

Presence Inspection

SensorApps

SICK
Sensor Intelligence.



Described product

Presence Inspection (version 2.1)

Manufacturer

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Original document

This document is an original document of SICK AG.

1 About this document

1.1 Information on the operating instructions

These operating instructions provide important information on how to use products from SICK AG. Prerequisites for safe work are:

- Compliance with all safety notes and handling instructions supplied.
- Compliance with local work safety regulations and general safety regulations for product applications .

The operating instructions are intended to be used by qualified personnel.



NOTE

Read these operating instructions carefully before starting any work, in order to familiarize yourself with the product and its function.

The instructions constitute an integral part of the product and must be accessible to staff at all times.

These operating instructions do not provide information on operating the machine or system in which the product is integrated. For information about this, refer to the operating instructions of the specific machine.

1.2 Explanation of symbols

Warnings and important information in this document are labeled with symbols. The warnings are introduced by signal words that indicate the extent of the danger. These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.



DANGER

... indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.



WARNING

... indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented.



CAUTION

... indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.



NOTICE

... indicates a potentially harmful situation, which may lead to material damage if not prevented.



NOTE

... highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

1.3 Further information



NOTE

Further documentation for the device can be found on the online product page at:

- www.sick.com/InspectorP63x
- www.sick.com/InspectorP64x
- www.sick.com/InspectorP65x

There, additional information has been provided depending on the product, such as:

- Model-specific online data sheets for device variants, containing technical data, dimensional drawing, and specification diagrams
 - EU declarations of conformity for the product family
 - Dimensional drawings and 3D CAD dimension models of the device variants in various electronic formats
 - This documentation, available in English and German, and in other languages if necessary
 - Other publications related to the devices described here
 - Publications dealing with accessories
-

Documents on request

Overview of command strings for the device.

2 Safety information

2.1 Intended use

Presence Inspection is a SensorApp for the InspectorP6xx family of 2D cameras. Presence Inspection uses vision-based quality inspection by applying embedded image analysis tools to images acquired by the InspectorP6xx camera. The results are sent to a control system via external interfaces.

2.2 Improper use

Any use outside of the stated areas, in particular use outside of the technical specifications and the requirements for intended use, will be deemed to be incorrect use.

- The device does not constitute a safety component in accordance with the respective applicable safety standards for machines.
- The device must not be used in explosion-hazardous areas, in corrosive environments or under extreme environmental conditions.
- Any use of accessories not specifically approved by SICK AG is at your own risk.



WARNING

Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- Device should be used only in accordance with its intended use.
 - All information in these operating instructions must be strictly observed.
-

2.3 Internet protocol (IP) technology



NOTE

SICK uses standard IP technology in its products. The emphasis is placed on availability of products and services.

SICK always assumes the following prerequisites:

- The customer ensures the integrity and confidentiality of the data and rights affected by its own use of the aforementioned products.
 - In all cases, the customer implements the appropriate security measures, such as network separation, firewalls, virus protection, and patch management.
-

2.4 Limitation of liability

Relevant standards and regulations, the latest technological developments, and our many years of knowledge and experience have all been taken into account when compiling the data and information contained in these operating instructions. The manufacturer accepts no liability for damage caused by:

- Non-adherence to the product documentation (e.g., operating instructions)
- Incorrect use
- Use of untrained staff
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts, consumables, and accessories

With special variants, where optional extras have been ordered, or owing to the latest technical changes, the actual scope of delivery may vary from the features and illustrations shown here.

2.5 Modifications and conversions



NOTICE

Modifications and conversions to the device may result in unforeseeable dangers.

Interrupting or modifying the device or SICK software will invalidate any warranty claims against SICK AG. This applies in particular to opening the housing, even as part of mounting and electrical installation.

2.6 Requirements for skilled persons and operating personnel



WARNING

Risk of injury due to insufficient training.

Improper handling of the device may result in considerable personal injury and material damage.

- All work must only ever be carried out by the stipulated persons.

This product documentation refers to the following qualification requirements for the various activities associated with the device:

- **Instructed personnel** have been briefed by the operator about the tasks assigned to them and about potential dangers arising from improper action.
- **Skilled personnel** have the specialist training, skills, and experience, as well as knowledge of the relevant regulations, to be able to perform tasks delegated to them and to detect and avoid any potential dangers independently.
- **Electricians** have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions to be able to carry out work on electrical systems and to detect and avoid any potential dangers independently. In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g. Master Electrician). Other relevant regulations applicable in other countries must be observed.

The following qualifications are required for various activities:

Table 1: Activities and technical requirements

Activities	Qualification
Mounting, maintenance	<ul style="list-style-type: none"> ■ Basic practical technical training ■ Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	<ul style="list-style-type: none"> ■ Practical electrical training ■ Knowledge of current electrical safety regulations ■ Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	<ul style="list-style-type: none"> ■ Basic knowledge of the Windows™ operating system in use ■ Basic knowledge of the design and setup of the described connections and interfaces ■ Basic knowledge of data transmission ■ Knowledge of the programming of image-processing systems and network components

Activities	Qualification
Operation of the device for the particular application	<ul style="list-style-type: none"> ■ Knowledge of the operation and control of the devices in their particular application ■ Knowledge of the software and hardware environment for the particular application

2.7 Operational safety and particular hazards

Please observe the safety notes and the warnings listed here and in other chapters of this product documentation to reduce the possibility of risks to health and avoid dangerous situations.

LED radiation of the internal illumination unit (variants of the VI55I illumination unit)



NOTE

Only the VI55I integrable illumination units from SICK intended for the application can be used as internal illumination units.

Risk group 1

- Color of illumination: blue (aperture angle: wide, medium), red or white
- Color of spot: red, green



CAUTION

Warning! Optical radiation: LED risk group 1

The LEDs may pose a danger to the eyes and skin in the event of incorrect use.

- Protect the eyes and skin against radiation.
- Use suitable eye protection.
- Use protective measures such as a screen to shield the radiation.
- Do not open the housing. Opening the housing will not switch off the light source. Opening the housing may increase the level of risk.
- Comply with the current national regulations on photobiological security of lamps and lamp systems.

Risk group 2

- Color of illumination: blue (aperture angle: narrow)



CAUTION

Warning! Optical radiation: LED risk group 2

The LEDs may pose a danger to the eyes in the event of incorrect use.

- Protect the eyes and skin against radiation.
- Use suitable eye protection.
- Never point the light source at people.
- Use protective measures such as a screen to shield the radiation.
- Avoid any reflections on people from reflective surfaces. Be particularly careful during mounting and alignment work.
- Do not open the housing. Opening the housing will not switch off the light source. Opening the housing may increase the level of risk.
- Comply with the current national regulations on photobiological security of lamps and lamp systems.



CAUTION

Optical radiation: Laser class 1

The accessible radiation does not pose a danger when viewed directly for up to 100 seconds. It may pose a danger to the eyes and skin in the event of incorrect use.

- Do not open the housing. Opening the housing may increase the level of risk.
 - Current national regulations regarding laser protection must be observed.
-



CAUTION

Hazardous radiation.

If any operating or adjusting devices other than those specified here are used or other methods are employed, this can lead to dangerous exposure to radiation. Damage to the eyes is possible.

- If the product is operated in conjunction with external illumination systems, the risks described here may be exceeded. This must be taken into consideration by users on a case-by-case basis.
 - Do not look into the light source when it is switched on.
 - Comply with the latest version of the applicable regulations on photobiological safety of lamps and lamp systems as well as on laser protection.
-

For both radiation types:

It is not possible to entirely rule out temporary disorienting optical effects, particularly in conditions of dim lighting. Disorienting optical effects may come in the form of daz-zle, flash blindness, afterimages, photosensitive epilepsy , depending on parameteriza-tion), or impairment of color vision, for example.



WARNING

Electrical voltage!

Electrical voltage can cause severe injury or death.

- Work on electrical systems must only be performed by qualified electricians.
 - The power supply must be disconnected when attaching and detaching electrical connections.
 - The product must only be connected to a voltage supply as set out in the require-ments in the operating instructions.
 - National and regional regulations must be complied with.
 - Safety requirements relating to work on electrical systems must be complied with.
-



WARNING

Risk of injury and damage caused by potential equalization currents!

Improper grounding can lead to dangerous equipotential bonding currents, which may in turn lead to dangerous voltages on metallic surfaces, such as the housing. Electrical voltage can cause severe injury or death.

- Work on electrical systems must only be performed by qualified electricians.
 - Follow the notes in the operating instructions.
 - Install the grounding for the product and the system in accordance with national and regional regulations.
-

3 Product description

3.1 Overview

Presence Inspection is a SensorApp for the InspectorP6xx family of 2D cameras. Presence Inspection uses vision-based quality inspection to ensure that desired qualities are present and undesired elements are not present.

Presence Inspection is configured through a web-based graphical user interface, which contains a selection of software tools for image analysis, result output, and communication. The tools are listed and described in "[Tool box - System](#)", [page 20](#) and "[Tool box - Jobs](#)", [page 22](#).

In addition to the tools that are included by default, Presence Inspection supports the creation and import of additional tools. For a description of how to import a tool through SICK AppManager, see "[Installing tools](#)", [page 11](#). A tutorial for tool development is available from the Presence Inspection page in the SICK Support Portal, [supportportal.sick.com](#).

3.2 System requirements

Hardware

The following devices support the use of Presence Inspection:

- InspectorP631
- InspectorP632
- InspectorP642
- InspectorP652
- InspectorP654
- SICK AppStudio Emulator (full featured)

Software

- The SICK AppManager software ([www.sick.com/SICK_AppManager](#)) is required for installing Presence Inspection on a device.
- InspectorP6xx firmware v 3.1.0 or later is required to run Presence Inspection. Download the firmware from the SICK Support Portal, [supportportal.sick.com](#).

Supported web browsers

- Google Chrome

4 Installation

4.1 Installing Presence Inspection

SICK AppManager

A PC running the SICK AppManager software is required for the following actions:

- Installing a SensorApp on a device.
- Reading and changing the device's IP address.
- Installing firmware updates.

Download SICK AppManager from www.sick.com/SICK_AppManager.

Installing Presence Inspection on a device

The latest version of the Presence Inspection SensorApp (.stpk file) is available from the SICK AppPool (<http://apppool.cloud.sick.com/>). The use of the SICK AppPool requires a SICK ID, which can be obtained at the login page at the link above.

If the PC has Internet access when connected to the device, Presence Inspection can be downloaded and installed directly from SICK AppPool using SICK AppManager. If the PC does not have Internet access prior to the installation, Presence Inspection must be downloaded to the PC prior to the installation. See [figure 1](#).

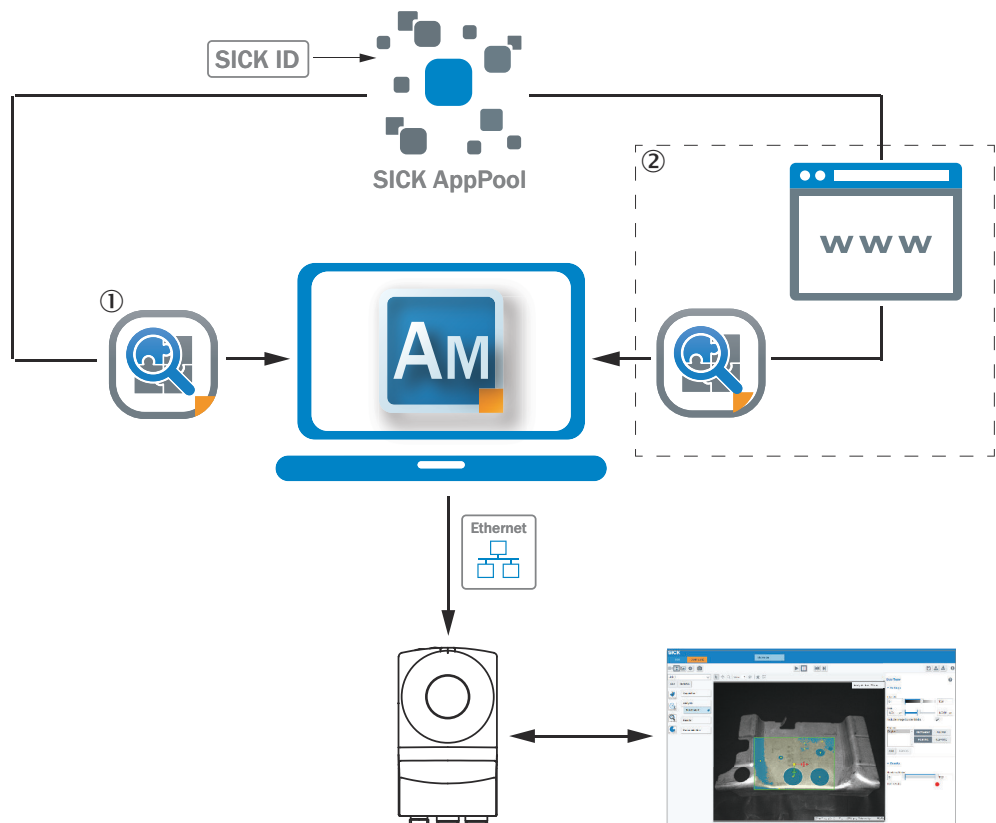


Figure 1: Online and offline solutions for installing Presence Inspection via SICK AppManager

- ① Online solution: Download and install Presence Inspection directly from the SICK AppPool using SICK AppManager
- ② Offline solution: Download Presence Inspection from apppool.sick.cloud.com to the PC prior to the installation

**NOTE**

Before starting the installation, make sure that the network communication settings on the PC are correctly set up:

- The PC must be on the same network as the device.
- The PC must not use the same IP address as the device.

**NOTE**

When upgrading or downgrading the Presence Inspection SensorApp, the associated configuration file is deleted.

To re-use the existing configuration file, export it before the upgrade and re-import it after the upgrade.

To install Presence Inspection using SICK AppManager:

1. Connect the device to the PC via Ethernet.
2. On the PC, open SICK AppManager.
3. Under the **Device Search** tab in SICK AppManager, click **Scan** to search for available devices on the network.
4. In the list of available devices, select the device where you want to install Presence Inspection.
5. If the device tab (lower left pane) contains any active applications, including old versions of Presence Inspection, right-click the applications and delete them.
6. To download and install Presence Inspection directly from the AppPool:
 - a) Click **Login to SICK ID** (below the **Utils** menu in SICK AppManager) to log in to SICK AppPool.
 - b) Click the **AppPool** tab.
 - c) Select Presence Inspection in the list of available SensorApps.
 - d) Click **Download and install** to download Presence Inspection to the PC and install it on the device.
- Or:

To install a downloaded Presence Inspection .stpk file from the PC to the device:

 - a) Click the **Local Packages** tab in SICK AppManager.
 - b) Drag and drop the Presence Inspection SensorApp into the file list.
 - c) Click **Install** to install Presence Inspection on the device.
- ✓ Presence Inspection is now installed and running on the device.
7. To open the user interface, open a web browser window and type the IP address of the device.

4.2 Installing tools

In addition to the tools that are included by default, Presence Inspection supports installation of additional tools. Each tool is a separate .sapk file which is installed via SICK AppManager.

To install a tool via SICK AppManager, follow the installation process described in ["Installing Presence Inspection", page 10](#). For a tool to work properly, both the Presence Inspection SensorApp and the installed tool must be present on the device.

**NOTE**

When the tool installation is complete, reload the web browser to view the installed tool in the user interface.

5 Operation

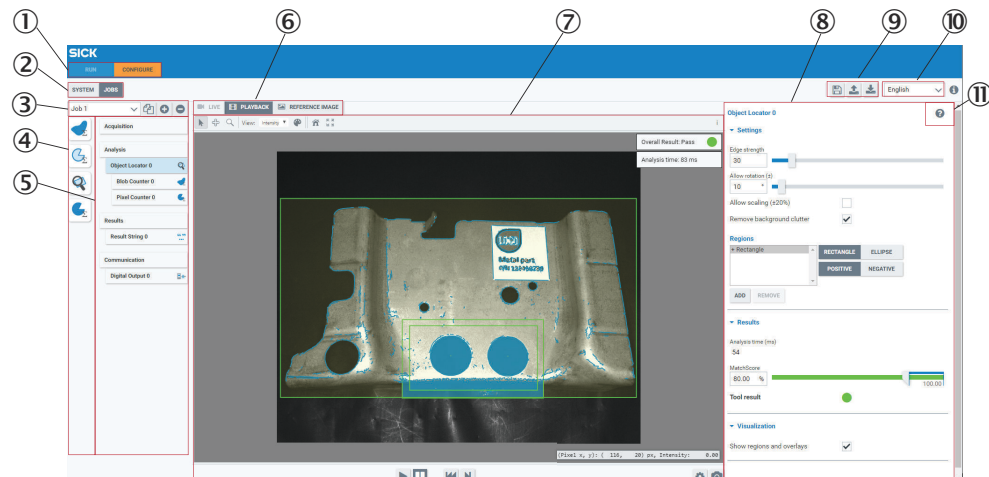
5.1 User interface

Opening the user interface

To open the Presence Inspection user interface from a web browser:

1. Open a web browser window.
2. Type the IP address of the device. The default IP address is 192.168.0.1.

Overview of the user interface



- ① Mode selection (Run/Configure)
- ② System/Jobs switch
- ③ Job list
- ④ Toolbox
- ⑤ Tool tree
- ⑥ Image source selection
- ⑦ Image viewer
- ⑧ Tool pane
- ⑨ Save, import and export options
- ⑩ Language selection
- ⑪ Tool help

5.2 Run mode

Run is the default mode when starting Presence Inspection. Use **Run** mode for inspection of objects in a real environment, based on the configuration created in **Configure** mode.

In **Run** mode, images are acquired continuously or by an external trigger. All acquired images are analyzed. To decrease the processing time, only some of the acquired images are displayed in the viewer in the user interface.

**NOTE**

When the system is in **Run** mode:

- The communication interfaces are active and communicate with the connected external devices.
- No changes to the tool tree or tool settings are possible.
- To switch jobs, click the job list in the job handling section in the user interface or use a **Job Selection I/O** tool to switch jobs via digital inputs (see "[Job Selection I/O tool](#)", page 21).

5.3 Configure mode

Use **Configure** mode to set up a configuration for the application of interest.

**NOTICE**

Click **Save Permanently** in the configuration toolbar to save a configuration to the device's flash memory. If a configuration is not saved before disconnecting the power to the device, all settings are lost.

**NOTE**

All communication interfaces are inactive in **Configure** mode.

Follow the steps below to set up a configuration:

1. Add tools to the **System** tool tree and edit the tool settings, see "[Tool categories - System](#)", page 14.
2. Select an image source for the configuration, see "[Image source](#)", page 15.
3. Select a job, see "[Creating and switching jobs](#)", page 16.
4. Add tools to the job tool tree and adjust the tool settings, see "[Tool categories - Jobs](#)", page 17.
5. Edit the image acquisition settings for the job, see "[Editing the image acquisition settings](#)", page 18.
6. If multiple jobs are required for an application, repeat step 1, 3, 4 and 5 for each job.
7. Save the resulting configuration to the device and export the configuration for back-up, see "[Saving, importing and exporting a configuration](#)", page 19.

5.3.1 Tool tree

The Presence Inspection SensorApp concept is based on a tool tree structure, which contains defined categories and associated tools. A configuration contains one tool tree for the system level (see "[System settings](#)", page 14) and one additional tool tree for each created job (see "[Job settings](#)", page 15).

The user adapts each tool tree to the application of interest by adding tool instances to the different categories. The available tools for each category are described in detail in "[Tool box - System](#)", page 20 and "[Tool box - Jobs](#)", page 22.

An example of a job tool tree is displayed in [figure 2](#).

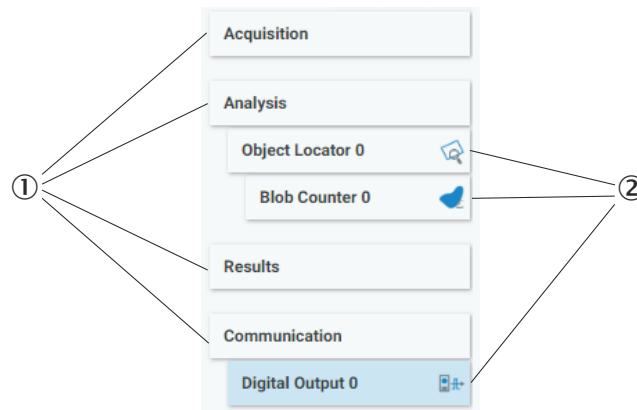


Figure 2: Example of a job tool tree with added tool instances

- ① Categories
- ② Added tool instances

Adding and removing tools

To add a tool instance to a tool tree:

1. Click a category in the tool tree to display its associated tools.
2. Click and drag a tool icon to the correct category in the tool tree to create a new instance of the tool.

To remove a tool instance from a tool tree, use one of the following options:

- Select the tool instance in the tool tree and press **Delete** on the PC keyboard. In the dialog box that appears, click "Yes" to confirm the deletion.
- Click and hold the tool instance in the tool tree until a trash can icon appears, then click the trash can icon.

Editing the tool settings

Click a tool instance in the tool tree to display its tool pane, which contains all the available settings and result parameters. For more information about the settings and result parameters, click the tool help (Help button) in the tool pane.

5.3.2 System settings

The **System** page contains a tool tree with tools related to the device interfaces. Tool instances that are added to the **System** tool tree are valid for all jobs.

To access and edit the **System** page, set the **System/Jobs** toggle (figure 3) to **System**.

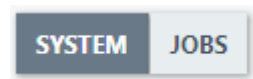


Figure 3: System/Jobs toggle, here set to System

5.3.2.1 Tool categories - System

The **System** tool categories are listed below. For descriptions of the individual **System** tools, see "[Tool box - System](#)", page 20.

Interfaces

The **Interfaces** category contains tools that communicate with external devices. Tools in the **Communication** category can use the **Interfaces** tools for communication and data transmission. The **Interfaces** tools are valid for all jobs.

5.3.3 Job settings

The **Job** page contains settings for individual jobs. Each job consists of a tool tree and a reference image.

To access and edit the **Job** page, set the **System/Jobs** toggle (figure 3) to **Jobs**.

5.3.3.1 Image source

Use the image source selection buttons on the **Job** page to select an image source for the configuration. Each option has a set of associated controls, which are displayed below the image viewer.



NOTE

The selected image source is only used during the configuration. In **Run** mode, the analysis is based on live images.

Live image



Set up the configuration based on live images. The **Live** option is suitable for configuring in the real inspection environment.



NOTE

- The **Live** option is not available when using the SICK AppStudio Emulator.

Table 2: Controls available for live images

Control	Name	Function
	Free running	Acquire images continuously.
	Run triggered	Acquire images based on an external trigger. To enable the Run triggered button: 1 Click the Acquisition workflow step. 2 Select the External trigger on DI1 check box in the tool pane.
	Stop	Stop the image acquisition.
	Trigger	Acquire one single image (trigger an image acquisition by clicking the button).
	Update Reference Image	Set the currently displayed image as the reference image. The currently stored reference image is overwritten.






Playback image



Set up the configuration based on recorded images, without access to a real device.

Table 3: Controls for playback images

Control	Name	Function
	Play	Display and loop through the images in the target folder.

Control	Name	Function
	Pause	Pause the playback.
	First image	Go to the first image in the series.
	Next image	Step to the next image in the series.
	Settings	<p>Cycle images (On/Off)</p> <p>Image folder: The folder where the recorded images are stored. The folder must be a public folder on the device or a folder on an SD card. Examples:</p> <pre>/public/myDirectory</pre> <pre>/sdcard/0/myDirectory</pre>
	Update Reference Image	Set the currently displayed image as the reference image. The currently stored reference image is overwritten.


Reference image



Set up the configuration based on a saved reference image. This option is suitable if there is one particular image that you want to use for the configuration.

- The reference image is job-specific and must be defined for each job.
- To save a reference image, click **Update Reference Image** (available for the **Live** and **Playback** options).
- A reference image is required for setting the region of interest for the **Object Locator** tool.

Table 4: Controls for the reference image

Control	Name	Function
	Reference Image	View the saved reference image.



5.3.3.2 Creating and switching jobs


Create a job for each inspection situation and object type. The job list in the upper left part of the user interface displays the active job.

If there is no configuration saved on the device when starting Presence Inspection, a new job ('Job 1') is created automatically.

Adding and removing jobs

Use the buttons next to the job list to add and remove jobs to and from a configuration:

Icon	Name	Description
	Clone current job	Create a copy of the currently selected job and add to the configuration
	Add job	Add a new job to the configuration

Icon	Name	Description
	Remove selected job	Remove the currently selected job from the configuration

Selecting jobs

Click the job list to display and switch between existing jobs.

When the device is restarted, the most recent active job is reactivated (Requirement: **Save Permanently** has been done prior to the restart, see "[Saving, importing and exporting a configuration](#)", page 19).

5.3.3.3 Tool categories - Jobs

The tool tree structure for each job on the **Job** page is formed as a workflow, consisting of the four categories below. For descriptions of the individual **Job** tools, see "[Tool box - Jobs](#)", page 22.

Acquisition

The **Acquisition** category contains settings for image acquisition and image quality. Changes to the image acquisition settings are applied to the next acquired image.

Analysis

The **Analysis** category contains tools for image processing and image analysis.

Results

The **Results** category contains settings and tools for result processing and output handling.

Communication

The **Communication** category contains tools for sending results to external devices.

5.3.3.3.1 Setting the region of interest for a tool

Some tools in the **Analysis** category operate within a defined region of interest (ROI). For such tools, the tool pane contains a **Regions** list where the ROI can be set. The ROI is displayed as a rectangular or elliptic overlay in the image viewer.

- Click a region in the image viewer to select the corresponding tool and display its tool pane.
- Hover over a region in the image viewer to highlight its handles.
- Click and drag the center handle to move a region.
- Click and drag the side or corner handles to resize a region.

Adding regions for a tool

When a tool is added to the tool tree, it is automatically assigned a rectangular default region which is displayed in the **Regions** list. To add additional regions, click **Add**.

Because at least one region is required for each tool, the **Remove** button is only enabled if the **Regions** list contains more than one item.

Positive and negative regions



NOTE

If the total ROI is negative, the tool is invalid and gives a **Fail** result.

Each region in the **Region** list is defined as positive or negative. The total ROI for a tool is defined as the union of all the positive regions subtracted by the union of all the negative regions, according to [figure 4](#).

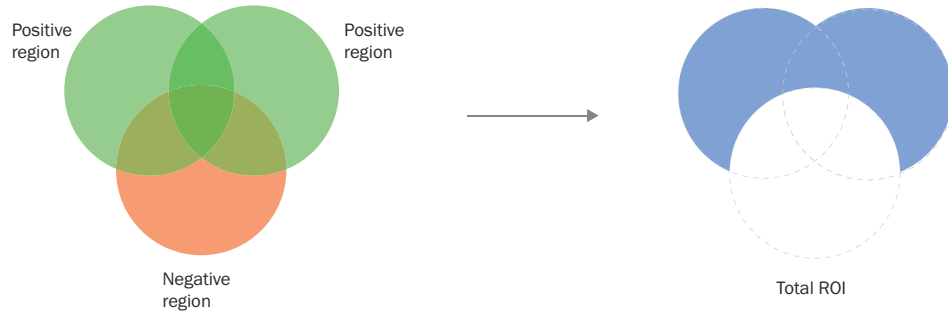


Figure 4: Positive and negative regions and the total ROI

Visualization of results

In the image viewer, the ROI for the active tool is displayed with a yellow transparent overlay. The ROI border-color corresponds to the tool result (green color for **Pass**, red color for **Fail**).

To hide the overlay for a tool instance, clear the **Show regions and overlays** check box in the tool pane.

5.3.3.4 Editing the image acquisition settings

To edit the image acquisition settings for a job, click the **Acquisition** category. The **Acquisition** settings are displayed in the tool pane to the right of the image viewer.



NOTE

Changes to the image acquisition settings are applied to the next acquired image.

Setting	Description
Exposure time	The exposure time of the sensor. Increase the exposure time to get a brighter image.
Brightness	The brightness (gain factor) for the image acquisition. Keep the brightness low to reduce the level of noise. If a brighter image is required, it is recommended to increase the exposure time before increasing the brightness.
Contrast	The contrast level for the image acquisition. Increase the contrast to make objects in the image more distinguishable.
Focus	The focus distance (in mm) for devices with dynamic focus. The lower and upper limits are set based on the possible focus distances for the device. This option is only available for devices with dynamic focus.
External trigger on DI1	Enable the use of an external trigger, e.g. a photoelectric switch, to trigger an image acquisition. The external trigger must be connected to digital input port 1.
Delay	The delay between the trigger signal and the image acquisition when using an external trigger. This option is only available when the External trigger on DI1 check-box is selected.
Record images	Record and save all acquired images to a specified target folder. Images are only recorded when the system is in Configure mode and Live images are used as image source.

Setting	Description
Record directory	The full path to the target folder where the recorded images are saved. The target folder must be a public folder on the device or a folder on an SD card. Examples: /public/myDirectory /sdcard/0/myDirectory If the selected target folder is not valid, an error message appears in the log.




5.3.4 Saving, importing and exporting a configuration

A configuration includes one or more jobs and a reference image. To save, export or import a configuration, use the buttons in the upper right part of the user interface.



NOTICE

If a configuration is not saved before disconnecting the power to the device, all settings are lost.

Button	Name	Description
	Save Permanently	Save a configuration from the device's working memory to the flash memory.
	Export Configuration	Export a configuration from the device's working memory to the connected PC.
	Import Configuration	Import a configuration from the connected PC and save it to the device's working memory. To save the imported configuration permanently to the device, click Save Permanently .

6 Annex

6.1 Licenses

SICK uses open-source software. This software is licensed by the rights holders using the following licenses among others: the free licenses GNU General Public License (GPL Version2, GPL Version3) and GNU Lesser General Public License (LGPL), the MIT license, zLib license, and the licenses derived from the BSD license.

This program is provided for general use, but WITHOUT ANY WARRANTY OF ANY KIND. This warranty disclaimer also extends to the implicit assurance of marketability or suitability of the program for a particular purpose.

More details can be found in the GNU General Public License. View the complete license texts here: www.sick.com/licensetexts. Printed copies of the license texts are also available on request.

6.2 Tool box - System

6.2.1 Interfaces tools

The **Interfaces** category contains tools that communicate with external devices. Tools in the **Communication** category can use the **Interfaces** tools for communication and data transmission. The **Interfaces** tools are valid for all jobs.

6.2.1.1 Fieldbus tool

The **Fieldbus** tool is a static (non-removable) tool that contains the available fieldbus modes for the device.



NOTE

Click **Apply and reboot** to restart the device and apply the updated settings.

Settings

Setting	Description
Mode	<ul style="list-style-type: none"> Select EtherNet/IP to enable EtherNet/IP. Select Off to inactivate all fieldbus options.

6.2.1.2 I/O Configuration tool



The **I/O Configuration** tool lets the user select which digital I/Os to use as inputs and outputs. The ports that are set to inputs can be used by the **Job Selection I/O** tool, and the ports that are set to outputs can be used by the **Digital Output** tool.



NOTE

All options are not available for all ports.

Settings

Setting	Description
I/O	The port number of the digital I/O.

Setting	Description
Usage	<p>Select how to use the port:</p> <ul style="list-style-type: none"> • IN/Image Trigger: Use the port as input for external triggering. This option is only available for I/O 1. • IN/Job selection: Use the port as input for the Job Selection I/O tool. • OUT/Digital output: Use the port as output for the Digital Output tool.

6.2.1.3 Job Selection I/O tool



The **Job Selection I/O** tool enables job selection via digital input signals. The tool operates by linking a job to a binary configuration of digital input signals. To select the job, the digital input signals must be correctly set to HIGH and LOW according to the configuration.



NOTE

An **I/O Configuration** tool instance must be added before the **Job Selection I/O** tool can be used. The ports that are set as **IN/ Job Selection** in the **I/O Configuration** tool are available in the **Job Selection I/O** tool.



NOTE

To select a job, all corresponding input signals must be set to their correct values within 1 ms.

Settings

Setting	Description
Value	Index of the current row.
Job	The job that is linked to the configuration of input signals on the current row.
Digital input (IN1, IN2, ...)	<p>Each column represents an available digital input port. Each row represents a binary configuration of digital input signals, where "1" corresponds to signal level HIGH and "0" corresponds to signal level LOW.</p> <p>To select a job, all input signal levels on the same row must be set according to the given configuration.</p>

6.2.1.4 TCP Client tool



The **TCP Client** tool sets up an interface for sending data to an external server, using a TCP protocol.

Settings

Setting	Description
Server IP address	The external server's IP address.
Port	The port number to connect to on the external server.

The **Connection Status** indicator displays the real-time status of the connection between the **TCP Client** tool and the external server:

- Green indicator: The connection is successfully set up.
- Red indicator: There is no connection to the server.

6.2.1.5 TCP Server tool



The **TCP Server** tool provides a server that external TCP clients can connect to. Data can then be sent from the server to the connected clients using a TCP protocol.

Settings

Setting	Description
Port	The port that the clients can connect to.

The **Number of clients connected** indicator shows how many clients that are currently connected to the server.

6.3 Tool box - Jobs

6.3.1 Analysis tools

The **Analysis** category contains tools for image processing and image analysis.

6.3.1.1 Blob Counter tool



The **Blob Counter** tool counts blobs within its region of interest. A blob is defined as a cluster of connected pixels within a specified intensity and area range.



NOTE

If the object position varies between the acquired images, this tool must be linked to an **Object Locator** tool. Tools which are linked to an **Object Locator** tool are repositioned according to the position of the located object. Drag and drop the tool onto an added **Object Locator** tool to link them.

Settings

Setting	Description
Intensity	Only search for pixels with an intensity value within the specified intensity range.
Area	Only include blobs with an area within the specified area range.
Include image border blobs	Include blobs that touch the image border.

Regions

This tool operates within its region of interest (ROI), which is set in the **Regions** section in the tool pane. For more information about how to set the ROI, see "[Setting the region of interest for a tool](#)", page 17.

Results

Result	Description	Variable name
Number of blobs	The number of found blobs.	NumBlobs
Tool result	Total result, based on the set threshold values for Number of blobs .	Pass

6.3.1.2 Edge Pixel Counter tool



The **Edge Pixel Counter** tool counts all pixels which are located on edges within the tool's region of interest.

**NOTE**

If the object position varies between the acquired images, this tool must be linked to an **Object Locator** tool. Tools which are linked to an **Object Locator** tool are repositioned according to the position of the located object. Drag and drop the tool onto an added **Object Locator** tool to link them.

Settings

Setting	Description
Edge strength	Threshold value for detecting an edge. A high edge strength means that a high contrast is required between an edge and the background.

Regions

This tool operates within its region of interest (ROI), which is set in the **Regions** section in the tool pane. For more information about how to set the ROI, see "[Setting the region of interest for a tool](#)", page 17.

Results

Result	Description	Variable name
Edge pixels	The number of found edge pixels in relation to the total number of pixels within the region of interest.	Coverage
Tool result	Total result, based on the set threshold values for Edge pixels .	Pass

6.3.1.3 Object Locator tool



The **Object Locator** tool uses edge matching to first locate an object in a reference image, then find the position of similar objects in other images. Use the **Object Locator** tool when the position or rotation of the object varies.

Reference image

The **Object Locator** tool requires a reference image for teach-in of a reference object and for setting the region of interest. Teach-in is done automatically when a reference image is added or updated. For each new image, the **Object Locator** tool produces a transform that describes how the located object's position and rotation varies relative to the reference image.

- Click **Update Reference Image** to add or update the reference image. The teach-in of the reference object is automatically done on the updated image.
- Click **View Reference Image** to display the current reference image and set the ROI for the tool.

Linking other tools to the Object Locator

Drag and drop a tool instance onto an **Object Locator** tool instance to create a parent-child relationship. For each new image, the region of interest for each child tool is repositioned according to the transform produced by the parent **Object Locator** tool. Tools that are linked as children appear as indented items below the **Object Locator** tool instance in the tool tree.

Settings

Setting	Description
Edge strength	Threshold value for locating an edge. A high value means that a high contrast is required between an edge and the background. An optimal edge strength value includes the edges of the reference object while excluding clutter edges in the background.
Allow rotation (\pm)	The maximum allowed object rotation in relation to the reference object. Decrease the allowed rotation to increase the speed and robustness of the analysis.
Allow scaling (\pm 20%)	Search for objects which are scaled in relation to the reference object. Scaling is suitable if the distance between the object and the sensor varies. De-select this option to increase the speed and robustness of the analysis.
Remove background clutter	Make the Object Locator tool more robust to background noise. De-select this option if the background is clean.

Regions

This tool operates within its region of interest (ROI), which is set in the **Regions** section in the tool pane. For more information about how to set the ROI, see "[Setting the region of interest for a tool](#)", page 17.

Results

Result	Description	Variable name
Match score	The percentage of matching between the taught reference object and the current object.	MatchScore
Tool result	The total result, based on the set threshold value for Match score .	Pass

6.3.1.4 Pixel Counter tool



The **Pixel Counter** tool counts the pixels in a specified intensity range within the tool's region of interest.



NOTE

If the object position varies between the acquired images, this tool must be linked to an **Object Locator** tool. Tools which are linked to an **Object Locator** tool are repositioned according to the position of the located object. Drag and drop the tool onto an added **Object Locator** tool to link them.

Settings

Setting	Description
Intensity	Only include pixels that have an intensity value within the specified range.

Regions

This tool operates within its region of interest (ROI), which is set in the **Regions** section in the tool pane. For more information about how to set the ROI, see ["Setting the region of interest for a tool"](#), page 17.

Results

Result	Description	Variable name
Coverage	The percentage of found pixels in relation to the total number of pixels within the region of interest.	Coverage
Tool result	Total result, based on the set threshold values for Coverage .	Pass

6.3.2 Results tools

The **Results** category contains tools for result processing and output handling.

6.3.2.1 Expression Parser tool



The **Expression Parser** tool is used for creating an expression, based on mathematical and logical operations. The expression is evaluated and the result value is updated for each new image. The data type of the result value is evaluated each time the expression is changed.

The **Expression Parser** tool result can be used by other tools:

- If the expression returns a boolean value, the **Digital Output** tool can use the result value for setting the signal levels of the digital outputs. A true value corresponds to signal level HIGH, and a false value corresponds to signal level LOW.
- The **Send String** tool can send the result value as a string to external devices.

Settings

Setting	Description
Expression	Create an expression by inserting any combination of the following elements: <ul style="list-style-type: none"> • Mathematical operators • Logical operators • Mathematical functions • Constants • General variables related to the image acquisition and the tool output See the "References" section for a list of available elements.
Output Type	The data type for the expression output. The data type is updated each time the expression is changed.

Results

Result	Description
Value	The result value, based on the expression created in the Settings section. The result value is updated for each new image. The result value may be a string, boolean or real number. The data type is evaluated each time the expression is changed.

Examples

Insert a tool result in an expression

Use the following syntax to insert a tool result in an expression:

```
result("<tool name>", "<result name>")
```

The name of each tool instance is displayed in the tool tree. Use a colon operator between the tool name and the number. For example, "PixelCounter1" is referred to as "PixelCounter:1".

Create an expression that is true if the Blob Counter tool finds more than two blobs

Expression:

```
result("BlobCounter:0", "NumBlobs") >= 2
```

Result value/Result type:

true/boolean

Check that the average coverage of two Pixel Counter tools is greater than 50%

Expression:

```
((result("PixelCounter:0", "Coverage") + result("PixelCounter:1", "Coverage"))/2) > 50.0
```

Result value/Result type:

false/boolean

Get the maximum value from two PixelCounter tools

Expression:

```
max(result("PixelCounter:0", "Coverage"), result("PixelCounter:1", "Coverage"))
```

Result value/Result type:

0.78/number

Check if the number of found blobs is even (dividable by two)

Expression:

```
fmod(result("BlobCounter:0", "NumBlobs"), 2) == 0
```

Result value/Result type:

true/boolean

Reference

The **Expression Parser** tool supports a set of operators and functions for result handling. See the tables below for details.

Table 5: Mathematical operators

Operator	Result type	Description
^	NUM	Exponentiation
/	NUM	Division
*	NUM	Multiplication
+	NUM	Addition
-	NUM	Subtraction

Table 6: Logical operators

Operator	Result type	Description
>	BOOL	Larger than

Operator	Result type	Description
>=	BOOL	Larger than or equal to
<	BOOL	Smaller than
<=	BOOL	Smaller than or equal to
==	BOOL	Equal to
!=	BOOL	Not equal to
and	BOOL	Logical and
or	BOOL	Logical or
not	BOOL	Logical not of a boolean x
true	BOOL	
false	BOOL	

Table 7: Mathematical functions

Function	Result type	Description
abs (x)	NUM	Returns the absolute value of x
acos (x)	NUM	Returns the arccosine of x in radians.
asin (x)	NUM	Returns the arcsine of x in radians.
atan (x)	NUM	Returns the arctangent of x in radians.
atan2 (x, y)	NUM	Returns the arctangent of y/x (in radians), but uses the signs of both parameters to find the quadrant of the result.
ceil (x)	NUM	Rounds x up to the nearest integer.
cos (x)	NUM	Returns the cosine of x in radians.
cosh (x)	NUM	Returns the hyperbolic cosine of x in radians.
deg (x)	NUM	Converts radians to degrees.
exp (x)	NUM	Returns e to the power of x (e ^x).
floor (x)	NUM	Rounds x down to the nearest integer.
fmod (x, y)	NUM	Returns x modulo y.
log (x)	NUM	Returns the natural logarithm of x.
log10 (x)	NUM	Returns the logarithm of x (base 10).
max (a, b)	NUM	Returns the maximum value of a and b.
min (a, b)	NUM	Returns the minimum value of a and b.
pow (x, y)	NUM	Returns x to the power of y (x ^y).
rad (x)	NUM	Converts degrees to radians.
sin (x)	NUM	Returns the sine of x in radians.
sinh (x)	NUM	Returns the hyperbolic sine of x in radians.
sqrt (x)	NUM	Returns the square root of x.
tan (x)	NUM	Returns the tangent of x in radians.
tanh (x)	NUM	Returns the hyperbolic tangent of x in radians.

Table 8: Mathematical constants

Constant	Result type	Description
pi	NUM	Returns the value of pi.

Table 9: General variables

Variable	Result type	Description
ImageNumber	NUM	Returns the image number for the currently acquired image.
OverallResult	BOOL	Returns the overall result, based on the tool results for the applied Analysis tools.

6.3.2.2 Result String tool

“ ” The **Result String** tool is used for creating a text string, based on the available tool results. The created string can be used by the communication tools that support sending strings to external devices.

Settings

Setting	Description
String Formatter	<p>Create an output string by inserting any combination of the following options into the String Formatter:</p> <ul style="list-style-type: none"> • Tool result: Select an option from the Results list and click Add. The result is inserted at the end of the current string. • Static text: Write the text directly in the String Formatter. • Line break: Type <code>\n</code>. <p>The resulting output string is displayed as the Output string in the Results section.</p>
Number of decimals	Select the number of decimals to display in the output string for results of number type.
Boolean representation	Select how to format boolean values in the output string.

The **Select Result** list contains the available results for the current job. See the tool help pages for descriptions of the tool results and corresponding variable names.

Result

Result	Description
Output string	The output string, based on the text string created in the String Formatter in the Settings section. The Output string is updated for each new image.

Examples

Examples of formatted strings and the corresponding output strings are shown below.

Format a test string

String Formatter:

```
Hello World
```

Corresponding output string:

```
Hello World
```

Format a test string with a line break

String Formatter:

```
Hello \nWorld
```

Corresponding output string:

```
Hello
```


World

Format a string which includes the image number

String Formatter:

```
Image number: \n\ImageNumber()
```

Corresponding output string:

```
Image number:
```

```
83
```

Format a string which includes the number of blobs from the BlobCounter0 tool

String Formatter:

```
Number of blobs: \n\result("BlobCounter:0", "NumBlobs")
```

Corresponding output string:

```
Number of blobs:
```

```
4.00
```

Format a string which includes the result and the coverage for the PixelCounter0 tool

String Formatter:

```
{\result("PixelCounter:0", "Pass");\result("PixelCounter:0", "Coverage")}
```

Corresponding output string:

```
{false;82.12}
```

Format a string which includes a result that does not exist

String Formatter:

```
\result("BlobCounter:0", "InvalidResultName")
```

Corresponding output string:

```
{Error: Tool BlobCounter:0 has no result named InvalidResultName}
```

Format a string which includes a tool that does not exist

String Formatter:

```
\result("InvalidTool:0", "Result")
```

Corresponding output string:

```
{Error: Tool InvalidTool:0 is not found}
```

6.3.3 Communication tools

The **Communication** category contains tools for sending results to external devices.

6.3.3.1 Digital Output tool



The **Digital Output** tool sends tool results to the device's digital outputs. When a **Digital Output** tool has been added to the tool tree, click it to view a list of available ports and edit the associated settings. To configure additional ports as outputs, use the **I/O Configuration** tool on the **System** page.



NOTE

The digital outputs are only active in **Run** mode.

**NOTE**

An **I/O Configuration** tool instance must be added before the **Digital Output** tool can be used. The ports that are set as **OUT/Digital Output** by the **I/O Configuration** tool are available in the **Digital Output** tool.

Settings

The following settings are available for each digital output port:

Setting	Description
Enabled	Activate the port for output signals.
Result	Select a result which will give output signal HIGH. The Result list contains the following options: <ul style="list-style-type: none"> • All Passed: A Pass result for all Analysis tool instances gives output signal HIGH. • All Expression Parser tool instances where the output is a boolean value: A True result for the selected tool instance gives output signal HIGH. • All Analysis tool instances: A Pass result for the selected tool instance gives output signal HIGH.

The **State** indicator displays the current status based on the **Result**. For example: If **Result** is set to **All Passed** and all tool results are **Pass**, the **State** indicator turns green.

6.3.3.2 EtherNet/IP tool



The **EtherNet/IP** tool sends a byte stream assembly to a listening PLC using the EtherNet/IP™ standard, see www.odva.org. The assembly type-structure is predefined but the content of each position is editable.

The **EtherNet/IP** tool requires that EtherNet/IP is enabled. To enable EtherNet/IP:

1. Go to **Configure** mode.
2. Click **System** in the upper left part of the user interface.
3. In the **Fieldbus** section, select **EtherNet/IP**.
4. Click **Apply and reboot** to restart the device and apply the updated settings. If **Apply and Reboot** is inactive, it means that EtherNet/IP is already enabled.

Settings

The **Settings** section displays the assembly configuration to send to the PLC. The order and length of the assembly cannot be changed by the user. The assembly configuration consists of the following data types:

Number of positions	Data type	Size	Range
12	SINT	1 byte	[-128, 127]
12	INT	2 bytes	[-32768, 32767]
11	DINT	4 bytes	[-2 ³¹ , 2 ³¹ -1]
12	REAL	4 bytes	Represented as IEEE 754 binary32 format

For each position in the assembly, select one of the following list options:

- Select **Empty** to set the value to zero (default option).
- Select a tool result. The results list includes all available results that are numbers or booleans.

If a float number is inserted into an integer position, the number is rounded down before sending it to the PLC. Boolean values are represented as integers, where 1 = true, 0 = false.

An EDS file for the InspectorP6xx is available from the "Fieldbus kit for InspectorP6XX" page in the SICK Support Portal, supportportal.sick.com.



NOTICE

When inserting tool results into the assembly, make sure that the results are assigned the correct data type. If a result value is outside the available range for the assigned data type, no data is sent to the PLC.



NOTE

For Rockwell PLCs with Logix software: When copying data from an input assembly to a created UDT, copy the data from the third byte where the SINT array starts. According to the Logix alignment rule, arrays begin and end on 32-bit word boundaries. The InspectorPxx assembly has two reserved bytes first in the assembly. If copying from the first byte, the two first SINTs are used as padding.

6.3.3.3 Send String tool



The **Send String** tool sends text strings from a **Result String** or **Expression Parser** tool to an external device. When the system is in **Run** mode, a text string is sent to the external device for each new image.

Settings

Setting	Description
Interface tool ID	The ID of the interface tool that connects to the external device. All TCP Client and TCP Server tool instances in the System tool tree can be used. The tool ID is the name of the tool instance with a colon between the tool name and the instance number. Example: If a tool instance is named "TCPServer0" in the tool tree, the corresponding tool ID is <code>TCPServer:0</code>
Result tool instance	The tool instance that creates the text string to send as output. All Result String and Expression Parser tool instances are available as options.

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