

# Sigma

## Quick Start Manual



Technology leader in bond testing worldwide



# xyztec

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T e c h n o l o g y   l e a d e r   i n   b o n d   t e s t i n g   w o r l d w i d e

# 1 Machine specifications of the Sigma

## Force sensors

Ranges 100 gf, 1 kgf, 10 kgf, 100 kgf, 200 kgf

Max. shear force 200 kgf

Max. pull force 200 kgf

Accuracy  $\pm 0,075 \%$

ADC resolution 24 bit

Min. landing force 2,5 gf

## Axes

Resolution of optical encoders  $\pm 30 \text{ nm}$

x-axis 370 mm

y-axis 168 mm

z-axis 168 mm

Axis speed 50 mm/s

Hook concentricity  $\pm 10 \mu\text{m}$

Rotational accuracy  $\pm 1^\circ$

## Dimensions

x footprint 620 mm

y footprint 558 mm

Height 608 mm

Weight 80 kg

## Software

Supports from Microsoft Windows 7, 32 and 64 bit systems

Intuitive, no special knowledge required

Customization of the user interface according to customer requirements

Integrated Report editor and data export

Integrated SPC and GR&R analyses

Different languages and user hierarchies

Export to xls, docx, pptx, pdf, xps, csv, xml, etc.

Easy data sorting, grouping and filtering

Customizable screens, optimized for wide and touch screens

## Handling and control

Ergonomic layout according to SEMI S8

Microscope adjustable in height, depth and angle

Swivel microscope holder

Ergonomic joysticks with each 6 buttons for fast control

LED illumination



## 1.1 Intended Use of the equipment

The xyztec Sigma bondtester is a precision materials-testing instrument designed for the mechanical testing and analysis of interconnects used in semiconductor, micro-electronics, and related high-reliability manufacturing environments. The system is intended to perform destructive and non-destructive bond tests—including shear, pull, peel, push, and specialized test methods—on components such as wire bonds, solder joints, die attachments, ball bonds, micro-bumps, clips, ribbons, and other micro-mechanical connections.

The equipment is intended for use by trained technical personnel in laboratory, engineering, production, and quality-control environments. Its purpose is to measure the mechanical strength and failure modes of interconnect structures in order to support process development, qualification, reliability assessment, and ongoing process monitoring.

## 1.2 Name and address of the manufacturer

**XYZTEC bv**

J.F. Kennedylaan 14b

5981 XC

Panningen

The Netherlands

## 2 Warning & safety instructions and procedures

This bond tester complies with current safety requirements. Inappropriate use can, however, lead to personal injury and damage to property. To avoid the risk of accidents and damage to the machine, it is required to read these instructions carefully before using it for the first time. It is the responsibility of the user to maintain knowledge of these instructions over time. They contain important information on its safety, use and maintenance. In case any part of this document or of the tester usage is unclear to the reader or the user, discontinue usage immediately and contact XYZTEC in written form.

### Correct application

- Bond testers are designed as an invaluable tool during the design process and for manufacturing quality control to ensure optimum yield and the very best product reliability.
- This machine is not suitable for outdoor use and must be used in a safe and stable indoor environment.
- It must only be used to test bonds. Any other use is not permitted. XYZTEC cannot be held liable, accountable or culpable for damage resulting from any usage of the machine, including incorrect or improper use or operation.
- This bond tester is not intended for use by people with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning its use by a person responsible for their safety. The tester also may not be used by children. Never attempt to use the machine when any safety feature is not in place or operational, or when any person or animal is inside the tester.

### Technical safety

- Observe the instructions in described in chapter 2 at all times.
- Before setting up or using the machine, check it for any externally visible damage. Do not install or use a damaged machine.
- The electrical disconnecter must be easily accessible after installation so that the machine can be disconnected from the electricity supply if necessary.
- Unauthorised repairs can result in unforeseen dangers for the user. Repairs may only be undertaken by a XYZTEC authorised service technician. Failure to comply with this requirement voids the warranty. The end user is always responsible for the operation of the tester.
- If an external system that requires vacuum or compressed air is connected to the machine, this is not covered by the TÜV certification evaluation. It is therefore the responsibility of the user.

In order to correctly and safely use the system described in this document, it is essential that the safety procedures and the safety precautions specified in this manual are followed!



## 2.1 Personnel requirements

Operation, adjustment, maintenance, and repair of any system may only be carried out by qualified and trained personnel.

In this document, the assumption is made that operators, maintenance personnel and service personnel are properly trained in the tasks that they are intended to perform. The following training levels are defined:

- Maintenance/Service
- Supervisor
- Operator

**NOTE:** For each level a training is available.

## 2.2 Basic safety rules

- Do not use the system in an environment where flammable gasses are present or where it is extremely dirty.
- If any personal protection equipment (PPE) is mentioned, it should be used in accordance with the manufacturer's instructions.
- Do not defeat or bridge safety devices, connectors, etc.
- Use only XYZTEC recommended spares and tools.
- Keep your fingers and other body parts outside the machine.

## 2.3 Instructions for lifting and carrying

### 2.3.1 Carrying and Lifting Instructions

#### GENERAL SAFETY WARNING

The xyztec Sigma bondtester is a precision instrument. Incorrect lifting, carrying, or handling may cause personal injury or damage to the equipment. Only trained and authorized personnel may lift or move the system.

### 2.3.2 Preparation Before Lifting

- Power down the system and disconnect the main power cable.
- Disconnect all external connections, including air supply, network cables, USB devices, and any auxiliary equipment.
- Remove loose parts such as fixtures and samples from the work area.

### 2.3.3 Lifting with Two or More Persons

- Some Sigma configurations allow assisted team lifting. Only use this method if the weight is within manual handling regulations of your region.
- Lift only from the chassis at the lower frame.
- Do not lift by the test head, monitor, X- stage, or any attached modules.
- Coordinate the lift by counting down before lifting and setting the unit down.

### 2.3.4 Setting the Machine Down

- Lower the system gently at a controlled speed.
- Ensure the surface is flat, stable, and rated for the weight of the equipment.
- After placement, confirm the tester is level and does not rock.
- Reinstall fixtures, reconnect cables, and verify that moving axes operate freely.

### 2.3.5 Post-Installation Check

Once the system is in place:

- Inspect for damage or loose connectors from transport.

## 2.4 General safety requirements

To ensure safe operation, the main supply cord used with this equipment must always meet the electrical ratings and safety requirements specified for the XYZTEC Sigma Bondtester.

Do not replace the detachable main supply cord!

XYZTEC Sigma Bondtester cords do:

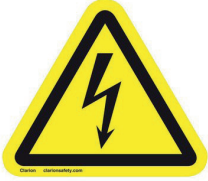
- Comply with the equipment's voltage and current ratings,
- Include a protective-earth (ground) conductor,

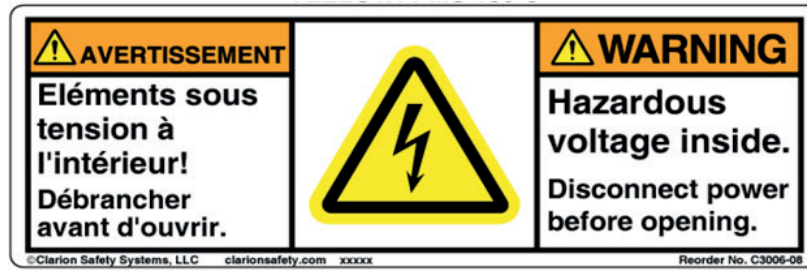
- Are approved according to local/national standards (e.g., IEC, UL, CE), and
- Have connectors suitable for the appliance inlet and the regional mains outlet.

Using an undersized, damaged, or non-compliant mains cord may result in overheating, fire hazard, electric shock, or equipment malfunction.

If the mains cord becomes damaged or requires replacement, it must be replaced only with a properly rated cord supplied or approved by XYZTEC, or one that meets all specified technical and safety requirements.

## 2.5 Safety labels

| Category                                                                                                                          | Pictogram                                                                           | Description                                                                                                                                                                                                                      | French description                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WARNING</b><br>Hand Entanglement Rotating Gears<br><br><b>FRENCH:</b><br>Enchevêtrement des mains dans des engrenages rotatifs |    | Serious injury to hands.<br>Keep hands away from moving parts.<br><br>This label is used to alert machine operators, maintenance personnel, and visitors to the serious hazard of hand entanglement with exposed rotating gears. | Blessures graves aux mains.<br>Gardez les mains éloignées des pièces mobiles.<br><br>Cette étiquette sert à avertir les opérateurs de machines, le personnel de maintenance et les visiteurs du danger grave que représentent les engrenages rotatifs exposés pour les mains. |
| <b>WARNING</b><br>Burn Hazard Hot Surface<br><br><b>FRENCH:</b><br>Risque de brûlure, Surface chaude                              |  | To avoid burns and reduce the risk of fires, machine is clearly marked with warnings about heat hazards or hot surface temperatures.                                                                                             | Afin d'éviter les brûlures et de réduire les risques d'incendie, la machine est clairement marquée d'avertissements concernant les risques liés à la chaleur ou aux températures élevées des surfaces.                                                                        |
| <b>WARNING</b><br>Hand Crush Force From Above<br><br><b>FRENCH:</b><br>Force d'écrasement manuel par le haut                      |  | Label to communicate the risk of hand injury due to overhead mechanical force.                                                                                                                                                   | Étiquette indiquant le risque de blessure à la main dû à une force mécanique exercée au-dessus de la tête.                                                                                                                                                                    |
| <b>WARNING</b><br>Electrical Shock Electrocution<br><br><b>FRENCH:</b><br>Choc électrique Électrocution                           |  | This label provides a warning of the potential for electric shock or fatal electrocution.                                                                                                                                        | Cette étiquette avertit du risque de choc électrique ou d'électrocution mortelle.                                                                                                                                                                                             |



## 2.6 Equipment rating information

### 2.6.1 Electrical Supply Ratings

Supply voltage / voltage range:

- [90 – 254 VAC], single-phase

Frequency / frequency range:

- [47 / 63 Hz]

Power rating:

- [250 W]

### 2.6.2 Input and Output Connections

The xyztec Sigma bondtester includes the following input and output connections:

- Mains power inlet: IEC C14 appliance inlet with protective earth
- Network connection: RJ-45 Ethernet port [10/100/1000 Mbps]
- USB ports: For peripherals such as keyboards, mice, camera's, data export devices
- 

### 2.6.3 Insulation Rating of External Circuits

External circuits are rated for:

- Working voltage:  $\leq 60$  V DC
- Insulation category: Basic Insulation



## 2.6.4 Environmental Conditions for Intended Use

The xyztec Sigma bondtester is designed for operation under the following environmental conditions:

- Use: Indoor use only
- Altitude: Up to 2000 m above sea level
- Operating temperature: +15 °C to +35 °C
- Relative humidity: 20% to 80%, non-condensing
- Mains supply voltage fluctuations: Up to  $\pm 10\%$  of nominal voltage
- Overvoltage category: Not applicable, is cord/plug-connected equipment
- Wet location: The equipment is not intended for wet or damp locations
- Pollution degree: Pollution Degree 2

Operation outside these conditions may result in degraded performance or safety risks.

## 2.6.5 Ingress Protection Rating (IEC 60529)

The xyztec Sigma bondtester is rated: Ingress protection: IP20

The equipment provides protection against finger access to hazardous parts but is not protected against water ingress. The tester must not be exposed to dripping or splashing liquids.

## 2.6.6 Impact Rating

The XYZTEC Sigma Bondtester has an impact resistance rating of:

- Impact rating: < 5 J

Accordingly, the equipment must be handled with care. The housing, display, and mechanical assemblies must not be subjected to mechanical shock, dropping, or impacts. Avoid placing objects on the equipment that may fall and cause damage.

## 2.7 Equipment installation

The following installation instructions must be followed carefully by qualified technical personnel. Improper installation, grounding may result in personal injury, damage to the equipment, or faulty test results. Before installation begins, ensure that all safety, power, and environmental requirements are met.

### 2.7.1 Assembly, Location and Mounting Requirements

- Unpack the bondtester with multiple trained personnel (see the “Carrying and Lifting Instructions” section).
- Place the equipment on a stable, level surface with sufficient load-bearing capacity. The surface must support the full weight of the Sigma system without deformation.
- Ensure a clearance of at least 200 mm on all sides of the unit to allow safe access for operation, maintenance, and ventilation.
- Do not place the unit against walls or inside enclosed spaces without adequate clearance.
- The system must be installed indoors in a clean, dry area free from excessive dust, moisture, or conductive contaminants.

### 2.7.2 Protective Earthing

- The Sigma bondtester incorporates a protective-earth (PE) connection in the mains connection. The installer must ensure that the system is properly grounded via the protective-earth conductor.
- Additionally a grounding earth wire is connected to the Sigma bondtester frame, connect the earth (ground) conductor to the equipment’s table or an earth terminal cable before connecting the mains.
- Under no circumstances should the protective-earth connection be bypassed, disconnected, or substituted by any other connection.

### 2.7.3 Connections to the Supply

- The bondtester must be connected to a mains supply that matches the specified voltage and frequency range
- Use a properly rated power cable and connector (e.g. IEC appliance inlet) compatible with the supply.
- Ensure that all external cables (power, air supply, communication) are routed to avoid mechanical stress, sharp bends, kinks, or contact with hot or moving parts.
- Do not connect or disconnect the mains supply when the unit is powered on; always power down the unit first.

### 2.7.4 Permanently Connected Equipment — Wiring and Protection Requirements

Not applicable, the xyztec Sigma bondtester is not hard-wired.



### 2.7.5 Ventilation Requirements

- The equipment must be installed in a well-ventilated indoor location.
- Maintain the 200 mm side and rear clearance to allow free airflow around the unit.
- Do not block ventilation slots or place the system within enclosed cabinets that may obstruct airflow (without consulting with xyztec first).

### 2.7.6 Requirements for Special External Services

- 
- Maintain ambient operating conditions within the specified limits: temperature +15 °C to +35 °C, relative humidity 20%–80% (non-condensing).
- Do not subject the equipment to rapid or extreme temperature changes, condensation, or moisture.

### 2.7.7 Sound Level Considerations

During normal operation, the bondtester produces noise primarily from its axes. Measured A-weighted sound level is [ $\leq 70$  dB(A)] at operator distance of 1 meter (typical 62dB(A)).

## 2.8 Equipment positioning instructions

To ensure safe operation and the ability to quickly remove power in an emergency, the equipment shall be installed so that the disconnecting device (such as the mains plug) is easily reachable at all times.

Do not position the equipment in a way that makes it difficult to operate the disconnecting device.

The following requirements must be observed during installation:

- The mains plug must remain clearly visible and unobstructed.
- Maintain adequate clearance around the rear and sides of the equipment so that the operator can access the disconnecting device without having to move the machine.
- Do not install the unit inside enclosed furniture, against walls that block access, or in locations where cables are pinched, trapped, or inaccessible.
- The disconnecting device must be operable without tools and without the need to remove panels, covers, or other equipment.

Failure to provide proper access to the disconnecting device may prevent safe and rapid isolation of the equipment in the event of a fault, emergency, or maintenance requirement.

## 2.9 Instructions for interconnection to accessories and other equipment including indication of suitable accessories, detachable parts and any special materials

The xyztec Sigma bondtester may be used with various accessories, detachable parts, and external equipment. To ensure safe and reliable operation, all interconnections must be made only with components that are suitable for use with this equipment and meet the requirements outlined below.

### 2.9.1 General Requirements

- Only use accessories, fixtures, cartridges, stages, sensors, test tools, or external devices that are approved, specified, or recommended by XYZTEC.
- Accessories and parts shall be installed and removed only by trained personnel following the instructions provided by the manufacturer.
- Before connecting any external device, confirm that its electrical, mechanical, and environmental specifications are compatible with the bondtester.

### 2.9.2 Electrical Interconnections

- Connect only external equipment that operates within the voltage limits and insulation categories specified for the Sigma.
- Do not connect equipment that introduces hazardous live voltages or exceeds the rated current, voltage, or power for any connector.
- Ensure all cables are properly routed and secured to prevent strain, entanglement, or damage.

### 2.9.3 Mechanical and Functional Interconnections

- Mechanical accessories such as shear tools, pull hooks or clamps must be mounted only on the designated mechanical interfaces.
- Do not modify or adapt mounting surfaces, fasteners, or housings.
- Verify that moving parts have adequate clearance and that the accessory does not obstruct sensors, cameras, axes of motion, or safety guards.



## 2.9.4 Prohibited Interconnections

- Do not interconnect third-party devices to internal circuits, internal wiring, or non-designated connectors.
- Do not attach accessories that alter the equipment's structural integrity, force calibration, or axis motion paths.
- Do not connect devices that may introduce unsafe voltages, electromagnetic interference, or mechanical instability.

## 3 XYZTEC Sigma software

### 3.1 Starting the software

Before starting the Condor Sigma software make sure the Core Sigma tester is powered on and connected. The software can be used without a tester, but functionality will be limited. XYZTEC also offers a simulator software that can be used to simulate the Condor Sigma tester. If the simulator software is running the Condor Sigma software will not detect the connected Condor Sigma tester. Make sure to close the simulator software before starting the software if the real tester is required.

To start up the software just double click on the Condor Sigma icon on the desktop.



Figure 1: XYZTEC Sigma software

If this icon is not available you can start the Windows Explorer and browse to the directory where the Condor Sigma is installed. By default this is the directory **C:\Program Files\XYZTEC\ Condor Sigma** or **C:\Program Files (x86)\XYZTEC\Condor Sigma** on a 64 bit operating system. Look for the file **xyz\_sigma.exe**. To create a shortcut to this program just right click on the file and select Send to. In the submenu select Desktop (create shortcut).

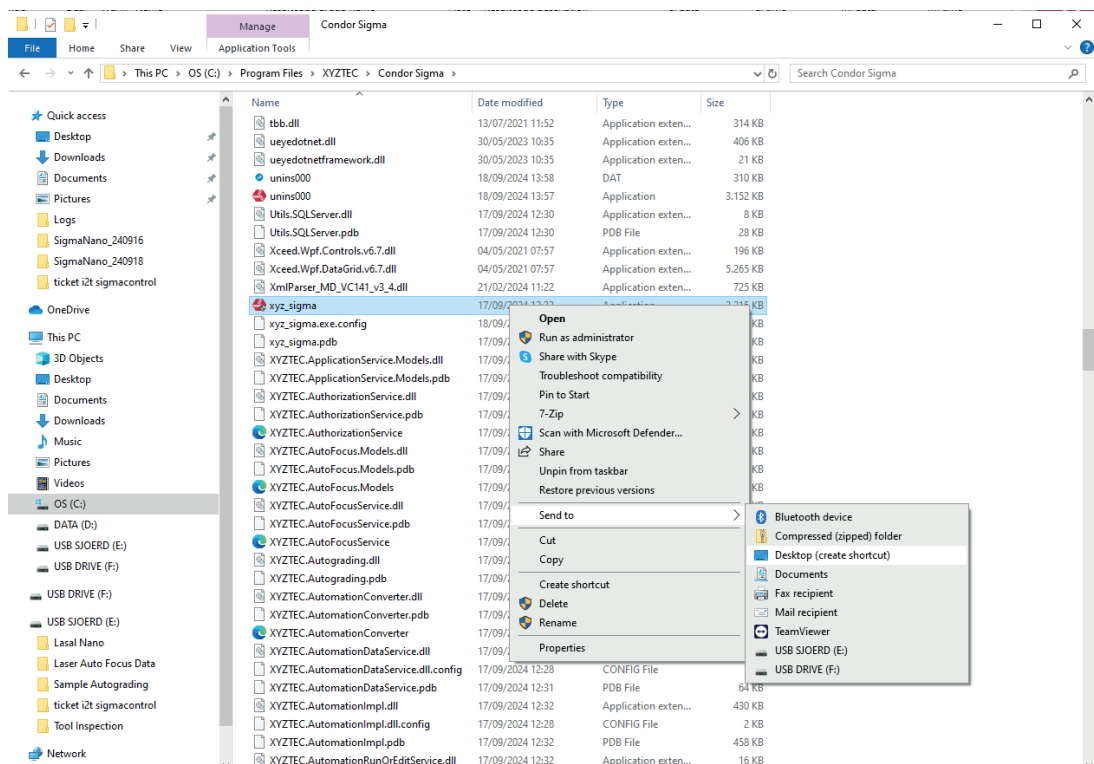


Figure 2: Creating a short cut for the XYZTEC Sigma software

You can also double click the file name to just run the program without making a shortcut. Depending on the Windows version it is also possible to use the options Pin to Taskbar to pin the application to the taskbar or Pin to Start Menu to pin the application to the start menu. This also makes it easy to start the application quickly.



Figure 3: XYZTEC Sigma application pinned to the task bar

## 3.2 Screen layout

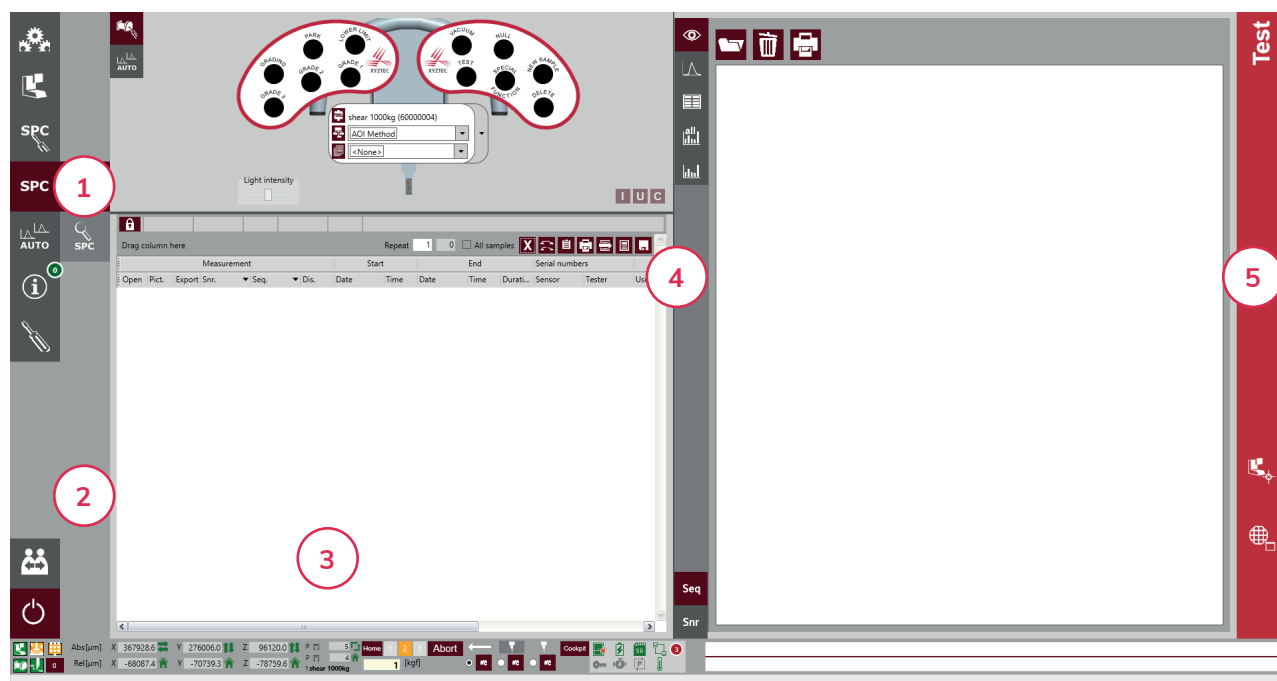


Figure 4: Screen layout with indication of layout areas

The picture shown above shows the screen layout for the Sigma software. Six areas on this picture have a number and a colored rectangle shows the boundaries for these areas.

### Area Description

- 1 Main menu structure:**

The main menu is actually a vertical bar with tiles. Depending on the selected tile a submenu can be shown. This is also a vertical bar directly to the right side of the main menu. The selected tile is colored red. The available options are shown as grey tiles. The icons will be explained in the next chapter.
- 2 Control tiles:**

Two options are available. The upper tile opens the login dialog. This can be used to switch from the current user to a different available user. The lowest tile shuts down the software.
- 3 Status bar:**

The status bar shows information about the tester, the current positions for the stages, the live measurement graph, currently selected sensor as well as the currently applied force and the general status of the machine condition, e.g. front door status, etc.

4

**Active screen area:**

This shows the screen that belongs to the currently selected menu option.

5

**Vertical information bar:**

This bar shows the currently selected menu option. In the figure above this is the users screen. The vertical text will change if a different main or sub menu option is selected.

The XYZTEC Sigma software uses tool tips to help you understand the available icons and controls. If the mouse cursor is over an active area and the mouse is not moved for a few seconds a tool tip will pop up. The text in the tool tip gives the operator information about the specific icon or control.

The title bar also displays information about the software, the currently logged in user and the currently used test method.

The XYZTEC Sigma software is designed for a wide screen monitor with a resolution of 1400x900 or more. Using this software on a standard monitor or a monitor with a lower resolution will make certain screen areas difficult to reach.

## 3.3 Main menu and sub menu structure

### 3.3.1 Main menu

The menu interface of the XYZTEC Sigma software consists of tiles and icons. This chapter explains the different icons and also explains how to navigate the main menu. The main menu is the most left vertical bar with icons. Below is a display of the main menu:

|                                                                                    |                          |                                                                           |
|------------------------------------------------------------------------------------|--------------------------|---------------------------------------------------------------------------|
|   | <b>General settings:</b> | Software settings, users and authorizations                               |
|   | <b>Tester settings:</b>  | Tester setup, measurement unit setup, calibration and GR&R                |
|   | <b>SPC settings:</b>     | Result codes and groups, methods, forms and Assignment                    |
|   | <b>SPC screen:</b>       | Test screen showing all test results, statistics and graphs, query screen |
|   | <b>Automation:</b>       | Automation selection and editor                                           |
|  | <b>Information:</b>      | Information and messages                                                  |

The selected option has a dark red background color. Depending on the selected option a submenu may be shown if the specific choice also offers additional options. In the submenu the selected option is also displayed with a dark red background. For all tiles in the main menu and the sub menu's tooltips are available.

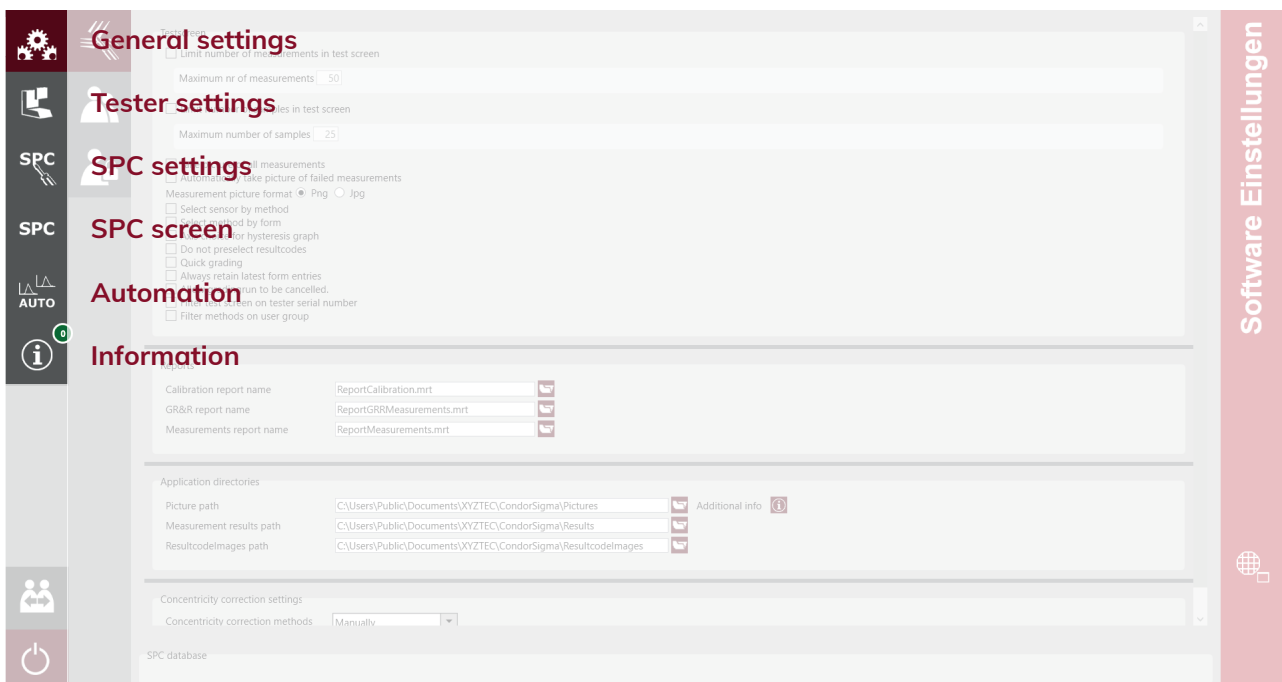


Figure 5: Main menu side barW

### 3.3.2 Sub menu

Below is the sub menu for the **General settings** and a short explanation of each option:

|                                                                                   |                           |                                                              |
|-----------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------|
|  | <b>Software settings:</b> | General software settings for the Sigma software             |
|  | <b>Users:</b>             | Manage the users for the Sigma software                      |
|  | <b>User groups:</b>       | Manage the available user groups that set the authorizations |

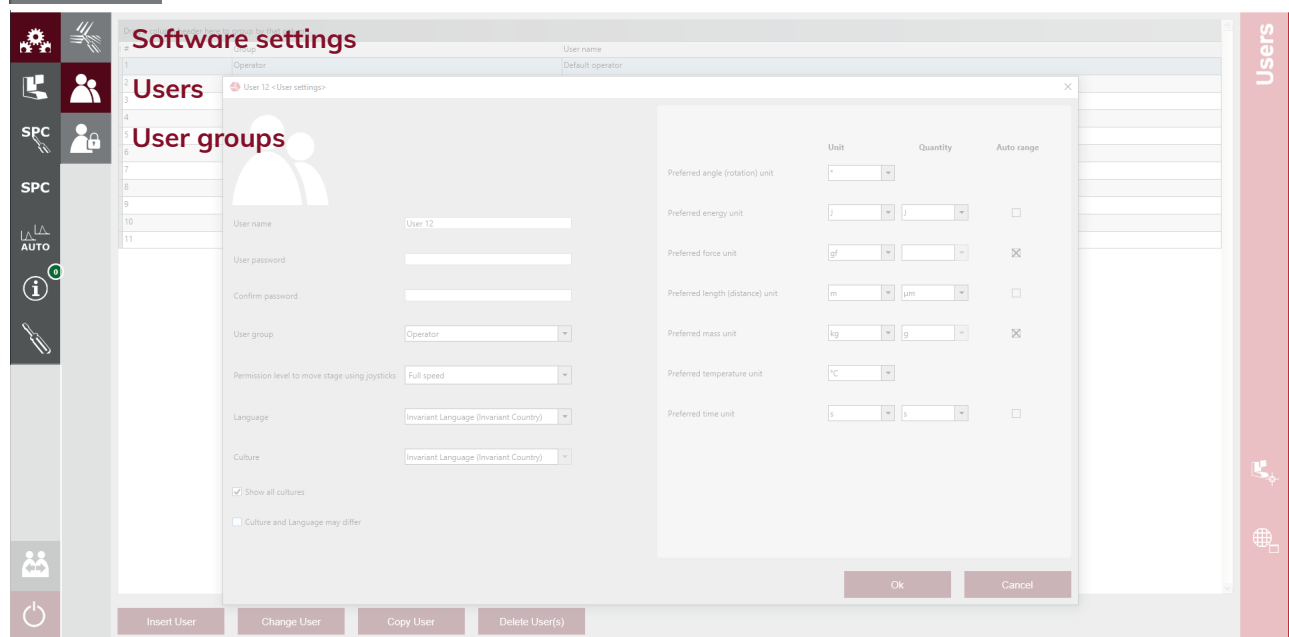


Figure 6: Sub menu: General settings

The sub menu of **Tester settings** looks as follows:

|                                                                                   |                          |                                                   |
|-----------------------------------------------------------------------------------|--------------------------|---------------------------------------------------|
|  | <b>Tester platform:</b>  | Set the tester settings, joysticks and the stages |
|  | <b>Measurement unit:</b> | Setup the measurement unit and sensor settings    |
|  | <b>Calibration:</b>      | Sensor calibration                                |
|  | <b>GR&amp;R:</b>         | GR&R statistics with SPC                          |

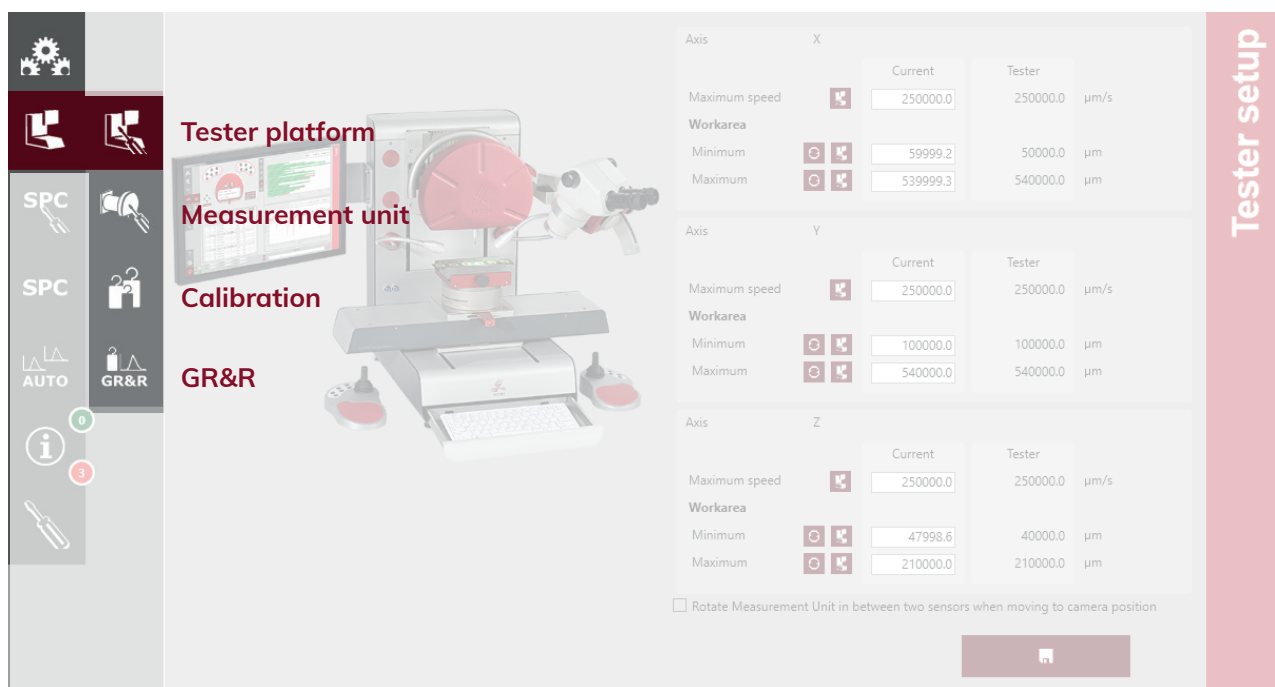


Figure 7: Sub menu: Tester settings

The sub menu of the **SPC settings** looks as follows:

|                                                                                   |                       |                                                               |
|-----------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------|
|  | <b>Result codes:</b>  | Result code groups and result codes for grading a measurement |
|  | <b>Test methods:</b>  | Management of test methods                                    |
|  | <b>Form editor:</b>   | Management of forms for a new sample                          |
|  | <b>Export editor:</b> | Management of automated file and report export                |

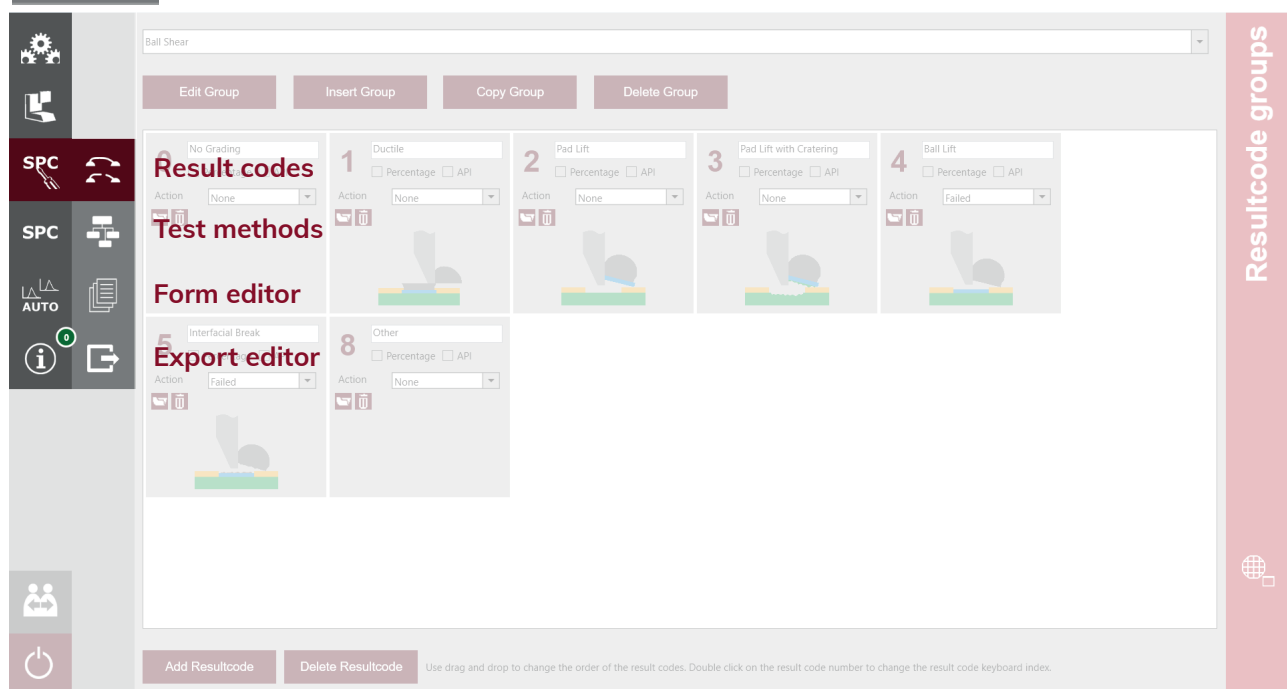


Figure 8: Sub menu: SPC settings

The sub menu of the **SPC screen** looks as follows:

|                                                                                     |               |                                                                       |
|-------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|
|  | <b>SPC:</b>   | Test screen with SPC: numerical and graphical display of test results |
|  | <b>Query:</b> | Query screen with SPC to filter for required information              |

When the **Automation** menu is selected only one option is available in the sub menu:

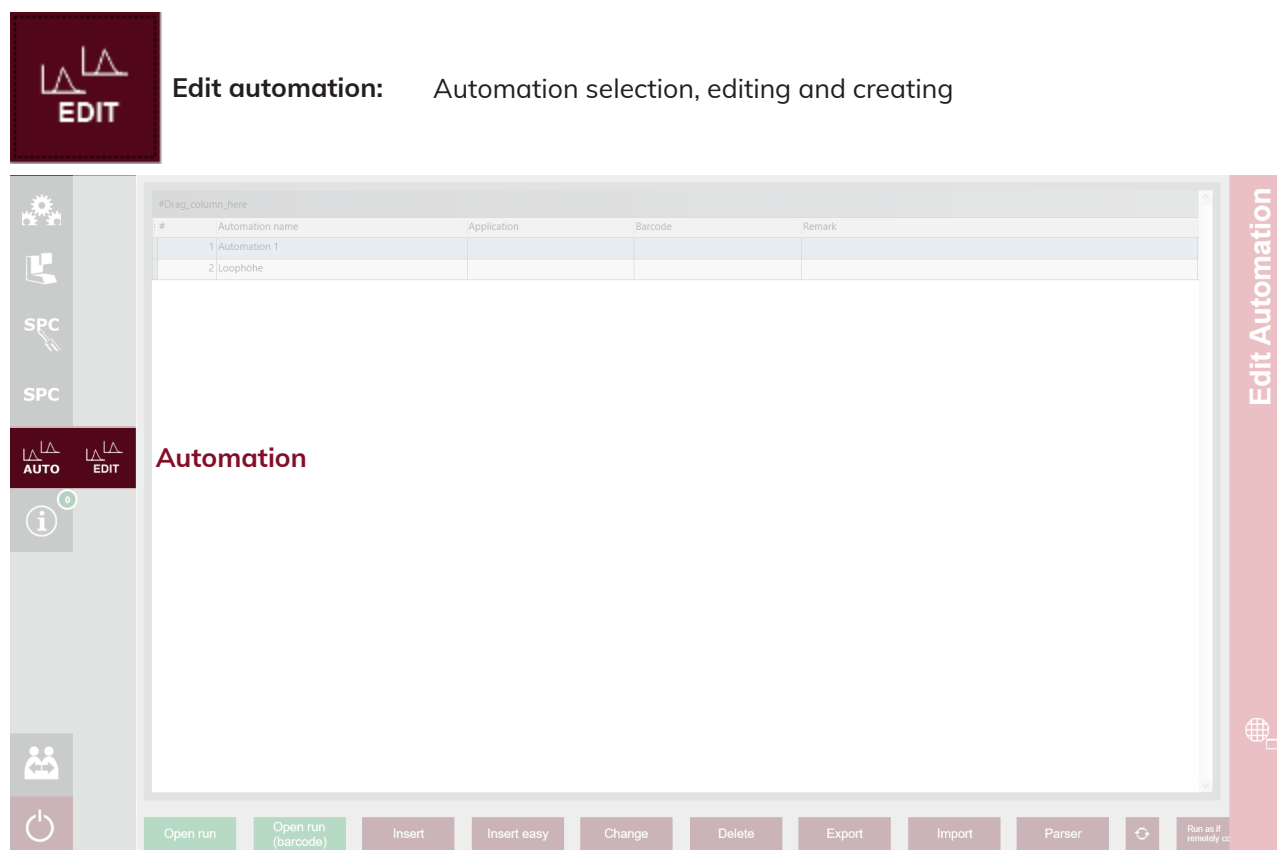
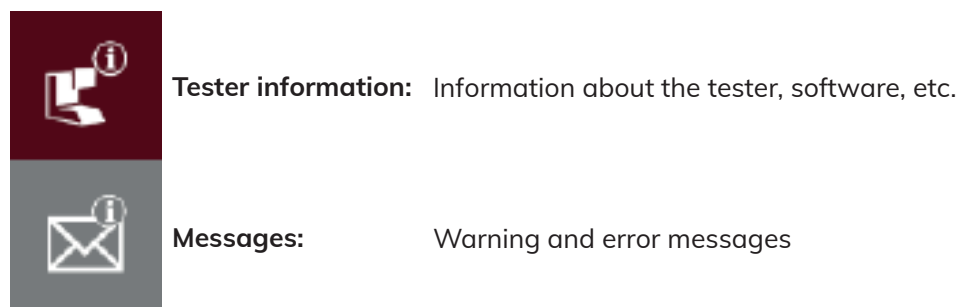


Figure 9: Sub menu: Automation

The sub menu of the **Information** looks as follows:



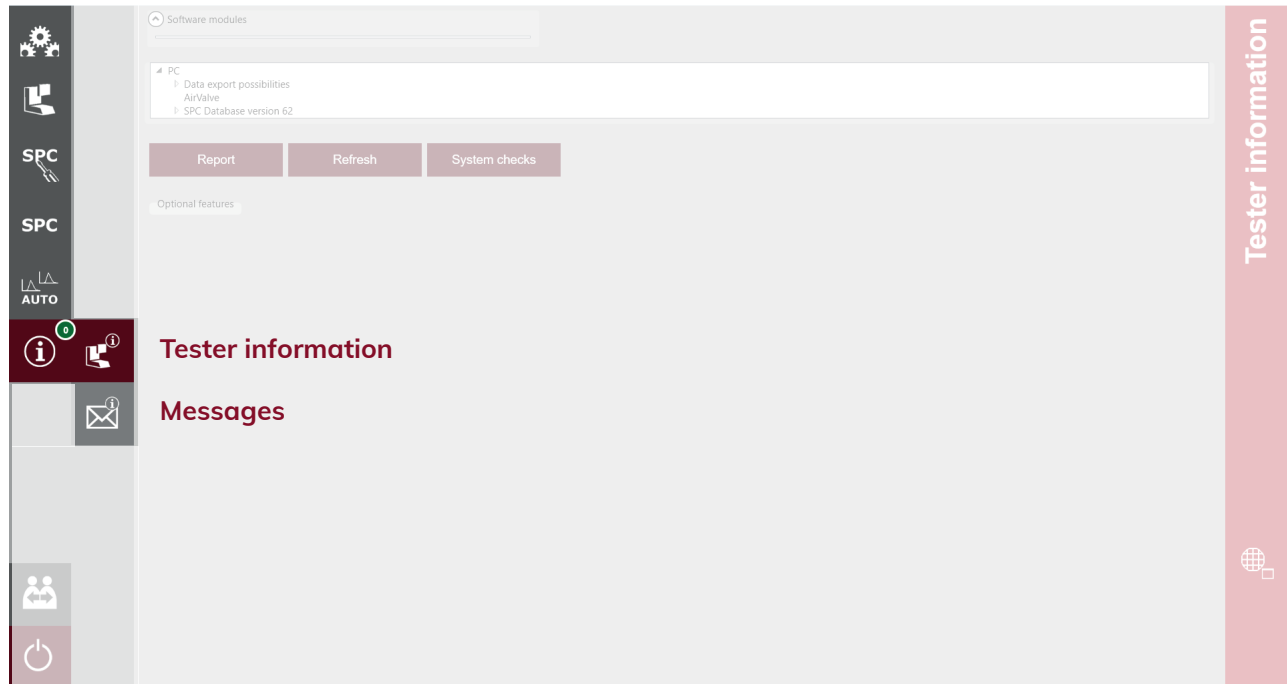


Figure 10: Sub menu: Tester information

With the tool tips and by remembering the icons for the different options navigating through the XYZTEC Sigma software is easy.

The Information menu button in the main menu can also show a small green or red circle with a number. This indicates if there are any warnings (green circle) or errors (red circle).



Figure 11: Information icon

Check the messages area to find out more. In the messages screen the **Resolve** button after a messages can be used to resolve a warning or error, if possible. Resolving errors can only be performed if the currently logged in user has at least supervisor or engineer rights. An operator cannot resolve any messages.

| Resolvable errors |                                                                                                                                                      |  |  |  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
|                   | Description                                                                                                                                          |  |  |  |
| <b>Resolve</b>    | Please resolve how cameras are mapped to positions (One camera is not connected)                                                                     |  |  |  |
| <b>Resolve</b>    | The current firmware version of the Sigma is '5.18.9026.57574'. The software was originally shipped with version '5.18.8997.0'. Consider downgrading |  |  |  |
| <b>Resolve</b>    | The 'startup as xyztec user' option is enabled                                                                                                       |  |  |  |

| Messages list     |        |        |   |                                                                                                                                                                                   |
|-------------------|--------|--------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time              | Sev    | Error  | # | Description                                                                                                                                                                       |
| 24-09-19 14:55:29 | Advice | 5.1    | 2 | Sensor 3 ('Pull 100gf Tweezer') is configured with a tweezer (with serial number '00841110'). This tweezer is not connected. Please plug in the tweezer's USB connector           |
| 24-09-19 14:55:29 | Advice | 100.11 | 1 | Sensor 'Pull 1kgf Tweezer': The 'collision detect force' is set to 0.15 [N], which is low for a 11.8 [N] tool. 1.18 [N] is a good default. Complaining stops when between [0.5883 |
| 24-09-19 14:55:11 | Advice | 2.4    | 1 | FactoryMode = True, please change this                                                                                                                                            |

Figure 12: Messages shown in XYZTEC Sigma software

### 3.4 Working with a data grid

In the Condor Sigma software data is sometimes shown in the form of a data grid. The data grid is comparable with a table, but offers a lot more and nicer features. We will demonstrate these features in the Methods screen.

| Type           | #  | Test | U.group | Order | Type | Range | Des. | Warn. | Name                         | Resultcode group name | Auto | Resultcode description | C. date    | C. time  | M. date    | M. time  |
|----------------|----|------|---------|-------|------|-------|------|-------|------------------------------|-----------------------|------|------------------------|------------|----------|------------|----------|
| AOI (1 item)   | 1  |      |         |       | AOI  |       |      |       | AOI Method                   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| ↓↑F (11 items) | 11 |      |         |       | ↓↑F  |       |      |       | Cold bump pull 100 µm b...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 12 |      |         |       | ↓↑F  |       |      |       | Cold bump pull 300 µm b...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 13 |      |         |       | ↓↑F  |       |      |       | Cold bump pull 450 µm b...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 14 |      |         |       | ↓↑F  |       |      |       | Cold bump pull 500 µm b...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 15 |      |         |       | ↓↑F  |       |      |       | Cold bump pull 750 µm b...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 9  |      |         |       | ↓↑F  |       |      |       | Pull 100x1000 µm alumin...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 7  |      |         |       | ↓↑F  |       |      |       | Pull 150 µm aluminium wire   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 10 |      |         |       | ↓↑F  |       |      |       | Pull 200x2000 µm alumin...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 6  |      |         |       | ↓↑F  |       |      |       | Pull 25 µm aluminium wire    |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 5  |      |         |       | ↓↑F  |       |      |       | Pull 25 µm gold wire         |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 8  |      |         |       | ↓↑F  |       |      |       | Pull 500 µm aluminium wire   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| ↓F (9 items)   | 21 |      |         |       | ↓F   |       |      |       | Die shear                    |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 22 |      |         |       | ↓F   |       |      |       | Finetune camera offset (...) |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 25 |      |         |       | ↓F   |       |      |       | Infinion sample              |                       |      |                        | 09/04/2024 | 16:27:56 | 09/04/2024 | 16:40:30 |
|                | 27 |      |         |       | ↓F   |       |      |       | Repeatability jig            |                       |      |                        | 09/05/2024 | 12:17:17 | 09/11/2024 | 13:21:14 |
|                | 19 |      |         |       | ↓F   |       |      |       | Shear 100x1000µm alumin...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 18 |      |         |       | ↓F   |       |      |       | Shear 150µm aluminium...     |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 20 |      |         |       | ↓F   |       |      |       | Shear 200x2000µm alumin...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 17 |      |         |       | ↓F   |       |      |       | Shear 25µm aluminium wire    |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
|                | 16 |      |         |       | ↓F   |       |      |       | Shear 25µm gold wire         |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| ↑D (1 item)    | 2  |      |         |       | ↑D   |       |      |       | loopheight 25 µm gold w...   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| ↑D (1 item)    | 4  |      |         |       | ↑D   |       |      |       | probe test                   |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| ↓↑F (1 item)   | 3  |      |         |       | ↓↑F  |       |      |       | Sample peel method           |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |

Figure 13: Data grid showing the available test methods

The picture above shows the Methods screen. The large table area on the screen shows a list of all available methods. In the beginning when using our Sigma software this will be a list you can easily oversee. After a while a lot of methods can make the overview more difficult. The data grid can help you by sorting, grouping (multiple columns and nesting supported) and filtering. This chapter shows how to get the most of the data grid.

A first helpful feature of the data grid is sorting data. Sorting data is very easy. Just click on the column header (not the arrow besides the header) to sort the data in ascending order for this specific column. Click again on the same column header to sort the data in descending order. A third click will fall back to the default of an unsorted dataset.

| # | Type | Destructive | Name         |
|---|------|-------------|--------------|
| 1 | ↓↑F  |             | Jig shear ca |
| 2 |      |             | Just record  |
| 3 | ↓↑F  | ✓           | Gold ribbon  |
| 4 | ↓↑F  | ✓           | Aluminium    |
| 5 | ↓↑F  | ✓           | Ribbon ribt  |
| 6 | ↓↑F  | ✓           | Copper ribt  |
| 7 | ↓↑F  | ✓           | Gold wire p  |

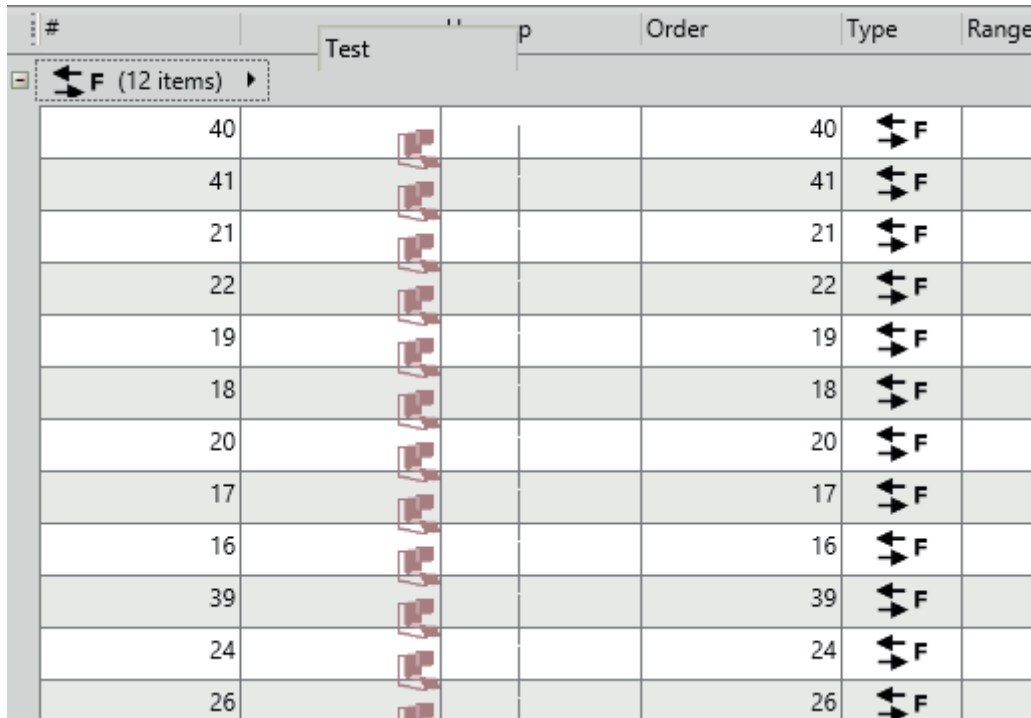
  

| #  | Type | Destructive | Name         |
|----|------|-------------|--------------|
| 17 | ↓↑F  |             | Weight calil |
| 16 | ↓↑F  | ✓           | Die shear    |
| 15 | ↓↑F  | ✓           | Ball shear   |
| 14 | ↓↑F  | ✓           | Aluminium    |
| 13 | ↓↑F  | ✓           | Gold wire sl |
| 12 |      |             | Scriptable n |
| 11 | ↓↑F  | ✓           | Gold wire p  |

Figure 14: Ascending and descending sort on the method number (#) column

In the data grid it is only possible to sort the data on one column. It is however still possible to sort on multiple columns by using the grouping options for data.

Grouping data on a specific column is very easy. Just left click on the column header, keep the mouse button pressed and drag the header to the grouping area. Then release the left mouse button to drop the column header. The grouping area can be recognized on the text "Drag a column header here to group by that column" or the text "Drag column here".



| #  | Test | p | Order | Type | Range |
|----|------|---|-------|------|-------|
| 40 |      |   |       | F    |       |
| 41 |      |   |       | F    |       |
| 21 |      |   |       | F    |       |
| 22 |      |   |       | F    |       |
| 19 |      |   |       | F    |       |
| 18 |      |   |       | F    |       |
| 20 |      |   |       | F    |       |
| 17 |      |   |       | F    |       |
| 16 |      |   |       | F    |       |
| 39 |      |   |       | F    |       |
| 24 |      |   |       | F    |       |
| 26 |      |   |       | F    |       |

Figure 15: Grouping the methods on method type

The figure shown above shows the drag and drop of the column Type to the grouping area. After dropping the column the methods will be grouped on the method type. All pull methods, peel methods, shear methods etc. will be grouped together as shown below.

| #                   | Test | U.group | Order | Type | Range | Des. | Warn. | Name                          | Result... | Auto | Result... | C. date    | C. time  |
|---------------------|------|---------|-------|------|-------|------|-------|-------------------------------|-----------|------|-----------|------------|----------|
| <b>F (12 items)</b> |      |         |       |      |       |      |       |                               |           |      |           |            |          |
| 40                  |      |         | 40    | F    |       | ✓    |       | Battery test                  |           |      |           | 09/18/2024 | 10:58:33 |
| 41                  |      |         | 41    | F    |       | ✓    |       | Battery test long             |           |      |           | 09/18/2024 | 11:17:30 |
| 21                  |      |         | 21    | F    |       | ✓    |       | Die shear                     |           |      |           | 09/12/2022 | 11:33:08 |
| 22                  |      |         | 22    | F    |       | ✓    |       | Finetune camera offset (...)  |           |      |           | 09/12/2022 | 11:33:08 |
| 19                  |      |         | 19    | F    |       | ✓    |       | Shear 100x1000µm alumi...     |           |      |           | 09/12/2022 | 11:33:08 |
| 18                  |      |         | 18    | F    |       | ✓    |       | Shear 150µm aluminum...       |           |      |           | 09/12/2022 | 11:33:08 |
| 20                  |      |         | 20    | F    |       | ✓    |       | Shear 200x2000µm alumi...     |           |      |           | 09/12/2022 | 11:33:08 |
| 17                  |      |         | 17    | F    |       | ✓    |       | Shear 25µm aluminum wire      |           |      |           | 09/12/2022 | 11:33:08 |
| 16                  |      |         | 16    | F    |       |      |       | Shear 25µm gold wire          |           |      |           | 09/12/2022 | 11:33:08 |
| 39                  |      |         | 39    | F    | 0.10  | ✓    |       | test export count test        |           |      |           | 02/19/2024 | 11:16:25 |
| 24                  |      |         | 24    | F    |       | ✓    |       | test jig                      |           |      |           | 09/12/2022 | 11:34:00 |
| 26                  |      |         | 26    | F    |       | ✓    |       | UPH shear 500mmps             |           |      |           | 02/08/2023 | 10:30:35 |
| <b>F (15 items)</b> |      |         |       |      |       |      |       |                               |           |      |           |            |          |
| 11                  |      |         | 11    | ↓↑F  |       | ✓    |       | Cold bump pull 100 µm b...    |           |      |           | 09/12/2022 | 11:33:08 |
| 12                  |      |         | 12    | ↓↑F  |       | ✓    |       | Cold bump pull 300 µm b...    |           |      |           | 09/12/2022 | 11:33:08 |
| 13                  |      |         | 13    | ↓↑F  |       | ✓    |       | Cold bump pull 450 µm b...    |           |      |           | 09/12/2022 | 11:33:08 |
| 14                  |      |         | 14    | ↓↑F  |       | ✓    |       | Cold bump pull 500 µm b...    |           |      |           | 09/12/2022 | 11:33:08 |
| 15                  |      |         | 15    | ↓↑F  |       | ✓    |       | Cold bump pull 750 µm b...    |           |      |           | 09/12/2022 | 11:33:08 |
| 33                  |      |         | 33    | ↓↑F  |       | ✓    |       | die pull test                 |           |      |           | 09/26/2023 | 13:16:39 |
| 34                  |      |         | 34    | ↓↑F  |       | ✓    |       | DvE die pull test test for... |           |      |           | 11/27/2023 | 10:56:51 |
| 25                  |      |         | 25    | ↓↑F  |       | ✓    |       | Jig test                      |           |      |           | 09/12/2022 | 15:04:31 |

Figure 16: Methods grouped by type of method

It is also possible to group on multiple levels. If you would also drag and drop the Destructive column the methods would be grouped by method type first and then by the fact whether the method is destructive or not. This way all destructive pull methods are grouped together. Even when the data is grouped you can still choose to sort on a specific column to make it more easy to find a method or get a better overview.

Each group gets a header that shows the group contents and the number of items in the group. When a lot of data is available it is also possible to use groups for a faster navigation. Just click on the arrow besides the method content and select the group that is needed

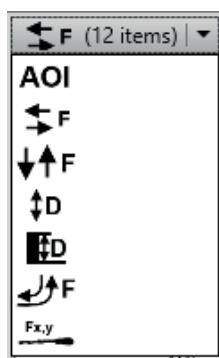


Figure 17: Navigating the methods by selecting a group (type)

The example in the picture above shows how to filter on the method name (Name). Move the mouse cursor over the column header. An arrow is shown on the right side of the header. Just click on this arrow. A list of all column values is shown. This is a unique list. If a specific value is checked (click on the check box in front of the name) this item will be part of the filtered data. You can check multiple items. The data grid immediately shows the filtered data. After filtering on specific items the column will show a filter icon. To remove a filter just click on the arrow/filter and click Clear filter or uncheck the checked items. The Condor Sigma software contains multiple nested filters. Filtering is especially useful in the query screen.

### 3.5 Users and user groups

Click software settings and then users in the main menu. The picture below shows the selected menu options. The users screen shows all available users in a data grid. Just as explained in the chapter before you can sort the data, group the data or use a filter. the image shown below shows the users that are pre-defined as default in the XYZTEC Sigma software. They can be changed, modified, deleted and adjusted any time by the operators' needs as long as the user group has the rights to do so.

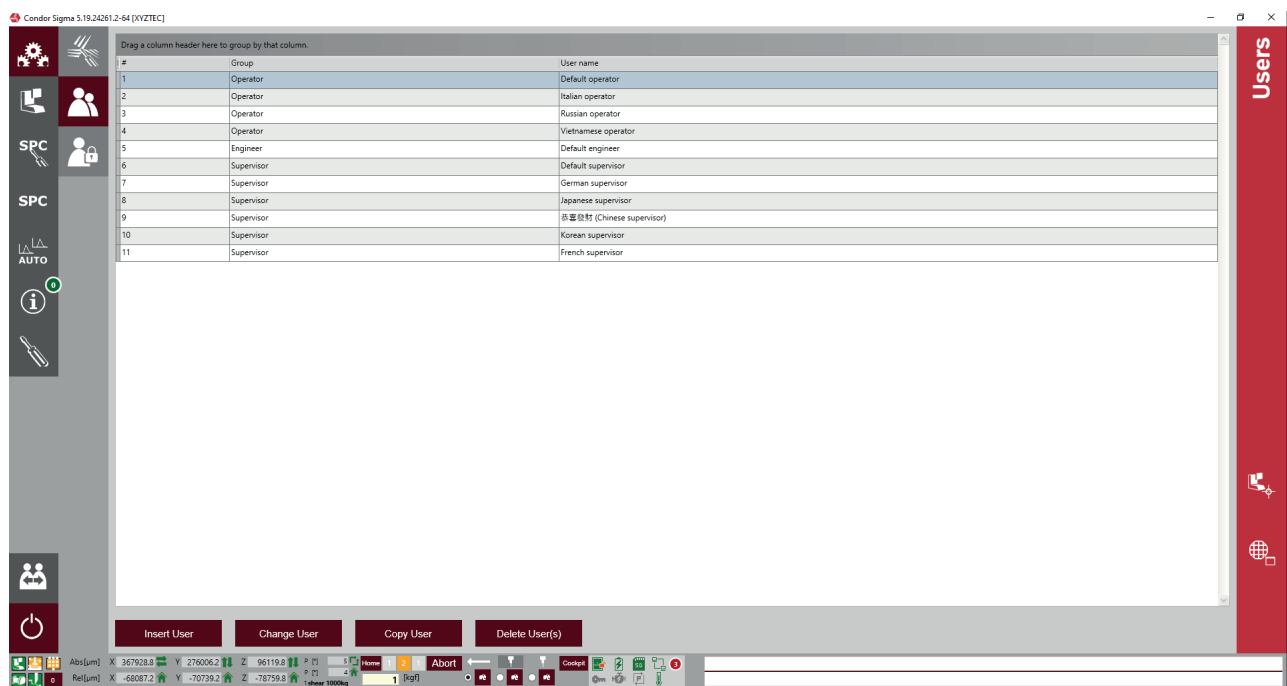


Figure 18: Users screen

Below the data grid the buttons **Insert User**, **Change User**, **Copy User** and **Delete User(s)** are available. If a user is selected and **Change User** is clicked the window below will open. The User name should identify the user with an unique name. The User group determines the authorizations.

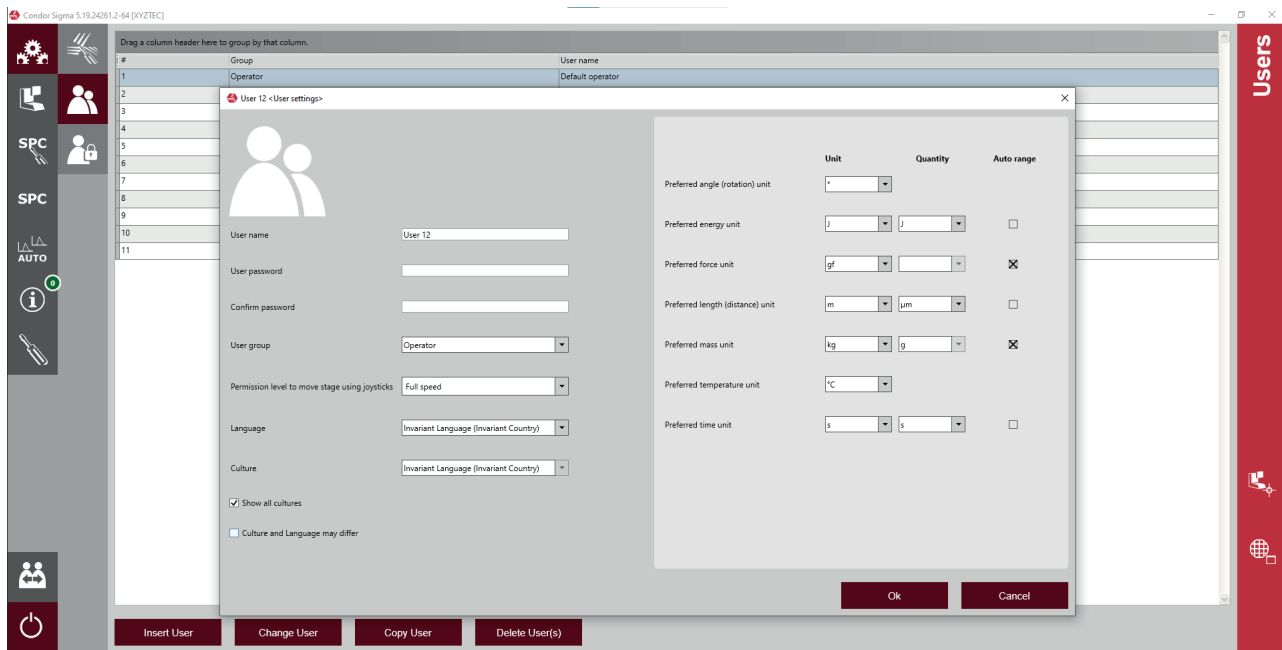


Figure 19: User settings screen

The user settings can be used to change the preferred unit, the settings for the culture or language and the user group (authorisations). The culture settings are used to determine the way numerical data or date/time is shown. The default Culture is Invariant language/Invariant country. Numerical data uses a decimal point. Date and time use the format month/day/year. Make sure to choose the correct setting for your country.

The Language setting can be used to set the language for the Condor Sigma software. If **Show all cultures** is checked the list of cultures and languages is the same as Windows offers. If this is not checked the list will only show the cultures that also offer a translation.

In most cases the option **Culture and language** may differ and can be unchecked. In some cases, for example a German user that likes to get the English language, but the German culture settings (decimal comma), it is necessary to check this option. If checked it is possible to select a different settings for the language and the culture.

The unit settings can be used to arrange the setting the Preferred angle unit, Preferred energy unit, Preferred force unit, Preferred length (distance) unit, Preferred mass unit, Preferred temperature unit and Preferred time unit. The unit angle offers a choice between degree (°, default) and radial (rad). For energy the only choice is joule (J). Force offers a choice between Newton (N) and gram force (gf). Length offers a choice between the metric system (m) or inches (inch). The unit for the mass is kg. This setting is used when entering a weight in calibration mode. For temperature we offer degrees Celsius (°C, default), Kelvin (K) and degrees Fahrenheit (°F). Time only offers a choice for seconds (s).

The Auto range setting automatically selects a specific unit quantity when a value is in a specific scope. If enabled for the force the system will automatically show kgf if the selected sensor has a force range above 1000 gf. To define and manage the different user rights you have to edit this in the **User group** settings as shown below:

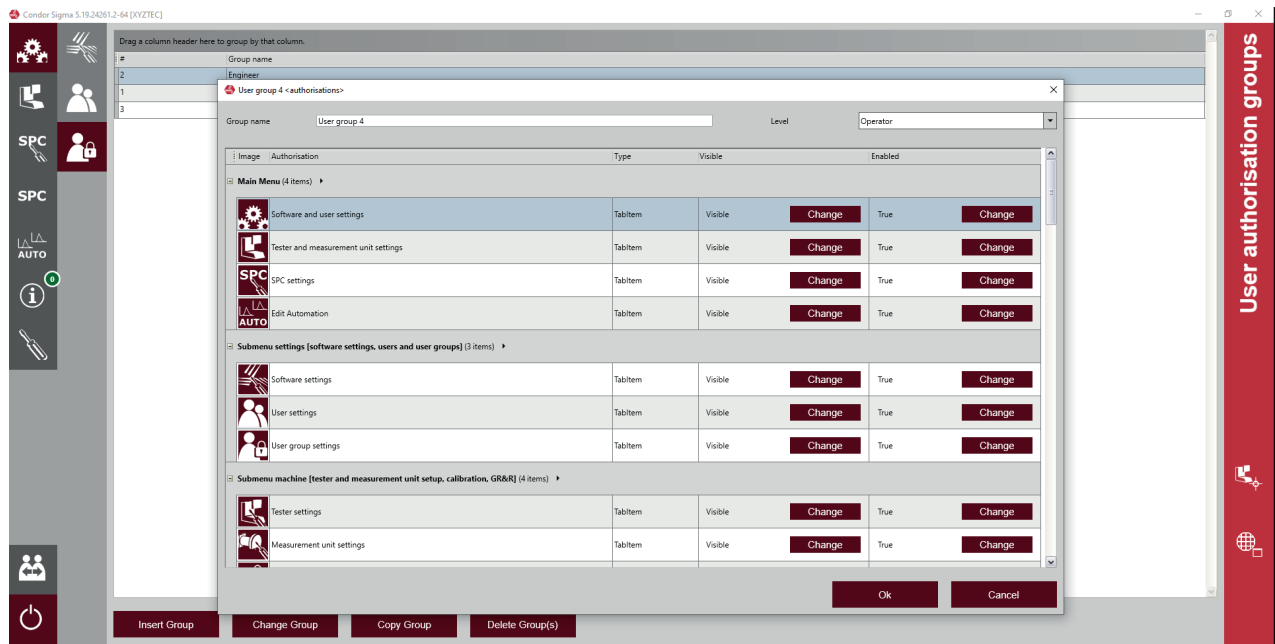


Figure 20: How to insert and edit a user group

The XYZTEC Sigma software divides into the following three user groups that can be equipped with different rights according to a defined right hierarchy:

1. Operator
2. Engineer
3. Supervisor

The user group **Supervisor** has the right to give and take rights per default. There it can be selected whether the **Operator** and/or **Engineer** is allowed to see all available software settings or not. The columns **Visible** and **Enabled** define if the user can see the software settings without the option to click it or if the functions are hidden. For instance, when the **Supervisor** wants the operator to just see perform the test requirements without the possibility to modify anything but the test method settings selves, all other software settings can be disabled and/or made invisible.

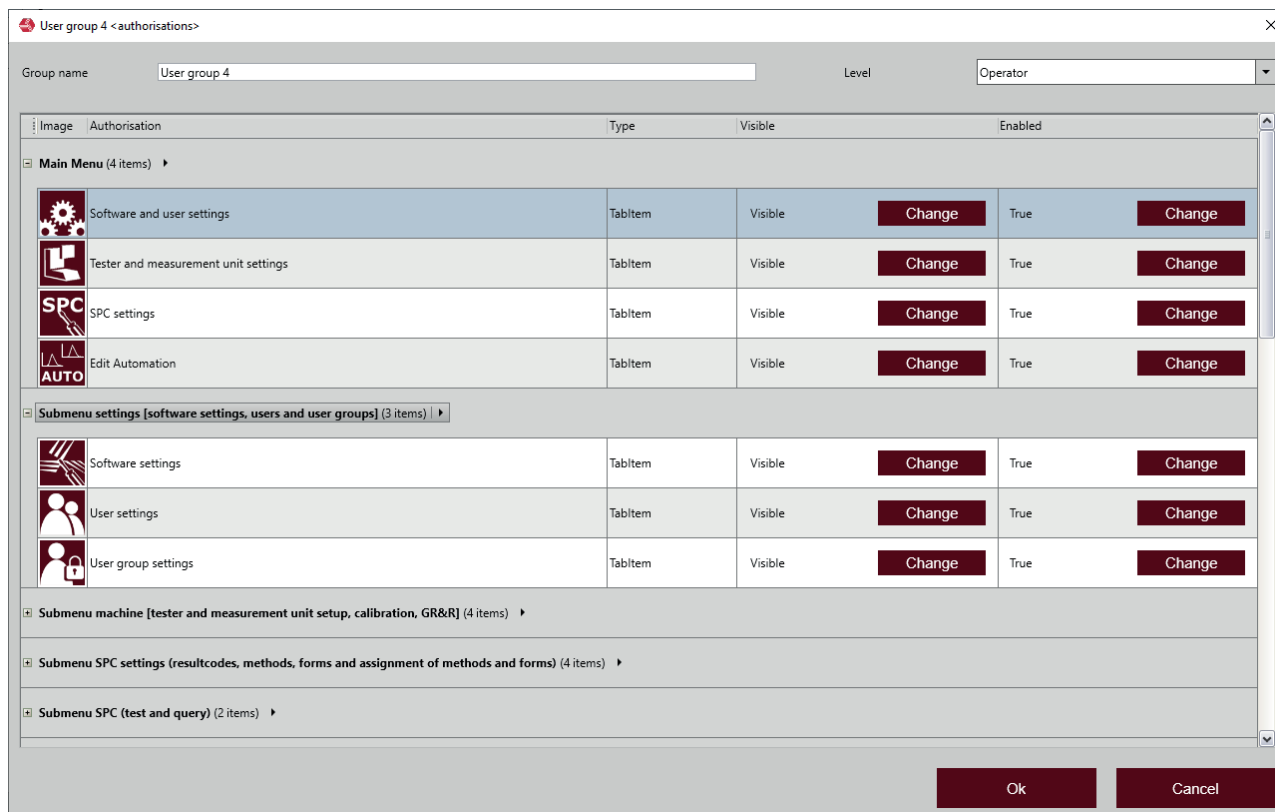


Figure 21: Right management of user groups

### 3.6 Result codes and result code groups

After a test is performed in most cases the operator will need to visually check the result and determine a grading or failure code. For a pull test for example after pulling the wire the operator will need to visually determine if the wire broke, or if the bond (wedge or ball) broke. Other situations like a neck break or heel break are also possible. The XYZtec Sigma software offers an easy-to-use way to define the available result codes and result code groups.

Setting up result codes and groups is a job for the engineer. If setup correctly the operators can work efficiently and make less mistakes when performing a grading. Click **SPC settings** and then **Result code groups** in the main menu. The picture below shows the selected menu options.

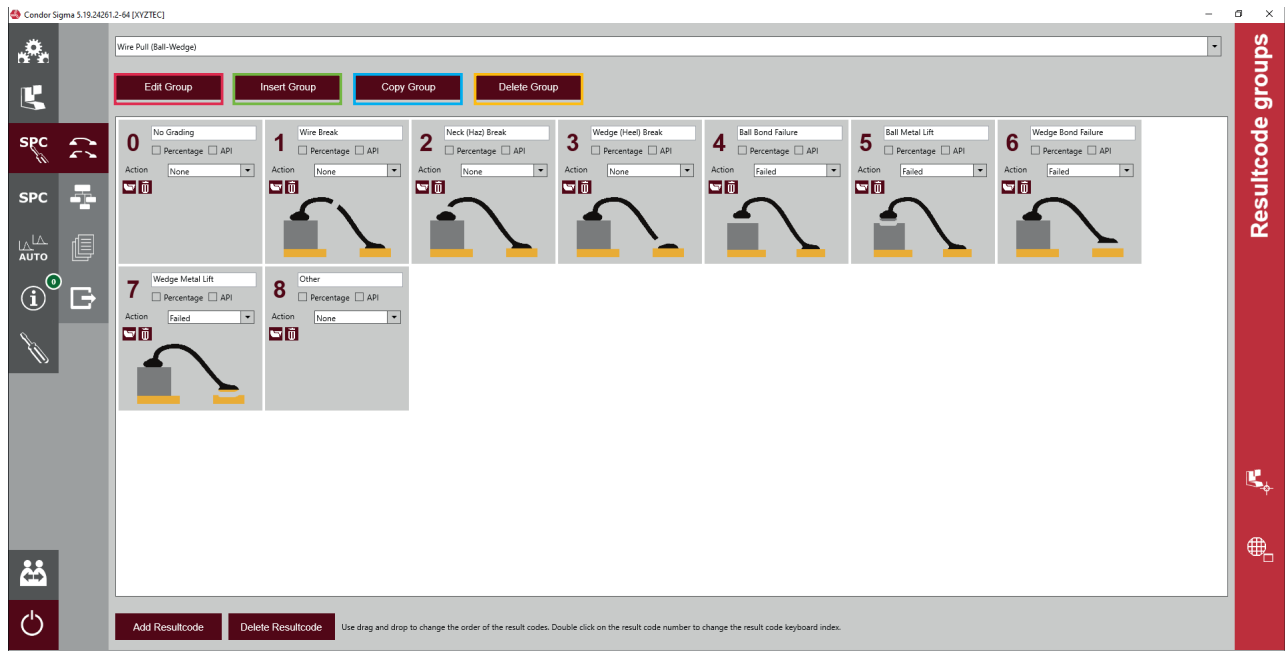


Figure 22: Result codes and result code groups

A default pre-set of result code groups and result codes are available, including helpful pictures that clearly show when to choose a specific result code. In the upper part of the screen you select a result code group by clicking the drop-down menu. By default the Wire pull (Ball-Wedge) result code group is selected. With the **Edit group** button the name of the selected group can be changed. **Insert group** will insert a new group. **Copy group** will copy a group, including all available resultcodes. **Delete group** will delete the selected group.

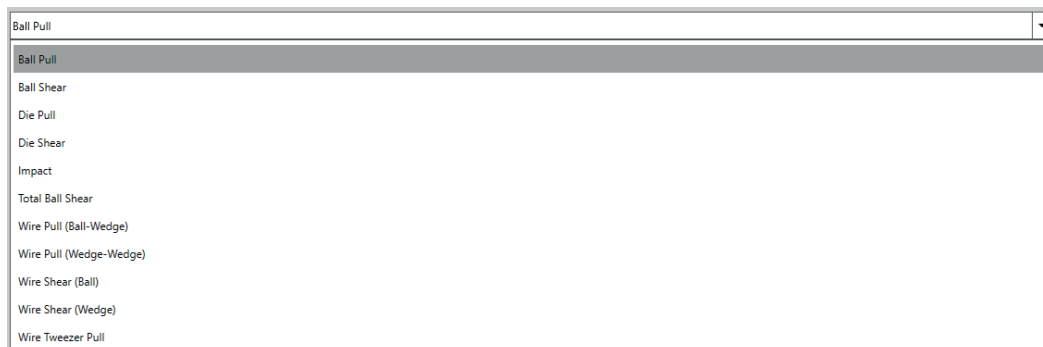


Figure 23: Result code groups

The lower part shows tiles. Each tile contains a result code. Each result code shows a Number, a Name, a checkbox to enable a grading percentage, the resultcode action for the selected code and a picture for the result code. The number can be a number from 0 to 9. The number corresponds with a keyboard key that can be used to quickly select the result code on the joystick when a grading is performed. The name of the result code is important. It should clearly describe the kind of grading to make it more easy for the operator to understand. If Percentage is checked after performing the grading the operator also needs to select a percentage from 0 to 100.

The percentage setting is mostly used for (total) ball shear testing to describe how much of sheared area



is ductile or brittle. The operator can make an estimate and store this with the measurement.

**Result code actions** can be used to perform a certain action when this specific grading is chosen. Below is a list of the possible result code actions:

- Fail:** The measurement result should always be considered a **fail**, when the test was performed incorrectly but still should be taken into account for calculating the statistics even if the result is within the fail limits. The corresponding measurement will be highlighted in red color.
- Disable:** The measurement result is **disabled**. The result is still available, but not taken into account when calculating the statistics.
- Reject:** The measurement will not be stored (is rejected). If the test is not performed correctly due to an operator error a result code with the result code action **reject** can be used to not store the result.
- Remark:** When a result code with the **remark** action is selected the operator needs to type in a remark after performing the grading.

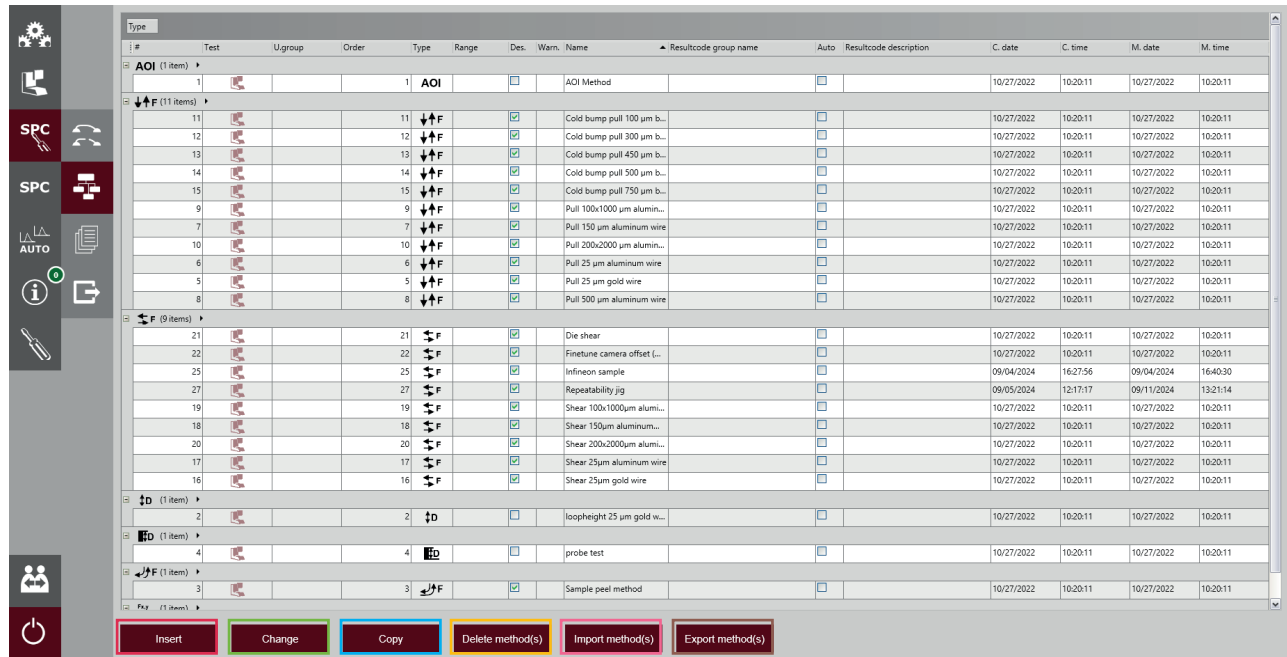
The result code picture can help the operator to select the correct code. By default schematic pictures are used, but photos are also supported. To help the operator make a good choice the picture must clearly show the situation after a test. The operator can then compare the result with the picture and make a good choice.

To add or change a picture just click on the button with the open folder icon. Then select a picture. The picture will be copied to a special folder that contains all result code pictures and the name for the picture is changed to RCOD\_XXXXXX\_YYYYYY..ZZZ, where XXXXXX is the result code group number, YYYYYY is the result code number and ZZZ is the extension (wmf, jpg gif, png or bmp are supported).

Changing a result code is very easy. Just click on the part that needs to be changed (the name, percentage, action or picture) and change the current setting. All changes are stored immediately. With Insert Result-code a new code is inserted. Delete Resultcode removes the currently selected code.

### 3.7 Test methods and method settings

After defining the result code groups and result codes it is time to see how to define or change the **Method settings**. In this chapter the method screen itself and the procedures of how to change the method settings will be explained. To open the methods screen go to **SPC Settings** and then click the **Methods** button. The below picture shows the selections in the main menu.



| i #                 | Test | U.group | Order | Type | Range | Des.                         | Warn. | Name       | Resultcode group name | Auto | Resultcode description | C. date    | C. time  | M. date    | M. time  |
|---------------------|------|---------|-------|------|-------|------------------------------|-------|------------|-----------------------|------|------------------------|------------|----------|------------|----------|
| <b>AOI (1 item)</b> |      |         |       |      |       |                              |       |            |                       |      |                        |            |          |            |          |
| 1                   |      |         | 1     | AOI  |       |                              |       | AOI Method |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| <b>F (11 items)</b> |      |         |       |      |       |                              |       |            |                       |      |                        |            |          |            |          |
| 11                  |      |         | 11    | F    |       | Cold bump pull 100 µm b...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 12                  |      |         | 12    | F    |       | Cold bump pull 300 µm b...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 13                  |      |         | 13    | F    |       | Cold bump pull 450 µm b...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 14                  |      |         | 14    | F    |       | Cold bump pull 500 µm b...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 15                  |      |         | 15    | F    |       | Cold bump pull 750 µm b...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 9                   |      |         | 9     | F    |       | Pull 100x1000 µm alumin...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 7                   |      |         | 7     | F    |       | Pull 150 µm aluminum wire    |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 10                  |      |         | 10    | F    |       | Pull 200x2000 µm alumin...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 6                   |      |         | 6     | F    |       | Pull 25 µm aluminum wire     |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 5                   |      |         | 5     | F    |       | Pull 25 µm gold wire         |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 8                   |      |         | 8     | F    |       | Pull 500 µm aluminum wire    |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| <b>F (9 items)</b>  |      |         |       |      |       |                              |       |            |                       |      |                        |            |          |            |          |
| 21                  |      |         | 21    | F    |       | Die shear                    |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 22                  |      |         | 22    | F    |       | Finetune camera offset (...) |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 25                  |      |         | 25    | F    |       | Infinion sample              |       |            |                       |      |                        | 09/04/2024 | 16:27:56 | 09/04/2024 | 16:40:30 |
| 27                  |      |         | 27    | F    |       | Repeatability jig            |       |            |                       |      |                        | 09/05/2024 | 12:17:17 | 09/11/2024 | 13:21:14 |
| 19                  |      |         | 19    | F    |       | Shear 100x1000µm alumi...    |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 18                  |      |         | 18    | F    |       | Shear 150µm aluminum...      |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 20                  |      |         | 20    | F    |       | Shear 200x2000µm alumi...    |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 17                  |      |         | 17    | F    |       | Shear 25µm aluminum wire     |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| 16                  |      |         | 16    | F    |       | Shear 25µm gold wire         |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| <b>D (1 item)</b>   |      |         |       |      |       |                              |       |            |                       |      |                        |            |          |            |          |
| 2                   |      |         | 2     | D    |       | loopheight 25 µm gold w...   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| <b>D (1 item)</b>   |      |         |       |      |       |                              |       |            |                       |      |                        |            |          |            |          |
| 4                   |      |         | 4     | D    |       | probe test                   |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |
| <b>F (1 item)</b>   |      |         |       |      |       |                              |       |            |                       |      |                        |            |          |            |          |
| 3                   |      |         | 3     | F    |       | Sample peel method           |       |            |                       |      |                        | 10/27/2022 | 10:20:11 | 10/27/2022 | 10:20:11 |

Figure 24: SPC settings screen listing the created (and available) test methods

The XYZTEC Sigma software offers a selection of predefined methods by default. With **Insert Method** a new method can be added. **Change Method** will open the method settings screen for the currently selected method. **Copy Method** copies the selected method to a new method and opens the method settings. **Delete Method(s)** will delete the selected method(s). **Import Method** can be used to import these XML files. **Export Method(s)** will export the method settings in one or multiple XML files. The Condor Sigma software supports multiple method types. For example the pull test and the shear test. Each type of method is identified with an icon. Below is an overview of these icons and the kind of test they belong to.

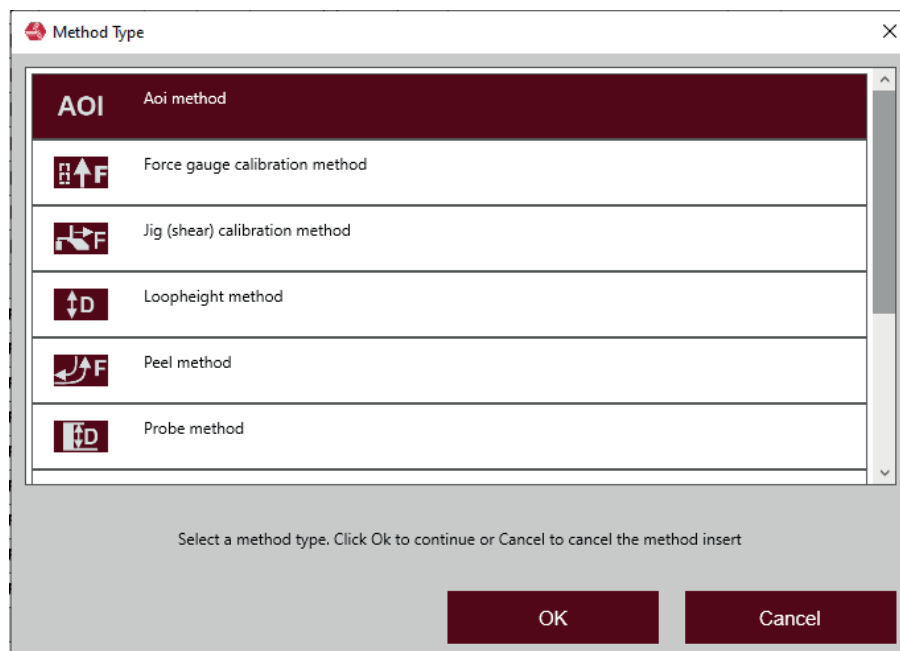


Figure 25: Menu to insert a new method type

-  AOI method
-  Calibration method
-  Jig (shear) calibration method
-  Loop height method
-  Peel method
-  Probe method
-  Pull method
-  Shear method
-  Scratch method
-  Weight calibration

If the Insert Method button is clicked the dialog window shown above is opened. Select a method type and then click **OK** to continue or Cancel to cancel creating the method. Each method type shows the icon for the type and a short description. After the **OK** button is clicked a window will open with the settings for this specific method. In the first example the pull method is selected before clicking **OK**.

### 3.7.1 How to set up a Pull method

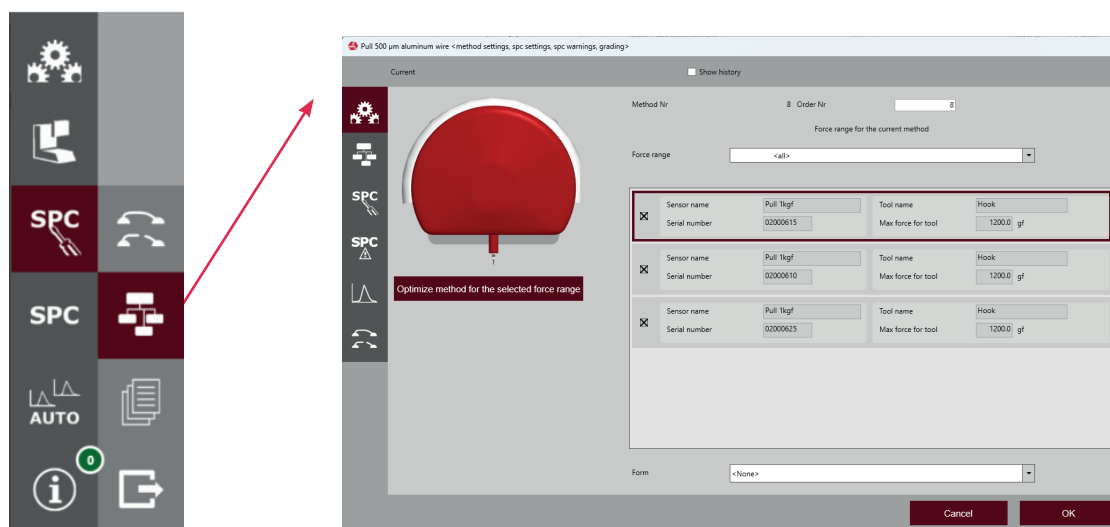


Figure 26:

Pull method settings, selecting the force range and corresponding sensor

The first tab shows the general method settings. It is important to determine the force range that is requi-

red. In the example above the 100 gf force range is selected. There are two 100 gf pull sensors available on this system. If the button **Optimize method for the selected force range** is clicked the software will automatically set some method values based on the selected force range. It is also possible to force a specific form when the method is selected.

On the left side is a vertical menu with six icons. The first icon on the left side bar are the General settings , followed by the Method settings  selected by default, the SPC settings , SPC warnings , Measurement graph settings  and last the Grading settings  defining the result codes. Click the icon for the Method settings. The window with the method settings will now show the settings for a pull test.

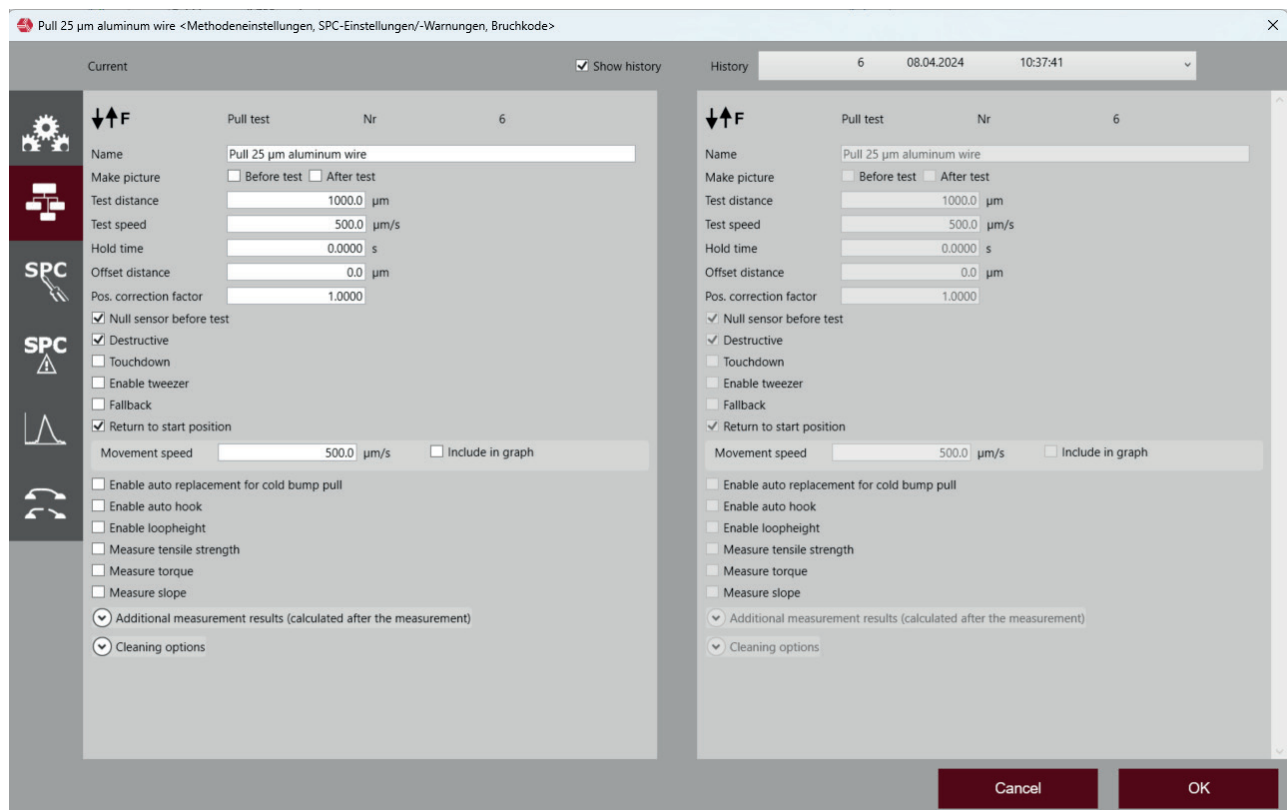


Figure 27: Pull test method settings to define the required parameters

On the first line the method type is shown. In this case the pull test icon and the text Pull test. Once a method is created it is not possible to change the method type! The name for the method should be easy to recognize that clearly describes the kind of test or sample that is going to be tested. *Pull 25 µm aluminum wire* is a good description of the test method as it clearly describes what the test is aimed for and what is being tested. If the name clearly describes the purpose it will be easier to find the right method.

The **Test distance** is the distance that the system will move the Z-stage to perform the test. A positive distance will start a movement up (pull test). A negative distance a movement down (push test). Make sure the test distance is sufficient to pull the wire.

**Test speed** sets the speed during the test. The best test speed is determined by the required units per hour and the required accuracy. A good starting point is always 250 µm/s as this speed also was found to work best for all applications regardless of wire thickness and tool size.

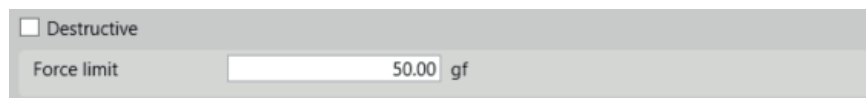


**Hold time** can be used to wait after the test. This setting can be used in two cases.

- Case 1: If the operator needs more time to check the grading the hold time can help.
- Case 2: During a non-destructive test the pre-set force limit will be applied for the pre-set hold time.

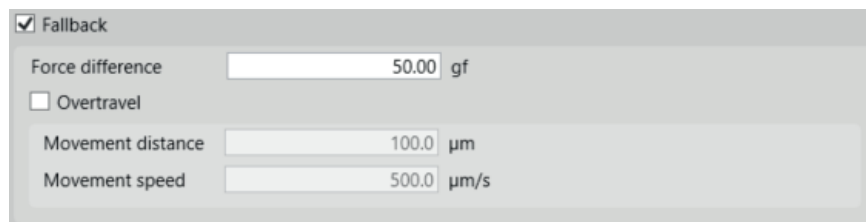
**Null sensor before test** is checked by default. The sensor is automatically nulled before a test. In some very rare cases this setting needs to be disabled. For example when a preload is already applied to the sensor when the test is started, but this preload still needs to be part of the measurement.

Most pull tests are by default **destructive test**. The goal of the test is to break the tested wire apart. To perform a destructive test the box in front of **Destructive** must be checked. To perform a non-destructive test the box must be unchecked. When Destructive is unchecked the Force limit must be set. This should be the force the tested part should be able to withstand during the test.



**Figure 28:** Software setting for non-destructive testing with force limit (destructive testing is unchecked and therefore disabled)

The **Fallback** in the XYZTEC Sigma software can be used to optimize the number of tests per hour. In a lot of cases the customer is interested in the force graph until the peak has been reached and a small distance after the peak. The rest of the graph does not add real value. Since less distance is moved the total test time is shorter and when many tests are performed this setting will increase the number of tests per hour. If this is important the Fallback should be checked.



**Figure 29:** Software setting for testing with Fallback (Fallback is checked and therefore enabled)

If fallback is enabled a **Force difference** needs to be set. When the force drops more than the force difference defined in method settings the software will stop the test. Check **Overtravel** to enable the overtravel feature to clear the region of interest. This makes it possible to move further in the test direction for the **Movement distance** with the defined **Movement speed**. In most cases the movement distance is relatively short. This setting can sometimes help to remove the pulled wire from the hook. It also adds additional data to the measurement graph.

By default **Return to start position** is checked. After the test has finished the stages will move back to the start position. In most cases this is exactly what is needed. In some cases, however, we may not want to move back. Uncheck the box in those cases. If the box is checked the **Movement speed** for the move to the start position can be set. If the box in front of **Include in graph** is checked the movement to the start position is also recorded as part of the force graph. By default this option is not checked and the move back is not part of the graph.



Figure 30: Software setting to return to start position after the test is performed

If the box in front of **Enable autohook** is checked the auto hooking feature is used. By default when a wire pull test is performed the operator manually needs to move under the wire before starting the test. With auto hooking a lower limit needs to be set in the test screen before a test is started. The hook can be positioned **Along the wire** or **Across the wire**.

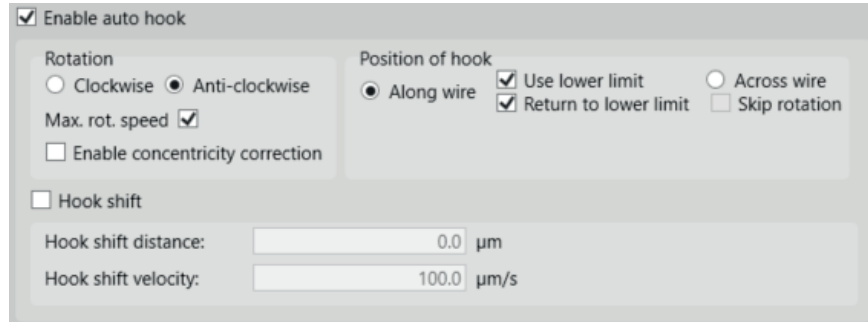


Figure 31: Software setting to enable auto hook

**Along the wire** means that the hook is aligned with the wire. It is important that the hook can rotate under the wire. If the box in front of **Lower Limit** is checked the stage will first move to the lower limit. The rotation point of the hook should be on a safe distance from the wire where the hook can still rotate under the wire after moving down. If **Lower Limit** is not checked the lower limit is not used and the hook will rotate on the current position. Make sure to have a starting position on the correct height to safely rotate the hook under the wire. If the wires are on different heights unchecking the **Lower Limit** makes it easier for the operator to perform the test. In most cases the lower limit is used.

Picture 3 and 4 on the right side show the hook **Across the wire**. The hook is perpendicular to the wire. The rotation point of the hook should also be on a safe distance from the wire, in such a way that the hook will rotate under the wire after moving down. With this setting using the lower limit is required. The advantage of across the wire is that it is easier to see how the hook is positioned. Disadvantage is the additional rotation. Please note that when the hook is too close to the wire and the test is non-destructive, it is possible that the wire is stretched and after the test the hook lands on the wire. Make sure to keep a certain distance.

**Auto hook** is especially a good feature when a lot of parallel wires are tested. It is still important to get the right position, but it is not necessary to manually move between the wires and rotate under the wire.

An additional feature is the so called **Hook Shift**. This feature helps to shift the hook further under the wire and reduces the chance of missing the wire. Check **Hook Shift** to enable this feature. The hook shift distance sets the distance the hook is shifted under the wire. In most cases this is a relatively small distance. The Hook shift velocity sets the speed for this move.

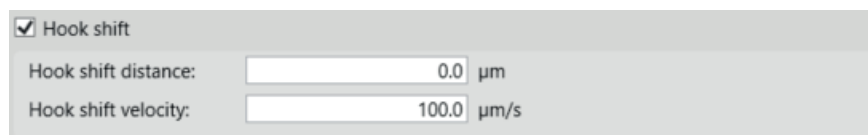


Figure 32: Software setting to enable Hook shift



It is also possible to combine a pull test with a **Loopheight measurement**. In this case the system will perform a touchdown on the surface and then move up and aims to detect the wire with a relatively low force. After this the pull test is performed. The Sigma software can remember the touchdown, to make the test more efficient. It is also possible to detect a touchdown on a different location, when it is not an option to land when positioned under the wire. To measure the loopheight correctly, it is mandatory to enter both the wire diameter as well as the diameter of the hook shaft.

☒ Enable loopheight  
☐ Force measurement during loop height

Touch ☒ Remember surface detect ☐ Skip first measurement

Force  gf  
 Distance  µm  
 Speed  µm/s

Wire diameter  µm  
 Hook diameter  µm

**Figure 33:** Software setting to enable Loopheight measurement during normal pull test

The settings under **Touch** are used for the surface and wire detection. **Remember surface detect** is used to remember the z-height for the surface detection. For the next test the surface detection is skipped. If **Remember surface detect** is checked the option **Skip first measurement** becomes available. If this option is checked the system will only detect the surface and not perform a wire detection or the test. The software will show that the measurement is not stored. The next measurement the wire detection and the pull test are performed. The loopheight is calculated with the z-height from the surface detection. For the surface detection the **Force** determines the landing force. The **Distance** is the maximum distance the machine will search for the surface or the wire. The **Speed** sets the speed for surface detection. Depending on the current sensor it is important to set the force to a low value (for example 5 gf for a 100 gf sensor) and also use a low speed (for example 100 µm/s) to reduce the impact to the surface. The Touchdown speed always should be lower the original Test speed.

To calculate the correct loopheight it is also important to set the correct Wire diameter and the correct Hook diameter. Since the lower part of the hook is used for the surface detection and the upper part is used for the wire detection, the hook diameter has to be added to the measured distance. If the top of the wire is defined as the loopheight, the wire diameter also needs to be added. If the lower part of the wire is defined as the loopheight, the wire diameter should be set to 0.0 µm.

When the area of contact is known it is possible to calculate the applied pressure. To set this result, check **Measure pressure**. Select the **Surface type** (square, circle, rectangle) and set the Side for a square, the Diameter for a circle and Width and Height for a rectangle. The software will use these settings to calculate the correct pressure for a specific applied force.

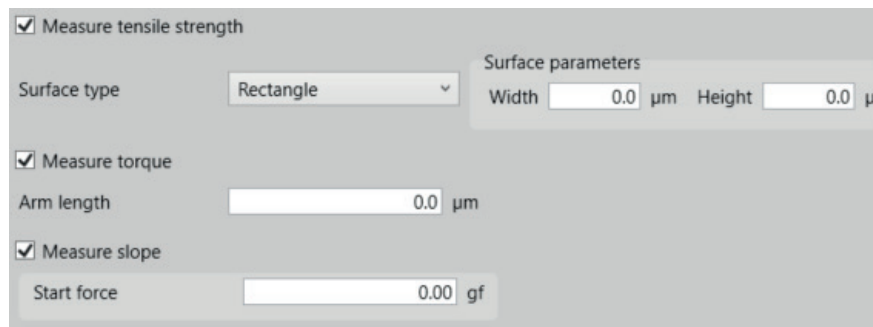


Figure 34: Software settings to measure tensile strength, torque and slope

The Condor Sigma software can get multiple results from one measurement. By default the **Peak force** is the result. It is also possible to get the **Average force**, **Minimum force**, **Force range**, **Standard deviation force**, **Peak energy** and **Total energy**. Since these results are calculated from the measurement graph they are called **Additional measurements** (calculated after the measurement). Just check the required measurement results.

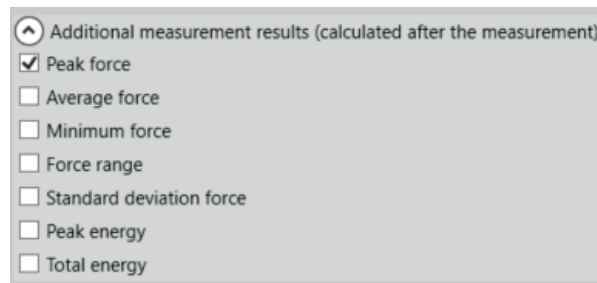


Figure 35: Software setting to enable additional measurements

The average force is determined by totaling all the forces for each measurement samples in the measurement graph and dividing this by the number of measurement samples in the graph. By default all measurement samples are used. For the peak force (highest force) this is not a problem in most cases.

The software also offers to set a region of interest under the measurement graph settings. With the region of interest it is possible to only include measurements above or below a certain force.

For pull tests with a tweezer a sensor with tweezer is required. Check Enable tweezer to see the tweezer settings.

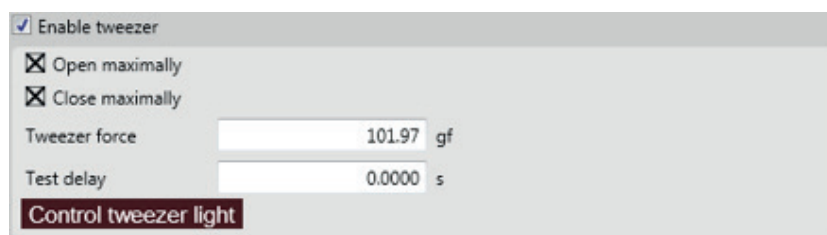


Figure 36: Software setting for tweezer control

By default **Open maximally** and **Close maximally** are checked. In some cases it is not possible to open the tweezer completely without hitting obstructions. In that case uncheck the Open maximally setting and set the **Opening distance**. In the same way it is also possible to limit the Closing distance by disabling Close

maximally. The Tweezer force sets the gripping force for the tweezer. To make sure the pull test does not start before the tweezers have gripped the part the Test delay needs to be set.

For cold bump pull testing it is also important to check **Touchdown**. This enables a surface detection before trying to grip the bump. For this touchdown only the **Force**, **Distance** and **Speed** can be set.

### 3.7.2 How to set up a Shear method

Accordingly to the procedure of setting up a pull method, a shear test method will be inserted and edited in the same way.

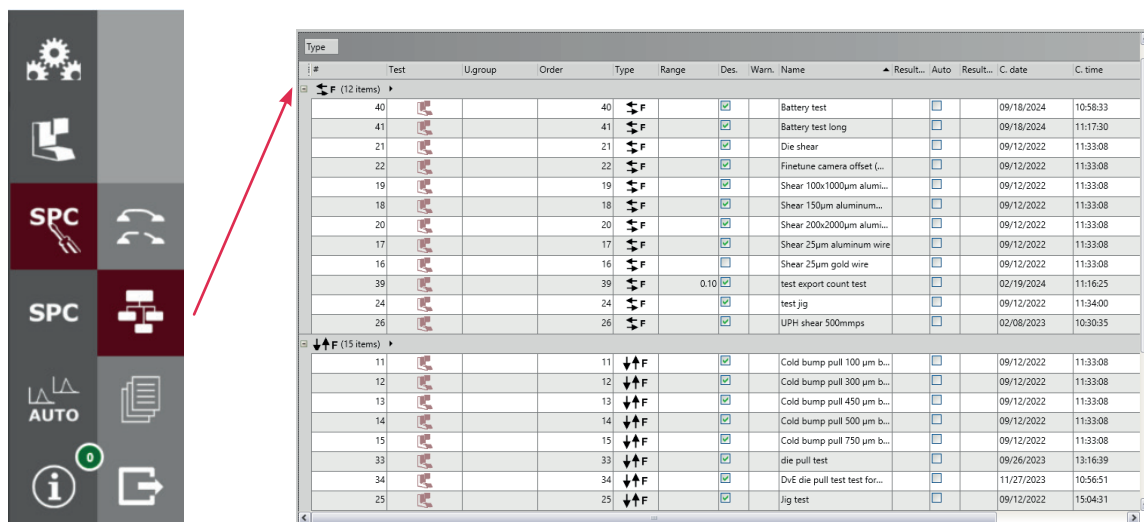


Figure 37: How to set up a new test method

On the left side there is the same vertical menu with the known six icons. The first icon on the left side bar are the General settings , followed by the Method settings  selected by default, the SPC settings , SPC warnings , Measurement graph settings  and last the Grading settings  defining the result codes. Click the icon for the Method settings. The window with the method settings will now show the settings for a shear test.

**Figure 38:** Shear test method settings to define the required parameters

The first line shows the icon for a shear test  and a field to give the shear method a name. As stated before make sure that the name describes the method in such a way that it is easy for the operator to recognize what the method does.

The **Test distance** is the distance that the system will move the Y-stage to perform the test. A positive distance will shear away from the operator, whereas a negative distance start the shear towards the operator. Make sure the test distance is sufficient to shear the component, e.g. the die. For shear sensors with force ranges lower than 10kgf (<10kgf) the shear test can be performed in any direction. The shear dorection then is depending on the angel, in which the shear chisel is positioned and where the flat side, the side where we shear with, faces to.

**Test speed** sets the speed during the test. The best test speed is determined by the required units per hour and the required accuracy. A good starting point is always 250 µm/s as this speed also was found to work best for all applications regardless of wire thickness and tool size.

**Hold time** can be used to wait after the test or to simulate creep behavior, thus this setting can be used in two cases.

- Case 1: If the operator needs more time to check the grading the hold time can help.
- Case 2: During a non-destructive test the pre-set force limit will be applied for the pre-set hold time, hence creep behavior.

**Null sensor before test** is checked by default. The sensor is automatically nulled before a test. In some very rare cases this setting needs to be disabled. For example when a preload is already applied to the sensor when the test is started, but this preload still needs to be part of the measurement.

Most shear tests are **destructive test** by default. The goal of the test is to break the bonded component

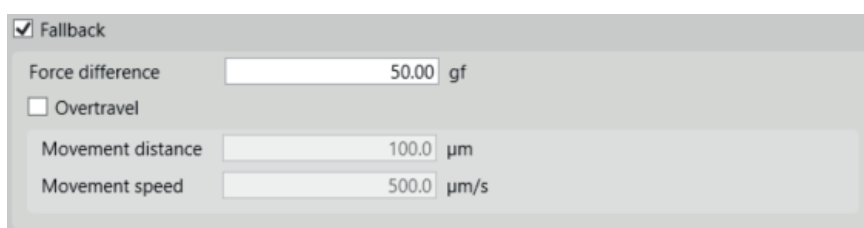


apart from the substrate beneath, no matter whether the component was glued, sintered or bonded either by solder balls or Au studs. To perform a destructive test the box in front of **Destructive** must be checked. To perform a non-destructive test the box must be unchecked. When Destructive is unchecked the Force limit must be set. This should be the force the tested part should be able to withstand during the test.



**Figure 39:** Software setting for non-destructive testing with force limit (destructive testing is unchecked and therefore disabled)

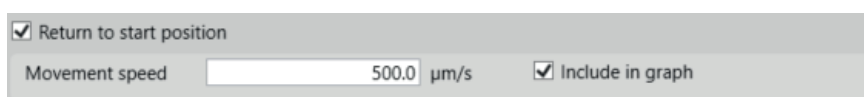
The **Fallback** in the XYZTEC Sigma software can be used to optimize the number of tests per hour. In a lot of cases the customer is interested in the force graph until the peak has been reached and a small distance after the peak. The rest of the graph does not add real value. Since less distance is moved the total test time is shorter and when many tests are performed this setting will increase the number of tests per hour. If this is important the Fallback should be checked.



**Figure 40:** Software setting for testing with Fallback (Fallback is checked and therefore enabled)

If fallback is enabled a **Force difference** needs to be set. When the force drops more than the force difference defined in method settings the software will stop the test. Check **Overtravel** to enable the overtravel feature to clear the region of interest. This makes it possible to move further in the test direction for the **Movement distance** with the defined **Movement speed**. In most cases the movement distance is relatively short and is set to clear the region of interest to classify the grading and validate the intermetallic connection (IMC) or phase. This setting can sometimes help to remove the pulled wire from the hook. It also adds additional data to the measurement graph.

By default **Return to start position** is checked. After the test has finished the stages will move back to the start position. In most cases this is exactly what is needed. In some cases, however, we may not want to move back. Uncheck the box in those cases. If the box is checked the **Movement speed** for the move to the start position can be set. If the box in front of **Include in graph** is checked the movement to the start position is also recorded as part of the force graph. By default this option is not checked and the move back is not part of the graph.



**Figure 41:** Software setting to return to start position after the test is performed

### 3.7.3 How to set up a Peel method

For pull sensors the Sigma software also supports a peel test. During a peel test the X- and Z stage or the Y and Z stage move the pre-set test distance with the same test speed. Because two stages move at the same time this generates a peeling effect. In most cases a peel test is performed with a tweezer.

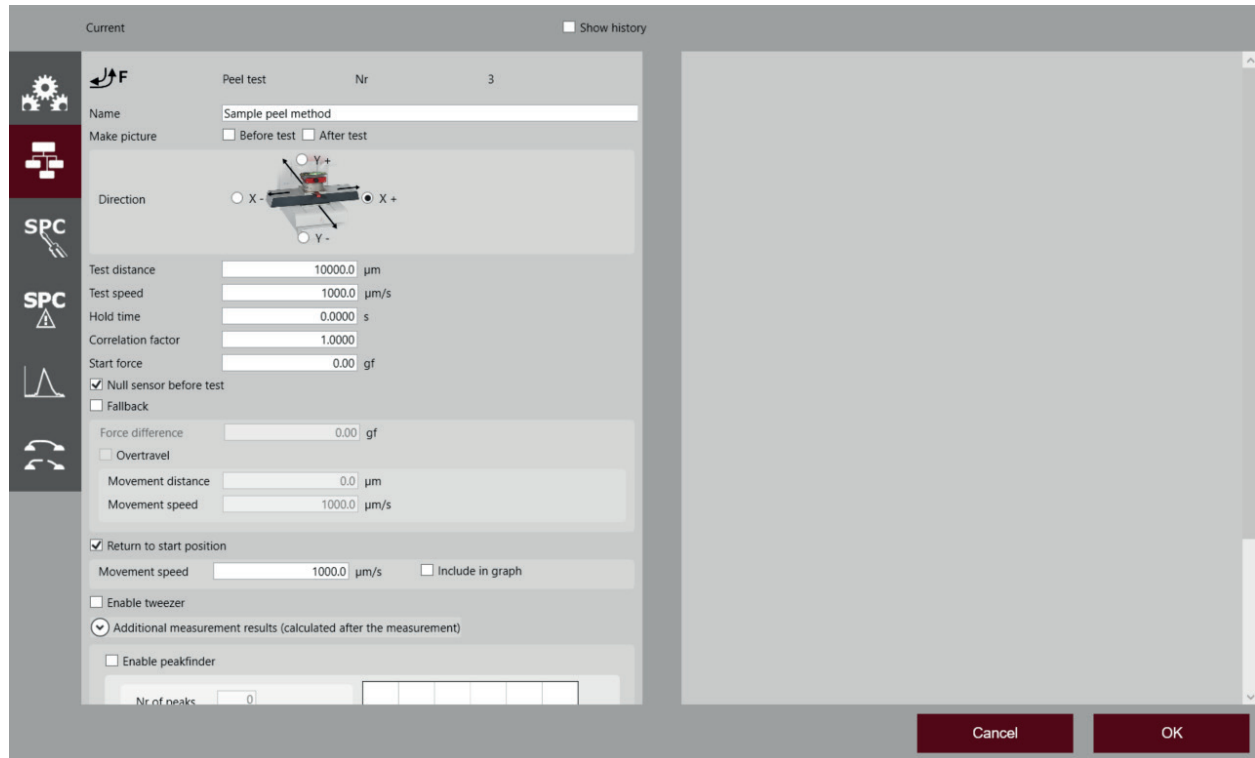


Figure 42: Peel test method settings to define the required parameters

The first line shows the icon for a peel test  and a field to give the peel method a name. As stated before make sure that the name describes the method in such a way that it is easy for the operator to recognize what the method does.

The first setting sets the **Direction** for the peel test. It is possible to select the X stage in positive (X +) or negative (X -) direction. The same is possible for the Y stage.

The **Test distance** is the distance both the Z axis and the selected axis (either X or Y) will move.

**Test speed** sets the speed during the test. The best test speed is determined by the required units per hour and the required accuracy. A good starting point is always 250 µm/s as this speed also was found to work best for all applications regardless of wire thickness and tool size.

The **Start force** can be used to first generate a pre-set preload. The system will only move the Z stage until the start force is reached. After this both the set stage and the z-stage will move the pre-set distance.

**Null sensor before test** is checked by default. The sensor is automatically nulled before a test. In some very rare cases this setting needs to be disabled. For example when a preload is already applied to the sensor when the test is started, but this preload still needs to be part of the measurement.

The **Fallback** in the XYZTEC Sigma software can be used to optimize the number of tests per hour. In a lot of cases the customer is interested in the force graph until the peak has been reached and a small

distance after the peak. The rest of the graph does not add real value. Mostly, this function is unchecked for peel tests.

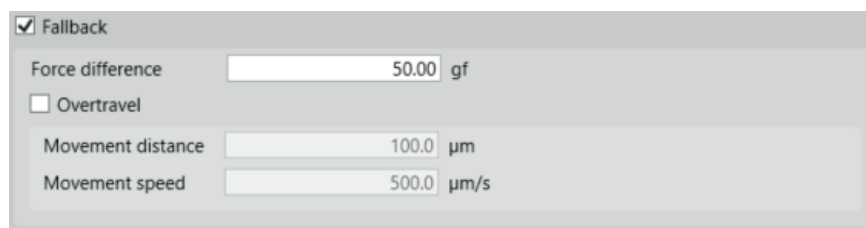


Figure 43: Software setting for testing with Fallback (Fallback is checked and therefore enabled)

By default **Return to start position** is checked. After the test has finished the stages will move back to the start position. If the box is checked the **Movement speed** for the move to the start position can be set. If the box in front of **Include in graph** is checked the movement to the start position is also recorded as part of the force graph. By default this option is not checked and the move back is not part of the graph.

**Enable tweezer** enabled the tweezer. For most peel tests a tweezer is required. The tweezer settings are also the same as for the pull test.

For the peel test only the peak force may not be enough. In many cases the measurement graph will show multiple peaks and troughs. The peak force would then be the force shown in the highest peak. This is not sufficient to qualify the test result. For peel testing the average force may be a better qualification. Also the total energy is used often. Make sure to check all the required test results required for qualification.

The XYZTEC Sigma software also offers the possibility to **enable Peakfinder** to automatically filter the peaks from the other measurements results. Therefore, the operator need to enter the number of peaks that should be found and the respective threshold where the peaks should be within. The same can be done for finding troughs.

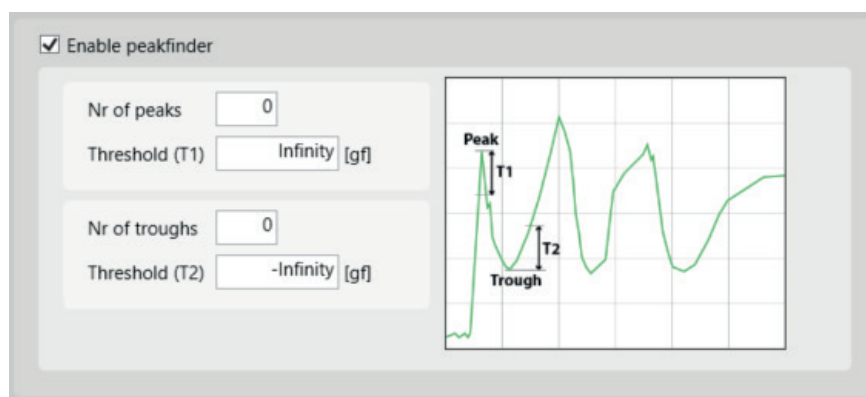


Figure 44: Software setting to enable peakfinder

### 3.7.4 How to set up a Loopheight method

Current ☐ Show history

Loopheight method Nr 2

Name loopheight 25 µm gold wire

Movement speed 1000.0 µm/s

Touch ☐ Remember surface detect ☐ Skip first measurement

Force 20.00 gf

Distance 1000.0 µm

Speed 100.0 µm/s

Wire diameter 0.0 µm

Hook diameter 0.0 µm

☒ Enable auto hook

Rotation ☐ Clockwise ☒ Anti-clockwise

Position of hook ☒ Along wire ☐ Across wire

Max. rot. speed ☒ Use lower limit ☒ Return to lower limit ☐ Skip rotation

☐ Enable concentricity correction

☐ Hook shift

Hook shift distance: 0.0 µm

Hook shift velocity: 100.0 µm/s

Cancel OK

Figure 45: Loopheight test method settings to define the required parameters

The first line shows the icon for a loopheight test  and a field to give the loopheight measurement a name. As stated before make sure that the name describes the method in such a way that it is easy for the operator to recognize what the method does.

The loopheight method can be used to only determine the loopheight, without performing a pull test. The settings are the same as the loopheight settings for a pull test. The test result is the measured distance. The wire diameter and hook diameter will be added to the measured distance.

### 3.7.5 How to set up a Probe method

Figure 46: Probe test method settings to define the required parameters

The first line shows the icon for a probe test  and a field to give the probe method a name. As stated before make sure that the name describes the method in such a way that it is easy for the operator to recognize what the method does.

A probe test is a different kind of distance measurement. A touchdown is performed on a specific position. The machine will move in a pre-set direction. Another touchdown is performed. The distance between the surface Z-height is calculated and is the test result for this test. The touchdown settings are the same as for the pull and shear method. The **Distance** sets the movement distance, the **Velocity** sets the speed to move this distance.

If **Use tool rotation** is checked the system will move in the direction of the tool. If this option is not checked a setting for the direction, similar to the peel test becomes available. Select either a positive X direction (X +), or negative X direction (X -), or a positive Y direction (Y +) or a negative Y direction (Y -). The system will use this setting to determine where the stages need to move before performing the second surface detection.

The **Return to start position** is also available and works the same way as with the other tests.

### 3.7.6 Test method history

When a method has been stored and is opened again for further editing you can see the history of the method settings on the right side. This way the software keeps track of the changes in the method. The upper right side shows all the history for the current method. If you change any settings and click the **OK** button, these settings are stored as the current method settings and the latest history and the previous settings can be found under the previous history. This list shows a history number, the modification date and the modification time. When a test is performed a reference is stored to the latest history.

The screenshot displays the 'Test method history' window for a 'Shear test' method named 'Die shear'. The window is split into two panes: 'Current' on the left and 'History' on the right. The 'Current' pane shows the current settings for the test method, including parameters like Test distance (500.0 µm), Test speed (250.0 µm/s), Hold time (0.0000 s), Offset distance (0.0 µm), Correlation factor (1.0000), Force limit (200.00 gf), and various checkboxes for sensor and destructive testing. The 'History' pane shows a list of previous settings, with the most recent entry (Nr. 21) selected. The history entry shows the same parameters as the current settings, but with some differences, such as a Force limit of 1000.00 gf. The 'History' pane also includes a table with columns for 'Nr.', 'Date', and 'Time'. The 'Current' pane has a 'Show history' checkbox checked. The 'History' pane has a dropdown menu showing the selected history entry (Nr. 21, 08.04.2024, 10:37:42). The 'Current' pane has a 'Cancel' button and an 'OK' button. The 'History' pane has a 'Cancel' button and an 'OK' button.

**Figure 47:** Test method history for shear method „Die shear“

The advantage of this system is that it is always possible to see the exact settings that have been used for a specific test. Especially when a test method has just been created the method settings may be changed a few times, before the setting is correct. The history makes sure it is still possible to track the changes and even see if specific settings give better results.

### 3.7.7 SPC result settings

The third menu choice in the vertical menu are the SPC result settings.

Current ☐ Show history

☐ Fixed sample size  
Sample size

☐ Enable enhanced close sample options for OCAP  
Passed measurements

Result type  ☐ Filter

Statistical calculations

| USL      | [gf] | LSL       | [gf] | # times |
|----------|------|-----------|------|---------|
| Infinity |      | -Infinity |      | 3       |

Graphs

| Max      | [gf] | UCL      | [gf] | TA   | [gf] | LCL       | [gf] | Min       | [gf] |
|----------|------|----------|------|------|------|-----------|------|-----------|------|
| Infinity |      | Infinity |      | 0.00 |      | -Infinity |      | -Infinity |      |

Cancel OK

Figure 48: SPC result setting to define tolerances and limits

Every test method can have one or multiple results. For the standard pull and shear test currently only the **Peak force** is offered as the result. Depending on the settings for measuring tensile strength, loopheight and the additional measurement results more settings may be available. The Result type shows the current type of result. This type cannot be changed.

The **Spec limits** are used for the calculation of the  $C_{pk}$ . It is important to set a correct **lower (LSL)** and **upper spec limit (USL)** to get a valid  $C_{pk}$  value. When set to +/- Infinity the value is not used and the  $C_{pk}$  is not calculated.

The **# of times sigma** setting is by default set to 3. The control limits in this case are the average minus 3\*sigma and the average plus 3\*sigma. If **# of times sigma** is set to 4 the calculation becomes the average plus or minus 4\*sigma.

The graphs settings are available for the **maximum (Max)**, **upper control limit (UCL)**, **target average (TA)**, **lower control limit (LCL)** and **minimum (Min)**.

The information on the right side of the SPC result settings also explains all these settings and show the graph settings in action. In most cases the method is created first and a few tests are performed. The results are used to optimize the SPC result settings. When a lot of experience is available for specific tests, the settings can be done immediately. If these settings are adjusted the test screen or the graphs will immediately reflect the changes

### 3.7.8 SPC warnings

| Warning   | Parameter  | Value | Operator | Unit | Action                   |
|-----------|------------|-------|----------|------|--------------------------|
| Warning 1 | Peak force | 1.00  | <        | gf   | Consider fail            |
| Warning 2 | Peak force | 1.50  | <        | gf   | Consider warning         |
| Warning 3 | Peak force | 8.00  | >        | gf   | Force measurement remark |
| Warning 4 | Peak force | 0.50  | <        | gf   | Unlock by engineer       |
| Warning 5 | Peak force | 0.00  | <        | gf   | Reject measurement       |

Figure 49: SPC warnings and intervention limits

The lower fail limit and the upper fail limit can be edited under the SPC warnings. Under SPC warnings a new warning can be added by clicking the **Add** button. Give the warning a meaningful name (like lower fail limit or fail for the fail limit). Select the test result. Any available test result can be chosen. Select if the force is smaller (<), or smaller or equal (<=), or larger (>) or larger or equal (>=). After this set the quantity to compare the test result with. In this case the measured peak force is compared with 55 gf and if this peak force is smaller than 55 gf the action **Consider fail** is performed. When a measurement result is a failed result the software will show this with a red background. Also in the statistics the number of failed measurements is shown.

The action **Consider warning** only shows an orange background. This is not shown in the statistics. The action **Force measurement remark** forces the operator to enter a measurement remark, to explain why the measurement is below or above the pre-set value. The option **Unlock by engineer** will show the login screen. Only an engineer can unlock the software now. It is also possible to reject a previous measurement after it was done by choosing **Reject measurement**. Treat this action always with caution as this measurement will not show up for the statistics, hence will be missing in the report. That can cause confusing.

### 3.7.9 Measurement graph settings

In the method there are also some settings for the measurement graph that can also influence the measurement result. It is possible to set an area of interest for the measurement graph. This area of interest can also have an influence on the measurement result. It is also shown in the measurement graph.

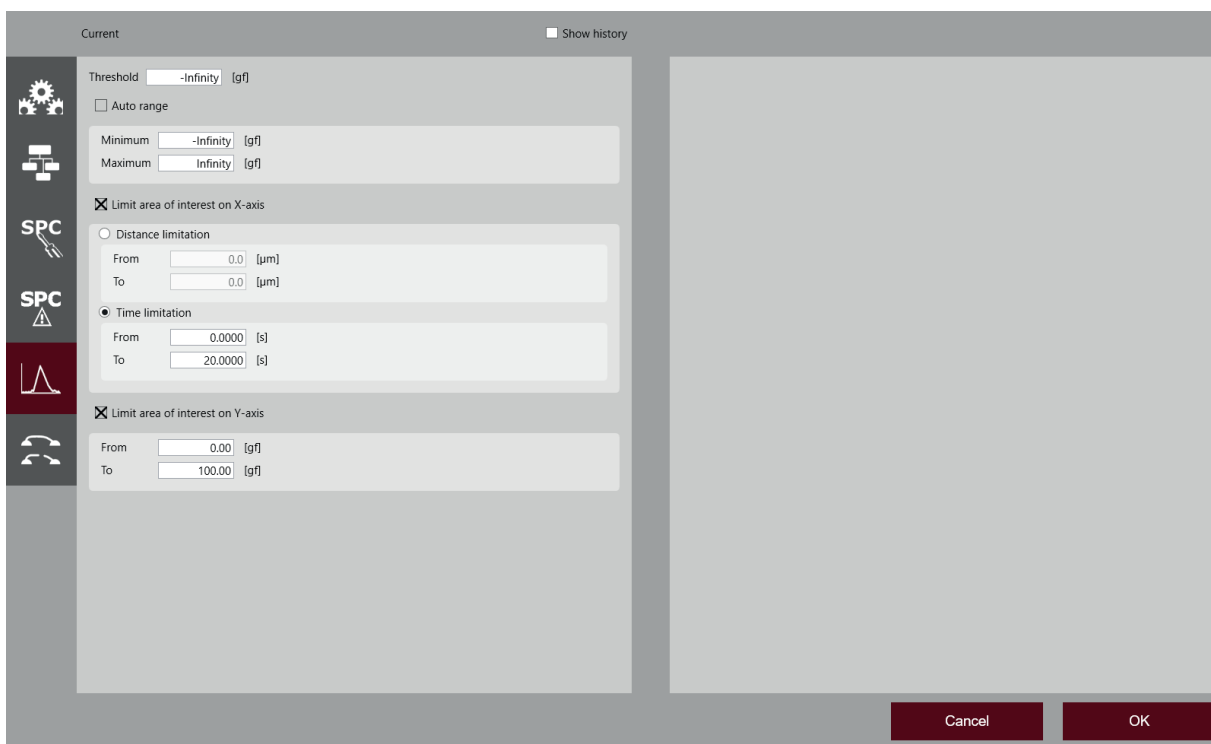


Figure 50: Measurement graph settings

Check **Limit area of interest on X-axis** to set an area of interest for the X axis. Select **Distance limitation** or **Time limitation**. For the distance enter a **From distance** and a **To distance**. For the time enter a **From time** and a **To time**. Check **Limit area of interest on Y-axis** to set an area of interest for the Y axis. Set a **From value** and **To value** for the force. In the measurement graph this would look as below picture shows:

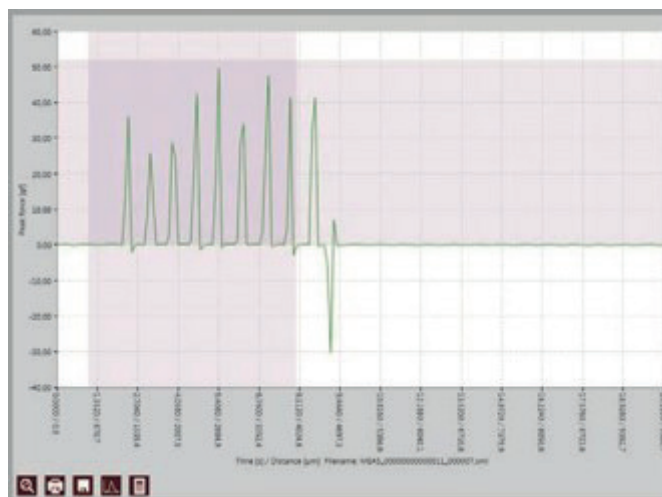


Figure 51: Measurement graph with area of interest

### 3.7.10 Result codes and result code groups

The last menu choice in the vertical menu is used to choose the result code group and set a default result code.

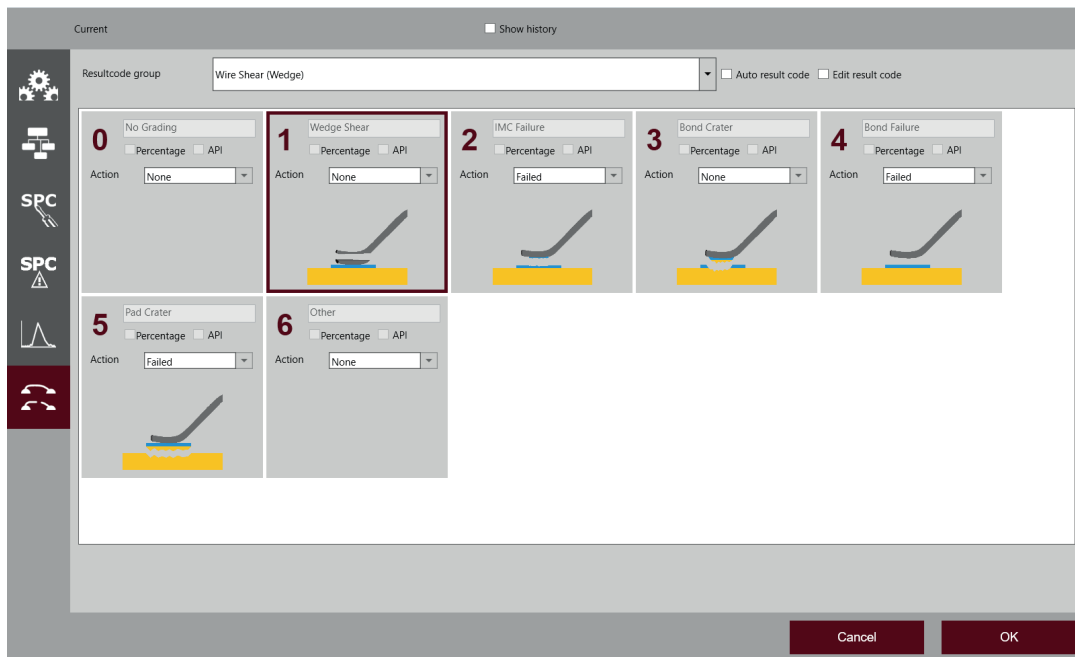


Figure 52: Software screen to select a resultcode

By default the Result code group is set to **<none>**. In this case grading is disabled and after a test a grading or failure mode can not be set. If a result code group is selected grading will become available. A drop-down menu shows all the result codes available.

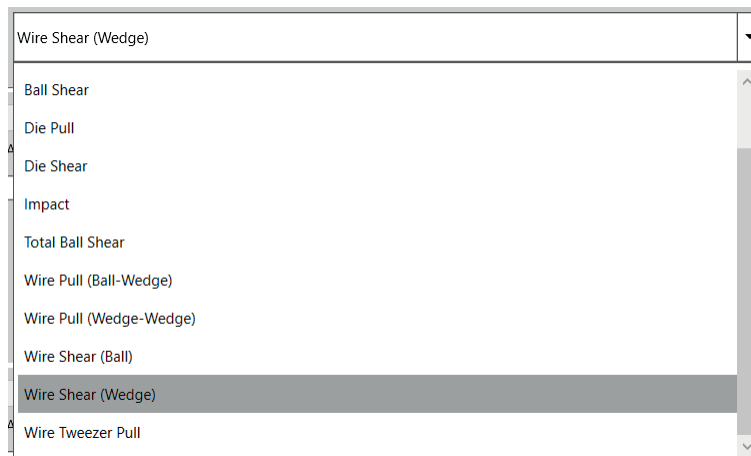
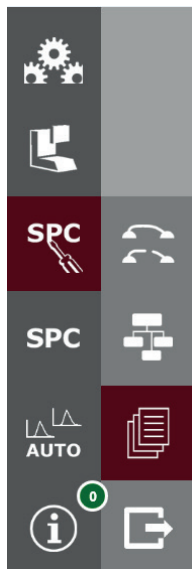


Figure 53: Result code options

The result code group list will show all available result code groups. It is important to define the resultcode group before trying to use this in a method. If a resultcode group is selected the option **Auto result code** can be checked. It is possible to change a resultcode by checking **Edit resultcodes**. After checking this option the resultcodes can be edited.

If **Auto result code** is checked and a result code is selected (tile with a dark red boundary) the XYZTEC Sigma software will automatically use this result code if the measurement is not considered a fail (see the SPC warnings). In the case demonstrated above the software will assume the **Wedge Shear** as the default result code. It is still possible to change this afterwards by regrading the measurement.

### 3.8 Forms and fields



In the past when bond testers were not controlled by PC software the information for the current sample/measurement was written on a card or form. An engineer created this form and printed it. The operator fills out the important data. For different parts or different tests different forms may be required.

This concept is also used in the XYZTEC Sigma software. The engineer can create a form and create fields. These fields can be used on the form. When a new sample is created this form is opened and the operator needs to fill in the required data. This data is stored with the sample and can be used for statistical analysis and look ups. The fields on the form will also be available as columns in the test and the query screen.

Form: 1 Sigma machine demo

Buttons: Insert Form, Copy Form, Delete Form, Import Form, Export Form, Import multiple, Export all, Insert Field, Delete Field

Form name: Sigma machine demo

Form description:

☐ Limit samples    Nr samples:    ☐ Auto print

| Line | Field Nr | Filter                   | Field name      |
|------|----------|--------------------------|-----------------|
| 1    | 1        | <input type="checkbox"/> | Product         |
| 2    | 2        | <input type="checkbox"/> | Badge#          |
| 3    | 3        | <input type="checkbox"/> | Production line |
| 4    | 4        | <input type="checkbox"/> | Product ID      |
| 5    | 5        | <input type="checkbox"/> | Product group   |

Buttons: Preview, Parser

All available fields:

- Field name: Product  
Control: [ab] Manage  
Input mask: [##]
- Field name: Badge#  
Control: [ab] Manage  
Input mask: [##]
- Field name: Production line  
Control: [ab] Manage  
Input mask: [##]
- Field name: Product ID  
Control: [ab] \* Manage  
Input mask: [##]
- Field name: Product group  
Control: [ab] Manage  
Input mask: [##]

Figure 54: Form „Sigma machine demo“ with fields

The upper left side of this screen shows a selection for the form. By default no forms are available. To create a new form click the **Insert Form** button. To copy an available form click the **Copy Form** button. To delete the selected form click the **Delete Form** button.

The area below the form selection shows the contents of the form. Each form has a **Form name** and a **Form description**. Every form also offers the setting **Limit samples** to limit the number of samples in the tests screen. If **Limit samples** is checked the Nr of Samples can be set. **Auto print** will automatically print a pdf file when this number of samples has been created.

Figure 55: Settings to edit a form

These pdf files are stored in the C:\Users\Public\Documents\XYZTEC\CondorSigma\AutoPrint directory. The Method selection can be used to select a default method when a form is selected. Below this an empty area is available to add the required fields.

The right side of the screen shows the available fields. By default no fields are available. To create a field just click the **Insert Field** button. To delete the selected field click the **Delete Field** button. The available fields are shown as tiles with all the required data directly available for editing. The first important part of the field is the **Field name**. Use a clear field name so other engineers also understand what the field is used for. The **Control** shows the kind of control that is used on the form. The XYZTEC Sigma software offers multiple types of controls.

|  |                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------|
|  | Operator can select available items and add new items                                                 |
|  | Operator can only select available items                                                              |
|  | Operator can only select available items. Items show a picture to facilitate choosing the correct one |
|  | Operator can only add new items. The added item must have a complete new and different name           |
|  | Operator can type in the item. The item name can already exist                                        |
|  | Operator can select a date from a calendar control.                                                   |

The **Manage** button opens a new screen where the engineer can add or delete field items. Select only items can be added this way.

The **Input mask** can be used to ensure a predefined format when a new field item is entered. Especially numerical data, date or time needs to be formatted, to make sure that the input is always the same. Using the calendar control also ensures the correct format for a date. To support the engineer with creating a mask a button is available after the mask. Click the button to open the dialog window below.

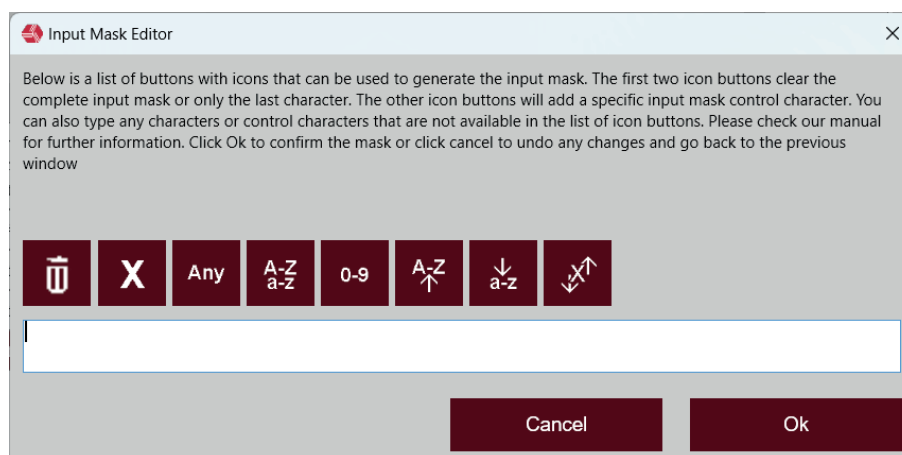


Figure 56: Input mask editor

The input mask editor offers multiple buttons that can help the engineer to create an input mask. Below is a list of all the buttons and their function.



Clears the complete mask.



Clears the last character of the mask.



The character C is added to the mask, an input of the character is needed. This can be any character.



The character L is added to the mask. Input of a letter A to Z or a to z is required.



The character 0 is added to the mask. Input of any number 0-9 is required.



The character > is added to the mask. All characters after this character will be converted to upper case.



The character < is added to the mask. All characters after this character will be converted to lower case.



The character | is added to the mask. The lower case or upper case function is disabled from this character.

A few examples of a mask:

|          |                                                                                |
|----------|--------------------------------------------------------------------------------|
| 0000     | Input of four numbers (0-9) required. For example 1103 is okay.                |
| 0000_LL  | Input can be 1234_aa or 1234_AA.                                               |
| 0000_>LL | Input can now only be 1234_AA. If 1234_aa is typed it is converted to 1234_AA. |
| 00:00    | Input for time. Input can be 13:30 or 05:59.                                   |
| 00/00/00 | Input for data. Input can be 05/01/12.                                         |

The mask checks if the input confirms to the mask but does not check if the input is a valid time or date. XYZTEC advises to use the calendar control for more control. When the mask is created click the **OK** button to confirm or Cancel to exit without saving.

### 3.8.1 Adding and or deleting items

Click the **Manage** button for a specific field to add new items or delete available items. This is especially important if the control has been set to a select only list. When a new sample is created the user cannot select any values if these are not already available.

The Manage field items window is opened. On the right side the current field is shown. It is no problem to change the field parameters. The upper left part shows the part where the item can be changed. The lower left part shows all available items. The **Insert** button inserts a new item to the list. The **Delete** button removes the selected item.

Be careful not to delete items that have been used to create a sample. In that case the link to the item will be lost and it may become more difficult to find this sample. The sample will however still be available.

To add a new item click **Insert** and type in the name for the item in the area on the upper left corner. If a mask is used it is possible that certain characters cannot be used for input. If the control with pictures is used it is also possible to select a picture for each item.

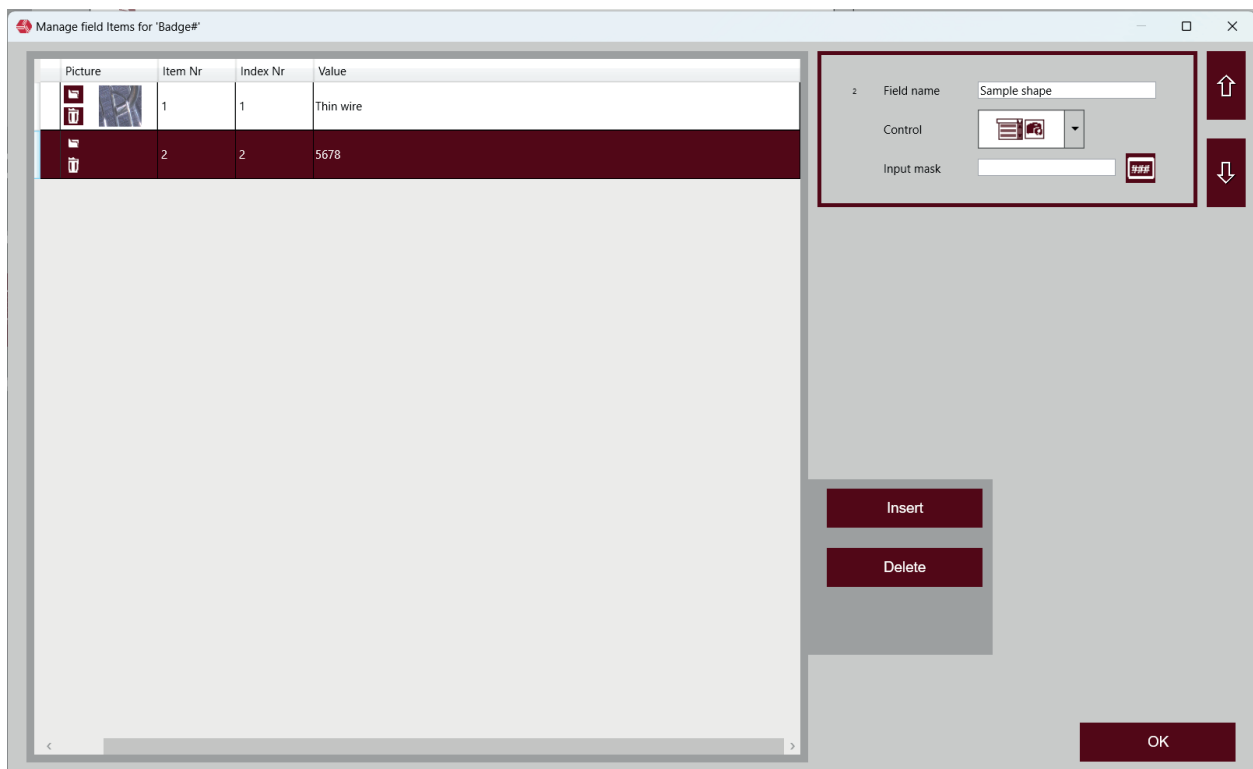


Figure 57: Form editor to manage field item with pictures

It is not necessary to go back to the Forms screen to manage the items for a different field. The scroll bar on the upper right corner can be used to change the field to a different field. After this new items can be added for this field.

### 3.8.2 Adding and or removing field from form

Back in the forms screen the available fields can be added to the form with drag and drop or by clicking the **arrows** between the form area and the fields area. For drag and drop click with the left mouse button on a field and hold the mouse button while the mouse cursor is moved over the white form area. The mouse cursor will change and the left mouse button can be released to drop the field on the form.

Figure 58: Arrows between form area and (left side) field area (right side)

To use the arrow buttons between the form area and the field area just select a field. Then click the upper arrow that points from the fields area to the form area. To remove a field from the form just select this field on the form and click the lower arrow that points from the form area to the fields area. A form can hold up to 4,294,967,296 fields and the same number of forms is supported.

### 3.8.3 Previewing a form

When the form is finished and all required fields are on the form the **Preview** button can be used to test the form. A window will open with the form preview. For each field the field name is shown and the control. For the Product and the Lot Nr the operator will need to select a value from the list. By default a value is already selected.

1 Product

2 Sample shape

3 Production line

4 Product ID

5 Product group

Integrated scanner I.Scanner Control External scanner Cancel OK

Figure 59: Preview of the created form

### 3.9 Automatic SPC Export settings

| Export type | Export description | Enabled                  | Mode          | Settings | Format |
|-------------|--------------------|--------------------------|---------------|----------|--------|
| File export | File export        | <input type="checkbox"/> | Sample closed | Edit     | Edit   |
| File export | File export        | <input type="checkbox"/> | Sample closed | Edit     | Edit   |
| File export | File export        | <input type="checkbox"/> | Sample closed | Edit     | Edit   |

SPC SPC AUTO

Insert Delete Run

SPC Export

Figure 60: Software screen to manage automatic SPC file export

After defining the test methods and maybe also one or multiple forms the next step can be to define an automatic SPC export. The XYZTEC Sigma software offers a specially developed SPC export formatter that can be used to format the data in the system to any required format. The formatter also allows basic calculations. This formatted data can be stored in a specific file, send to a COM port or in the future send to other interfaces. Although the formatter does require some basic knowledge of programming the inter-

face is still easy enough to learn and setup your own export.

The software supports multiple exports that can be enabled when needed. Click the checkbox in the **Enabled** column to enable an automatic export.

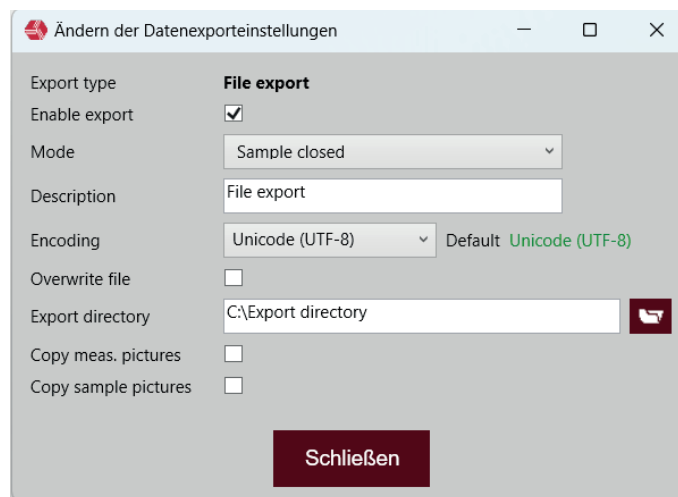
| Export type | Export description | Enabled                             | Mode          | Settings | Format |
|-------------|--------------------|-------------------------------------|---------------|----------|--------|
| File export | File export        | <input checked="" type="checkbox"/> | Sample closed | Edit     | Edit   |
| File export | File export        | <input type="checkbox"/>            | Sample closed | Edit     | Edit   |
| File export | File export        | <input type="checkbox"/>            | Sample closed | Edit     | Edit   |

**Figure 61:** File export editor with **Enabled** checked

Data can be exported when the sample is closed or when a measurement is made. In most cases (especially when measurements need to be graded) it is most practical to export when a sample is closed.

Click below **Mode** on the selection box and choose **Sample closed** or **Measurement based**, depending on your needs.

Click the **Insert** button to create a new export. Click the **Delete** button to remove an export. Click the **Run** button to test the export on the latest sample and measurements. To change the export settings click the **Edit** button in the **Settings** column. To change the format click the **Edit** button in the **Format** column. In the example above a file export is created by clicking Insert. Click the **Edit** button in the **Settings** column to view the export settings. Depending on the type of export different settings may be available. For file export it is important to set a base directory for the export.



**Figure 62:** Change of file export settings

For file export the export can be enabled or disabled, the mode can be changed. When the data is exported and the export file already exists the software can add the new data to the file or overwrite the current file with a new file. If Renew file is enabled the file is overwritten with the new data. If this option is disabled the data is added. The Description shows a clear name for the export. To set the Export directory click the  button and select or even create the directory for the export. In the example above all the exported data is stored in the C:\Export directory. The automatic software can also store data on a network drive. To change or set the actual format click the Edit button in the Format column. A window is

opened that shows the export format.

Figure 63: SPC export formatter

The export formatter offers an area to set the file name, an area to set the header, an area to set the data definition, an area for the export data and a footer at the end of the file/export. Make sure to enable this checkbox to export to a file. When the file name is enabled the **Add before**, **Add after** and **Delete** buttons become enabled and can be used to add items to the file name area. Click the **Add after** button to open a new Window showing all available text items and predefined tokens.

Figure 64: Text items and predefined tokens to edit the file export

Text items can be separators like a comma, semi colon, end of line etc. Custom items can also be created. The predefined tokens contain all available data. For example the token `Sample_Nr` contains the sample number. In this example click the `Sample_Nr` token. The token is added to the file name area.



Figure 65: Sample Nr token added to file export

Now by default the data has sample number 1 the file name would be 1. For sample number 15 the file name would be 15. When you exporting the data and looking in the export directory the sorting of the file name would look like 1,10,11,2,3 etc. It is better manageable to get something like 00001, 00002, 00003 ... 00010 etc. To change how the sample number should be formatted during export double click on the token. A window with the tokens settings is opened.

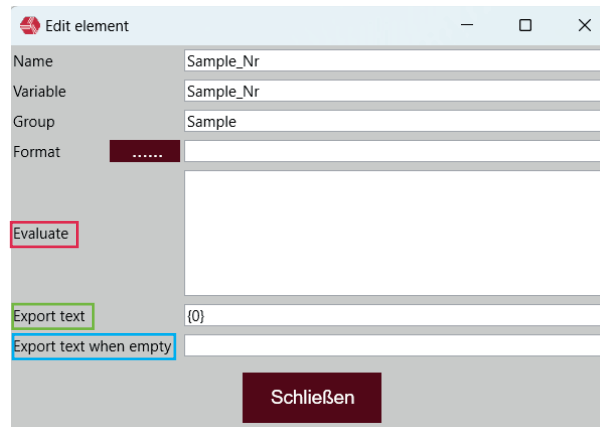


Figure 66: Edit element to modify the token

The **Name**, **Variable** and **Group** are preset and cannot be changed. To change the format click the **.....** button. A special format builder window is opened that can help to format the value correctly.

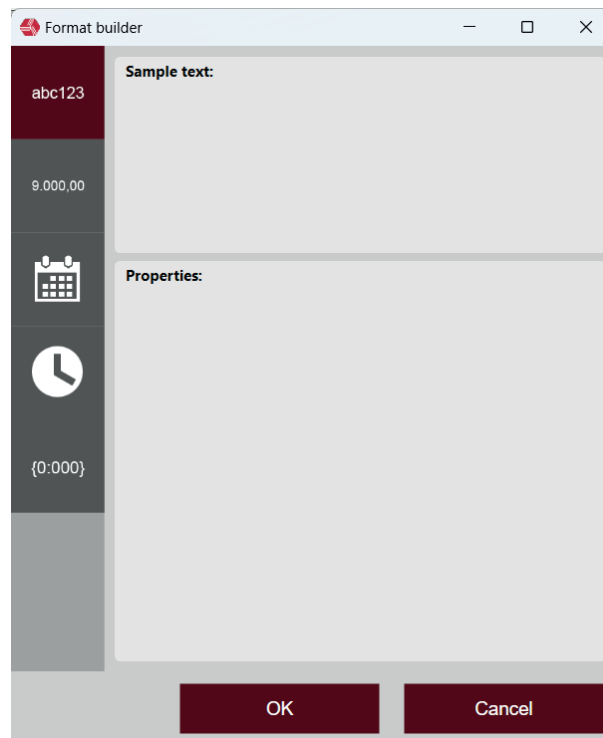


Figure 67: Format builder to edit the value output

On the left side a menu bar offers multiple format options. The default for a text value is no format at all. The text AaBbCc1234 would be exported as AaBbCc1234. Only in rare cases a text value should be formatted.

The **abc123** choice will not perform any formatting. The **9.000,00** choice offers settings for numerical formatting. The  choice offers settings for formatting a date. The  choice offers settings for formatting a time. The **{0:000}** choice offers settings for some custom formatting.

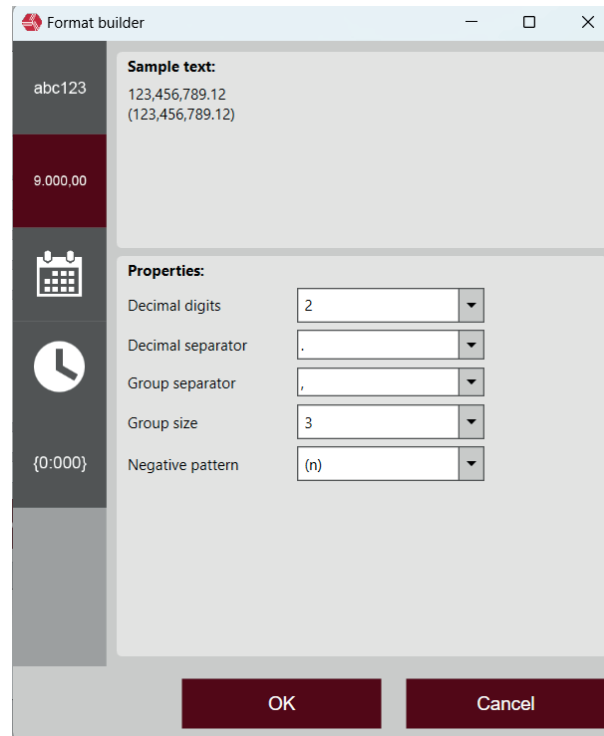


Figure 68: Format builder to edit numerical outputs

The formatting options for a numerical format are:

|                   |                                                                                                                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Decimal digits    | Number of decimal digits. If set to 2 digits a value like 2124.3456 is exported as 2124.34.                                                                                                                                                                                                                                     |
| Decimal separator | The decimal separator used. This can be a point (.) or a comma (,). With a comma the value 2124.3456 is exported as 2124,3456.                                                                                                                                                                                                  |
| Group separator   | The separator for numeric grouping. In some countries a separator is used for all thousands. The numeric value 123456.456 becomes 123,345.456 if the grouping separator is set to a comma. To not use any grouping make sure to select the empty separator. Grouping helps to make large numbers more readable.                 |
| Group size        | By default grouping is often done with every thousand (group size 3). This can also be set to every hundred. The value 123456.456 becomes 12,34,56.456.                                                                                                                                                                         |
| Negative pattern  | Negative numbers can be displayed like: <ul style="list-style-type: none"> <li>(1) =&gt; setting (n) for the value -1,</li> <li>-1 =&gt; setting -n for the value -1,</li> <li>- 1 =&gt; setting - n for the value -1,</li> <li>1- =&gt; setting n- for the value -1</li> <li>1 - =&gt; setting n - for the value -1</li> </ul> |

With these settings most numerical values can be formatted as required.

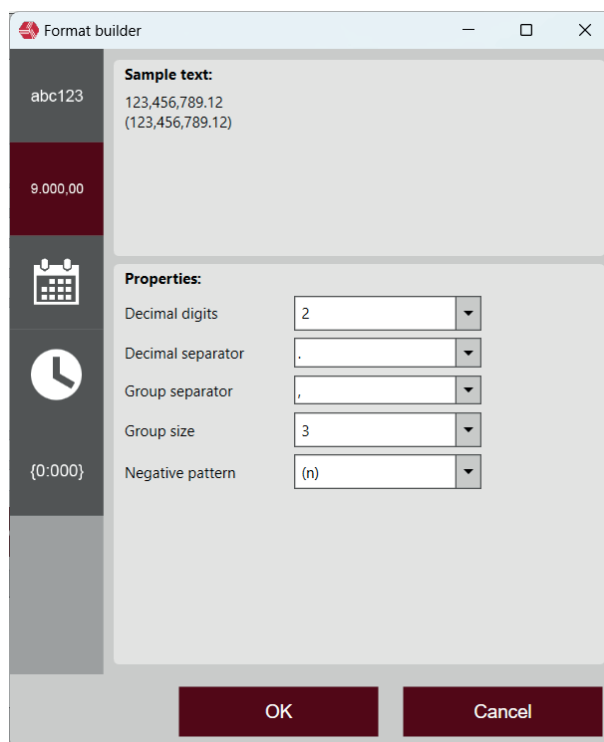


Figure 69: Format builder to edit date outputs

For formatting a date the following options are available:

|                |                                           |
|----------------|-------------------------------------------|
| {0:M/d/yyyy}   | The 6th September 2016 becomes 9/6/2016   |
| {0:MM/dd/yyyy} | The 6th September 2016 becomes 09/06/2016 |
| {0:MM/dd/yy}   | The 6th September 2016 becomes 09/06/16   |

In general M is the month number. MM would show month number 1 as 01. The d is the day of the month, day 1 would show as 1, dd would show day 1 as 01. The yyyy shows the full year number. The yy shows only the last two digits. For the separation of the month, day and year and the order (month, day year or day, month, year for example) multiple options are available. Choose the best fit for the date. It is also no problem to generate your own date format, e.g. something like {0:yyyyMMdd} would give you 20160906 for the 6th September 2016. You can also use the format to get the year, month or date separately. For example {0:Y} would export 2016 only for the 6th September 2016.

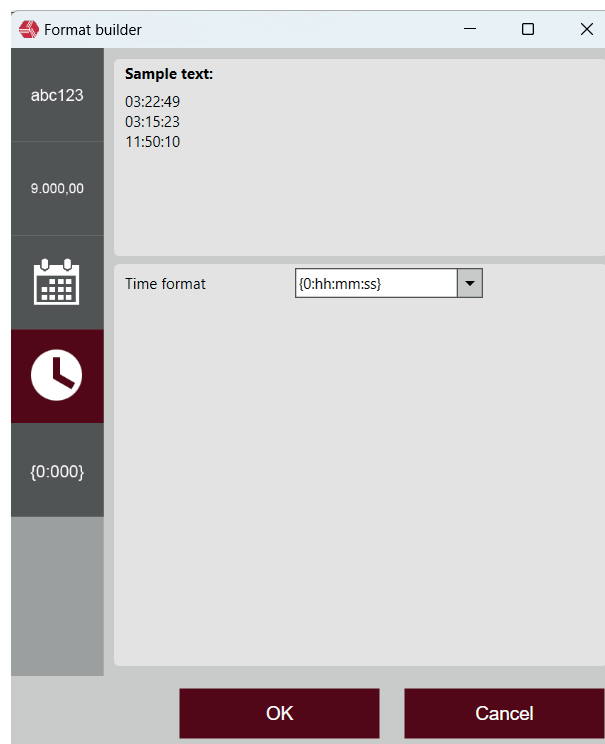


Figure 70: Format builder to edit time outputs

For the time h shows the hour. One h shows 1 o'clock like 1:00:00. The hh would show 1 o'clock as 01:00. This is the time based on a 12 hours scale. HH would show the time based on a 24 hours scale. The m stands for the minutes. A mm would show 1 as 01. The s stands for the seconds. The ss shows 01 for one second. The separator by default is a double colon. The XYZTEC Sigma software also offer the underscore. You can also use the format to get the hour, the minutes or the seconds for a specific time. For example {0:H} would export 14 for the time 14:09:45.

Besides that, custom formats ( {0:000} button) are also supported within the software. For example to format a number to 000100 (trailing zero's, 6 digits). The list of custom formats may also grow in future software versions. Currently the software offers trailing zero's with 3 digits, trailing zero's with 6 digits, trailing zero's with 10 digits and trailing zero's with 19 digits. We will choose the latest one for the sample number. If a predefined format is not available it is possible to generate your own format.

The **Evaluate** can be used to perform calculations, this will be shown this later in this chapter.

The **Export text** shows how the formatted value is exported. By default the value is exported with the specified format. The label {0} is replaced with the formatted value. In this example we will export the sample number trailed with SAM and we also add the file extension .scv. The sample with number 19 is now exported as SAM0000000000000000000019.csv. This would be a useful file name when each sample is exported separately.

The **Export text when empty** would be the text exported when the value is empty. A sample number will always be available. More specific data may not always be available. After this our token for the sample number looks like figure 86.

Figure 71: Edit element with formatted sample number in the file name

We now have defined a file name. Next we will add some data for the export.

Figure 72: SPC export formatter: Sample Nr is used for file name

Make sure that **Enable data** is checked and click **Add after**. Select **Meas\_SeqNr** from the predefined tokens and click **Add after**. Select the predefined text item called Comma and click **Add after**. Select **Meas\_ResultcodeNr** for the number of the selected grading and click **Add after**. Select the predefined text item called Comma and click **Add after**. Select **Result\_ForcePeakValue** for the peak force measurement and click **Add after**. Select the predefined text item called **CR\LF**. This is actually a carriage return followed by a line feed, this is the end of a line in the export.

Now double click on *Result\_ForcePeakValue*, choose a correct format for the force and also perform a calculation. For the format choose the settings in the format builder as shown in the following figure.

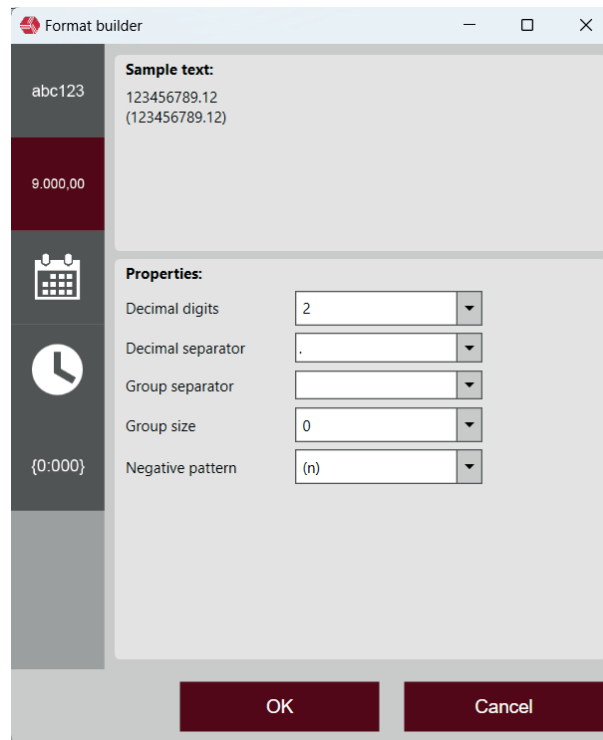


Figure 73: Format for the peak force

The format is set to 2 decimals, a point as separator and no grouping. Negative numbers are exported with a trailing minus. For the Evaluate we will enter **101.97\*Data["Result\_ForcePeakValue"]**. The Data["Result\_ForcePeakValue"] is actually the peak force. This force is in Newton. If we multiply with 101.97 we have calculated from N to gf. The factor 101.97 is not the most accurate, but sufficient for this export.

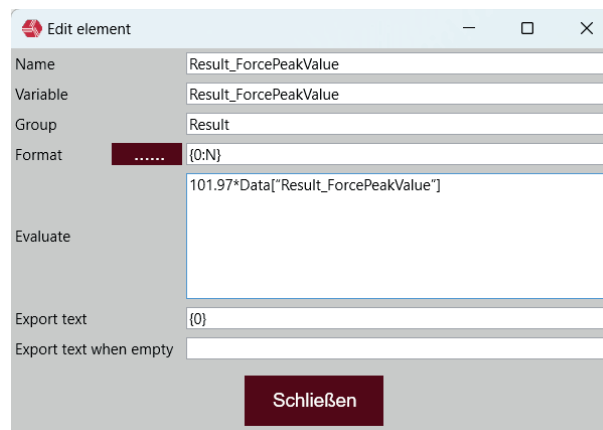


Figure 74: Format settings for the peak force

Be careful when performing evaluations. A typing error will generate problems with the export. We now have a very basic export that exports all the measurements in a sample and shows the sequence number, a comma, the grading, a comma, the peak force and a end of line. The complete export looks like below:



☒ Enable file name

| Sample_Nr | Meas_SeqNr | Comma | Meas_ResultcodeN | Comma | Result_ForcePeakV | CR/LF |
|-----------|------------|-------|------------------|-------|-------------------|-------|
| 0         | 0          | ,     | 0                | ,     |                   | \n    |

Add before Add after Delete

☐ Enable header ☐ Header in column

Add before Add after Delete

☐ Enable definition

Add before Add after Delete

☒ Enable data

| Sample_Nr |
|-----------|
| 0         |

Add before Add after Delete

☐ Enable footer ☐ Footer in column

Add before Add after Delete

Import format Export format Test format

Schließen

**Figure 75:** SPC export formatter: Export settings as described above

Click **Test format** to see a small example of how this can look. Click **Export format** to export the defined format to a xml file. Click **Import format** to import from an existing format file. Click **Schließen** (Close) to go back to the export definition.

### 3.10 Test screen: Test results on one sight

After setting up all SPC Settings the first tests can be performed. Under SPC the first option in the sub-menu is the Test screen.

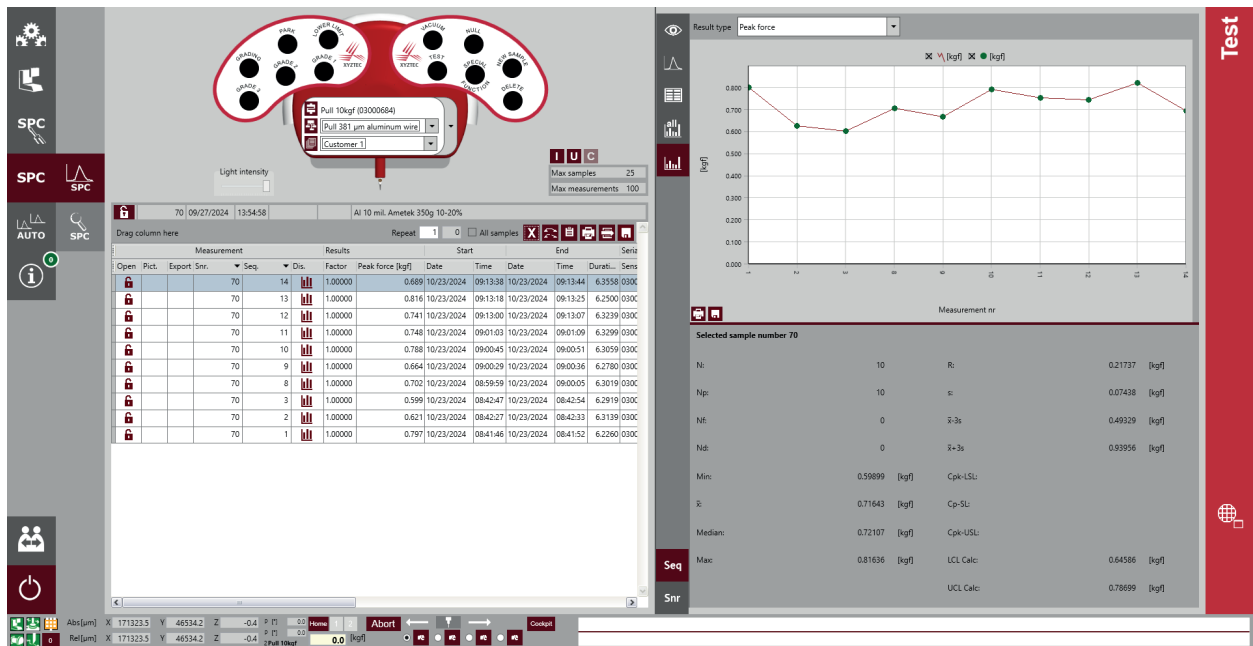


Figure 76: Sigma test screen showing the test results

The upper left side of the test screen shows the measurement unit, surrounded by the control panels with buttons for the left and right joystick. The buttons on the control panels can be used to trigger the same function as the real joystick buttons. The selection box on the measurement unit can be used to select a different sensor, a different method or a different form if the user is authorized to do so.

To change the method settings the  button (method settings) can be used. The methods settings Window from the previous methods chapter is opened and the changes for the method can be set. However, it is not possible to change the force range or the form selection here.

To change the form settings the  button can be used. The forms window will be opened. In the forms window the form selection is disabled.

The area in the lower left corner shows the available measurements. When no measurements are available the right side of the screen would only show empty tabs.

To perform a measurement just press the  button on the joysticks or click the **Test** button on the control panels. Before starting a test, however it is important to first check what tool is available on the current sensor and depending on the test change the tool to a different tool. The second step is to check if the work holder can be used to perform the specific test on the current application. If not change the work holder to a more appropriate type and mount the test sample on the work holder. When the work holder and tool are okay the joysticks can be used to position the tool on the correct position to start the test. After this press the **Test** button.

During the test a second press on the **Test** button on the joystick or on the screen will abort the running test. Use this to abort when the test seems to go wrong. Depending on the kind of test and the method settings by most tests a force will be applied and a measurement is made. In most cases the stages will also move back to the start position after the test. During the test the status bar will show the different stages of the test and also show if a problem occurs. When the test is finished without errors the measurement is stored and shown in the list on the lower left side.

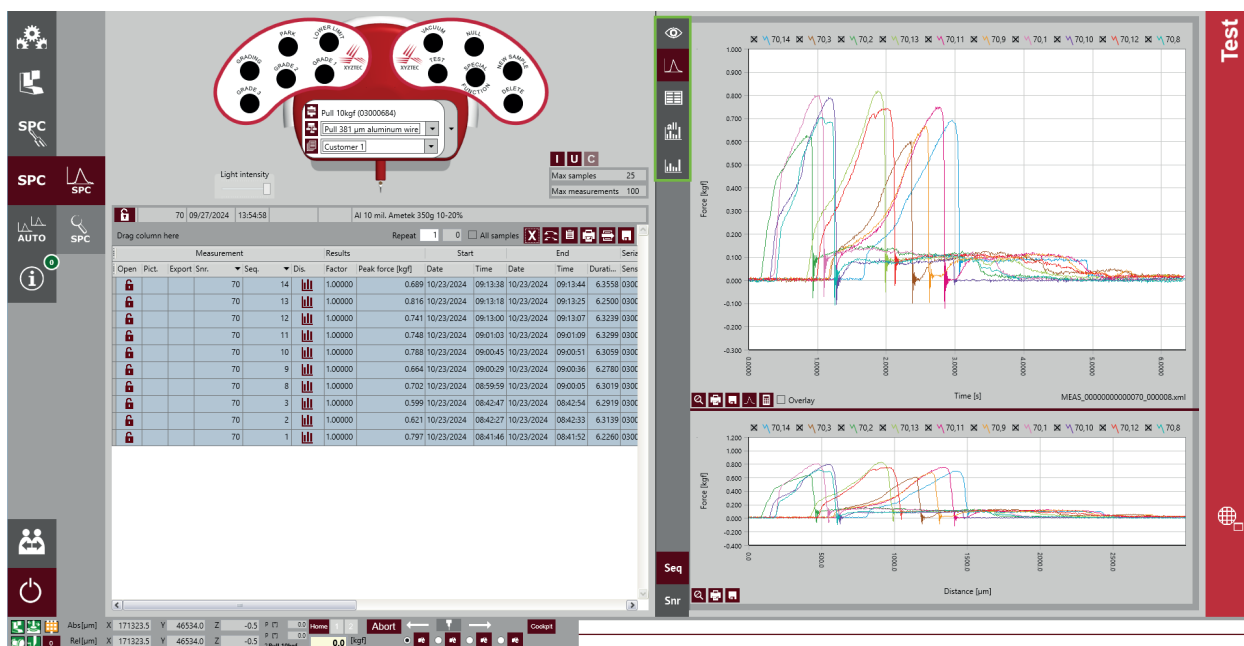


Figure 77: Sigma test screen with overlaid graphs from multiple measurements

The right area shows a **vertical bar** with buttons. By default if All samples is unchecked five buttons are available. The red coloured button is always the currently active feature. In the screen above the all measurement statistics are shown.

|  |                       |                                                        |
|--|-----------------------|--------------------------------------------------------|
|  | <b>First button:</b>  | opens the camera window                                |
|  | <b>Second button:</b> | shows any pictures stored for the selected measurement |
|  | <b>Third button:</b>  | shows the measurement graphs                           |
|  | <b>Fourth button:</b> | shows the statistics for all measurements              |
|  | <b>Fifth button:</b>  | shows general statistics of the sample                 |

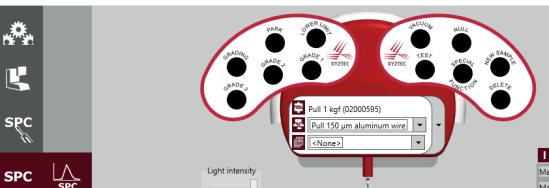
If **All samples** is checked and grading is enabled within the test method three additional buttons become available.



A bar chart with five bars representing different age groups. The bars are labeled from left to right as 10-19, 20-29, 30-39, 40-49, and 50-59. The heights of the bars are approximately 1.5, 2.5, 2.0, 1.5, and 2.0 units respectively.

A bar chart with five bars representing different age groups. The heights of the bars are approximately 2, 4, 3, 2, and 5 units respectively from left to right.

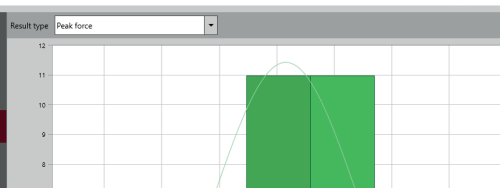
In the lower left corner the measurement data is shown. The upper area shows the currently active and open sample. The button with a lock shows if the sample is open  or closed . If this button is showing the open icon and is clicked the sample will be closed and the button shows the close icon. A sample is closed when the end date and time are set. Below this is the area that is used for grouping the data on a specific column. Click on a column header and drag and drop this in the area indicated with **Drag column here**. After this the data will be grouped on the values for this column. When a grouping is created the trend graphs for the grouping will also become available.



Light intensity

Max samples: 25  
Max measurements: 100

Result type: Peak force



| Group: Wire Pull (Wedge-Wire...) |       |        |     |     |      |        |                |                      |                     |
|----------------------------------|-------|--------|-----|-----|------|--------|----------------|----------------------|---------------------|
| Open                             | Pict. | Export | Snr | Seq | Dis. | Factor | Peak force [g] | Code                 | %                   |
|                                  |       |        |     | 30  | 32   | 1.000  | 144.3          | Wedge (Heel) Brea... | 09/24/2024 16:42:20 |
|                                  |       |        |     | 30  | 31   | 1.000  | 148.0          | Wedge (Heel) Brea... | 09/24/2024 16:42:05 |
|                                  |       |        |     | 30  | 30   | 1.000  | 149.2          | Wedge (Heel) Brea... | 09/24/2024 16:41:53 |
|                                  |       |        |     | 30  | 29   | 1.000  | 132.3          | Wedge (Heel) Brea... | 09/24/2024 16:41:39 |
|                                  |       |        |     | 30  | 28   | 1.000  | 135.3          | Wedge (Heel) Brea... | 09/24/2024 16:41:27 |
|                                  |       |        |     | 30  | 27   | 1.000  | 128.5          | Wedge (Heel) Brea... | 09/24/2024 16:41:09 |
|                                  |       |        |     | 30  | 26   | 1.000  | 139.1          | Wedge (Heel) Brea... | 09/24/2024 16:40:42 |
|                                  |       |        |     | 30  | 25   | 1.000  | 145.5          | Wedge (Heel) Brea... | 09/24/2024 16:40:07 |
|                                  |       |        |     | 30  | 24   | 1.000  | 146.6          | Wedge (Heel) Brea... | 09/24/2024 16:39:51 |
|                                  |       |        |     | 30  | 23   | 1.000  | 139.0          | Wedge (Heel) Brea... | 09/24/2024 16:39:18 |
|                                  |       |        |     | 30  | 22   | 1.000  | 145.6          | Wedge (Heel) Brea... | 09/24/2024 16:39:18 |
|                                  |       |        |     | 30  | 21   | 1.000  | 153.7          | Wedge (Heel) Brea... | 09/24/2024 16:38:52 |
|                                  |       |        |     | 30  | 20   | 1.000  | 137.2          | Wedge (Heel) Brea... | 09/24/2024 16:38:28 |
|                                  |       |        |     | 30  | 19   | 1.000  | 148.8          | Wedge (Heel) Brea... | 09/24/2024 16:38:02 |
|                                  |       |        |     | 30  | 18   | 1.000  | 147.6          | Wedge (Heel) Brea... | 09/24/2024 16:35:22 |
|                                  |       |        |     | 30  | 17   | 1.000  | 139.1          | Wedge (Heel) Brea... | 09/24/2024 16:34:56 |
|                                  |       |        |     | 30  | 16   | 1.000  | 148.9          | Wedge (Heel) Brea... | 09/24/2024 16:34:38 |
|                                  |       |        |     | 30  | 15   | 1.000  | 152.8          | Wedge (Heel) Brea... | 09/24/2024 16:34:19 |
|                                  |       |        |     | 30  | 14   | 1.000  | 151.5          | Wedge (Heel) Brea... | 09/24/2024 16:34:04 |

Statistical Summary:

|         |             |           |             |
|---------|-------------|-----------|-------------|
| N:      | 32          | R:        | 67.329 [g]  |
| Np:     | 32          | n:        | 12.730 [g]  |
| NE:     | 0           | p-3s:     | 102.280 [g] |
| Nd:     | 0           | p+3s:     | 179.758 [g] |
| Min:    | 109.593 [g] | Cpk-LSL:  |             |
| S:      | 141.569 [g] | Cp-SL:    |             |
| Median: | 144.108 [g] | Cpk-USL:  |             |
| Max:    | 176.922 [g] | LCL Calc: | 134.818 [g] |
|         |             | UCL Calc: | 148.320 [g] |

Seq

Snr

Sometimes a test needs to be repeated a pre-set number of times. Change the number in the **Repeat**  field to the number of times the test should be performed. This option can be very helpful when a non-destructive test needs to be performed multiple times on the same part to indicate alternating load.



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changes can be stored with this **Save** button. If no form is set the changes will be for the selected method. If a form is selected these changes will be stored for the specific combination of form and method. Screens with trend graphs are displayed in the following.

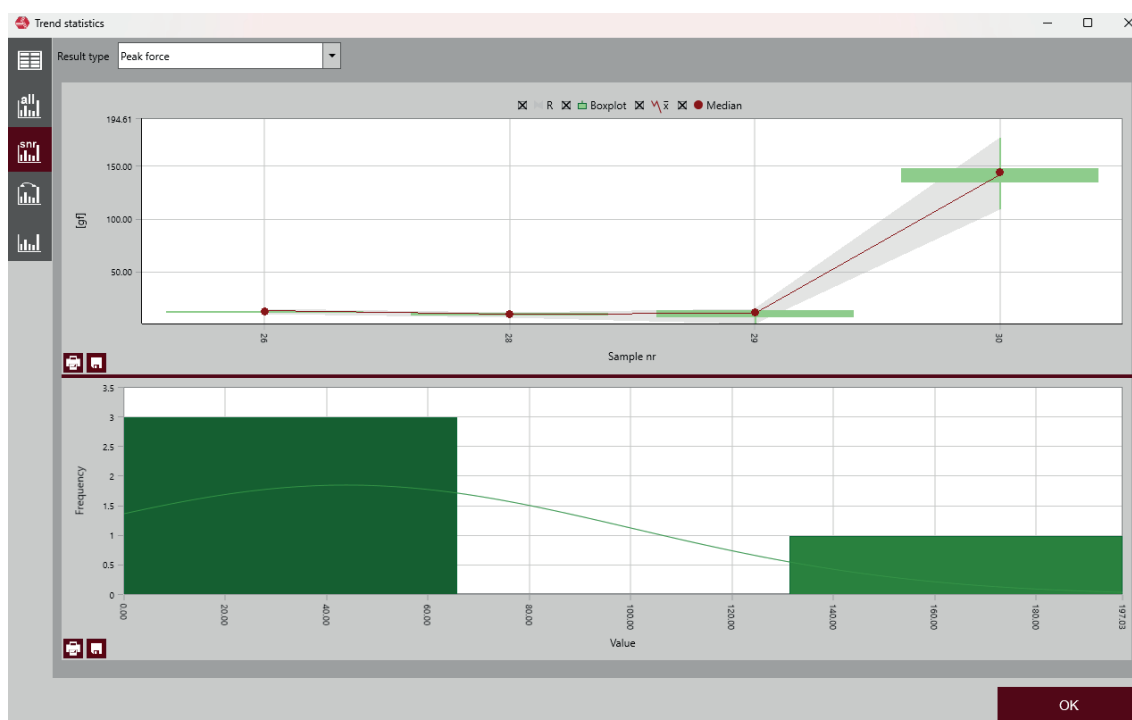


Figure 79: Trend graphs sorted by sample number

If the current method uses a result code group the measurements will be graded and the trend graphs for the grading statistics becomes available.

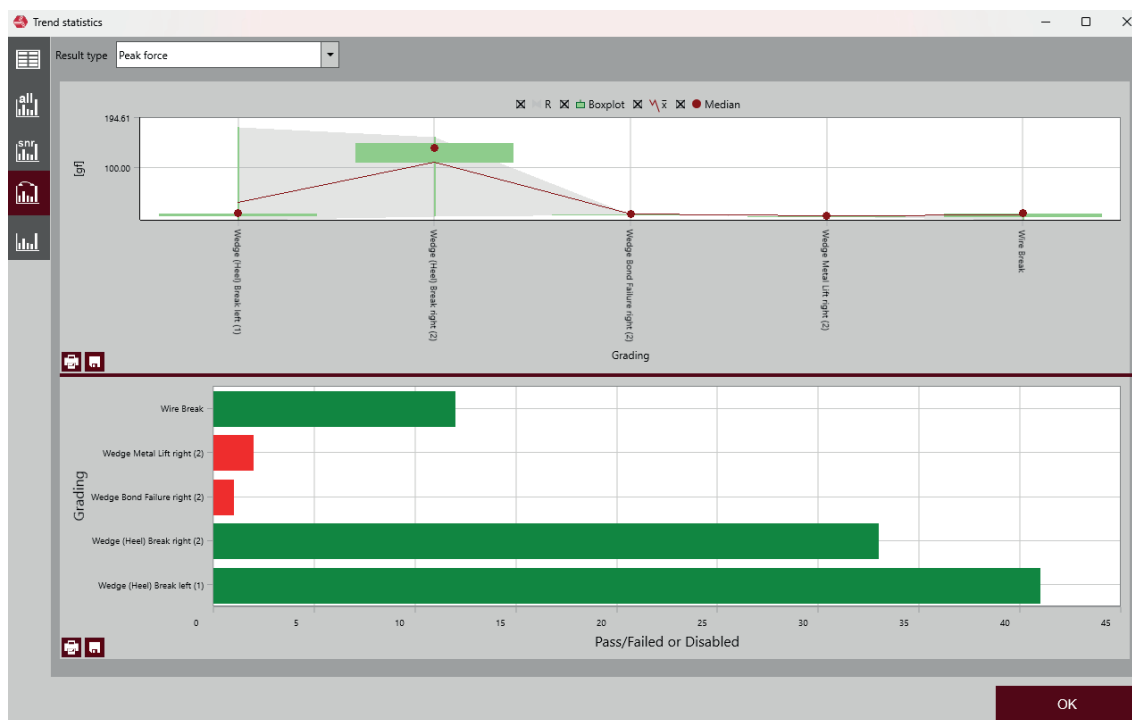


Figure 80: Trend graphs sorted by grading

The XYZTEC Sigma software can keep track of the statistics for all measurements, the samples, the grading and the group statistics. This makes the software very flexible, but still easy to use. The software will also only keep track of this statistics if it is required.

The next step is to perform some tests using a form. Make sure a form is available with the required data. Select this form in the test screen. When a measurement is performed a new sample needs to be created and the below dialog window will open.

| Field           | Value      |
|-----------------|------------|
| 1 Bonder        | Bondor     |
| 2 Wire size     | 250 micron |
| 3 Wire material | Al         |
| 4 Bond tool     | Au         |

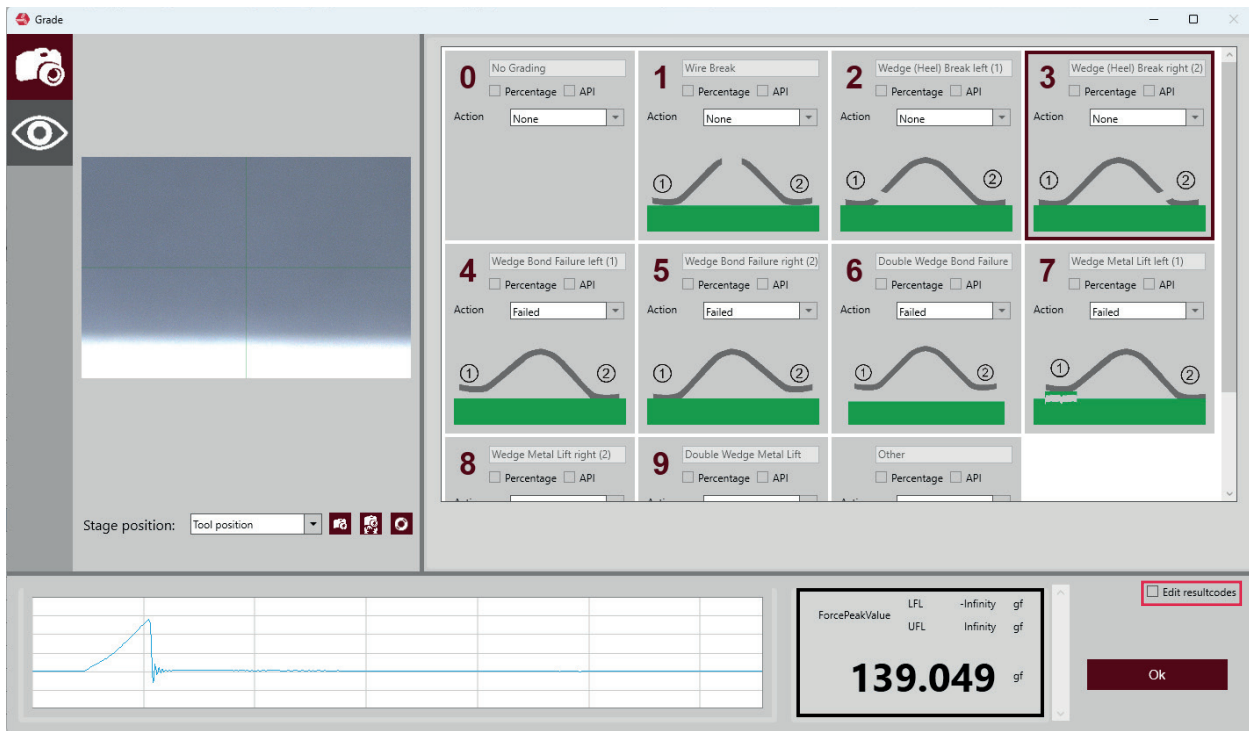
Buttons: Integrated scanner, I Scanner Control, External scanner, Cancel, OK

Figure 81: New sample dialog

In this case a bonder, wire size, wire material and bond tool has to be defined for each new sample that will be created and opened. The Sigma software also supports using a barcode scanner. Both a special automatic integrated barcode scanner and a standard manual barcode scanner are supported. Please contact XYZTEC for more information about this.

The fields bonder, wire size, wire material and bond tool will now also be available as columns in the measurement grid. It is now also possible to group on specific data, like for example the bonder. When this option is used the software will show the statistics for each bonder. With sufficient data this gives a very good idea about the bonder performance.

When a test is performed and the method uses a result code group the grading window will open after a test. All available result codes for the methods result code group are shown. In the lower area the measurement graph and the measurement result including the lower and upper fail limits are shown. If the box in front of **Edit resultcodes** is checked the available codes can be changed.



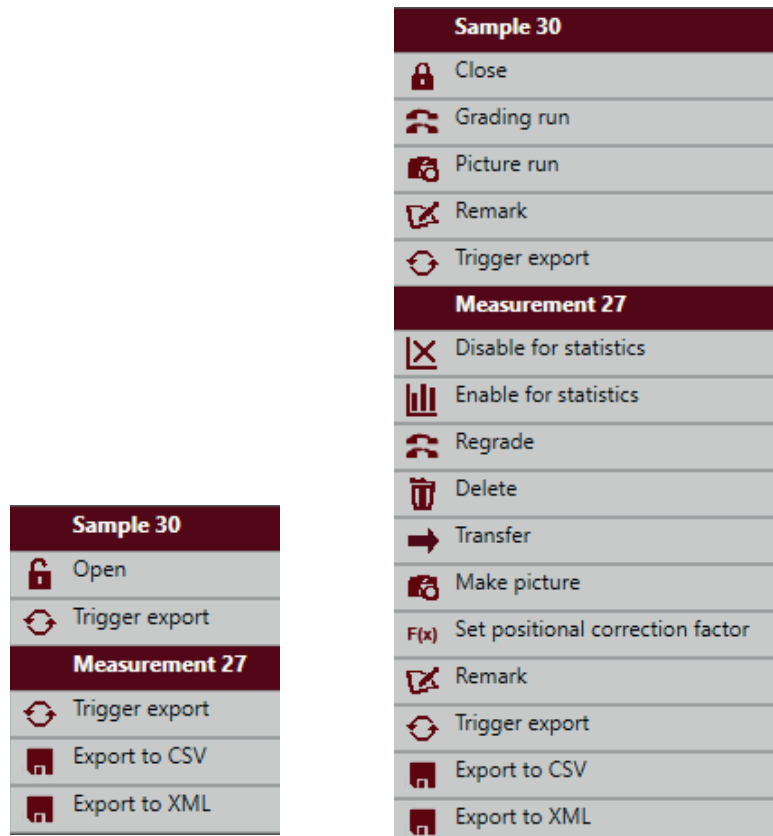
**Figure 82:** Grading window to match the result code to the occurred test behavior

To select a grading use the numeric keys 0-9, select the grading with the mouse, or use the Grade 1, Grade 2 or Grade 3 buttons on the left joystick or the screen. The Grading button on the joysticks or the screen changes the selected grading. The Test button confirms the selection.



**Figure 83:** Left joystick to select the short cut gradings 1, 2 and 3

The data grid on the lower left side also offers a popup menu. If the sample is open the menu will offer more options than when the sample is closed. Right click on the measurement and a window pops up showing the actions that can be made for both the sample and the measurement itself.

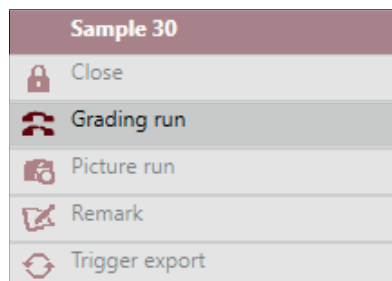


**Figure 84:** Right click menu for measurements, left side is a closed sample, right side is open sample

The popup menu always shows the currently selected sample and the currently selected measurement. The menu options under the sample are sample related. **Open** or **Close** will open or close the sample. If a sample is closed no measurements can be added. It is also not possible to change the grading or make any changes that influence the sample statistics when the sample already was closed.

Picture run will make a picture for all measurements in the sample. The **Remark** for a sample can be used to type a sample related remark.

### 3.10.1 Open sample



**Grading run** is used to grade all the measurements in a sample. The grading run opens a screen with some settings for the grading run. By right-clicking on the measurement the grading run can be performed. This is only possible when the sample is still editable hence open.

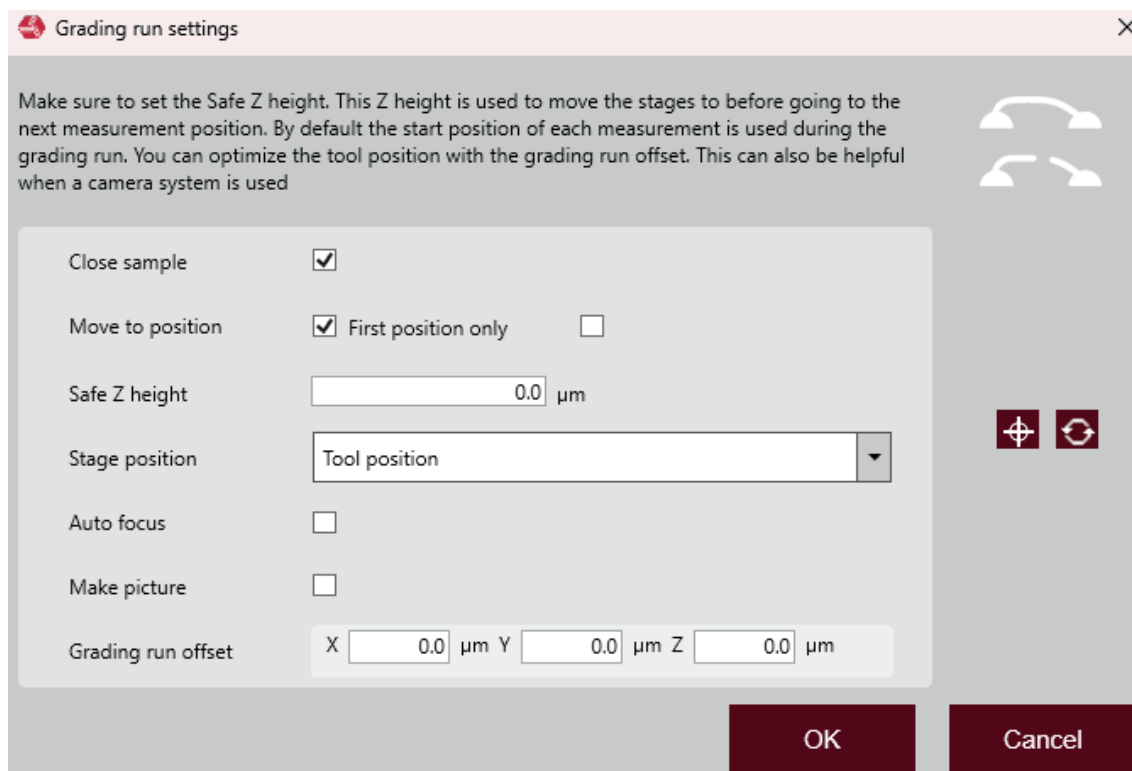


Figure 85: Grading run settings

**Close sample** can be used to automatically close the selected sample after the grading run. **Move to position** moves the test position under the selected camera or the microscope/tool position. The **Safe Z height** is used to move between test positions to avoid collisions. The  button (refresh) and  button (position) buttons can be used to get the current z-height (refresh) or move to the set z-height (position). The Stage position selects using the tool/microscope position, the left camera or the right camera. Grading run offset can be used to optimize the position to determine the grading. This is a relative offset from the test position. Confirm with **OK** to start the grading run.

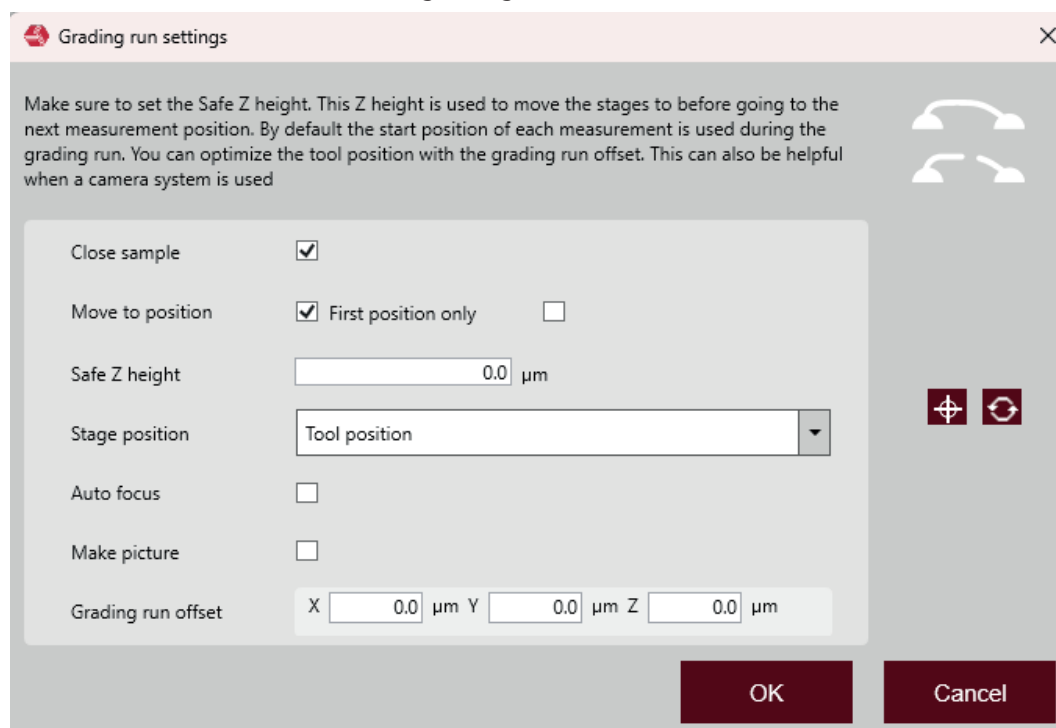


Figure 86: Grading window during grading run

The title bar for the grading window shows the current sample and sequence number. The buttons **Prev** and **Next** are only available for the grading run. The **Next** button selects the next measurement. If **Move to position** is enabled in the previous screen the system will automatically move the test position under the microscope/tool position or camera. The **Prev** button will select the previous measurement and when **Move to position** is enabled in the previous screen the system will automatically move the test position under the microscope/tool position or camera. Click **OK** when the grading is finished for this sample.

**Trigger export** can be used together with the Sigma Export software to force a new export for the selected sample.

### 3.10.2 Measurement in an open sample

**Measurement** shows the measurement related options.

**Disable for statistics** will disable the selected measurement from the statistics. The software will show the number of disabled measurements. These measurements are however not used for the statistical calculations but still visible in the statistics overview. This avoids gaps in the measurement results relevant for the statistics.

**Enable for statistics** will undo the function mentioned before. When a measurement was set to be disabled by mistake, it can easily be enabled for statistics again without causing issues.

**Regrade** will open the grading window (see figure 86) to change the grading for the selected measurement.

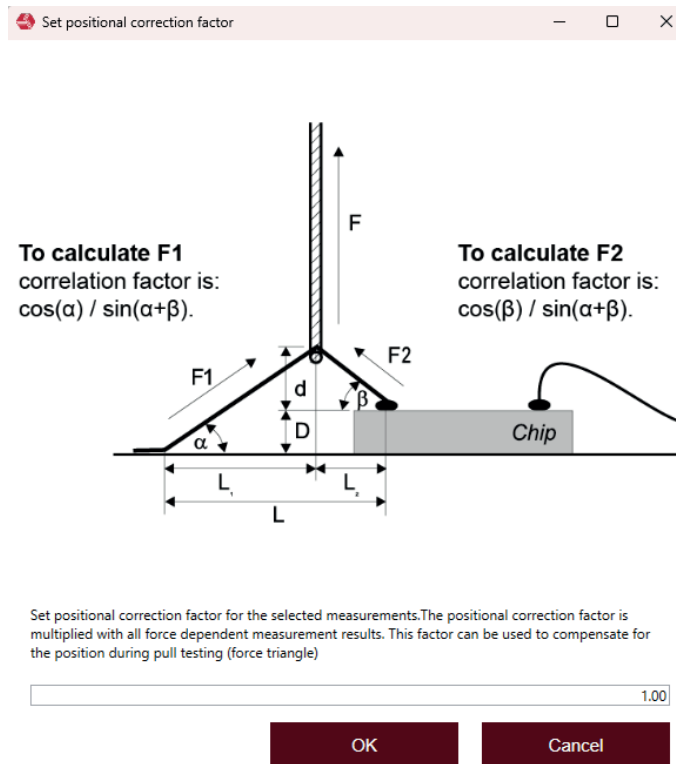
**Delete** will delete the selected measurement(s). The software will ask the operator to really delete the measurement as this step cannot be undone.

**Transfer** is used to move a measurement from one sample number to a different sample number. A window will open with the available sample numbers for the transfer. This function can be used when the operator did collect test results that were stored in the currently opened sample but wants it to be in another one for e.g. better traceability, allocation or just because the new data does not belong to the previous one. Then, the new test results can be either transferred into an existing sample or into a new one.

**Make picture** opens the camera window to make a picture for the selected measurement. When more cameras are mounted and available on the Sigma the

**Set positional correction factor** opens a Window to set the positional correction factor. This factor can be used if the wire lengths are different, to make the test results comparable. It can also be used to compensate for the force triangle.





**Figure 87:** Definition of positional correction factor

**Remark** in this case is the measurement remark. The measurement remark can be used to document any specific situations for the tested part (for example when a wire was damaged before the test).

**Trigger export** can be used together with the Sigma Export software to force a new export for the selected measurement(s).

**Export to CSV** creates a csv file with the force graph data for the selected measurement(s).

**Export to XML** creates an XML file with the force graph data for the selected measurement(s).

Both export files are stored in the C:\Users\Public\Documents\XYZTEC\CondorSigma\Results directory.

Besides the data grid with the measurement data it is also possible to switch the view from measurement data to the sample statistics. Click **Snr** to select the sample statistics and **Seq** to select the measurement data.

If multiple results are available it is also possible to get the statistics for a different result type. Below example shows how to select the result type. For the selected method a lot of result types are available.

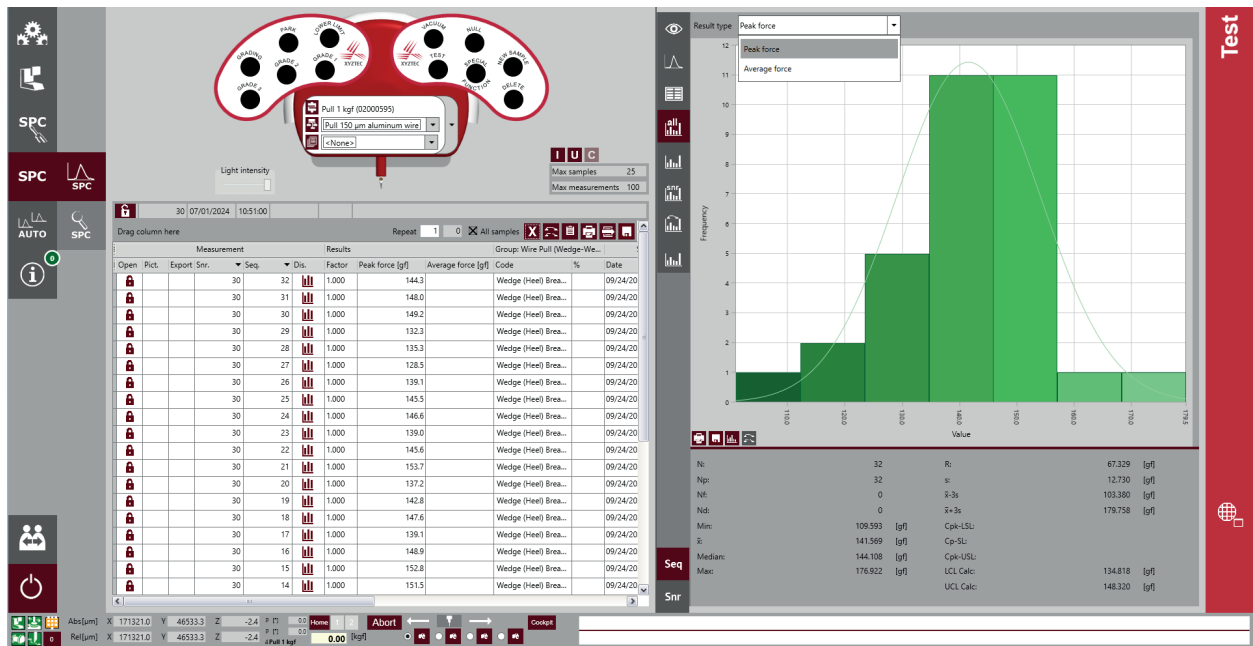


Figure 88: Selecting a different result type. Available result types must be set in the test method definition

If a different result type is selected the trend graphs and all measurements statistics will immediately reflect this. The XYZTEC Sigma software offers full SPC on all available test results. In the next screen the trend graph for the sample statistics is shown.

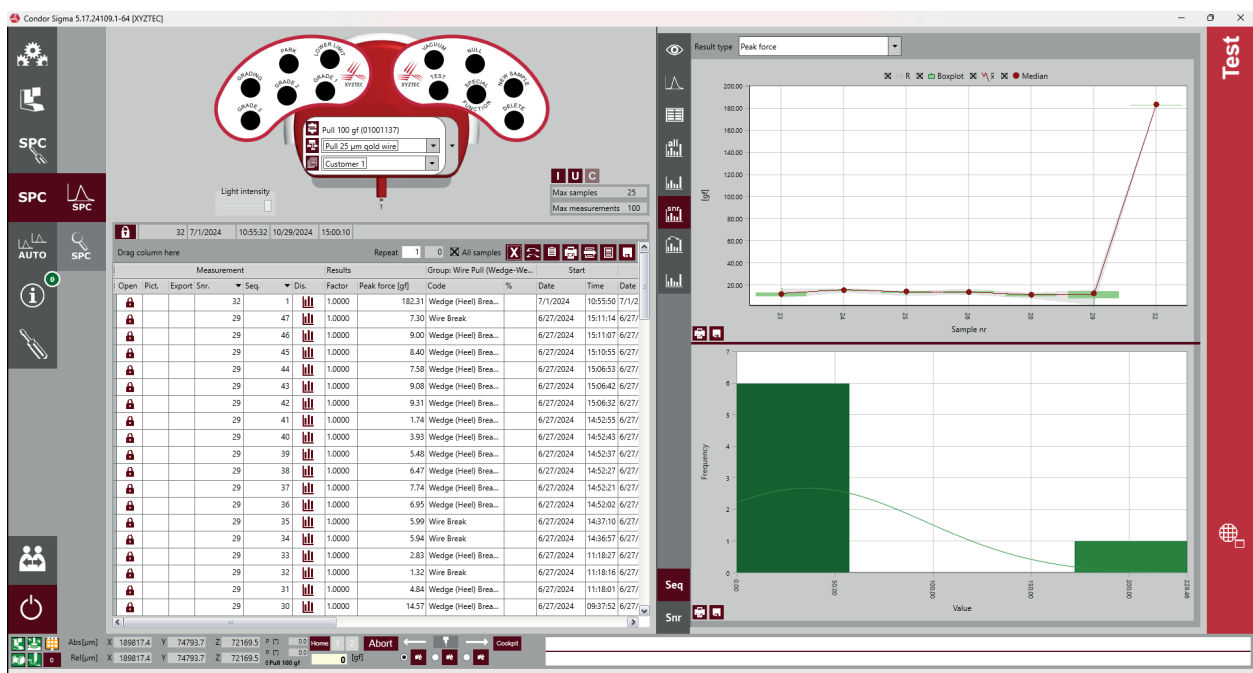


Figure 89: SPC test screen with trend graphs sorted by sample number

### 3.10.3 Individual programmable functions

The XYZTEC Sigma software offers the option of assigning a desired function to some of the buttons available in the software. The SPC screen itself offers the option of defining three machine actions using the three buttons to teach an **Initial position**, a **Loading/unloading position** as well as a **Cleaning position**.

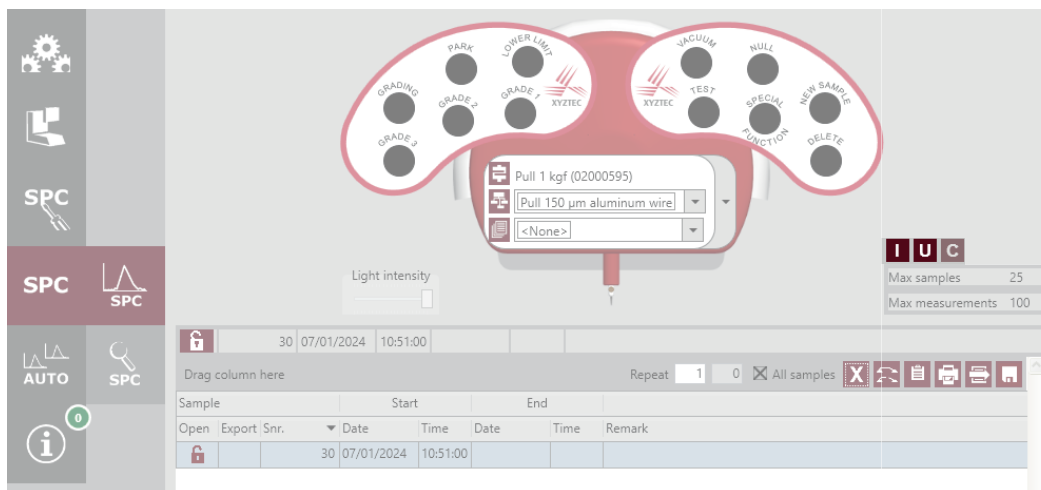


Figure 90: Available self-assignable software settings for machine actions

These **IUC** buttons can be programmed in the **Measurement unit and sensor settings** screen for each sensor.

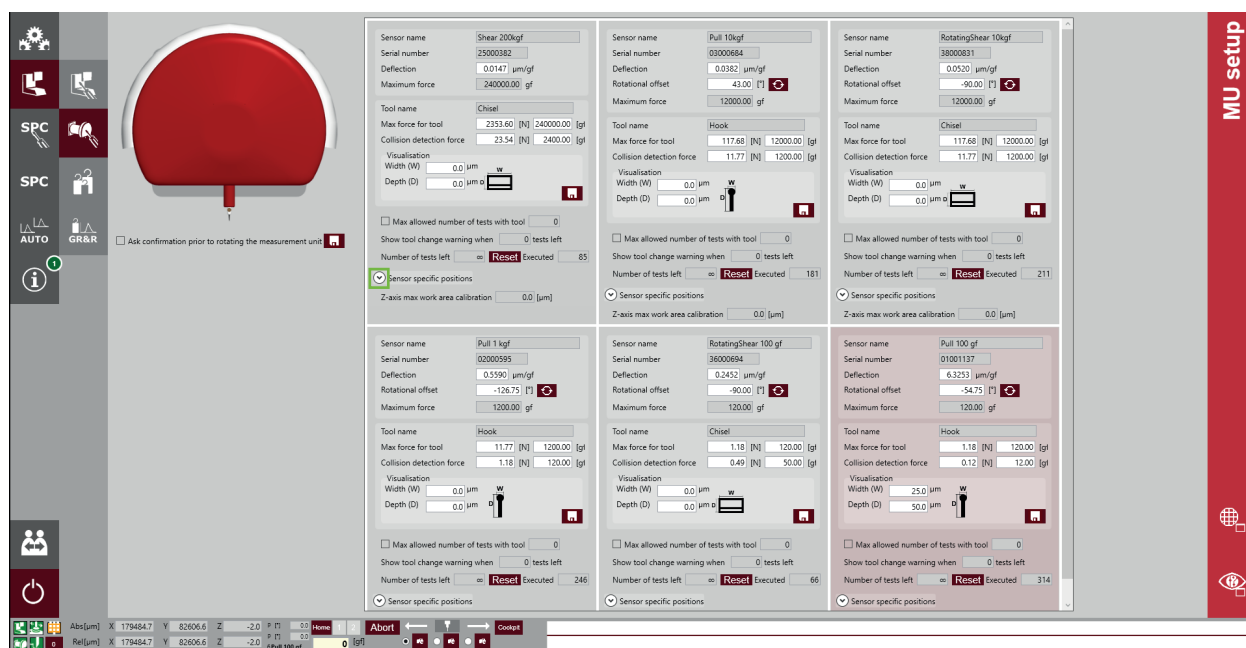


Figure 91: MU setup: Sensor settings for programming default locations

Click on the **little green arrow** symbolizing a drop down menu for the corresponding sensor to define the required positions for initializin, loading/unloading and cleaning. The cleaning position becomes applicable once a cleaning unit such as to clean the tweezer tip jaws or shear chisels from residues like solder balls.

Sensor name: Shear 200kgf  
 Serial number: 25000382  
 Deflection: 0.0147  $\mu\text{m/gf}$   
 Maximum force: 240000.00 gf

Tool name: Chisel  
 Max force for tool: 2353.60 [N] 240000.00 [gf]  
 Collision detection force: 23.54 [N] 2400.00 [gf]

Visualisation  
 Width (W): 0.0  $\mu\text{m}$   
 Depth (D): 0.0  $\mu\text{m}$

☐ Max allowed number of tests with tool: 0  
 Show tool change warning when: 0 tests left  
 Number of tests left:  $\infty$  **Reset** Executed: 85

Sensor specific positions

Offset left camera  
 X: -85910.7 [ $\mu\text{m}$ ] Y: 46420.6 [ $\mu\text{m}$ ] Z: -11594.2 [ $\mu\text{m}$ ] P: 0.00 [°]

Offset right camera  
 X: 85547.6 [ $\mu\text{m}$ ] Y: 46128.7 [ $\mu\text{m}$ ] Z: -18555.5 [ $\mu\text{m}$ ] P: 0.00 [°]

Offset 2nd left camera  
 X: 0.0 [ $\mu\text{m}$ ] Y: 0.0 [ $\mu\text{m}$ ] Z: 0.0 [ $\mu\text{m}$ ] P: 0.00 [°]

Offset 2nd right camera  
 X: 0.0 [ $\mu\text{m}$ ] Y: 0.0 [ $\mu\text{m}$ ] Z: 0.0 [ $\mu\text{m}$ ] P: 0.00 [°]

☒ Initial position  
 X: 188080.4 [ $\mu\text{m}$ ] Y: 86724.1 [ $\mu\text{m}$ ] Z: 0.0 [ $\mu\text{m}$ ]

☒ Unload position  
 X: 15323.2 [ $\mu\text{m}$ ] Y: 10966.1 [ $\mu\text{m}$ ] Z: 0.0 [ $\mu\text{m}$ ]

☐ Clean position  
☐ Touchdown test position

Z-axis max work area calibration: 0.0 [ $\mu\text{m}$ ]

Figure 92: MU setup: Sensor settings. Drop down menu to set default locations

The joysticks both the left and right one also provide self assignable buttons to facilitate the handling and operation of the Sigma machine. Both joysticks are equipped with six buttons each:

- five buttons on the left joystick can be defined individually, and

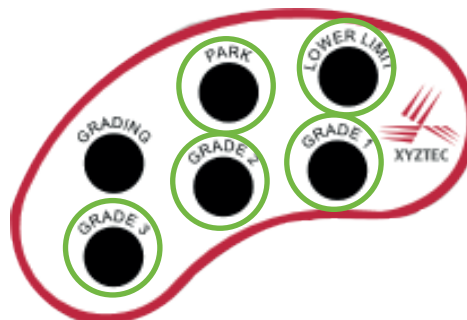


Figure 93: Left joystick

- one button on the right joystick can be defined individually.

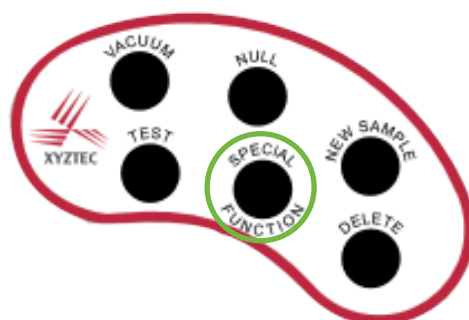


Figure 94: Right joystick

- PARK:** Moves the RMU to absolute  $z = 0$ , thus the RMU move up
- LOWER LIMIT:** Sets the current  $z$  position as the lowest RMU positions. Even when conducting a test the RMU will not move further down than that newly defined lower limit. To undo this setting/delete the temporarily stored position press **Lower Limit** button + **alt**.
- GRADE 1:** Grades the occurred code to the grading that is stored as position 1 to expedite the grading process, e.g. when performing a grading run. Gratings order can be modified in SPC settings.
- GRADE 2:** Grades the occurred code to the grading that is stored as position 2 to expedite the grading process, e.g. when performing a grading run. Gratings order can be modified in SPC settings.
- GRADE 3:** Grades the occurred code to the grading that is stored as position 3 to expedite the grading process, e.g. when performing a grading run. Gratings order can be modified in SPC settings.
- SPECIAL FUNCTION:** Performs any action that was stored as a special function, such as Grade 4-8, Clear lower Limit, Clean tool by blowing residues. Ask your local XYZTEC contact person.

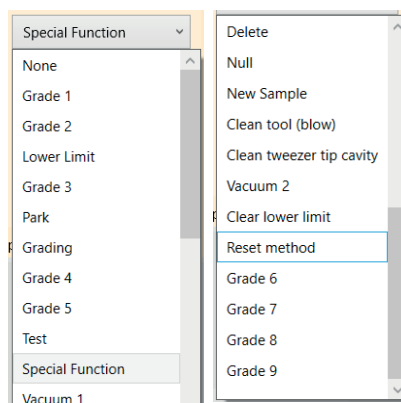


Figure 95: Options for Special Function assignment. This can be done by XYZTEC service only.

## 3.11 Status indication and hidden right mouse clicks

### 3.11.1 General software settings

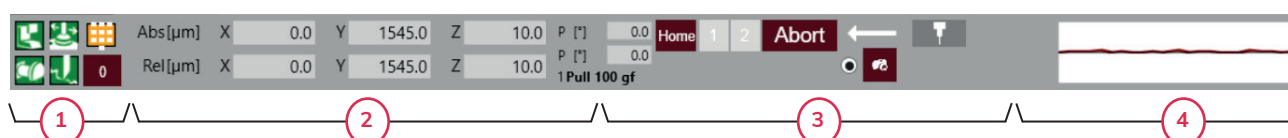
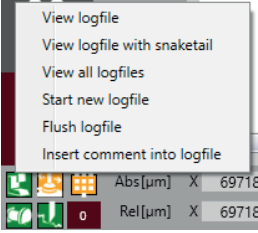
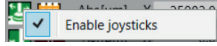
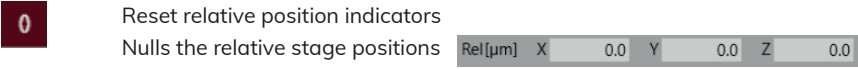


Figure 96: Status indication bar

The bottom of the XYZTEC Sigma software screen shows always the above shown status indication bar. This bar can be divided into four sections:

| Section | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p><b>Tester status:</b><br/>These little icons show the general tester status important for conducting proper bond tests.</p> <p><b>Tester ok</b><br/>Icon must always be green. When orange or red right mouse click to get the following pop up menu:</p>  <p>From there logfiles can be generated and the machine can be set to perform again</p> <p><b>Joysticks active</b><br/>Joysticks are enabled when this icon is green.<br/>When the machine went into overload and tool protection is active the joysticks will disable to avoid damaging the sensor, thus they have to be enabled. To enable right mouse click on the joystick icon and check Enable Joysticks.</p>  <p><b>Move stages using arrow keys on keypad</b><br/>This function is enabled when the icon is green. As soon as it gets orange, the relative stage positions have to be modified, i.e. when negative.</p> <p><b>Measurement Unit ok</b><br/>When the communication from machine to RMU is lost the icon will indicate this. When taking off the RMU this icon gets red as the machine is not able to correspond to the measurement unit.</p> <p><b>Touchdown protection</b><br/>This function protects the sensor from each applied overload such as when moving the z axis too fast in positive direction (downwards movement) to eventually hit the surface of the sample to be tested.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p>Yellow: Touchdown<br/>       Orange: Tool protection error by touchdown sensor<br/>       Red: Tool protection error in test direction (or opposite)<br/>       Indian red: Emergency switch / axis unsafe or unpowered / safety switch / vacuum error<br/>       Dark red: Sensor overload (press the sensor overload button to recover)</p> </div> <p><b>Reset relative position indicators</b><br/>Nulls the relative stage positions</p>  |

2

**Relative and absolute axes positions:**

The upper line shows the absolute axes positions that go from 0.00  $\mu\text{m}$  (minimum) to the respective absolute maximum of the axis. For the standard Sigma machine that would be:

- x axis: 368,000.0  $\mu\text{m}$ , i.e. 368 mm
- y axis: 168,000.0  $\mu\text{m}$ , i.e. 168 mm
- z axis: 168,000.0  $\mu\text{m}$ , i.e. 168 mm

Abs[ $\mu\text{m}$ ] X 368000.0 Y 168000.0 Z 168000.0

The absolute maximum axes position for the Sigma HF are as follows:

- x axis: 600,000.0  $\mu\text{m}$ , i.e. 600 mm
- y axis: 600,000.0  $\mu\text{m}$ , i.e. 600 mm
- z axis: 200,000.0  $\mu\text{m}$ , i.e. 200 mm

These values cannot be changed manually by typing in a new position. They can only be changed by moving the axes using the joysticks. When the absolute maximum positions are reached the displayed axes positions are highlighted red as in the example above.

The lower line shows the relative axes positions. The relative positions can be changed by clicking the 0 button to null them.

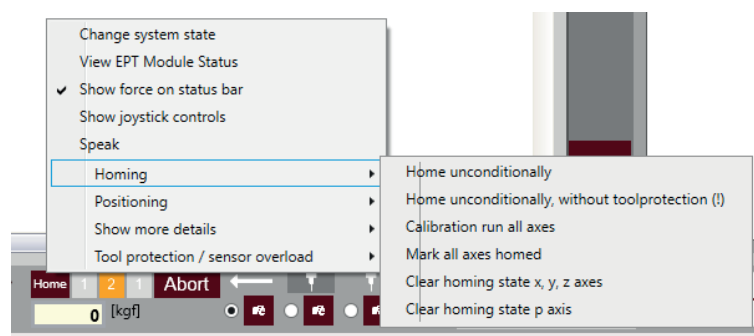
Rel[ $\mu\text{m}$ ] X -20346.9 Y -20346.9 Z -20346.9

3

**Activation of machine enhancements:**

In this section not only the camera views can be enabled but also tool-to-camera positions are described. Besides that the stages can be moved from tool position to right or left camera position.

The Home button will trigger the machine to perform another homing procedure. A right mouse click on that button will display the following pop up menu for additional homing options:



The Abort button will stop the machine movement.

The button will move the stages to tool position, unless the machine is already in that position. The tool position is always stored as default.

The button will move the stages to the left camera position when the machine is equipped with a right camera. If not, the field will be empty.

The button will move the stages to the right camera position when the machine is equipped with a right camera. If not, the field will be empty.

The button will show the left camera view when the machine is equipped with a right camera. If not, the field will be empty. Make sure the sample is place underneath the respective camera.

The button will show the scope camera view when the machine is equipped with a right camera. If not, the field will be empty. Make sure the sample is place underneath the respective camera.

The button will show the right camera view when the machine is equipped with a right camera. If not, the field will be empty. Make sure the sample is place underneath the respective camera.

4

**Live force load:**

The live force load graph shows the currently applied force to the sensor in action according to the force-time diagram. This graph is NOT meant for any statistical analyses or other representative assessments but it provides a first quantitative overview. When the machine idles the curve shows the baseline:



### 3.12 Query screen

The XYZTEC Sigma software also offers a very easy to use option to query the measurements. In the SPC sub menu the second choice shows SPC with a magnifying glass. Under this menu choice you can find the query screen.

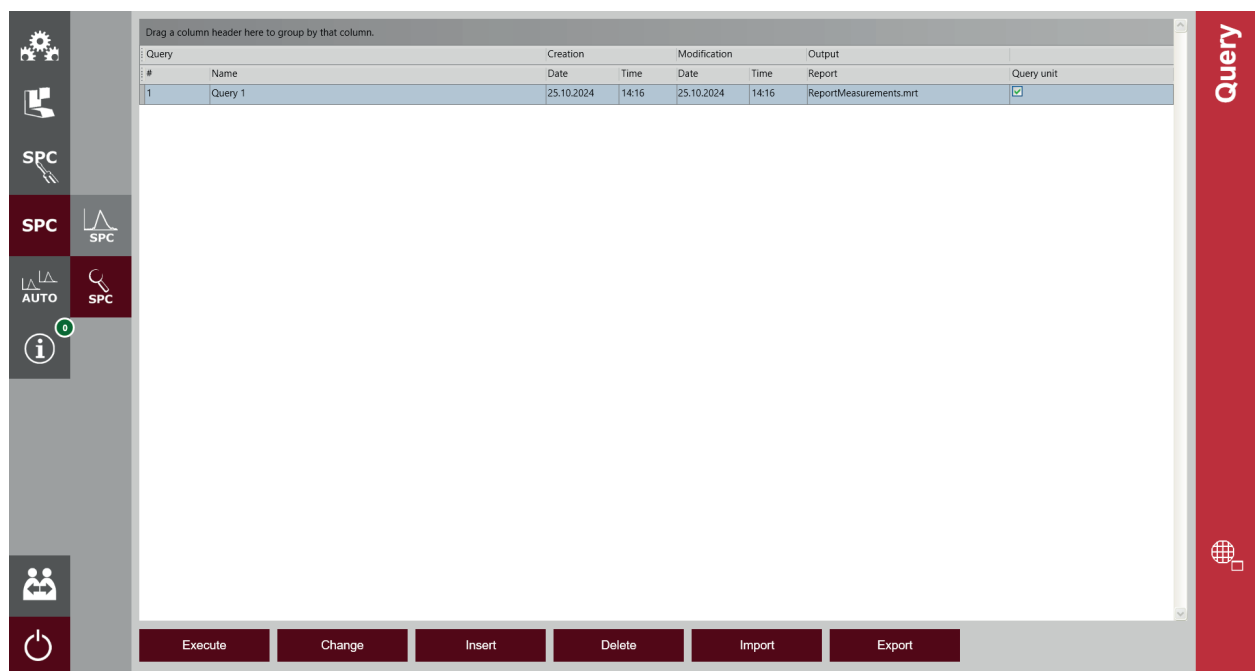


Figure 97: Query screen, showing one query

By default no query is selected and the data grid with the query results is empty. Click the **Insert** button to create a new query.

**Figure 98:** Pop up window to insert a new query

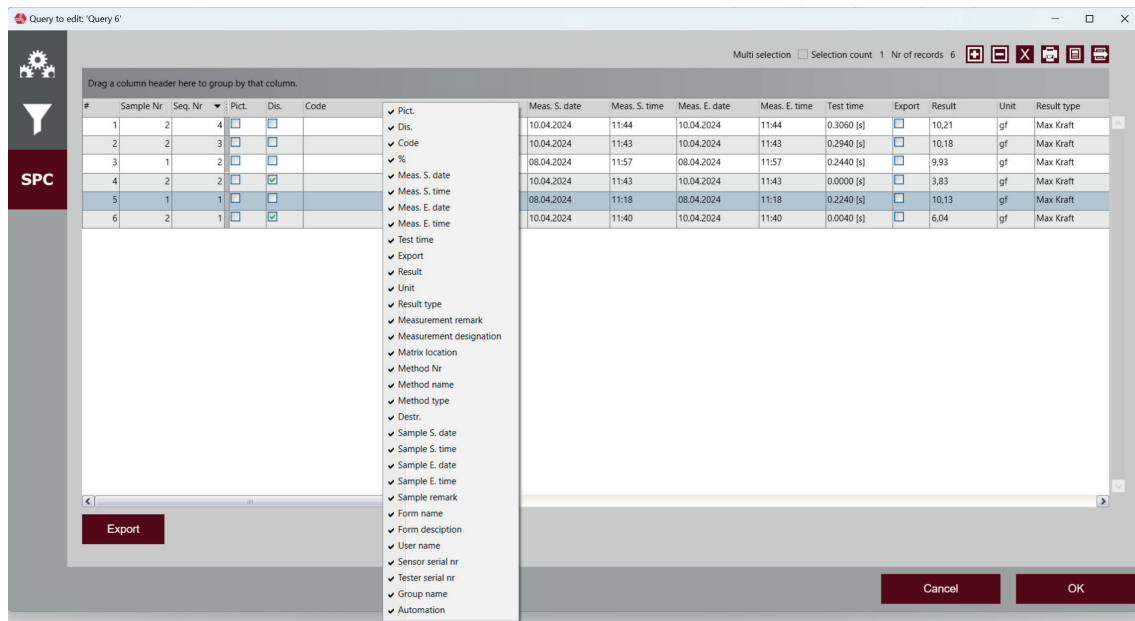
The Insert/Edit query dialog window offers a query number that cannot be changed and a query name. Use clear names for the query to make it easier to locate specific queries. Click **OK** to confirm and go back to the query screen.

The new query is now created and all measurement data is shown in the data grid with the results. Only a default set of columns are shown. The idea behind the query screen is to limit this complete set until only the required data is left. To limit the data you can use the filter options in the column headers. If the mouse cursor is moved over the column header an arrow is shown after the name of the column. Click on the arrow to see the unique values available for this column. Select the values that are needed. It is possible to select multiple values. The figure shown below screen shows the filter for the sequence column.

| # | Sample Nr | Seq. Nr | Pict                     | Dis                                 | Code | % | Meas. S. date | Meas. S. time | Meas. E. date | Meas. E. time | Test time  | Export                   | Result | Unit | Result type |
|---|-----------|---------|--------------------------|-------------------------------------|------|---|---------------|---------------|---------------|---------------|------------|--------------------------|--------|------|-------------|
| 1 | 1         | 1       | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 08.04.2024    | 11:18         | 08.04.2024    | 11:18         | 0.2240 [s] | <input type="checkbox"/> | 10.13  | gf   | Max Kraft   |
| 2 | 1         | 2       | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 08.04.2024    | 11:57         | 08.04.2024    | 11:57         | 0.2440 [s] | <input type="checkbox"/> | 9.93   | gf   | Max Kraft   |
| 3 | 2         | 1       | <input type="checkbox"/> | <input checked="" type="checkbox"/> |      |   | 10.04.2024    | 11:40         | 10.04.2024    | 11:40         | 0.0040 [s] | <input type="checkbox"/> | 6.04   | gf   | Max Kraft   |
| 4 | 2         | 2       | <input type="checkbox"/> | <input checked="" type="checkbox"/> |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.0000 [s] | <input type="checkbox"/> | 3.83   | gf   | Max Kraft   |
| 5 | 2         | 3       | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.2940 [s] | <input type="checkbox"/> | 10.18  | gf   | Max Kraft   |
| 6 | 2         | 4       | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 10.04.2024    | 11:44         | 10.04.2024    | 11:44         | 0.3050 [s] | <input type="checkbox"/> | 10.21  | gf   | Max Kraft   |

**Figure 99:** All measurement results and default columns

A right mouse click on the column headers will open the following screen:



**Figure 100:** Right mouse click to show checked settings

To add additional columns right click on any column header. Select the required columns by clicking on the column name. It is also possible to hide available columns. A check mark shows if a column is visible. The number of available columns also depends on the number of available fields. Up to 30 fields can be shown.

| Sample Nr               |
|-------------------------|
| Sample start date       |
| Sample start time       |
| Sample end date         |
| Sample end time         |
| Sample remark           |
| Method                  |
| Form name               |
| Form description        |
| User                    |
| Automation name         |
| Automation barcode      |
| Tester serial Nr        |
| Resultcode group        |
| Sensor serial Nr        |
| Resultcode              |
| Measurement Nr          |
| Measurement start date  |
| Measurement start time  |
| Measurement end date    |
| Measurement end time    |
| Measurement remark      |
| Measurement designation |
| Matrix location         |
| Measurement result      |
| Product                 |
| Sample shape            |
| Production line         |
| Product ID              |
| Product group           |

**Figure 101:** Available columns for query screen

In the example above the form name, bonder, lot, batch and package columns are added to the default set. After this the query screen looks as below. It is now possible to filter on the form name or one or more specific fields.

When the result set is below the 1000 records the results can be printed  or exported . The  button will store the current query layout, with the selected filters. The  button opens a window with query specific settings for the units. By default the user setting and the currently selected sensor are used as the base setting. This makes it possible for a operator that works with the unit gf to print a report with the unit N.

Query to edit: 'Query 5'

Query name: Query 5

Report name: ReportMeasurements.mrt

SPC Use query unit settings: ☒

|                                  | Unit | Quantity |
|----------------------------------|------|----------|
| Preferred angle (rotation) unit  | °    |          |
| Preferred energy unit            | J    | J        |
| Preferred force unit             | gf   |          |
| Preferred length (distance) unit | m    | µm       |
| Preferred mass unit              | kg   | g        |
| Preferred temperature unit       | °C   |          |
| Preferred time unit              | s    | s        |

Cancel OK

Figure 102: Unit settings for query

Make sure to uncheck the option **Enable user units**. After this the units for the angle, energy, force, length, mass, temperature and time can be selected. For some units the quantity can also be set. Click **OK** to confirm. Unit settings are also stored with the query. Make sure to click the save button after making adjustments.

The  and  buttons can only be used when a grouping is used. Plus will open all groups, minus will close all groups.

The query screen also offers to group the data on a specific column. By clicking on the **Seq Nr.** header, keeping the left mouse button pressed and dragging the column header in the area for grouping the data, the table is sorted by the sequence number.

Drag a (Seq. Nr.) here to group by that column.

| # | Seq. Nr. | Sample Nr. | Pict. | Dis. | Code | % | Meas. S. date | Meas. S. time | Meas. E. date | Meas. E. time | Test time  | Export | Result | Unit | Result type |
|---|----------|------------|-------|------|------|---|---------------|---------------|---------------|---------------|------------|--------|--------|------|-------------|
| 1 | 1        | 2          |       |      |      |   | 10.04.2024    | 11:40         | 10.04.2024    | 11:40         | 0.0040 [s] |        | 6,04   | gf   | Max Kraft   |
| 2 | 1        | 1          |       |      |      |   | 08.04.2024    | 11:18         | 08.04.2024    | 11:18         | 0.2240 [s] |        | 10,13  | gf   | Max Kraft   |
| 3 | 2        | 1          |       |      |      |   | 08.04.2024    | 11:57         | 08.04.2024    | 11:57         | 0.2440 [s] |        | 9,93   | gf   | Max Kraft   |
| 4 | 2        | 2          |       |      |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.0000 [s] |        | 3,83   | gf   | Max Kraft   |
| 5 | 3        | 2          |       |      |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.2940 [s] |        | 10,18  | gf   | Max Kraft   |
| 6 | 4        | 2          |       |      |      |   | 10.04.2024    | 11:44         | 10.04.2024    | 11:44         | 0.3060 [s] |        | 10,21  | gf   | Max Kraft   |

Figure 103: Drag and drop desired column to change sorting criteria

The query screen will now show the data with the grouping.

Query to edit: 'Query 6'

Multi selection ☐ Selection count 1 Nr of records 6

| #                 | Seq. Nr | Sample Nr | Pict.                               | Dis.                                | Code | % | Meas. S. date | Meas. S. time | Meas. E. date | Meas. E. time | Test time  | Export                              | Result | Unit | Result type |
|-------------------|---------|-----------|-------------------------------------|-------------------------------------|------|---|---------------|---------------|---------------|---------------|------------|-------------------------------------|--------|------|-------------|
| <b>Seq. Nr: 1</b> |         |           |                                     |                                     |      |   |               |               |               |               |            |                                     |        |      |             |
| 1                 | 1       | 2         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |      |   | 10.04.2024    | 11:40         | 10.04.2024    | 11:40         | 0.0040 [s] | <input type="checkbox"/>            | 6,04   | gf   | Max Kraft   |
| 2                 | 1       | 1         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |      |   | 08.04.2024    | 11:18         | 08.04.2024    | 11:18         | 0.2240 [s] | <input checked="" type="checkbox"/> | 10,13  | gf   | Max Kraft   |
| <b>Seq. Nr: 2</b> |         |           |                                     |                                     |      |   |               |               |               |               |            |                                     |        |      |             |
| 3                 | 2       | 1         | <input type="checkbox"/>            | <input type="checkbox"/>            |      |   | 08.04.2024    | 11:57         | 08.04.2024    | 11:57         | 0.2440 [s] | <input type="checkbox"/>            | 9,93   | gf   | Max Kraft   |
| 4                 | 2       | 2         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.0000 [s] | <input type="checkbox"/>            | 3,83   | gf   | Max Kraft   |
| <b>Seq. Nr: 3</b> |         |           |                                     |                                     |      |   |               |               |               |               |            |                                     |        |      |             |
| 5                 | 3       | 2         | <input type="checkbox"/>            | <input type="checkbox"/>            |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.2940 [s] | <input type="checkbox"/>            | 10,18  | gf   | Max Kraft   |
| <b>Seq. Nr: 4</b> |         |           |                                     |                                     |      |   |               |               |               |               |            |                                     |        |      |             |
| 6                 | 4       | 2         | <input type="checkbox"/>            | <input type="checkbox"/>            |      |   | 10.04.2024    | 11:44         | 10.04.2024    | 11:44         | 0.3060 [s] | <input type="checkbox"/>            | 10,21  | gf   | Max Kraft   |

Export

Cancel OK

Figure 104: Query screen with grouping by sequence number

A right click on a measurement result shows a popup menu.

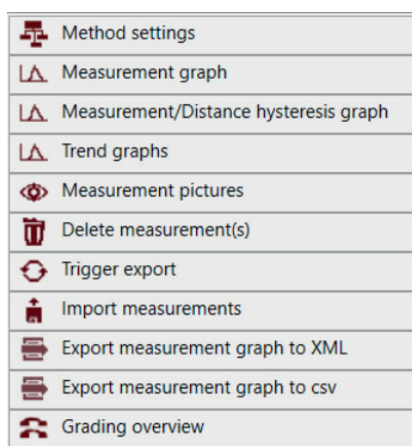


Figure 105: Query pop up menu after right click on result (peak force)

The option **Method settings** opens a window with the method settings used to get this measurement result. The method settings window is opened. The left side of the window shows the current method settings, the right side shows the settings used when the measurement was made.

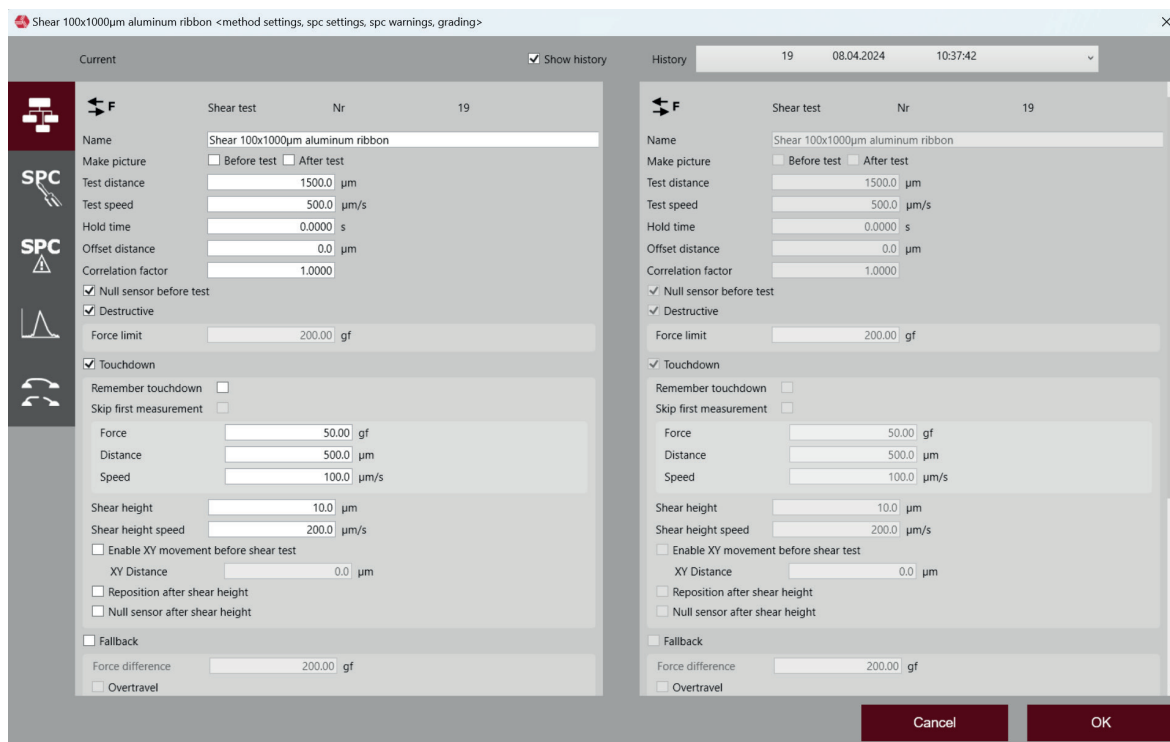


Figure 106: Method settings shown in query mode

**Measurement graph** opens the measurement graph for the selected measurement result. **Measurement/Distance hysteresis graph** opens the hysteresis graph for the selected measurement result.

**Trend graphs** generates the statistics for the currently available measurement results by opening a window. This window offers the same statistical options and graph options as the test screendoes too.

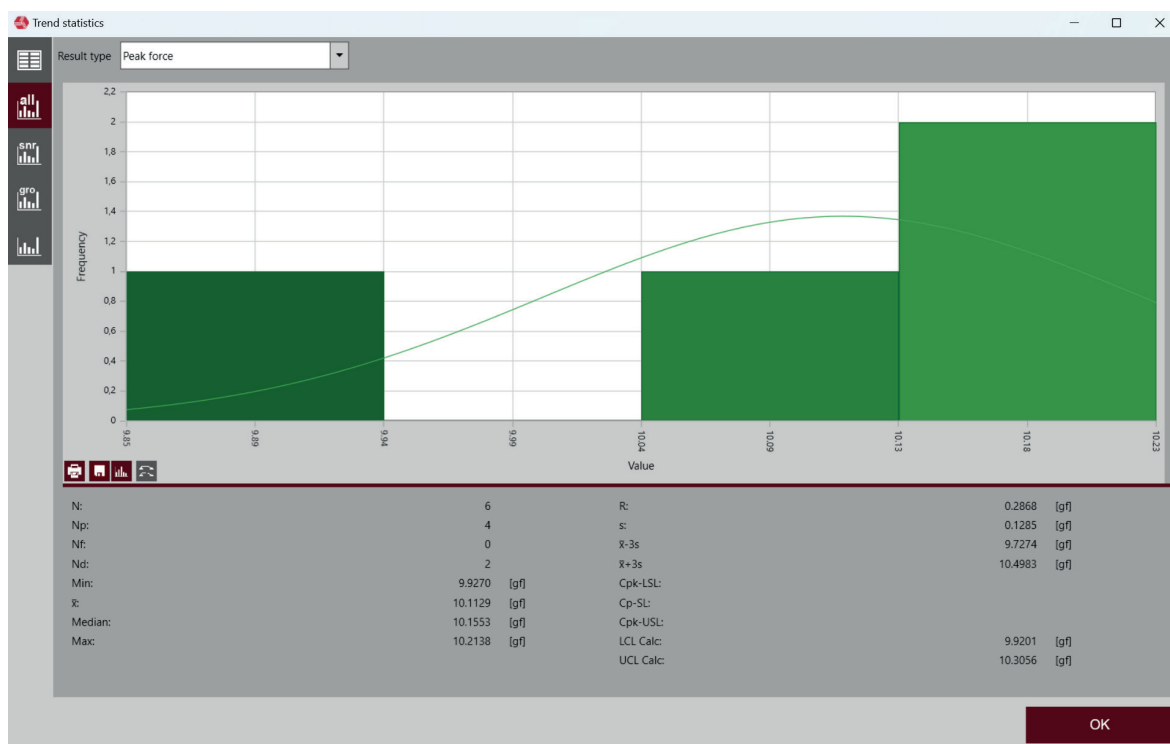


Figure 107: Trend graph and statistics shown in query mode

**Measurement pictures** opens a window showing any available pictures for the selected measurement.

**Delete** makes it possible to delete the selected result(s).

**Trigger export** automatically exports the sample the measurements belongs to.

**Import measurements** will import desired measurements stored in another sample to be added to the currently selected sample.

**Export measurement graph to XML** exports the selected measurement result(s) to an xml file. This works the same as the export feature in the test screen.

**Export measurement graph to csv** will export the selected measurement results to a csv file.

**Grading overview** will show the failure modes that were selected for each measurement when grading was enabled for the respective test method.

It is also possible to sort the data in the query screen in a special way. To sort the **Sample Nr** in ascending order left click the column header once. Click again to sort in descending order. A third click will remove the sort order. The query table can also be sorted by the **Sample Nr** according to sorting by **Seq Nr**.

Query to edit: "Query 6"

Multi selection ☐ Selection count 1 Nr of records 6

Query settings for the table: Sample Nr, Unit, Pict., Dis., Code, %, Meas. S. date, Meas. S. time, Meas. E. date, Meas. E. time, Test time, Export, Result, Unit, Result type

| Sample Nr           | Seq Nr | Unit | Pict.                    | Dis.                                | Code | % | Meas. S. date | Meas. S. time | Meas. E. date | Meas. E. time | Test time  | Export                   | Result | Unit | Result type |
|---------------------|--------|------|--------------------------|-------------------------------------|------|---|---------------|---------------|---------------|---------------|------------|--------------------------|--------|------|-------------|
| <b>Sample Nr: 1</b> |        |      |                          |                                     |      |   |               |               |               |               |            |                          |        |      |             |
| 1                   | 1      | 1    | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 08.04.2024    | 11:18         | 08.04.2024    | 11:18         | 0.2240 [s] | <input type="checkbox"/> | 10,13  | gf   | Max Kraft   |
| 2                   | 2      | 1    | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 08.04.2024    | 11:57         | 08.04.2024    | 11:57         | 0.2440 [s] | <input type="checkbox"/> | 9,93   | gf   | Max Kraft   |
| <b>Sample Nr: 2</b> |        |      |                          |                                     |      |   |               |               |               |               |            |                          |        |      |             |
| 3                   | 1      | 2    | <input type="checkbox"/> | <input checked="" type="checkbox"/> |      |   | 10.04.2024    | 11:40         | 10.04.2024    | 11:40         | 0.0040 [s] | <input type="checkbox"/> | 6,04   | gf   | Max Kraft   |
| 4                   | 2      | 2    | <input type="checkbox"/> | <input checked="" type="checkbox"/> |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.0000 [s] | <input type="checkbox"/> | 3,83   | gf   | Max Kraft   |
| 5                   | 3      | 2    | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 10.04.2024    | 11:43         | 10.04.2024    | 11:43         | 0.2940 [s] | <input type="checkbox"/> | 10,18  | gf   | Max Kraft   |
| 6                   | 4      | 2    | <input type="checkbox"/> | <input type="checkbox"/>            |      |   | 10.04.2024    | 11:44         | 10.04.2024    | 11:44         | 0.3060 [s] | <input type="checkbox"/> | 10,21  | gf   | Max Kraft   |

Export

Cancel OK

**Figure 108:** Query screen with grouping by sample number

## 4 Maintenance schedule

| Item                                             | When         |       |           |                            | Who      |
|--------------------------------------------------|--------------|-------|-----------|----------------------------|----------|
|                                                  | As necessary | Daily | 12 months | Required when disassembled |          |
| Clean machine and empty debris collection tray   | X            |       |           |                            | Operator |
| Check quick release interface clamp              | X            |       |           |                            | Operator |
| Check test tools for damage or wear              | X            | X     |           |                            | Service  |
| Cleaning linear encoder                          |              |       |           | X                          | Service  |
| Lubricate linear rails and leadscrews            |              |       | X         |                            | Service  |
| Lubricate RMU locking pin                        |              |       | X         |                            | Service  |
| Lubricate shear clamp gears                      |              |       | X         |                            | Service  |
| Inspect all cables for wear or damage            |              |       | X         |                            | Service  |
| Lubricate RMU locking pin (Sigma, Sigma HF only) |              |       |           | X                          | Service  |

### 4.1 How to's...

#### 4.1.1 ...adjust the shear tool

Before doing an actual sheartest, the tool has to be mounted properly. First fit the tool on the sensor with the two bolts and tighten the screws so the tool can just move as shown in the figure below.

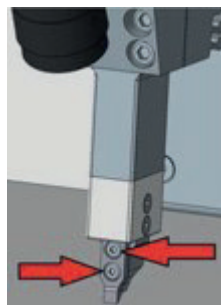


Figure 109: Set screws to adjust the shear tool

Put a touchdown load of 200gf on the tool, so it is pushed to the top stop of the sensor. Fix the two bolts, with the load applied, with a torque of 1,25 Nm. The touchdown load depends on the sensor force range hence a 100gf shear sensor just needs a touchdown load of 2 - 10 gf whereas the 200kgf shear sensor can go up to 200gf.



### 4.1.2 ...clean the machine and empty the debris collection tray

Open the drawer of the machine and clean the debris collection tray carefully as necessary with a vacuum cleaner.

### 4.1.3 ...check quick release interface clamp and the test tools

Inspect the test tools and interface clamp for damage or wear and replace these if needed. In the event of any faults which you cannot remedy yourself, please contact XYZTEC.

### 4.1.4 ...lubricate linear rails and leadscrews

Lubrication of the linear rails and leadscrews should be done with Arcanol MULTITOP grease. The lubricant should be applied on the leadscrew and rails with a cloth. No big particles of the grease should be left, only a film is taken care of the lubrication of leadscrew and linear guides.

## 4.2 Service

Maintenances marked with “Service” should only be undertaken by a XYZTEC authorized service technician. Failure to comply voids the warranty. The contact details for XYZTEC are given at the back of these instructions.

## 5 EU Declaration of Conformity: CE

**Manufacturer's name:** xyztec bv

**Manufacturer's address:** J.F. Kennedylaan 14B  
5981CX Panningen  
The Netherlands



**Declares that the product:**

Product name: XYZTEC Condor Sigma series  
Model numbers: Sigma, Sigma Lite, Sigma w8, Sigma W12, Sigma MAG, Sigma HF  
Accessories: PMU, SMU, LMU, TMU, IMU & RMU  
Joysticks, Heater Work Holder, Rotating Stage, USB Tweezers

**Meets the provisions of following directives and is in conformity with the mentioned standards:**

**Directives:**

|            |                                                                         |
|------------|-------------------------------------------------------------------------|
| 2006/42/EC | Machinery Directive                                                     |
| 2014/30/EU | EMC Directive                                                           |
| 2011/65/EU | RoHS Directive (According to Article 2; „Large-scale Industrial tools“) |

**Standards:**

|                               |                                                                                                                           |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| EN ISO 12100:2010             | Safety of machinery - General principles for design – Risk assessment and risk reduction                                  |
| EN ISO 13849-1:2015           | Safety of machinery – Safety Related parts of control systems – Part 1: General principles for design                     |
| EN IEC 60204-33:2011          | Safety of machinery – Electrical equipment of machines – Part 33: Requirements for semiconductor fabrication equipment    |
| EN IEC 61000-6-4:2007/A1:2011 | Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments         |
| EN IEC 61000-6-2:2005         | Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments                  |
| NFPA79 (2018)                 | Electrical Standard for Industrial Machinery                                                                              |
| FCC 47 CFR Part 15 Subpart B  | Federal Communication Commission – Title 47 – Code of Federal Regulations – Part 15, Sub part B – Unintentional Radiators |
| SEMI S2-0818E                 | Environmental, Health, and Safety Guidelines for Semiconductor Manufacturing Equipment                                    |
| SEMI S3-0218                  | Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment                                     |

The party authorized to compile the technical file is: xyztec bv

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xyztec bv  
Panningen, October 2024



T e c h n o l o g y   l e a d e r   i n   b o n d   t e s t i n g   w o r l d w i d e