selection**, select the part you wish to monitor.
2. Select weld beads and weld beads measurements.
3. Click **Apply filters**



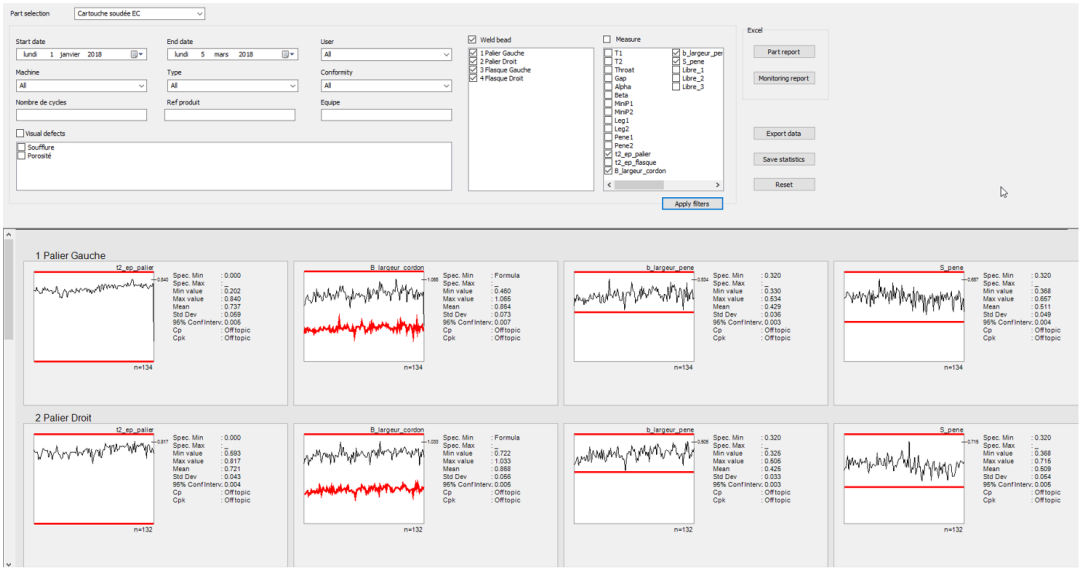
Date selection

1. Select the time period you wish to cover in the fields **Start date** and **End date**.
2. Click **Apply filters**.

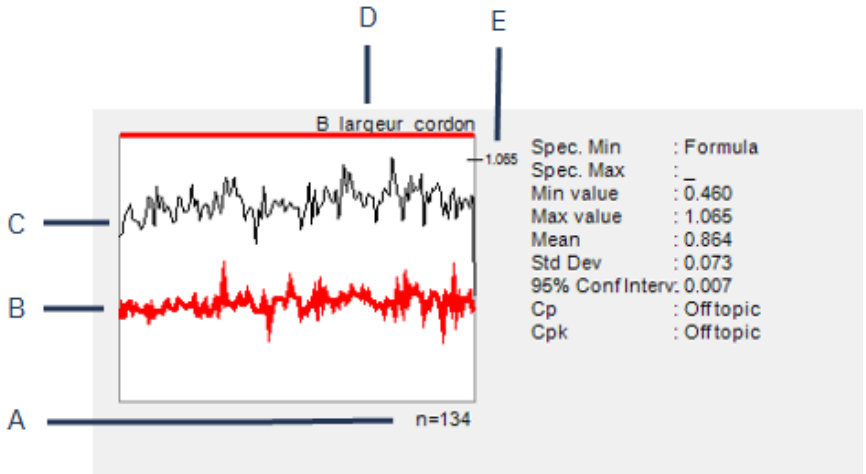
Filter selection

1. Select the filters you wish to use:
   - **Machine**
   - **Type**
   - **Conformity**
   - **Number of cycles**
   - **Ref. product**
   - **Equipment**
   - **Visual defects**
2. Click **Apply filters**.

When the data is processed (this may take a while if there is a lot of data to be processed), evolution charts and statistical values are shown.



Statistical information



A Number of measurements filtered

B Defined minimum value (if set)

C Measurement evolution

D Weld bead name

E Defined maximum value (if set)

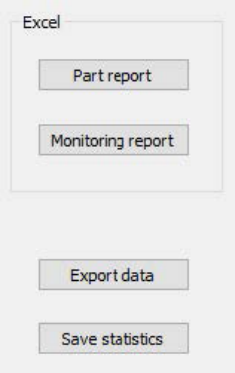
Value	Description
Spec. Min	Defined minimum value (if set)
Spec. Max	Defined maximum value (if set)
Min value	Minimum measured value
Max value	Maximum measured value
Mean	Mean value
Std Dev	Standard deviation
95% Conf Interv.	95% confidence interval
Cp	Cp value
Cpk	Cpk value
CpU	CpU value (if only maximum value is defined)
CpL	CpL value (if only minimum value is defined)

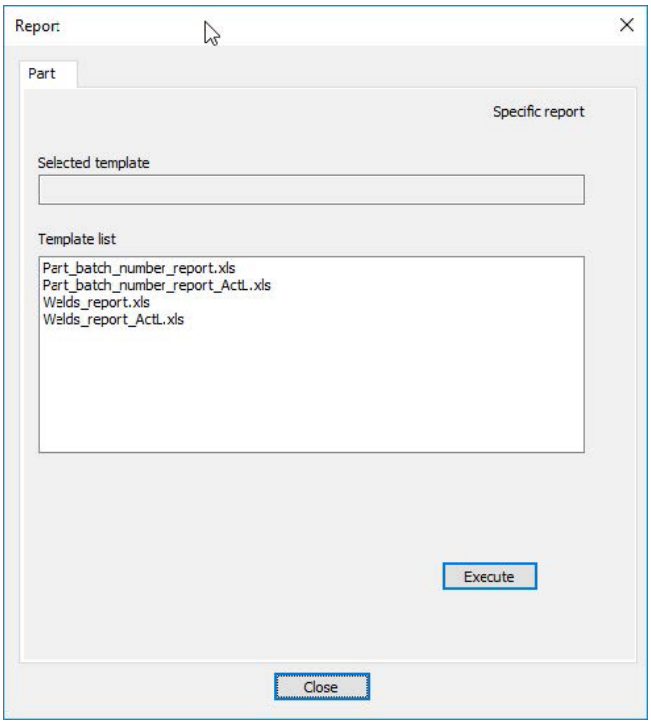
Value	Description
Formula	A formula is used to calculate the Min and/or Max.
Off topic	The value cannot be calculated. For Cp and Cpk the values cannot be calculated if formulas are used for Min & Max.

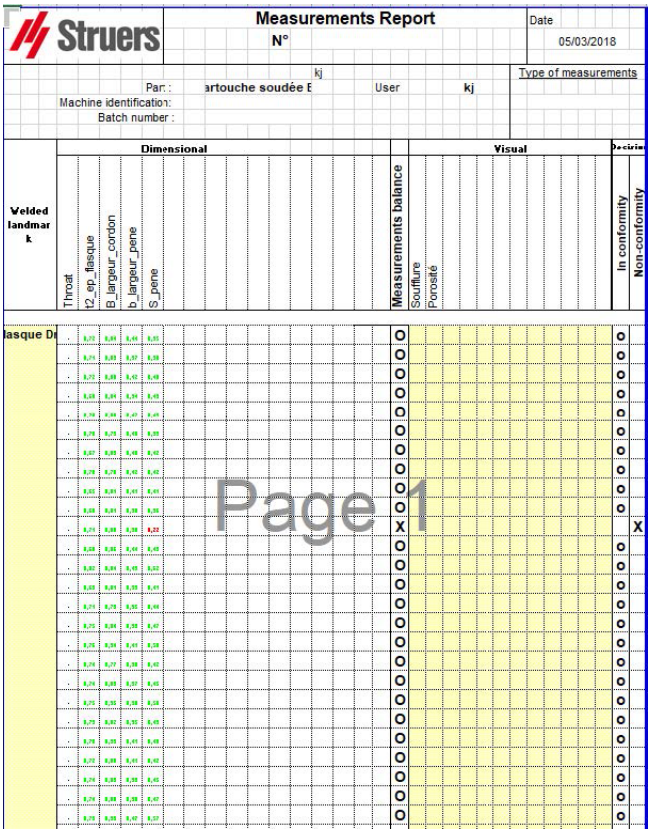
16.9 Save results and reports

Create a complete part report

1. To create a complete part report with all filtered data, click **Part report**.

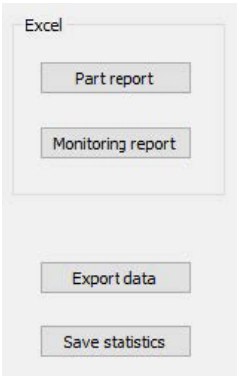


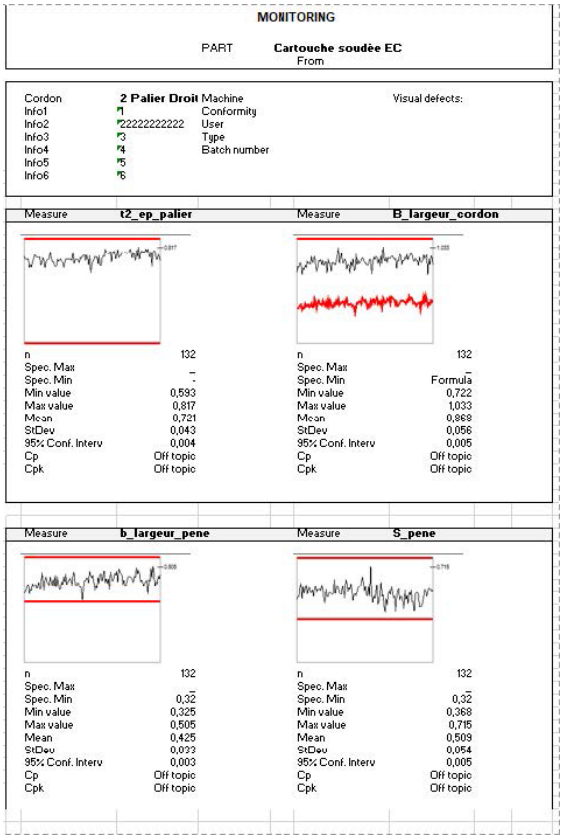




Create a complete monitoring report

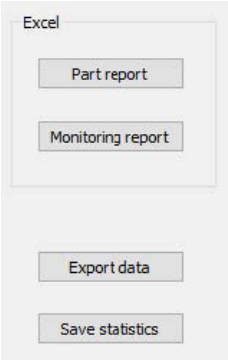
1. To create a complete monitoring report with all filtered data, click **Monitoring report**.





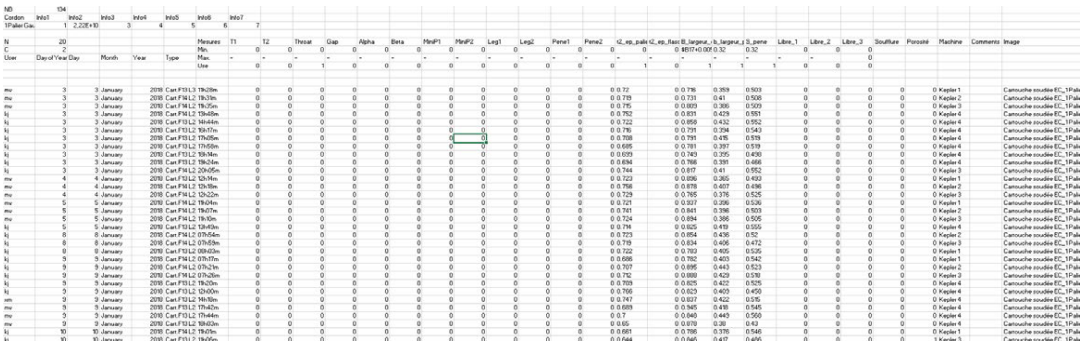
Export data

1. To export raw data as .csv files, click **Export data**.

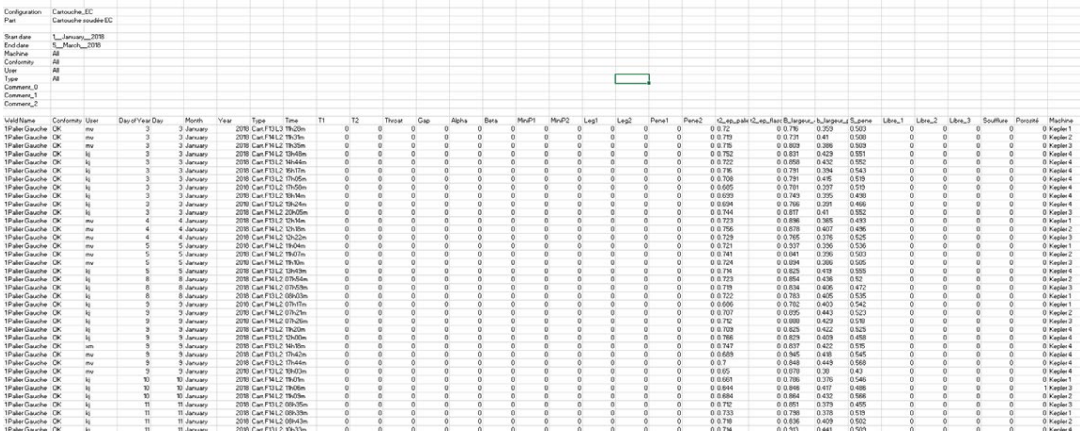


All the images are saved in separate folders.

A .csv file is created for each selected weld.

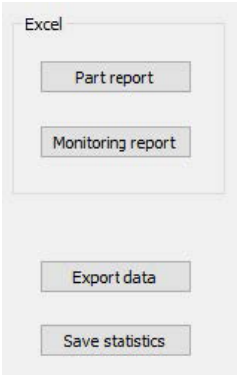


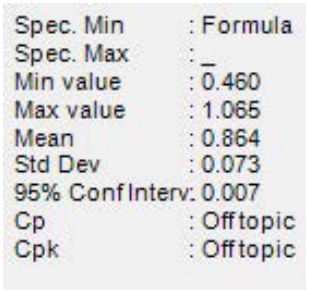
A global .csv file is created with the values of all selected welds.



Save statistics

1. To save statistics as an .xml file, click **Save statistics**.





17 The DataView module (option)

This module is available as an option to the software

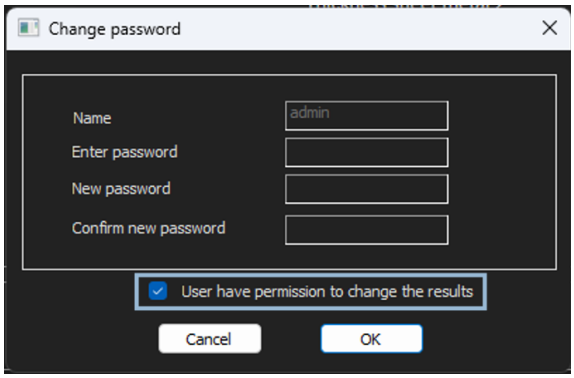
This feature offers the following functions:

- Viewing old results files
- Deleting old results (a specific line)
- Redoing measurements on already saved images
- Replacing old measurements with the redone measurement

Operator management

To be able to get access to all “review data” features, the operator must have access to modify the results files.

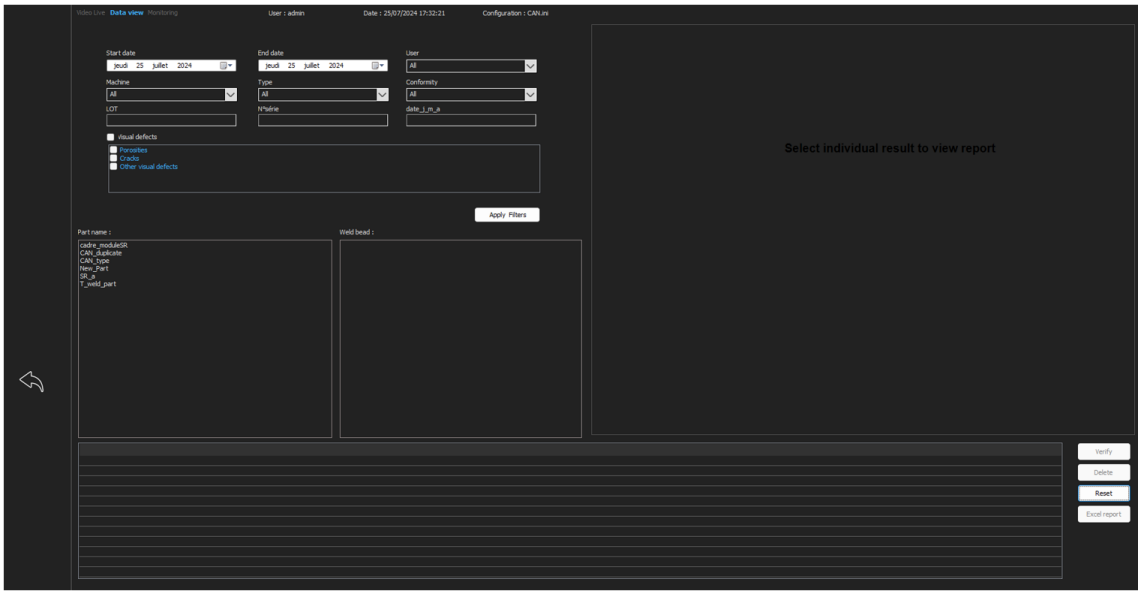
You can change the operators' access rights in the software part **Administration**.



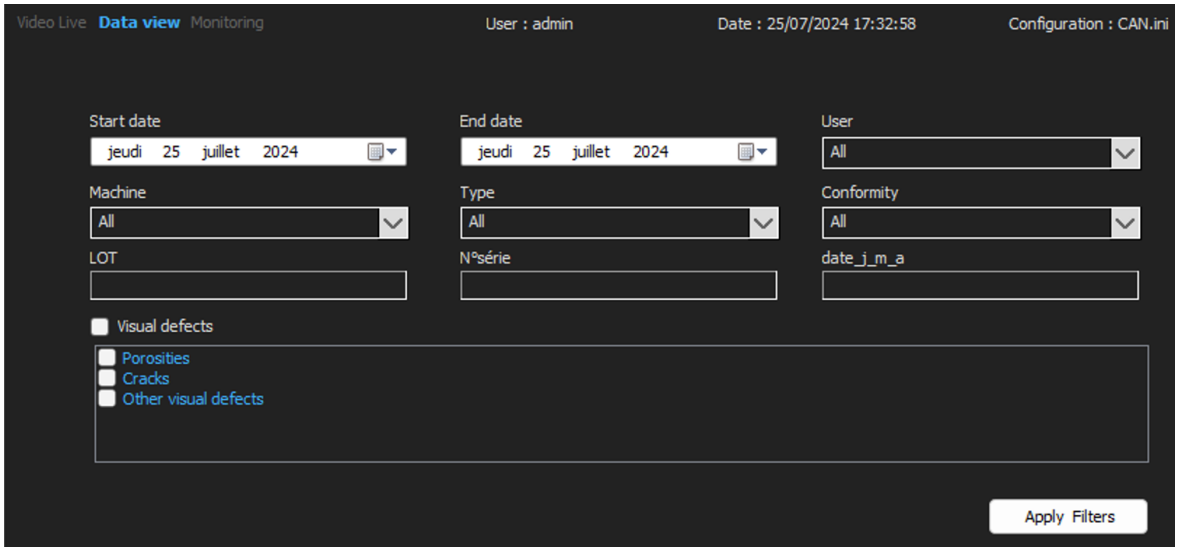
The DataView window

In the main window, a **DataView** icon is shown.

1. To access this feature, click the icon **DataView**.



Sorting keys



Part and weld bead selection

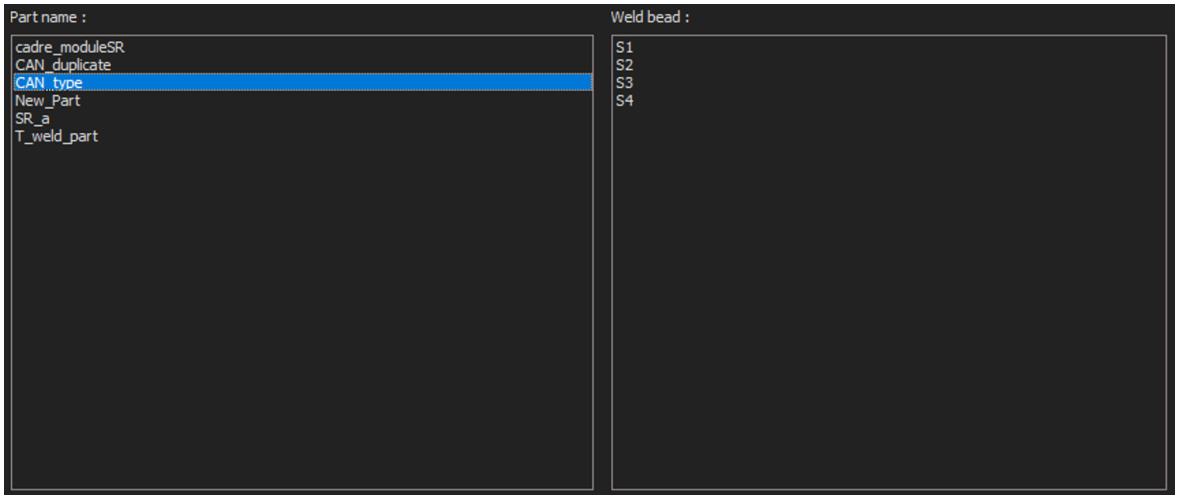
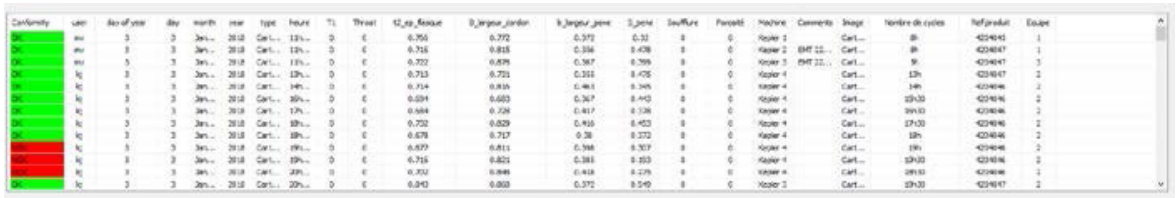
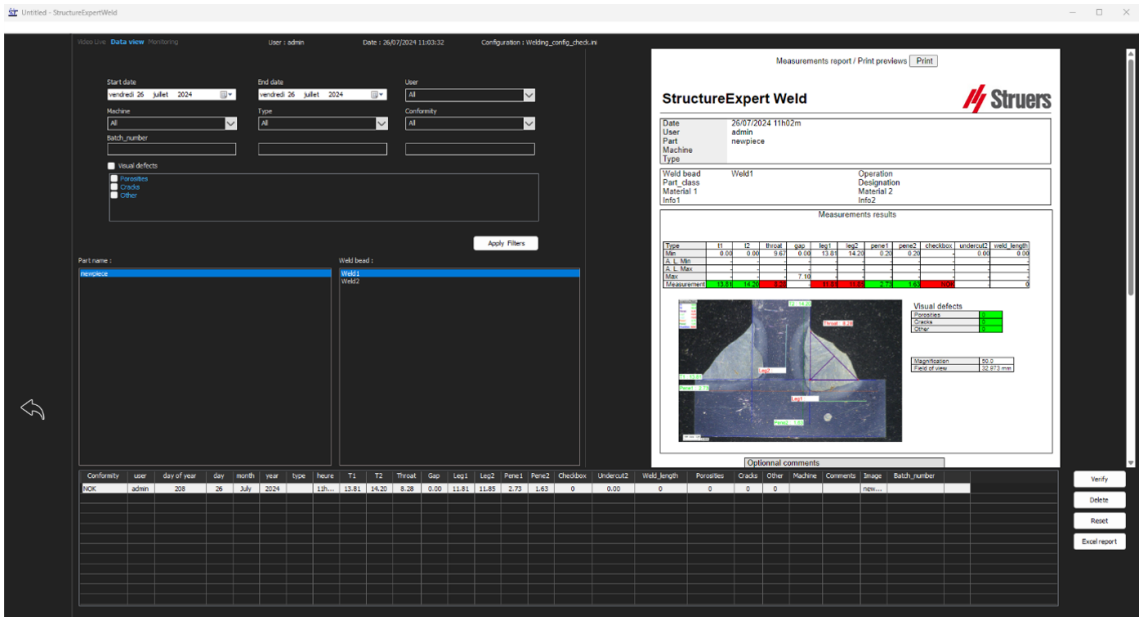


Table of results of the filtering data



Measurement report of the selected measurement line



17.1 DataView features

Verify

Reload the RAW image (with measurement), which has been captured at the date of measurement and then redo the measurement.

Verify is only active if a RAW image exists. If there is no RAW image, the button remains inactive.

Delete

Delete the active measurement line after the operator’s confirmation.

Excel report

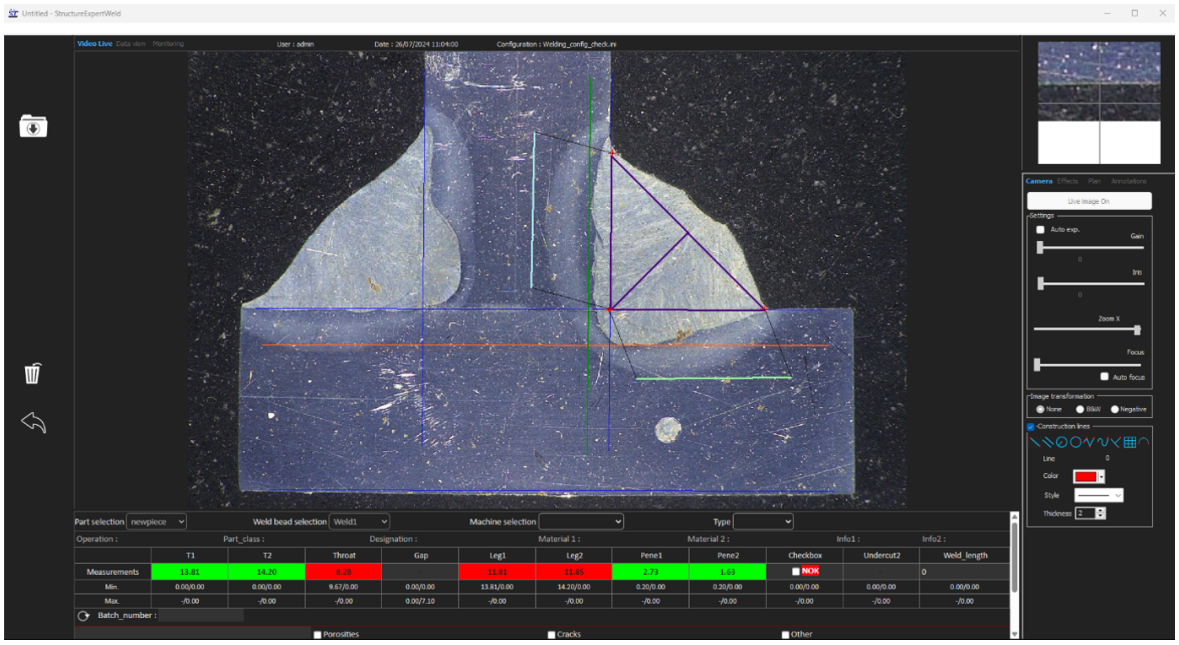
Create an Excel report of the active measurement line.

Reset

Reset the selections (part, weld, ...).

Verifying a measurement with data view

When you click **Verify**, the RAW image is loaded automatically in the tab **Video Live**.



- Part name and weld name are loaded automatically and cannot be changed.
- Machine selection, type and batch number are also loaded automatically and can be changed.
- The correct calibration is loaded.
- Original measurement lines are shown.

Redoing a measurement

To redo a measurement, click on the measurement title. Original lines/results are deleted. Redo the measurement.

Saving an old measurement

If you click on **Save results**, the **new** measurement will replace the old measurement in the global Excel results files at the original date.

Discarding new results

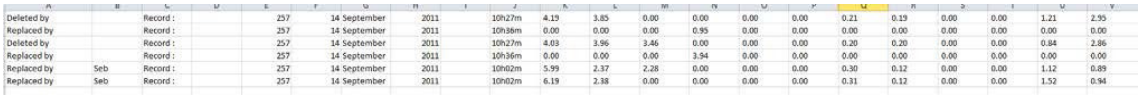
If you do not want to save the new results, Click **Back** and click Yes.

Raw images and data trash

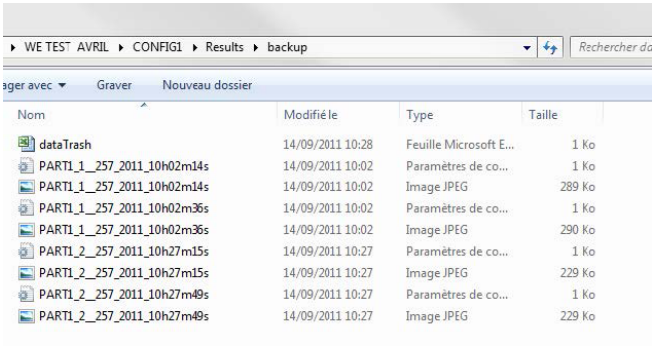
RAW Images are located in the folder **.../Configuration name/Results/Backup**

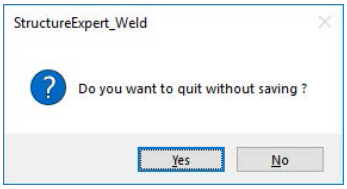
One .JPG file for each image, one text file containing the calibration, and one text file containing the measurement lines positions.

Data trash is located in the folder **.../Configuration name/Results/Backup**



All the deleted or modified results are automatically saved in the file **dataTrash.xls**.

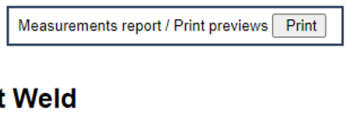




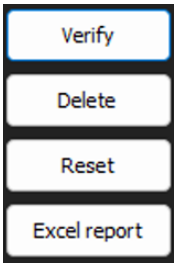
Printing a report in the module DataView

To print a report in the module **DataView**, choose between the following two options:

1. Click on **Print** at the top of the report.



2. Or click on **Excel report** to generate an Excel report.



18 The module Report Generator (option)

See the dedicated user manual.

19 The QDas module (option)

Introduction

The software provides a solution for saving weld bead measurements in the QDas format.

Use the **SEW_QDas_Settings.exe** software to manage QDas settings in StructureExpert Weld (SEW):

- Associating QDas tags (K1xxx, K2xxx, K0xxx) to SEW data.
- Defining the folder for saving data.

Part Data/K1 tags
QDas tags in Range K1xxx (known as Part Data) will be associated with:
– Configuration Name – Part Name – Weld Bead Name – Operation, Part_Class, Designation, Material 1, Material 2, Info 1, Info 2. 

Characteristic/K2 tags
QDas tags in Range K2xxx (known as Characteristic Data) will be associated with:
– Measure Id – Description – Unit – Min/Action Limit Min – Max/Action Limit Max – Formula

Value/k0 tags
QDas tags in Range K0xxx (known as Values) will be associated with: – User – Date – Machine – Type – Text comment – Comment1 (batch number), comment 2, comment 3)

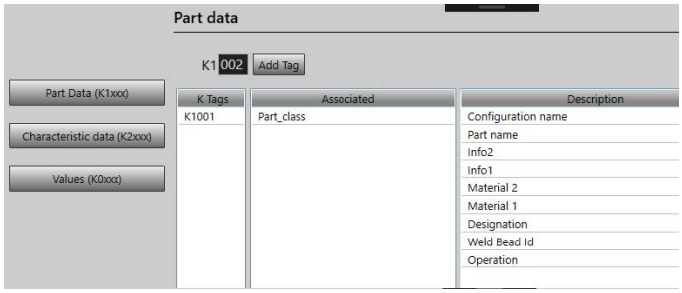
19.1 SEW_QDas settings

SEW_QDas_Settings.exe is located at the root of the software installation folder.

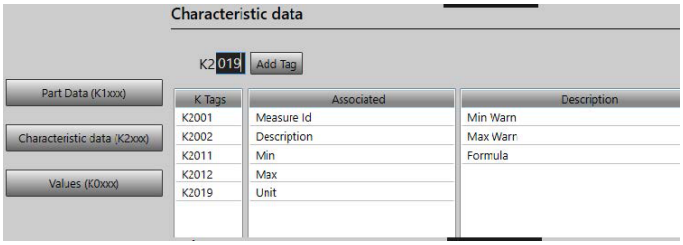
This software is used as a setting software to associate each tag with SEW data.

Use the 3 screens as shown in the following:

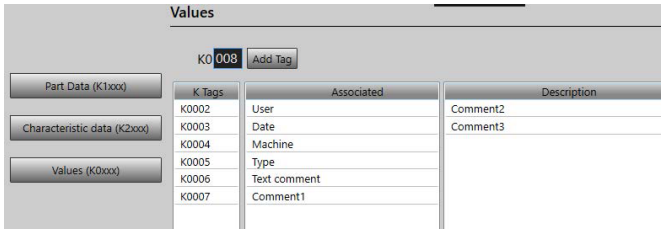
1. Associating **Part data**



2. Associating **Characteristics data**



3. Associating **Values**

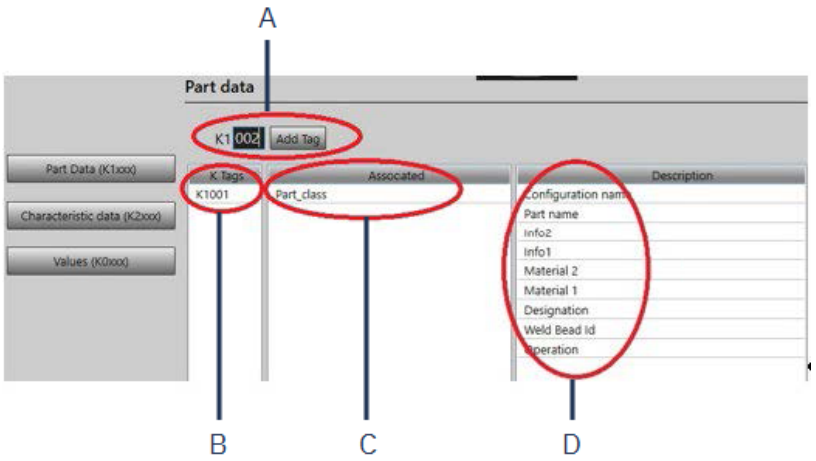


Associating SEW data to QDas tag:

1. Select the screen corresponding to the data/tags.
2. Enter the tag number for the part. (A).

3. Click **Add tag** (Add tag) to store the new tag in the **K Tags** (K Tags) list. (B).
4. Click on the text in the **Description** data list (D) that you wish to associate to the tag.
5. Drag the text to the **Associated** list. (C)

   The following graphic shows Tag k1001 already associated to SEW data called Part_Class (B) and (C).



Removing tags/associated data

- To remove a tag and the associated SEW data ((B) and (C)), double-click on the K tag you wish to remove. (B)
- To remove only the associated data ((C)), drag the text to the description list. (D)

Additional options

- Click **More Options** to access additional options.

When you save a QDas file, measurement values can be saved in two different ways:

- On a single line, with a separator character

```
 0.00| 0.00| 0.00| 0.00| 0.00| 0.56| 0.00| 0.00| 1.00| 0.00| 0.00|0|0|0
K0004/0 20.03.20/09:45:00
K0006/0
K0008/0 1
K0009/0
K0010/0 0
 0.00| 0.00| 0.00| 0.00| 7.44| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|0|0|0
K0004/0 20.03.20/09:45:07
K0006/0
K0008/0 1
K0009/0
K0010/0 0
 0.00| 0.00| 0.00| 0.00| 0.00| 8.18| 0.00| 0.00| 1.00| 0.00| 0.00|0|0|0
```

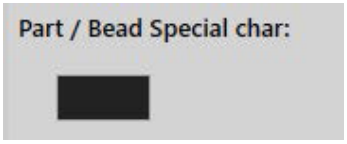
or

- Each measurement value can be associated with its measurement number, K-Field

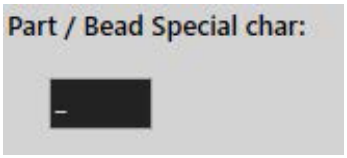
```
K0004/0 20.03.20/10:51:47
K0006/0
K0008/0 1
K0009/0
K0010/0 0
K0001/1  0.00
K0001/2  0.00
K0001/3  0.00
K0001/4  0.00
K0001/9  2.61
K0001/10  0.00
K0001/11  0.00
K0001/12  0.00
K0001/13  1.00
K0001/14  0.00
K0001/15  0.00
K0001/16 0
K0001/17 0
K0001/18 0
K0004/0 20.03.20/10:51:52
K0006/0
K0008/0 1
K0009/0
K0010/0 0
```

*The **Part / Bead Special char** field*

When you create parts and welds in SEW software, the most frequently used special character is the underscore "_" as a prefix to the part name or more often to the weld name: e.g. _001, _ 025, _0136....This will ensure correct sorting in the software as well as in the Excel reports.

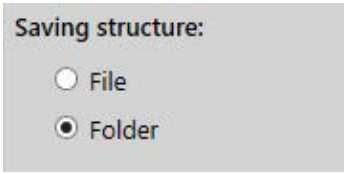


The special character underscore "_" can be a problem when you save data in the QDas format, so this option enables saving all the results eliminating "_" in all part names and weld names.



Enter the special character you wish to remove.

Saving a QDas file



When you save a QDas file, the file is usually saved in a sub-folder.

However, you can also save the file in a fixed folder using the file option, therefor files are saved in a fixed location:

Config_demo2_NewPart_Convex1_00000001.dfq

File names structure:

Configuration name_Part_name_weld identification_000000x.dfq

Defining a QDas saving folder

- To define the saving folder for QDas data, click **Browse**.

19.2 QDas results

When you have saved settings, you can use SEW to save QDas results.

Whenever you wish to save results, they will be saved as usual in the Excel format, and also in the QDas format according to the settings.

SEW uses the QDas folder to save QDas data. Each result will be store in a subfolder defined as :

QDasFolder/ConfigurationName/BeadName/xxxxxxxx.dfq

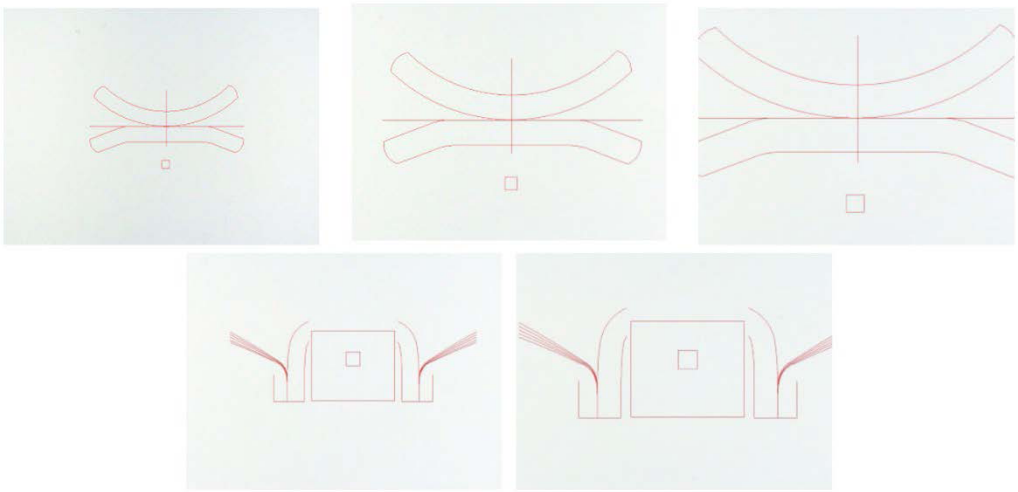
The results will be saved as a DFQ structure. The name is defined by 8 digits from 00000001.dfq. As seen in the QDas specification, the name is incremented at every modification in the descriptive part (known as DFD).

20 The DXF module (option)

The DXF module allows import of .DXF files in the SEW software. It is supported from software version V3.20

The .DXF files are opened on the captured image, and drawings can be moved and orientated according to the sample position.

The drawings follow the magnification of the captured image, as the scale is incorporated in the .DXF file.



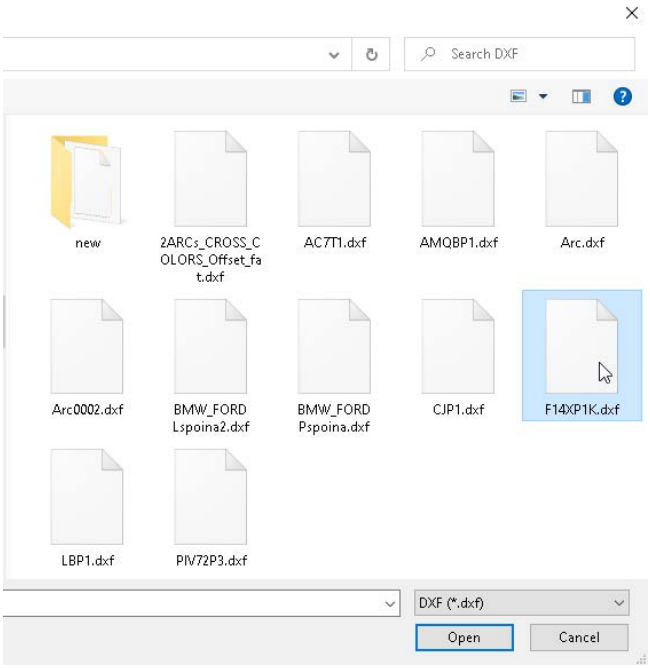
The DXF module is very useful for displaying complex drawings on SEW images. The main objective is to have reference lines for making precise measurements.

20.1 DXF operating mode

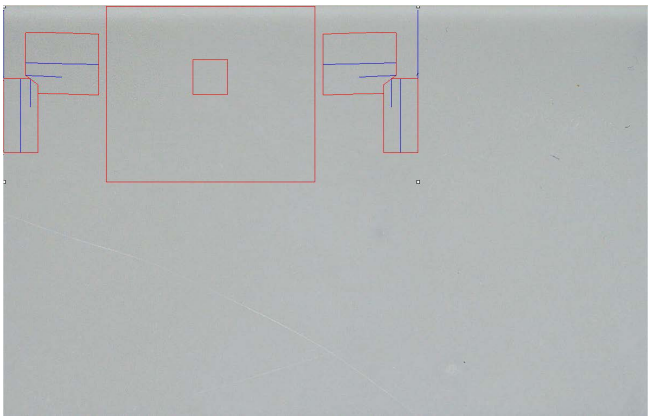
1. Capture the weld sample image.
2. Right-click on the image and select **DXF**.

Or

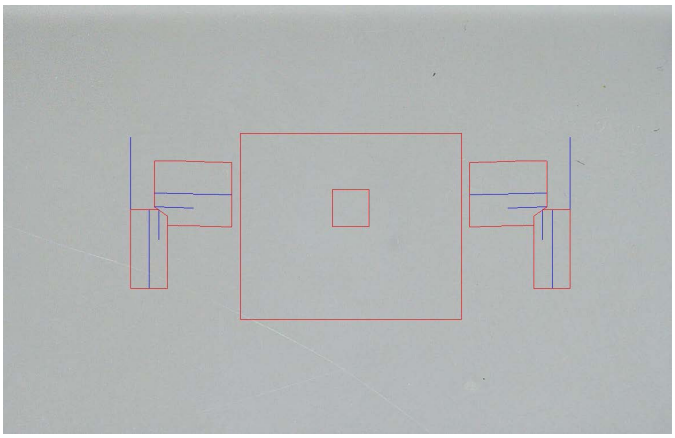
3. Select the tab **Effects** and select **DXF**.
4. Select the .DXF file you wish to open in the image.



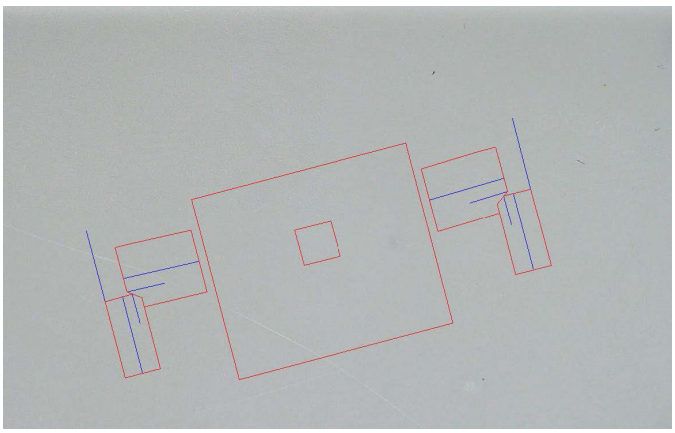
5. The .DXF file is automatically opened and adjusted to the upper left corner.

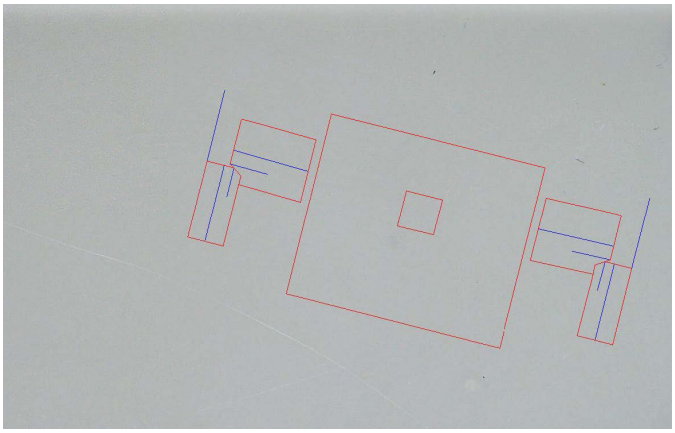


6. Click on the DXF drawing to move it to the desired position on the sample.

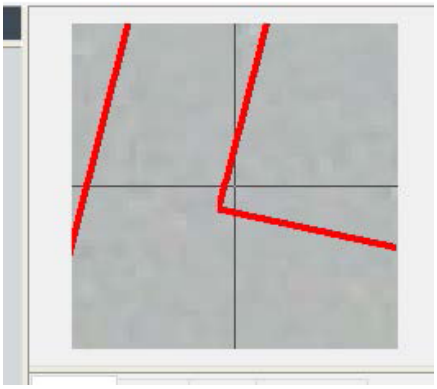


7. Use CTRL + the mouse scrolling function to adjust the orientation of the drawing.





8. When the .DXF drawing is correctly adjusted, the drawings can be seen in the upper right magnification window of the software to facilitate measurements.



9. Make the measurements as usual.
10. If you wish to include the .DXF drawing on the saved image, check off the check box **Merge construction lines and texts**. If not, the .DXF drawing will be remove before the image is saved.

21 The XML/JSON module (option)

To facilitate the integration of the generated data into third-party software, use the XML/JSON module (Option) to save data in the .XML or .JSON formats.

The software continues to save data in the usual way, as described in this manual, and will save some additional files.

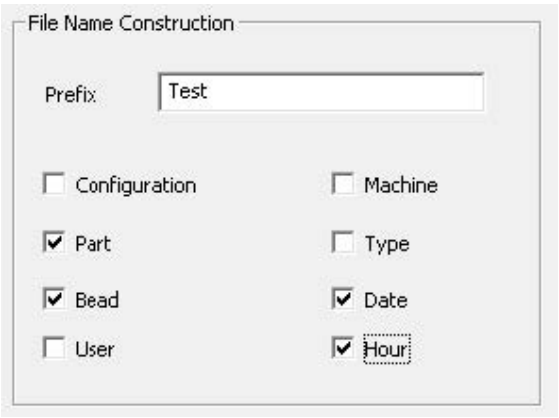
If the option is activated, a new tab, **XML/JSON** is shown in **Settings.exe**.

In this module, you can define

- The file saving path (local drive or network drive)
- File name rules

You can also define a prefix as well as any necessary information in the file name.

Each information is separated by an underscore : _



In the above example file name will be **Test_Part_Bead_Date_Hour**.

If a file is already present in the saving folder and a new file has the same name, the new file will automatically replace the old one.

- File format : XML or JSON.
- If a copy of the saved image is needed with the saved file.

All the generated files are saved in the selected path.

All these files will not be deleted except by manual or automatic user operation.

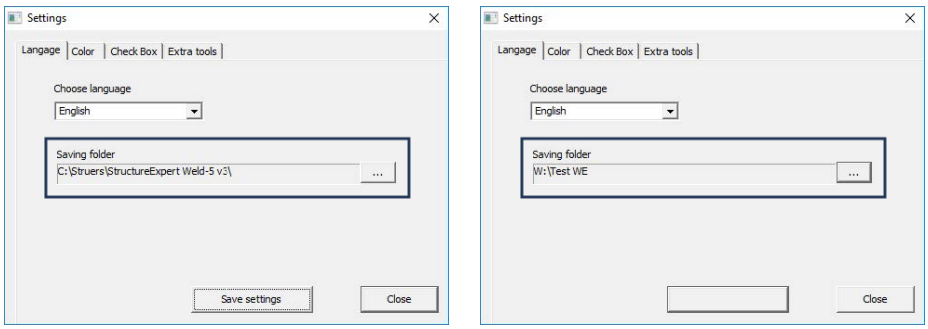
22 Appendix 1: Change network saving path

Change the saving path on the network/Networking StructureExpert Weld systems

A network drive must be accessible to save StructureExpert Weld data on the network or to share data between several StructureExpert Weld systems.

To change the StructureExpert Weld saving path, do the following:

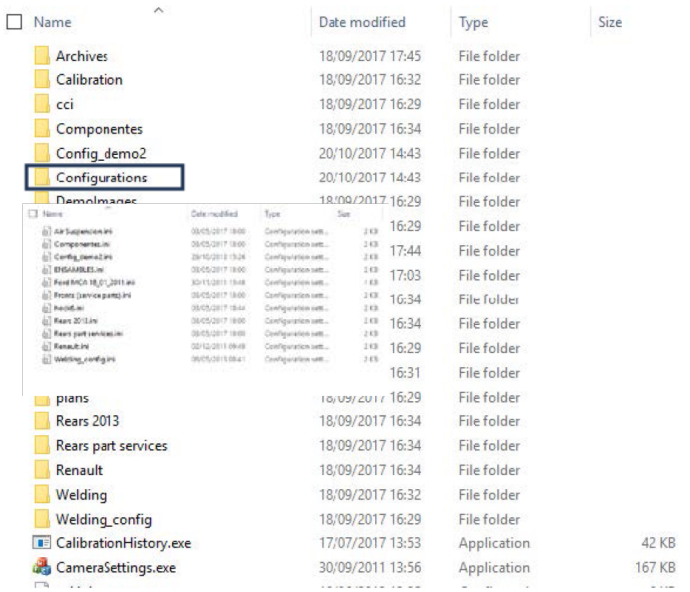
1. During the installation process, change the saving path at the end of the installation process.



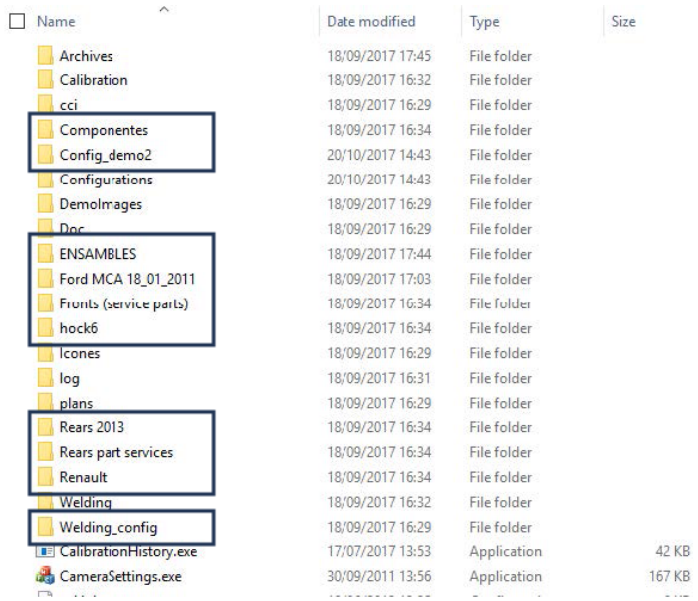
2. After installation, with existing data, copy the existing data in the shared network drive.

Folder configurations

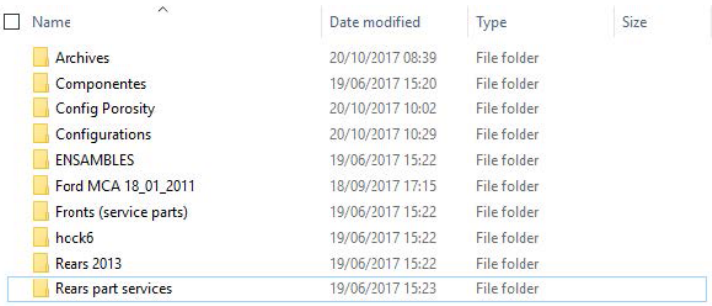
Data to be copied or to be moved:



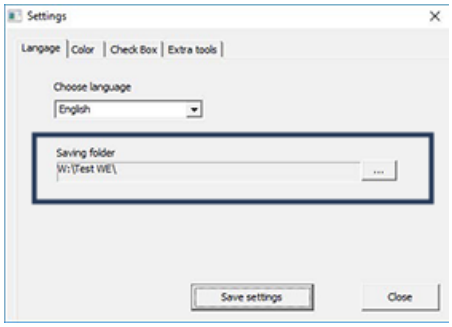
Folders of the different configurations



All the data required is now on the network drive:



3. In the installation folder of the StructureExpert Weld software, open **Settings.exe** and change the saving path to the network drive.



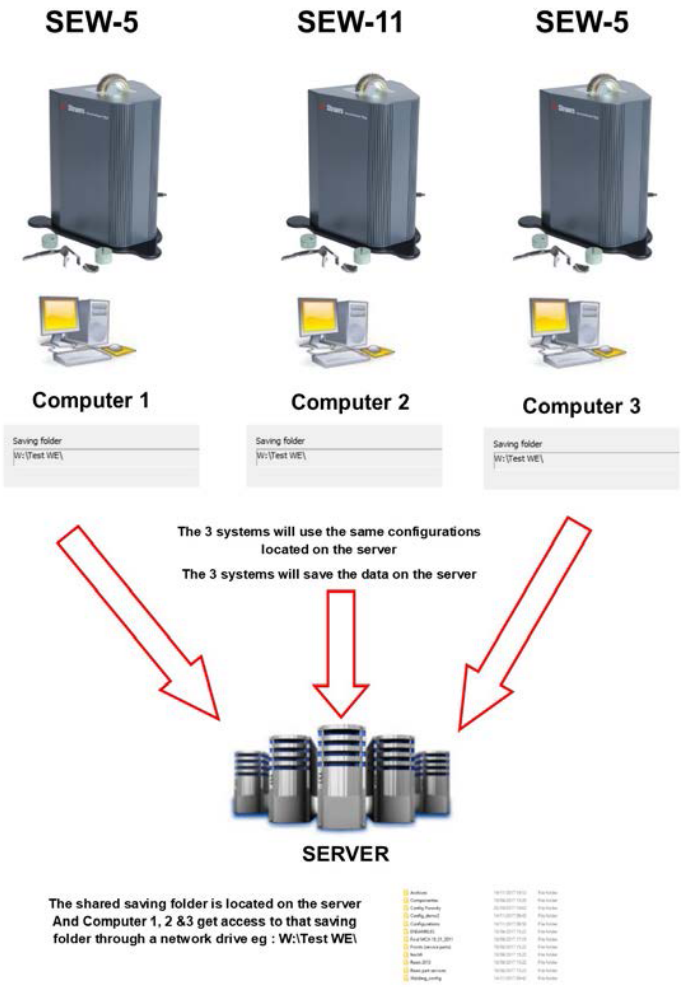
When you use the StructureExpert Weld software, data will now be loaded and saved on the network drive.

Networking StructureExpert Weld systems

In this example, StructureExpert Weld is installed on **Computer 1**, **Computer 2** and **Computer 3**.

The data is on a server.

Each computer has access to the server through a network drive.



Notes on StructureExpert Weld software data

The Configuration folder

The **Configuration** folder contains all the created configurations files.

Air Suspension.ini	03/05/2017 18:00	Configuration sett...	2 KB
Componentes.ini	03/05/2017 18:00	Configuration sett...	2 KB
Config Porosity.ini	20/10/2017 10:27	Configuration sett...	2 KB
Config_demo2.ini	29/10/2013 15:26	Configuration sett...	2 KB
ENSAMBLES.ini	03/05/2017 18:00	Configuration sett...	2 KB
Ford MCA 18_01_2011.ini	30/11/2011 15:46	Configuration sett...	1 KB
Fronts (service parts).ini	03/05/2017 18:00	Configuration sett...	2 KB
hock6.ini	03/05/2017 18:44	Configuration sett...	2 KB
Rears 2013.ini	03/05/2017 18:00	Configuration sett...	2 KB
Rears part services.ini	03/05/2017 18:00	Configuration sett...	2 KB
Renault.ini	02/12/2011 09:49	Configuration sett...	2 KB
Welding_config.ini	06/05/2013 08:41	Configuration sett...	2 KB

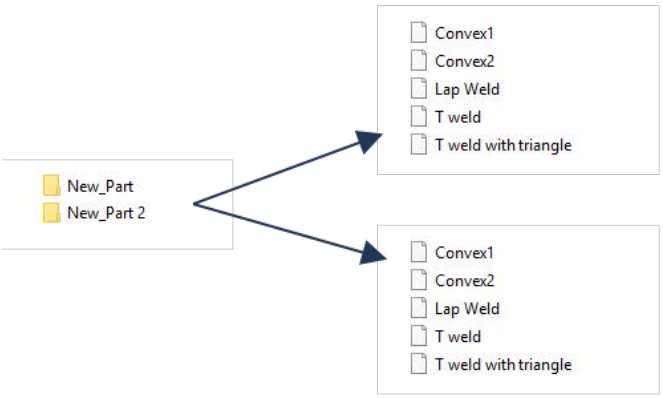
Folders of the configurations

Each folder has 3 sub-folders.

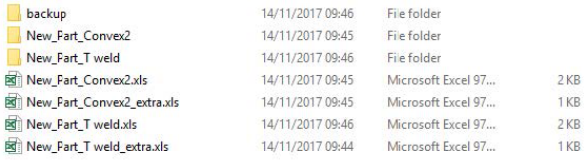
The Cordons folder

The **Cordons** folder contains a folder for each created part.

Each part folder contains all the welds of the part.



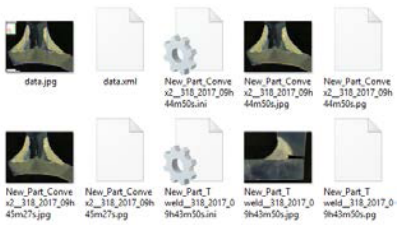
The Results folder



The Backup folder (only with the Dataview module)

This folder contains all the raw images without merged measurements and the associated calibration.

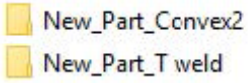
These images are used in the StructureExpert Weld software to remeasure the welds.



The Images folder

A folder is automatically created for each weld for saving images.

The name of the folder is built using "Part name_Weld name".

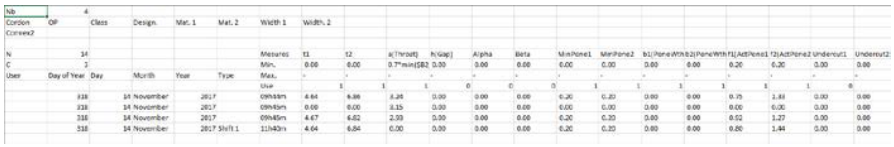


Each image is automatically saved.

The name of the image is built using "Part name_Weld name_user_date_hour".

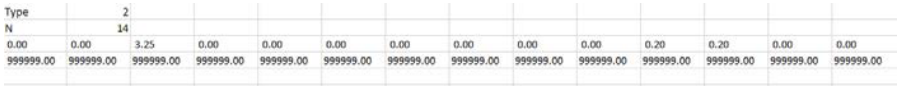
Excel result files

All the results of a same weld are saved in an excel files.



Extra Excel files (only with the Action limit module)

The extra.xls file contains the action limit settings of the weld.

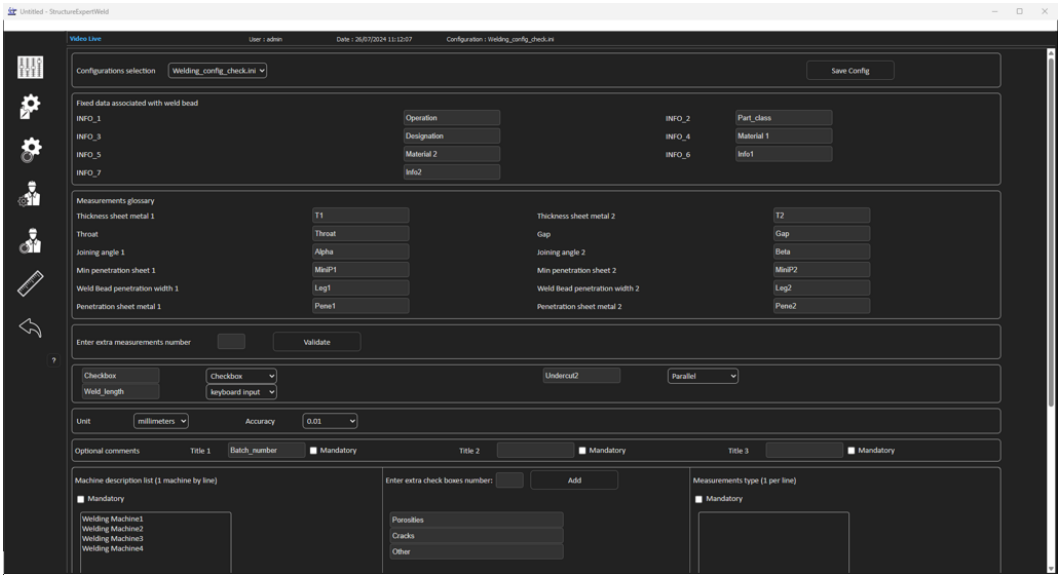


23 Appendix 2: Visual check of weld beads

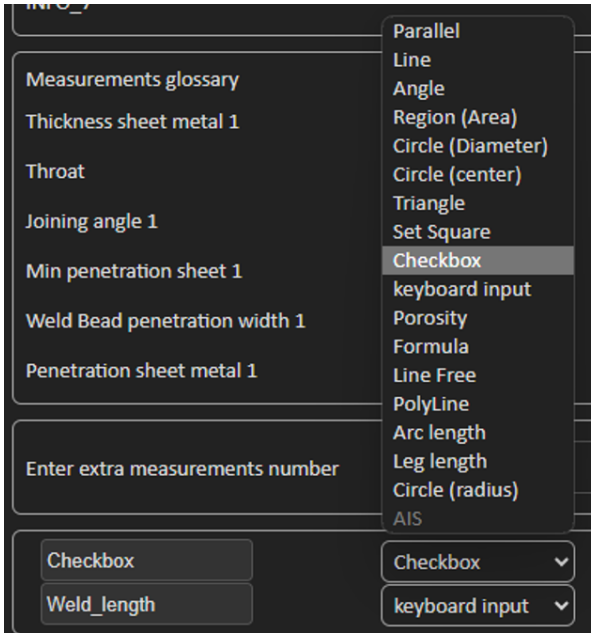
Check box

Some welding standards do not require geometrical evaluation of the weld but only a visual inspection to see if the weld is correct or incorrect.

To facilitate this kind of inspection, a specific tool has been implemented into StructureExpert Weld software.

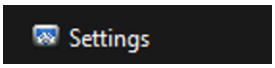


When you create a new software configuration (**Administration** > **General Description**), a tool is available in the **Enter extra measurements number** > **Check Box** list.

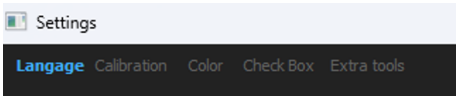


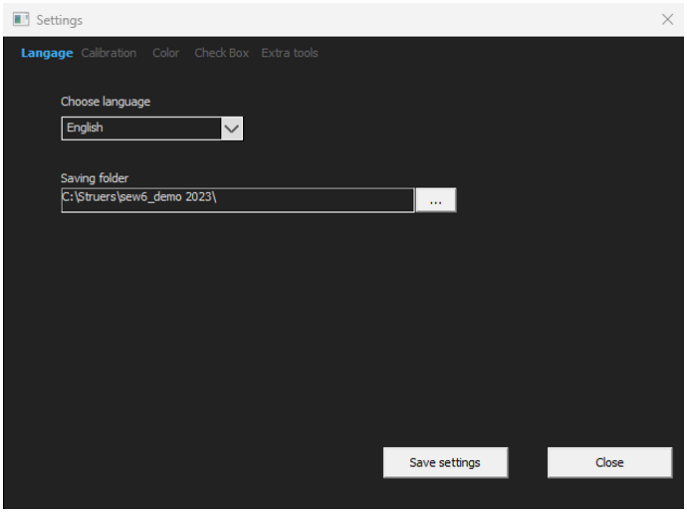
1. To evaluate a weld, create a check box.
   - If the check box is unchecked, the weld is incorrect – The result is shown in RED.
   - If the check box is checked, the weld is correct – The result is shown in GREEN.

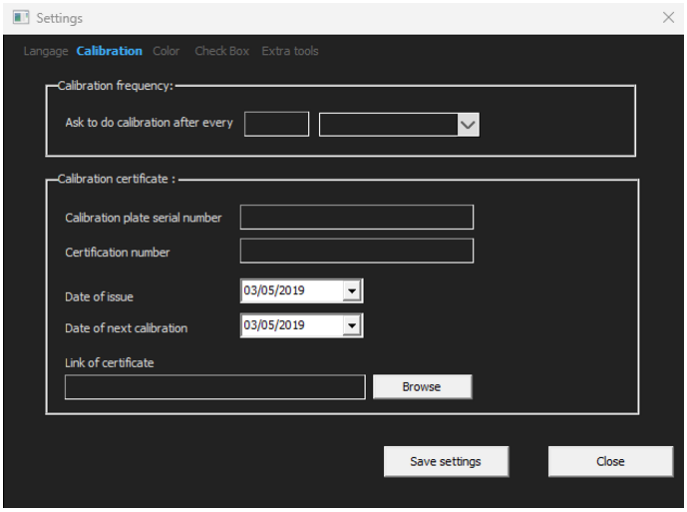
Note
You can change the text which is shown when weld is correct or incorrect in the **Settings.exe** file in the installation folder of the software.

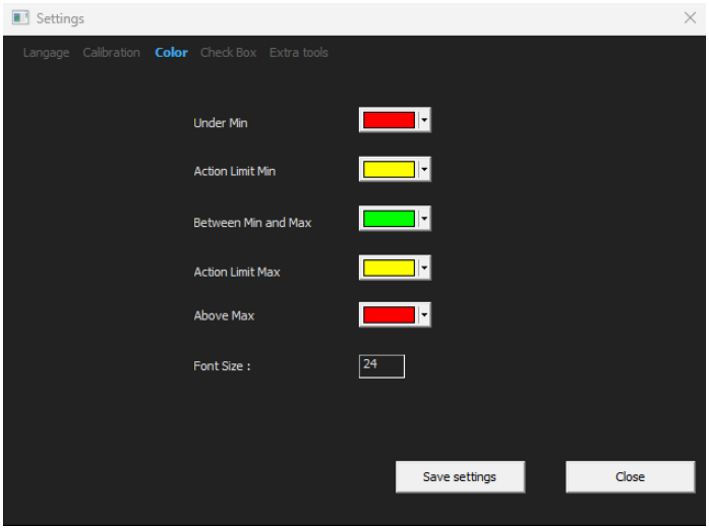


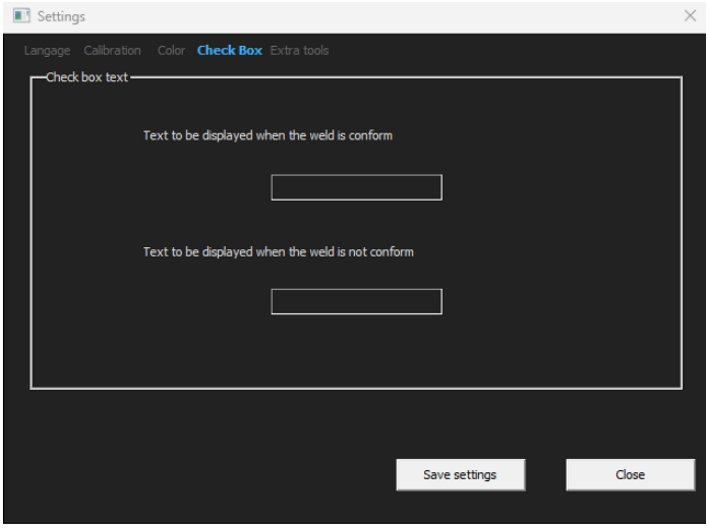
The setting file is composed of 5 menus:

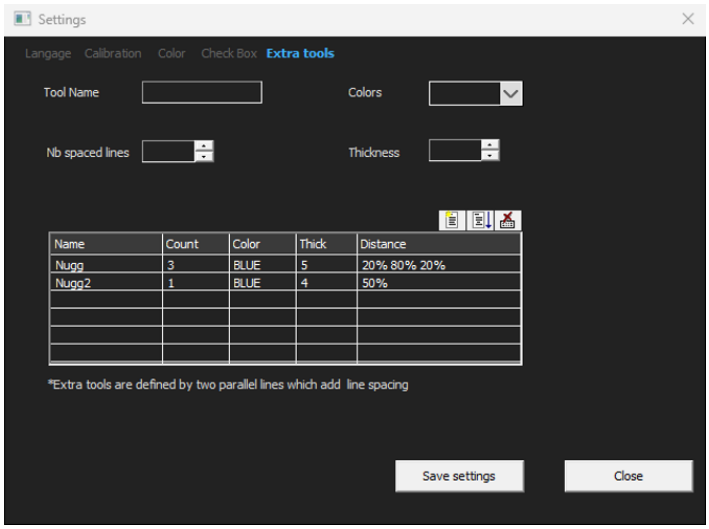




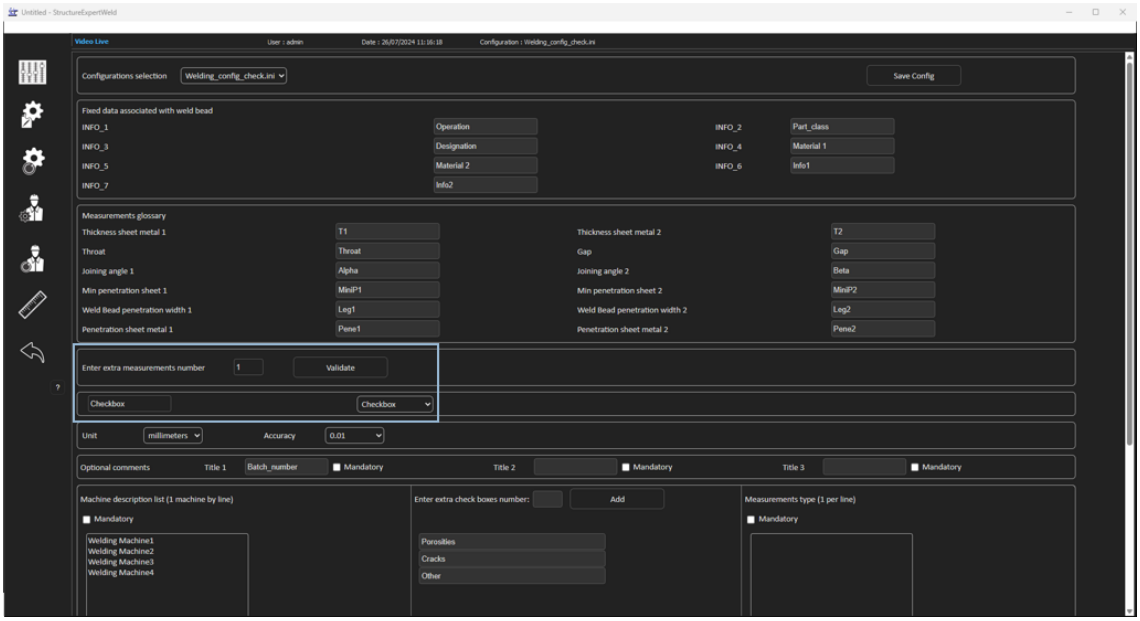



Settings
Langage
Calibration
Color
Check Box
Extra tools
Under Min
Action Limit Min
Between Min and Max
Action Limit Max
Above Max
Font Size :
24
Save settings
Close

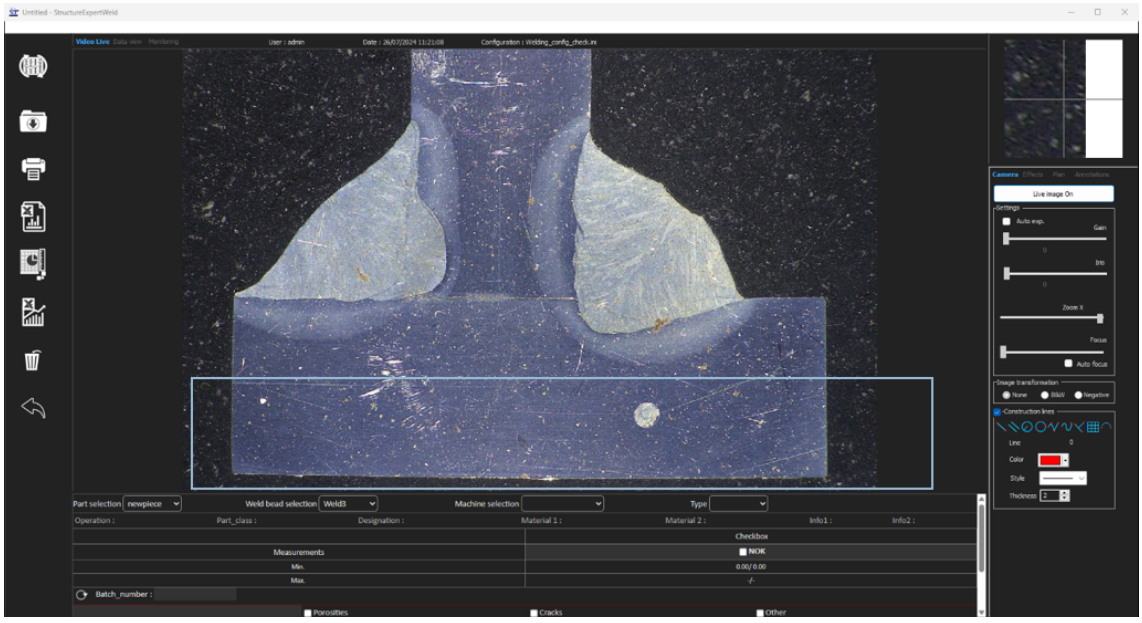

Settings
Langage
Calibration
Color
Check Box
Extra tools
Check box text
Text to be displayed when the weld is conform
Text to be displayed when the weld is not conform
Save settings
Close


Settings
Langage
Calibration
Color
Check Box
Extra tools
Tool Name
Colors
Nb spaced lines
Thickness
Name
Count
Color
Thick
Distance
Nugg
3
BLUE
5
20% 80% 20%
Nugg2
1
BLUE
4
50%
*Extra tools are defined by two parallel lines which add line spacing
Save settings
Close

Configuration example: No measurement - only visual inspection.

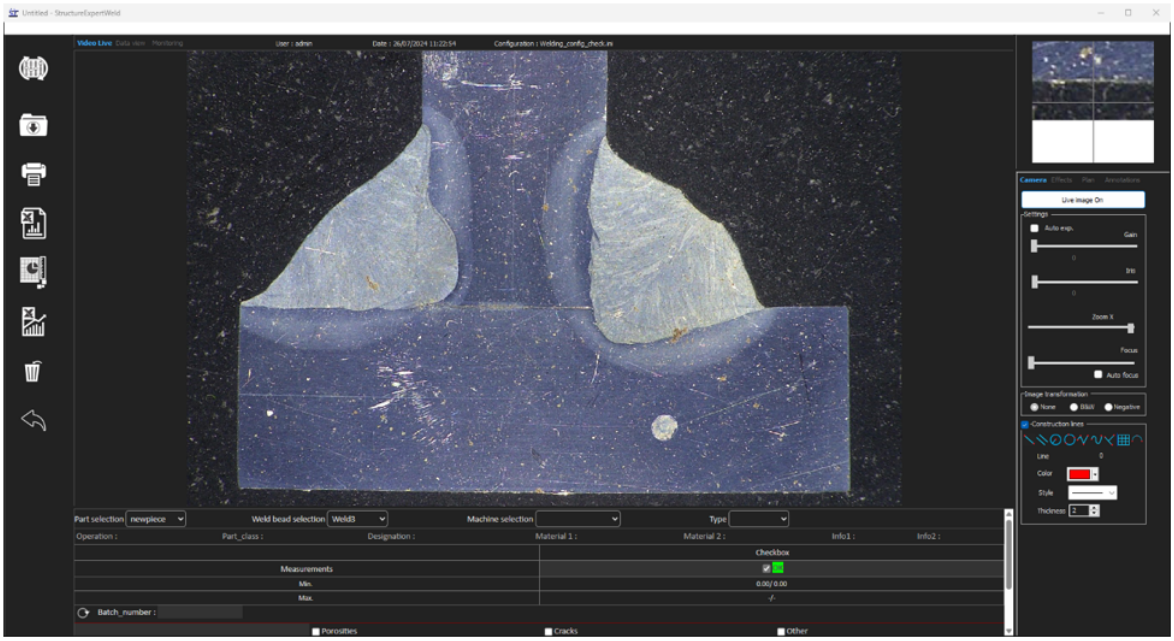


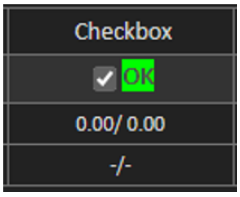
Setting up a new part



Visual inspection - correct weld

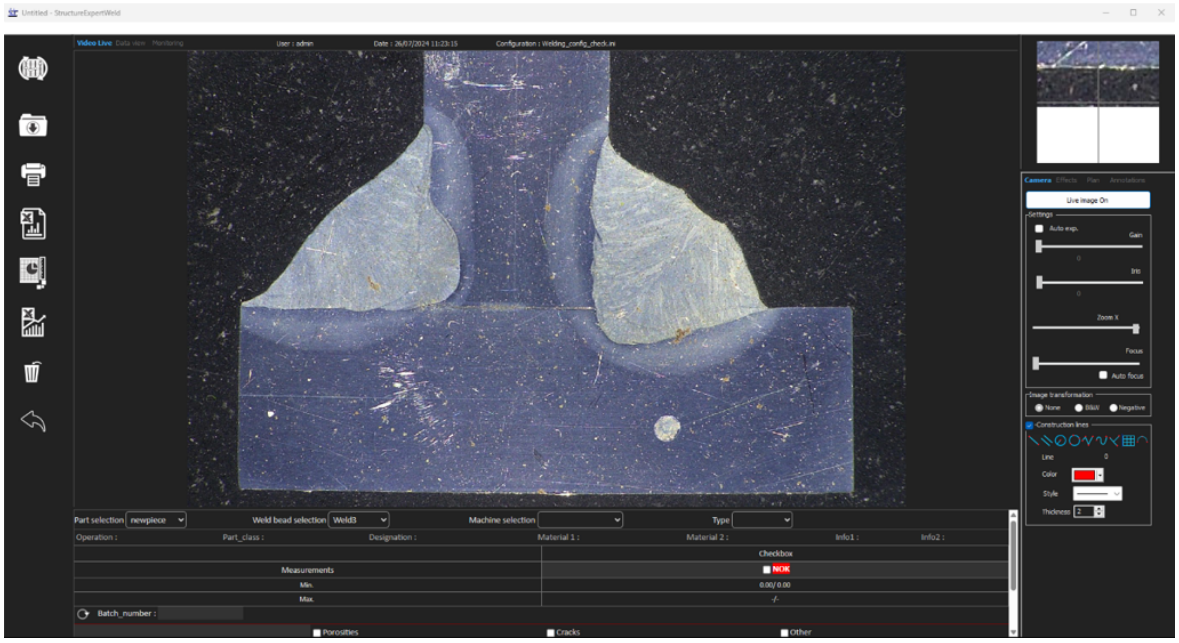
The box is checked and is shown in green, also in the image.

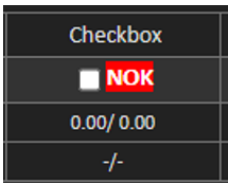




Visual inspection - incorrect weld

The box is not checked and is shown in red, also in the image.





24 Appendix 3: Min & Max action limits (option)

Some welding standards require additional parameters to the acceptance criteria (min & max values), the Min & Max action limits.

To be in conformity with the most advanced welding standard, Min & Max action limits have been implemented in the StructureExpert Weld software.

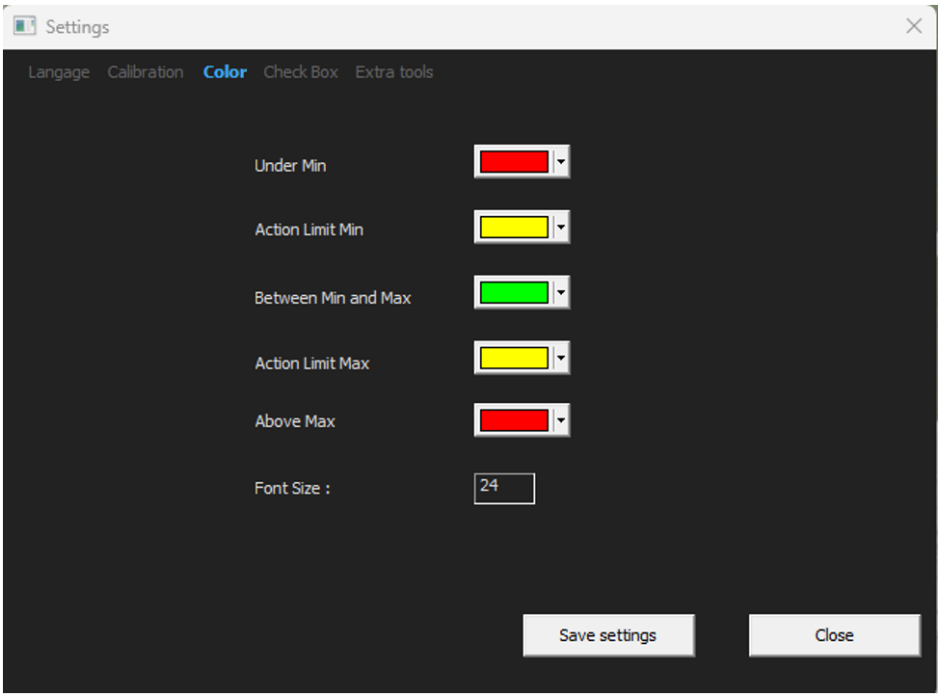
1. In the **Administration** part of the software, select **New Part** and/or **Modify Part**.

   In addition to the acceptance criteria, you can define Min & Max action limits.

   When you make a measurement, results will be shown with the following colors:

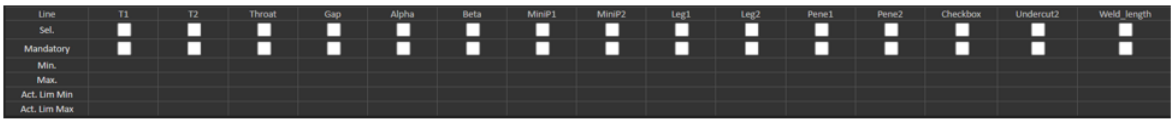
   - **Under Min** RED
   - **Between Min & Max** GREEN
   - **Above Max** RED
   - Between **Min & Min Action limit** YELLOW
   - Between **Max & Max Action limit** YELLOW

Note
You can change the colors in the **Settings.exe** file in the installation folder of the software.



Setting up a part using Min & Max action limits

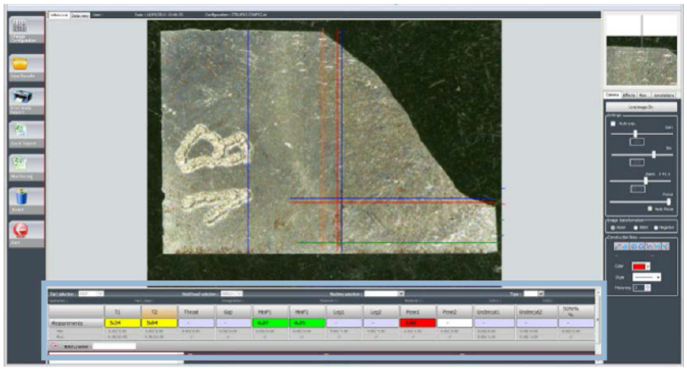
Note
From version 3.0: Min& Max action limits can be defined with fixed values as well as formulas.
For details about formulas, see Formula ►54 and Create parts and welds ►21.

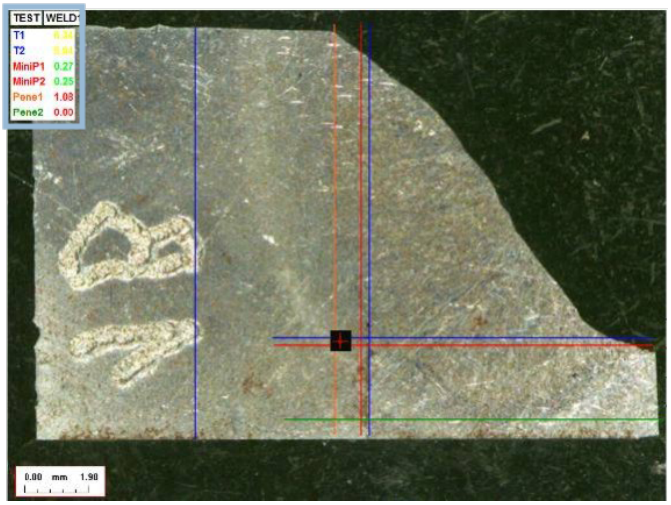


- Values of Min action limits must be higher than the Min value.
- Values of Max action limits must be lower than the Max value.

If these conditions are not met, results between Action Limits & Min/Max will be shown in Green.

Measurements using Min & Max action limits





Results are automatically compared to the acceptance criteria and Min/Max action limits, and are shown with the following colors:

- **Under Min** RED
- **Between Min & Max** GREEN
- **Above Max** RED
- Between **Min & Min Action limit** YELLOW
- Between **Max & Max Action limit** YELLOW

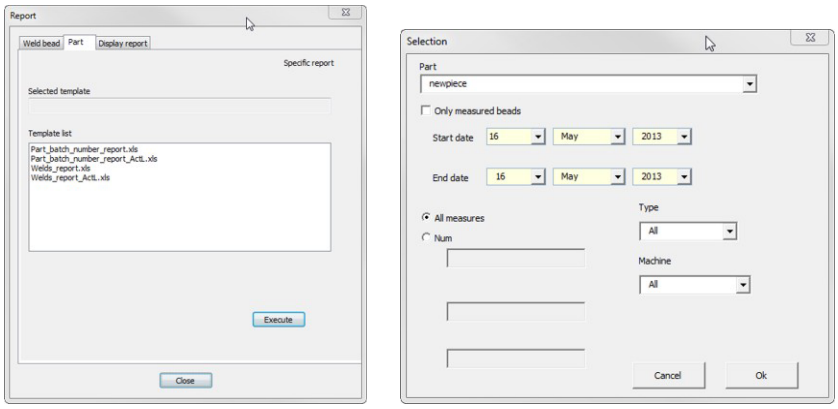
Note
You can change the colors in the **Settings.exe** file in the installation folder of the software.

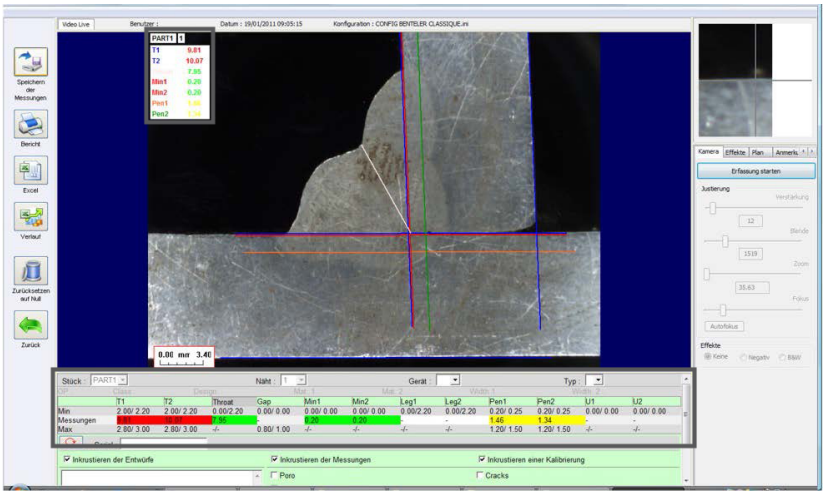
Printing a report

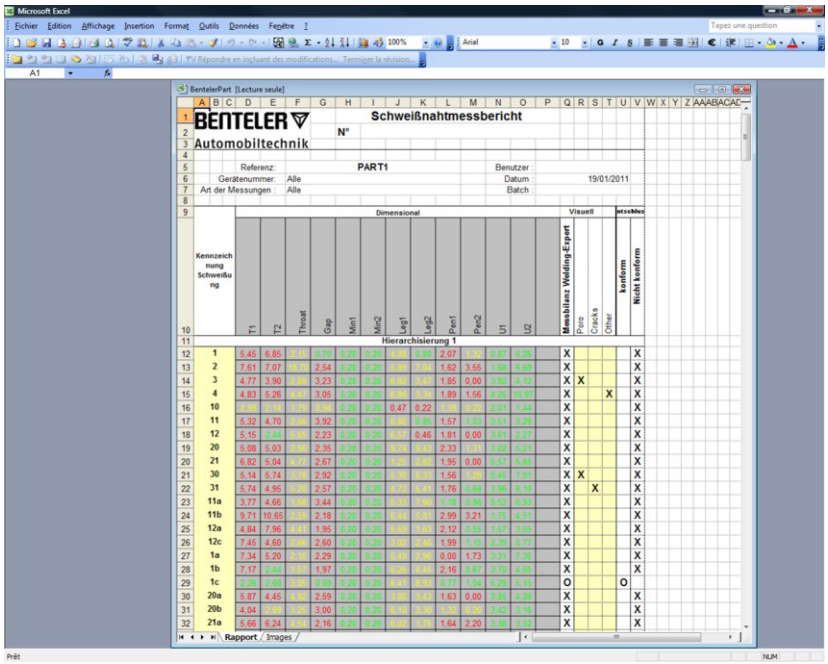
Min & Max action limit option requires a specific report template

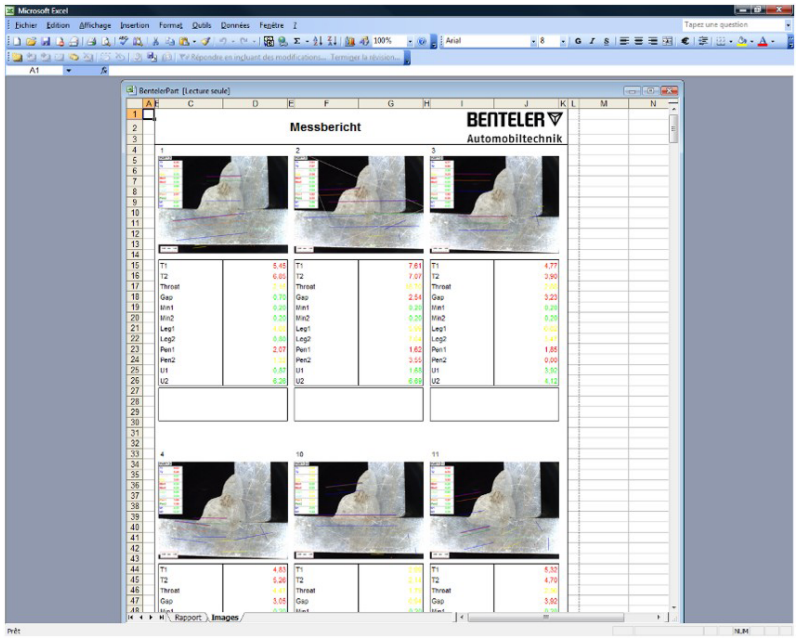
- Part_batch_number_report_ActL.xls
- Welds_report_ActL.xls

1. Select the report to be created.



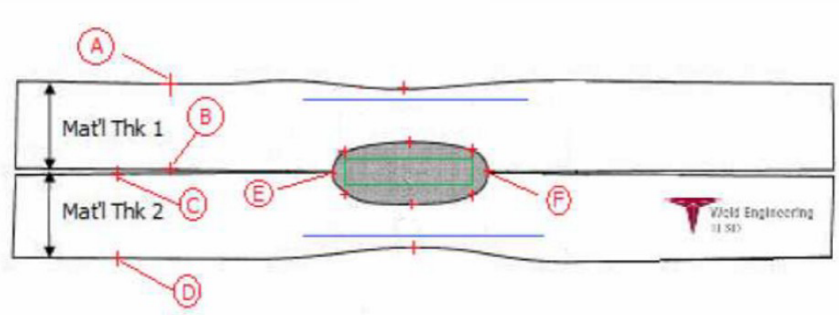






25 Appendix 4: Resistance Weld Nugget measurements

25.1 Specific drawings and measurements



Collecting points

- **A** and **B**, to obtain material thickness of T1.
- **C** and **D**, to obtain material thickness of T2.
- **E** and **F**, to obtain nugget diameter.

From this a rectangle can be generated that is in 10 percent from each edge (**E** and **F**) of the nugget, to determine where the sides are positioned.

The top is up 20% of T1 (top sheet thickness) from the center line of the nugget (faying surfaces of the 2 plates being welded) generated by the points **E** and **F**.

The bottom of the rectangle is down 20% of T2 from the **E** and **F** center line. This rectangle sets the minimum penetration lines (green rectangle in picture above). The green rectangle, for acceptance purposes, must be inside the weld nugget being viewed.

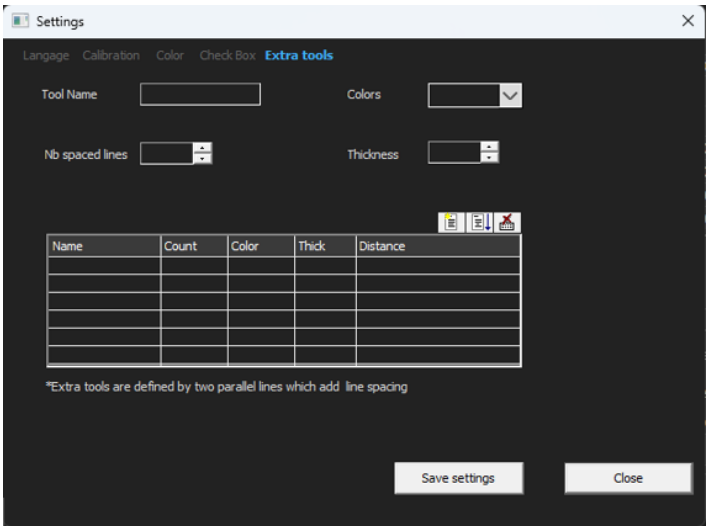
From the above collected points, the 2 blues lines are generated by placing the blue lines at 80 percent of **A** and **B** (material thickness) above line **E** and **F**. This is the maximum penetration line. The nugget cannot extend above this line.

The bottom blue line is 80 percent of **C** and **D** (material thickness) below line **E** and **F**. This is the maximum penetration of material 2.

25.2 Resistance Weld Nugget measurement settings

Use **Settings.exe** to create specific measurement tools.

- Click the **Extra tools** (Extra tools) tab.



The goal is to create the following measurements:

- **A** and **B**, material thickness T1.
- **C** and **D**, material thickness T2.
- **E** and **F**, nugget diameter.

For each measurement, define reference lines in relation to the above measurements:

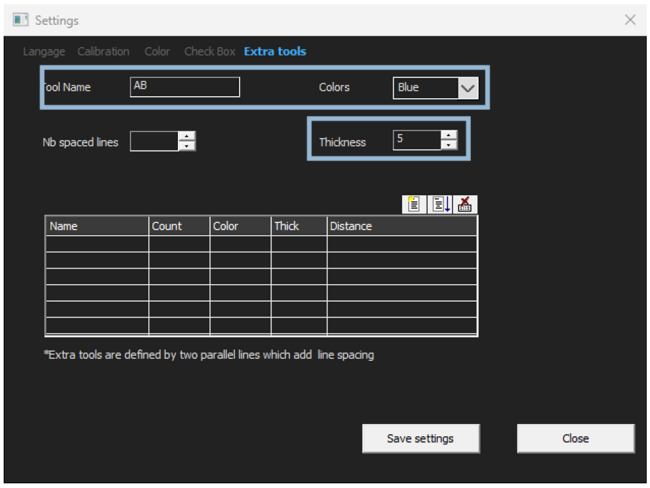
- For **A** and **B**: 1 line at 20% of T1 and 1 line at 80% of T1

- For **C** and **D**: 1 line at 20% of T1 and 1 line at 80% of T2

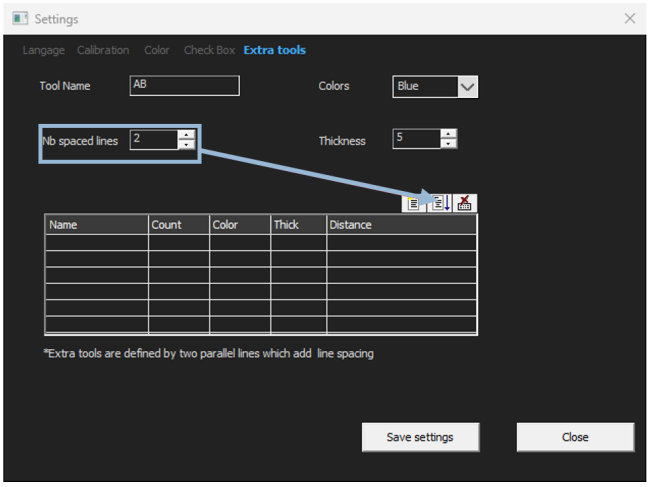
- For **E** and **F**:1 line at 10% of Nugget diameter and 1 line at 90% of Nugget diameter.

Procedure

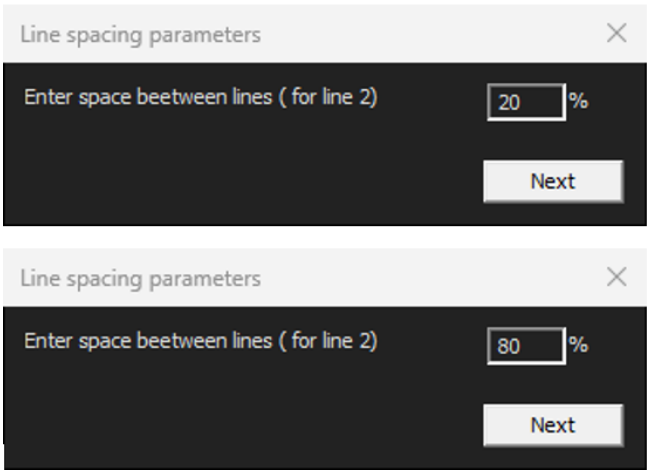
1. Define tool name, color and thicknesses.

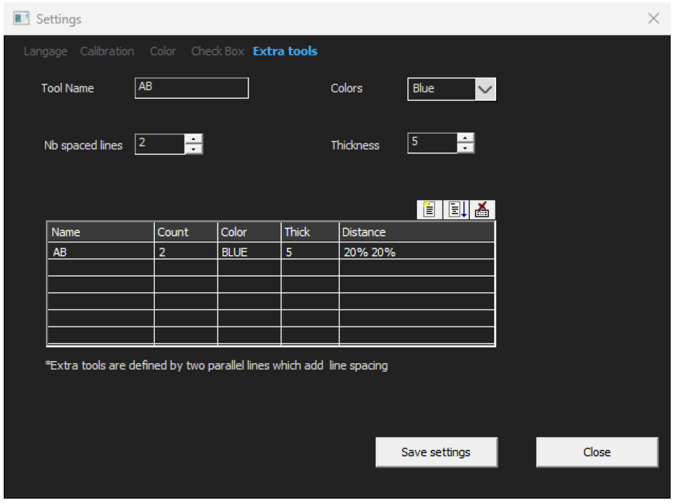


2. Define the number of reference lines (**spaced lines**).

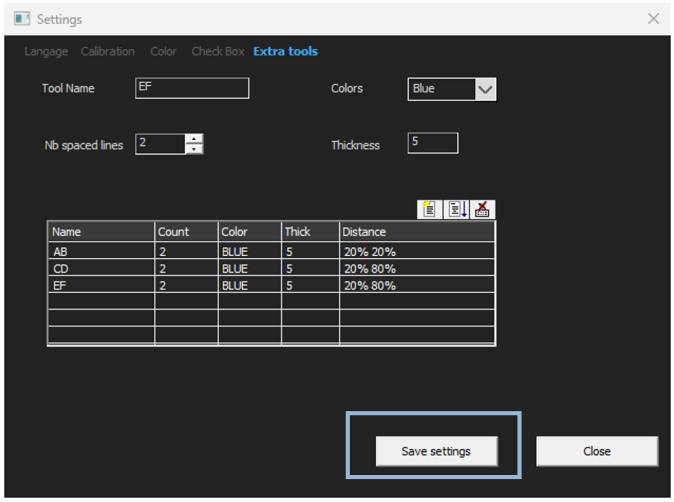


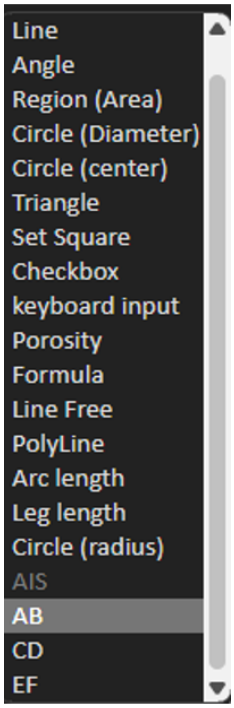
3. Validate with the arrow icon as shown.
4. Define the placement of each reference line in %.





5. Define all the needed measurements.

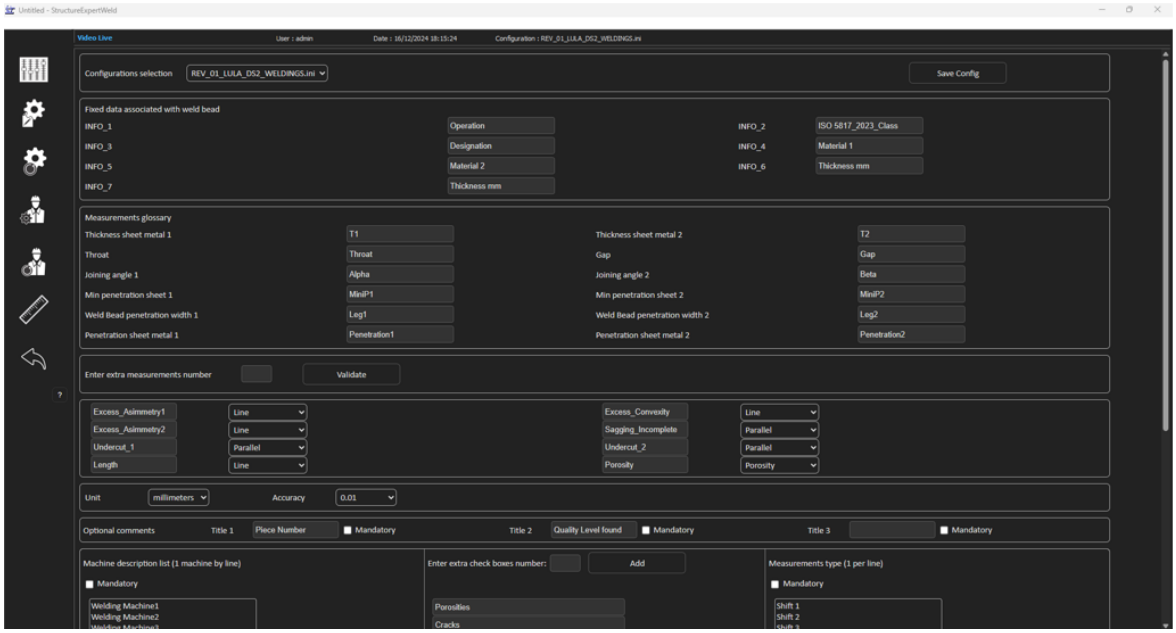




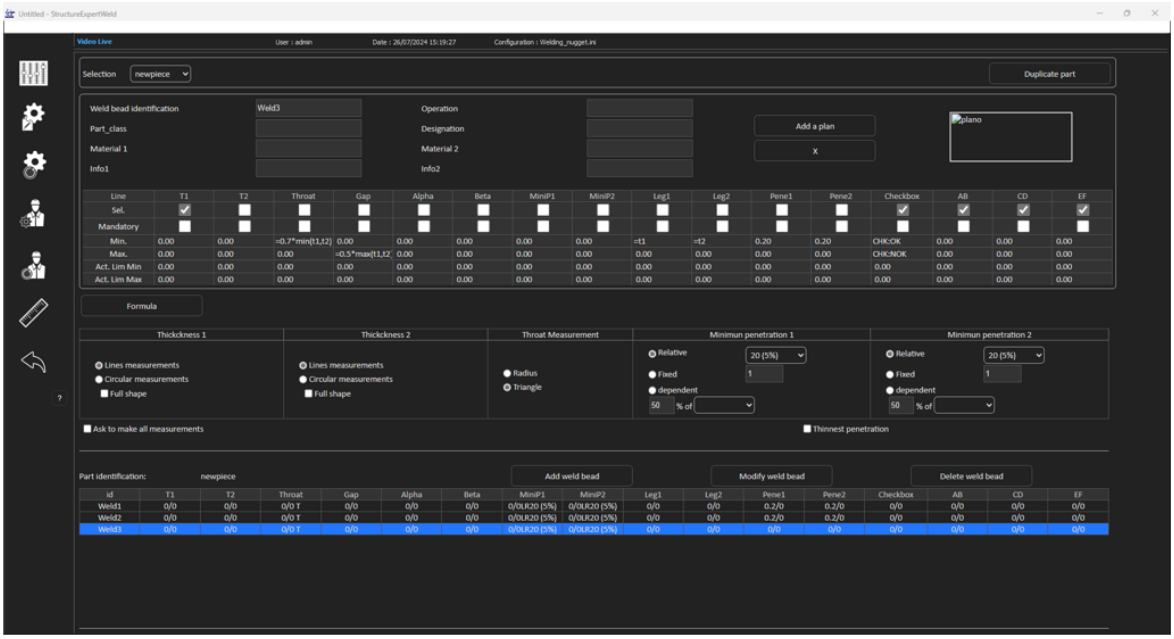
6. Save settings.

   These “new measurements” are now available for creating or modifying the general software configuration.

Example of software configuration

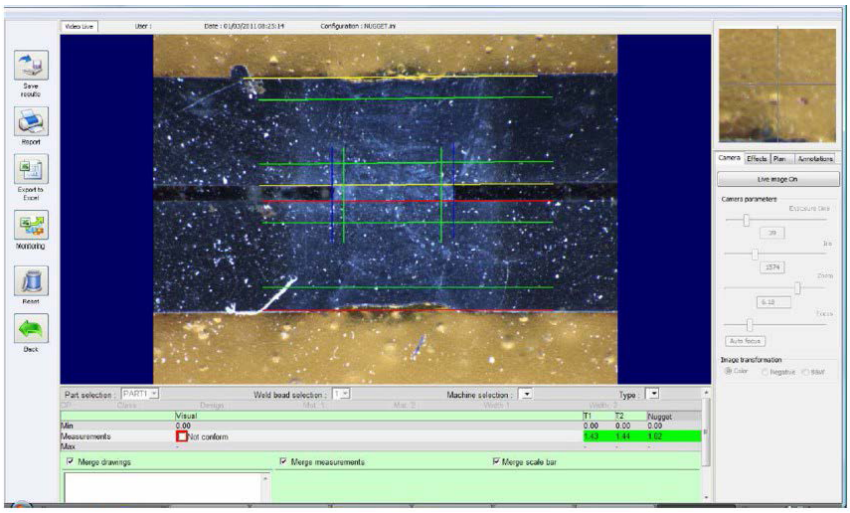


Example of part creation

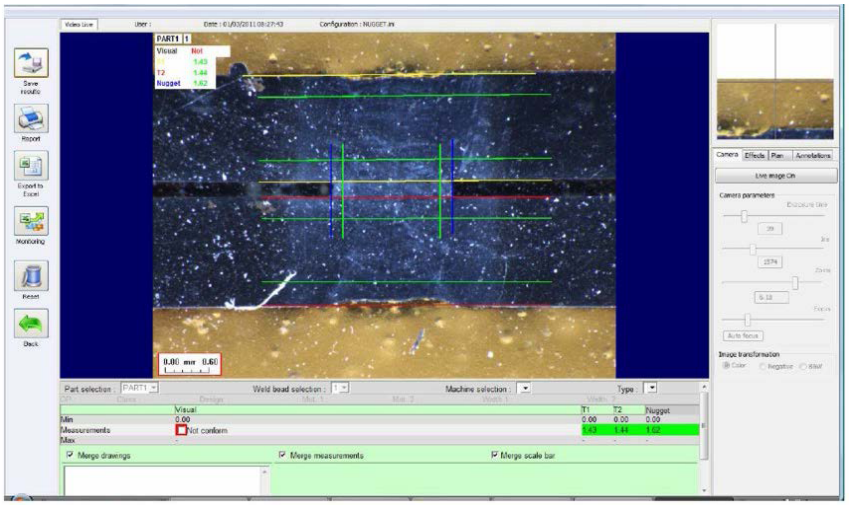


Measurements

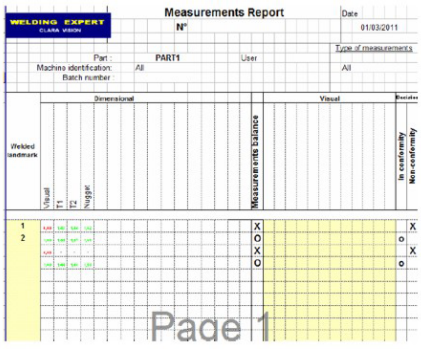
- T1 measurement: Automatic placement of reference line.
- T2 measurement: Automatic placement of reference line.
- Nugget measurement: Automatic placement of reference line.

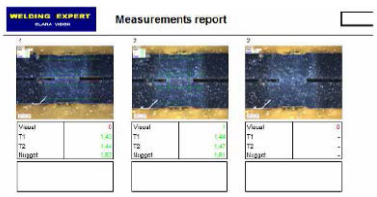


1. Visual check: Check whether the green rectangle is inside the weld nugget.
2. Save the results.



3. Print a report.





26 Manufacturer

Struers ApS
Pederstrupvej 84
DK-2750 Ballerup, Denmark
Telephone: +45 44 600 800
Fax: +45 44 600 801
www.struers.com

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Ensuring Certainty

en	For translations see
bg	За преводи вижте
cs	Překlady viz
da	Se oversættelser på
de	Übersetzungen finden Sie unter
el	Για μεταφράσεις, ανατρέξτε στη διεύθυνση
es	Para ver las traducciones consulte
et	Tõlked leiate aadressilt
fi	Katso käännökset osoitteesta
fr	Pour les traductions, voir
hr	Za prijevode idite na
hu	A fordítások itt érhetők el
it	Per le traduzioni consultare
ja	翻訳については、
lt	Vertimai patalpinti
lv	Tulkojumus skatīt
nl	Voor vertalingen zie
no	For oversettelser se
pl	Aby znaleźć tłumaczenia, sprawdź
pt	Consulte as traduções disponíveis em
ro	Pentru traduceri, consultați
se	För översättningar besök
sk	Preklady sú dostupné na stránke
sl	Za prevode si oglejte
tr	Çeviriler için bkz
zh	翻译见

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