

RT | Vision.t

Online glue and sealant application inspection system

RTVision.t V.4.6

Operating Manual V.1.2 - English
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Chapter 1
Foreword

1 Foreword

1.1 Safety notes

It is important that you observe the listed safety precautions.

Signal words - definitions



Indicates that there is exceptionally great danger when handling the respective product. If a warning is not heeded and no precaution against danger is taken, there will definitely be a serious injury or even death.



Identifies a possible danger of a product, which can lead to serious injuries or even death if adequate precautions are not taken.



Indicates a potentially dangerous situation, which can lead to medium or light injuries or damage to property.

Information – material damage

Indicates a possibly dangerous situation. If it is not prevented, the product or something near it could be damaged..

The safety notes listed here relate to the risk assessment performed in accordance with the Machinery Directive 2006/42/EC concerning potential residual risks that may exist despite all possible technical protection measures being performed.

Warning symbols if used on components and their meaning:



Danger - Danger to life from electric shock

Indicates life-threatening situations due to electric current. Failure to follow the safety instructions may result in serious injury or death. The work being performed may only be carried out by a qualified electrician who has been trained on the system.



Beware of optical radiation

The sensors used for image processing are fitted with high-performance LEDs as a light source. Please note that use of a UV source is also possible here in addition to white light and RGB.



Caution – Heating of housing surface

The RTVision.t V4 Sensor is installed in the robot cell. If a break occurs in the safety circuit of the robot cell during regular production operation, this may give rise to unforeseen continuous operation of the sensor lighting. This also causes a significant and permanent increase in the heating of the sensor housing. The unintended continuous operation of the sensor is ended after five minutes by the internal safety cutoff. This time frame can be changed in consultation with QUISS personnel. Should it be necessary to dismantle the sensor, it must first be switched off (including the strobe controller) and work continued using suitable personnel protection equipment (PSA).

Responsibility of the operator

The system is used in the commercial and industrial sector and integrated in an existing system. The operator is therefore bound by legal obligations to comply with standards and work safety regulations and to observe the safety, accident prevention and environmental regulations valid for the area of application of the system. Claims of any kind due to damage resulting from improper use are excluded and the operator alone is liable. Furthermore, the operator is responsible for intercepting signals issued by the system as envisioned and to integrate these signals in his system control and process them. The image processing system is parameterized in accordance with the quality assurance thresholds prescribed by the customer/operator. Subsequent changes to these thresholds are not the responsibility of the QUISS GmbH.

Precautionary measures during use



Danger of electric shock.

High voltage - Danger of electric shock.

Some of the components operate under high voltage. Disconnect the system from the power supply for cleaning and maintenance. In particular, always switch off the strobe controller before carrying out any work on the sensor.

Observe the supply voltage

Use the device only with the specified voltage.

Live cables

Do not damage, modify, over-bend, twist or pull the power cable. Do not place any objects on it and keep it away from heat (insulation could melt).

Damaged cables must be replaced immediately by trained staff or the QUISS service department .



Warning - Danger of electric shock and fire

Workplace - Danger of electric shock and fire

Do not use the device at locations with high humidity, high levels of dust or oily smoke/vapors.

Abnormal conditions - Danger of electric shock and fire

If smoke or noise develops, disconnect the device from the power supply immediately and contact the QUISS service department.

Foreign bodies/liquids - Danger of electric shock and fire

Never insert foreign bodies into the plug, slits or other openings. Never place drinks or other liquids on or directly beside the device.

If foreign bodies or liquids get into the device, switch off the power supply immediately and contact the QUISS service department.

Dropping/toppling and damage - Danger of electric shock and fire

If the device should topple over, be dropped or damaged, switch off the power supply immediately and contact the QUISS service department.

You must not reach into the RTVision.t system - Danger of electric shock and fire

Only QUISS personnel may install additional components.

Dismantling - Danger of electric shock and fire

Never dismantle or modify the device. To extend the hardware, contact the QUISS service department.



Danger - Electric shock during maintenance

Must be observed before and during system maintenance

- All maintenance work may only performed by qualified specialists. Observe the accident prevention regulations of the employers' accident insurance fund relating to work on electrical equipment in this respect and the safety precautions described here.
- The system must be fully de-energized before the control cabinet is opened. Please see the E-Plan for details of disconnecting from the mains supply. Before disconnecting the power supply, close the application as described above and shut down the Vision Controller PC properly.
- The complete system must be de-energized before working on the sensor (replacing the protective panel, screwing on/unscrewing). This especially applies to the strobe controller. Please see the E-Plan for details of disconnecting from the mains supply. Before disconnecting the power supply, close the application and shut down the computer.
- Before opening the computer housing ensure that the mains plug is pulled out and all cables to external devices have been removed.
- When changing computer components ensure that this does not release any static discharges.
- Never open the computer power unit. It does not contain components that require maintenance. System components may still be carrying life-endangering voltages even after the mains plug has been pulled out. If the power supply unit is damaged, have it replaced by an authorized expert.



Caution

Disconnect the device from the power supply if you are not using it for a longer period. If you replace or renew live cables, remember that the maximum cable length is 28 m or 30m.

At least once per year:

Remove the plug from the socket and remove the dust around the pins of the plug.



Caution - Observe the light source

Do not look directly into the LED light source!

Obey your sensitive eye reflex or natural aversion reaction and do not look into the sensor lighting.

Continuous or high frequency lighting can give rise to stroboscopic effects, which similar to shadowing, flickering or flashing can trigger epileptic seizures in at-risk persons.

Information – material damage

Operation of the system

- You should not make changes to parameters unless you have received instruction in the meaning of the individual parameters.
- If you have made changes to parameters, do not forget to save or accept them.
- If you want to switch off the system, do not simply turn off the computer. First close the application properly and then shut the computer down.
- When using high image frequencies, the software takes up considerable system resources. The system is designed accordingly. However, additional programs and/or tasks can interfere with the inspection and teach-in process and should therefore be avoided at all costs. If you have to run other software in parallel with RTVision.t then contact QUISS GmbH beforehand (see [Contact](#)^[212]).
- Back up the system regularly, as the content of the memory could be lost or changed due to a malfunction or repair of the device.
- Do not subject the system to any excessive electrical or magnetic fields that could be caused by electro-welding, for example.
- When operating the RTVision.t system, note the regulations concerning the environmental temperature. Do not subject the system to excessive heat or cold. Ensure that there is always sufficient fresh airflow for the computer and control cabinet.

- Do not operate the system in a contaminated or dirty environment, or in damp or heavily particle-laden air conditions.
- The device is suitable and has been tested for a power supply of 230V at 50Hz. Manual setting is therefore not necessary. Remember that the maximum cable length is 30m.

Transport

- The RTVision.t must never be moved when it is switched on.
- Use only the original box/packaging material to transport or ship the device.

Intended use¹⁰

The RTVision.t system is used to inspect and document glue beads with digital imaging methods for errors, interruptions or deviations. To do this, before starting operation, the parameters for detecting errors must be defined in the application software of the RTVision.t system in accordance with the customer's specifications.

- The product is state of the art and is safe to operate.
- If the product is not used properly or not used as intended, this could result in a dangerous situation.
- Unauthorized modifications and/or changes to the product are not permitted for safety reasons.
- The RTVision.t system may be installed, operated and maintained only by trained and authorized personnel.
- No permanent workplace is intended on the system with this product. The product can generally be operated in automatic/normal operation without permanent supervision.

1.1.1 ESD information

Electronic assemblies with integrated circuits are very sensitive to excess voltages and electrostatic discharges.



Caution - Material damage

Electrostatically sensitive assemblies can be destroyed by discharges below the human perception threshold. These discharges occur, for example, by touching an assembly or its connections. The damage can also occur after a long operating period.

Fundamental precautions for electrostatic discharges:

- Ensure good grounding when handling assemblies (e.g. during maintenance, replacing components, cleaning and similar work)
- Avoid touching contacts or electric components
- If measurements have to be carried out on assemblies, the person carrying out the task must ground him or herself beforehand, e.g. by touching a grounded metal surface or by wearing suitable ESD-capable shoes.
- Note Always observe the occupational safety regulations at your workplace.

1.2 Copyright

This manual remains the copyrighted property of QUISS GmbH. This system is entrusted to the customer as stipulated in the contract. These documents may not be duplicated or made accessible to third parties (in particular to competing companies) in whole or in part without the express consent of the manufacturer.

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1.3 Disclaimer

Changes, usage

The information contained in this document may change without prior notice.

Copying or reproduction in any form is strictly prohibited without the written authorization of QUISS GmbH.

Important information about deviations

This manual describes the application software RTVision.t for use with one physical sensor (with fixed working distance) and is valid for RTVision.t Version 4.6.

Because of different versions or specific on-site requirements, there may be differences in the content (including pictures) between this description and the system that is installed locally. The values in the picture are not data that you should use in your system as guide values.

The RTVision.t system is dependent on the signaling control unit (robot, glue process, higher-level PLC), which requires special technologies from the manufacturer depending on the complexity of its use. These are described separately as regards the settings in the application software and should be obtained from QUISS GmbH if necessary.

The RTVision.t system may be installed, operated and maintained only by trained and authorized personnel.

Based on our experience, we consider this online help to be as comprehensible as possible and will provide you with comprehensive support for any problems and questions that may arise. However, there is always room for improvement. If you notice any mistakes or ambiguities, please let us know so that your practical experience can help us to improve subsequent versions.

Warranty

QUISS GmbH does not accept any responsibility for damages caused by errors or omissions in the information provided in this manual.

QUISS GmbH does not provide any guarantee for damages that are caused by improper use, non-observance of the safety and maintenance regulations or by unauthorized modifications.

Intended Use

The RTVision.t system is used to inspect and document glue beads with digital imaging methods for errors, interruptions or deviations. To do this, before starting operation, the parameters for detecting errors must be defined in the application software of the RTVision.t system in accordance with the operator's specifications.

The RTVision.t system may be installed, operated and maintained only by trained and authorized personnel.



Warning

The device may be used only for the applications described in the technical description and only in combination with third-party devices and components recommended or approved by QUISS GmbH . For the product to work error-free and safely, it must be transported, stored, installed and assembled properly and be operated and maintained correctly.

If necessary, the customer should change system settings and the user management to suit its requirements. However, this is to be done only by arrangement with QUISS GmbH so that no settings are made that could damage the system or affect its performance.

Chapter 2

Introduction

2 Introduction

2.1 Short description – Technical requirements

The bonding or sealing of components as a replacement or complement for other joining techniques is commonplace in a broad range of industries. Both methods can be used to join a wide variety of materials, often with the help of robots. Despite cutting-edge application technologies for glues and sealants, it is often not possible to keep process parameters constant. Since bonds and seals require absolute quality, automatic process control is required.

The online glue and sealant application inspection system RTVision.t is a 100 percent inspection system. The user sets all the parameters once and then the online inspection system performs a fully automatic visual inspection of the glue or sealant application during the actual application process.

The .t stands for "TRACKING"



Unless otherwise noted in this manual, the term "glue" can also be replaced with "sealant".

The system inspects the following characteristics:

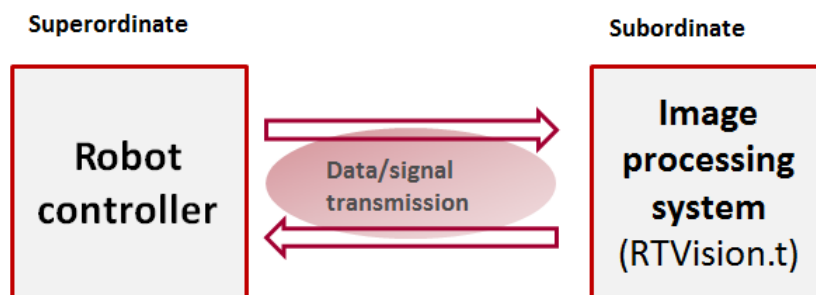
- glue bead width
- glue bead continuity
- glue bead position relative to the applicator nozzle
- glue bead position relative to a component edge (reference, option of parameterization)
- glue bead distance from a component edge (double reference, option of parameterization)

Hence, the system contributes to ensuring the rigidity, solidity, leakproofness of the joint and ensures a defined crash behavior. Performing the inspection during the actual application process avoids additional inspection times and bulky inspection setups.



The term "CONTROLLER" is used in this manual to mean the robot controller or the feed controller (adhesive application controller).

While the image processing system RTVision.t communicates with the robot controller and/or glue controller, it is always the subordinate system here.



The online inspection system RTVision.t must be able to communicate with the robot controller for the purpose of exchanging various signals and data.

The signals are used, for example, to transmit:

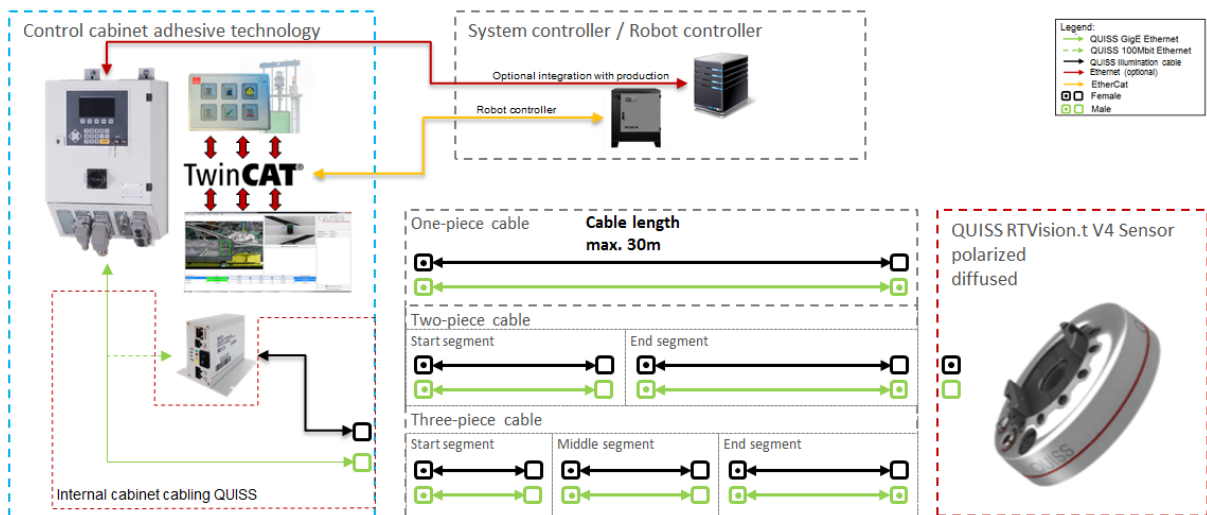
- Inspection results

- Start / stop events or
- General system messages and data

Communications is via fieldbus systems (e.g. ProfiNET, ProfiBUS, Ethernet IP, CANopen,...)



Please note that for parameterization in RTVision.t, the system must be already finally functional. Robot speed, glue control and travel paths must be installed as defined in the production conditions so that final parameterization of the products can take place in RTVision.t. If the robot speed is changed, for example, following parameterization, the product must be taught in again, re-parameterized if necessary and the error map adapted to the new start positions of the areas.



Example of an integrated monitoring system according to customer specification

Technical requirements

The potential applications of the online inspection system are dependent on the shape, color and surface structure of the component, the type of glue application, properties of the glue as well as the guiding of the nozzle during the application of the glue.

A detailed feasibility study therefore has to be performed based on original components and glues prior to configuration of the inspection system.

The sensor, which is positioned vertically with respect to the glue bead, should ideally be parallel to the surface of the component while the glue is being applied. Slight tilting of the sensor is possible (max. +/- 8°), but not usually practicable owing to the dependency on the component surface, the component geometry and the condition of the glue.

Owing to external influences (e.g. strong light changes, different metal sheets, degree of oil contamination or basic contaminants), deviations can arise in practice in the image processing system. The light conditions in the robot cell must therefore no longer change significantly following the initial configuration of the system, as they could otherwise falsify the image recording.

The RTVision.t system is an online inspection system, which performs the image recording directly after the application of the glue, which means that the robot should be moved on approx. 2-3 cm after the glue application nozzle is switched off in order to also record the end of the inspection track. This area can be parameterized separately in RTVision.t so as to allow the complete inspection track to be checked.

Operating system

The RTVision.t system is developed as standard for use on Windows operating systems in versions Windows 7 / Windows 10 with 32 / 64 bit.

The license check for RTVision.t is carried out either on the basis of an appropriately configured dongle or via installed license files, which are stored by the QUISS service department on the server by means of license software.

2.2 Layout of Operating Manual

This manual is divided into the following sections:

Foreword

Contains information on copyright, safety instructions (please note!) and disclaimer

Introduction

Brief description of the image processing system and the manual structure.

Function overview

Basic information on the main functions of the image processing system. This can be very helpful in understanding how the system works.

Quick start

Description and sequence of simple parameterization in step-by-step instructions. The individual dialogs and detailed parameterization options are described in the next sections.

Configuration mode description

Detailed description of the functions and control elements in configuration mode (RTVision.t client).

Automatic mode

Detailed description of the functions and control elements in automatic mode (RTVision.t server)

Results evaluation

Description of the results evaluation and its tools

Communication

Description of the communication interface.

Appendix

Maintenance, sensor replacement, error messages, glossary, contact

2.3 Using the online help

General

We believe this online help is as comprehensible as possible and will provide you with comprehensive support for any problems and questions that may arise. However, there is always potential to improve. If you notice any mistakes or ambiguities, please let us know so that your practical experience can help us improve subsequent versions (you will find contact options at [Contact](#)²¹²).

We cannot accept any liability for any errors that may appear in this manual or for any operating errors of the inspection system that may result from this.

We appreciate your understanding in this respect.

Calling up the online help/structure of the online help

The online help is called up with the **F1** key. The help is available in both automatic mode and configuration mode. The online help is opened as an HTML manual and contains no context-sensitive help.

The best way to find what you are looking for is via **SEARCH** and **LIST TOPICS** or **DISPLAY**. In this way, you discover more about the term you are querying in different contexts.

If you follow the links in the individual help topics, click **BACK** to return to the previous start pages.

In addition to explaining the individual functions, this manual also provides a description of the basic functions and sequences in the section "Quick start" to get you up and running with our product. You will also find a brief explanation of frequently used terms in the help function in the glossary.



Navigation

Navigation buttons are provided in the top right area of the online help. Use these buttons to open the different pages of the manual. They are used to call up the previous and following help topic as well as to return to the start page. The navigation bar is always visible at the top right-hand side of the window.



Notation/symbols

Within the manual, special parts of the text are marked as follows:

	The exclamation mark indicates important information that you must take into account.
	Further tips and information for faster and easier use
<i>Button</i>	Buttons and names of buttons are shown in bold + italics.
Window name	Names from the program, e.g. tab name, dialog name, list entries, etc. are shown in bold. Words separated by describe a menu path for selection.
<i>test.appl</i>	Files or directory paths and menu entries are shown in italics.

Chapter 3

Function overview

3 Function overview

3.1 General – New functions

RTVision.t consists of the following components:

- RTVision.t (Server)
- RTVision.t (Client)
- RTVision.t (Viewer)
- RTVision.t (Export)

On the RTVision.t (Server) component runs the online adhesive application inspection system in automatic mode.

The RTVision.t (Client) is used to parameterize the system. Communication between RTVision.t (Server) and RTVision.t (Client) takes place via a TCP/IP connection, which means that RTVision.t (Client) can also be on a remote computer and the parameters can be optimized in parallel with production.

The actual parameterization of the software is performed in configuration mode (Client). This involves setting all the measured variables required to inspect the workpieces in automatic mode (Server). The application is transmitted to the server at the end of the parameterization and only then enters the test process.

The actual glue inspection is executed in automatic mode. This involves checking the glue bead in the current image and comparing the visual measurement results with the specifications. The application file defined via parameters in configuration mode (Client) is accessed by default for this purpose and the inspection results are transmitted to the higher-level controller. The results established online (OK, NOK, WARN) are shown on the screen while the inspection by the server is ongoing.

The RTVision.t (Viewer) is used to visualize measurements and show them in specially prepared graphics – historical data series can also be imported from report files.

The RTVision.t (Export) tool is used only for service cases, to export the associated data record after contacting QUISS service including all defined configurations. This data record is zipped and can be sent to QUISS by e-mail.

Which functions are new?

The most important new functions in Version V.4.6 as described here include:

- Sensor management is only active when there is a connection between the client and server.
- Manual calibration of the server is not provided for – the sensor is initialized (by the QUISS service department) at startup. The calibration data is stored on the sensor ex works.
- Diagnostic dialog for hardware problems in automatic mode (Server) under **Settings | Hardware state**.
- The hardware state is shown in the server dialog in the event of an error message.
- The total gap length for the product can be defined (Client).
- Predefined settings can generate the number of products, associated ID and inspections when the new application and product are created.
- Button for screen keyboard can be displayed (option)

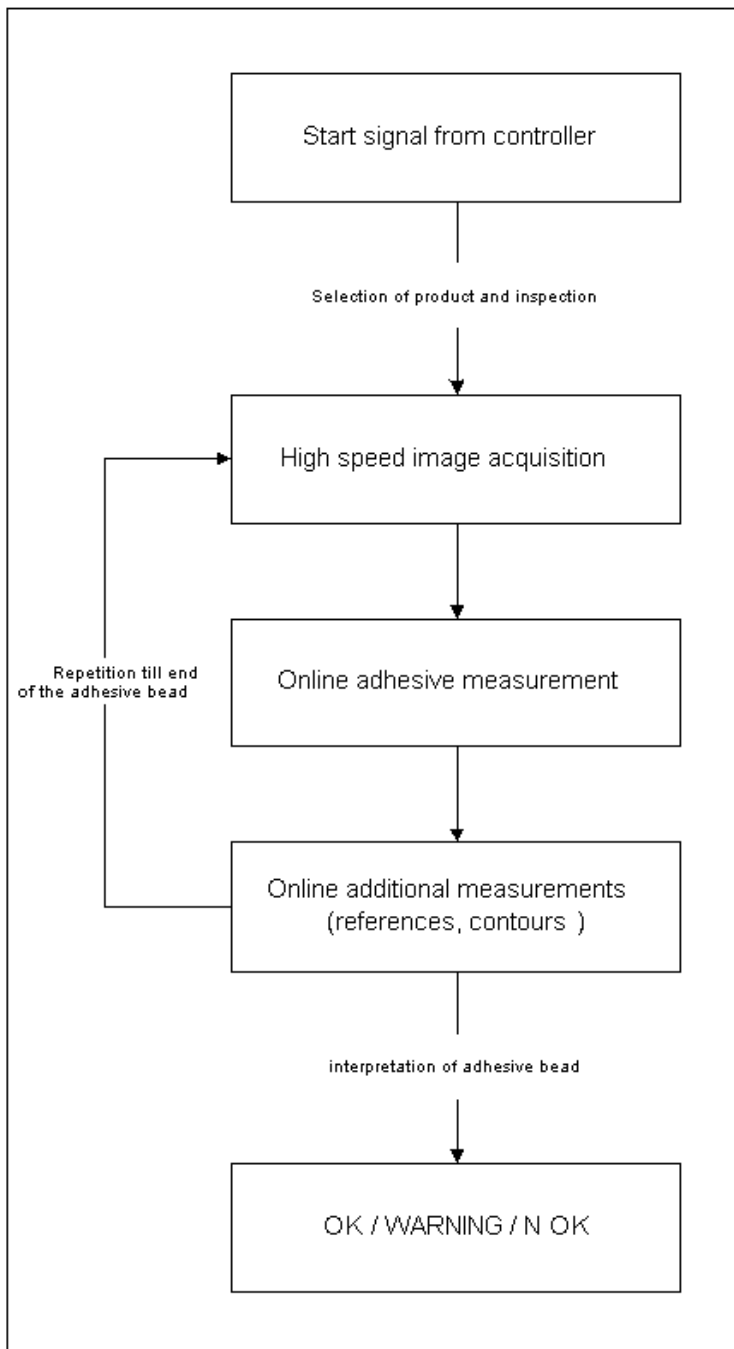
- Target inspection / sensor comparison with reference is possible
- Display of storage path in status bar
- Warnings and error image sequences are stored in separate folders
- Application files are stored in separate folders in client and server versions
- The display of the program version in the status bar is optional

3.2 Automatic mode (Server)

The actual workpiece inspections are performed in automatic mode²¹. This involves measuring the glue bead in the current image and comparing the measurement results with the specifications. The inspection file (the so-called application file) created in configuration mode is accessed for the inspection. The name of the current inspection file can be found together with the storage path in the status bar in automatic mode.

After the image processing software launches, the system is in automatic mode and is ready to perform inspections provided parameterization has been successfully completed.

The following overview shows the basic inspection sequence:

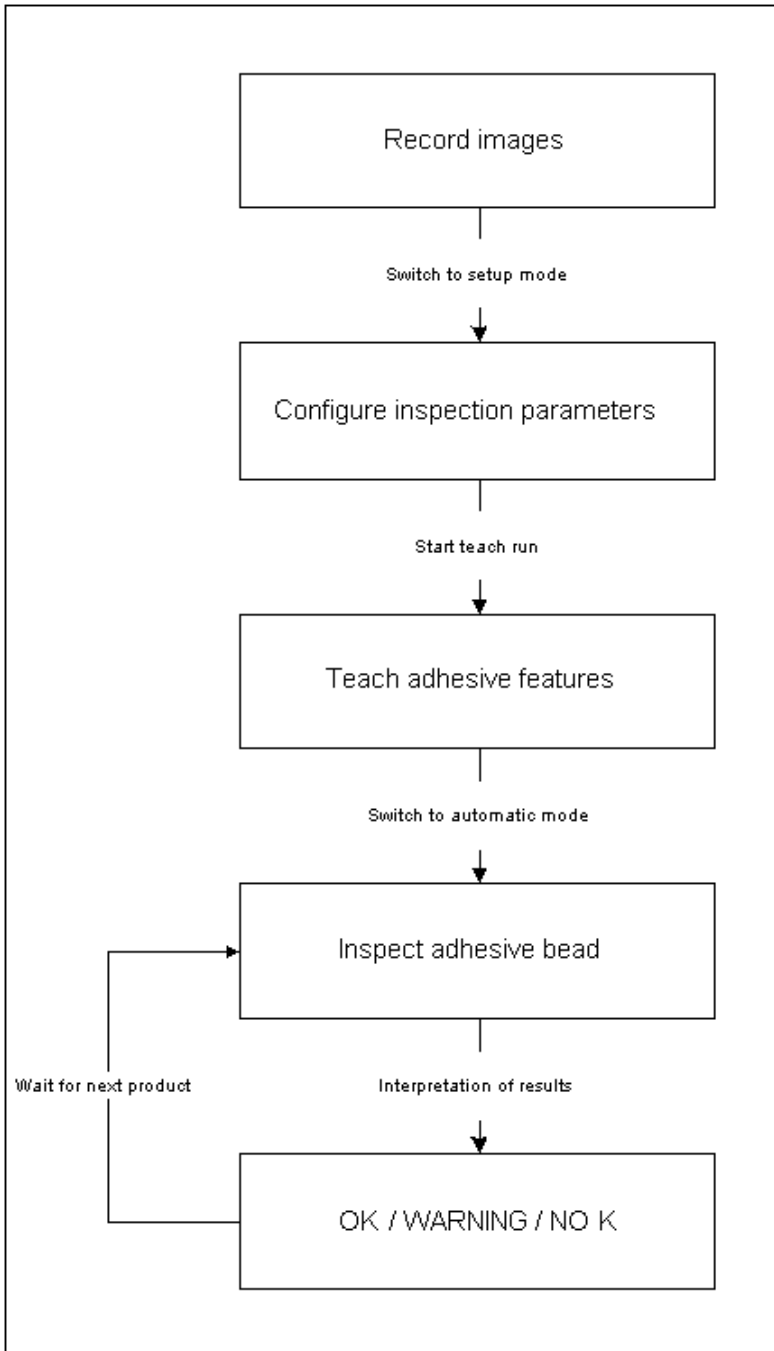


3.3 Configuration mode (Client)

The actual parameterization of the software is performed in [configuration mode](#)²². This involves setting all the measured variables required to inspect the workpieces in automatic mode.

Configuration mode is explained in greater detail in [Configuration mode description](#)⁵⁰. You will find details of how to switch to the client in the section [Change between server and client](#)²⁶.

The following overview shows the basic parameterization sequence: The application file currently open is displayed by name together with its storage path in the status bar of the client window.



3.4 Running the application software

The application normally starts automatically when the Vision Controller computer is turned on. If a manual start is required, start the program by double-clicking the RTVision.t (Server) icon on the Windows desktop (you will need to be logged in as a Windows administrator for this).

The application always starts in automatic mode and is ready to perform inspections once loading is complete.



The program can only be exited after entering a password. This must be set up via user management or by the administrator.

Products, inspections and other elements can be edited with the function buttons:

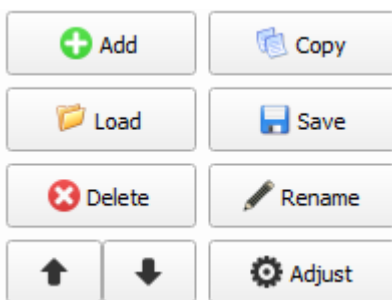


Fig.: Buttons for processing the products

Add

To create a new element, click **Add**. A new entry with a standard name and a consecutively numbered ID will appear in the list.

Copy

Use this button if you want to duplicate a product. The copied product is initially given a standard name (this can be changed).

Load

To load a product file, click **Load**. A selection window then opens. Select the directory containing the file to be loaded. Click the name of the file to be loaded followed by **Open**.

Save

So that the complete parameterization does not have to be created again when elements are similar, products, inspections, areas, references and contours can be saved and reloaded. This is made possible by the fact that a product always contains the associated inspections and areas (see [Application structure](#)²⁹). Saving is also recommended for backup purposes.

To save a product file, click **Save**. A selection window then opens. Select the directory where the file is to be saved together with its name. Then click **Save**.

Rename

To rename a product, select the required product in the list of products. Then click **Rename**. Change the name as required.

When the new name is created with Add, a default product name "Product_X" is offered by the system, though this can likewise be changed.

Delete

To delete a product from the list of products, first select the required product(s). Then click **Delete**. Answer the confirmation prompt with **Yes**.

Up/down arrow key

To change the sequence of a product in the list of products, first select the required product(s). Then click the required **arrow key**.

Adjust

You are brought to the next lower level in the setting options, which exist for the product or the inspection. You can also carry out the same step by double-clicking the product or the inspection.

3.4.1 Starting and exiting the application

The application normally starts automatically when the Vision Controller computer is turned on. If a manual start is required, start the program by double-clicking the RTVision.t (Server) icon on the Windows desktop (you will need to be logged in as a Windows administrator for this).

The application always starts in automatic mode and is ready to perform inspections once loading is complete.



The program can only be exited after entering a password. This must be set up via user management or by the administrator.

RTVision.t (Server) and client communicate with one another as soon as they are connected.

If both programs are open and the connection data (IP) is correct, the client and server are connected to one another by selecting **Connect**.

If the application is in automatic mode, the RTVision.t (Server) checks the product(s) using a parameterized application.

If the software is to be shut down properly, e.g. for maintenance or repairs, select **Exit program** on the RTVision.t (Server).

Approval by user management is followed by closure of the RTVision.t (Server).

The client can be opened via **Unlock configuration mode**.

Also select **Exit program** there and after the password-protected process has been confirmed, the RTVision.t (Client) is also closed.

If required, you can now shut down the computer.




Before replacing a sensor or carrying out other work on the sensor/camera or the cables, switch off the strobe controller (not via the software, but directly on the component). Make sure with all work performed on the sensor or in the control cabinet that the system is not live.


You will find further information on this in:

Care and maintenance¹⁹⁴


3.5 Switching between automatic mode and configuration mode

To do this, change from RTVision.t (Server), which performs an inspection in automatic mode, to the RTVision.t (Client), in which you can specify the precise definition of the application in configuration mode.


 You can optimize the parameters in configuration mode without interrupting the inspection currently being performed by RTVision.t in automatic mode. To do this, you need to switch from automatic to configuration mode.

 Check repeatedly which application is currently being processed; this is shown in the server and in the client in the status bar.

- Login: The user name and password are requested each time configuration mode is started or reactivated.
- To switch from automatic to configuration mode, click **Start configuration mode** in automatic mode or select **Settings | Configuration mode** in the menu bar.
- To switch from configuration to automatic mode, click **Lock program** in configuration mode or select **File | Lock program** in the menu bar. Configuration mode is automatically logged out for security reasons.

 The application file loaded in configuration mode is not automatically saved or accepted with **Lock program**.

- To exit configuration mode, click **Exit program** or select **File | Exit program** in the menu bar.

 Any changes not saved will be discarded. An appropriate message is shown first.

3.6 Directory structure / files

Directory structure

A fixed storage path exists on C:\QUISS..... by default. This is stored in the installation setup. The installation routine for RTVision.t creates the following directories:

Appl	Contains the application files
Backup	Contains the backups created automatically when a modified application file is saved
Data	Contains all other data saved manually by the user
Default	Contains the defaults for the area and reference properties
Error	Contains the error image sequences.
History	Contains the result logs
Image	Contains the image sequences used for teach-in
Ini	Contains the system configuration files (only for the QUISS service department) .
Log	Contains the files where the entries from the log book are saved
Report	Contains the result files and can be viewed for example with the RTVision.t Viewer.
Script	<p>Contains a deletion program, which is assigned a predefined start time by the configuration program of RTVision.t (a non-production time is recommended, for example Sunday / time). The program searches automatically in the background at the predefined time for files that fulfill certain deletion criteria (e.g. older than x days) and removes these from the storage location. Make sure to comply with the folder structure created during installation so that the program can access the specific deletion process via the relative path.</p> <p>For assistance with the configuration, please consult the QUISS service department.</p>
Sensor	Contains the sensor settings / calibration (only for the QUISS service department).
Statistics	Contains the files for the product and inspection statistics.
Warning	Contains the images that triggered warnings.

Files

The following file types are used by RTVision.t:

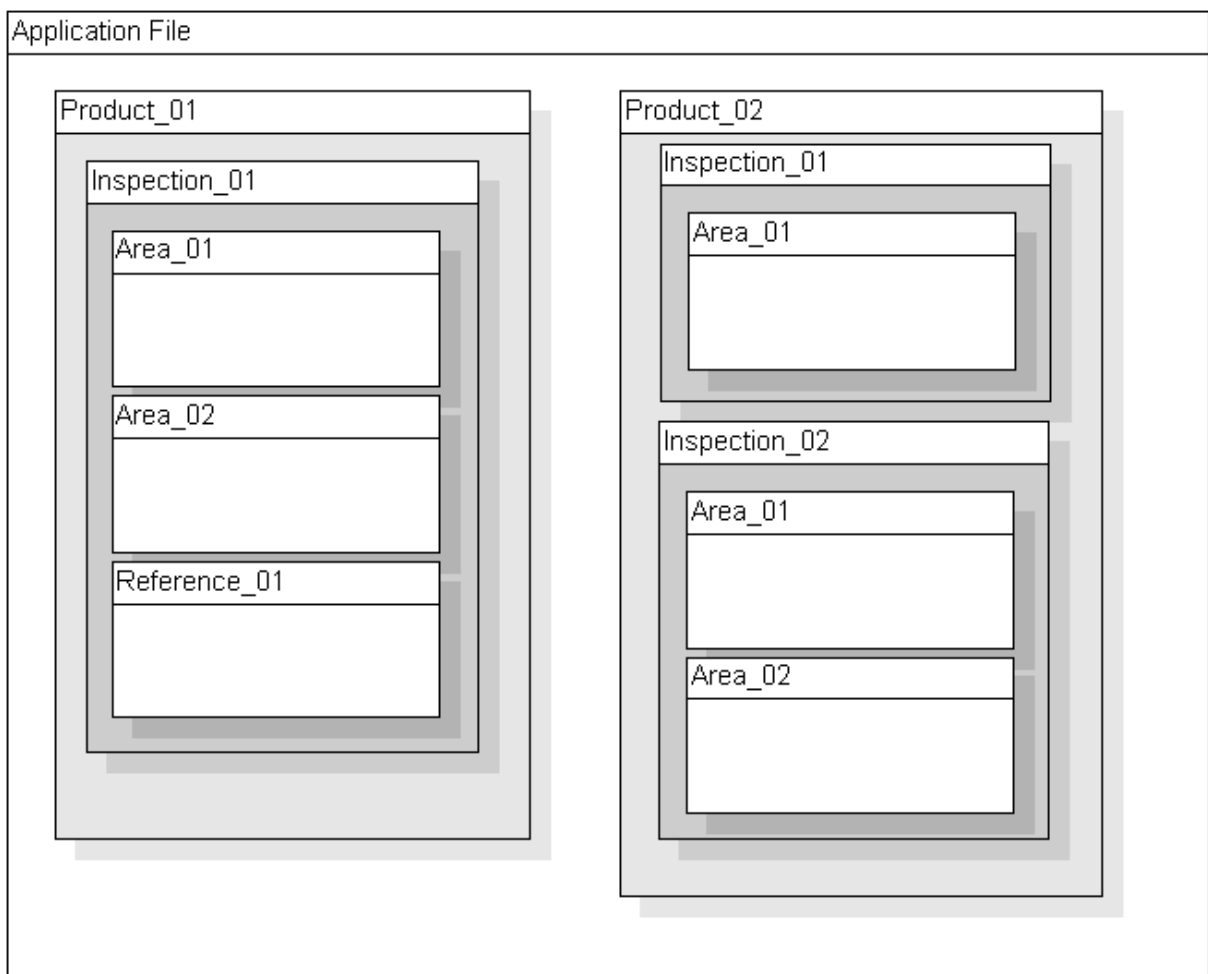
*.ini	Based on the configuration it contains, controls the behavior and communication of RTVision.t. Only for the QUISS service department. Under no circumstances should changes be made independently.
*.bmp	The individual images in the image sequences are stored in bmp file format.
*.appl	Contains the entire application, i.e. all the data required for the glue application inspection.
The following files can be created separately, although their information is always also contained in the application file (*.appl).	
*.prod	Product file
*.insp	Inspection file
*.area	Area file
*.ref	Reference file
*.sen	Sensor file
*.exp	Exposure file
*.cont	Contour file
*.xml	Contains distance/time information for the individual images in the image sequences

3.7 Application structure

An application basically contains the following parameter sets:

- Products
- Inspections
- Areas
- Contours
- References
- Exposure control

The hierarchy of the parameter sets looks as follows:



You will find further information on this in:

Directory structure / files^{D27}

Application file

The application file combines all the data and parameters required for the inspection.

Products

Products are the first parameter group beneath the application file. A product basically corresponds to a workpiece type. Each application must therefore contain at least one product. If a station processes different workpiece types, they can be created as individual products.

Example: Product_01 = front left door; Product_02 = front right door.

Two products were used in the illustration on the previous page. Each product is assigned a product ID (1-255) that can be used by the higher-level controller to select the product.

The component images used for the error map in automatic mode are also stored in the products. The glue bead can be edited in a subsequent step.

You will find further information on this in:

[Product overview](#)⁵⁰

Inspections

One or more inspections are created within a product. An inspection is normally created for each glue bead applied to the component. Each product therefore contains at least one inspection. In the example above, the first product contains only one inspection while the second product contains two inspections.

More than one inspection will be required if the glue bead applied to a component is not continuous.

There is no need to create separate inspections when using different tolerances for inspecting specific areas within a glue bead. Inspections themselves can be divided into defined, freely selectable areas. References can also be created within an inspection.

Any number of inspections can be created, however they are always subordinate to a product. They are therefore managed within a product. Inspections are automatically saved when the associated product or the application is saved.

You will find further information on this in:

[General information about inspections](#)⁶³

Areas

Areas are created within an inspection. An area contains, among other things, the error tolerances and the image processing parameters required to locate the glue bead in the image. At least one area must be created per inspection, although there is no upper limit.

If different tolerances are to be used within a glue bead inspection, this can be achieved with any number of areas.

You will find further information on this in:

General information about areas⁷⁵

Individual references

References can be created within an inspection, however they are not absolutely necessary.

References are used to check the position of a component edge relative to the nozzle at specific points. This is done by setting references at these points. Any number of references can be created within an inspection. Good contrasting cut edges on the component can be used as a feature for references.

Error and warning limits are also created for references. A reference containing errors will lead directly to an overall result of NOK.

You will find further information on this in:

General information about references¹⁰⁶

Double references

Double references can be created within an inspection, however they are not absolutely necessary.

They consist of a primary reference and an additional reference and are used to measure the distance from the glue bead to another edge at specific points. This is done by setting double references at these points. Any number of double references can be created within an inspection. Any edges (e.g. component edges) can be used for measurement purposes.

Error and warning limits are also created for double references. A double reference containing errors will lead directly to an overall result of NOK.

You will find further information on this in:

General information about references¹⁰⁶

Synchronization references

Synchronization references can be created at the start of an inspection before an initial measurement – e.g. in an area – is performed. They increase the repetition accuracy of the measurements; however, they are not absolutely necessary for an inspection.

Any reference at the start of an inspection before an initial measurement and defined in the direction of travel can be used as a synchronization reference. It is used to synchronize the position of the inspection system and the robot, which permits a more precise evaluation of the glue bead.



The quality of the evaluation may be significantly impaired if a synchronization reference is not set up correctly. It is therefore necessary to ensure that the general conditions are adhered to when setting up synchronization references.

You will find further information on this in:

General information about references¹⁰⁵

Exposure control

Exposure control is necessary if workpieces made from different materials (e.g. Usibor, galvanized sheet metal) with different reflective properties are to be inspected. This makes it possible to control the exposure time of the cameras and therefore the brightness within an inspection.

3.8 Image structure / image sequences

Camera arrangement

The diagram below shows the arrangement of the camera images around the glue applicator nozzle. The red (dashed) line shows the switching threshold from one camera to the next.

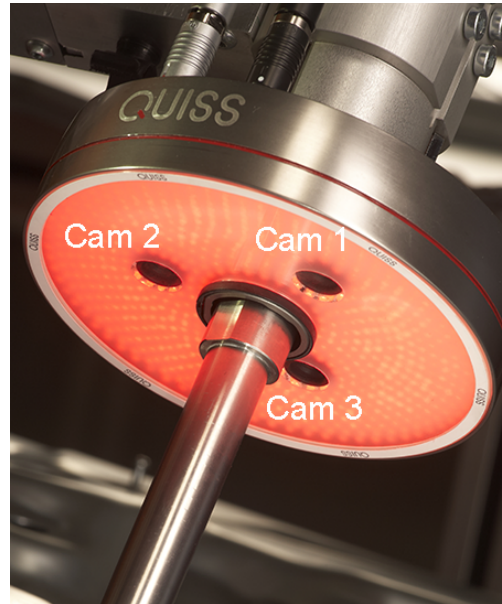
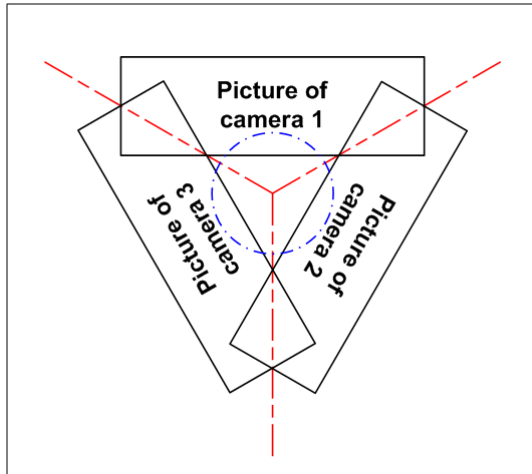


Fig.: Schematic arrangement of the cameras in the Sensor RTVision.t V4

Images

The online sensor contains three cameras arranged at 120° to each other to provide the 360° degree view of the glue applicator nozzle required for the online inspection of glue or sealant application. The images recorded by these cameras are simultaneously transferred to the vision controller over a Gigabit Ethernet interface at a frequency of 200 Hz (equivalent to 1 image every 5 milliseconds).

At least one of the cameras is always behind the applicator nozzle to record images with glue.

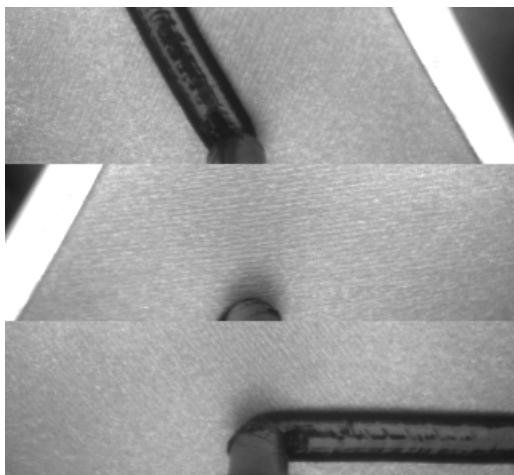


Fig.: All three cameras transmit the images at the same time.

You will also see in the diagram above that the camera images overlap. This is necessary to ensure reliable recording of the glue bead at all times. This is why the glue bead can be seen in two camera images in the example above.

Image sequences

The high image frequency results in a large number of images that are managed as image sequences in the image processing software. An image sequence can be considered a kind of film consisting of a large number of individual images. The distance / time information for each individual image in a sequence is saved in an auxiliary XML file for each sequence.

3.9 Inspecting the glue bead – Methodology

The methodology for glue bead detection can be configured in many ways to achieve optimum results.

Edge detection:

For RTVision.t a glue bead essentially consists of a pair of edges. The transition from light to dark (or vice versa) between two image regions is referred to as the edge. When searching for a glue bead, therefore, the system is actually searching for two edges with inverse light / dark transitions.

During the search, all the edges that are detected are evaluated via rating functions⁸² with certain probabilities. The glue bead is formed by the two edges with the highest probability rating.

Brightness analysis:

Under certain circumstances it may happen that the sealant is applied in such a way that the inspection system cannot detect the edges.

As an alternative to the edge detection method described in the previous section, an option exists to perform a gray level-based brightness analysis in designated areas. This makes it possible to inspect glue beads even without detecting edges. This inspection method is useful for checking the continuity of the applied glue bead in places where there are no discernible bead edges (e.g. narrow housing flanges).



It does, however, require a difference in contrast between the glue bead and the component surface (i.e. the brightness analysis alone is not suitable for "black on black")

In such an area, the glue bead is only defined using the gray level, i.e. it is not possible to check the width and position of a glue bead. For that reason, the inspection is limited to a continuity check.

Glue measurement:

The actual glue measurement is carried out within a configurable opening angle (from the glue nozzle) and within a limited selectable search radius.

Glue model:

RTVision.t uses rating functions to identify the pair of edges corresponding to the glue bead from the multitude found in the image. These rating functions⁸² are described as the "glue model".

The glue model defines the possible properties of the glue in the respective area. This is necessary so that the software can select the correct edge pair belonging to the glue from the multitude found in the image. For example, it defines which widths could qualify as glue.

Chapter 4

Quick start

4 Quick start

4.1 Sequence of the individual steps



Condition: The hardware (camera and strobe controller) and sensor are configured successfully in the server module by the QUISS installation and commissioning department. The section [System variants](#)¹²⁷ provides a brief overview of the work performed in this regard.

Before starting to configure the application in the RTVision.t (Client), it is advisable to clarify how many products (component types) will be set up and how many inspections (beads) they include.

All sensor data and the parameter data for the products is contained in the final *.appl file to be transferred.

Procedure for commissioning software – teaching in products

Step 1: Basic activities

- Create application and products
- Create inspection
- Record image sequence
- Configure the product image (provisional)

Step 2: Parameterization

- Define parameters

Step 3: Optimization

- Test and teach in parameter settings
- Perform navigation run
- Adapt the error map

1. Establish a connection to the application (Server) (click **Connect**)
2. Configure the sensor in the client: **Settings | Manage sensors | Add sensor | Adjust | Activate sensor link**.
3. Create the individual products and the corresponding inspections. When configuring a product, the product ID (1-255) should also be assigned. The ID uniquely identifies the component type and is required for selection of the product by the controller.

Target inspection (option): Note the special use of predefined IDs for the target inspection (optional function). It should be performed every time a component is replaced mechanically (e.g. robot, applicator head, gripper, sensor), when changes are made or could be made within the system.

The automatic request to perform the inspection based on the predefined product ID is implemented in the communication remote station by the plant manufacturer. In the event of a second dispenser, an additional product ID is defined accordingly. The inspection can operate cyclically, for example, via the PLC, with parameterizable cycle times. If a deviation occurs during a routine inspection, the

magnitude of the error must first be estimated and, depending on the result, the sensor head checked for example. Apart from the sensor, the other mechanical components also have to be considered as potential causes of the error message.

4. Record the image sequences in RTVision.t (Server) for the defined products.
5. Load a product image and set up the glue beads (provisional link to the image sequence – see item 10).
6. Load an image sequence in RTVision.t (Client) for a previously selected product within an inspection.
7. Set up the glue and position checks by adding areas and references for each inspection (define parameters).
8. Test and teach in the newly defined parameters.
9. Check the parameterization prior to handover to the server (negative run).
10. Synchronize the error map by ensuring the correct linking of the bead paths in the product image.
11. Transfer the application to automatic mode.

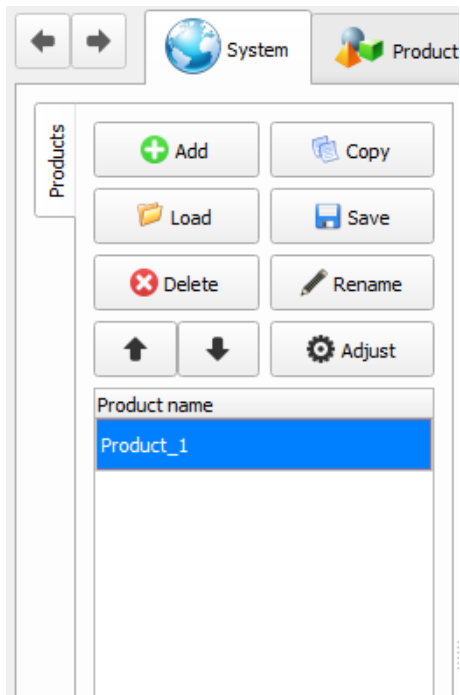
The system is now ready to perform an online glue inspection on the required product (component).

Any deviation from the taught-in parameters will be detected and evaluated by the RTVision.t server (OK, Warning, NOK, error).

If the thresholds are too small, the error definitions specify which tolerances will result in a warning or a NOK during an inspection in automatic mode.

Specification of the error definition and any changes within the system are the responsibility of the customer.

4.2 Creating the application and products



1. Switch from automatic to configuration mode (Client).
2. Select **File | Local application | New**. A new application is created.

If data is transferred initially from the robot controller to the image-processing system, the system uses the corresponding defaults and the associated *Presetting* dialog is displayed when the new application is created.

3. Click **Add** to create products.
4. If necessary, edit the product name with **Rename**.
5. The sensor is selected in the Settings menu (along the right-hand side) or will have been selected automatically if the sensor already has a default setting.

Select a sensor if necessary and assign the corresponding product ID.

Sensors can be created and managed in sensor management under **Settings | Manage sensors**. More information in [Sensor management](#)¹²⁵.

You can also decide whether data storage should be activated / deactivated for the selected product and specify the data storage frequency.

Example: "10" means that the data for every tenth component of the same product is saved.

If additional functions are activated, such as the optionally available target inspection (sensor comparison) or the repair function (repair settings), they will likewise be offered as a checkbox to be marked.

You will find further information on this in:

[Save result data](#)¹⁶⁸

[Menu commands in the system overview](#)¹⁵³

4.3 Configuring the product image

There are settings which should be made for each created inspection, but which are not absolutely necessary for the actual inspection process. They mainly refer to the error map. They can be ignored if the error map is not to be used.



In order to help the worker locate the error on the component in practice, it is strongly recommended to make the settings described here.

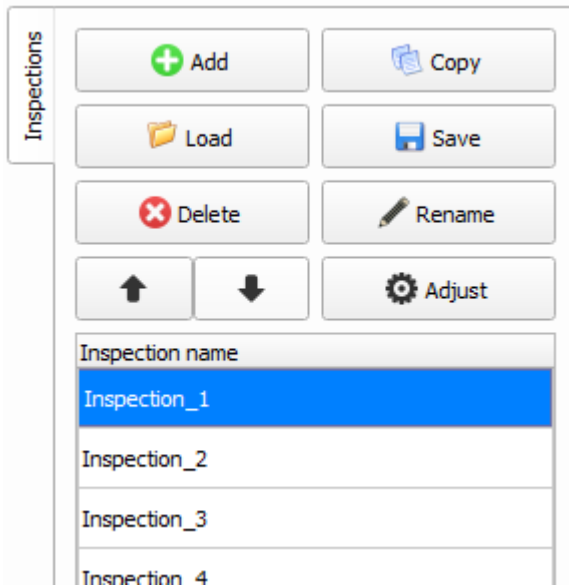
An appropriate product image must be stored before the error map can be used (file format *.bmp, *.jpg or *.png). The position of the individual glue beads on the product image must then be drawn in (bead path). This bead path / inspection track must then be linked with the recorded image data.

It is only following parameterization that the product image is finally configured based on the start positions defined in the areas, so that an error map synchronized with the automatically executed test sequence is generated by linking with the positions of the bead path from the image sequences.

A detailed description of how to define and link the bead paths can be found in section [Configuring the product image and bead paths](#)⁶⁰.

On the *System* tab, click **Load product image** and select the associated product image. The product image is loaded and displayed.

4.4 Creating inspections

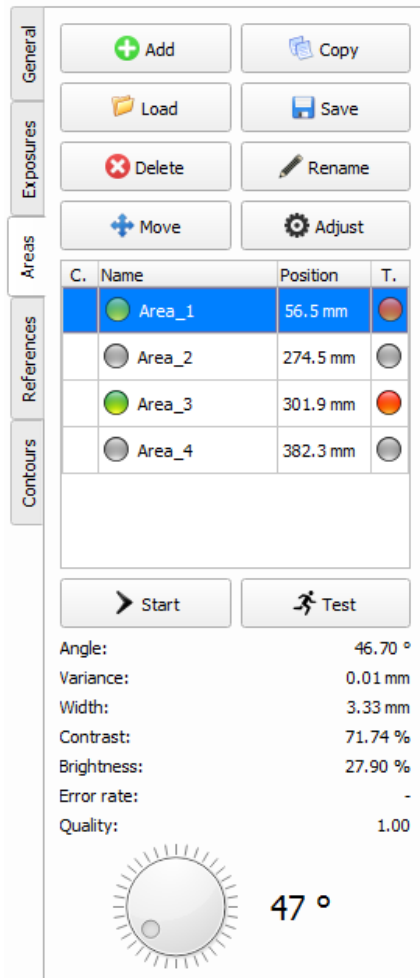


1. Go to the *System* tab. This brings you to the product overview.
2. Double-click the product where the inspections are to be created.
This takes you to the inspection overview.
3. Click **Add** to create the required number of inspections and rename them if necessary.
4. Select the inspection and click **Edit inspection track**. You can now create and edit the inspection track in the product image.
5. In Settings, define the other parameters in order to link the glue seam / inspection track with the associated inspection. Load the relevant image sequence.

You will find further information on this in:

Control elements in the product overview⁵⁷

4.5 Create areas – Standard method



For easier detection, glue bead detection is split into areas.

Each inspection can work with several areas. These include gaps in the glue seam / glue bead as well as different widths of sections along the bead.

Properties can thus be configured individually to suit the circumstances.

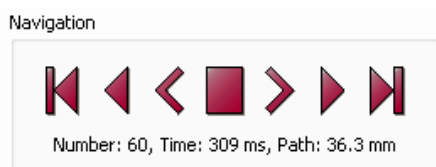
To do this, select the respective area and click "Adjust" to open the "Adjust area" configuration dialog.

The method described here assumes that the two edges of a glue bead can always be properly detected (edge pair detection)

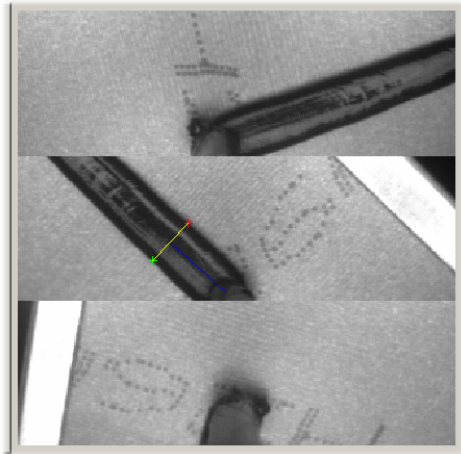
If edges cannot be detected uniquely, under certain circumstances, the method described in section [Creating areas by means of a brightness analysis](#)⁹⁷ may be used.

1. Switch to the *Areas* tab. The image sequence loaded in the previous step ([Create inspection](#)⁴²) can still be used.

2. With the [image navigator](#)⁶² go to the position where the glue application begins in the image and, with the mouse (tool), mark the glue orthogonally (vertically) to the direction of the glue application (see image below). To mark it, keep the left mouse key depressed.



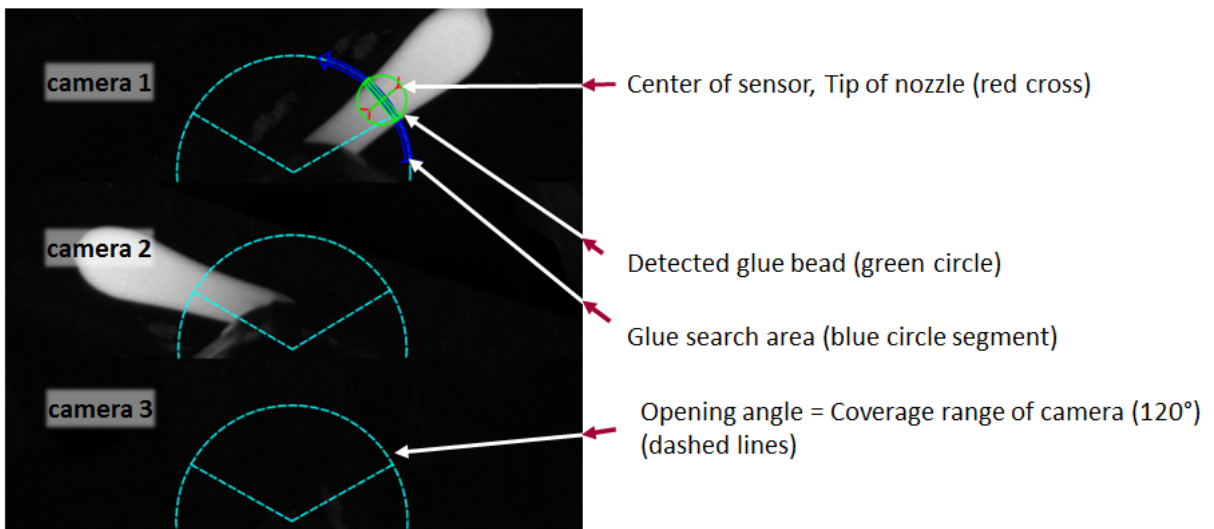
You can use the image navigator to scan the glue bead forward and back from the three camera perspectives via path / time observation.



3. Right-click and select **Create area** from the pop-up menu.

- If the glue was correctly detected (test run, angle adjustment), click OK to accept the area.
- If the glue was not correctly detected, the parameters (basic definitions, glue definitions, error definitions) must be adjusted.

Visualization and interpretation of the seam detection in the image sequence



You will find further information on this in:

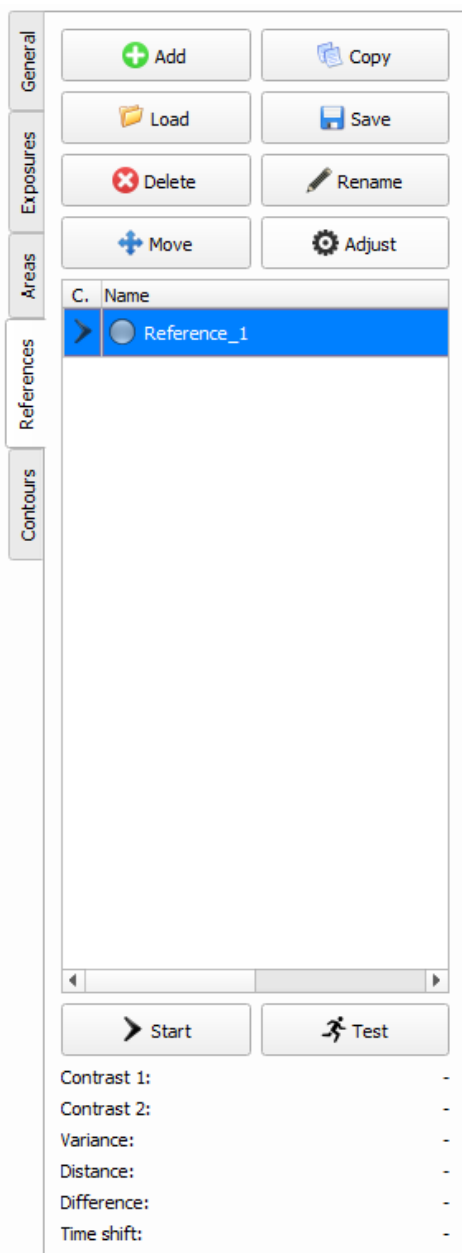
Settings for areas⁷⁷

Areas context menu⁹¹

Teaching in areas¹⁰⁴

Graphic display of the glue inspection⁹⁴

4.6 Creating single references



References can be created within an inspection, however they are not absolutely necessary.

References are used to check the position of a component edge relative to the nozzle. Like areas, references must be created and taught in.

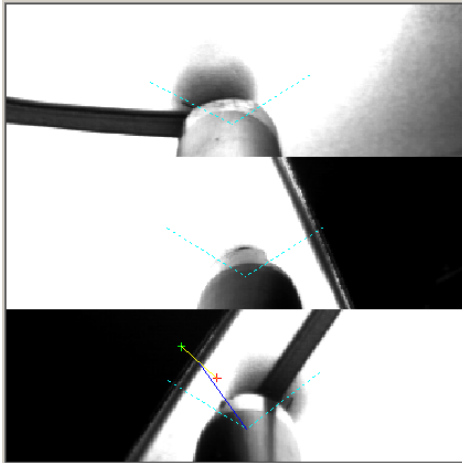
1. Switch to the *References* tab. You can continue to use the image sequence loaded in the previous step.

2. With the image navigator⁶² go to the position where the reference (unchangeable feature of the component) is to be created.

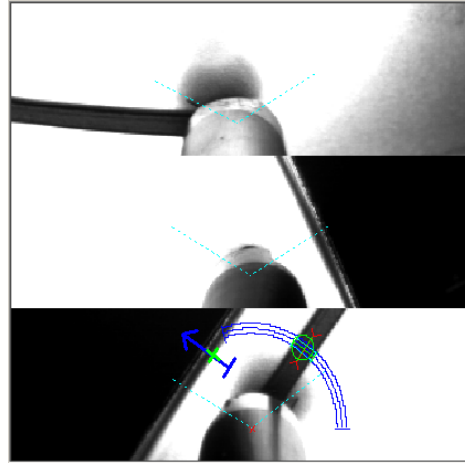
3. Mark the area where a reference is to be searched for (search area) using the mouse (measurement tool). The direction in which you drag the search area determines the search direction for the reference.

The length of the marked area represents the search window where the system will search for the reference edge.

The start and end points of the marking are indicated by a thin red cross or a thin green cross (see image on left).



Generating a reference



Reference found

The error definitions of the [reference properties](#)¹⁰⁷ define tolerances by default within which the reference must be found. The search area should therefore be extensive enough to contain these limit values.

4. Right-click and select *Create reference* from the pop-up menu.

- If the reference edge was correctly detected, click **OK** to accept the reference.
- If the reference edge was not correctly detected, the parameters must be adjusted. Then click **Test** to verify the parameters. If the reference edge is now correctly detected, click **OK**.

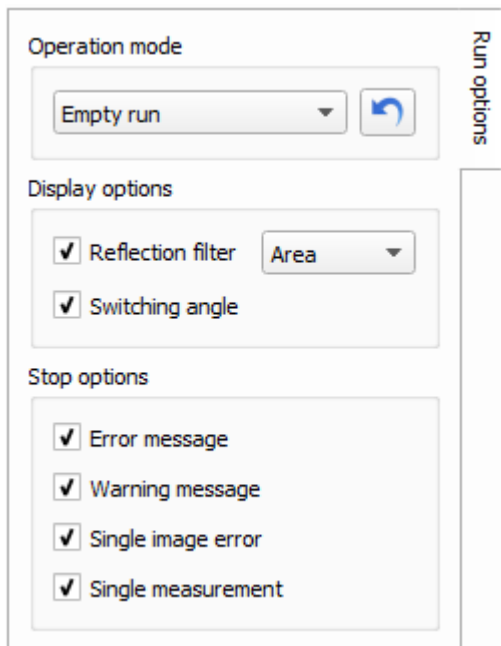
A correctly detected reference will be indicated by a thick green cross (see image on right).

You will find further information on this in:

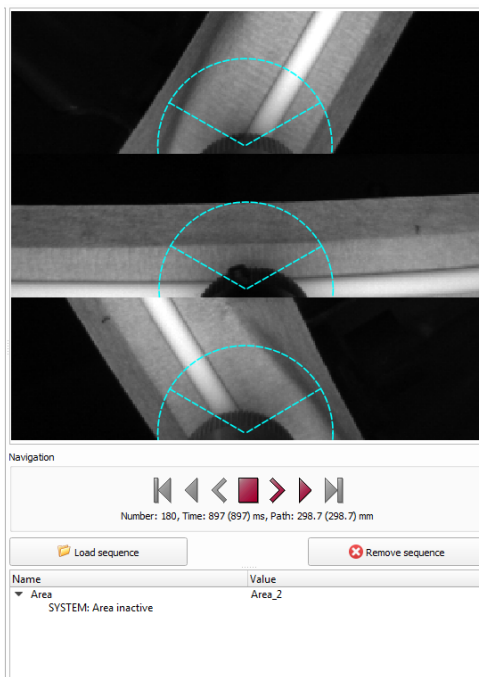
[Properties of references](#)¹⁰⁷

[Teaching in references](#)¹¹⁷

4.7 Testing and teaching in parameter settings



1. In [Run options](#)⁶⁹ select all options.
2. Select Test run as the Operation mode in Run options.
3. If references were created, the image playback stops at the respective places (only if Single measurement was enabled in stop options). Check whether the references were found (green cross on blue arrow) and continue the test run using the image navigator.
4. If the test run does not stop other than at the references, it means that all the parameters are correctly set. If it stops at a point where no reference has been created, it means that the parameter settings of the area in question need to be checked and if necessary corrected. The detected errors are shown below the [image navigator](#)⁶² in Messages.



Correct all the errors before continuing with the next step.

5. Teach in all the areas and references by selecting **Teach run** from the list under Run options, Operation mode. Wait until the entire image sequence has been taught in.
6. Finish by starting a measurement run to verify the teach-in run. To do this, select **Measurement run** from the list under Run options, Operating mode.

You will find further information on this in:

[Types of operations](#)⁶⁹

[Image navigator](#)⁶²

[Identifying and correcting parameterization errors](#)⁸⁷

4.8 Starting the inspection and evaluation

When the connection to the RTVision.t (Server) has been established via **Connect**, the application can be sent to the server with **Transmit application**.

If the robot controller sends the signal Product ON, the product image is shown in the server. If the robot controller then sends the signal Inspection ON, the automatic inspection begins.

All earlier measurements can be displayed and selected individually via **View | Display history**.

Double-click a selected measurement to start the RTVision.t (Viewer) . If you now select an individual inspection and click **Detailed view**, all parameters can be evaluated.

You will find further information on this in:

[Basic interface description](#)¹⁷⁹

[Configuration mode description](#)⁵⁰

[Automatic mode](#)¹⁴⁸

[View / delete history](#)¹⁷³

[Detail view in Viewer](#)¹⁷⁴

Chapter 5

Configuration mode description

5 Configuration mode description

5.1 General information about configuration mode (Client)

The product overview in configuration mode gives you a quick overview of the contents of a product. It also lets you do the following:

- Create / manage products
- Create / manage inspections, including areas, references and exposures
- Display / modify the product image (see [Configuring the product image](#)⁴¹)
- Load image sequences (see [Image sequences](#)¹⁶⁶)
- Create inspection-related bead paths as well as the associated links on the product image

Display in the status bar in configuration mode

To refer to a changed application or an application that is being changed, place "*" after the file extension .apl, which is shown clearly in the status bar displayed at the bottom of the screen in configuration mode.

The storage path of the application file is also shown here.

Save application

Saves the application currently being processed in the client (configuration mode) locally on the client. The application is not transmitted to the server (automatic mode) since the server and client are not connected to one another.

Transmit application

Transfers and saves the current application file loaded in configuration mode in automatic mode on the server.

This version is saved additionally in the client.

The **Transmit application** button is only available if a connection exists between configuration mode (Client) and automatic mode.

You will find further information on this in:

[Switching between automatic mode and configuration mode](#)²⁶



There must be an active connection for this. Check the client to see whether the connection is

marked active at the top right-hand side:



Lock program

Configuration mode can be locked following the password prompt. Automatic mode (Server) is also fetched to the foreground.

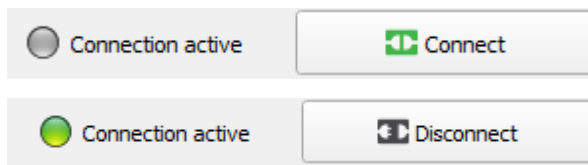
Exit program

Configuration mode can be exited with the button of the same name. Changes that have not been saved are rejected following appropriate notification.

The connection between the server and client is cleared down.

Server / client connection

If configuration mode is restarted, the connection to the server must be manually activated with **Connect**. It does not take place automatically.



Use the **Connect** button to establish the connection to the RTVision.t server.

A connection exists between the server and client. The connection is cleared down automatically when the program is closed or actively by pressing the **Disconnect** button.

Fig.: Status display and button for the server / client connection of the RTVision.t system

The connection must exist between the client and server to access the system defaults for creating a new product or a new application.

Display keyboard

This button allows the activated Windows keyboard to be displayed.

You will find further information on this in:

Using presettings⁵³

Deleting presettings¹⁵⁵

5.2 Client screen view

The image processing system can be used to inspect different components (e.g. "Left door", "Right door", "Tailgate", etc.), even if they are all processed at one station.

The component types can change in accordance with production requirements. Each component includes a series of variables to be inspected (parameters).

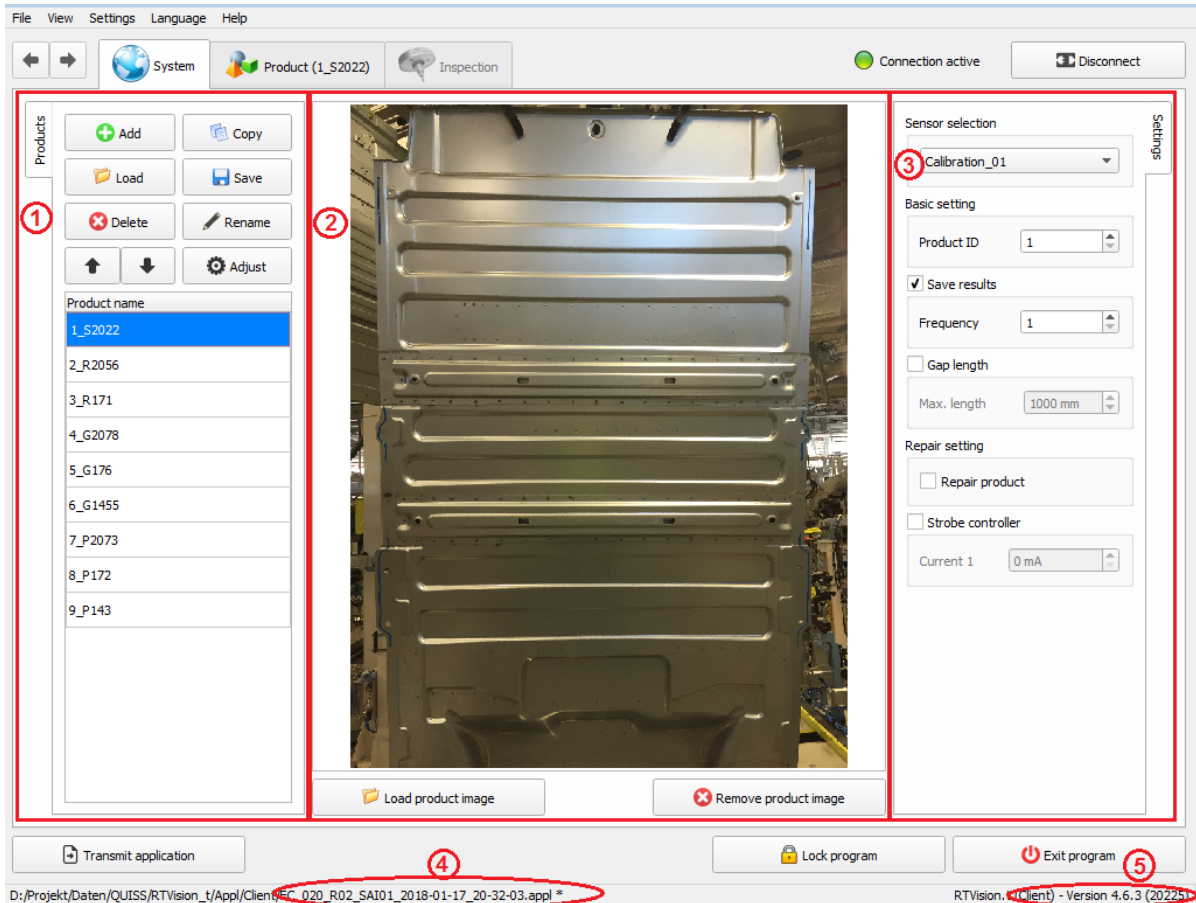


Fig.: Product overview in configuration mode (Client) – Screen layout

Screen layout – Listing on left 1

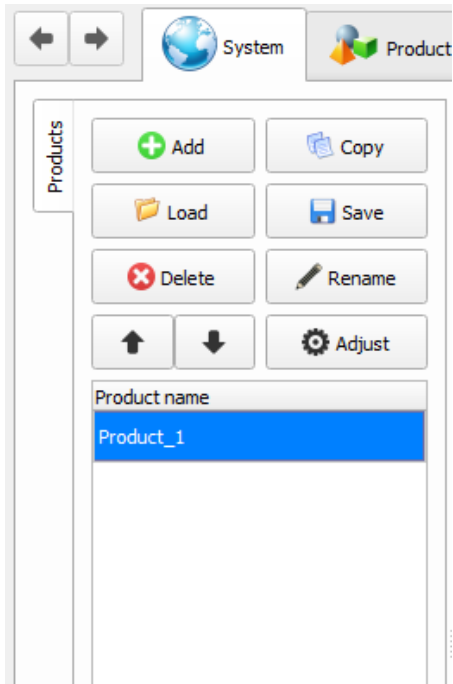
The list of created products, inspections, exposures, areas, references, etc. is shown on the left side of the screen.

The respective list elements can be opened and then processed accordingly by double-clicking the required element.



The product created for the target inspection with a predefined ID number represents an exception here. No further processing with inspections is possible with this product and it also cannot be opened by double-clicking it.

Product management is used to manage the various workpiece / component types and assign them on the basis of ID numbers, which are used by the higher-level controller to access the products (right side of screen).



In addition, on a system level you can assign sensors for the respective products and activate specific changes in the lighting (managed by means of the strobe controller).

Control elements

Add

To create a new product, click **Add**. A new entry with a standard name and a consecutive ID will appear in the list of products.

If the client and server are connected to one another, the system checks if data for the ID and the number of inspections exists for the new product in the **Presetting** window.

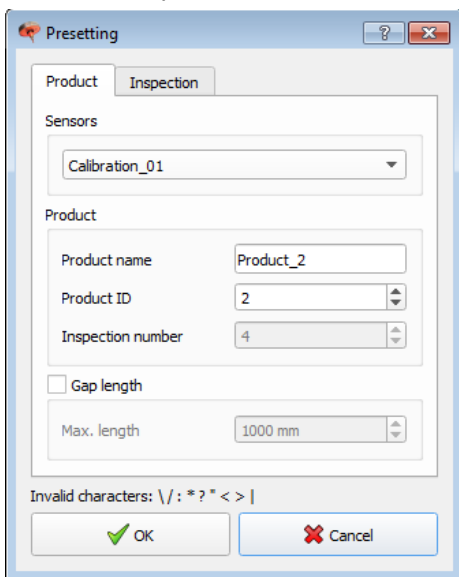


Fig.: The product name, the next free ID or an ID that is already linked with the new product are preassigned. In addition, the number of inspections is already predefined by the robot controller.

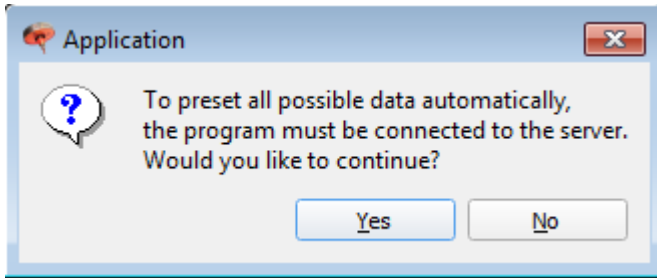


Fig.: If server and client are not connected to one another, the presettings from the server cannot be used. It is still possible to create applications or products without the presettings.

The creation of new products or new applications on the basis of presettings is thus simplified considerably.



If data is created that is at variance with the presettings, for example in relation to the number of inspections used, this is always possible since additional inspections can be added to those already created or existing data can be deleted. The flexibility of the system is thus preserved. The ID numbers, product names and inspections can also continue to be finally reconciled against the data from the robot controller.

Copy

Use this button if you want to duplicate a product. The copied product is initially given a standard name (this can be changed).

Load

To load a product file, click **Load**. A selection window then opens. Select the directory containing the file to be loaded. Click the name of the file to be loaded followed by **Open**.

Save

Products can be saved and loaded again so that the entire set of parameters does not always have to be created from new when dealing with similar workpiece types. This is made possible by the fact that a product always contains the associated inspections and areas (see [Application structure](#)²⁹). Saving is also recommended for backup purposes.

To save a product file, click **Save**. A selection window then opens. Select the directory where the file is to be saved together with its name. Then click **Save**.

Rename

To rename a product, select the required product in the list of products. Then click **Rename**. Change the name as required.

Delete

To delete a product from the list of products, first select the required product(s). Then click **Delete**. Answer the confirmation prompt with **Yes**.

Arrow up / down

The arrows can be used to change the order of the products in the list.

Screen layout – Center ②

Load product image

A product image must be defined for each component in order to display an image of the component to be inspected in automatic mode. If this product image is to be used as an error map, the bead path on the product image must additionally be defined for each inspection.

You will find further information on this in section Configuring the product image and bead paths⁶⁰.

Files in bitmap, JPEG and TIFF format can be used as product images.



The product image should show all the glue beads to be inspected on the component.

To assign a background image to a product, click **Load product image**. A selection window then opens. In this window, select the directory containing the file to be loaded. Click the name of the file followed by **Open**. Alternatively, you can load the screen by double-clicking the selected image file.

Screen layout – Right side ③

Product setting options

Various options offered by the RTVision.t system can be activated on the right of the screen layout, which can be defined for the specific product and may therefore differ from the server control.

The sensor selection and product ID are shown as standard, and likewise the storage of result data.

Sensor selection

Generally speaking, the RTVision.t is operated with a physical sensor. Here, you assign the product the sensor created previously in sensor management. This could also be a virtual sensor; in this case, the same physical sensor is addressed but a different brightness was defined because the test conditions (material, glue, lighting) for this product specify this.

Basic setting

You can enter the product ID directly in the **Product ID** (1-255) or increase or decrease the number using the arrow buttons.

Each ID must be unique. It is needed for communication with the robot controls.



Note that ID numbers are likewise preassigned from the presettings (source: Robot controller).

Save result data

Here you can decide whether data storage should be activated / deactivated for the selected product and specify the data storage frequency.

Example: "10" means that the data for every tenth component of the same products is saved.

You will find further information on this in section Save result data⁶⁸.



The **Save result data** checkbox is marked by default; i.e. if saving result data is activated in the menu commands in automatic mode,^{D153} the measurement results for every product that is created are stored automatically. Uncheck the box if you do not want to save the result data for a specific product.

Repair setting (optional)

The repair function can be selectively activated / deactivated for the selected product using the **Repair product** checkbox .



The repair function is an optional software enhancement and must be enabled separately. The programming of the communication interface in the higher-level controller must also be extended.

Screen layout – Status bar ④ and ⑤
Status bar

The name of the loaded application file *.apl is shown together with the storage path on the left of the status bar.

The opened software module of the RTVision.t system is shown on the right side together with the installed version (optional functions).

5.3 Product overview

5.3.1 Control elements



Please note that for parameterization in RTVision.t, the system must be already finally functional. Robot speed, glue control and travel paths must be installed as defined in the production conditions so that final parameterization of the products can take place in RTVision.t. If the robot speed is changed, for example, following parameterization, the product must be taught in again, re-parameterized if necessary and the error map adapted to the new start positions of the areas.

Add

To create a new inspection, click **Add**. A new entry with a standard name in the defined local language appears in the list of inspections.



Unlike products, inspections are not numbered via the robot controller. They are always executed in the order in which they appear in the list of inspections. More information [here](#)⁶⁴.

Copy

Use this button if you want to duplicate an inspection. The copied inspection is initially given a standard name (this can be changed).

Load

Use this button to load an inspection from a specific inspection file. See also "Save".

Save

Inspections are normally saved together with all the other image processing parameters in a common file with the extension .appl. However, an inspection can also be saved to a separate file with the extension .insp using Save. This inspection can then be loaded and used again later (for more on this, see also the section [Directory structure / files](#)²⁷).

Rename

To rename an inspection, first select the required inspection in the list of inspections. Then click **Rename**. Change the name as required.

Delete

To delete an inspection, first select the required inspection(s) in the list of inspections. Then click **Delete**. Answer the confirmation prompt with **Yes**.

Arrow up / down

Use the two large arrow buttons beneath the list of created applications to change the order of the applications.



This also changes the order in which the inspections are executed.

Adjust

Double-click the inspection or select the "Adjust" button to open the marked inspection. The exposure settings can now be made and areas created on the inspection bead as well as references and contours.

Load sequence (local)

To load an image sequence for the overall product, click **Load sequence (local)**. A selection window then opens. In this window, select the directory containing the file to be loaded. Click the name of the file followed by **Open**.

Load sequence (external)

If the server is running on a different computer, load the image sequence via the **Load sequence (external)** button. A selection window then opens. In this window, select a product you want to load the image sequence for. Then click **OK**.



The image sequence loaded in the product overview can also be used for parameterization. You do not need to load a new sequence there.



Loading images for a complete product can take a very long time, depending on the complexity. For that reason, it is preferable to load the image sequences separately for the inspections you want to execute.

You will find further information on loading individual inspection image sequences in the section [Image source](#)⁷¹.

Edit inspection track

Teaches in a new bead path for the selected inspection. You will find further information on this in section Configuring the product image and bead paths^{□60}.

Image navigator

Lets you navigate through the loaded image sequences. You will find further information on this in section Navigating in image sequences^{□62}.

Add / delete links (position)

Creates a new link or deletes the currently selected link. You will find further information on this in section Configuring the product image and bead paths^{□60}.

Transmit application / Save application

Transfers and saves the current application file loaded in configuration mode (Client) to automatic mode (Server). This button is active automatically when there is a connection between the client and server.

If the inspection was configured locally in the client, the application cannot be transmitted, rather it is simply saved with **Save application**. As soon as the connection has been established between the client and server, the created application can be transmitted. An inconsistency check verifies prior to transmission whether the application can run in the way it has been created and provides appropriate information on which configuration steps are missing.

You will find further information on this in:

Switching between automatic mode and configuration mode^{□26}

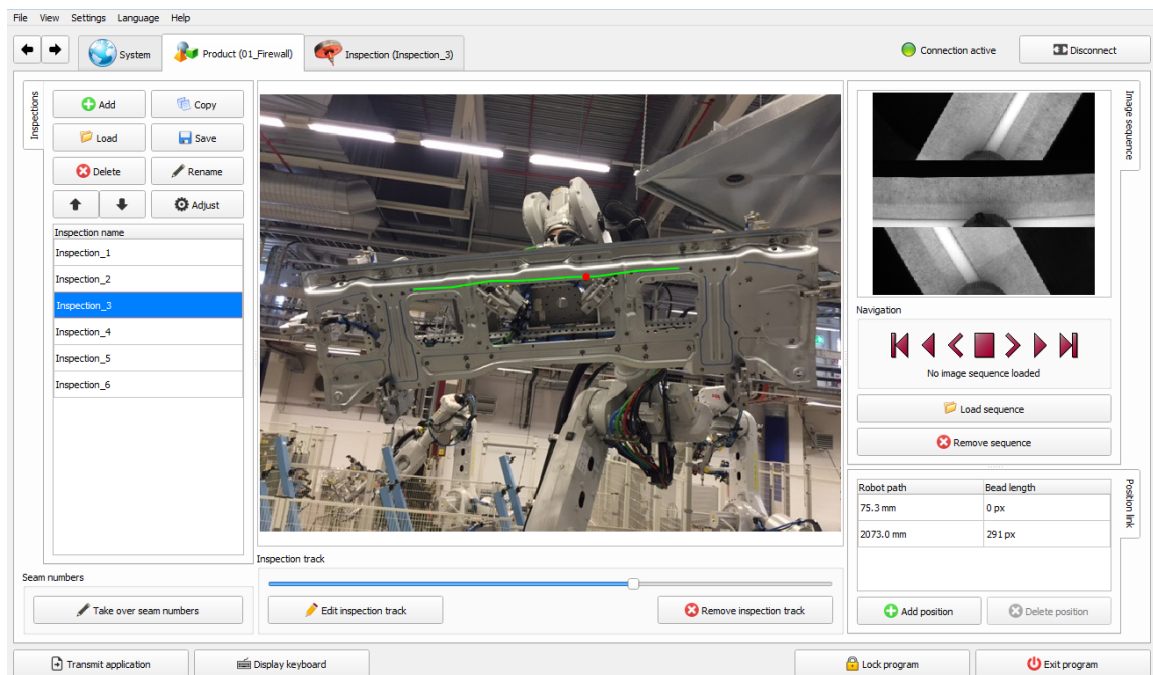
Inconsistency check^{□123}

5.3.2 Configuring the product image and bead paths

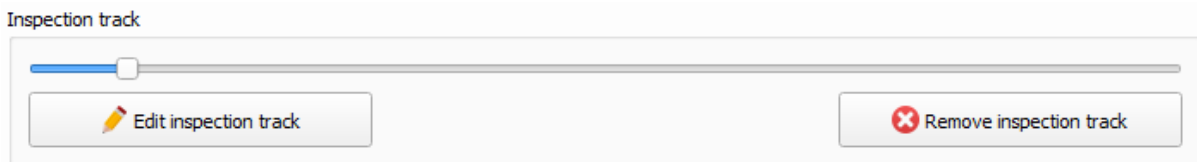
The bead paths can be created in the product image with start and end point as well as important intermediate points. This error map is shown with the current glue bead for testing in automatic mode, thus allowing any possible errors to become evident during testing along with their position. You can insert the product image and bead path prior to parameterization and create the glue bead. The bead path can only be linked with the image sequence, however, following parameterization of the entire inspection to enable online consideration in automatic mode in sync with the glue application.

Defining the bead path in the product image

1. On the *System* tab, click **Load product image** and select the associated product image. The product image (different file formats such as *.jpg, *.bmp or *.png are permitted) is loaded and displayed.
2. Go to the *Product* tab. Choose the required inspection.

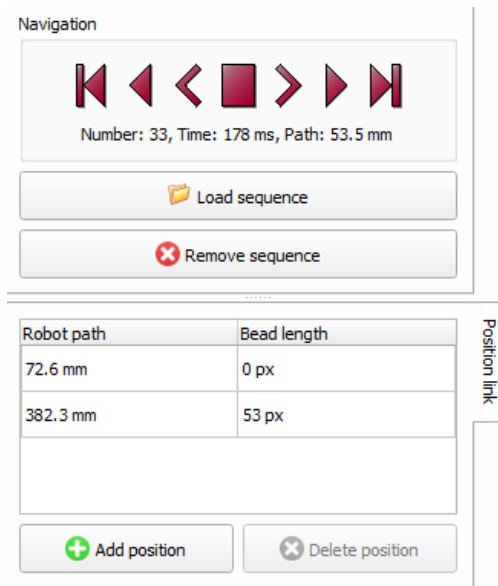


3. To teach in the bead path, select the inspection containing the bead you want to teach in and then click **Edit inspection track**.



4. In the next dialog, follow the instructions on the right-hand side to edit the bead path. When you are finished, click **OK** to accept the changes.

Linking the bead path with the image sequence



The bead path definition only tells the software the position of the bead in the product image. It does not yet know where along the bead (e.g. at 105 mm) to mark an error. That is why the bead path must be linked to the actual recorded image data.


The start and end point of the inspection track must be linked here in particular. To do this, link the respective position in the product image with the position from the image sequence (values are taken from the parameterized areas).


1. If the images for the relevant bead are no longer available in the memory, you can load the image sequence belonging to the inspection manually.


2. Then go to the start position of the bead using the image navigator – the value corresponds to the start position from the first area created.

Move the red dot using the slider beneath the product image until it indicates the start position of the glue application in the product image. Finally, click the **Add position** button. The position link created then appears in the link table on the left beside the button.

3. Repeat the last step, but this time at the end of the glue bead. Go to the value shown to you in the final area of the inspection using the image navigator.

 If the glue bead is very long or if you want to increase the accuracy of the display (e.g. in curves as a result of different robot speeds), it is recommended to add further links between the start and end positions at critical points in the glue bead (next to drilled holes, lock areas, etc.). To do this, go to the corresponding position in the adhesive application using the image navigator, then move the red dot again using the slider until it indicates the selected position in the component image and click **Add position**.

 If you want to test your links, go forward or back in the image sequence using the image navigator. The red dot will move accordingly in the product image.

 The links created here have no bearing on the inspection accuracy. They are provided purely to show the errors in the error map in automatic mode. The errors are then shown with a red dot at the bead position.

If you want to delete a link, start by clicking the corresponding entry in the *Links* table to select it and then click the **Delete position** button.

You will find further information on this in:

Navigating in image sequences ⁶²








Product overview ⁵⁰

5.3.3 Navigating in image sequences

The **image navigator** is provided for navigating within the image sequences.




The image navigator lets you do the following:

-  Skip to the start of the image sequence
-  Play the image sequence in reverse (play)
-  Skip back one image
-  Stop playback
-  Skip forward one image
-  Play the image sequence forwards (Play); repeated clicking accelerates the process.
-  Skip to the end of the image sequence

The image navigator also contains information about the current image number, the path and the time. The path and time refer to the "start inspection" command sent to the image processing system by the higher-level controller.



If you click Play several times,  you can increase the play speed incrementally, e.g. to run through very long image sequences faster – this applies also to the reverse play function.

In single step mode, you can navigate along the image sequence by turning the mouse wheel.

The image navigator is especially important for setting up the inspection tracks / bead paths.

You will find further information on this in:

Setting up bead paths⁶⁰

5.4 Inspections

5.4.1 General

The actual parameters for the glue bead and the inspection tolerances are set within an inspection.

Here you can:

- Make general settings, for example define the permitted gap length for the individual inspection.
- Define and create exposures
- Create areas
- Create references
- Create contours and define using polygon details

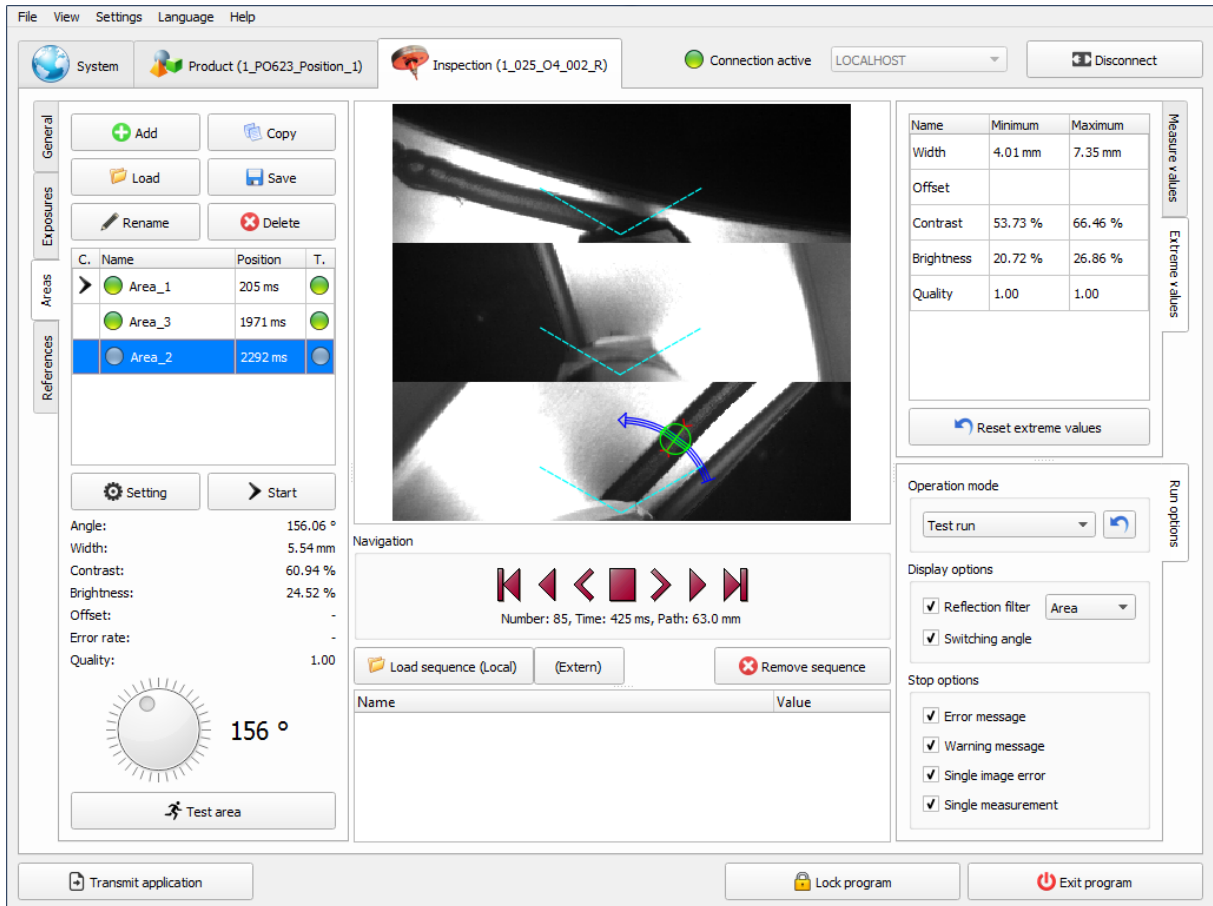
5.4.2 Inspection settings

Double-click an inspection to open the inspection overview. You can alternatively access the inspection overview with the **Adjust** button.

Various tabs (on the left-hand side) are offered here to make detailed settings for every single inspection.



Unlike products, inspections are not numbered internally via an ID. They are executed in the order in which they appear in the list of inspections. This applies also to the areas of the glue bead that are set up for each inspection.



Control elements

General

General settings can be changed here. These are the settings for

- Exposure time
- Current calibration
- Repair setting
- Inspection length (shows whether a teach-in run has been carried out for the inspection). The fixed tolerance is defined in the system and can be changed only in agreement with the QUISS service department.

You will find further information on this in:

[Image source](#)⁷¹

Exposures

Create and manage exposure settings, e.g. to balance out different light conditions during an inspection.

You will find further information on this in:

Exposures^{□73}.

Areas

For creating and managing areas.

References

For creating and managing references.

Contours

For creating and managing contours. Editing polygon(s).

Image navigator

Tool for navigating through the image sequence.

You will find further information on this in:

Navigating in image sequences^{□62}.

Messages window

List of all the messages and errors that occur in the image sequences during a test or measurement run (e.g. glue not found / glue too wide).

Measurement values

Auxiliary tool for measuring distances and angles in the currently displayed image using the mouse.

You will find further information on this in:

Auxiliary tools^{□67}.

Extreme values

Auxiliary tool for recording the extreme values of the glue bead.

You will find further information on this in:

Auxiliary tools^{□68}.

Operating mode / Run options

Settings used as a basis for the image navigator.

You will find further information on this in:

Run options^{□69}.

Load sequence

Click **Load sequence** to load a new image sequence. Unlike the product overview, where image sequences can also be loaded, here only the image sequence belonging to the inspection is loaded.



Only the image sequence for the current inspection is loaded, not the image sequence for the overall product.

You will find further information on this in:

General settings⁷¹.

If you want to load all the images for an entire product, you can do so in the product overview.



The image sequence loaded in the product overview can also be used for parameterization. Therefore you do not need to load a new sequence here.

You will find further information on this in:

Product overview⁵⁷

5.4.3 Auxiliary tools

The inspection overview provides two tools to make your work easier: They can be opened via the tabs on the right-hand side of the screen and refer in each case to the last run selected.

- Measurement values
- Extreme values

Measurement tool

Name	Value
X coordinate	278 px / 46.65 mm
Y coordinate	109 px / 18.26 mm
Distance to nozzle	75 px / 12.63 mm
Measured width	173 px / 29.04 mm
Angle to nozzle	21.14 °
Current brightness	11.00
Mean brightness	7.58

The measurement tool makes it much easier to set parameters for areas. It can be used to measure distances and angles (to the nozzle) directly in the images.

! To be able to use the measurement tool, an image sequence must be loaded and a calibration must be active.

You can use all three camera images to take a measurement on the displayed image. You have the option of measuring one point (single click) or measuring a distance (click, hold and drag). The result of your measurement is displayed in the measurement tool (measured values) to the right of the camera images.

The measurement tool is ideally suited for determining the width or brightness of the glue, for example, at every position. However, distances between the glue bead and the edge of the component can also be defined quickly. Right-clicking in the image sequence opens a context menu for processing further actions (creating areas, references).

Extreme values

Name	Minimum	Maximum
Width	3.33 mm	6.83 mm
Contrast	60.93	68.53
Brightness	12.51	16.30
Offset	-0.40 mm	0.27 mm
Quality	1.00	1.00

Measure values

Extreme values

Reset extreme values

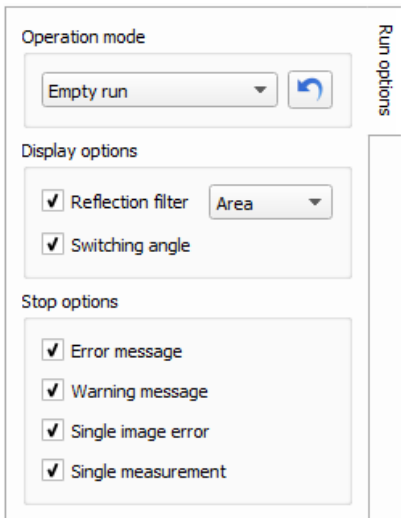
The extreme values display makes it much easier to set parameters for areas and optimize existing areas. During a test or measurement run, it records the extreme values of the glue bead (see also section [Run options](#)⁶⁹).

You do not need to start the extreme values display; it is always active.

If you want to reset the values, click the **Reset extreme values** button.

You will find further information on this in:
[Teaching in areas](#)¹⁰⁴

5.4.4 Run options




The settings selected in the run options are used each time you navigate through an image sequence using the image navigator.

Control elements for run options

Operating mode

The operating mode defines the settings used to run the image sequence. The following options are available:

Empty run	The glue bead is not evaluated at all. Use the image navigator ⁶² to move forward and back through the image sequence.
Test run	The glue definitions stored in the individual areas are applied to the image sequence. The system verifies whether these definitions will permit correct detection of the edges of the glue bead. The glue bead, nozzle position and the travel angle are depicted graphically in the image sequence in green, red and blue. See also: Visualization in RTVision.t ⁴⁴
Negative run	This test run stops when the glue is found and does not stop if it is not. It is used for negative control of the glue application and is executed without a prior order.  TIP: The measurement run without glue application is more helpful for optimization; this is also referred to as the negative run. An image sequence of the bead beforehand when the nozzle was closed (no glue) is checked in this case. The correct parameterization can therefore be checked with the measurement run and all deselected stop options. If the results are red, the parameterization was successful, since the correct statement that no glue was found is confirmed as an error.
Teach-in run	The glue bead found is taught in when this option is selected. The display in the image navigator changes and only the run options "Stop", "Forwards one image" and "Play image sequence" are available. Reversing is not possible during the teach-in run.
Optimization run	The optimization run is effective only in areas where the brightness analysis ⁹⁷ has been activated. It updates and optimizes the previously taught-in brightness

	values in the search window.
Measurement run	The glue definitions stored in the individual areas are applied to the image sequence. In addition, the measured values are compared with the taught-in values as a way of verifying the stored error definitions. The measurement run is therefore a simulation of a measurement performed in automatic mode. Use the activation / deactivation options of the different stop options for this purpose.

After the operating mode is changed, playback automatically starts from the beginning of the image sequence.

You will find further information on this in:

[Auxiliary tools](#)^{□67} (measurement and extreme values)

[Teaching in areas](#)^{□104} and [Teaching in references](#)^{□117}

[Detecting errors during parameterization](#)^{□87} (areas)

Show reflection filter

Shows the reflection filter set in the current area or for the current contour in the camera images during the run.

Show switching angle

Shows the switching angle determined during calibration in the camera images (light blue dashed lines).

Stop options

These checkboxes let you automatically interrupt image playback during test / teach-in and measurement runs. In this way you can be sure that you are not overlooking any errors.

The checkboxes have the following meanings:

Error message	Image playback stops if an error occurs in accordance with the tolerance values set in the current area.
Warning message	Image playback stops if a warning occurs in accordance with the tolerance values set in the current area.
Single image error	Image playback stops if no glue is found in an image. With triple measurement, glue must not be found during any of the three measurements.
Single measurement	Stops image playback at each reference or contour.

You can resume playback at any time after it stops using the image navigator.

5.4.5 Define inspections

5.4.5.1 General tab

Every inspection generally uses the globally applicable settings from the calibration. These settings can be changed via the *General* tab for specific settings for the selected inspection.



All changes concerning the calibration are only recommended under the instruction of the QUISS service department.

Opening the tab

Access the general settings by switching to an inspection and clicking the vertical *General* tab on the left-hand side of the screen.

Operator controls on the General tab

Exposure time

The brightness value for the inspection can also be changed here. This value then applies regardless of the value that was set globally in the sensor management.

In order to be certain as to which inspection is using which exposure value, this function should always be activated even if the global and individual value correspond.

Current calibration

Changes can be made here if necessary if the calibration has to be modified.

Gap length

Choose **Max. length** to set the maximum gap length permitted for each inspection.



Note that one level higher for a product you can also set the maximum gap length as a total of the maximum gaps of the individual inspections.

Repair setting

The repair function can be selectively activated / deactivated for the selected inspection using the **Repair inspection** checkbox.



The repair function is an optional software enhancement and must be enabled separately. The programming of the communication interface in the higher-level controller must also be extended.

Inspection length taught-in

The field is green if a length was taught in for the current inspection. In this case, the taught-in length for the inspection can be found in the **Inspection length** field. The set tolerance for the inspection length is shown in the **Fixed tolerance** field.



Depending on where the software version is installed, the RTVision.t system can operate in time- or distance-based mode. The lengths and also the times can be output accordingly in ms or in mm. The time- or distance-based methodology must be stated from the outset. Subsequent changes should be avoided as this would entail extensive changes subsequently both on the part of the robot controller and in the image processing system.

You will find further information on this in:

Inspection length⁷²

5.4.5.2 Inspection length

The inspection length is set in order to detect a bead path that is too long or too short.



The output is in [ms] as standard, but can also be specified in [mm] depending on the specific customer interface definition. The time- or distance-based methodology must be stated from the outset, and must therefore be agreed in advance with QUISS GmbH. Subsequent changes must be avoided as this would imply extensive changes subsequently both on the part of the robot controller and in the image processing system.

The time required to teach in an image sequence is recorded for each inspection. The teach-in process should therefore only be performed when all areas have been created and parameterized for the complete bead. A value is entered for the inspection length at the end of the teach-in process, which includes the full length of the glue bead. A system error (ERROR) will be output if the length of an inspection differs significantly from the length of the taught-in inspection.

The maximum permitted deviation from the taught-in length can be specified by means of a parameter in the INI file.

This is taken into account as a **Fixed tolerance** in the length of the inspection.



Values in the INI file are system values that may be changed only in agreement with an authorized service technician or the QUISS service department. To do this, the application must be closed and reopened, which is possible only during a break in production.



Only the first inspection with an incorrect length is indicated, even if there are multiple incorrect inspections. This is because if a system error (ERROR) occurs, the rest of the bead is not checked.

An error message is output in automatic mode. This is displayed in the error information window. Only one error message is ever written. If the length of an inspection was identified as incorrect, the entire inspection is indicated in red in the component image.

5.4.6 Exposures

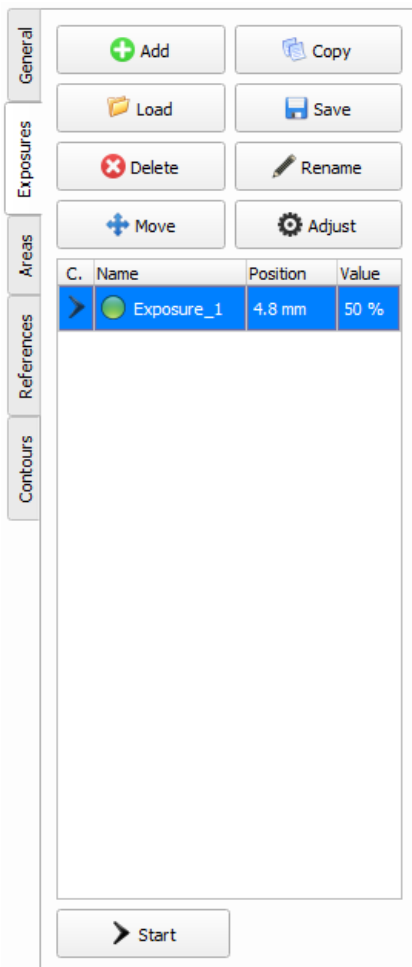
5.4.6.1 General information about exposures

Exposure control is necessary if workpieces made from different materials (e.g. Usibor, galvanized sheet metal) with different exposure durations are to be inspected. This makes it possible to control the exposure time of the cameras and therefore the brightness within an inspection.

The exposure can also be changed or optimized within the inspection in a specific area of the inspection, since both can be interlinked by means of an identical start position.

Opening the tab

Access the exposures by switching to an inspection and clicking the vertical *Exposures* tab on the left-hand side of the screen.



Control elements

Add

Creates a new exposure with a standard name. This name can be changed later. Exposures created using this button must be parameterized manually.

Copy

Use this button if you want to duplicate an exposure. The copied exposure is initially given a standard name (this can be changed).

Load

To load an exposure, click **Load**. A selection window then opens. Click the name of the file to be loaded followed by **Open**.

Save

To save an exposure, click **Save**. A selection window then opens. Assign a name and then click **Save**.

Rename

To rename an exposure, select the required exposure in the list. Then click **Rename**. Change the name as required.

Delete

To delete an exposure, first select the required exposure(s) in the list. Then click **Delete**. Answer the confirmation prompt with **Yes**.

Move

Opens the **Move start positions** dialog to set the start position of the area to be inspected with the modified exposure. If the start position of several exposures is to be changed, mark them in the list and all marked exposures will be moved by the same value in one step by clicking **Move**.

Adjust exposure

Double-click an exposure object or click **Adjust** to open the **Adjust exposure** window. In this window you can activate or deactivate the exposure object and specify the required brightness in % in addition to the start position.

You will find further information on this in:

Dialog **Adjust exposure** ⁷⁴

Start

Click **Start** to move the image sequence to the image where the exposure begins.

C. column in the list of exposures

Marks the currently displayed exposure object with an arrow.

Name column in the list of exposures

The indicator shows whether this exposure is active. The name of the exposure is also shown here.

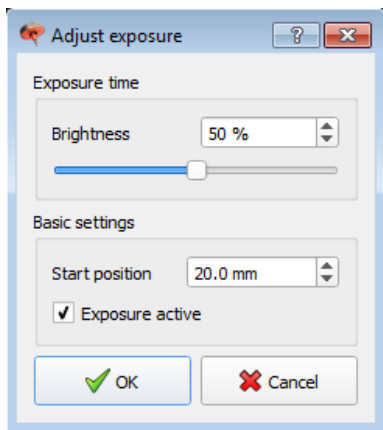
Position column in the list of exposures

Specifies (in ms) the start position of an exposure within an inspection.

Value column in the list of exposures

This column shows the brightness value set for the exposure as a percentage.

5.4.6.2 Settings for exposures



The parameters for an exposure are defined in this dialog.

Exposure time

The brightness of the exposure can be defined using the slider or entered directly. The brightness is controlled via the exposure time of the camera.

Start position

Determines the time in milliseconds when the exposure should be changed. The specification refers to the value specified in the Image navigator ⁶².

Exposure active

Activates / deactivates the exposure.

OK

Click **OK** to save processes / changes and close the window.

Cancel

Click **Cancel** to discard processes / changes and close the window.

5.4.7 Areas

5.4.7.1 General

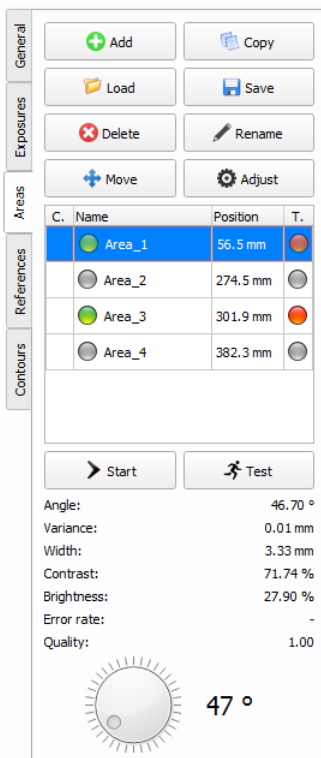
Areas are used to divide an inspection into any number of sections. This may be necessary, for example, due to different glue bead widths or changed light conditions. The error tolerance of an area should not be set too large so that deviations are detected in good time.

Types of areas

A distinction is made between two different types of areas in RTVision.t :

1. Active areas: in addition to the general [Area definitions](#)^{D79} they contain all [Glue](#)^{D82} and [Error definitions](#)^{D85} that are needed to inspect a glue bead. Multiple areas can be created within an inspection to be able to set different inspection parameters, such as varying exposures also.
2. Inactive areas: are used to exclude parts of the glue bead from the inspection or to exclude active areas completely. Inspection parameters do not need to be created for inactive areas since the glue application is not inspected in these areas.

Open the Areas tab



You access the areas by switching to an inspection and clicking the vertical **Areas** tab on the left in the picture.

Control elements

Add

Creates a new, inactive area with a standard name that can be changed later. Areas created using this button must be parameterized manually.

Copy

Use this button if you want to duplicate an area. The copied area is initially given a standard name (this can be changed).

Load

To load an area, click **Load**. A selection window then opens. Click the name of the file to be loaded followed by **Open**.

Save

To save an area, click **Save**. A selection window then opens. Assign a name and then click **Save**.

Rename

To rename an area, first select the required area in the list of areas. Then click **Rename**. Change the name as required.

Delete

To delete an area, select the required area(s) in the list of areas. Then click **Delete**. Answer the confirmation prompt with **Yes**.

Move

Opens the **Move start positions** dialog to set the start position of the active or inactive area precisely. If the start position of several areas is to be changed, mark them in the list and all marked areas will be moved by the same value in one step by clicking **Move**.

Adjust

Opens the **Adjust area** window. Select the corresponding area in the list of areas and click **Create**. Double-clicking the area also opens the **Adjust area** window.

Start

Click **Start** to go to the image where the area begins.

Test area

Tests the properties and parameters stored in the selected area in the current image.



To test the area in the image where it begins, click the **Start** button.

Angle knob

Glue search at a specific position (angle).

C. column in the list of areas

Marks the currently displayed area with an arrow.

Name column in the list of areas

The light indicates whether this area is active. The name of the area is also shown here.

Position column in the list of areas

Specifies (in ms) the start position of an area within an inspection.

T. column in the list of areas

The light indicates that this area has been taught in successfully.

Displayed values

The values shown under **Angle**, **Width**, **Contrast**, **Brightness**, **Variance**, **Error rate** and **Quality** correspond to the values measured in the current image.

5.4.7.2 Settings for areas

The settings for areas are divided into the following elements:

- [Basic settings](#)⁷⁷ in the *Adjust area* dialog

Tabs to be selected

- [Basic definitions](#)⁷⁹
- [Glue definitions](#)⁸²
- [Error definitions](#)⁸⁵
- [Repair](#)⁸⁹

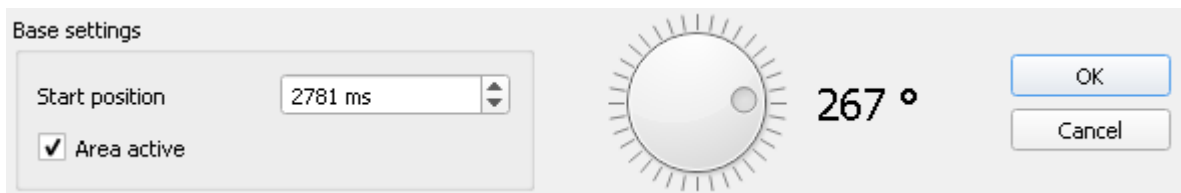


The repair function is an optional software enhancement and must be enabled separately. The programming of the communication interface in the higher-level controller must also be extended. The *Repair* tab is visible only if the repair function is enabled.

5.4.7.2.1 General parameters

Mark the area for which you want to set parameters. Now click the **Adjust** button or open the **Adjust area** dialog by double-clicking the area name.

The general parameters (basic settings) can be found in the **Adjust area** dialog under the basic settings for the respective area (regardless of the tab that is selected in the dialog).



Start position

Determines the start position of the area in milliseconds. The specification refers to the value specified in the [Image navigator](#)⁶². If the area is created interactively by marking with the cursor, the start position is applied automatically.



The start position is output in [ms] as standard, but can also be specified in [mm] depending on the specific customer installation.

You will find further information on this in:

[Areas context menu](#)⁹¹

Area active / inactive

Activates / deactivates the area. The settings cannot be changed if an area is inactive. An area can also be created as an active or inactive area interactively from the context menu by marking with the cursor.



An area that is active does not necessarily also need to be taught in. Information about the teach-in status is shown in column T., whereas the active / inactive indicator is shown by a green or gray lamp in front of the name of the area. If the lamp in column T. is red, the required teach-in run of an area marked as active is missing. You will find further information on this in section [.Teaching in areas](#)¹⁰⁴.



The glue application is not inspected in inactive areas. Inactive areas are shown by a gray lamp in front of their name and in column T. They allow the image sequence to be recorded smoothly up to the end of the bead since they are defined 2-3 cm beyond the end of the bead, but not checked.

You will find further information on this in:

[Areas context menu](#)⁹¹

Angle knob

Defines the angle for the glue search in degrees around the applicator nozzle. If the area is created interactively by marking with the cursor, the angle is applied automatically.

OK

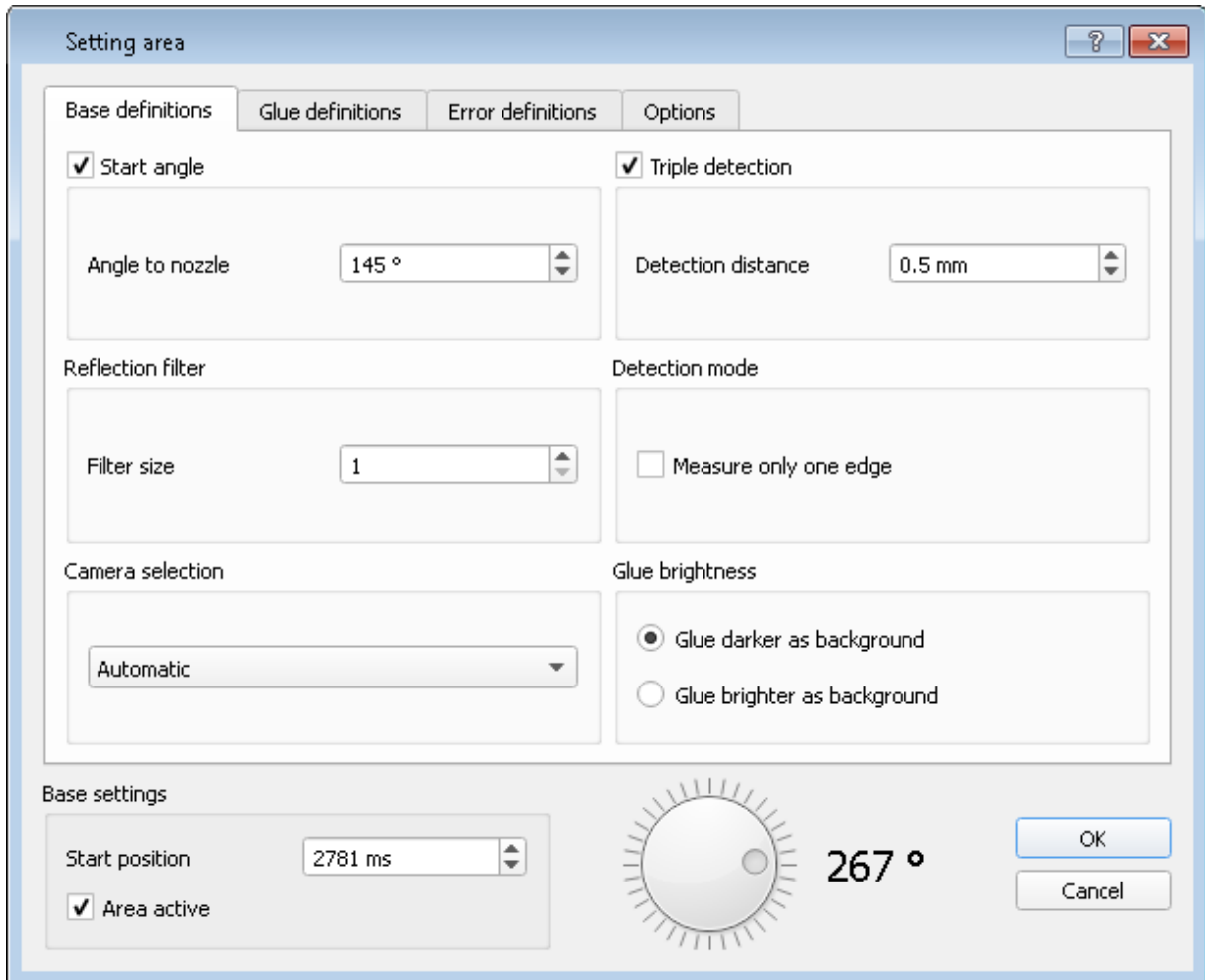
Click **OK** to save procedures / changes and close the window.

Cancel

Click **Cancel** to discard processes / changes and close the window.

5.4.7.2.2 Basic definitions

In the *Adjust area* window, define the basic parameters for the selected area.

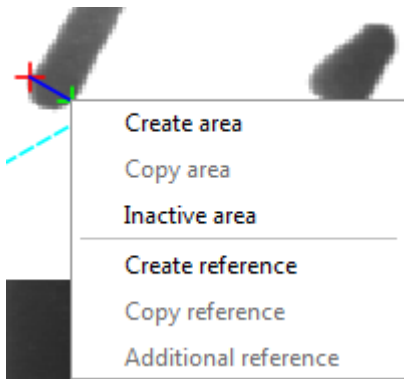
Start angle

Shows the angle to the nozzle. The angle information is taken from the last image of the previous area.



The starting angle can also be determined easily from the image sequence by using the measurement tool.

Go to the starting point in the image sequence, measure the bead width with the measuring tool and right-click **Create area** in the context menu to open the dialog shown above including the value determined for the start angle.



See also section [Create areas](#)^{□43} e.g. standard method or [Auxiliary tools](#)^{□67}

Reflection filter

The reflection filter can be used to minimize reflections on the glue bead and the sheet metal. The stronger the reflections that occur, the higher the set value should be. A value of 0 means that no reflections will be eliminated. The reflection filter can be optionally activated in the run options (see section [Run options](#)^{□69}). The effect is most obvious with an activated filter in individual step mode of the active area. If you change the filter value, e.g. between 2 and 50, in the window above, the filter effect is interactively visible in the displayed frame.



With a high filter value (max. 50), actual edges in the image also become blurred.

Camera selection

Specify whether the software should select the camera automatically or whether a specific camera should be used. Normally, this option can be left in automatic mode.



When using a specific camera, the system will not switch to another camera if the glue crosses the switching threshold between the cameras.

Measuring methods

Edge pair detection

The measurement range is defined by an edge pair. The limit values are defined by the parameters on the *Glue definitions* and *Error definitions* tabs.

Detection can be further improved by marking the **Additional method (Brightness analysis)** checkbox.

Single edge detection

If this is checked, you can restrict the inspection to one edge of a glue bead in the relevant area. The selection of the edge to be inspected (left or right) is dependent on the setting under *Edge transition* on the *Glue definitions* tab. Detection can be further improved by marking the **Additional method (Brightness analysis)** checkbox.

The single edge detection is useful when the glue seam is close to another seam and only the removed edge forms a clear contrast with the background.



Width measurement is not possible with this setting.

Brightness analysis

This can be carried out as a stand-alone measurement or in combination with single edge detection or edge pair detection as an additional method.

For details, refer to section [Additional method \(Brightness analysis\)](#)⁹⁹.

As an alternative to edge detection, it is also possible to carry out a gray level-based brightness analysis. For details, refer to section [Brightness analysis](#)⁹⁷.

Gap inspection

Gap inspection allows inspection of places on the components that must contain no glue so that they can be processed further. A typical application case is the inspection of step seams, although this can also be covered with inactive areas and the standard methods.

In the case of active areas, but with the selective measuring method **Gap inspection**, a NOK message is output if glue is detected in the scanning area. For details, refer to section [Glue gap](#)¹⁰²

Triple detection active

If this box is checked, the glue bead in each image will be measured three times (triple measurement). If it is not checked, the measurement will only be performed once (single measurement).



It is recommended that triple detection is always checked to increase the evaluation reliability of the system.

Detection distance

If triple detection is active, the distance between the individual measurements can be specified. In certain radii, this can improve the search quality. The maximum distance is 1.0 mm. The defined detection distance is reflected in the line spacing (3 lines) of the green circle mark on the image sequence.



Fig.: Graphical depiction of the detection distance with triple detection

5.4.7.2.3 Glue definitions

In the glue definitions in the *Adjust area* window, the imaging parameters (rating functions), glue width, glue deviation, edge contrast and glue brightness are defined to determine the glue. The software needs these parameters to distinguish the glue and the glue edges from e.g. a component edge.

In order to reliably find the glue bead from the multitude of edge pairs visible in an image, the system first has to identify all the edge pairs in order to weight them using the above-mentioned rating functions. The basic principle is described in section [Inspecting the glue bead](#)¹⁹⁵.

The weighting takes place in the four rating functions, using four sampling points in each case. The position of these sampling points as well as the rating at the sampling points can be changed. The software calculates an overall quality rating from the four rating functions for each edge pair. This overall quality rating can be seen in the screen area on the left in the client during the teach-in run. This array of adjustment options (up to 32 parameters can be defined) allows **Detailed definitions**, which offer an additional graphical display.

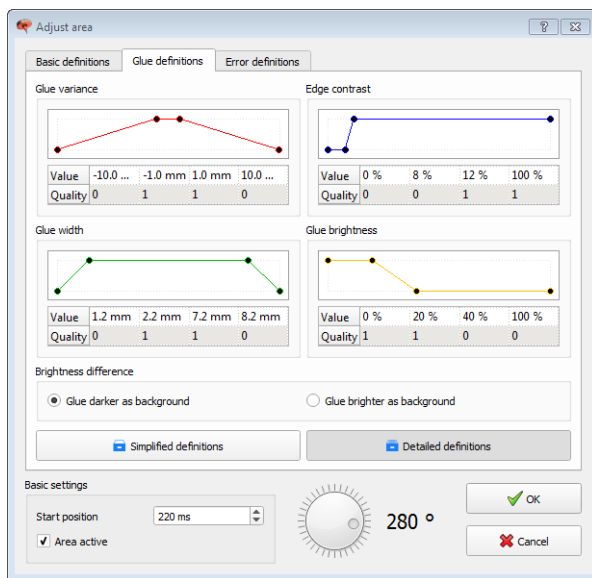


Fig.: The button for **Detailed definitions** is shown in dark gray and is active. These definitions can be found in the relevant dialog.

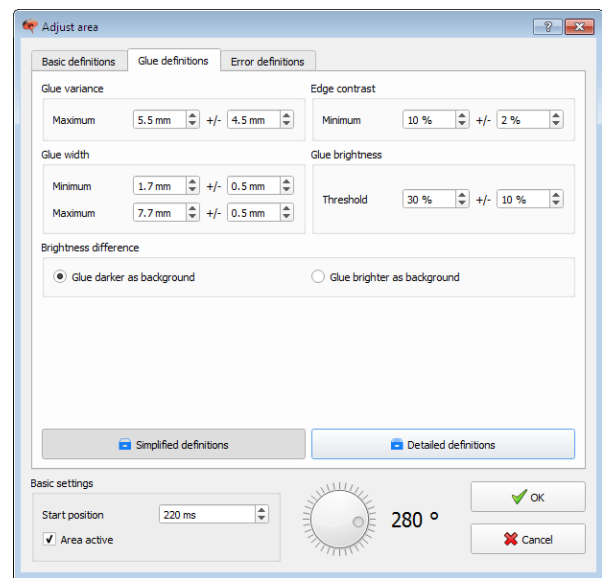


Fig.: The button for **Simplified definitions** is shown in dark gray and is active. These definitions can be found in the relevant dialog.

In the case of symmetrical rating functions, in particular, the **Simplified definitions** can be used especially on the basis of numeric values as a definition tool.

The **Simplified definitions** button shown in dark gray shows you the corresponding active dialog. This dialog has a significantly reduced range of options for adjusting the parameters, since variation is possible with the same value via +/- for each parameter. A value difference between + and - does not apply here. Equally, the quality rating also cannot be influenced.

Once you have decided on a detailed definition, it is no longer possible to switch to the other method as the symmetry of the parameter settings has generally been canceled.



The detailed definition is the ideal tool for the complex glue bead and provides expert assistance in relation to the parameter evaluation. It offers greater scope for parameterization including quality variance.

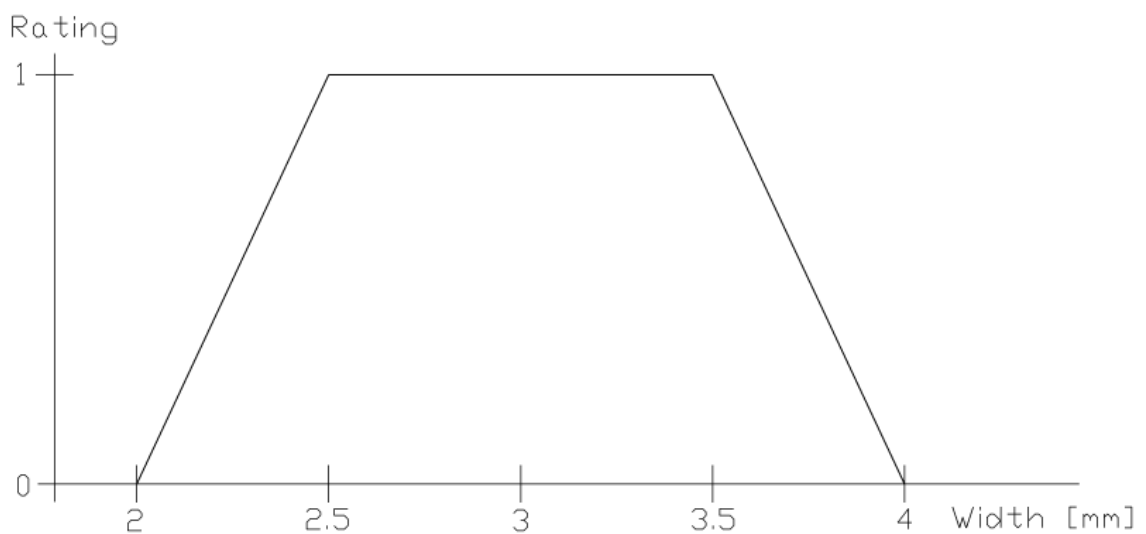
The simplified definition is the tool for unique glue quality, clear edges and symmetrical data structure.


Rating the glue width

The width of individual edge pairs is rated here. This makes it possible to exclude edge pairs that are too far apart. First, determine the actual width of the glue, using the measurement tool, and estimate by how much the glue width can vary. These upper and lower limits should be given a quality rating of 1. All widths greater and lower respectively should be given a quality rating of 0.

Example: The glue application should be 3 mm wide. The average width, however, is 2.5 mm to 3.5mm. This produces the following rating function:

[mm]	2	2.5	3.5	4
Quality	0	1	1	0



 The actual spread can be estimated using the Extreme values display⁶⁷.

Glue variance rating

Rates the position of the glue. The following values are preset:

[mm]	-5	-4	4	5
Quality	0	1	1	0

Edge contrast rating

Rates the edge contrast between the substrate and glue. This value cannot be determined using the measurement tool. Even though a contrast is specified, if it is used then the system is generally very restricted in its search values and tends to issue the error message "Glue not found". If faults like shadowing or reflection then arise, delimiting the edge contrast is a promising adjustment option that can be applied successfully with caution. 100% is maximum contrast. The following values are preset:

[0...100]	0	10	30	100
Quality	0	0	1	1

You will find further information on this in section [Edge detection](#)⁹⁵

Glue brightness rating

Rates the brightness of the glue. A value of 0% corresponds to black 100% to white. The values in between correspond to the gray level between dark and bright. The following values are preset:

[0...100]	0	40	60	100
Quality	1	1	0	0

This option is visible only when edge pair detection is selected. The latter can be adjusted for the respective inspection in **Adjust area | Basic definitions | Measuring methods**.

Glue brightness

Here you can specify whether the glue in question is a dark glue on a bright background or a bright glue on a dark background.

These options are grayed out if **Single edge detection** is carried out.



If you change to **Glue brighter as background**, remember to also change the quality settings.

Edge transition

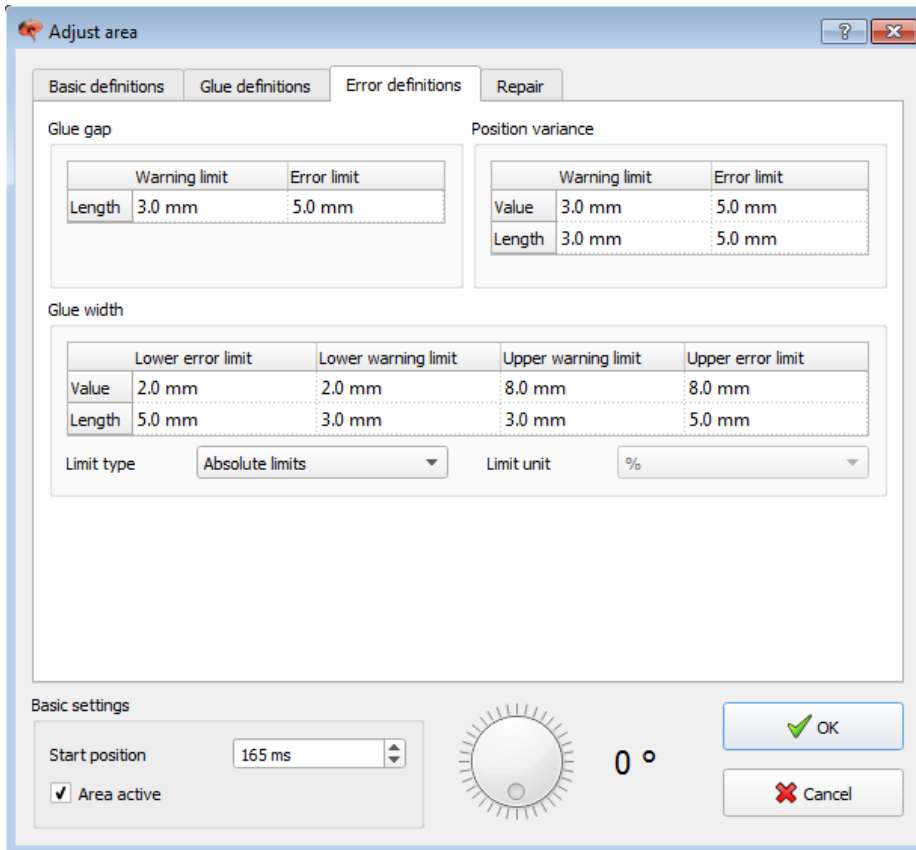
Here you can specify which edge transition should be used (from bright to dark or vice versa).



This option is visible only when **Single edge detection** is selected.

5.4.7.2.4 Error definition

The error definitions specify which tolerances will result in a warning or a NOK during an inspection in automatic mode.



In order for the system to be able to show not just errors but also warnings, limit values for both errors and warnings must be entered.

Glue gap	Defines the maximum permissible length for a glue gap; any greater gap will result in an error message or warning message. Is disabled if Gap variance rating is selected as a measuring method.
Min./max. glue width	Defines which change (decrease or increase) in the width of the glue bead will result in an error message or warning message. Whether an error or warning is output depends on whether the change in width exceeds the length specified in from . This error definition is active only if Edge pair detection is set as the measuring method.
Position variance	Defines which variance between the glue bead and nozzle will result in an error message or warning message. Whether an error or warning is output depends on whether the angle variance exceeds the length specified in from .

Configuration mode description / Inspections

Example of the error limit values to be entered in relative and absolute format (required width 5 mm).

	Specificati on in percent	Specification in mm relative	Specification in mm absolute
Upper error limit - Error limit max. width	50	2.5	7.5
Lower error limit - Error limit min. width	40	2.0	3.0
Upper warning limit - warning limit max. width	30	1.5	6.5
Lower warning limit - warning limit min. width	20	1.0	4.0



The glue width can be specified with a relative or absolute limit; the reference must be considered as the taught-in bead width.

With relative specifications in % and changing bead widths, the accepted error range also changes. Remember this!

5.4.7.2.5 Identifying and correcting parameterization errors

A test run is recommended after you have created areas. For this test run, all the boxes under **Stop options** should be checked. This ensures that problems caused by e.g. incorrect parameters will be identified. You should also activate the reflection filter.

Incorrect parameter settings can happen especially when areas are created manually. If this happens, the glue bead may not be found at all or the wrong width may be measured. If all the boxes under **Stop options** are checked, then the test run will be stopped if the glue is not found. You can then take corrective action. Incorrectly measured widths will not cause image playback to stop. This error must be identified by the operator.

If the test run stops, you should proceed as described below. Each time you make a change, test whether it has a positive effect on the problem and whether it results in any negative effects somewhere else in the glue bead.

Here is a list of the most common parameterization errors:

1. The area starts in the wrong place

Check the *Start position* parameter in the *Adjust area* window in **Basic settings**.

The start position can be shifted here directly or via the **Areas context menu** via a relative shift in the ms range (+/- entry possible).

2. Playback stops directly at the start of the area

If playback stops directly at the start of the area, check whether the **starting angle** is correct. You will also find this information in the *Adjust area* window on the *Basic definitions* tab.

3. No glue found when switching from one area to the next

Check whether the *Starting angle* is correct in the *Adjust area* window on the **Basic definitions** tab.

4. No glue is found when switching from one camera to the next, the search area is not above the glue.

Check the search area and modify if necessary. You can check your settings at any time using the **Test** button

5. Single or multiple measurements do not find any glue within an area.

Check whether there are reflections on the glue bead. If this is the case, in the *Adjust area* window on the **Basic definitions** tab, increase the **reflection filter** (e.g. between 2 and 40).

If the glue bead merges with any seams or edges, the **reflection filter** setting is too high.



You can check your settings at any time using the **Test** button.

Measure the width at the current position using the mouse (measurement tool). Check whether this width is covered in the **Glue width rating** function.

You will find the rating function in the *Adjust area* window on the *Glue definitions* tab. If not, adjust the rating function accordingly.

Measure the average gray level of the glue at the current position using the mouse (measurement tool). Check whether this gray level is covered in the **Glue brightness rating** function.

You will find the rating function in the *Adjust area* window on the *glue definitions* tab. If not, adjust the rating function accordingly.

-If the image looks very fuzzy and low in contrast, check the **Edge contrast rating** function. The edge contrast cannot be measured directly using the tool.

The **extreme values** for contrast are, however, logged in the extreme values display. Check whether the values shown in the extreme values display are covered in the **Edge contrast rating** function.

You will find the rating function in the *Adjust area* window on the *Glue definitions* tab. If not, adjust the rating function accordingly.

You will find further information on this in:

Create areas ⁹³

Glue definitions ⁸²

Run options ⁶⁹

Edge detection ⁹⁵

5.4.7.2.6 Repair (option)

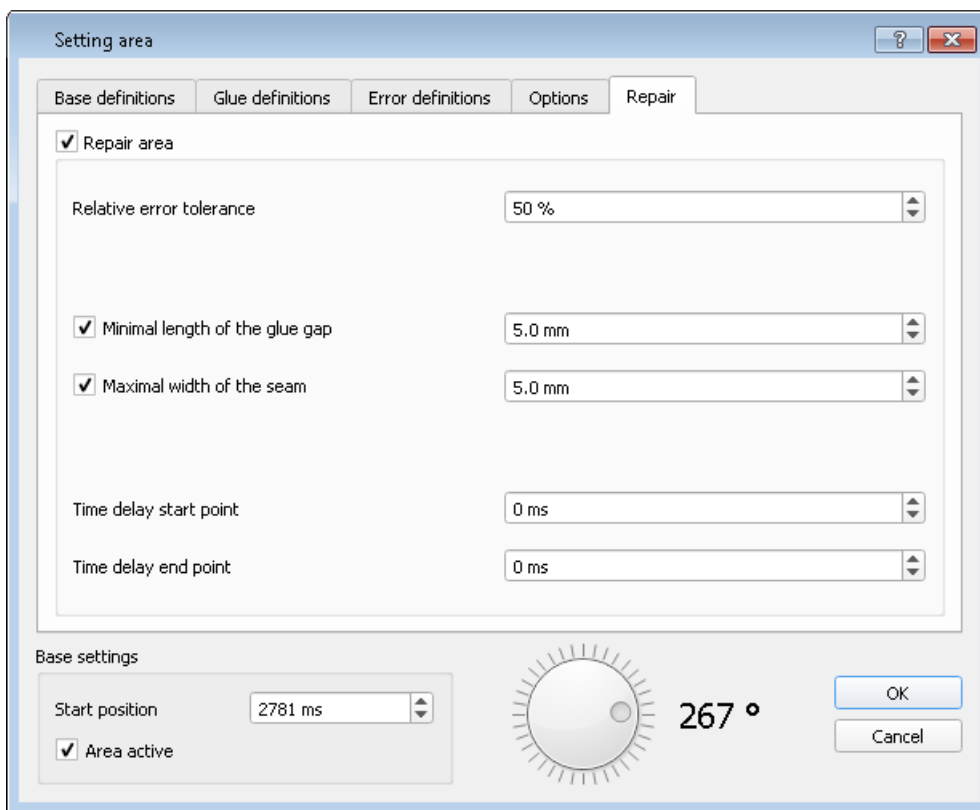


The repair function is an optional enhancement of RTVision.t and must be enabled separately. The programming of the communication interface in the higher-level controller must also be extended. The associated **Repair** tab is only visible if the repair function is enabled.



The repair is possible only if the function is checked for the application, product, inspection and area. This allows the repair to be easily controlled from the superordinate level. The repair settings for the area properties impose further restrictions in terms of reparability.

In special cases, a component that returns a NOK result can be upgraded to OK through subsequent automatic reworking (repair) and repeat inspection. However, this option is only available if the error can be fixed by reapplying glue. For example, gaps in a glue bead can be touched up but position errors and violations of the maximum glue width cannot be repaired. The system remembers the position of the faults and can rework them in a second run.



You can activate the repair function for the selected area on the *Repair* tab. The following settings can also be made:

Relative error tolerance

The error and warning limit values for maximum glue width specified in Error definition¹⁸⁵ can be increased here for the inspection during the repair run.

Minimal length of the glue gap

Defines the minimum length for categorizing a glue gap as repairable. If this box is not checked, a glue gap will be categorized as always repairable.

Maximal width of the seam

Defines the maximum width for categorizing a width error as repairable. If this box is not checked, a width error will be categorized as always repairable.



The **Maximal width of the seam** setting is only valid for glue beads that are too thin.

Time delay start point time

Defines an offset value in the ms range that moves the start time of the repair to compensate for any delays in the signal flow.

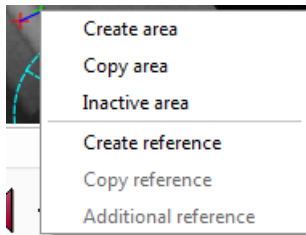
Time delay end point

Defines an offset value in the ms range that moves the end time of the repair to compensate for any delays in the signal flow.

See also [How does the repair interface work?](#)¹⁹¹

5.4.7.3 Areas context menu

The context menu below opens when you click and measure the inspection track in the image sequence and then right-click.



Menu commands

Create area

An area is created in accordance with the marking selected in the image sequence.

The start position of the area can be defined by selecting the **Move** button in the **Move start positions** dialog.

Copy area

If at least one area already exists, an additional area can be created from the image sequence (by left-clicking the image sequence reached via the navigator) via the context menu as a copy with identical data for the basic, glue and error definitions.

Inactive area

An inactive area can be created here. Use the start position that then has to be defined to move the inactive area to the required position.



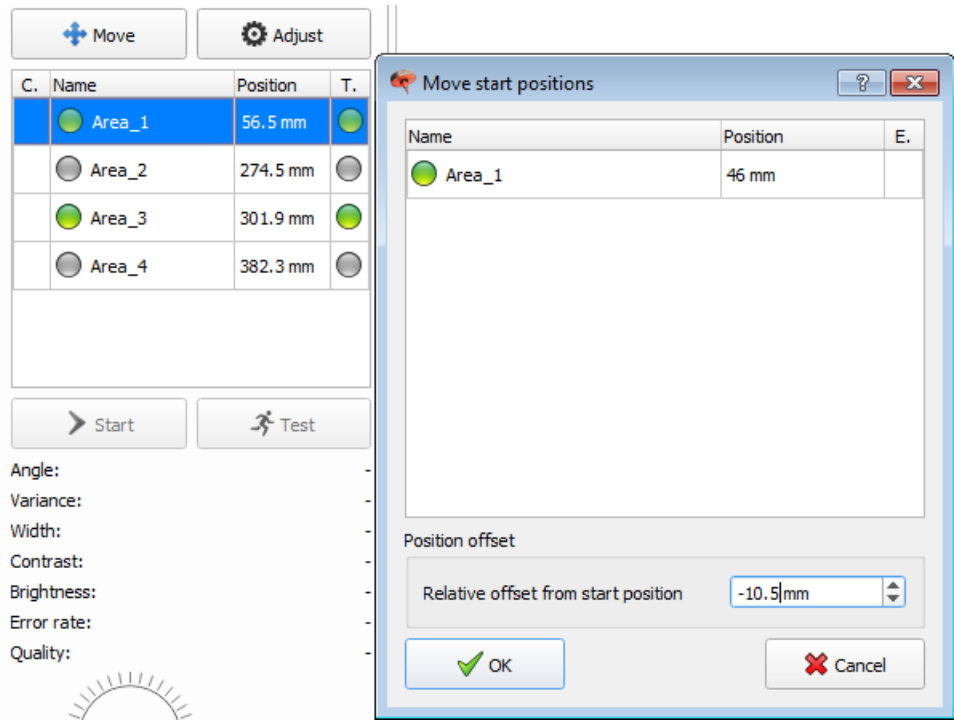
RTVision.t performs an online check while the sealant is being applied, but the sensor only records the image sequences following application of the glue. The use of inactive areas allows the controlled inspection of a glue seam through to the end of the bead or the recording of gaps without checks being made.

Move start position

Can be used to move the start position for multiple selected areas at once.

This is an advantage if the start position has to be moved by the same relative value in several areas.

The start position of the area can be defined by selecting the **Move** button in the **Move start positions** dialog.



Example: The original **Area_1** is stored with 56.5 mm. The change due to the relative shift is shown immediately and could be applied to all marked areas listed here with **OK**.

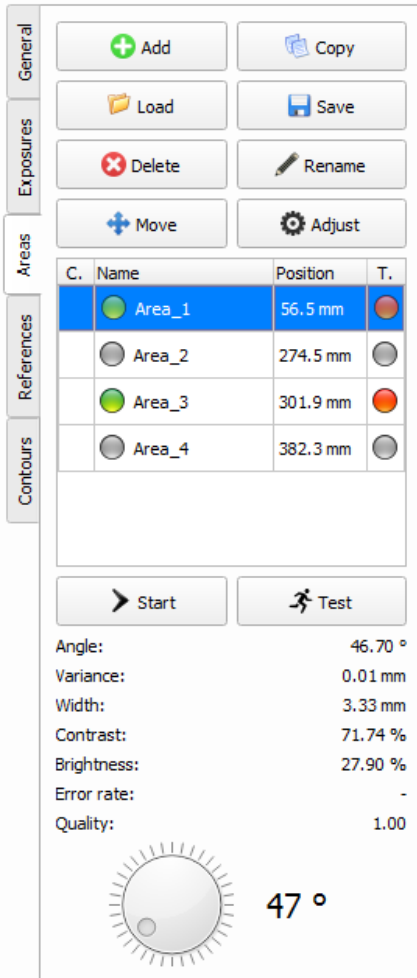


The output is in [ms] as standard, but can also be specified in [mm] depending on the specific customer interface definition. The time- or distance-based methodology must be stated from the outset, and must therefore be agreed in advance with QUISS GmbH. Subsequent changes must be avoided as this would imply extensive changes subsequently both on the part of the robot controller and in the image processing system.

You will find further information on this in:

Standard interface for time-based image processing¹⁷⁹

5.4.7.4 Create areas
 5.4.7.4.1 Standard method



For easier detection, glue bead detection is split into areas.

Each inspection can work with several areas. These include gaps in the glue seam / glue bead as well as different widths of sections along the bead.

Properties can thus be configured individually to suit the circumstances. To do this, select the respective area and click **Adjust** to open the **Adjust area** configuration dialog.

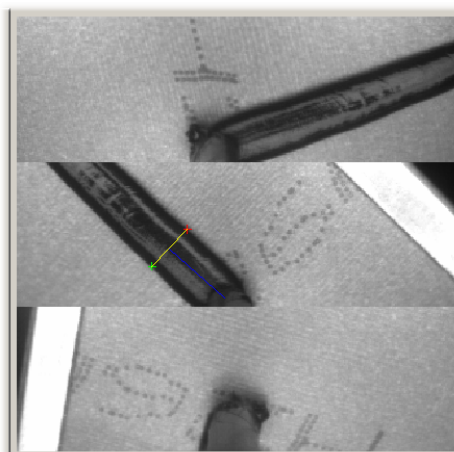
The method described here assumes that the two edges of a glue bead can always be properly detected. If no edges can be detected, under certain circumstances, the method described in [Creating areas by means of a brightness analysis](#)⁹⁷ may be used.

1. Switch to the *Areas* tab. The image sequence loaded in the previous step ([Create inspection](#)⁴²) can still be used.

2. With the [image navigator](#)⁶² go to the position where the glue application begins in the image and, with the mouse (tool), mark the glue orthogonally (vertically) to the direction of the glue application (see image below). To mark it, keep the left mouse key depressed.



You can use the image navigator to scan the glue bead forward and back from the three camera perspectives via path / time observation.



3. Right-click and select *Create area* from the pop-up menu.

- If the glue was correctly detected, click OK to accept the area.
- If the glue was not correctly detected, the parameters (basic definitions, glue definitions, error definitions) must be adjusted.

You will find further information on this in:

[Visualization and interpretation of the seam in the image sequence](#)⁴⁴

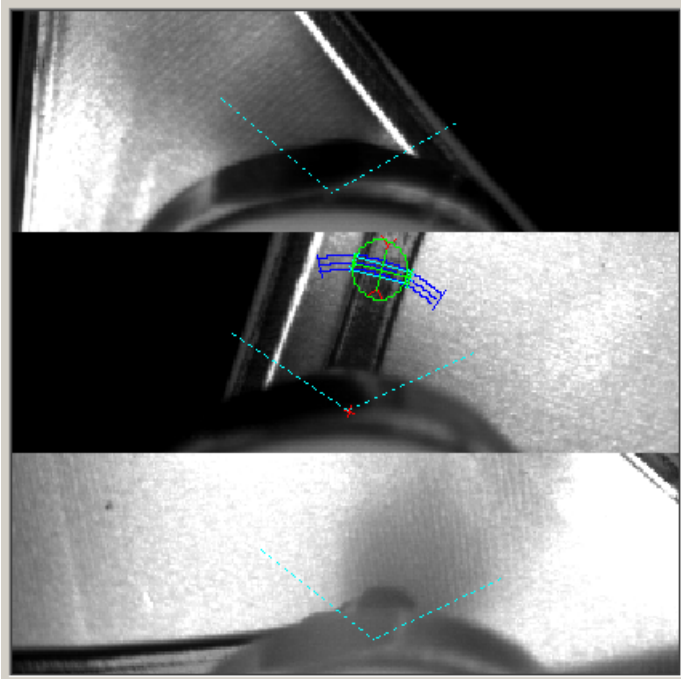
[Settings for areas](#)⁷⁷

[Areas context menu](#)⁹¹

[Teaching in areas](#)¹⁰⁴

5.4.7.4.2 Graphic display of the glue inspection

The graphic displays shown during measurement of the glue have the following meaning:



Blue circle segments

Show the actual search area. The search for glue is restricted to this segment. One circle segment indicates single measurement, three segments indicate triple measurement.

Green lines

With edge detection: show the measured glue width of the respective circle segment.

Green lines

With brightness analysis: show the examined area.

Red lines

The green lines described above turn red if the specified error / warning limit values are exceeded.

Green circle

With single measurement: shows the measured glue width (applied as a circle with a diameter of the measured width).

With triple measurement: shows the average width of the glue width measured in the three circle segments.

You will find further information on this in:

Edge detection⁹⁵

Brightness analysis⁹⁷

Visualization of glue bead⁴⁴

5.4.7.4.3 Edge detection

A search window is positioned in the camera image over the point where the glue bead should be. The system will only search for the glue bead within this window. The information about the position of the glue bead is acquired from the previous image or at the start of the bead from the user's specifications (see also section [Glue definitions](#)⁸²).

This approach is possible since the high image frequency means that there are very few differences between two successive images. Since RTVision.t inspects the entire area around the nozzle, the actual search area is shaped like a circle segment (see dark blue circle segments).

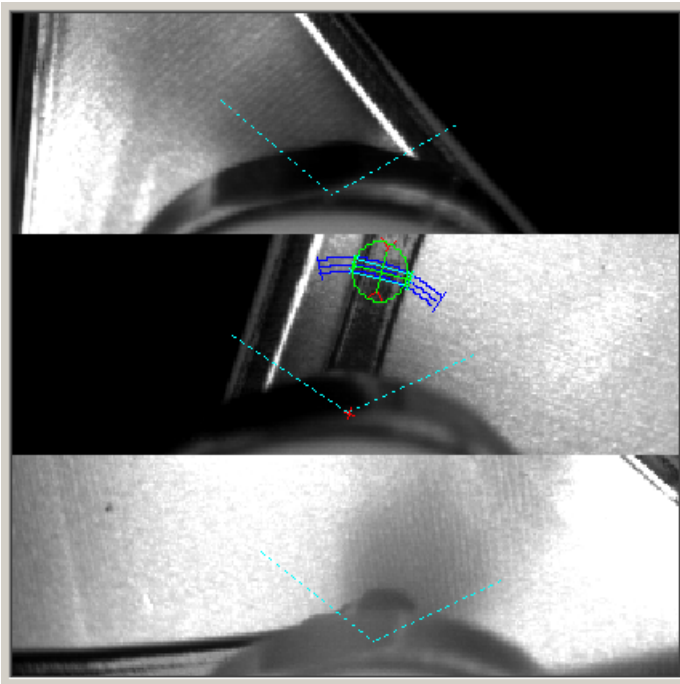


Fig.: Detection of the glue bead (triple measurement)

For RTVision.t a glue bead essentially consists of a pair of edges. The transition from light to dark (or vice versa) between two image regions is referred to as the edge. Therefore, when searching for a glue bead, the system is actually searching for two edges with inverse light / dark transitions.

During the search, all the edges that are detected are evaluated via [rating functions](#)⁸² with certain probabilities.

The glue bead is formed by the two edges with the highest probability rating.

The width and position of the glue bead is then measured.



Tip: The default values for the glue definition can be used very effectively during standard checks for locating the glue bead. It is only if deviations arise because of shadowing or reflections that the default values for edge contrast or glue brightness should be defined more narrowly. The aim always is to keep the green circle on the glue bead. The error messages are not triggered by the glue definitions, rather via the error definition values defined. The error definition is checked by the test run performed after the test and teach-in run.

If the message "Glue not found" is issued, although glue exists, then the values for the glue definition have generally been defined too restrictively. Make sure in particular with

edge contrast and glue width not to align too strictly with the measured values from the test run, since measured values only reflect the mean values for both edges, with no separate consideration of the left or right edge.

This measurement can be performed once (single measurement) or three times (triple measurement) for each image. The lengths of any interruptions in the glue bead are also recorded.



There is an option to activate a pure [brightness analysis](#)^{□97} area by area on the basis of edge searching and detection. The glue or sealant bead in such an area is only defined via the gray level, i.e. it is not possible to measure the width in this case. The brightness analysis can be carried out alternatively to or also in addition to edge detection.

The wealth of information acquired about a glue bead enables RTVision.t to rate with a high degree of accuracy whether the glue bead is OK or not OK. The main criteria for an OK rating are:

- No interruptions (or a defined interruption length must not be exceeded)
- Glue bead width within predefined tolerances
- Glue bead position within predefined tolerances

You will find further information on this in:

[Settings for areas](#)^{□75}

[Create areas](#)^{□43}

[Visualization and interpretation of the seam in the image sequence](#)^{□44}

5.4.7.4.4 Creating areas by means of a brightness analysis

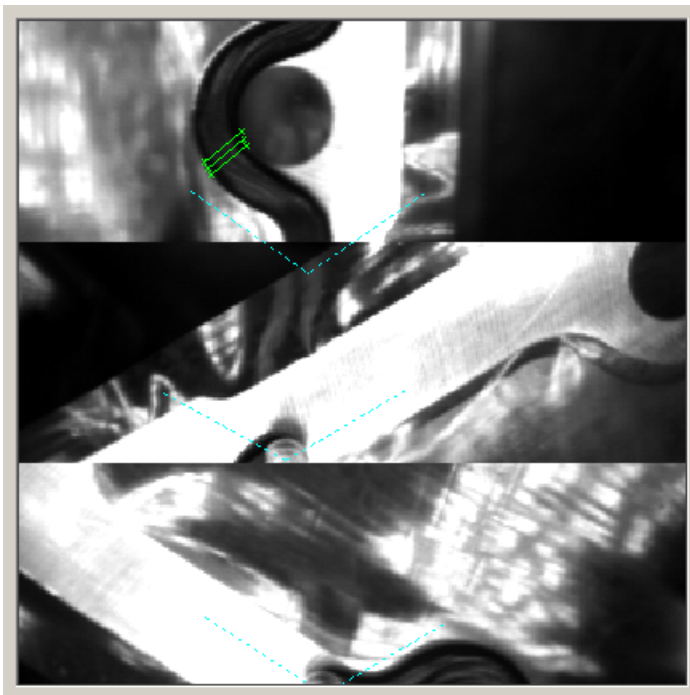
Under certain circumstances it may happen that the glue is applied in such a way that the inspection system cannot detect the edges.

As an alternative to the edge detection method described in the previous section, the option exists to perform a gray level-based brightness analysis in designated areas. This makes it possible to inspect glue beads even without detecting edges. This inspection method is useful for checking the continuity of the applied bead in places where there are no discernible bead edges (e.g. narrow housing flanges).



It does, however, require a difference in contrast between the glue bead and the component surface under the bead (i.e. the brightness analysis is not suitable for "black on black".)

The adhesive bead is only defined using the gray level in such an area, i.e. it is not possible to check the width and position of an adhesive bead. For that reason, the inspection is limited to a continuity check.



Detection of the glue bead by means of a brightness analysis

If this happens, a brightness analysis can be activated area by area so that the glue bead can at least be checked for continuity.

1. To teach in the "edgeless" area, a glue bead where the problematic location is covered with a material with an easily distinguishable contrast compared to the adhesive must first be acquired.
2. These images are parameterized as before using the standard method⁴³.
3. An area where the brightness analysis is activated is then created at the problematic location (specification of the positive and negative brightness deviation in gray levels %). 0% stands for black, 100% for white.
4. The application parameterized in this way is taught in.

5. The cover must then be removed before a second recording run.
6. An optimization run is performed with the second image sequence (see also [Run options](#)^{D69}). The taught-in values are optimized for the actual conditions. As a result of the first run, the system knows where the glue bead should be. The taught-in values are optimized in the background and this is not obvious to the user. It is only with the measurement run that it is obvious that the brightness analysis is being used due to the change in the green detection circle for the square.



The brightness analysis can be used only if there is a visible contrast between the glue bead and the component surface under the bead (i.e. the brightness analysis is not suitable for "black on black").

You will find further information on this in:

[Settings for areas](#)^{D75}

[Areas context menu](#)^{D91}

[Teaching in areas](#)^{D104}

5.4.7.4.5 Additional method (Brightness analysis)

In addition to the alternative measurement method *Brightness analysis* it can also be used as an additional method in certain cases.

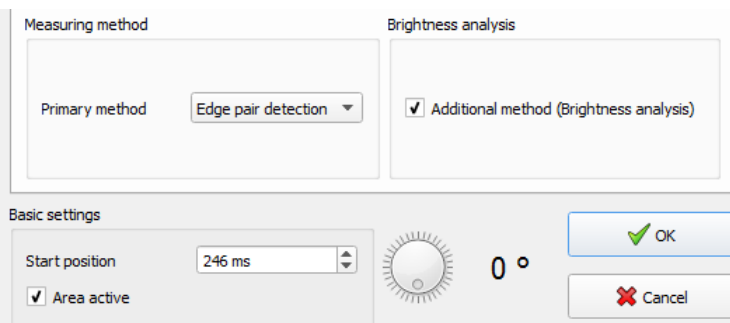
As an additional method, the brightness analysis can also be used for edge pair or single edge detection.

This is useful if material or glue deviations occur occasionally in the glue bead which means that edge pair or single edge detection is not exact enough.

With the additional brightness analysis, a defined measurement width can be inspected via gray level comparison.

Edge pair detection + brightness analysis combination

With this combination, edge pair detection is carried out first and, if glue is detected, a brightness analysis is also carried out. The settings for this are made for each area in the *Adjust area* dialog. Activate **Additional method (Brightness analysis)** after selecting **Edge pair detection** from the *Measuring method* field.

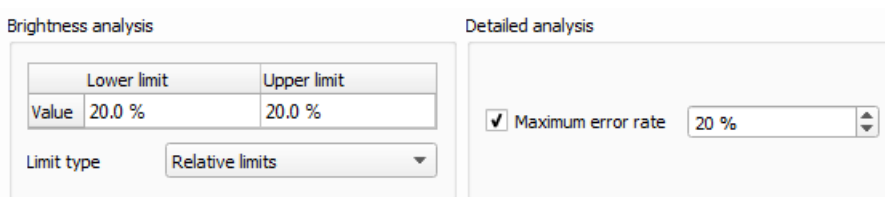


The comparison is carried out on the glue width that is detected. If the comparison is unsuccessful, the glue is classified as "not detected". As with the brightness analysis, the brightness limits can be set here and also the maximum error rate on the **Error definitions** tab.

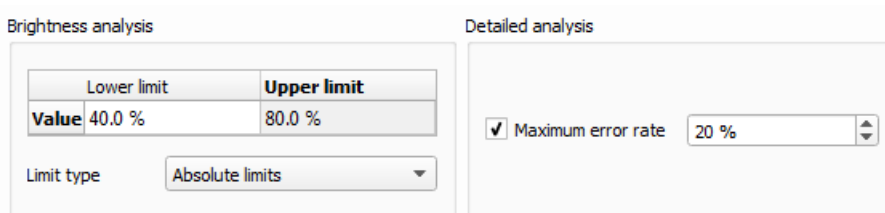
The brightness limits can be entered as relative percentages (in relation to gray level 0%=black and 100%=white) or as absolute values.

Example of relative and absolute with an assumed average gray level of 60%

Relative limits with +/- 20% to 60%



Absolute limits with 40% and 80% absolute to 60%



For a **Detailed analysis**, a **Maximum error rate** is entered as a % that does not relate to the gray level % but to the number of results with a pixel-based review of the results.

Example: per pixel the result is considered OK or NOK. If, for example, with 50 pixels at one point, 11 pixels are NOK, with an error rate of 20% the overall result is NOK.

In other words, the number of OK/NOK results per pixel is considered and this is used to calculate an error rate. This then produces the overall result OK or NOK.

This error rate fine-tunes the evaluation even more.

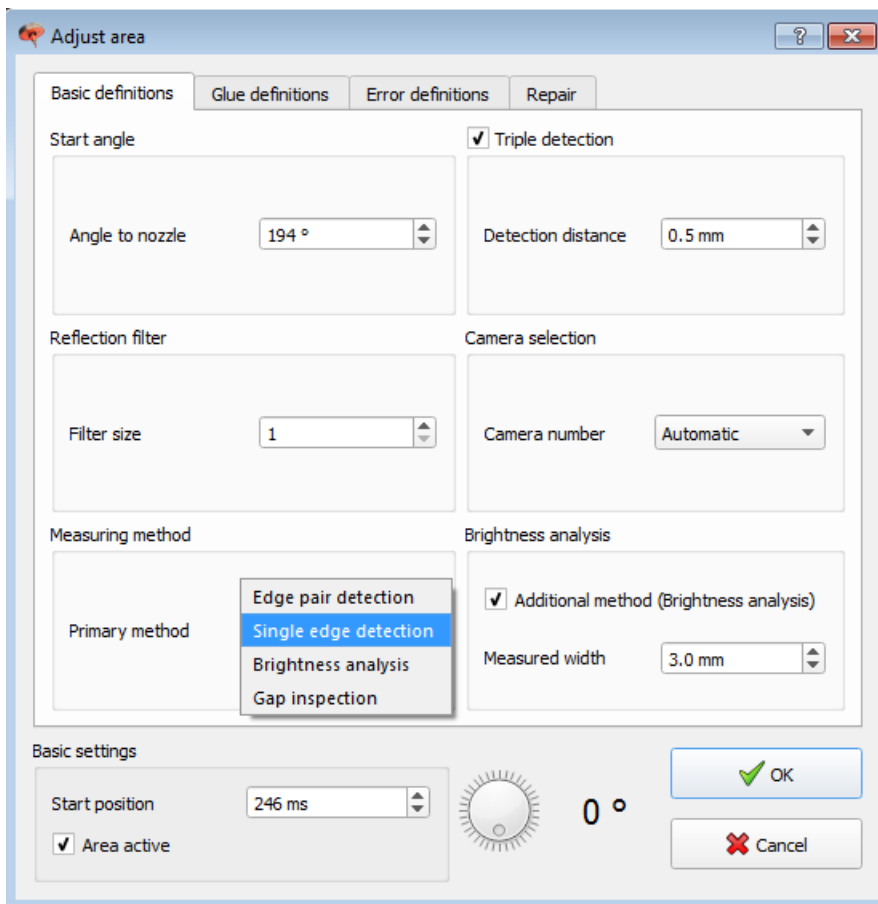
Single edge detection and brightness analysis combination

As opposed to edge pair detection with brightness analysis, in this measuring method the user defines the measured width for the brightness analysis.

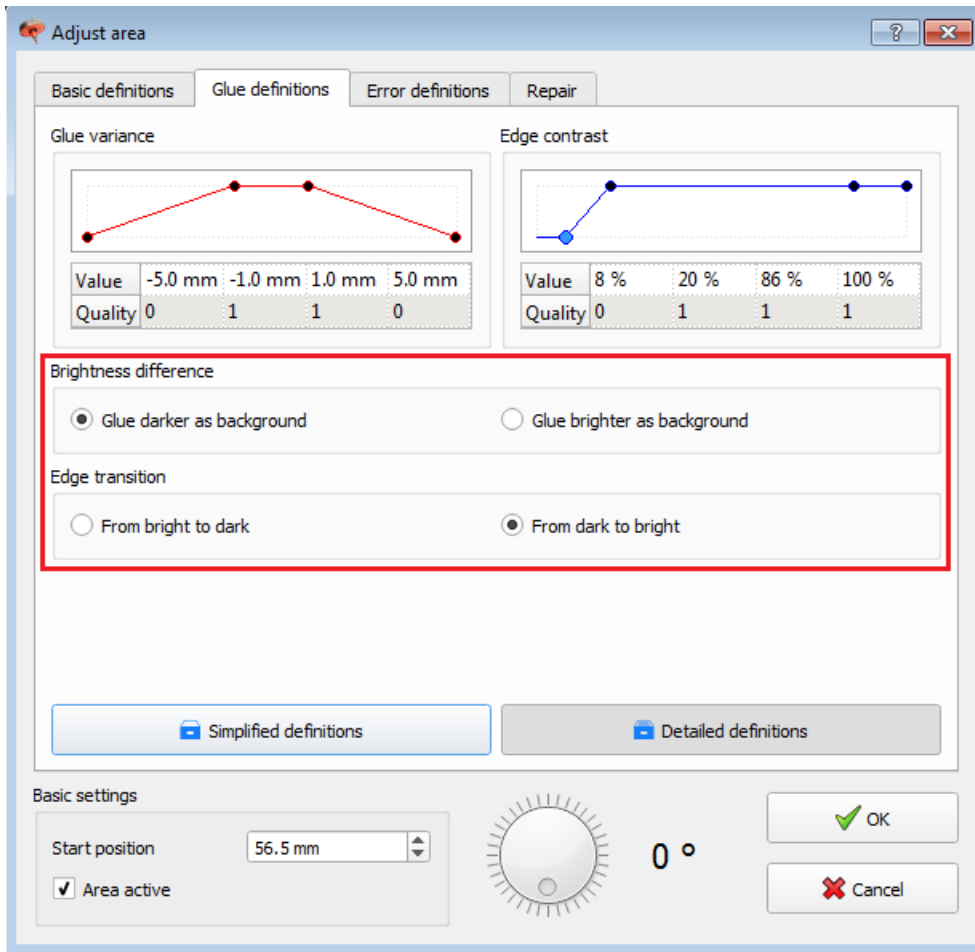
With single edge detection, a clear edge can be seen only on one side, the other side is, for example, the end of the component or the glue and material have the same color and do not create a contrast. By defining the measured width, the inspection can be carried out successfully in the subsequent brightness analysis.

Hence, the combination of single edge detection and brightness analysis is almost ideal in most cases because it is the most exact measuring method.

On the *Basic definitions* tab, the **Measured width** field is available when brightness analysis is used as an additional method..



On the *Glue definitions* tab, the measurement direction is defined by the combination of **Glue brightness** and **Edge transition**.



5.4.7.4.6 Glue gap

In practice, the glue definition or edge pair detection can also be used for gap variance rating. Gap variance rating is simply inverse edge pair detection.

This means that in the glue definition it is defined what a glue is or is not.

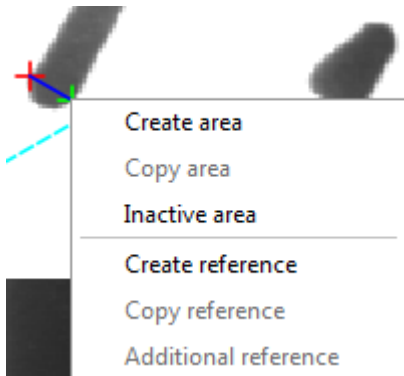
If a glue is detected, it is classified as "detected". Initially as a single image error, from a certain length it becomes a warning / error.

The difference to edge pair detection is that here a fixed measuring angle (starting angle) is defined and does not have to be taught in.



The starting angle can also be determined easily from the image sequence by using the measurement tool.

Go to the starting point in the image sequence, measure the bead width with the measuring tool and right-click **Create area** in the context menu to open the dialog shown including the value determined for the start angle. This can also be used to determine the starting angle at the start of a glue gap.



This angle is then valid for the whole area. If the measuring angle changes over time, several areas should be used to cover the entire section.

Step seams may not always be the same length.

So as not to generate pseudo errors, for the glue-gap and gap-glue transitions, inactive areas that are as large (long) as the glue process and

signal inaccuracy should be used. To compensate for signal inaccuracy, a synchronization reference should be used at the start of the inspection.

You will find further information on this in:

Create areas⁴³

Auxiliary tools⁶⁷

Synchronization reference¹¹⁶

5.4.7.4.7 Glue model

As previously described, RTVision.t uses rating functions to identify the pair of edges corresponding to the glue bead from the multitude found in the image. These rating functions⁶² are described as the "glue model".

The settings for the rating functions for every inspection are made in the respective area in *Adjust area* on the *Glue definitions* tab.

The glue model defines the possible properties of the glue in the respective area. This is necessary so that the software can select the correct edge pair belonging to the glue from the multitude found in the image. For example, it defines which widths could qualify as glue.

If, for example, different application speeds result in the glue width within an area increasing from 3 mm to 6 mm, the glue model will define the entire range between 3 mm and 6 mm as a possible glue width.

The maximum and minimum values are shown in the Extreme values display⁶⁸.

5.4.7.5 Teaching in areas

To teach in areas, the areas must be created successfully.

Areas are taught in as follows:

1. Switch to configuration mode and select the appropriate product / inspection.
2. Load the required image sequence.
3. Reset the extreme values display by clicking **Reset**.
4. With the exception of **Single measurement**, check all the boxes on the *Run options* tab.
5. First start a **test run**, by selecting **Test run** from the list in **Run options I Operation mode**. This is the best way of finding incorrect parameter settings, since image playback will stop immediately at these points.
6. If the test run completes without any problems, check once again whether the values displayed in **Extreme values** are within the values set in the area settings in Glue definitions.
7. If this is the case, select **Teach run** from the list under **Run options I Operation mode** to start the teach run. Let the image sequence run until the end so that all the areas are taught in.



The teach-in run must always be performed, otherwise the online inspection system will not be able to inspect any components.



You can check on the **Areas** tab in the *Inspections* window whether all the areas in an inspection have been correctly taught in. Failure of any of the lights in the **T.** column in the list of areas to come on indicates that the corresponding area was not taught in.

8. Finish by starting a measurement run to verify the **teach-in run**. To do this, select **Measurement run** from the list under **Run options I Operation mode**.

The screenshot shows the RTVision software interface. At the top, there are menu options: File, View, Settings, Language, Help. Below the menu is a toolbar with icons for System, Product (01_Firewall), and Inspection (Inspection_1). A 'Connection active' indicator and a 'Connect' button are also present.

The main interface is divided into several sections:

- General:** Contains buttons for Add, Copy, Load, Save, Delete, Rename, Move, and Adjust.
- Exposures:** Contains buttons for Delete, Rename, Move, and Adjust.
- Areas:** A table listing areas with their names, positions, and status (T. column):

C.	Name	Position	T.
●	Area_1	56.5 mm	●
○	Area_2	274.5 mm	○
●	Area_3	301.9 mm	●
○	Area_4	382.3 mm	○
- References:** A table with columns for Name and Value.
- Contours:** A section for contour settings.
- Start/Stop:** Buttons for Start and Test.
- Parameters:** A list of parameters: Angle (46.70°), Variance (0.01 mm), Width (3.33 mm), Contrast (71.74%), Brightness (27.90%), Error rate (-), and Quality (1.00). A circular gauge shows a value of 47°.
- Navigation:** Playback controls (stop, previous, play, next, end) and status: Number: 169, Time: 847 ms, Path: 254.0 mm. Buttons for Load sequence and Remove sequence are also present.
- Measured values:** A table showing current values:

Name	Minimum	Maximum
Variance	-0.02 mm	0.02 mm
Width	2.83 mm	4.70 mm
Contrast	67.27 %	74.22 %
Brightness	23.86 %	30.85 %
Quality	1.00	1.00
- Extreme values:** A section for extreme values with a 'Reset extreme values' button.
- Operation mode:** A dropdown menu set to 'Test run' with a refresh button.
- Display options:** Checkboxes for Reflection filter (checked), Area (dropdown), and Switching angle (checked).
- Stop options:** Checkboxes for Error message (checked), Warning message (checked), Single image error (checked), and Single measurement (checked).

At the bottom, there are buttons for Save application, Display keyboard, Lock program, and Exit program.

5.4.8 References

5.4.8.1 General

References are used to check the position of a component edge relative to the nozzle at specific points. Like areas, references must be created and taught in.



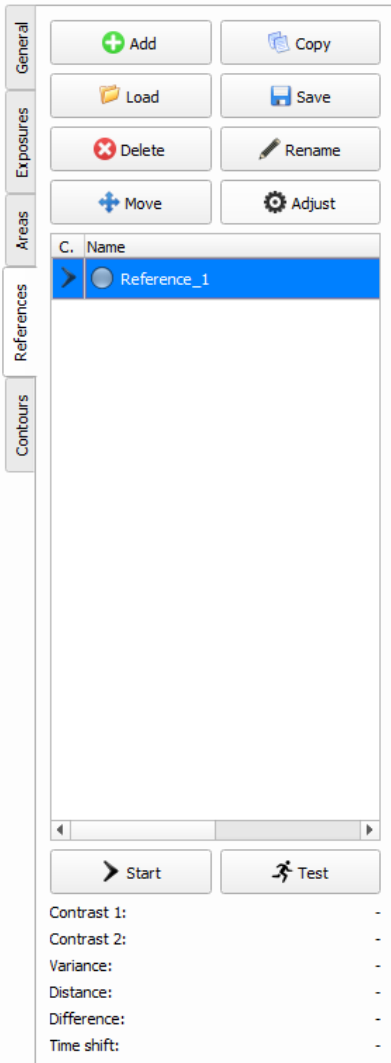
Double references can also be used to measure the distance between two edges, e.g. the distance between a glue bead and a component edge to the left or right of the glue bead. They can also be used to measure the distance from the end of a glue bead to a component edge in the direction of travel of the glue application system (by means of a double reference). Double references¹¹³ work with a primary and the defined additional reference and the required distance measurements.



Synchronization references can be used to avoid a delayed start trigger by acting as special references for an inspection. This is done by using the position of a synchronization reference to compare the calculated distance and the distance actually covered.

Opening the tab

To access the references, go to an inspection and click the vertical *References* tab on the left-hand side of the screen.



Control elements

Add

Creates a new, inactive reference with a standard name that can be changed later. References created using this button must be parameterized manually.

Copy

Use this button if you want to duplicate a reference. The copied reference is initially given a standard name (this can be changed).

Load

To load a reference, click **Load**. A selection window then opens. Click the name of the file to be loaded followed by **Open**.

Save

To save a reference, click **Save**. A selection window then opens. Assign a name and click **Save**.

Rename

To rename a reference, first select the required reference in the list of references. Then click **Rename**. Change the name as required.

Delete

To delete a reference, first select the required reference(s) in the list of references. Then click **Delete**. Answer the confirmation prompt with **Yes**.

Move

Opens the **Move start positions** dialog to set the start position of the active or inactive reference precisely. If the start position of several references is to be changed, mark them in the list and all marked references will be moved by the same value in one step by clicking **Move**.

Adjust

Opens the *Adjust reference* window. Click the relevant reference in the list of references followed by **Adjust**. Double-clicking the reference also opens the *Adjust reference* window.

Start

Clicking the **Start** button skips the image sequence to the image where the reference was created.

Test reference

Tests the properties stored in the selected reference in the current image.



To test the reference in the image where it was created, first click the **Start** button.

C. column in the list of references

Marks the currently displayed reference with an arrow.

Name column in the list of references

The green indicator shows whether this reference is active. The name of the reference is also shown here.

Position column in the list of references

Specifies (in ms) the position of a reference within an inspection.

T. column in the list of references

The light indicates whether this reference has been taught in.

Displayed values

The values shown under **Contrast**, **Variance**, **Distance**, **Difference** and **Time shift** correspond to the values measured in the current image.

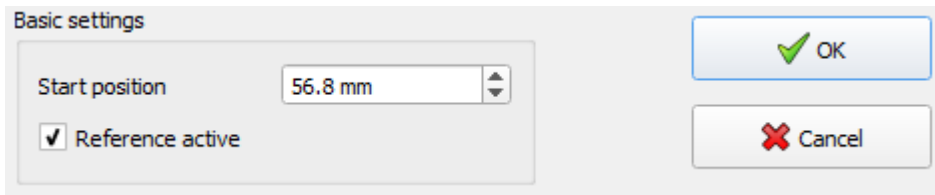
5.4.8.2 Settings for references

The settings for references are divided into the following elements:

- General parameters¹⁰⁸
- Primary reference¹⁰⁹
- Additional reference¹¹⁰
- Error definitions¹¹⁵
- Synchronization reference¹¹⁶

5.4.8.2.1 General parameters

You will find the general parameters (basis settings) in the *Adjust reference* window.



Start position

Determines the time in milliseconds when referencing should take place. The specification refers to the value specified in the [Image navigator](#)¹⁶².

Reference active

Activates / deactivates the reference. If a reference is inactive, the definitions for the reference and errors cannot be changed.



A reference that is active does not necessarily also need to be taught in. This must be done by means of an additional teach-in run.

You will find further information on this in section [Teaching in references](#)¹¹⁷.

OK

Click **OK** to save processes / changes and close the window.

Cancel

Click **Cancel** to discard processes / changes and close the window.

5.4.8.2.2 Primary reference

The primary reference defines the image processing parameters for a "standard" individual reference. The parameters are required to define the position of the reference in the image.

A reference basically consists of an elongated search area whose position and length are defined by the start and end points of the search area. The system searches for edge transitions along the search area in a similar way to when the glue bead is being inspected. To this end, it is necessary to define whether the edge transition goes from "dark to bright" or from "bright to dark" and, in instances where multiple edges are found, whether the first or last edge found should be used.

Start point

Defines the starting point of the search area based on an angle and the distance to the nozzle. These values can be determined via the [measurement tool](#)⁶⁷.

End point

Defines the end point of the search area based on an angle and the distance to the nozzle. These values can be determined via the [measurement tool](#)⁶⁷.

Check edge deviation

The box is checked if the distance between two edges is to be measured by means of a primary and additional reference (see section [Additional reference](#)¹¹¹). At the same time, a shift (edge deviation) of the primary reference is inspected like a "normal" single reference. This box must be unchecked if this is not to happen.



The box can only be unchecked if the [Additional reference](#)¹¹¹ was activated beforehand with the Distance measurement active checkbox. The Check edge deviation checkbox cannot be checked if it is grayed out.



If the **Check edge deviation** function is deactivated while an additional reference is active, in Error definitions¹¹⁵, no error or warning limits can be specified for **Maximum edge deviation**.

Edge transition

Here you can specify whether the edge transition is from "dark to bright" or from "bright to dark".

Edge position

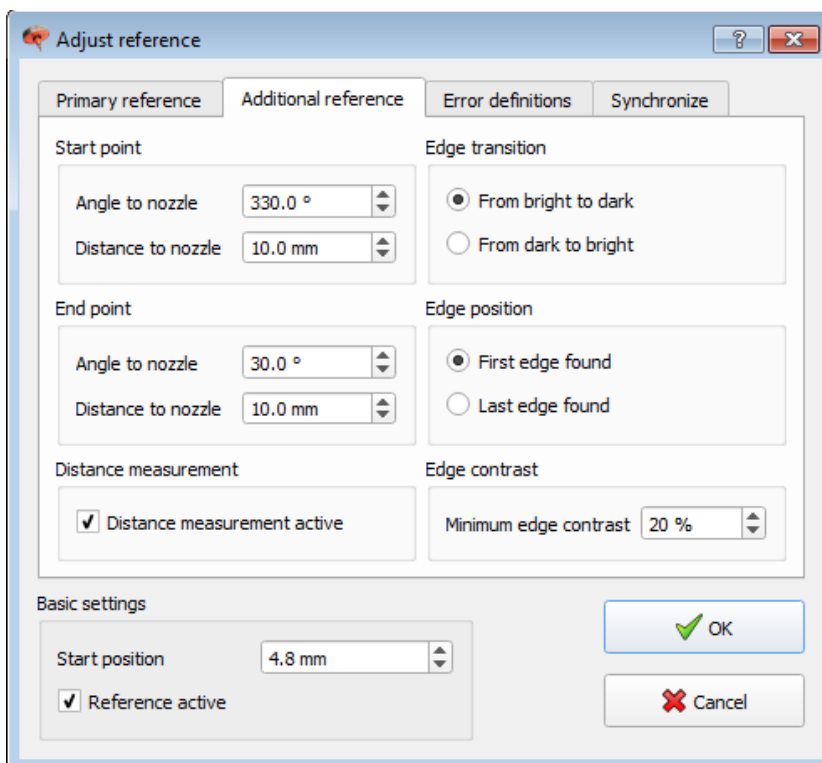
Here you can specify whether the first or last edge found should be used for evaluation purposes.

Minimum edge contrast

Specifies the minimum edge contrast that must be achieved in order to detect an edge transition.

5.4.8.2.3 Additional reference

The additional reference also defines the image processing parameters for a reference. These parameters are required to be able to measure the distance between two edges in an image in combination with a primary reference.



Start point

Defines the starting point of the search area based on an angle and the distance to the nozzle. These values can be determined via the measurement tool⁶⁷.

End point

Defines the end point of the search area based on an angle and the distance to the nozzle. These values can be determined via the [measurement tool](#)^{□67}.

Activate distance measurement

Activates/deactivates the additional reference for measuring the distance between two edges.



If the function **Activate distance measurement** is deactivated, in [Error definitions](#)^{□115} no error or warning limits can be specified for **Maximum distance variance**.

Edge transition

Here you can specify whether the edge transition is from "dark to bright" or from "bright to dark".

Edge position

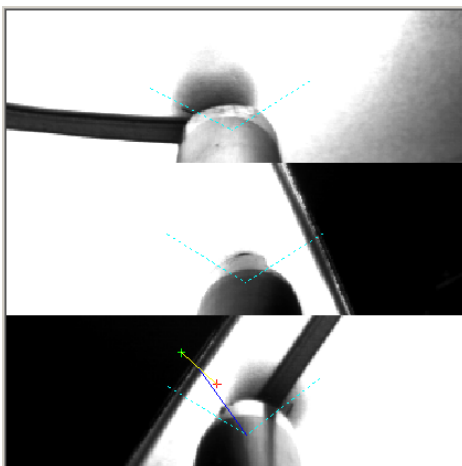
Here you can specify whether the first or last edge found should be used for evaluation purposes.

Minimum edge contrast

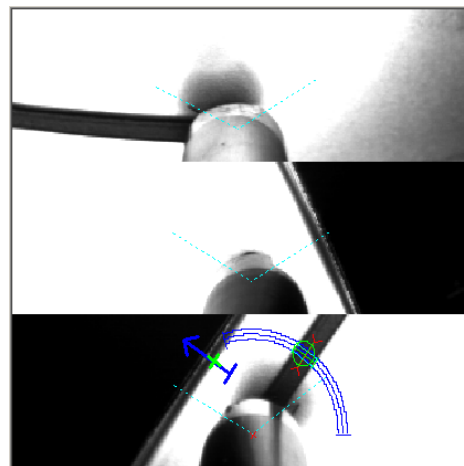
Specifies the minimum edge contrast that must be achieved in order to detect an edge transition.

5.4.8.2.4 Creating a reference

1. With the [image navigator](#)^{□62} go to the position where the reference is to be created.
2. Mark the area where a reference is to be searched for (search area) using the mouse ([measurement tool](#)^{□67}). The direction in which you drag the search area determines the search direction for the reference. The length of the marked area represents the search window where the system will search for the reference edge. The start and end points of the marking are indicated by a thin red cross or a thin green cross (see image on left). If possible, the search area should include a light / dark edge.



Generating a reference



Reference found



By default, in the error definition of the *Adjust reference*¹⁰⁷ window, tolerances are defined within which the reference must be found. The search area should therefore be extensive enough to contain these limit values.

3. Right-click and select *Create reference* from the pop-up menu.

- If the reference edge was correctly detected, click OK to accept the reference.
- If the reference edge was not correctly detected, the parameters must be adjusted. Then click **Test** to verify the parameters. If the reference edge is now correctly detected, click **OK**.



A correctly detected reference will be indicated by a thick green cross (see image on right).

The screenshot shows the 'Setting reference' dialog box with the following settings:

- Primary reference** (selected tab)
- Start point**: Angle to nozzle: 237.5°, Distance to nozzle: 20.1 mm
- End point**: Angle to nozzle: 149.5°, Distance to nozzle: 7.9 mm
- Distance measurement**: Check edge deviation
- Edge transition**: From bright to dark, From dark to bright
- Edge position**: First detection edge, Last detection edge
- Edge contrast**: Minimal edge contrast: 30%
- Base settings**: Start position: 275 ms, Reference active

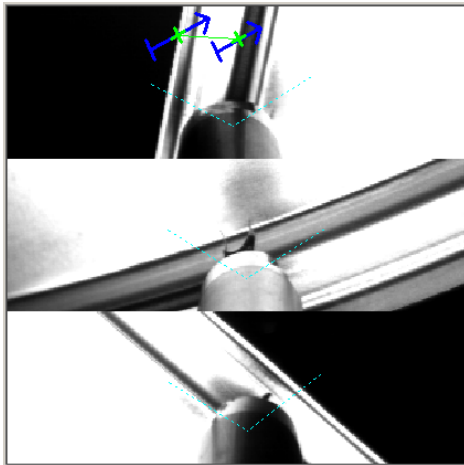
4. When you have created a reference, it has to be taught in with a teach-in run. (See section *Teaching in references*¹¹⁷).

5.4.8.2.5 Creating distance measurements (double references)

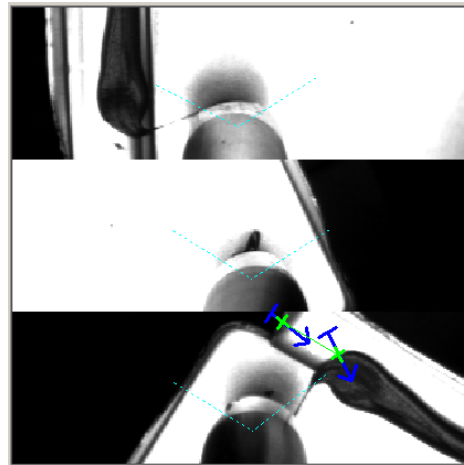
There are two ways of creating a double reference:

A. Creating two individual references as a double reference in the same image

1. First, carry out the steps described under [Creating a reference](#)⁴⁵.
2. Then mark the primary reference just created in the list of references.
3. Click Test reference to see the primary reference in the image (this is not absolutely necessary, but makes it easier to create the additional reference).
4. Mark the area where a search is to be performed for the additional reference (so-called search area), using the mouse (measurement tool). The search direction for the additional reference matches the direction you drag the search area. The length of the marked area represents the search window where the system will search for the reference edge. The start and end points of the marking are indicated by a thin red cross and thin green cross.



*Distance measurement
Side of bead to component edge*



*Distance measurement
End of bead to component edge*

5. Right-click and select Additional reference from the pop-up menu.
 - If the reference edge was correctly detected, click OK to accept the additional reference.
 - If the reference edge was not correctly detected, the parameters must be adjusted. Then click **Test reference** to verify the parameters. If the reference edge is now correctly detected, click **OK**.



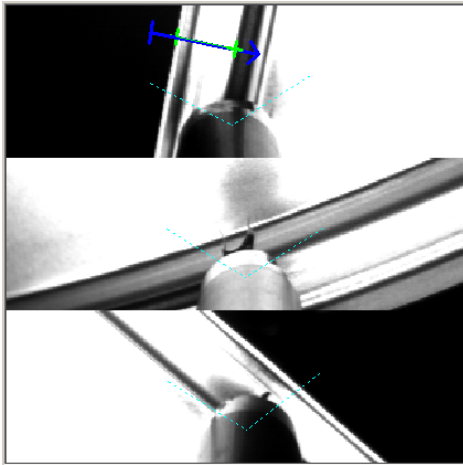
A correctly detected reference will be indicated by a thick green cross (see image).



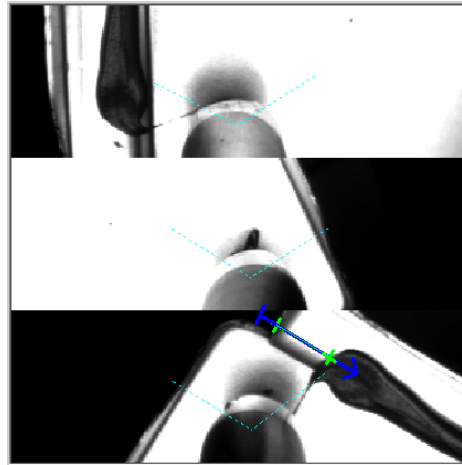
The additional reference is part of the primary reference, therefore it is not shown as a stand-alone reference in the list of references.

B. Creating a reference as a double reference

1. First, carry out the steps described under [Creating a reference](#)¹⁴⁵. Make sure when marking the area where the system is to search for both the primary and additional references that it contains both edges.



*Distance measurement
Side of bead to component edge*



*Distance measurement
End of bead to component edge*

2. Check the **Distance measurement active** box on the *Additional reference* tab.
3. Change the settings under **Edge transition** and **Edge position** on the same tab if necessary.
 - If the reference edge was correctly detected, click **OK** to accept the additional reference.
 - If the reference edge was not correctly detected, the parameters must be adjusted. Then click **Test** to verify the parameters. If the reference edge is now correctly detected, click **OK**.

You will find further information on this in:

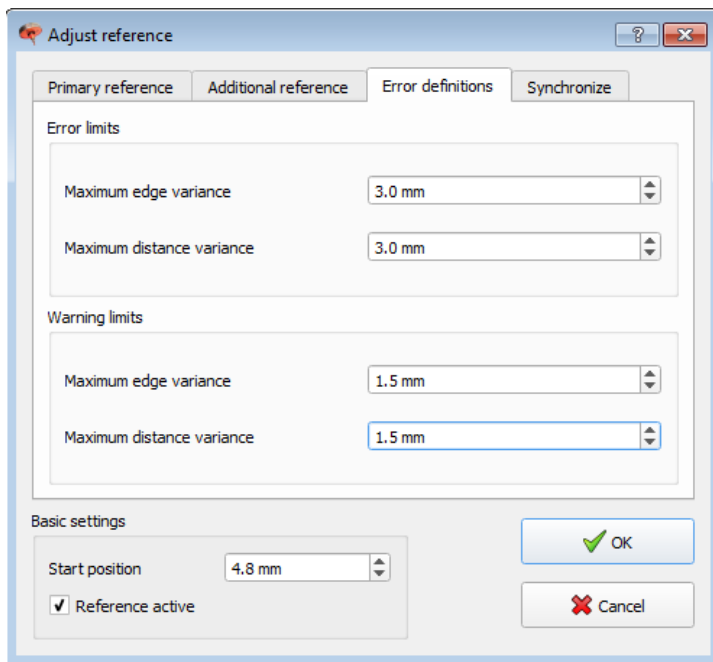
[Properties of references](#)¹⁰⁷

[Creating a reference](#)⁴⁵

[Teaching in references](#)¹¹⁷

5.4.8.2.6 Error definitions

The error definitions specify which tolerances will result in a warning or a NOK during an inspection in automatic mode.



Error limits, maximal edge deviation

If an edge is found within the search area and its position differs from the taught-in position by more than the value entered in this field, this will result in a NOK message.

Error limits, maximal distance deviation

If two edges (primary and additional reference) are found within the search area(s) and their distance differs from the taught-in distance by more than the value entered in this field, this will result in a NOK message.

Warning limits, maximal edge deviation

If an edge is found within the search area and its position differs from the taught-in position by more than the value entered in this field, this will result in a warning message.

Warning limits, maximal distance deviation

If two edges (primary and additional reference) are found within the search area(s) and their distance differs from the taught-in distance by more than the value entered in this field, this will result in a warning message.

5.4.8.2.7 Synchronization

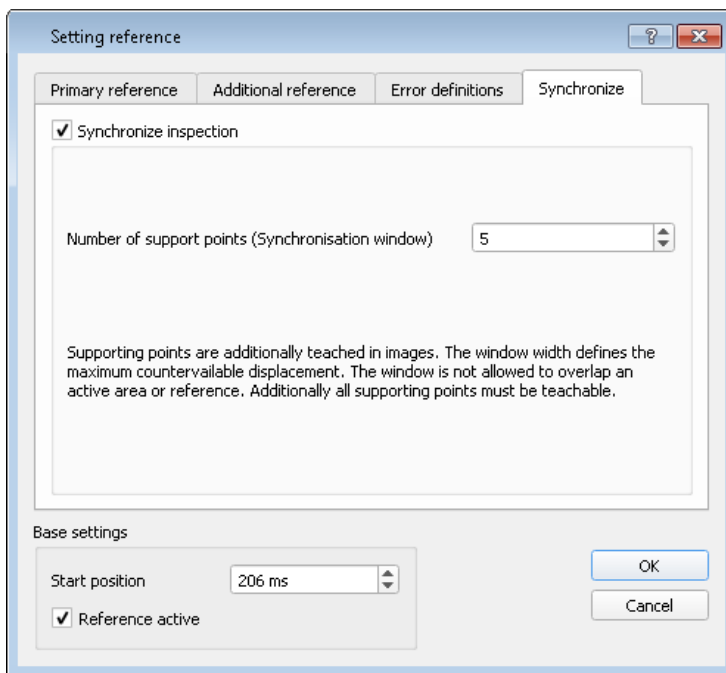
A reference can be used as a synchronization reference. This type of reference compensates for any positional inaccuracies caused by the delay in the trigger signal (to start the inspection) coming from the robot. Ideally, carry out synchronization when the component edge is easily recognizable.



If the component edge cannot be detected, the reference is the preferred method.



The window of a synchronization reference must not overlap an area or a reference.



Synchronize inspection

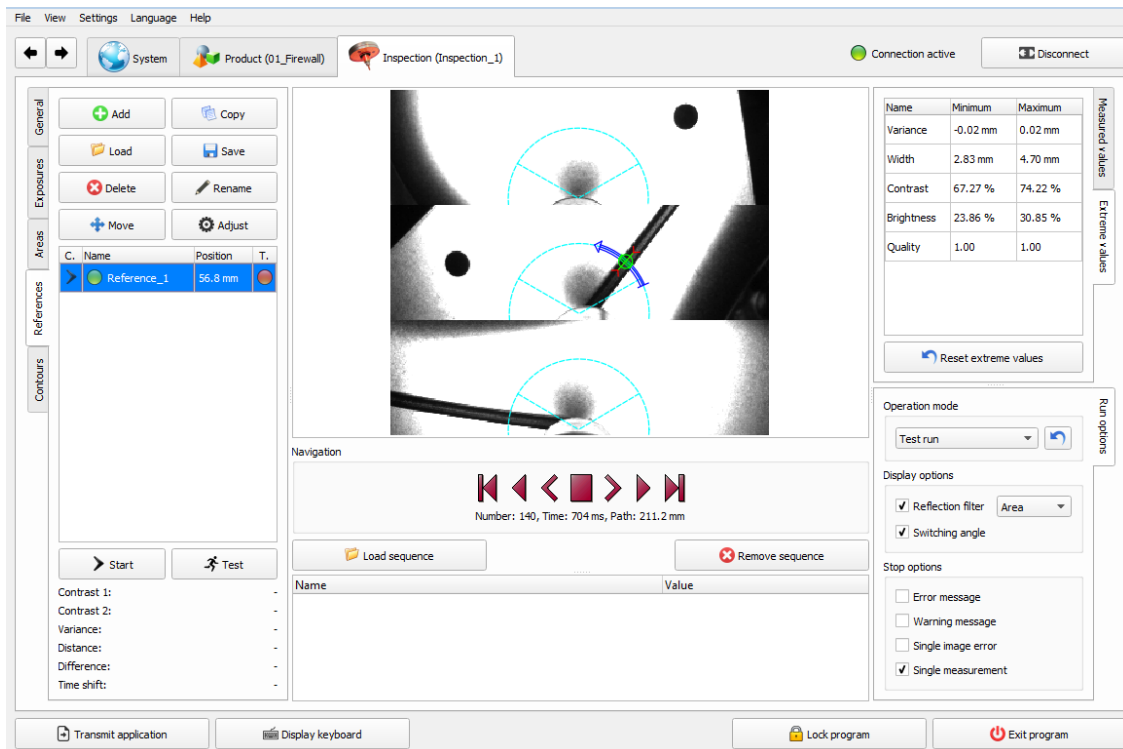
If this box is checked, the reference can be used to synchronize the inspection. This enables repeated inaccuracies to be compensated for.

Count of supporting points (Synchronization window)

A window is defined by a number of supporting points. This window specifies the maximum inspection displacement. The entire sequence is moved to the new start time, defined by the reference.

5.4.8.3 Teaching in references

References are taught in as follows:



1. Switch to configuration mode and select the appropriate product / inspection.
2. Load the required image sequence.
3. Select Single measurement on the Run options⁶⁹ tab in the stop options area.
4. To start a test run, select Test run from the list in Run options, Operation mode.

This is the best way of finding incorrect parameter settings, since image playback will stop immediately at these points.

5. Select *Teach run* from the list under **Run options, Operation mode** in order to start the teach-in run. Let the image sequence run until the end so that all the references are taught in.



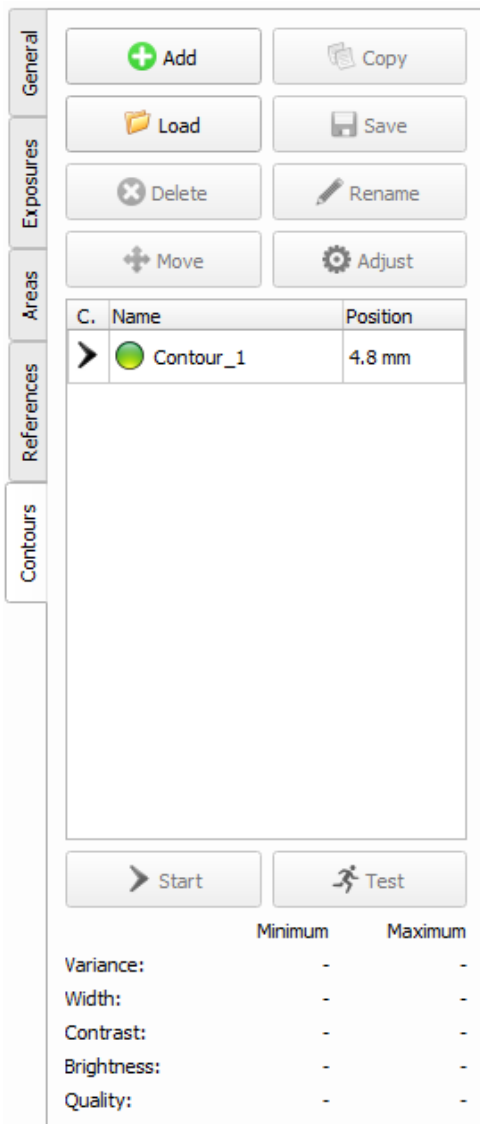
The teach-in run must always be performed, otherwise the online inspection system will not be able to inspect any components.



You can check on the *References* tab in the *Inspections* window whether all the references in an inspection have been correctly taught in. Failure of any of the lights in the T. column to come on indicates that the corresponding reference was not taught in. If the lamp is red, a setting is wrong.

6. Finish by starting a measurement run to verify the teach-in run. To do this, in Run options⁶⁹, **Operation mode**, select **Measurement run** from the list.

5.4.9 Contour detection

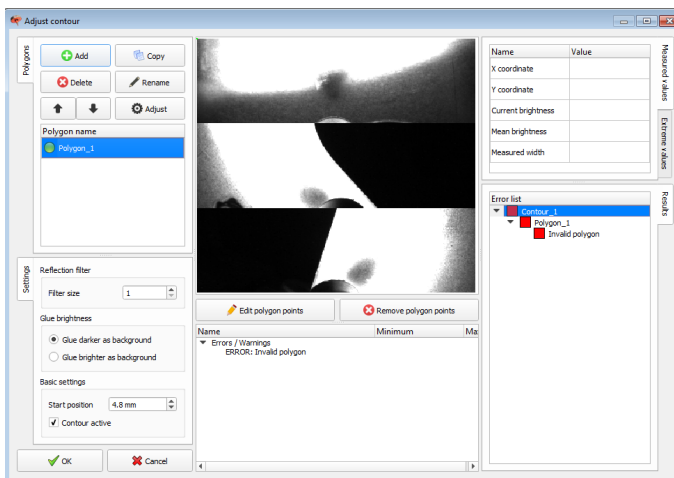


Contour detection can be used when normal glue scanning is not possible (e.g. in narrow curves). Every glue can be detected if the edges are recognizable in the image. In this case, an entire search area is defined in which the edges of the glue are to be searched for rather than a single scan.

Open the *Contours* tab for the respective inspection.

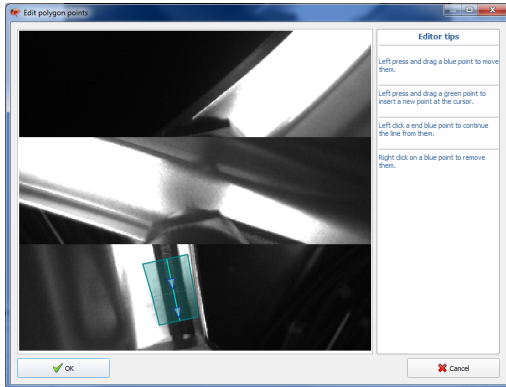
1. Select an inspection and then select the vertical *Contours* tab on the left side of the screen.
2. Use the *Image navigator* to go to the position where the polygon is to be created.
3. Click **Add** to create a new contour.
4. Double-click the contour to open the *Adjust contour* window.
5. Now click **Add** to add a polygon.
6. Mark this and click **Edit polygon points** to start the polygon editor.

This is done with the left and right mouse keys and by dragging the polygons with the mouse.



Operation within the contour screen is similar to the areas. Contours can be added, copied, stored, and deleted. In general, attention should be paid that a start position in ms is defined for each contour. In practice, the required position is reached via the navigation and the polygon editor is then started. With this procedure, the start position is applied in the basic settings from the navigation and the editor shows the respective section.

The polygons can now be created and the associated glue and error definitions can be set.

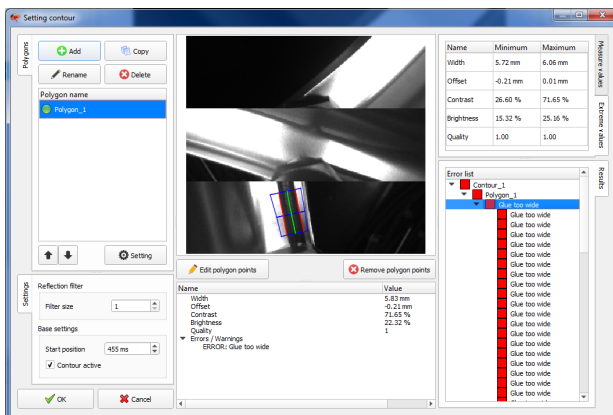


Polygons can be created interactively with the mouse. On the right-hand side of the screen there are editor tips that simplify operation.

When a polygon is selected, the respective search area is highlighted.

Note

The direction of the arrow should match the direction of impact of the robot.



When the polygon has been created, the recognized errors and warnings are immediately listed in the error list. To prevent errors, the glue or error definitions may have to be adjusted with the **Adjust Polygons** buttons.

All created polygons are listed in the polygon list. A contour model may contain one or more polygons. A polygon contains the search area and the glue and error definitions.



Define the search area with the polygon so that the glue bead and an adequate edge area are included. If the polygon was created with an edge area that is too small (too precisely on the glue bead), this could result in an error message, as the system cannot recognize any glue because the associated edge definition defined here is not within the search area.

Reflection filter

The reflection filter can be used to minimize reflections on the glue bead and the sheet metal. The stronger the reflections that occur, the higher the set value should be. A value of 0 means that no reflections will be eliminated, the filter function is inactive.

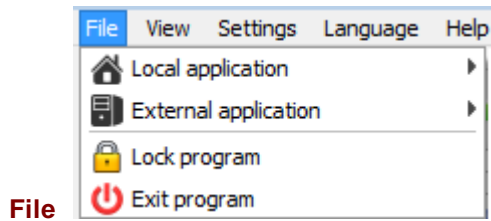
Basic settings

Check **Contour active** to switch on contour detection at the respective frame position. It is also possible to activate or deactivate several polygons in one frame. To do this, select the required polygon and then click Adjust. The Adjust polygon window opens, where the polygon can be activated and deactivated via the basic settings. If a polygon is inactive, the glue and error definitions cannot be changed.

You will find further information on this in:

[Glue definitions](#)⁸²

5.5 Menu commands in configuration mode



Local application | New

Creates a new application file (*.appl).

Local application | Load

Reloads the current application from the hard disk.

Local application | Load ...

Opens an application file (*.appl) from the hard disk.

Local application | Save

Saves the application file currently open (*.appl) to the hard disk.

Local application | Save as ...

Saves the application file currently open (*.appl) under any name to the hard disk.

External application | Load

Loads the current application file from automatic mode to configuration mode.

External application | Load ...

Loads an application file accepted in automatic mode to configuration mode.

External application | Transfer

Transfers the application file (*.appl) currently loaded in configuration mode to automatic mode.



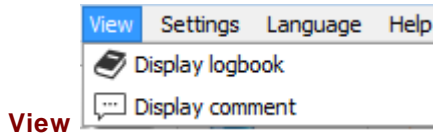
Inconsistency check: An inconsistency check is performed before an application is saved or transferred. You will find further information on the inconsistency check in the section [here](#)¹²³.

Lock program

Switches from configuration mode to automatic mode without exiting configuration mode. Configuration mode is locked for editing in the client.

Exit program

Exits configuration mode.

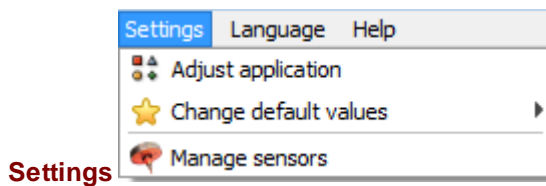


Display logbook

Shows the client log book.

Display comment

Shows the comment window for the application file currently loaded in the client. No changes are possible.



Adjust application

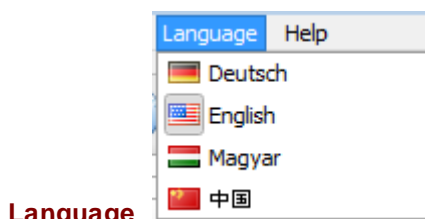
Adjusts the license options for the application to the server specifications. You will find further information on this in section [Adjust application](#)¹²⁴.

Change default values

Opens the dialog for setting the defaults for areas and references. You will find further information on this in section [Default values](#)¹⁴⁵.

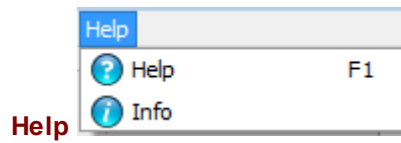
Manage sensors

Opens the Manage sensors dialog. You will find further information on this in section [Sensor management](#)¹²⁵. The function is only active if a connection already exists between the server and client.



Language

Changes the language for the software interface. Terms predefined on the system, for example for product, inspection, area of reference, etc., are displayed in the chosen national language.



Help F1

Opens the online help.

About

Shows information about the program version.

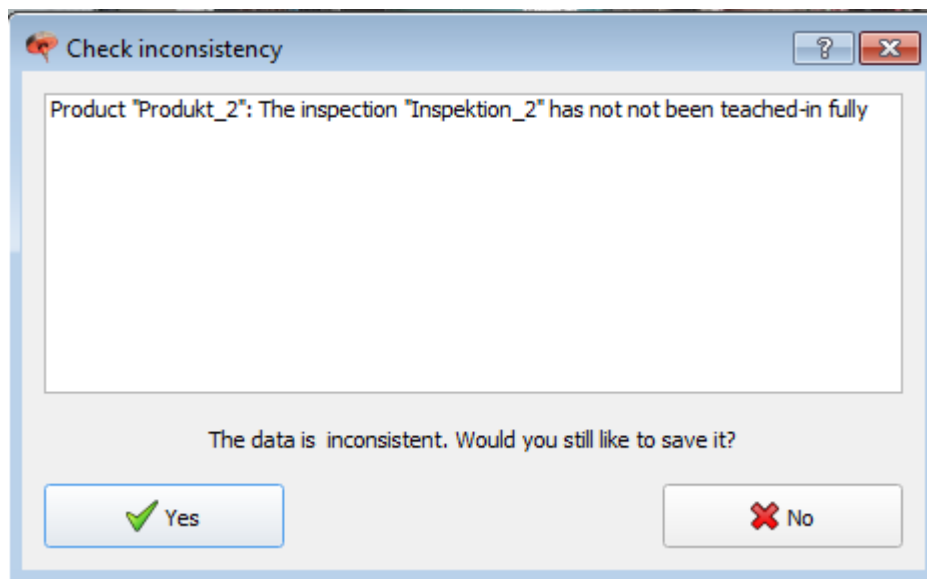
5.6 Inconsistency check

If a parameter setting has been changed, an inconsistency check is performed in configuration mode when the menu commands **File | Local application | Save**, **File | Local application | Save as ...** and **File | External application | Transfer** are executed.

The online inspection system performs the following checks for this inconsistency check:

- Was the sensor in the inspection(s) selected correctly?
- Was the calibration in the inspection(s) selected correctly?
- Was the selected calibration valid?
- Has the product ID already been used several times.
- Has the inspection length been taught in for all the inspections created?
- Have all the areas and references created been taught in?

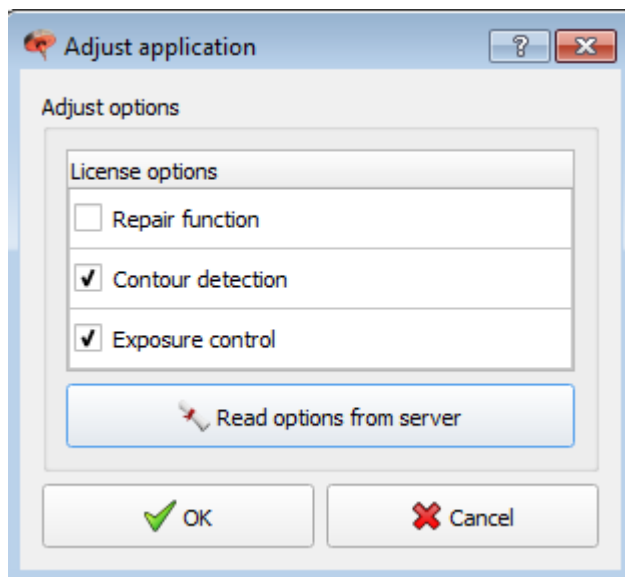
If at least one of these checks returns a negative result, a dialog opens showing which check was unsuccessful.



If the data is saved despite this warning, this may result in a system error (ERROR) during the next inspection run.

5.7 Adjust application

The individual functions for a specific application can be switched on and off here (Client) in **Settings | Adjust application**. They are dependent on the purchased license options for the RTVision.t system.



The license options can be adjusted both manually and automatically. The license options are imported from the server in the case of automatic adjustment by selecting the **Read options from server** button. The client must be connected to the server for this.



For transfer to be possible, the license options in the application must match the license options on the server.

5.8 Sensor management

Launching sensor management in configuration mode

The required sensor must be assigned to the product in configuration mode. For this assignment, the sensor must be created in the RTVision.t client.

Launch sensor management by selecting **Manage sensors** in the Settings menu.



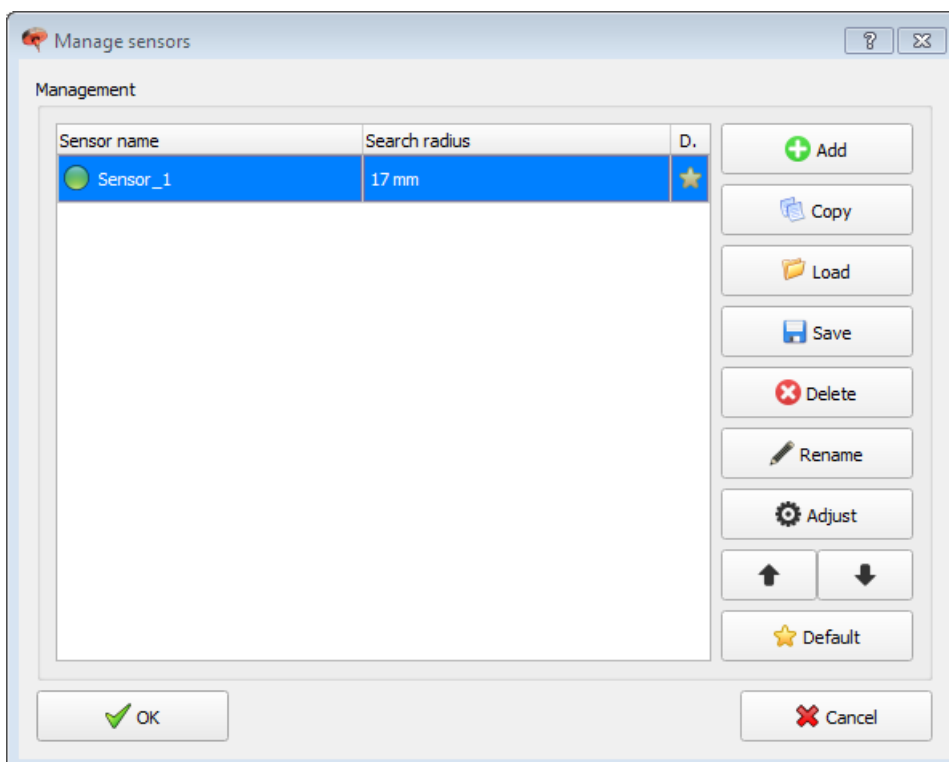
Background information:

There must be a connection to the RTVision.t-server. The link to the sensor and thus also its calibration data are saved in the sensor management on the server side. During commissioning by the QUISS service department, this calibration data is configured via the **Sensor link** box. This data applies universally, but can be changed in the RTVision.t client per product if necessary. To enable this, assignment of the sensor for the product is required and therefore product-specific sensor management maintained in the RTVision.t client.

Note

Sensor calibration is carried out at the factory, saved on the sensor and must generally not be overwritten manually.

If you wish to perform a manual calibration, you **must** contact the QUISS service department first, as QUISS GmbH accepts no liability for damage resulting from an independently performed calibration.



Control elements

Add

Creates a sensor. Then click **Adjust** to define settings. *Adjust sensor* opens where you can add image recording and the sensor calibration data via the sensor link.

Copy

Use this button if you want to duplicate a sensor. The copied sensor is initially given a standard name (this can be changed).

Load

Use this button to load a sensor from a specific sensor file. See also **Save**.

Save

Sensors are normally saved together with all the other image processing parameters in a common file with the extension *.appl*. A sensor can also be saved to a separate file with the extension *.sen*, using **Save**. It can then be loaded and used again later. You will find further information on this in section [Directory structure / files](#)¹²⁷.

Rename

To rename a sensor, start by marking the required sensor in the list of sensors. Then click **Rename**. Change the name as required.

Delete

To delete a sensor, select the required sensor in the list of sensors. Then click **Delete**. Answer the request for confirmation by clicking **OK**.

Adjust

This button takes you to the actual sensor dialog [Defining sensor settings](#)¹³³.

Default

Defines the selected sensor as the default sensor for new products. The sensor selected in this way is marked with an asterisk in the **D.** column in the list of sensors and is filled automatically when an additional product is added to the application.

Arrow up / down

The arrows can be used to change the order of the sensors in the list.

Search radius

This column shows the radius of the calibration circle used for the calibration process.

You will find further information on this in [Calibration](#)¹³⁶ and [Performing a calibration](#)¹³⁷.

Sensor name column

The lamp in front of the sensor name indicates that the sensor is functioning properly (green).

5.8.1 System variants

The RTVision.t system offers different variants depending on the local installation situation, application system and task.

Many different sensor types are available, which vary, for example, as regards lighting parameters, filters and working distances.



The default situation for the RTVision.t system is inspection with just ONE suitable sensor.

However, the application can be configured and set up to use several sensors. The sensor manager of the application allows you to create several physical sensors and also virtual sensors that differ, for example, only in their brightness. The different sensors can then be assigned to the individual products via the RTVision.t client.

If several physical sensors are in use, two conditions must be observed:

- the imaging system communicates with just ONE higher level controller
- the sensors can only carry out inspections one at a time and not simultaneously or parallel to each other.

Within the application you can define which brightnesses are to be used for the lighting of each sensor.

Information – material damage

The sensor optics may only be installed and configured by the QUISS service department.

The QUISS service department works on the RTVision.t server under **Service | Hardware state** and **Service | Sensor settings**.

Leave these basic settings on the RTVision.t server to the QUISS service department since empirical values are required for the optimized setting of hardware, especially the sensors.

The sensor systems delivered from the factory (camera with strobe controller) always have a fixed IP address that is identical for all sensor optics.

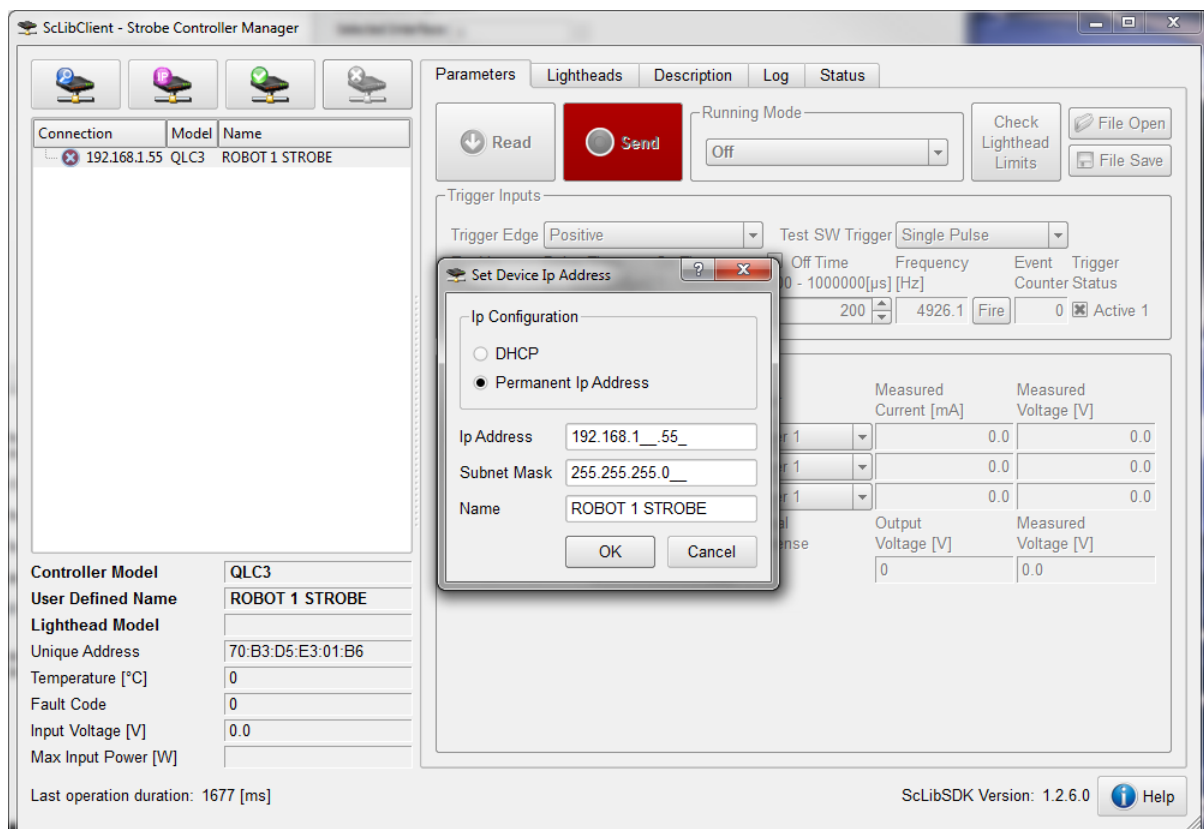
The strobe controller and cameras are then initialized in the RTVision.t server under **Service | Hardware state** and **Service | Sensor settings**.

Only then can the sensor management in the RTVision.t client be used for the product-specific assignment.

What happens if you work with more than 1 sensor?

If your system works with more than one physical sensor, the cameras and strobe controller must have different IP addresses. This is necessary so that they can be controlled selectively by the higher level controller and data transfer and evaluation is possible.


- When the strobe controller and camera have been connected to the local network, the sensor camera is assigned a new IP address with the installed configuration software (the software name depends on the type of camera).
- The associated strobe controller is then configured via the auxiliary program ScLibClient\QUISS\ScLibSDK\bin\Win32 or Win64).
- The **Find** button is used to search for the strobe controller and, if necessary, it is assigned a new IP address.



To simplify the initialization of several sensors in RTVision.t, it is advisable to connect and initialize just **one** system consisting of camera and strobe controller at a time. The assignment of the serial number (of the camera) and sensor in RTVision.t are thus unique.

- RTVision.t server is started.
- The basic settings are made in **Service | Sensor settings** in the **Adjust sensor** dialog.
- By default, delay and pulse duration are filled
- Leave optimum output voltage activated
- Adjust the power supply for the lighting intensity and color.

Depending on the ideal light output, the ideal power supply must be selected. Empirical values and images to be tested after initialization show how well the power supply is adjusted.

 **Information – material damage**

With the **RGB sensor**, three mA fields are available for color selection; with the single color sensor, only one field **Current** has to be set. Depending on the configuration of the sensor regarding scattered light or light with a polarized filter, base material and glue color, values between 500 mA and 1500 mA should be tried out.

The maximum values for power supply defined in the hardware must be observed to prevent overheating, for example. If white light is to be used with the RGB sensor, the same mA value (e.g. 1000mA) can be entered in all current channels; here, too, the overall maximum value for the strobe controller must be observed.

These mA values can be optimized later and are not fixed in the first step.

The settings for the strobe controller in the RTVision.t server apply globally across all products.



Special case of RGB sensor: For each individual product it is possible to optimize the strobe controller; this is then done for each product in configuration mode on the client in System overview. If the strobe controller is not activated for the product, the global server setting applies.

-
- Click **Save data** to apply and initialize the settings for the strobe controller. If initialization is successful, the field is green.

You will find further information on this in:

Menu commands in automatic mode under service¹⁵⁶

Sensor management¹²⁵

Sensor dialog¹³³

System overview⁵²

Following sensor replacement¹⁹⁸



In automatic mode, the strobe controller values of the RGB sensor configured for each product in configuration mode (Client) overwrite the global settings made on the server. This means that the RGB sensor can be optimized via the strobe controller individually for each product by means of the client. If the strobe controller on the client is not activated (not checked), the global settings defined on the server for the RGB sensor are used.

You will find further information on this in:

RGB sensor settings¹³⁰

5.8.2 The RGB sensor

Depending on the use and materials deployed, the RGB sensor provides flexibility for various products to define the lighting with ideal light-dark contrasts.

With three color channels for blue, red and green, the RGB sensor can be adapted for every product and its specific properties.

By combining the color channels, it can also be used for white.

The lighting is controlled by an LED light controller (strobe controller) that addresses all three channels selectively to control the coloration.

In the RTVision.t software, the strobe controller can be configured on the server and on the client (product-specific in this case).

Global setting

On the RTVision.t server, when the strobe controller is initialized in **Service | Sensor settings**, the power supply for optimum light-dark contrast is specified globally for all products.

See details in section [System variants](#)¹²⁷

Selective setting of the RGB sensor per product

On the RTVision.t client, you can specify a separate color definition of the strobe controller for each product. However, this applies only to this product and overwrites the global setting on the server only for this product. The other products remain covered by the global definition.

Settings

Sensor selection

Sensor_1
▼

Basic setting

Product ID
1
▲▼

Save results

Frequency
1
▲▼

Gap length

Max. length
1000 mm
▲▼

Repair setting

Repair product

Sensor settings

Compare sensor

Strobe controller

■
Current 1
0 mA
▲▼

■
Current 2
0 mA
▲▼

■
Current 3
500 μ mA
▲▼

! In automatic mode, the strobe controller values of the RGB sensor configured for each product in configuration mode (Client) overwrite the global settings made on the server. This means that the RGB sensor can be optimized via the strobe controller individually for each product by means of the client.

If the strobe controller on the client is not activated (not checked), the global settings defined on the server for the RGB sensor are used.

Settings

Sensor selection

Sensor_1

Basic setting

Product ID 1

Save results

Frequency 1

Gap length

Max. length 1000 mm

Repair setting

Repair product

Sensor settings

Compare sensor

Strobe controller

Current 1 0 mA

Current 2 0 mA

Current 3 0 mA

! The GLOBAL setting (from the server) overwrites the product setting if the strobe controller on the product level on the client is NOT activated (see below).

5.8.3 Sensor dialog

Note

Sensor calibration is carried out in the factory and generally does not have to be done again.

Every sensor is calibrated in the factory and includes its own specific calibration data. This is entered in the application via the sensor link.

CAUTION: Subsequent manual recalibration overwrites the calibration values set in the factory. Should this be unavoidable, consult the QUISS service department beforehand. All liability on the part of QUISS GmbH shall be excluded in the event of sensors being calibrated independently.

The calibration data of the sensor is loaded into the application in the *Adjust sensor* window.

See also: [sensor replacement](#)¹⁹⁸

If the client still did not have access to the sensor and camera data (prior to commissioning), click the checkbox **Sensor link**.

The stored data is transferred automatically to the client and the serial numbers of the sensor camera, including the calibration data, are loaded (green).

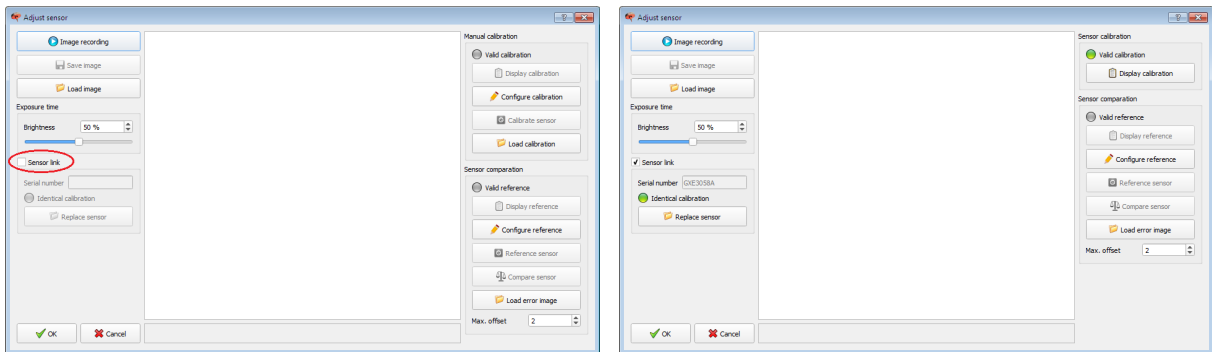


Fig.: The sensor link must be activated in configuration mode in order to transfer the sensor's calibration data to the application *Fig.: The sensor's calibration data has been transferred successfully*

Successful upload of the calibration is indicated when **Identical calibration** is green; the serial number of the sensor camera is also shown.

It must be ensured that the calibration data of the new sensor is uploaded successfully.

Only in absolutely exceptional cases should the relevant sensor be calibrated manually.

This function is active only if you uncheck **Sensor link**. However, this overwrites the specific sensor calibration installed in the factory.

The individual steps involved in manual calibration are described in section [Performing a calibration](#)¹³⁷.

Note

If necessary, before carrying out **manual calibration**, make sure to contact the QUISS service department.

Open the sensor dialog

In the [Sensor management](#)¹²⁵ of the client, select a sensor or create a new one. Then click **Adjust** or double-click the required sensor in the list of sensors. The *Adjust sensor* dialog opens.



In most cases, only one actual, physical sensor is installed so that it is not necessary to configure several sensors. However, this function was kept so that older software versions can be updated too, as in many cases they work with additional virtual sensors.

Control elements

[Image recording](#)

Starts local image recording and stops this if clicked again. This last image can then be saved with **Save image**.

[Save image](#)

Click **Save image** to save the currently displayed image. A selection window then opens. Select the directory where the file is to be saved together with its name and then click **Save**.



It is recommended to always save the image used for a calibration separately.

[Load image](#)

Loads an image from the hard disk for use in calibration or for referencing (optional). Select the directory containing the file to be loaded. Click the name, then **Open** or double-click the file to open it.

[Exposure time](#)

Sets the brightness as a percentage.

[Calibration state](#)

Green indicates that the calibration is valid for the application.



It does not show whether the new calibration was already loaded following a sensor replacement. This is shown on the left-hand side of the screen in **Identical calibration**.

The properties of the calibration can be displayed in Properties.

[Manual calibration \(avoid if possible!\)](#)

The selected sensor can be calibrated manually with **Configuration**, **Calibrate sensor** and **Load calibration**.

 **Note**

Manual calibration overwrites the calibration configured in the factory for the sensor!

However, in most cases, a calibration file already exists for the sensor, which means that it can be loaded via the checkbox **Sensor link** assuming there is a connection to the server if this is necessary, for example, after a [sensor replacement](#)¹⁹⁸.

OK

To save changes and close *Adjust sensor*, click **OK**.

Cancel

To discard changes and close *Adjust sensor*, click **Cancel**.

5.8.3.1 Calibration

RTVision.t performs a visual inspection (measurement) of the adhesive application during the application process. This measurement is based on the images supplied by the three cameras. The image information is shown in pixels. To make entering information as easy as possible for the user, the software uses millimeters instead of pixels. Before being delivered, the sensors are calibrated in the factory to establish the relationship between pixels and millimeters. Generally, end users do not have to carry out any manual calibration.

Note

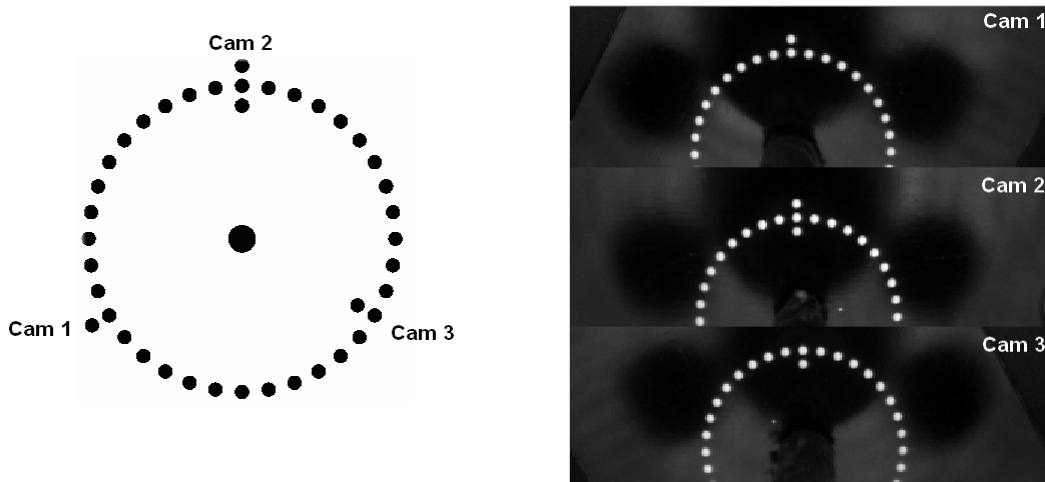
Sensor calibration is carried out in the factory and generally does not have to be done again.

Every sensor already contains its own specific calibration data on delivery. This is entered in the application via the sensor link.

CAUTION: Additional manual calibration overwrites the calibration values set in the factory. Should this be unavoidable, consult the QUISS service department beforehand. All liability on the part of QUISS GmbH shall be excluded in the event of sensors being calibrated independently.

Calibration also determines the position of the three cameras relative to each other in order to identify the precise switching point and the overlap area.

Calibration is performed using a calibration plate with a special pattern of dots.



You will find further information on calibration in the section [Performing a calibration](#)¹³⁷.

5.8.3.2 Performing a calibration manually

ⓘ Note - AVOID performing a manual calibration !!!

End users do not usually have to carry out any calibration manually. The calibration data is linked to the sensor technology and calibration is carried out in the factory.

Before **doing anything**, contact the QUISS service department if you plan to carry out **manual calibration** yourself. All liability on the part of QUISS GmbH shall be excluded in relation to all types of damages that occur as a result of a manual calibration being performed independently.

The following steps are required to perform a manual calibration:

1. In the [Sensor management](#)^{D125} in **Settings | Manage sensors**, first select a sensor or create a new one. Then click **Adjust**.
2. An image of the calibration plate is required for automatic calibration. This can either be loaded from the hard disk or recorded using the cameras.

If a new image is to be used for calibration, move the sensor to the calibration plate using the robot, or move the calibration plate under the sensor if the glue nozzle is stationary or use the mobile calibration device. The working distance of the sensor must be observed. The calibration plate and sensor must also be parallel to each other (no tilting).

Then align the sensor with the calibration plate for positioning the camera. This is done by swiveling the sensor through its fixing axis or by swiveling the calibration plate. The position is correct when the dot outside the circle is visible in the top camera image and the dot inside the circle is visible in the bottom camera image and these two dots are as close as possible to the same vertical line (see screenshot below).



A good and cleanly executed calibration is a prerequisite for using the image processing system.

Make sure to use the calibration stored on the sensor in the factory and avoid manual calibration where possible. Do not disconnect the sensor link following commissioning. You can load the calibration data for a newly replaced sensor without difficulty if a sensor link exists by selecting **Replace sensor**.

To load an image from the hard disk, click **Load image**.

3. Click **Sensor link**.

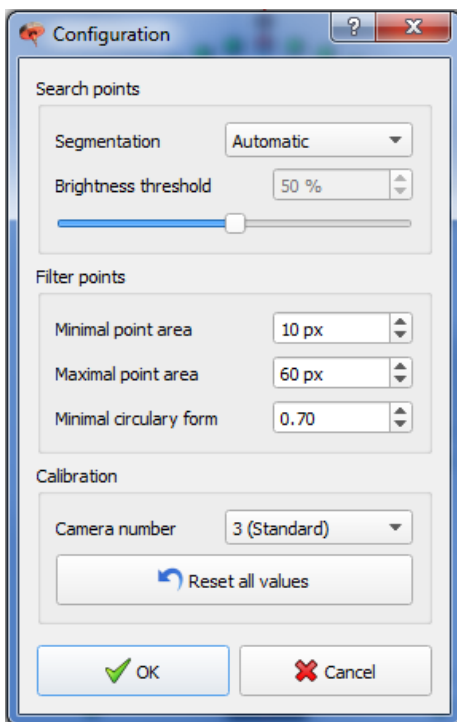
- Calibration is performed automatically.
- After successful calibration, the **Valid calibration** lamp is lit.

4. To reconstruct the calibration later, click the **Save image** button to save the image used for the calibration.

If calibration was not successful, click the **Configuration** button for an advanced setting option.



The simplest method is to optimize the point search by switching to **Manual** segmenting and additionally adjusting the brightness threshold.



Note - Danger of confusing calibration and referencing

While the manual calibration procedure is identical to the reference configuration procedure, a valid calibration must already exist for the reference configuration.

Do NOT change the calibration of your sensor from its ex works setting in the course of the reference configuration for the subsequent target inspections. The target inspection only checks for potential deviations from the reference within the system, comprising sensor, gluing unit, nozzle and robot. It does NOT calibrate the sensor and also should not result in manual calibration.

5.8.3.3 Configuration and execution of target inspection

For the target inspection, the complete system comprising the individual components (from the robot gripper arm through the dispenser with nozzle to the sensor) is referenced together, i.e. an image recording of the referencing plate is optimized in configuration mode (Client) and saved as a reference value in the product or application.

The application configured in this way with a specific product is transmitted to the server, where it is available for a repeat target inspection after a predefined product ID is called.

It checks the extent to which the current system status concerning imaging inspection deviates from a saved target status (reference). This is done using a permanently mounted reference target (referencing plate), which is approached with the call.

One possible application would be, for example, saving a cyclic call of the target inspection in the PLC so that the reference and actual position of the system to the referencing plate/reference target can be determined.

Furthermore, the test program can also be started after every mechanical replacement of a component (e.g. gripper, robot, sensor, nozzle, etc.) involving changes within the system and, if the result is NOK, the cause of the error can be determined and the magnitude of the error can be checked with regard to its relevance.

The settings made are specific for each station, as they reference the robot, sensor, gripper arm and dispenser with nozzle together as an (overall) system.

NOTE - Target inspection option

This test program is an optional function of the RTVision.t system and can be enabled after installation.

The functional box in the RTVision.t client is called **Sensor comparison** or **Compare sensors** depending on the delivery version.

If necessary, contact QUISS GmbH.



Note: Configuration of a reference is **NOT** the same as sensor calibration. The latter is performed internally at QUISS GmbH and is permanently saved on the sensor upon delivery.

Repeat calibration (manual) via RTVision.t is generally not required and is not intended. QUISS GmbH accepts no liability for any damage resulting from independently performed manual calibration of the sensor.

For **configuration of the target inspection**, paths must be programmed (by the plant manufacturer) and at the same time settings made in the RTVision.t system.

For configuration of the target inspection, a reference image is saved for the current sensor. In the target inspections that are then performed automatically, this reference is checked for current deviations of the nozzle position, which is set in pixels.

Procedure - robot controller

- The referencing plate (reference target) is mounted as close as possible to "Home" and must be unchangeable for repeated approach of the IR.
- The robot controller must be programmed so that when a predefined product ID is called, the center of the nozzle controls the center of the referencing plate, whereby the nozzle is perpendicular to the plate.
- The working distance must be maintained with a deviation of +/- 1 mm and the center points must be exactly one above the other.

- The robot arm rotates the sensor head until the three cameras display an optimal image of the reference target.
- Note this in the RTVision.t client in **Settings | Manage sensors | Sensor | Settings (see below)**. Ideally, the camera should show three dots one above the other and all images of the individual cameras should be one above or below the other.

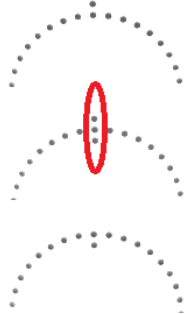


Fig.: The reference target is displayed in the RTVision.t client

When the optimal position is reached, this position must be saved as a fixed target position before the reference target in the IR.

i NOTE - Observe in the robot controller!

The created test program is called in the RTVision.t server. The predefined product ID is called with the saved inspection. For communication, the following applies: product ON, inspection ON, a short wait time must be observed (e.g. <100 ms before the referencing plate), then follows the signal for inspection OFF, product OFF. The robot can then leave the position before the reference target.

The result **OK / NOK** is output in automatic mode (Server).

For the initial configuration described here, additional settings in the RTVision.t client are required.

Procedure - settings in the RTVision.t client in two steps

- Creation of the product with predefined ID (Client)
and
- creation of the reference image - configuration of a reference with subsequent transmission of the application to the RTVision.t server.

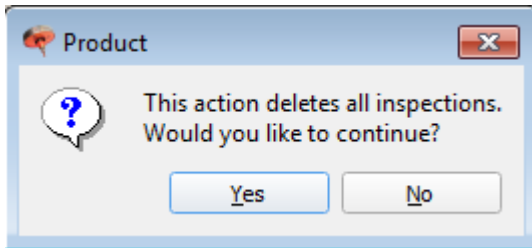
Step 1: Procedure - Creating a product with predefined ID

- Start the RTVision.t server and client. Select **Connect**.
- In the client, create an application with a product, e.g. "reference target" to which you assign the sensor and the defined product ID (in the example ID=99).

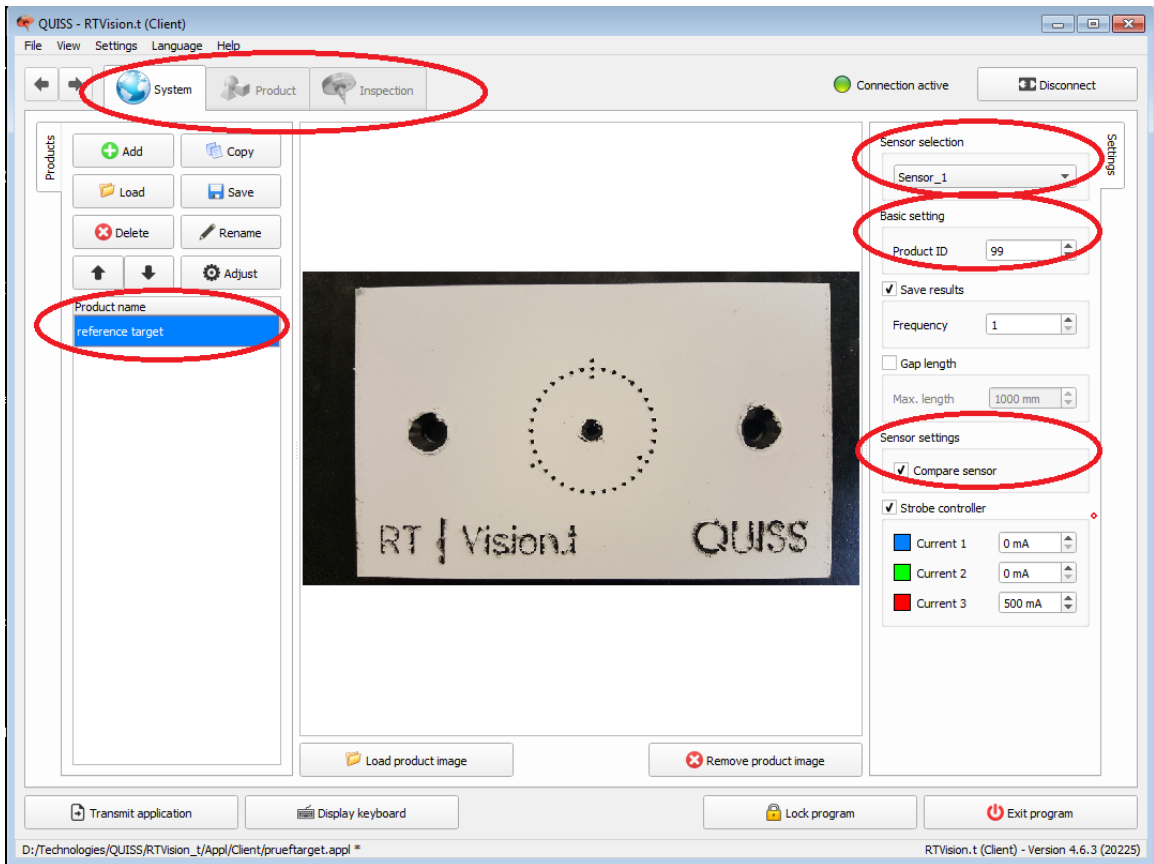


The target inspection is always linked with the product and its predefined ID via an inspection defined by the system. Accordingly, this ID may not be used for any other product inspection, as it does not allow individual configuration of the inspections.

- Check the box for **Compare sensor / Sensor comparison** and a specific system inspection is created automatically. To do this, any existing inspections must be deleted.



- When you confirm the confirmation prompt, an inspection is created by the system, which cannot be edited by the user (and administrator).



Step 2: Procedure - configuring the reference image

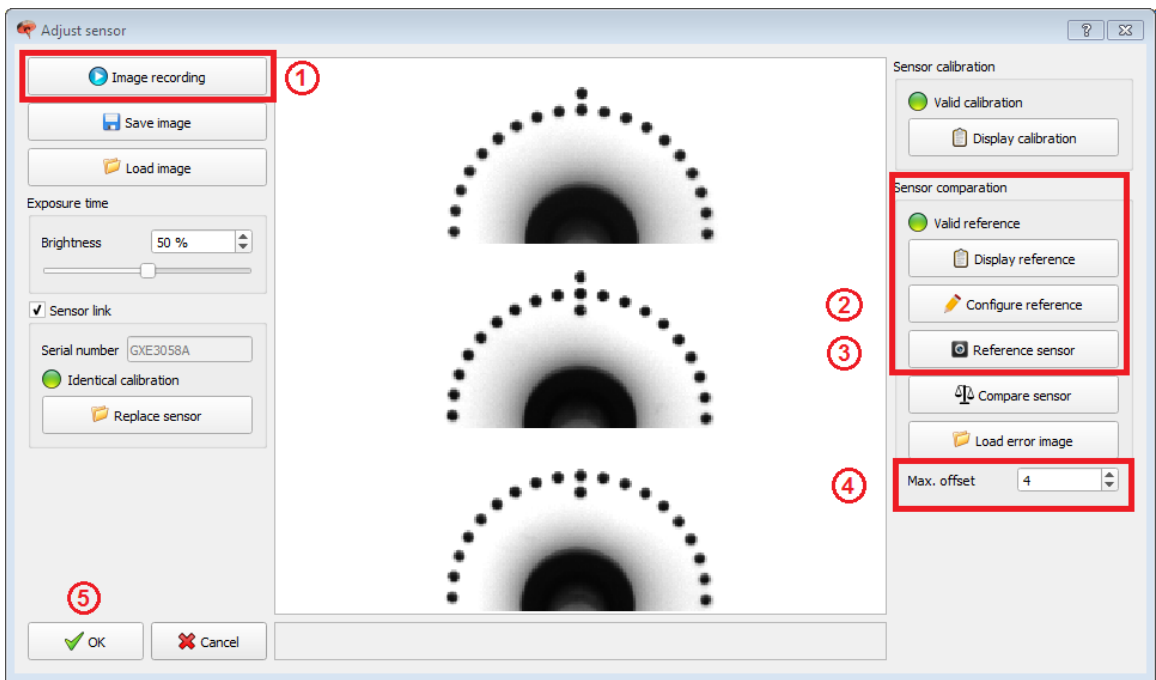
Before the application is transmitted, the reference image is configured. The IR is moved to the position "Target position" and the reference image is shown in the dialog in the RTVision.t client under **Settings | Manage sensors | Sensor | Settings** as described above.



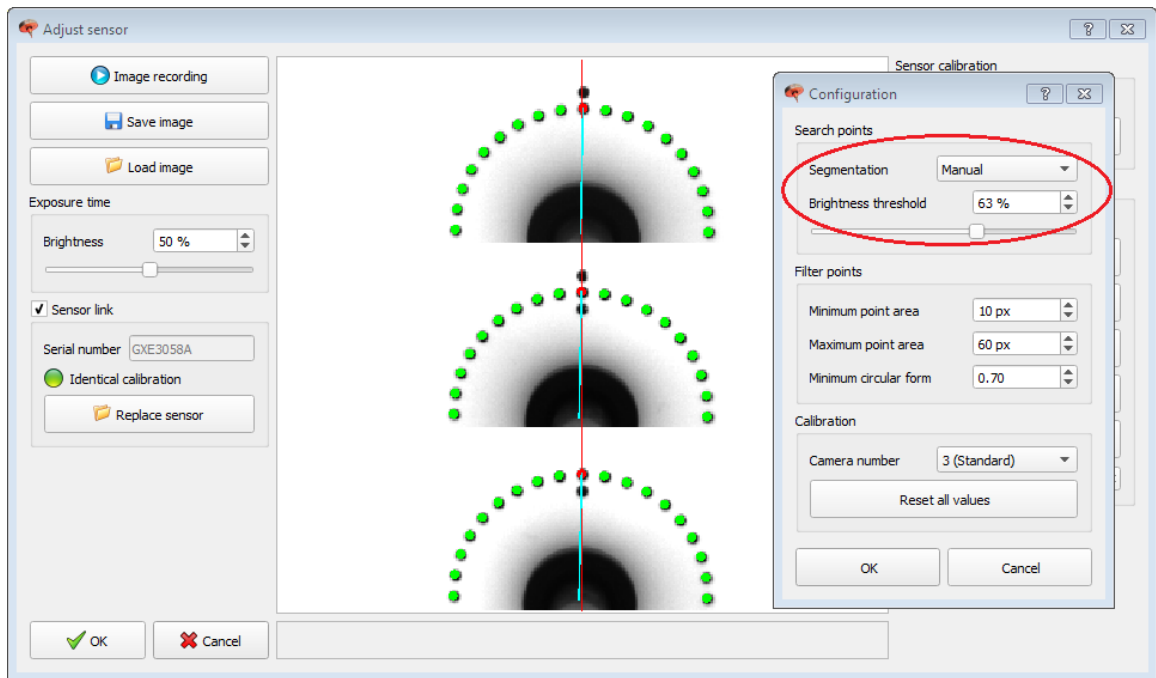
- After the sensor link is established, the calibration of the data is stored in the application (usually during commissioning by QUISS service department).
- The connection between the server and client must be maintained, as otherwise sensor management is not active.

For creation of the reference image, the position of the referencing plate (see description above) is approached. The correct working distance and centered nozzle position must be observed.

- The actual image is created with Image recording **1**:



- Then select **Configure reference** 2:



The recording of the reference target shown here represents the ideal point distribution, but this is not absolutely necessary in practice. It is important that the reference image and the image sequence from the inspection do not differ, or only differ within the set max. deviation [px].

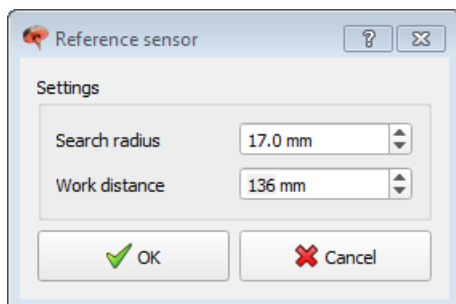
As soon as the **Configuration** dialog is opened, the quality of the current image recording is checked. For optimal display of the pixels, the brightness threshold can be varied in **manual** mode.

The more green pixels there are and the vertical the camera positioning one above the other, the better the reference image settings.



In most cases, it is sufficient to optimize the point search by means of the brightness threshold so that the default values for the point filtering can be retained.

- Click **OK** to accept the reference configuration and then transmit it to the current distance value of the sensor.
- To do this, select **Reference sensor** 3 to open the corresponding dialog and enter the values **Search radius** and real **Work distance** in [mm].



- Next, define the tolerance value for the permitted **maximum offset** ⁴ of the nozzle position in [px]. This is defined once during configuration and is essential for the result of the automatic application in the server later on.
- When you exit the dialog by clicking **OK**, ⁵ the reference image is automatically saved in a directory created by the system and subsequently used as a reference for every target inspection called.
- After completion of the configuration in the client, the application can be transmitted to the server.

Result interpretation - check errors!

If, for example, deviations with a tolerance of 4 px (~1 mm) are acceptable, the server result is **OK** for the target inspection. If the deviation of the calculated nozzle position is greater than 4 px, the server result after completion of the inspection would be **NOK**.

This is generally due to inaccuracy in one of the system components and should be checked before the start of production.



However, before making corrections to the hardware components, the error message from the target inspection should be checked with respect to the magnitude of the error and its relevance.

The error message **NOK** is output on the server side with no additional information. Here, the RTVision.t client offers the option of an analysis or reconfiguration for the target inspection.

- If the result is **NOK** on the server side, load the automatically saved error image sequence by clicking the **Load error image** button.
- By clicking the **Compare sensor** button you can compare the set parameters with the current reference image and analyze the accurate px result at a glance.

This table shows the position values of the nozzle tip including the calculated deviation in [px] and thus allows the error relevance to be assessed for an **NOK** result.

- If the error is acceptable, you can reconfigure the reference by increasing the maximum deviation [px]. A reference with a new deviation is configured, which then leads to an **OK** result as a new reference (image).
- However, if the maximum deviation is no longer acceptable, the complete system must be checked for incorrect adjustment of the individual hardware components.
- Avoid manual recalibration of the sensor if possible. A negative target inspection is not sufficient grounds for manual calibration of the sensor. It only shows deviations with respect to an original reference. The sensor is not calibrated in this case. A clear distinction must be made here.

5.9 Default values

Default values for new areas, references and polygons can be changed via the menu entry in RTVision.t Client **Settings | Change default values**. The input dialogs are the same as the dialogs used to set the parameters for the individual areas and references.

Control elements, e.g. Basic settings, for which defining default values makes no sense are locked.

If any default values are changed, these changes relate only to areas, references and polygons created from that point onwards.

Click **OK** to save the set values in the files.



Default values simplify and accelerate parameterization significantly. Before all areas within the inspections are created, the fixed parameters for the glue can therefore be defined, for example if error definitions are generally always identical for an inspection or also for the product. This error definition is already transferred for each new area created when entered as a default.

Note that changes to default values do not impact existing areas, references and polygons.

Transferring the default settings

To transfer a default setting to several systems, copy the files from this directory to the corresponding directories on the other systems.

The original default files should be backed up. They are filled with ideal values for the areas especially in relation to the glue definitions. These values are generally very helpful for finding the glue on the component.

You will find further information on this in:

Directory structure / files²⁷

Settings for areas⁷⁷

Edge detection⁹⁵

Settings for references¹⁰⁷

Adjust polygons¹¹⁸

5.10 Switching language

RTVision.t can be delivered in several language versions.

These can be switched at any time during operation

without having to restart the program. To switch to another language, select the required language version from the Language menu.

The language is always changed for the respective RTVision.t module via the **Language** menu.

Chapter 6
Automatic mode

6 Automatic mode

6.1 General

Automatic mode is used to perform the actual glue inspection, send the inspection results to the higher-level controller and display them on the screen.

Product name	OK	WARN	NOK	ERR	All results
All products	19 (100%)	0 (0%)	0 (0%)	0 (0%)	19 (100%)
Produkt_1	19 (100%)	0 (0%)	0 (0%)	0 (0%)	19 (100%)
Produkt_2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Fig.: Automatic mode of the basic interface shows the inspection results using the error map, image sequence and other product details, possibly with error messages being issued (on the right below the operation mode)

6.2 Control elements in automatic mode

Error map

The error map shows the errors found on a component during the online inspection. This involves storing a component image in any format (e.g. digital photo, CAD drawing in the file formats *.bmp, *.jpg or *.png.) for each product. A black area appears if there is no component image stored for a product.

You will find further information on this in:

[Configuring the product image](#)⁴¹

[Configuring the product image and bead paths](#)⁶⁰

[NOK display in automatic mode](#)¹⁵¹

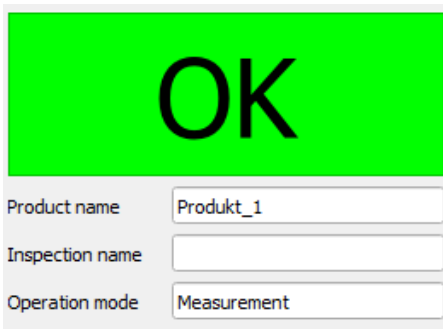
Camera images

The images transferred from the sensor cameras are shown to the right of the error map. The live images can be seen there during an inspection run. The so-called triple measurement is also shown in the camera image containing the glue bead.

You will find further information on this in: [Graphic display of the glue measurement](#)⁹⁴.

Overall result display

This shows the overall result of the most recent inspection.



The following results are possible:

Result	Display	Background	Meaning
Inspection OK	OK	Green	The inspected glue beads were error-free
Warning	WARN	Orange	The inspected glue beads were error-free, but the warning limits were exceeded
Inspection not OK	NOK	Red	The inspected glue beads contained errors
System error	ERR	Red	A system error occurred.

Automatic mode / Control elements in automatic mode

If the repair function is enabled, the following results can also be displayed or the event changes:

Result	Display	Background	Meaning
Inspection after Repair OK	OK	Green with white dots	The inspected glue beads were error-free, but only after repair
Warning after Repair	WARN	Orange with white dots	The inspected glue breads were error-free, but the warning limits were still exceeded after repair
Inspection not OK and repair not possible	NOK	Red	The inspected glue beads contained errors and cannot be repaired
Inspection not OK but repair possible	NOK	Red with white dots	The inspected glue beads contained errors, but can be repaired



The repair function is an optional software enhancement and must be enabled separately. The programming of the communication interface in the higher-level controller must also be extended.

Product / Inspection / Operating mode

The most recently used product, the most recently used inspection and the operating mode are shown beneath the overall result display.

Error list

The error list shows the errors found in the most recent inspection.

You will find further information on this in: [NOK display in automatic mode](#)¹⁵¹.

Error information window

A window containing further information is shown beneath the live image if a WARNING or NOK is selected in the error list.

In the event of a system error (ERR), the cause of the error is specified there.

Statistics list and bar chart

The statistics list in the bottom left corner in automatic mode shows all the inspection results for each taught-in product. An overall result is also displayed if there are multiple products created on one inspection system. All OKs, warnings, NOKs and system errors are listed separately for each product result and overall result. Double-click a specific product to open inspection statistics.

Configuration mode

Switches to configuration mode after a password is entered.

You will find further information on this in: [Switching between automatic mode and configuration mode](#)²⁶.

Exit

Exits the application after entering a password.



You can change the size of the individual screen areas as you wish. This change remains as long as the RTVision.t server application is running.

6.3 NOK display in automatic mode

If the online inspection system finds deviations from the set error and warning tolerances in the glue application while inspecting a component, it outputs an NOK or warning to the higher-level controller.

The screenshot shows the RTVision software interface. The main window displays a 3D model of a car body with a green arc highlighting a specific area. To the right, a camera view shows a close-up of the inspected area with a red dot indicating a detected error. The interface includes a menu bar (File, View, Settings, Service, Language, Help), a status bar, and a data table at the bottom.

Product name	OK	WARN	NOK	ERR	All results
All products	30 (85%)	0 (0%)	5 (14%)	0 (0%)	35 (100%)
Produkt_1	30 (85%)	0 (0%)	5 (14%)	0 (0%)	35 (100%)
Produkt_2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

In automatic mode, apart from the elements described in the section [Control elements and displays in automatic mode](#)¹⁴⁹ the following information is also provided:

Error map

If an NOK is present, all the detected errors are marked with a red dot and all the warnings are marked with an orange dot in the error map. In order to ensure a synchronous display of results, the positions must be set up correctly under [Configuring the product image and bead paths](#)⁶⁰.

Error image display

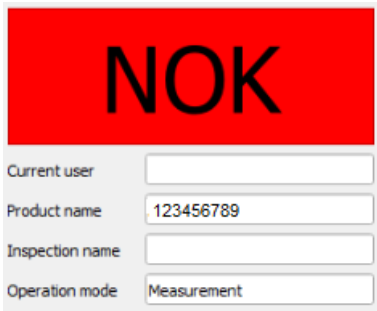
The current error image is shown to the right of the error map.

Error information

The errors found (ERROR and NOK) are described in plain text in the error information box. The reference values for the taught-in and actual values of the glue bead just inspected are shown.

Overall result display

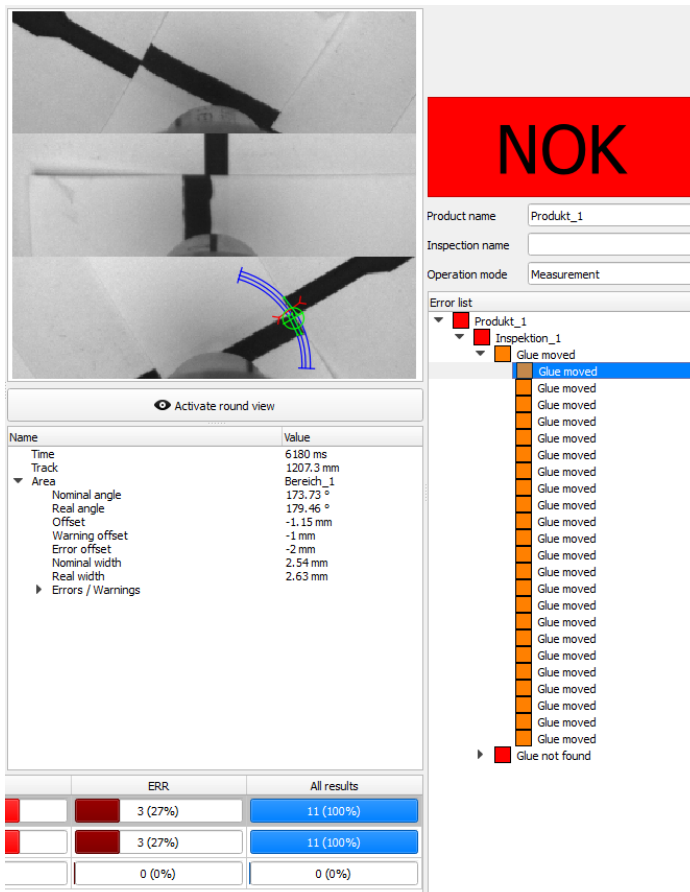
This shows the overall result of the most recent image acquisition and the most recent inspection.



You will find the possible results in the section [Control elements and displays in automatic mode](#)¹⁴⁹

Error list

The error list shows the individual errors found during the most recent inspection.



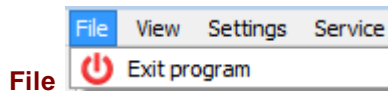
Clicking the errors in the list shows the associated error image, the position of the error on the component in the error map and the reference / actual values.

Errors that belong together are grouped, and the errors are also allocated to the individual inspections.



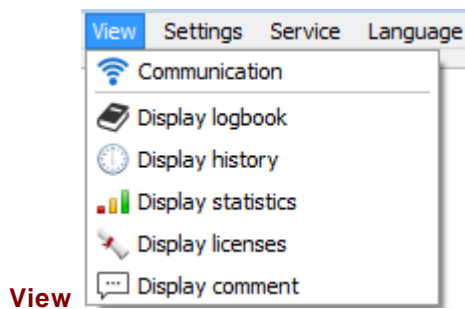
The error list is automatically cleared each time a new component is inspected.

6.4 Menu commands in automatic mode



Exit program

Exits the application after entering a password.



Communication

Opens the communication dialog. You will find further information on this in: [Communication dialog](#)¹⁶⁰

Display logbook

Opens the log book. You will find further information on this in: [Log book](#)¹⁶³.

Display history

Opens the history. You will find further information on this in: [The viewer](#)¹⁷³

Display statistics

Opens the inspection statistics window. The inspection statistics show the inspection results for a component or product for each inspection.

Display licenses

Shows all the available license options. These are function options that are enabled with the purchase of the application.

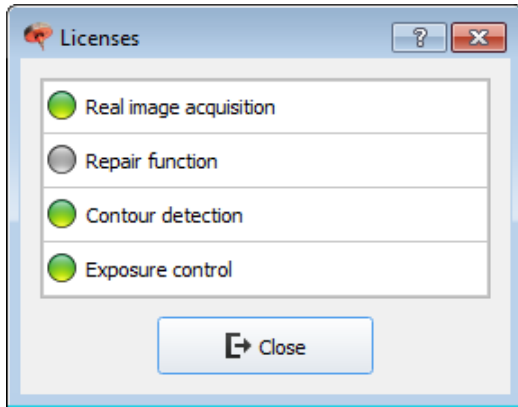


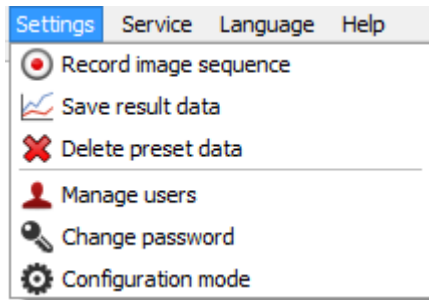
Fig.: Licenses available on the RTVision.t server

The function options highlighted in green are activated and can be used with the RTVision.t system.

License / Function	Description
Real image acquisition	If this option is active, you are using the product version of RTVision.t. The version shown in gray, for example, would be the training version of the software, which can only be used for training since it does not have real sensors and related image sequences.
Repair function	This option allows the renewed activation of glued areas issued with a NOK result, so that these can be repaired if necessary and checked again. You will find further information on this in: Repair interface ¹⁹¹
Contour detection	The inspection is more flexible in terms of parameterization at complex and low-contrast bead paths owing to the use of contours and contour detection.
Exposure control	An exposure setting that is adapted and/or optimized for the lighting conditions can be realized with this option for individual areas within the inspection.

Display comment

This comment window is offered for text input when the application is saved in configuration mode. The comment window can be opened here for viewing for the application currently loaded in automatic mode (Server).



Settings

All menu items available here are protected by means of password input.

Record image sequence

Opens the dialog for activating and configuring image recording. You will find further information on this in: [Recording image sequences](#)¹⁶⁶.

Save result data

Opens the dialog for activating and configuring storage of measurement data. You will find further information on this in: [Save result data](#)¹⁶⁸.

Delete preset data

Allows deletion of all defaults following password input, as transferred by the robot controller for application, product and inspection. These defaults can be used for each component when creating a new application, so that the number of products along with the assigned ID can be set by default together with the associated number of inspections. This simplifies the configuration process, since the designated number of products (with ID) and inspections is already preassigned when the new application is created. The flexibility in relation to creating the new application is preserved in this case (deletion/extension is possible). The configuration of the individual products or inspections is not defined and has to be carried out in the client (configuration mode).

Choose **Delete preset data** to delete the entire content of the *Preset.xml* file without impacting existing application files. Additional new applications can also be created with a blank *Preset.xml* file, in which case the number of products, associated ID and the number of inspections are defined here during the course of the configuration.

Manage users

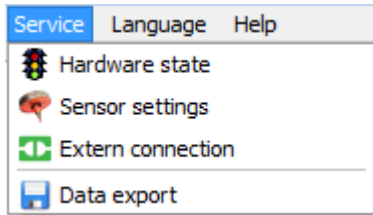
The user manager can be used to create users. It can also be used to assign system access rights to these users.

Change password

The password can be changed for the selected user.

Configuration mode

Switches to configuration mode after a password is entered. You will find further information on this in: [Switching between automatic mode and configuration mode](#)²⁶.



Service

All menu items available here are protected by means of password input.

Note

As a rule, these settings are made during service or configuration work by the QUISS service department and apply globally for the RTVision.t system.

Hardware state

Allows the current hardware state to be queried and renewed connection to the current hardware configuration to be established in cases where a sensor is replaced or a different hardware problem arises.

If hardware and/or communication problems arise, these are displayed in red in the server (automatic mode) window on the right-hand side below the manufacturer logo.

This display is not updated automatically however and therefore indicates a hardware error in general without stating any details.

With **Service | Hardware state** (password-protected), the cause of the error can be located or ideally resolved with the buttons **Update hardware status** and **Reconnect the hardware**.

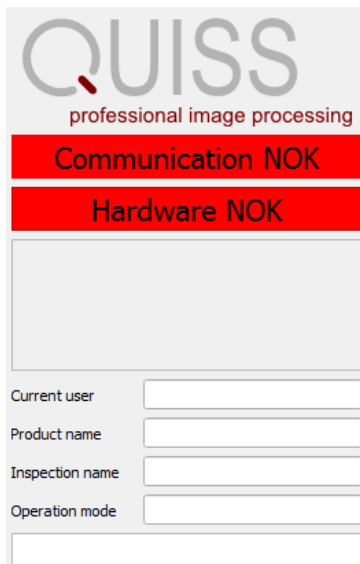


Fig.: A hardware error **HARDWARE NOK** is displayed

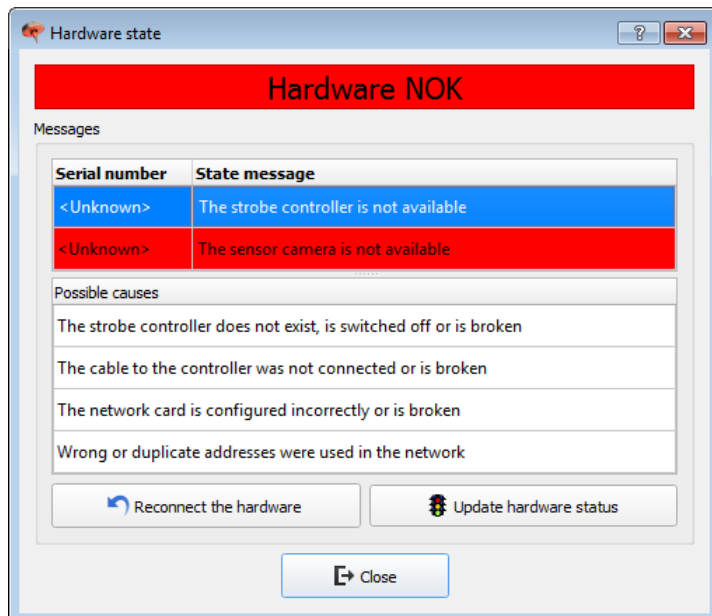


Fig.: The hardware in the server can be queried under **Service | Hardware state**

in the server among other information

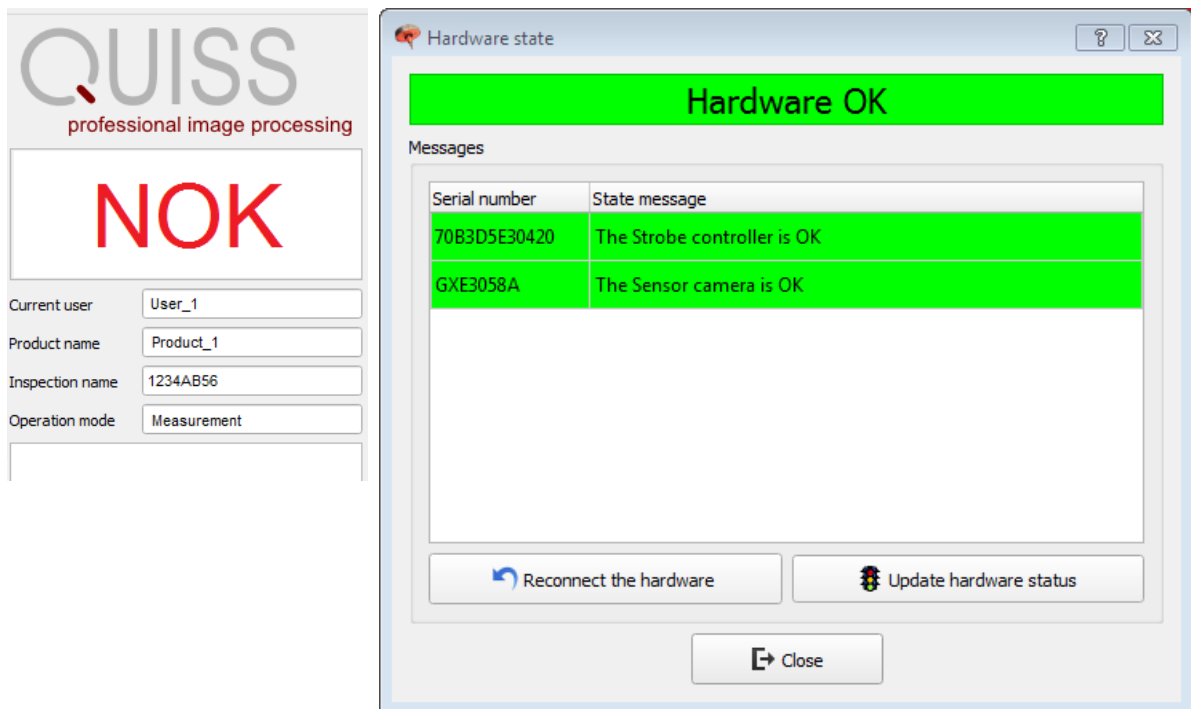


Fig.: Hardware and communication are ok (hardware state is not displayed on the server interface) Only the measurement result with the associated additional information is displayed.

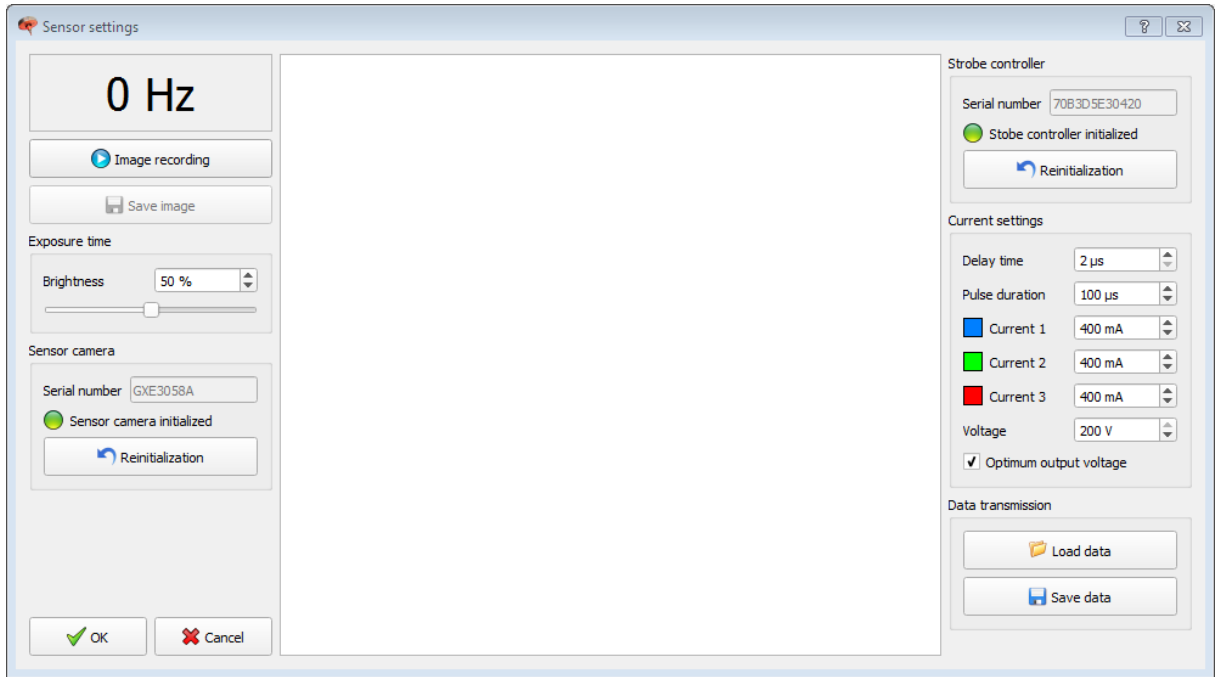
Fig.: To determine how up to date the view in the server is at present, the current status is queried in **Update hardware status** in **Service | Hardware state**.

Sensor settings



The correct setting is made by the QUISS service department during the course of commissioning.

Opens the dialog for setting the strobe controller. The sensor lighting can be controlled globally on the basis of different current values [mA].



The setting is then checked with an image recording.

The settings made here in the server for the sensor impact all products globally for which no assignment exists (to be performed in the client).



The dialog above shows the setting options for customers using the **RGB sensor**, which offers three colors for parameterization.

Via the current supply for the three channels **Current 1 (blue)**, **Current 2 (green)** and **Current 3 (red)**, you control the color of the lighting that is to be used globally.

In configuration mode, the strobe controller can be set differently from the global setting for each individual product. If a separate setting is not defined for the strobe controller, the global setting on the server that is typically made by the QUISS service technician is used for all products

External connection

Shows which client is connected to the server and whether a connection between the server and client is active (green).

Data export

Allows data recorded within a defined period to be exported.

The export module is opened. Choose the period for which you want to zip all your data and the results data. Then click **Export data** to send the compressed file to the QUISS service department.

While you are selecting the data, the size of the zip file is shown; consider the size that you can send by e-mail or FTP.

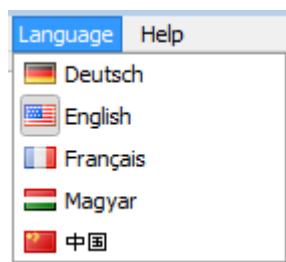
You will find further information on this in:

Hardware state²⁰⁴

Setting the strobe controller for each product¹³⁰

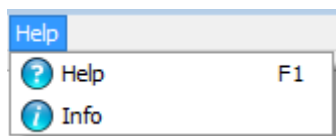
Global setting of the strobe controller on the RTVision.t server¹²⁷

Assigning sensors via sensor management¹²⁵



Language

Here you can select the language for the RTVision.t server



Help

Help or F1

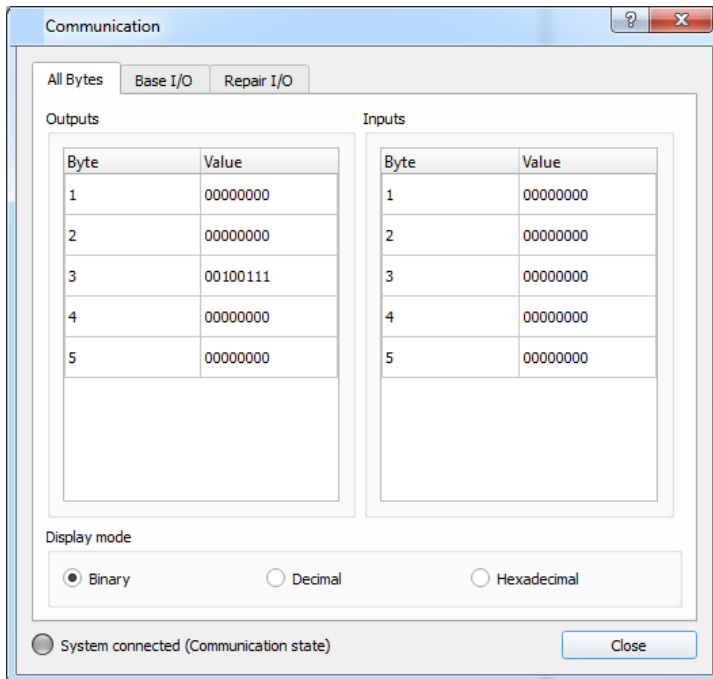
Opens the online help as a book.

About

Shows information about the program version. The version used can also be displayed permanently and is then shown in the status bar on the right-hand side.

6.5 Communication dialog

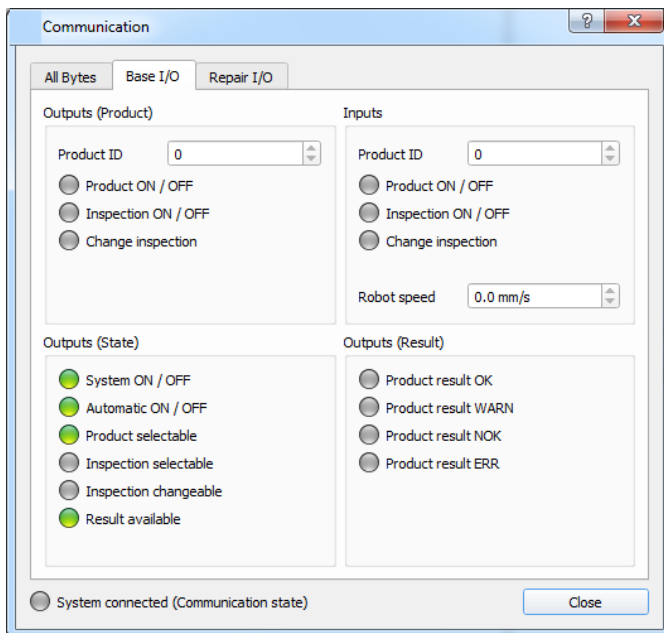
Choosing **View | Communication** opens the communications dialog between the RTVision.t (Server) and the controls. It can be used to check whether the bus connection is active. In the dialog shown below, the connection to the higher-level controller has been correctly established. The control lamp is active (green), the system is connected to the server.



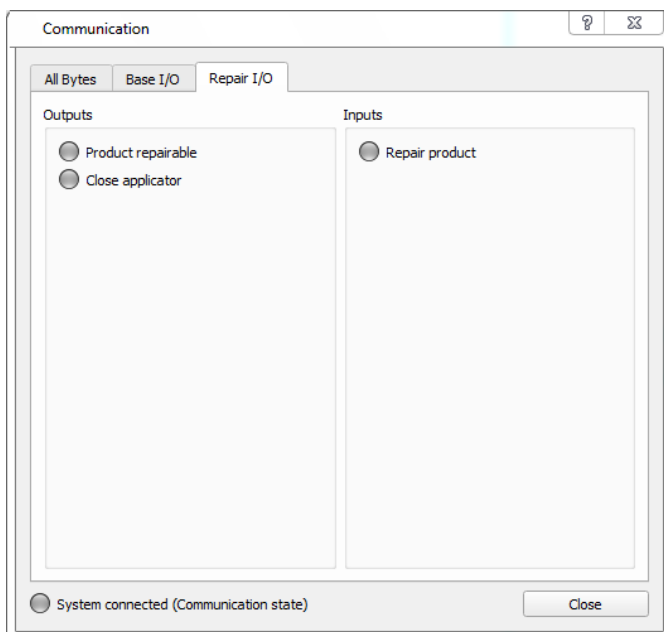
The **All bytes** tab shows the inputs and outputs as numerical values. The display can be toggled between the following types:

- Binary: binary display, e.g. "00000100"
- Decimal: decimal display, e.g. "005"
- Hexadecimal: hexadecimal display, e.g. "05"

The second tab, **Base I/O**, shows the current states of the inputs and outputs of the basic interface within the context of the RTVision.t log.



The third tab, **Repair I/O**, is only visible if the repair function in the software is activated and the corresponding signal inputs / outputs are defined. The dialog shows the inputs and outputs required for the repair.



The repair function is an optional enhancement of RTVision.t and must be enabled separately. The programming of the communication interface in the higher-level controller must also be extended.

 Note – Interface extensions

An additional tab in the communications dialog shows supplementary custom interface extensions in relation to communication, for example. This tab is usually referred to as *Optional I/O*.

You will find further information on this in:

Basic interface¹⁷⁹

6.6 Log book, history and statistics

In the module RTVision.t (Server) the **View** menu item allows you to display 3 types of log.

View | Display logbook opens the log book with information about all the individual steps that were on the system (log on/off, language change, communication, application transfer)

View | Display history opens the history where product-specific results are shown. The measurement results OK / NOK / ERR and WARN are listed together with the product, timestamp, operating mode and recording status.

You will find further information on this in:

[The viewer](#)¹⁷³

View | Display statistics opens the *Inspection statistics* window and shows the results of each inspection in relation to a component or product.

[See details](#)¹⁶⁵.

View | Display logbook

Opens the log book on the server with all system and diagnostics messages that were recorded. To see the log book in client configuration mode, likewise select **View | Display logbook**.

Date	Time	Message	Type
2015-04-15	13:34:42.226	The local user "Admin" has logged off	313
2015-04-15	13:34:42.226	The language was changed (EN)	332
2015-04-15	13:34:42.209	Der lokale Benutzer "Admin" hat sich angemeldet	312
2015-04-15	13:33:16.267	Fehler: Das Endsignal ist zu spät gekommen (Inspektion: Inspektion_1, Zeit: 9183 ms)	223
2015-04-15	13:32:54.046	Fehler: Das Endsignal ist zu spät gekommen (Inspektion: Inspektion_1, Zeit: 9742 ms)	223
2015-04-15	13:32:10.415	Die Applikation "C:\....."	302
2015-04-15	13:32:10.381	Die Kommunikation wurde aufgebaut	100
2015-04-15	13:32:04.727	Das System wurde gestartet	300

Control elements in the log book

Group

Selects the log book entries in *All groups*, *System*, *Inspection* or *Communication* that are to be displayed.

Priority >=

Selects the maximum priority level for the log book entries to be displayed.

The logged results are assigned a value (priority). Error entries have the highest priority ("2"). User logins, for example, have a medium priority ("1"). Activations of automatic mode, etc. have the lowest priority ("0").

Show last messages

Is checked by default and limits the focus to the most recent log book entry. This is particularly beneficial in automatic mode. You can uncheck this box if you want to review older log book entries.

Delete log book

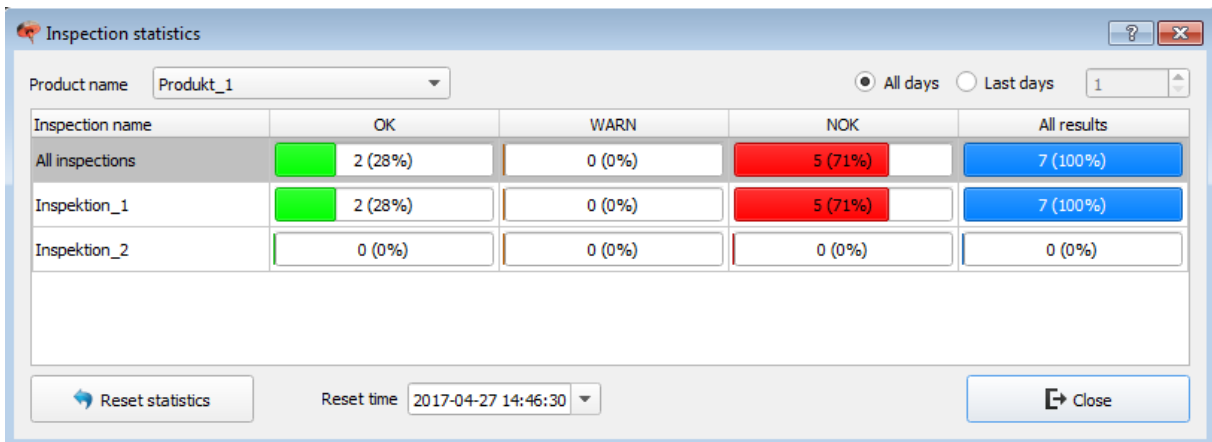
Deletes all the log book entries.

Close

Closes the log book.

6.6.1 Inspection statistics

On the RTVision.t (Server) in **View | Display statistics**, the **Inspection statistics** window opens. It shows the results of each inspection, always in relation to the component or product.



Control elements

Product name:

Select the required product with the associated inspection from the list.

According to the time window you can select **All days** or **Last days (1-100)**.

With **Reset statistics**, delete the statistics entries from the view and set all results to 0 (0%). This procedure is password protected!

At the same time, the date of the last zeroing is recorded and displayed.

Of course, the saved results as seen in the [Viewer](#)¹⁷³ can still be seen (load report).

6.7 Recording image sequences

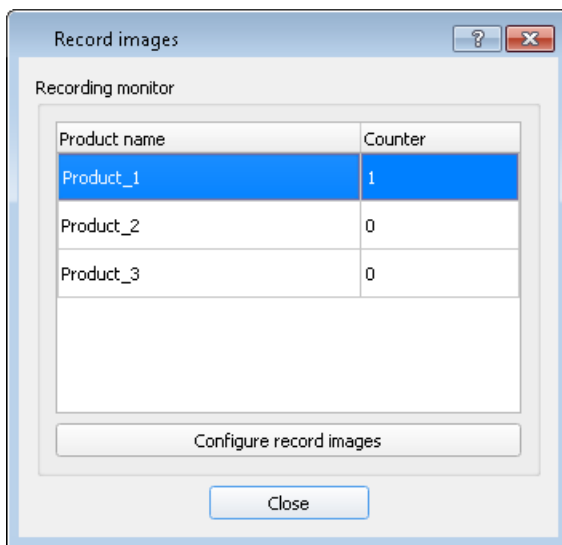
To be able to parameterize the system, you must start by recording image sequences. This is done in automatic mode.

1. In automatic mode in the menu bar^{D153} first click **Settings | Record image sequence**.



Automatic mode will not be exited while the recorded sequences are being configured.

2. Authorize yourself by entering a password in the *Login* dialog.
3. Select the relevant product in the *Record images* window.
4. Now click the **Configure record images** button or double-click the relevant product.



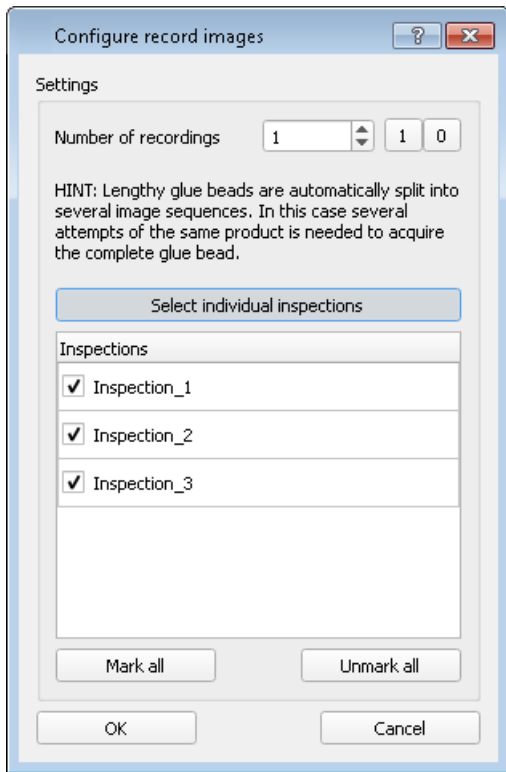
5. Enter the number of required image sequence records directly in the numerical field in the *Configure record images* window or increase the number using the arrow buttons. Click **OK**.



Long glue beads are automatically divided into multiple image sequences. Multiple passes are required in this case. In each of these passes, the online inspection system attempts to record as many inspections as possible. At a minimum, however, one inspection per image sequence will be recorded.

The record counter is only reset when all the inspections selected in the Record images dialog have been recorded.

6. Optionally, you can select the inspections to be recorded. To do this, click the **Select individual inspections** button.



7. Click **OK** to finish record configuration.

If the higher-level controller now sends the start signal for a component previously selected for image sequence recording to the inspection system, recording of the glue bead will start.

The current status of image recording is shown when a recording is taking place or has taken place.

Blue	The image sequence for the component currently being inspected is recorded.
Red	An error occurred during current image recording.
Yellow	Inspections are still to be recorded for the component.
Green	Image recording for the complete component finished without errors.

The recorded images are saved on the hard disk as soon as image recording ends.

If the inspection system is to be parameterized using the newly recorded images, you will need to switch to configuration mode.

You will find further information on this in:

Switching between automatic mode and configuration mode²⁶

6.8 Save result data

Saving the result data makes it possible to save not just error data but all the data recorded by the system during a component inspection to an individual XML file (one XML file is created per component).

Results data can be saved for each product, with the frequency indicating which component (product) will be measured and saved.

For example, "10" means that the data for every tenth component of the same product is saved.

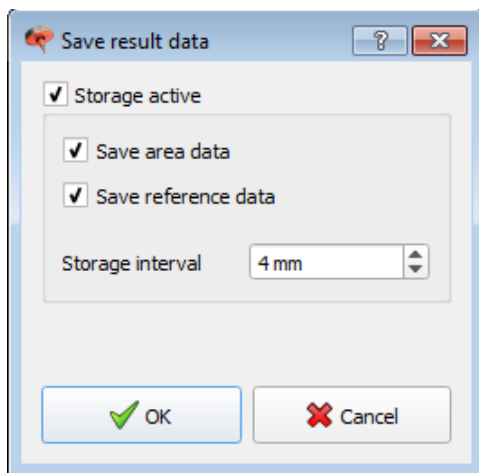
If different workpiece types (components/products) are produced and inspected in a station, in addition to activating result data storage generally in configuration mode (Client), you can decide whether the respective product should be excluded from the storage of result data.

The following result data can be logged:

- Width measurements (brightness measurement with activated [Brightness analysis](#)¹⁹⁷)
- Position deviation of the glue bead from references
- Distance measurements by means of double references

The procedure for activating storage of result data is as follows:

1. In automatic mode (Server), in the [menu bar](#)¹⁵³ click **Settings | Save result data**.
2. Authorize yourself by entering a password in the **Login** dialog.
3. In the **Save result data** window, check the **Storage active** checkbox.



4. Check the boxes as required.
5. In **Storage interval**, specify the data recording interval (in milliseconds) for measuring the component.



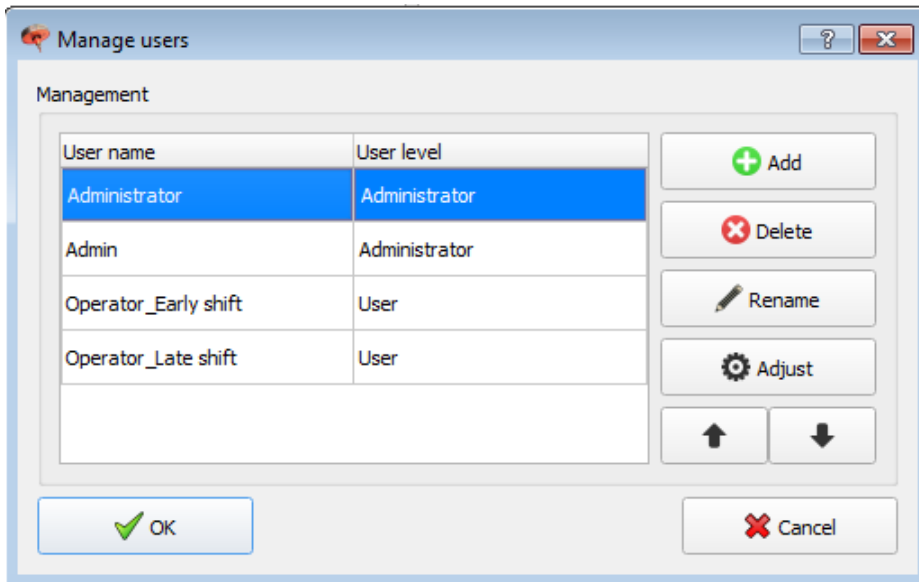
With values less than 5 ms, all area measurements will be recorded since the system records an image only every 5 ms (for more on this, see also [Image structure / image sequences](#)³³). Please consult the QUISS service department concerning the relevant data for distance-based quality testing.

6.9 User management

The User manager can be used to create users. It can also be used to assign system access rights to these users.

Calling up the User manager

To call up the User manager, select **Settings | Manage users** in the menu bar. To be able to use the User manager, you must have administrator rights in RTVision.t .



Control elements

Add

To create a new user, click **Add**. A new entry with a standard name appears in the list of users. The new user does not have a password yet. You can rename a user and change the user level by clicking the **Adjust** button.

Delete

To delete users, first select the required user(s) in the list of users. Then click **Delete**. Answer the confirmation prompt with **Yes**.

Rename

To rename a user, select the required user in the list of users. Then click **Rename**. Change the name as required.

Adjust

You can modify user properties here.

Arrow up / down

The arrows can be used to change the order of the users in the list.

Name

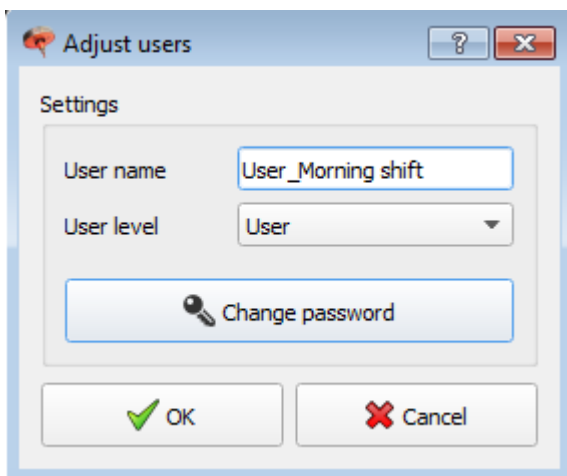
To rename a user, first select the required user in the list of users. Then click **Adjust**. You can edit the user name in the **User name** selection field (same function as **Rename**).

User level

The level determines the rights of the individual users in RTVision.t. To change the level, start by selecting the required user in the user list. Then click **Adjust**. You can then assign a level to this user in the **Level** selection field.

Change password

To set the password for a user, first select the required user. Then click **Adjust** followed by **Change password**. You can enter the new password in the dialog shown below. The password must be entered twice as a precaution. Both entries must be the same, otherwise an error message will be shown and you will have to enter the password again.



The currently logged in user can change his or her password directly via **Settings | Change password**. User management does not need to be called up for this purpose.

OK

Click **OK** to save changes and close the User manager.

Cancel

Click **Cancel** to discard changes and close the User manager.

6.10 Switching language

RTVision.t can be delivered in several language versions.

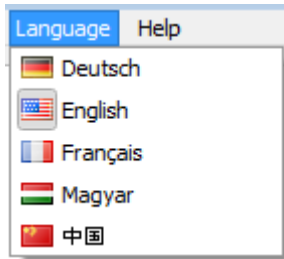


Fig.: Sample drop-down menu with various languages.

The language can be switched at any time during operation, though this operation is password protected. It is not necessary to restart the program.

To switch to another language, select the required language version from the *Language* menu.

The language is changed separately for every RTVision.t module following a password prompt.

Chapter 7

Results evaluation

7 Results evaluation

7.1 The viewer

The RTVision.t system logs all relevant measurement data in the background and saves it in special result files on the server for further processing. This data can be loaded and displayed with these result files. The viewer is a useful enhancement to the system for graphical displays of the measurement data and for error evaluation.

When a component inspection has been completed, select **Display history** in the *View main menu*. The history opens. Double-click a row to open the **viewer**.



Date	Time	Product name	Result	Operation mode	Recording status
2018-09-28	11:16:06	Produkt_1	OK	Measurement	
2018-09-28	11:13:50	Produkt_1	OK	Measurement	
2018-09-28	11:12:36	Produkt_1	OK	Measurement	
2018-09-28	11:11:22	Produkt_1	OK	Measurement	
2018-09-28	11:10:08	Produkt_1	OK	Measurement	
2018-09-28	11:06:14	Produkt_1	NOK	Measurement	
2018-09-28	10:52:44	Produkt_1	NOK	Measurement	
2018-09-28	10:49:49	Produkt_1	OK	Measurement	
2018-09-28	10:46:05	Produkt_1	ERR	Measurement	
2018-09-28	10:39:52	Produkt_1	NOK	Measurement	
2018-09-28	10:37:35	Produkt_1	NOK	Measurement	
2018-09-28	10:34:03	Produkt_1	WARN	Measurement	
2018-09-28	10:32:08	Produkt_1	WARN	Measurement	
2018-09-28	10:30:54	Produkt_1	WARN	Measurement	
2018-09-28	10:29:23	Produkt_1	OK	Measurement	
2018-09-28	10:26:25	Produkt_1	OK	Measurement	

The date, time, product and result status are shown in the history. Double-click a row to open the viewer with the results of the product.


The results are also automatically sorted by color.

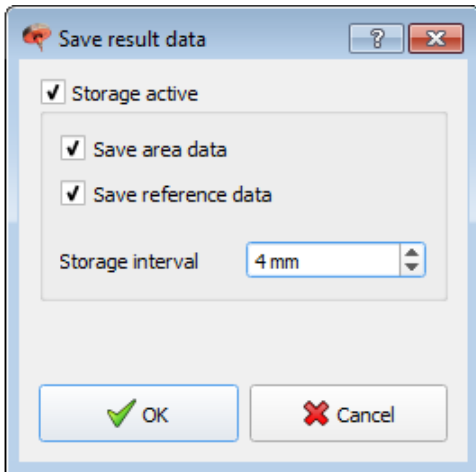
Delete history deletes the complete history that is shown in the window. It is not possible to delete individual results. Only the history shown in the window is deleted, NOT the result files saved for each measurement in the *Reports* directory.

To view these results selectively at a later time, open the RTVision.t viewer and choose **Load report**.

7.2 Detailed view

Storage of result data must be activated as a prerequisite for viewing details in the RTVision.t Viewer. On the RTVision.t server, activate the corresponding function in **Settings | Save result data**.

 With values less than 5 ms, all area measurements will be recorded since the system records an image "only" every 5 ms (see also section [Image structure / image sequences](#)^{D33})



Inspection name	OK	WARN	NOK	All results
All inspections	423 (99%)	0 (0%)	3 (0%)	426 (100%)
1_Inspection	423 (99%)	0 (0%)	3 (0%)	426 (100%)
2_Inspection	0 (0%)	0 (0%)	0 (0%)	0 (0%)
3_Inspection	0 (0%)	0 (0%)	0 (0%)	0 (0%)
4_Inspection	0 (0%)	0 (0%)	0 (0%)	0 (0%)

If the viewer is opened from History, individual inspections can be selected. This activates the **Detailed view** button. Double-click to open the detailed view. Here, there are extensive evaluation options, especially for evaluating errors.

Details about all errors are shown in the error list. The position of the respective error is also shown on the error map.

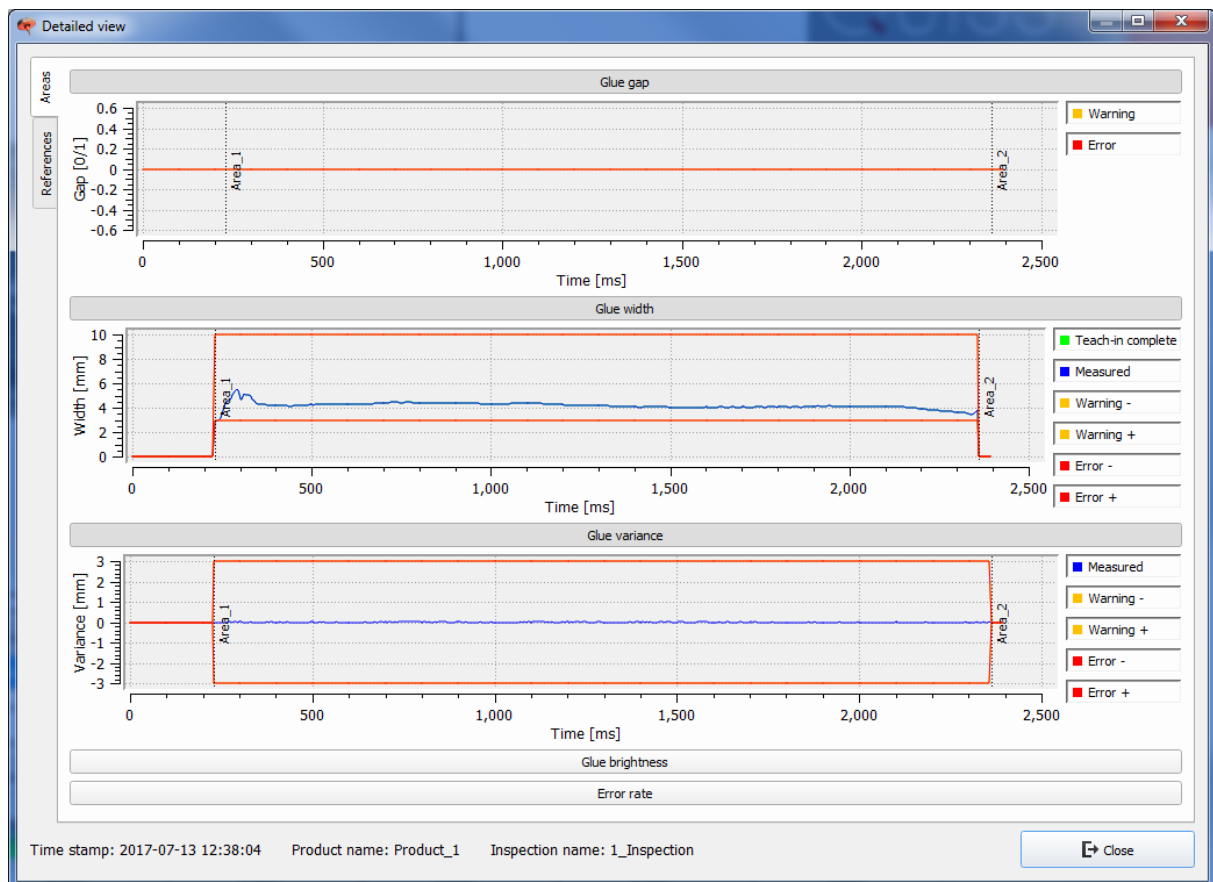
Detailed view:

Select an individual inspection and click **Detailed view** to evaluate the results further.

Left-click the overview to show and hide individual windows, such as glue gap, glue width, glue variance, glue brightness or error rate.

The measurement curves can also be shown and hidden with a left click.

Graphical evaluation of an inspection history



Error curves, warnings and measured values can be displayed as graphics. The product overview screen gives users a relatively exact idea of where the problem zones are; a detailed evaluation can then be made via the measurement data.

This precise error evaluation allows optimum parameterization of the system.

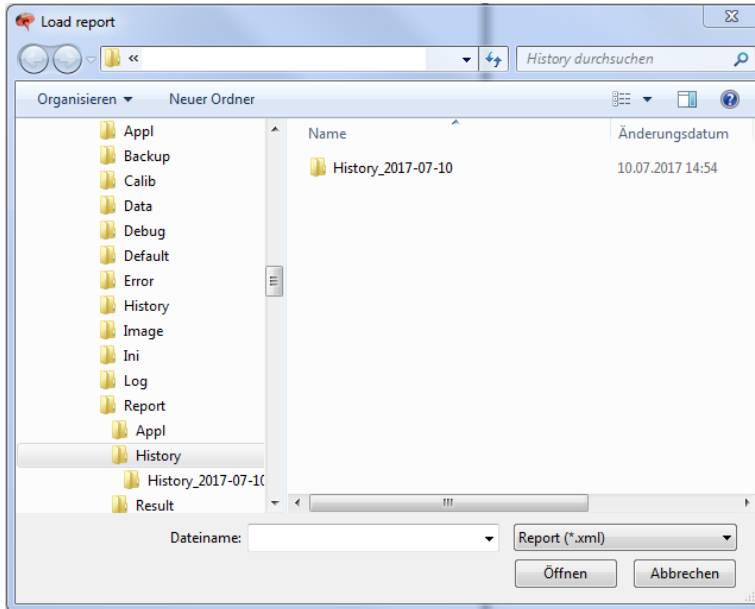
In the detailed view it is possible to zoom out of individual areas by dragging the window with the left mouse button. Right-click to return to the original view.

Some parameters can be enabled / disabled by clicking the name on the right-hand side of the screen (e.g. error + and error -).

Click the title line (e.g. glue gap or K) to show or hide the data tracks.

7.3 Load report

To evaluate historical inspections graphically, click **Load report** to also load and evaluate the archived logs of older inspections.



You will find further information on this in:

The viewer¹⁷³

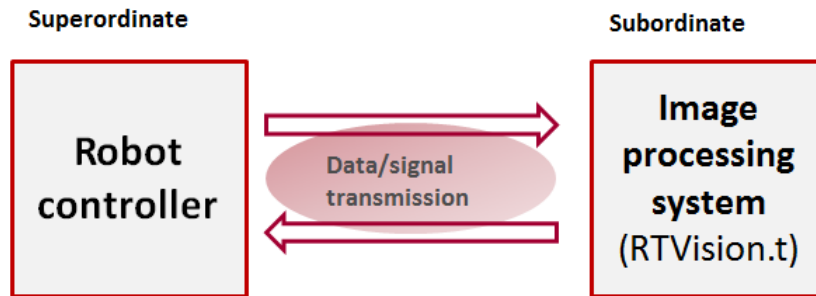
Log book, history and statistics¹⁶³

Chapter 8
Communication

8 Communication

8.1 General

The online inspection system RTVision.t must be able to communicate with the robot controller (hereinafter called the "controller") for the purpose of exchanging various signals and data.



The signals are used, for example, to transmit inspection results, start / stop events or general system messages (see below for details); the imaging system is always the secondary system in this case.

Communication with the controller takes place via fieldbus systems (PROFIBUS, INTERBUS, DeviceNet, CANopen, CC-Link), Industrial Ethernet systems (PROFINET, EtherNet/IP, EtherCAT) or parallel I/Os (bus couplers). Other systems on request.



A repair (additional purchase option) always requires a fresh run-through of the entire robot motion program.



There must be no difference in the robot path, speed and distance to the applicator head between the teach-in run, first order and repair run.

The basic interface can be adapted in terms of its communication with existing glue controllers and additional signals exchanged by extending the interface.

Prior to installing the RTVision.t system, consult with QUISS GmbH in order to define details of the data transfer jointly in advance.

8.2 Basic interface

The interface consists of two parts: the basic interface that is always used and the optional repair interface. The table below has been created from the point of view of the image processing system.

In the event of special requirements, for example for communication with a defined glue controller, an interface extension is required, which can be seen in the **Communication** dialog in the form of an additional "Optional I/O" tab.

Byte. Bit	Signal description	OUT	Byte. Bit	Signal description	IN
0.0	Product ON / OFF	1	0.0	Product ON / OFF	1
0.1	Inspection ON / OFF	2	0.1	Inspection ON / OFF	2
0.2	Change inspection	3	0.2	Change inspection	3
0.3		4	0.3		4
0.4		5	0.4		5
0.5		6	0.5		6
0.6		7	0.6		7
0.7		8	0.7		8
1.0	Product ID - bit 1	9	1.0	Product ID - bit 1	9
1.1	Product ID - bit 2	10	1.1	Product ID - bit 2	10
1.2	Product ID - bit 3	11	1.2	Product ID - bit 3	11
1.3	Product ID - bit 4	12	1.3	Product ID - bit 4	12
1.4	Product ID - bit 5	13	1.4	Product ID - bit 5	13
1.5	Product ID - bit 6	14	1.5	Product ID - bit 6	14
1.6	Product ID - bit 7	15	1.6	Product ID - bit 7	15
1.7	Product ID - bit 8	16	1.7	Product ID - bit 8	16
2.0	System ON / OFF	17	2.0	Speed - bit 1	17
2.1	Automatic ON / OFF	18	2.1	Speed - bit 2	18
2.2	Product selectable	19	2.2	Speed - bit 3	19
2.3	Inspection selectable	20	2.3	Speed - bit 4	20
2.4	Inspection changeable	21	2.4	Speed - bit 5	21
2.5	Result available	22	2.5	Speed - bit 6	22
2.6	Hardware ready	23	2.6	Speed - Bit 7	23
2.7		24	2.7	Speed - bit 8	24
3.0	Product result OK	25	3.0	Speed - bit 9	25
3.1	Product result WARN	26	3.1	Speed - bit 10	26
3.2	Product result NOK	27	3.2	Speed - bit 11	27
3.3	System message ERR	28	3.3	Speed - bit 12	28
3.4		29	3.4	Speed - bit 13	29
3.5		30	3.5	Speed - bit 14	30
3.6		31	3.6	Speed - bit 15	31
3.7		32	3.7	Speed - bit 16	32

8.2.1 Incoming signals

Product ON / OFF (0.0)

A change from 0 to 1 indicates the start of a product, a change from 1 to 0 ends the current product.

Inspection ON / OFF (0.1)

A change from 0 to 1 indicates the start of the inspection period, a change from 1 to 0 ends the current inspection area. Signal changes in this bit will be ignored if there is no product selected (i.e. "Product ON / OFF" is 0).

Change inspection (0.2)

Each signal edge (change from 0 to 1 or 1 to 0) during an inspection period (i.e. "Product ON / OFF" is 1 and "Inspection ON / OFF" is 1) brings about an uninterrupted change to the next inspection. Signal edges outside of inspection periods (i.e. "Product ON / OFF" is 0 or "Inspection ON / OFF" is 0) will be ignored.

This function is required if inspection parameters, such as the exposure settings for the sensor, are to be changed without interruption during application of the glue or sealant.

Product ID (1.0 - 1.7)

The number for selecting the product (component) is an 8-bit unsigned integer. The number is read when a product is selected (i.e. "Product ON / OFF" from 0 to 1).

Speed (2.0 - 3.7)

The system receives the speed of the robot as an unsigned integer via bits 2.0 to 3.7. A 0 (null) corresponds to 0 mm/s and the value 65,535 ($(2^{16}) - 1$) corresponds to the maximum speed that can be transmitted. This can be configured in mm/s. The transmitted data must use the same multiplier as is stored in the system. Configuration takes place in the file "RTVision_t.ini". **This file may only be processed explicitly by the QUISS service department.** The assignment is linear.

8.2.2 Outgoing signals

Mirrored signals

The mirrored signals indicate which input signals are currently applied to the system. However, delays can occur between the input signal (e.g. input: Product ON / OFF à 1) and the mirror (e.g. output: Product ON / OFF à 1). These delays are caused by tasks the system has to perform first in order to achieve the required status.

The following signals are mirrored:

Product ON / OFF (0.0)

Mirrors the incoming signal "Product ON / OFF".

Inspection ON / OFF (0.1)

Mirrors the incoming signal "Inspection ON / OFF".

Change inspection (0.2)

Mirrors the incoming signal "Change inspection".

Product ID (1.0 - 1.7)

Mirrors the incoming product ID. The product ID is read in at the moment the product is selected (Product ON / OFF à 1).

Status messages

The status messages provide information on the actual, current system status. There can also be delays between the input signal and the change in status with these signals due to tasks the system needs to perform.

The following states can be reported:

System ON / OFF (2.0)

Is set to 1 when the vision system is started.

Automatic ON / OFF (2.1)

Is set to 1 when automatic mode is started.

Product selectable (2.2)

Is set to 1 when the system is expecting a product to be selected.

Inspection selectable (2.3)

Is set to 1 when an inspection can be selected.

Inspection changeable (2.4)

Is set to 1 if an inspection can be changed.

Result available (2.5)

Is set to 1 if a product was ended and therefore a result is available (OK, WARN, NOK, ERR).

Hardware ready (2.6)

The sensor, camera and strobe controller are checked by the system when the program is started, when the product is selected and also when the sensor is checked manually to determine if it is correct.

Signal is set to 1 if the hardware status is OK, to zero if one or more components (also cable connection) is/are faulty.

Result messages:

The system uses the result messages to report the result of the most recent run.

The following results can be reported:

Product result OK / WARN / NOK / ERR (3.0 – 3.3)

If the signal "Result available" is set to 1, the system transmits the corresponding result with these bits.

8.2.3 Programming the controller

Selecting a product

A product may only be selected by the controller if the following signals are set:

Outgoing from RTVision.t (see also section [Outgoing signals](#)¹⁸¹)

- 2.0 "System ON / OFF" to 1
- 2.1 "Automatic ON / OFF" to 1
- 2.2 "Product selectable" to 1

Outgoing from the controller (see also [Incoming signals](#)¹⁸⁰)

- 0.0 "Product ON / OFF" to 0
- 0.1 "Inspection ON / OFF" to 0

Sequence on the controller side

1. Check whether the outgoing signals from RTVision.t (see above) are set correctly.
2. Check whether the outgoing signals from the controller (see above) are set correctly.
3. Send product number to RTVision.t .
4. Set signal "Product ON / OFF" to 1

When the product has been selected, RTVision.t sets the following signals.

- 1.0-1.7 "Product ID" correspond to the bits of the product number
- 0.0 "Product ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 1



If there is RTVision.t no product with the transmitted product number, the signal "Inspection selectable" will be left at 0 at the time when "Product ON / OFF" is mirrored.



If the bit "Inspection ON / OFF" was not reset to 0 before a product was selected, the signal "Inspection selectable" will be left at 0 even after the product is selected, even if the product number is valid.

Deselecting a product

A product may only be deselected by the controller if the following signals are set:

Outgoing from RTVision.t (see also section [Outgoing signals](#)¹⁸¹)

- 2.0 "System ON / OFF" to 1
- 2.1 "Automatic ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 1

Outgoing from the controller (see also [Incoming signals](#)¹⁸⁰)

- 0.0 "Product ON / OFF" to 1
- 0.1 "Inspection ON / OFF" to 0

Sequence on the controller side

1. Check whether the outgoing signals from RTVision.t (see above) are set correctly.
2. Check whether the outgoing signals from the controller (see above) are set correctly.
3. Set signal "Product ON / OFF" to 0

When the product has been deselected, RTVision.t sets the following signals.

- 0.0 "Product ON / OFF" to 0
- 2.2 "Product selectable" to 1
- 2.3 "Inspection selectable" to 0
- 2.5 "Result available" to 1

Canceling a product

Changing the signal "Product ON / OFF" from 1 to 0 during an inspection run cancels the product inspection, i.e. the inspection currently in progress is stopped. A system error (ERR) will be returned in this case.

Selecting an inspection

The signal "Inspection ON / OFF" may only be set to 1 by the controller if the following signals are set:

Outgoing from RTVision.t (see also section [Outgoing signals](#)¹⁸¹)

- 2.0 "System ON / OFF" to 1
- 2.1 "Automatic ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 1

Outgoing from the controller (see also [Incoming signals](#)¹⁸⁰)

- 0.0 "Product ON / OFF" to 1
- 0.1 "Inspection ON / OFF" to 0

Sequence on the controller side

1. Check whether the outgoing signals from RTVision.t (see above) are set correctly.
2. Set signal "Inspection ON / OFF" to 1.

When the inspection has been selected, RTVision.t sets the following signals.

- 0.1 "Inspection ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 0
- 2.4 "Inspection changeable" to 1

Deselecting an inspection

The signal "Inspection ON / OFF" may only be set to 0 by the controller if the following signals are set:

Outgoing from RTVision.t (see also section [Outgoing signals](#)¹⁸¹)

- 2.0 "System ON / OFF" to 1
- 2.1 "Automatic ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 0

Outgoing from the controller (see also [Incoming signals](#)¹⁸⁰)

- 0.0 "Product ON / OFF" to 1
- 0.1 "Inspection ON / OFF" to 1

Sequence on the controller side

1. Check whether the outgoing signals from RTVision.t (see above) are set correctly.
2. Set signal "Inspection ON / OFF" to 0.

When the inspection has been deselected, RTVision.t sets the following signals.

- 0.1 "Inspection ON / OFF" to 0
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 1
- 2.4 "Inspection changeable" to 0

Change inspection

The signal "Change inspection" may only be sent by the controller if the following signals are set:

Outgoing from RTVision.t (see also section [Outgoing signals](#)¹⁸¹)

- 2.0 "System ON / OFF" to 1
- 2.1 "Automatic ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 0
- 2.4 "Inspection changeable" to 1



The first inspection of a product must not be started with the signal "Change inspection" (0.2); instead it must always be started by setting the signal "Inspection ON / OFF" (0.0) to 1 (from 0).



The last inspection of a product must not be ended with the signal "Change inspection" (0.2); instead it must always be ended by setting the signal "Inspection ON / OFF" (0.0) to 0 (from 1).



The signal "Change inspection" (0.2) may only be changed if the signal "Inspection ON / OFF" (0.0) is set to 1.

Outgoing from the controller (see also [Incoming signals](#)¹⁸⁰)

- 0.0 "Product ON / OFF" to 1
- 0.1 "Inspection ON / OFF" to 1

Sequence on the controller side

1. Check whether the outgoing signals from RTVision.t (see above) are set correctly.
2. Inversion of the signal "Change inspection"

After an inspection has been changed, RTVision.t sets the following signals.

- 0.1 "Inspection ON / OFF" to 1
- 2.2 "Product selectable" to 0
- 2.3 "Inspection selectable" to 0
- 2.4 "Inspection changeable" to 1

Retrieval of the results

The result supplied by RTVision.t is only valid if the following signals are set:

Outgoing from RTVision.t (see also section [Outgoing signals](#)¹⁸¹)

2.0 "System ON / OFF" to 1

2.5 "Result available" to 1

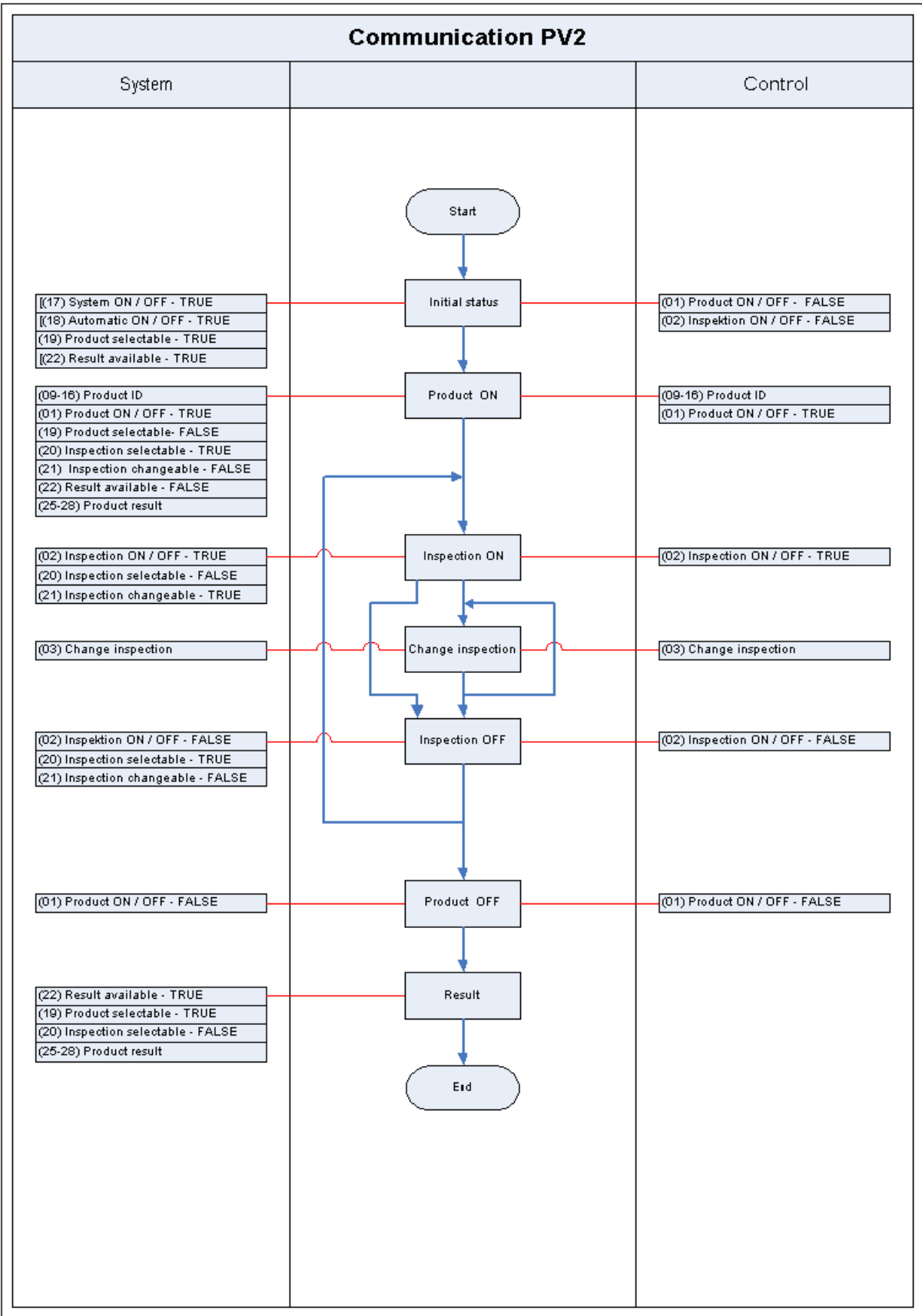
Sequence on the controller side

1. Check whether the outgoing signals from RTVision.t (see above) are set correctly.
2. Read bits 3.0 – 3.3 to query the result.

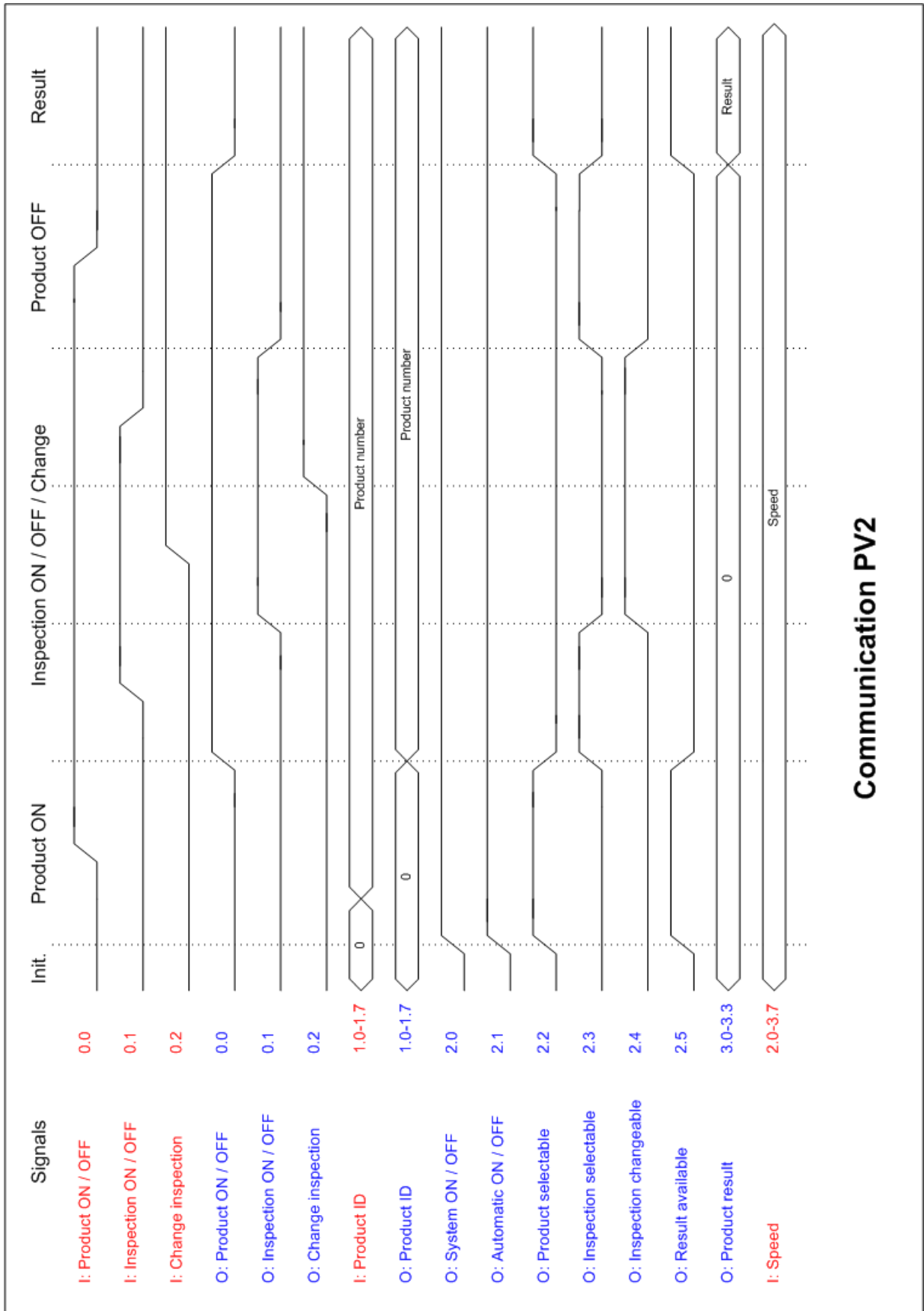


The controller must continually provide the same robot speed as a prerequisite for the correct operation of RTVision.t.

8.2.4 Flow chart



8.2.5 Time chart



8.3 Repair interface (option)

Implementation of the repair functionality requires an extended signal exchange between the RTVision_t inspection system and the systems involved in the process such as the adhesive controller, robot controller and higher-level PLC. By way of illustration, these systems should be collectively treated as a higher-level controller.

Like the inspection itself, the repair is performed on the basis of the product. In addition to supplying the product result, the inspection system signals to the higher-level controller whether a part that returned NOK can be repaired. The higher-level controller repeats the component program (robot path) if repair is required. It also signals to the inspection system that the most recently inspected component is to be repaired. The inspection system then provides information about the points on the bead where the applicator nozzle needs to be opened for the purpose of reworking the bead; this information is provided for the repair run as an output signal.

Signals

Bit offset	Signal output	Signal input
0	Product reparable	Repair product
1	Close nozzle	



The additional repair signals happen in the same time frame as the signals of the basic interface PV2.

Product reparable (0)

Whether a repair is possible is output synchronously with the output signal "Result available" after the first inspection. The signal is reset when the next product is selected. The previous component can no longer be repaired even if no repair is performed with the next product selection.

Repair product (0)

If, when a product is selected, the signal is set and the previous inspection detected a reparable component, the output signal "Close nozzle" can be used for the repair. In addition, the product ID for the repair inspection must not change compared with the first inspection.

Close nozzle (1)

Inspection status	Value for "Close nozzle"
Repair mode active, no product	0
Repair mode active, outside inspection	1
Repair mode active, request "Close nozzle"	1
Repair mode active, request "Open nozzle"	0

Basic settings for fieldbus communication

The following values are used for the repair function in the RTVision_t.ini configuration file:

[PROTOCOL-V2]

OutputStartRepair=<Byte Index>	Mapping of the output byte for repair on the fieldbus (>=5)
InputStartRepair=<Byte Index>	Mapping of the input byte for repair on the fieldbus (>=5)

For details, see [Repair](#)⁸⁹.

Chapter 9
Appendix

9 Appendix

9.1 Care and maintenance

Information – material damage

The RTVision.t system must be maintained regularly to ensure that it operates properly.

Care and maintenance work with access to the sensor head is possible only during a break in production.

Do not change the position of the sensor so that you do not have to adjust the application parameters. While cleaning, do not damage the special transparent screen of the sensor (e.g. fine scratches).

Cleaning the fan filters (computer)

Due to air exchange, over time the filter mats of the PC fan can become very dirty and must be cleaned at regular intervals.

To do this, open the lock on the front of the computer and then open the two covers. Inside the covers you will see a fan filter which you should clean with a vacuum cleaner.

The recommendation by QUISS GmbH is that you check for dirt every week. The level of dirt, however, depends very much on the surrounding conditions. We would therefore ask that the intervals be adjusted according to prior experience with maintenance.

Cleaning the sensor



Normally with RTVision.t because of the setup, the lens does not have to be cleaned.

The lenses have a special surface coat to prevent mirroring and reflections. A dirty surface on the lenses or other parts in the optical path caused by dust, oil or grease creates shadowing effects. The even imaging of the objects is consequently impaired. The lenses are behind a special Plexiglas screen so that it is enough to clean this screen regularly.

Effects of dirt on the sensor surface are:

- Over time, the recorded images become continuously darker
- Dark points in some areas of the image
- Over time, the recorded images become blurred

The recommendation by QUISS GmbH is that you check for dirt every week or always if one of the described phenomena occurs.

ⓘ Information – material damage:

Make sure that the transparent special screen of the sensor is not damaged. Scratches can cause changes in the optical properties or even a complete breakdown.

Do not rub with a dry cloth or clean with chemical solvents. Avoid all cleaning products that could damage the Plexiglas surface.

When wiping, avoid applying too much pressure to the surface.

Cleaning process:

- Use a soft, oil-free paintbrush to remove dust from the sensor surface.
- To remove oil, grease or fingerprints from the sensor surface, wipe the dirty area with a moist clean soft cloth and some household cleaning product and dry the surface. Use a microfiber cloth or an oil-free, clean soft cotton cloth.
- Repeat the wiping process until the sensor surface is completely clean.

Cleaning the lighting

If the surface of the lighting diffusers is dirty owing to dust, oil or greases, this causes shadows. Even illumination of the objects is consequently impaired.

Effects of dirt on the diffuser surface are:

- Over time, the recorded images become continuously darker
- Dark or blurred points in some areas of the image

The recommendation by QUISS GmbH is that you check for dirt every month or always if one of the two described phenomena occurs.

ⓘ Information – material damage:

Always ensure that the surface of the diffuser is not scratched when cleaning it.

Cleaning process:

- Use a soft, oil-free paintbrush to remove dust from the diffuser surface.
- To remove oil, grease or fingerprints from the diffuser surface, wipe the dirty area with a clean soft cloth and dry the surface. Then use an oil-free, washed-out and soft cotton cloth. Alternatively you can also use a reading glasses or lens cleaning cloth with alcohol or lens cleaning fluid. Repeat the wiping process until the diffuser surface is completely clean.

9.1.1 Change sensor cover



Danger of electric shock!

- Ensure that work can be carried out in accordance with occupational safety.
- This work may only be carried out by trained maintenance staff or other authorized personnel during a production break when the robot arm is not moving.
- Following the orderly shutting down of the ^{□25} image recording software RTVision.t make sure to switch off the strobe controller.
- Check that there is no voltage present in the system.
- When the strobe controller has been switched off, disconnect the cable on the sensor head.

The sensor optics are protected from environmental influences by an acrylic glass cover screen. Depending on the sensor version, it can also perform the function of a polarizing filter and/or a diffuser. When changing ensure the functionality of the cover screen is identical to the one being replaced.

As this cover screen is dirtied and therefore also scratched by the production environment, it should be checked regularly and changed as required.

Information – material damage

To remove and replace the cover screen you will require a pair of antistatic gloves (soft material) and an O-ring hook tool to remove the O-ring undamaged from the groove. Make sure that the transparent special screen of the sensor is not damaged. Scratches can cause changes in the optical properties or even a complete breakdown. Work with gloves to minimize the risk of damage for the new cover screen.

1. Maintenance work with access to the sensor head is possible only during a break in production.
2. When the application has been shut down, ^{□25} switch off the LED light controller (strobe controller).
3. Then disconnect the cable on the sensor head.
4. You do not have to disconnect the sensor from the robot arm to change the cover screen.

However, should you be forced to do so because of bad accessibility, then please always observe the information concerning sensor position in section Sensor replacement hardware ^{□198}.

5. Grip the O-ring with the O-ring hook tool and pull it carefully out of the sensor's housing groove. Now remove the seal ring and then remove the cover screen.
6. Place the new cover screen on the open sensor surface.

Ensure you do not damage any of the LEDs, cameras or the PCB on the inside here. Also handle cover screens with polarization film or diffuser coating especially carefully.



When placing on, the thin sponge rubber seal on the edge of the cover screen must face inwards to efficiently protect the optical components in the production environment against dirt.

7. Thread the O-ring over the axis and ensure that the O-ring in the housing groove grips evenly across its entire area, so that the new cover screen sits correctly.
8. Then clean the cover screen with a clean, soft and lint-free cotton cloth.
9. To start the system up again, connect the cable with the sensor head, then start the strobe controller and wait approx. 20 s until the camera system starts again.
10. Then start the RTVision.t server and client software.

Further information on handling the sensor:

Sensor replacement hardware¹⁹⁸

Sensor replacement - settings in the software²⁰⁰

9.1.2 Sensor replacement hardware



Danger of electric shock!

- Ensure that work can be carried out in accordance with occupational safety.
 - This work may only be carried out by trained maintenance staff or other authorized personnel during a production break when the robot arm is not moving.
 - When the image recording software has been shut down properly,^{□25} switch off the strobe controller.
 - When the strobe controller has been switched off, disconnect the cable on the sensor head.
 - Check that there is no voltage present in the system.
-



Information – material damage

You need a 2.5 mm Allen key and thread lock fluid for dismantling and reassembly.

For the physical sensor replacement, RTVision.t server and client must be shut^{□25} down. This can be done only during a break in production.

Make sure that the transparent special screen of the sensor is not damaged. Scratches can cause changes in the optical properties or even a complete breakdown.

All sensors are designed for a certain working distance.

The replaced physical sensor must have the same configuration so that no further settings are required. However, it may be necessary to teach in again in some circumstances.

If you replace the existing sensor with a different type of sensor, a complete new parameterization is required.

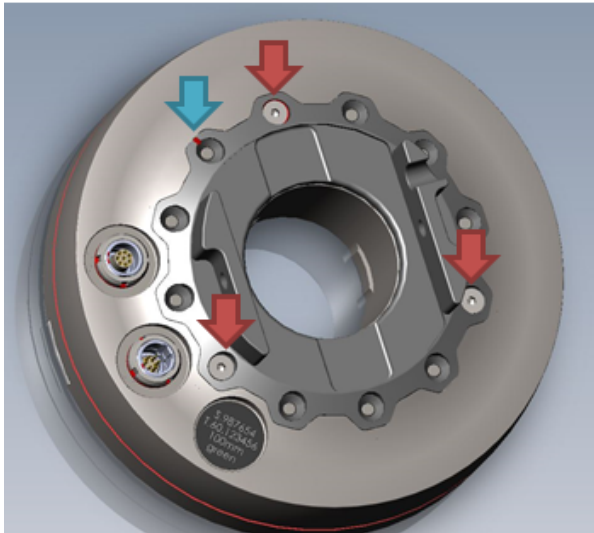
If you replace the existing sensor with the same sensor type, it is recommended that you perform sensor referencing on the referencing plate (software option).

Clarify the issue with the manufacturer beforehand and, if necessary, contact the QUISS service department.

1. Maintenance work with access to the sensor head is possible only during a break in production.
2. When the application has been shut down,^{□25} switch off the LED light controller (strobe controller). Check that there is no voltage present in the system.
3. Disconnect the cable and hold the sensor tightly while you undo the three screws.
4. If you are a trained maintenance worker, replace the physical sensor or contact the QUISS service department.



Make sure that the new sensor is positioned exactly like the old one. This is necessary to ensure that the camera position, working distance and search radius are identical.



12 position marks are engraved into the sensor housing (not visible in the picture).
 On the flange of the sensor is a corresponding groove (blue arrow).
 The three screws are marked with the red arrows.
 This ensures easily identifiable positioning.

5. During assembly, pay attention to the correct position and the maximum permitted tightening torque of 1.8 Nm for the Allen screws.
6. Secure the screws with locking fluid.
7. Connect the new sensor with the electric cabling.
8. Switch on the LED light controller (strobe controller).
 Wait about 20 seconds until the camera system starts.
9. Then start the RTVision.t server and client software.



Generally, the calibration data is applied when the server is restarted in the server module. You can see successful reinitialization in **Service | Hardware state** if the new serial number of the sensor camera was detected. Remember that the calibration data of the new sensor has to be loaded into the existing applications in the client. Start with the [Sensor link](#)²⁰⁰ in the client.

If after the sensor link the **global properties** differ from the replaced model, the system has to be taught in if required.

If necessary, contact the QUISS service department.

9.1.3 Sensor replacement software setting



Danger of electric shock!

- This work may only be carried out by trained maintenance staff or other authorized personnel during a production break when the robot arm is not moving.
 - When the imaging software has been shut down, switch off the strobe controller. Check that there is no voltage present in the system.
-



Note

For the physical sensor replacement, RTVision.t server and client must be shut down. This can be done only during a break in production.

All sensors are designed for a certain working distance. The replaced physical sensor must have the same configuration so that no settings / teach-in runs are required.

Clarify the issue with the manufacturer beforehand and, if necessary, contact the QUISS service department.

1. When the application has been shut down, switch off the LED light controller (strobe controller).
2. If you are a trained maintenance worker, replace the physical sensor or contact the QUISS service department.



Make sure that the new sensor is positioned exactly like the old one. This is necessary to ensure that the camera position, working distance and search radius are identical.

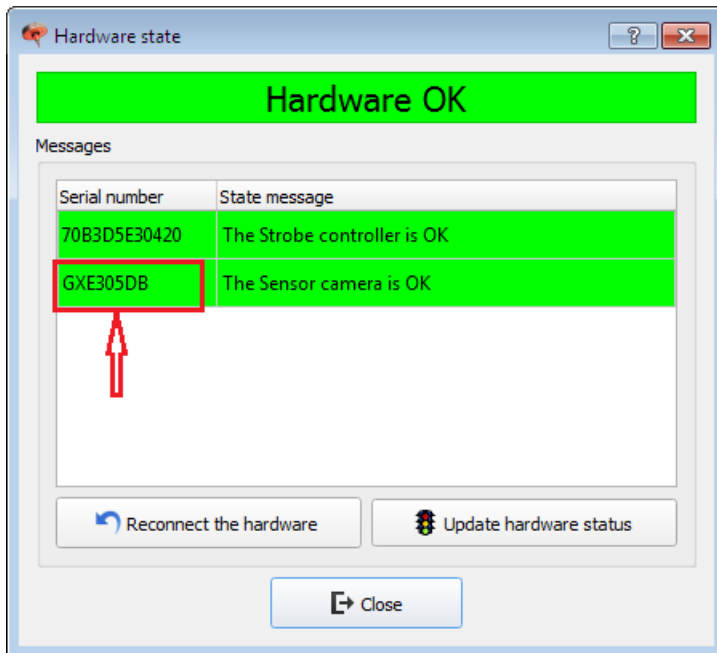
3. Connect the new sensor. Switch on the LED light controller (strobe controller).

Wait about 20 seconds until the camera system starts.

4. Then start the RTVision.t server and client software.

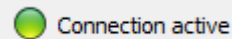


Generally, the calibration data is applied automatically when the server is restarted in the server module. You can see successful reinitialization in **Service | Hardware state** if the new serial number of the sensor camera was detected. Remember that the calibration data of the new sensor has to be loaded into the existing applications in the client. Start with the [Sensor link](#)²⁰⁰ in the client.

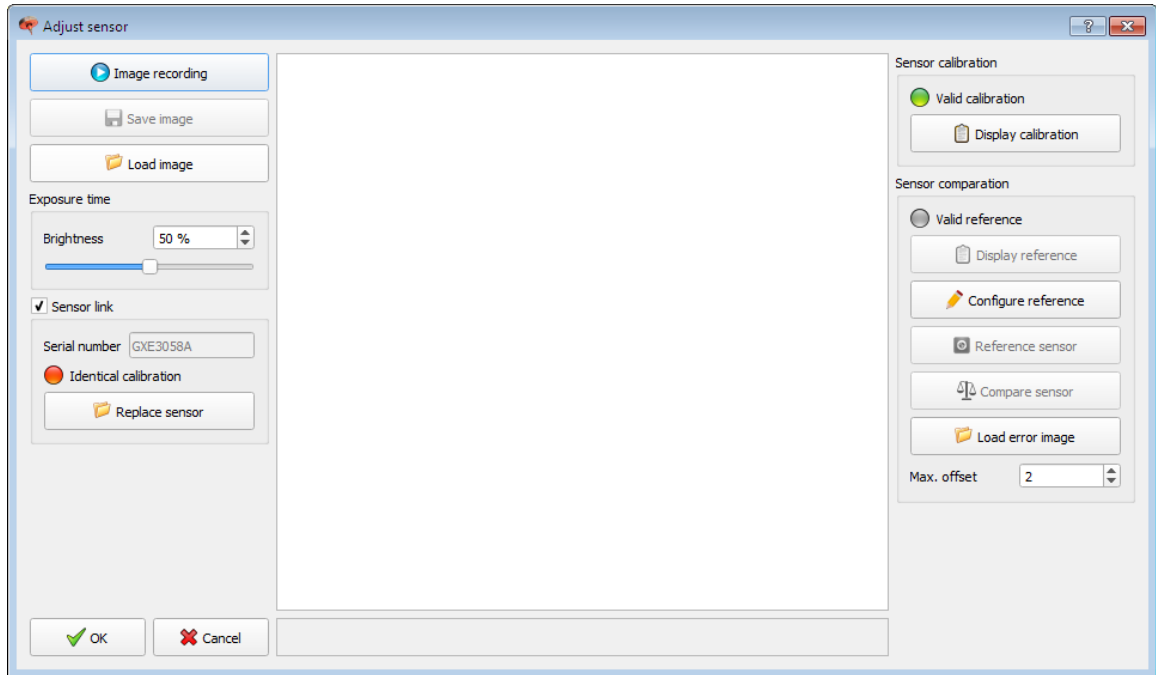
Check in the server under Service | Hardware state:

If the new sensor is installed, after restart of the RTVision.t server, the new serial number of the sensor camera must be read in and detected (see marked field).

The new data must then also be integrated into the RTVision.t client.

Sensor link in the client

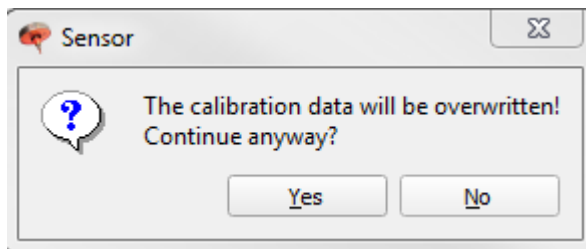
1. Connect the RTVision.t client to the server
2. In the client, select **Settings | Manage sensors**.
3. Select the sensor and click **Adjust** or double-click the sensor to open the **Adjust sensor** dialog.
4. In **Calibration status | Properties** note the global properties of the old sensor whose data is still valid in the application.
5. In the dialog on the left, the **Sensor link** box is active, but there may still be a red marking due to the non-matching serial number of the camera.



The system recognizes that the original calibration is still defined and when it is red, **Identical calibration** shows that the calibration and the new sensor are not identical.

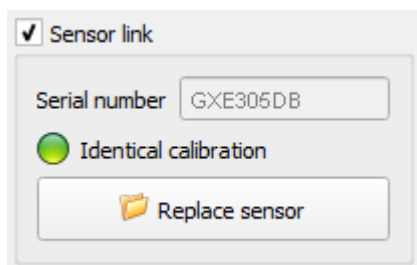
6. If a sensor is defective and has to be replaced, click **Replace sensor**.

7. Since the application is changed in the system, a message is output that the sensor calibration data stored in the application will be replaced by the data of the new sensor.



8. Click **Yes**.

The calibration data of the new sensor is loaded into the application and the new serial number of the sensor camera (internal) is entered. The data in the server and in the client is now identical.



At the same time, **Identical calibration** changes to green to show that the calibration data has been applied.

9. Before you confirm this for this application file, click the **Display calibration** button in the **Properties dialog** to compare the **global properties** (opening angle, search radius, working distance)

If the sensor type is the same, **Working distance** and **Search radius** should be the same.

NOTE - Manual calibration! - an extremely rare option

If after the sensor link the global properties differ from the replaced model, the system has to be taught in. If the deviations for the saved sensor-specific calibration are too big, manual calibration is the last option for overwriting the manufacturer-defined calibration on site. It is then only possible if the sensor link is deleted and it is intended to perform manual calibration via image recording.

Never perform manual calibration without prior consultation with **and approval** by the QUISS service department. QUISS GmbH accepts no liability for any damage resulting from independently performed manual calibration of the sensor.

If necessary, you can cancel the process or save the application under a different name and then transmit it.

10. If the data broadly match, click **OK**.

11. Save the updated application and transmit it to the RTVision.t server.

With the next component run, a new image sequence is created and checked according to the transmitted application. The result of this process shows the extent to which new parameterization is required.

12. Because interaction of the individual components (robot, sensor, adhesive control unit, nozzle) changes slightly when the sensor is replaced, a target inspection can be performed - if this option was acquired and is active. To do this, the referencing plate is moved to according to a test program, an image is created and this is compared with the reference image. If there are deviations within the system because of one of the components, the server will output NOK after completion of the test program. Before continuing with production, the individual components (robot, gripper arm, adhesive control unit, nozzle) of the referenced complete system should be checked. Even slight tilting of the sensor, for example, will cause a deviation between the new image and the reference image from the old configuration. This can be rectified and the test process repeated. However, there may also be damage to the nozzle or to the other system components causing this NOK result. With **Load error image**, you can analyze the error and thus assess the error relevance. Check this before adjusting the hardware components.



Note that manual **sensor calibration** and **target inspection** are completely different processes, but are implemented with identically named dialogs. Control is performed via different areas and buttons in the **Adjust sensor** dialog.

Avoid manual recalibration of the sensor if possible. A negative target inspection is not sufficient grounds for manual calibration of the sensor. It only shows deviations with respect to an original reference, which may be hardware-related, but may not necessarily be due to incorrect calibration.

You will find further information on this in:

Hardware state ²⁰⁴

9.1.4 Hardware state

The basic interface of RTVision.t from V. 4.6 now also offers signal output for "Hardware ready".

The functionality of the hardware (strobe controller, sensor camera and input / output cable connection) is thus tested automatically when the system is restarted but also before components are inspected.

If a NOK is output by this test, this is also visible in automatic mode of the server but no explanation is output for the fault.

The *Hardware state* shown under **Service | Hardware state** can provide assistance here.



Note that the hardware test is not performed constantly and therefore also not automatically, because this process can lead to delays. Manual queries should not be issued while component tests are ongoing since they disrupt execution of the test.

The functionality of the connection between the sensor and strobe controller is checked manually using the **Update hardware status** button in the **Hardware state** dialog.

Note here that no data stored on the hardware is read or assessed in this context, rather the "Hardware ready" query is processed without serial numbers or calibration data.

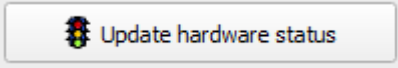
Pressing the **Reconnect the hardware** button, on the other hand, closes the connection completely, reads the data including the serial numbers and calibration data stored on the hardware and re-establishes the connection with the system.

Example: The cable connection to the sensor is interrupted.

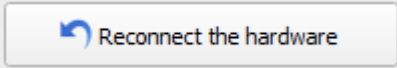
The query in the dialog with **Update hardware status** aborts after a few seconds with the message **The sensor camera is not accessible**. The serial number is displayed unchanged, however, since no query is issued in this case.

If the **Reconnect the hardware** button is selected, on the other hand, the message **The sensor camera is not accessible** is issued and a serial number is not detected. The system tried here to read the data from the hardware and since there was no cable connection, the message issued is as described.

Query with



Query with



Hardware state

Hardware NOK

Messages

Serial number	State message
70B3D5E30420	The Strobe controller is OK
GXE3058A	The sensor camera is not accessible

Reconnect the hardware
Update hardware status

Close

Hardware state

Hardware NOK

Messages

Serial number	State message
70B3D5E30420	The Strobe controller is OK
<Unknown>	The sensor camera is not available

Reconnect the hardware
Update hardware status

Close



If the strobe controller or sensor has been replaced, it can be checked here whether the hardware's own data was read and stored when the system was restarted. In the event that the sensor is replaced, make sure also that the correct calibration data for the new sensor was also recorded in the client. The sensor link **should be updated in this case** with the ***Replace sensor*** button.

You will find further information on this in:

Sensor replacement software setting²⁰⁰

Menu commands in automatic mode¹⁵⁶

9.2 Error messages

No.	Message	Explanation	Action
1	License not found	The license stick was removed from the system.	Insert the license stick.
2	The license options have changed	The license stick was replaced by another. The installed license stick does not belong to the system.	Insert original USB stick and restart program
3	The product does not exist	The higher-level controller sends a product ID that is not assigned in product management.	Check product ID between controller and system and change accordingly.
4	The product is irreparable	The product cannot be repaired.	Check if the product can be repaired before selecting this.
5	Too many inspections were selected	The number of inspections transferred via the interface is greater than the number of inspections created in the system.	Check the sequence between the controller and the system. Check the program and, if necessary, change the number of inspections.
6	Too few inspections were selected	The number of inspections transferred via the interface is less than the number of inspections created in the system.	Check the sequence between the controller and the system. Check the program and, if necessary, change the number of inspections.
7	The maximum permitted robot path was reached	The robot path signal has reached the maximum value	Correct the data resolution (PathMultiplier) on the system or robot
8	The sensor is too hot and was switched off Before this message appears, a warning message with information about the current recorded temperature is output in the log book: "The sensor is too hot and will soon be switched off (T= current °C)"	If the sensor is too hot, imaging is not started. However, this should always be checked physically. Sensor lamp off?	The sensor should be prevented from becoming too hot. The system stop signal must be received for imaging so that the sensor switches off and cools. Must be considered if, for example, an emergency stop was triggered during operation. A signal is no longer sent to imaging, the sensor is on and can trigger the message.

No.	Message	Explanation	Action
9	The sensor was switched off (overheating protection)	If imaging was active for too long, it switches off automatically. If the robot controller does not send a stop signal to imaging, the sensor remains active and, depending on the setting, can trigger overheating protection. However, this should always be checked physically. Sensor lamp off?	It should be prevented that the robot is stopped during the inspection. After a defined time, the sensor is switched off for safety reasons.
10	The product does not use a sensor	In the system, no sensor was assigned to a product.	In configuration mode, select the respective products and assign a camera.
11	The product is using an invalid calibration	The sensor has no valid calibration.	Replace the sensor.
12	The sensor calibration has changed	The calibration on the sensor no longer matches the calibration in the application file.	In configuration mode, replace the sensor in sensor management and then apply the application.
13	The product contains no inspections	A product was selected that has no inspections; the component cannot be inspected.	Create necessary inspections in configuration mode.
14	The sensor has no valid marking	The sensor has no license and can be used only with a hardware dongle.	Replace the sensor.
15	Invalid sensor type	This sensor does not contain the purchased license.	Replace the sensor type
16	The inspection is not completely taught in	The teach-in run in configuration mode was not completed.	Repeat the teach-in run to the end of the image sequence for the inspection concerned.
17	The robot path has changed too much	The received path signal has unexpectedly changed a lot.	Check the path calculation setting and correct accordingly.
18	An invalid robot path was received	The received path signal is invalid.	The fieldbus must be set up correctly.
19	The recording frequency is too low	Image recording no longer works or it is not optimal (below the permitted frequency)	Check the sensor, strobe controller, network card and special cabling

No.	Message	Explanation	Action
20	The time between 2 images is too long	Images are not being collected continuously. Hardware defect, e.g. cable break.	Check the following components: cable, sensor, strobe controller, vision controller. (in this order)
21	No images were recorded / image recording error	No images were collected. Hardware defect, e.g. cable break.	Check the following components: cable, sensor, strobe controller, vision controller. (in this order)
22	The end signal was received too soon	The system checks the time of the individual inspection. The teach-in run time is the reference time. With consideration of a tolerance, the signal "Inspection OFF" was sent earlier than expected.	Either the glue application was interrupted manually or the glue bead was shortened. If the glue bead was shortened, the sequence must be recorded again across all areas, the references must be checked and the teach-in run must be repeated in configuration mode.
23	The end signal was received too late	The system checks the time of the individual inspection. The teach-in run time is the reference time. With consideration of a tolerance, the signal "Inspection OFF" was sent later than expected.	Either the glue application was interrupted manually or the glue bead was extended. If the glue bead was extended, the sequence must be recorded again across all areas, the references must be checked and the teach-in run must be repeated in configuration mode.
24	No speed signal	The higher-level controller is not sending any speed signal (value 0 is received).	Check the program Robot stopped Log incorrect
25	The results cannot be saved on the hard disk	Reports and image sequences cannot be saved on the hard disk (HDD).	Insufficient capacity on the HDD. Required authorization missing. Delete data on the HDD if necessary.
26	The image recording length is too short	The system checks whether the distance between start and stop matches the length of the inspection.	The fieldbus must be set up correctly.

No.	Message	Explanation	Action
27	The additional storage area is not sufficient	The specially defined storage is not sufficient.	This storage area must be expanded.
28	At least one reference outside the inspection	At least one reference was defined outside the inspection	Increase the inspection length so that the reference can be carried out
29	At least one contour model outside the inspection	At least one contour detection was defined outside the inspection	Increase the inspection length so that the contour detection can be carried out
30	At least one reference that was skipped	At least one reference could not be carried out	Increase the distance between 2 references
31	At least one contour model that was skipped	At least one contour detection could not be carried out	Increase the distance between 2 contour detections.
32	Exposure time changed during glue inspection	The exposure time must not be changed manually during an inspection	Do not change the exposure time manually during an inspection

9.3 Glossary

Image sequence	A series of images taken quickly in succession. The RTVision.t system creates image sequences at a frequency of approx. 200 Hz from images taken every 5 ms. This image sequence of the glue bead acts as the basis for all subsequent parameterizations and tests of the RTVision.t system.
Client application	A client application is a computer program that assigns tasks to a server application or controls these. The client can be installed on the same computer or on a different computer.
Frame	An image within a video taken by the camera
Gray level	Corresponds to the brightness of a pixel. Most cameras can identify 256 different levels of brightness. Black equals 0 or 0%; white equals 255 or 100%
Gray level difference	This is the difference between the gray levels of adjacent pixels. The gray level difference is independent from the absolute brightness in many areas. The gray level difference is the most important property of adjacent pixels for forming the contour model. Corresponds to contrast.
Inspection	Contains the areas for the different distances of the bead path. Every area is parameterized differently and can be adapted precisely to the test conditions based on reference, exposure and contour. Determination of inspection result as "OK" or "NOK" Several inspections can be carried out for each product. A variety of parameterized areas exist accordingly for each inspection.
OK	No problem. The inspection has been completed and evaluated as error-free.
Calibration	Definition of the number of pixels per unit of length, e.g. pixels/mm. Required work step in the Hardware module in order to be able to work in the other parameters with the unit "mm". In the case of RTVision.t, the hardware is already calibrated ex works since the individual conditions such as search radius and working distance are known in advance.
Glue bead / bead	Referred to also as a glue seam or inspection track.
Adhesive bead	Referred to also as a glue bead or inspection track.
Inspection track	Referred to also as a glue bead or adhesive bead.
Contrast	This is the difference between the gray levels of adjacent pixels. The gray level difference is independent from the absolute brightness in many areas. The gray level difference is the most important property of adjacent pixels for

	forming the contour model. The contrast corresponds to the gray level difference.
Contour	A contour is a line or area that can be detected in the image, which is formed by gray level differences. A contour is only used for further analysis if the gray level differences are above the contours threshold.
Contour model	The contour model of an image only contains gray level differences (contours) that exceed a specific size – the contours threshold. All contour analyses are performed on the basis of the contour model.
NOK	Not OK. The inspection has been completed and errors were detected.
Orthogonal	Right angled, or two levels are vertical to each other
Parameter set	Contains all parameters or settings that are necessary for inspecting a product and are defined. A parameter set is selected in the Automatic module with its name – the product name. The product ID is used to activate or open it.
Product	The product describes a parameter set, the settings of which enable an inspection of the product. The product can be selected in the Automatic module. The product description (the product name) is defined in the Parameter module. An ID has to be assigned in order to open the product via the higher-level controller.
RGB sensor	or also RTVision.t V4 Sensor, [®] is operated in relation to the application system, material (substrate) and sealant with three different colors: red/green or blue. It is controlled via the LED light controller (strobe controller) with a total current of 100 - 5000mA depending on whether scattered or polarized light (filter type) is used.
Server application	A server application is a computer program that performs tasks as requested by the client application and outputs messages in this respect.
Tolerance	Tolerance is an accepted deviation of the actual value from a reference value.

9.4 Contact



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