Baumer

Technical Documentation

VeriSens® ID / CS / XF / XC Series

Contents

1 Welcome

Welcome to *VeriSens*® Help

Please read these operating instructions carefully and observe the safety instructions!

Target group:

These operating instructions are intended for users that want to perform sensor tasks with the *VeriSens*® Vision Sensor.

2 Imprint

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3 Safety instructions

Explanations of safety instructions

NOTE

Gives helpful notes on operation or other general recommendations.

ATTENTION!

Indicates a possibly dangerous situation. If the situation is not avoided, slight or minor injury could result or the device may be damaged.

WARNING!

Indicates an immediate imminent danger. If the danger is not avoided, the consequences are death or very serious injury.

General safety instructions for the *VeriSens*® Vision Sensor

NOTE

There is a scratch-resistant foil on the glass cover of the tube in the *VeriSens*® XC series. Remove the foil before you start any jobs.

NOTE

For optimum electrical noise immunity, the use of shielded cables is recommended. The appropriate cables can be obtained from Baumer.

NOTE

Network problems can be caused by a variety of issues, such as power saving modes on portable computers, faults with cables or other components, or incorrect settings on the PC. In case of problems, contact a technician who can test the computer to find the source of the network error.

NOTE

Printable ASCII symbols are supported for job, feature and data names in accordance with ISO/IEC 8859-1.
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ATTENTION!

Connection, installation and commissioning may only be carried out by specialized personnel.
Protect optical areas from moisture and dirt.

ATTENTION!

Protection class only valid if **all** plugs / connectors are connected according to this technical documentation!

ATTENTION

The device may become warm during operation. High temperatures may damage the device. Make sure that, at ambient temperatures around 50°C, (+122°F) the housing is assembled so that the generated heat is dissipated**!**

ATTENTION

Strong radiation or electrical fields can damage the VeriSens®. Never put the device in areas affected by strong radiation or strong electrical fields. These can be created by, for example, close proximity to lasers.

WARNING!

VeriSens® emits bright, pulsed light (Risk goup 1, low risk, EN 62471:2008).
Bright, pulsed light can cause damage to the eyes and seizures.
Never look directly into the pulsed light from the LEDs!

For VeriSens© with infrared illumination

NOTE

VeriSens® uses LED illumination of the risk group RG 0 (exempt group, no risk) as per IEC/EN 62471.

The radiation of the LEDs does not pose a hazard to the human eye if the *VeriSens*® is used for its intended purpose.

Even so, do not look directly into the light source – there is a danger of dazzle and irritation. Install the *VeriSens*® so that it is not possible to look directly into the light source.

4 Correct Use

The *VeriSens*® Vision Sensors in combination with the *Application Suite* software are used to monitor and verify:

- Completeness (*VeriSens*® CS-100 / XF-100 / XF-200 / XC-100 / XC-200)
- Presence (*VeriSens*® CS-100 / XF-100 / XF-200 / XC-100 / XC-200)
- Location (*VeriSens*® CS-100 / XF-100 / XF-200 / XC-100 / XC-200)
- Correct position (*VeriSens*® CS-100 / XF-100 / XF-200 / XC-100 / XC-200)
- Bar code and matrix code (*VeriSens*® ID-100 / ID-110 / XF-200 / XC-200)
- Numbers and characters (*VeriSens*® ID-110 / XF-200 / XC-200)

In objects carried past on conveyor belts, for example.

ATTENTION!

Only use the *VeriSens*® Vision Sensor for its intended purpose! Any use that is not described in the technical documentation shall invalidate the guarantee!

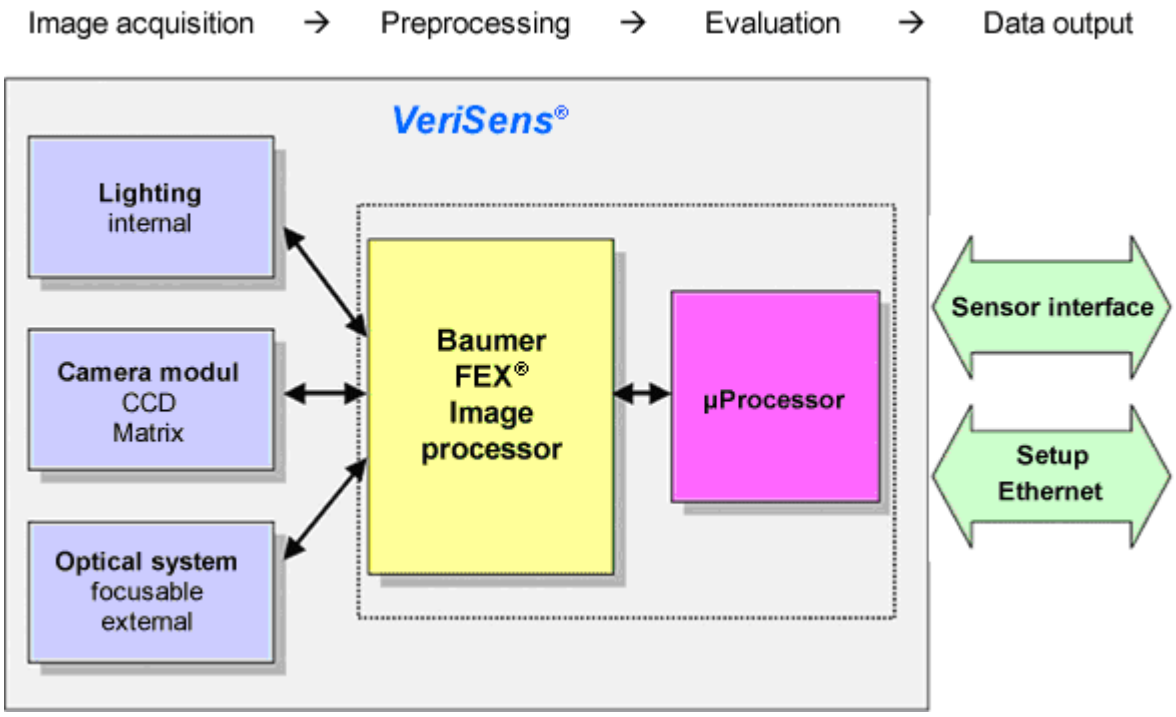
The latest information on the Baumer *VeriSens*® and links to other Baumer products are to be found at http://www.baumer.com/verisens.

5 Mode of operation

In contrast with conventional photoelectric sensors, the VeriSens® operates with digital images and is capable of conducting several sensor tasks with parameters set by the software.

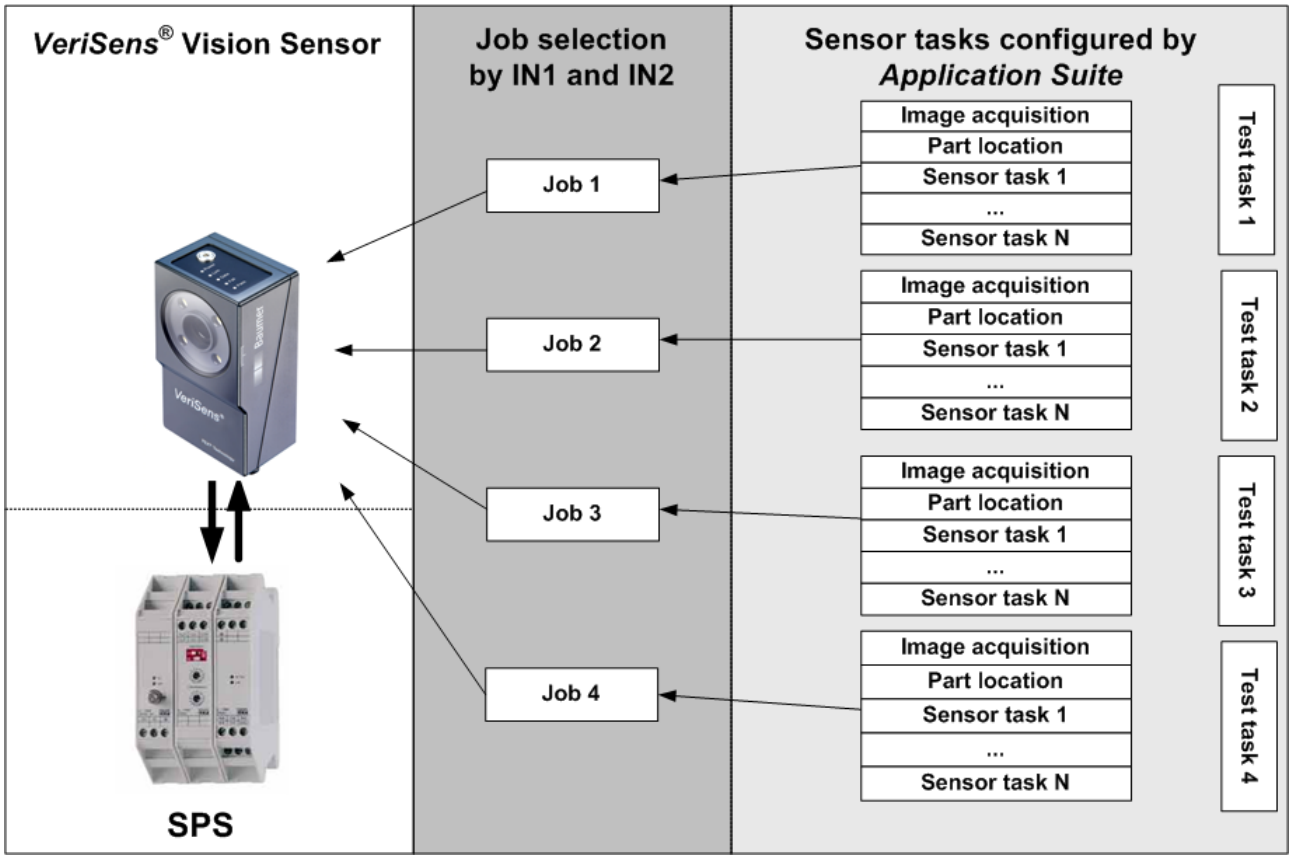
VeriSens®, *strength* lies in the detection of contours. With the procedure, differences in brightness can be optimally tolerated, as contours are usually independent of the absolute brightness (e.g. variations in illumination).
Because a workpiece can normally always be described by its relevant contours, this provides powerful tools to control the presence, position and completeness of parts. The high quality of the method ensures that a reliable result is always achieved even with a rapid sequence of objects.

The diagram shows the schematic mode of operation with the corresponding parts of the sensor.



Here, each *job* is divided into several *sensor tasks*. Each sensor task executes one task and returns an associated pass/fail result or the associated measured values. For this purpose, a working area must be defined that is either circular, an arc, rectangular or polygonal. The contours can be given via search arrows for geometrical sensor tasks.

Then you can link the results from the sensor tasks into one result and output it via a digital interface.
With *VeriSens*® the stored jobs can be selected via external switching inputs.



The VeriSens® operates in two operating modes:

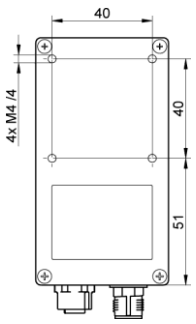
- *Activated*
- *Parameter settings*

In *activated* mode, the actual job is conducted. *VeriSens*® operates autonomously in this mode and can communicate directly with a PLC. *VeriSens*® receives all commands such as trigger or job number from the external control system and mainly returns a pass or fail result. In *activated* mode you can also use the *Application Suite* to monitor your test assignments.

In the *Configuration* mode you can configure and set the parameters for the jobs and features to be checked. This is conducted using the *Application Suite*.
Because a high-quality digital image provides many means of visual inspection, the parameters of the jobs have to be set according to the test assignment and the application. For this purpose, the *Application Suite* provides a pre-configured input mask for each feature to be checked, which supports the determination of the optimum settings.

6 Installation and Commissioning

6.1 Mechanical installation



You can operate *VeriSens*® in any position.

Fasten the *VeriSens*® to the M4 screws provided for this purpose.

Align the *VeriSens*® so that the image center indicated below points directly at the object to be inspected.

The *VeriSens*® should be installed so that it vibrates as little as possible during operation to avoid negative influences on the image quality (blurred images).

Install the *VeriSens*® so that there are no obstacles between the sensor and the object that could block the view or cause reflections.

The *VeriSens*® can inspect fixed areas at fixed distances. For this purpose, there are two variants with different focal distances of the optical systems (f = 10 mm and f = 16 mm).

NOTE

The field of view for the XC-100 / XC-200 depends on the lens used.

The tables below contain the maximum fields of view:

Lens	f = 10 mm
Object distance	Max. inspection area
50 mm	26 mm x 17 mm
100 mm	50 mm x 32 mm
200 mm	98 mm x 62 mm
300 mm	145 mm x 93 mm

Lens	f = 16 mm
Object distance	Max. inspection area
70 mm	18 mm x 11 mm
100 mm	26 mm x 17 mm
200 mm	55 mm x 35 mm
300 mm	84 mm x 54 mm

6.2 Electrical installation

For commissioning, you will require:

- A *VeriSens*® vision sensor,
- Installation CD for the *Application Suite,*
- A M12-connecting cable (not supplied)
- An Ethernet cable (not supplied)
- A normal PC with Ethernet interface (not supplied).

NOTE

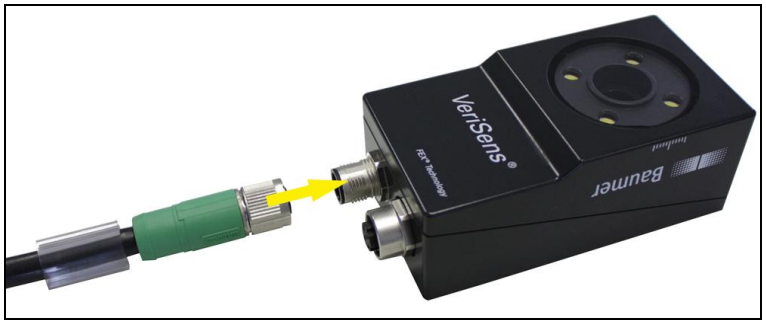
For optimum electrical noise immunity, the use of shielded cables is recommended. The appropriate cables can be obtained from Baumer.

ATTENTION!

When connecting the power cable, ensure that all conductors are correctly connected according to their color codes.

You will find the voltages necessary, the pin assignment and the corresponding electrical power under Technical Data.

Screw the 12-pin power cable with M12 plug onto the power supply connection on the *VeriSens*®.

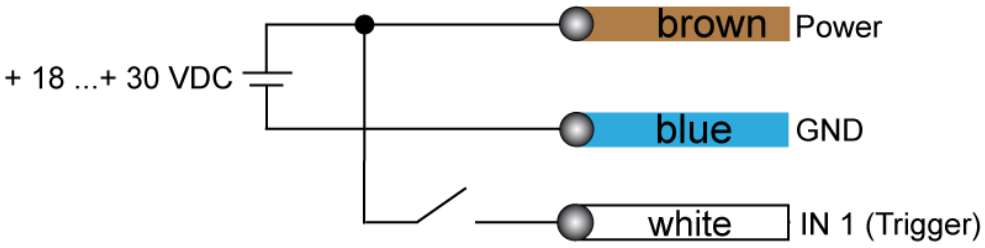


NOTE

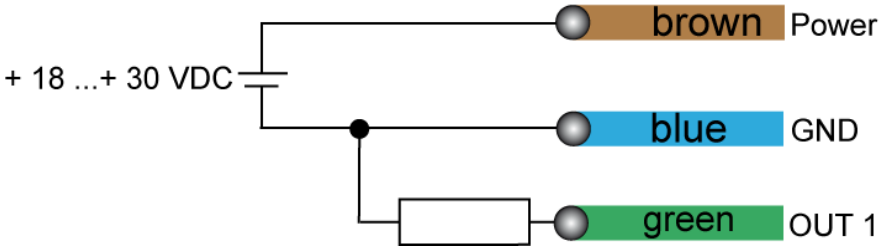
After installing the software, you can check the correct assignment of the digital connections in the menu: *Device → Digital I/Os assistant*.

6.3 Wiring

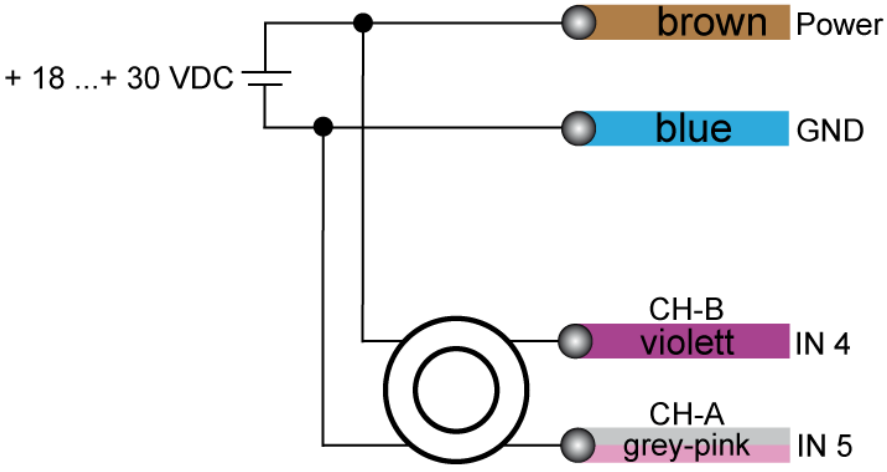
Input



Output



Encoder



6.3.1 Notes on using an encoder

You have two options for operating *VeriSens*® Vision Sensors with an encoder:

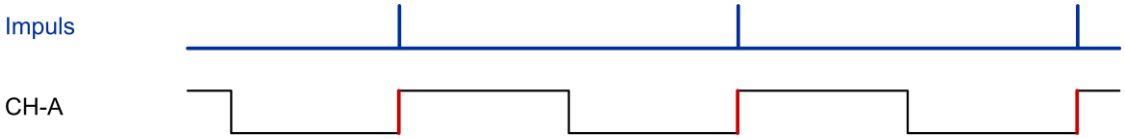
NOTE

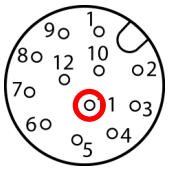
After installation, the inputs must be defined in the software using:

Device → Device settings → Digital I/O / Inputs

- **1-channel operation (CH-A)**
  In this mode, every **rising edge** of the signal corresponds to one pulse for the timing control of the device.
  It is not possible to detect the travel direction of the belt.

  The maximum frequency of 500 kHz should not be exceeded for reliable operation.



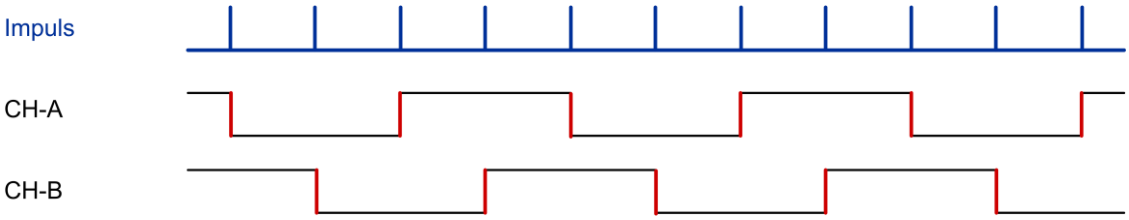


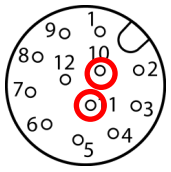
Pin assignment of the power cable

Connect the encoder CH-A to pin 11 (IN 5; gray-pink).

- **2-channel operation (CH-A and CH-B)**
  In this mode, every **rising and falling edge** of the signals corresponds to one pulse for the timing control of the device. The signals must alternate for the CH-A and CH-B channels.
  It is possible to detect the travel direction of the belt.

  The maximum frequency of 500 kHz/channel should not be exceeded for reliable operation.





Pin assignment of the power cable

Connect the encoder CH-A to pin 11 (IN 5; gray-pink).

Connect the encoder CH-B to pin 10 (IN 4; violet).

6.4 Installing the software

The following is a list of system requirements necessary for a proper operation of the *Application Suite*:

- **Operating system:** Microsoft Windows XP SP2, Microsoft Windows Vista (32 bit / 64 bit), Microsoft Windows 7 (32 bit / 64 bit), Win 8 (32 bit / 64 bit)
- **Processor:** Min. 500 MHz, 2 GHz recommended
- **Memory:** Min. 512 MB RAM, > 1 GB recommended
- **Hard drive:** Min. A minimum of about 150 MB of free disk space; including examples, about 400 MB
- **Display:** Resolution min. 1024 x 768 pixel, TrueColor recommended
- **Network:** Network connection for 10 Base-T / 100 Base-TX or faster

NOTE

Please observe that you require the administrator privileges for the installation of the *Application Suite* or device driver, however, you can use a version without installation.

The following browsers support the web interface:

Internet Explorer® 8/9
Firefox 3.6.28
Firefox 13

Javascript and Cookies must both be enabled.

ATTENTION!

Protection class only valid if all plugs / connectors are connected according to this technical documentation!

Connect *VeriSens*® to the Ethernet interface of your computer or connect *VeriSens*® and your computer in a common network:

1. Start the setup program from the CD and follow the installation instructions.

2. A link to the Application Suite will be made on your desktop. The *Application Suite* is launched by double clicking on this link.

3. Check the network settings to connect to *VeriSens*®.

When *VeriSens*® has been correctly connected and the software is successfully installed, the vision sensor can be commissioned using the *Application Suite.*

NOTE

You can launch the Application Suite using a command line parameter and automatically connect to a *VeriSens*® by way of the IP address.

Example: `appsuite2.exe /ip=192.168.0.250` (default IP address)

You can also use a command line parameter to launch the Application Suite in different languages.

/l=de (German)
/l=en (English)
/l=fr (French)
/l=zh (Chinese)

Example: `appsuite2.exe /ip=192.168.0.250 /l=en`
(Launch the Application Suite in English with the default IP address)

6.5 Commissioning the Ethernet interface on your computer

1. Assigning an IP address

To use *VeriSens*® in your network, you must assign a unique IP address to the device. Below is the default factory configuration:

1. If you have a DHCP server integrated into your network, the IP address is requested from this server. No additional manual actions are necessary on your part.

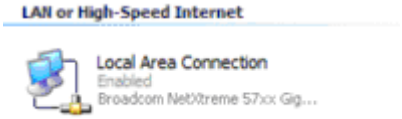
2. If a valid IP address cannot be obtained within 15 seconds, the default IP address of **192.168.0.250** (subnet mask: 255.255.255.0) is used.

NOTE

To avoid network malfunctions, ensure that each IP address is unique within your network and has not already been assigned!

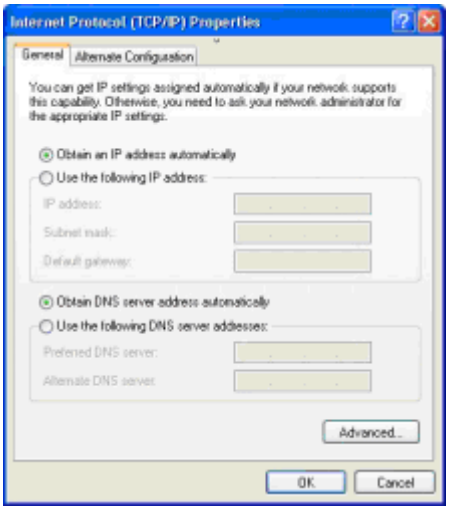
Now, link your PC into the same network as *VeriSens*®. Under certain circumstances, you may need to configure the IP address of your PC for this purpose. With Microsoft Windows XP, proceed as follows:

1) Open the "Start" menu and then move to "Settings > Control Panel > Network Connections".



2) Select your network (e.g., "Local Area Connection") and then the "Properties" entry in the context menu.

3) Select the "Internet Protocol (TCP/IP)" entry in the list of elements and then click the **Properties** button below the selection list. The following dialog box opens:



Activate the **Use the following IP address** option and select an address in the range 192.168.0.xxx that has not yet been used for the IP address. Enter 255.255.255.0 for the subnet mask and confirm these settings.

NOTE

For *VeriSens*® communication via Ethernet, the following ports are used:

- *Application Suite*: 51972 (default setting, programmable)
- Web interface: 80 (“HTTP")
- Process interface: 23 (default setting, programmable)

These ports must not be occupied by other programs or used for communication by the process interface!

Check that these ports are enabled in your firewall! You can find details on this topic in the manufacturer's documentation of your firewall.

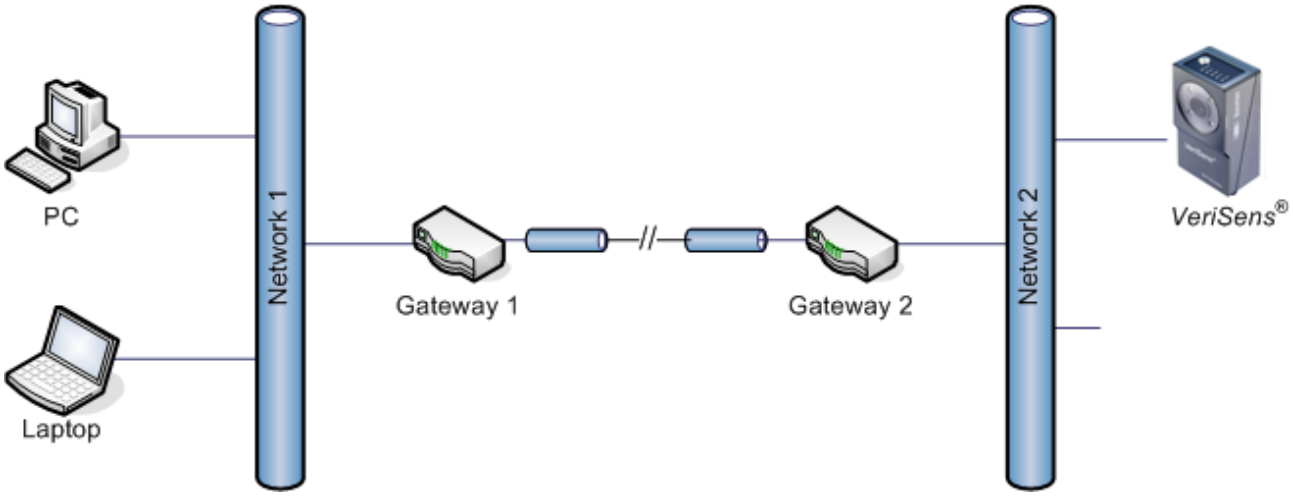
6.6 Notes on using gateways

With *VeriSens*® sensors, it is possible to establish a connection and to configure the device by way of a gateway.

NOTE

For communication across gateway boundaries, the public IP address of the *VeriSens*® must be known. Automatic detection of the device is only possible in the local network.

To establish the connection, use the options in the selection list of available devices.



To do this, set your PC and the *VeriSens*® as follows:

- **PC:** The gateway of the PC's local network (Gateway 1) must be set in the configuration of the network adapter.
- ***VeriSens*®:** The gateway of the device's local network (Gateway 2) must be set in the network configuration.

The following items must be kept in mind when an address conversion using NAT (Network Address Translation) is being used for at least one of the gateways:

- To connect the device using the *Application Suite*, you must specify the public address and port number of the **gateway** to which the *VeriSens*® is connected (Gateway 2).
- A separate port for communications must be used in the *VeriSens*® settings.
  You can find this setting under *Device → Device settings → IP address / Network*. Change the **Port** setting from *Standard* to the *desired port number*.
- Keep in mind that changes to the network settings of the device are only valid in the local network. If necessary, make sure that the NAT settings of the gateway are also configured to make communication possible.

6.7 Important network terms

ActiveX

Software technology from Microsoft to extend programs with additional functions

DHCP – *(Dynamic Host Configuration Protocol)*

Protocol for automatic assignment of the ➡ *IP addresses*

Ethernet

Wired data network technology for local data networks

Firewall

Software that checks and prevents access via the network

HTML – *(Hypertext Markup Language)*

Document language describing the formatting of text and graphics

IP address

"Mailing address" of a device in a network
Assignment of a ➡ *MAC address* to a specific network

JavaScript

Programming language for websites allowing, among other features, dynamic actions within websites

MAC address – *(Media Access Control)*

6-byte address, hardware identification number for network devices unique throughout the world

Ping

Program for determining whether a computer is available in a network

Port

(Additional) address of data packets in a network
Describes the Internet services used, e.g., 21 – FTP, 25 – e-mail, 80 – websites (HTTP)

TCP – *(Transmission Control Protocol)*

Reliable protocol for data transfer
All data packets are transferred in the proper sequence

UDP – *(User Datagram Protocol)*

Faster but less reliable protocol for data transfer
Under certain circumstances, data packets may be lost or received in a different sequence

6.8 LED panel

A screw and 5 LEDs are located on the Vision Sensor for displaying the various states.

Image focus setting screw: Used to set image focus.

NOTE

In the XC series, the image focus is set on the installed lens.

Power: Indicates that the Vision Sensor is being supplied with electricity.

Link: Indicates that the Vision Sensor is connected to the network.

Data: Indicates that data is being transferred.

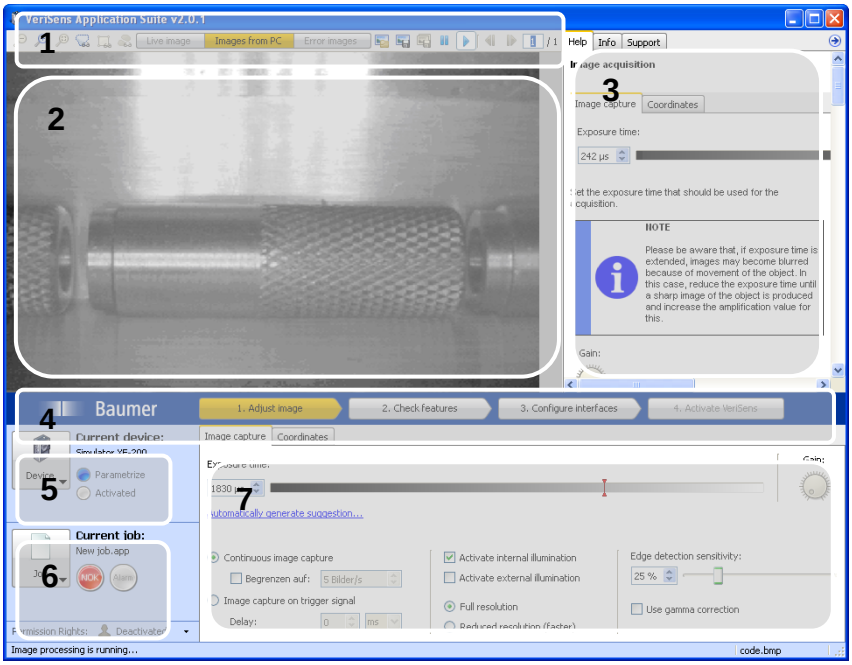
Fail: Lights up when a sensor task has been failed.

Pass Lights up when a sensor task has been passed.

7 Overview of the *Application Suite*

The *Application Suite* is the software package for commissioning, job creation, configuaration, service and maintenance of the *VeriSens*®. You can monitor the progress of the job in the *Activated* mode.

An overview of the operating modes of the *VeriSens*® is found in chapter Operating modes.



1 Image display options

2 Display screen

3 Help, info and support window

4 Job bar

5 Device menu / Operating mode display

6 Job menu / Result and user display

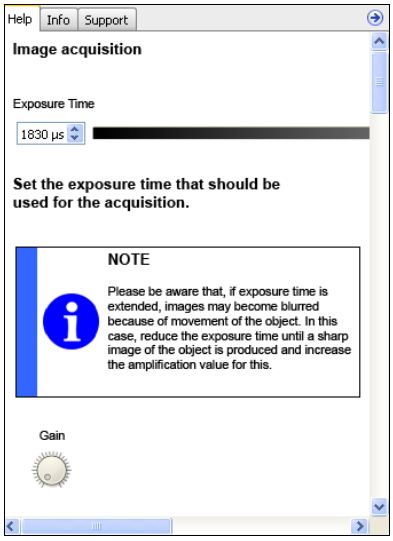
7 Parameter area

7.1 Operating modes of the *VeriSens*®

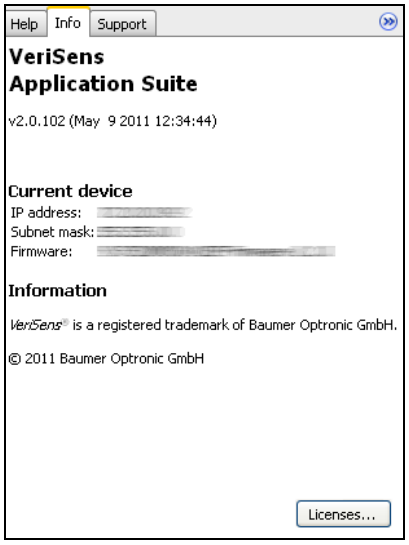
VeriSens® has two operating modes which differ mainly in the allocation of the priorities:

	Mode	Priority	Job processing	I/Os
1	***Activated***	Trigger (Image transfer only when permitted by computing time)	On *VeriSens*® Vision Sensor	Active
2	***Parameter settings***	Image transfer (trigger is ignored if necessary)	By computer	Inactive

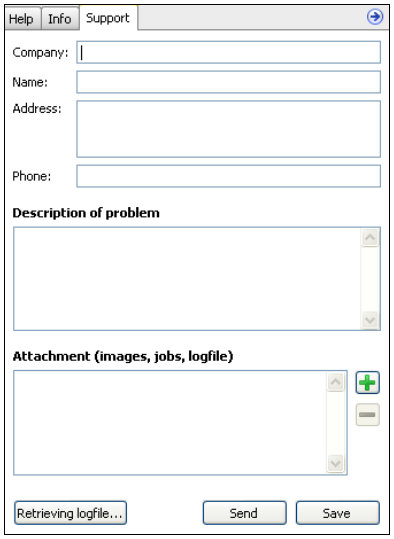
7.2 Help, info and support



Associated online help is available for each dialog on the *Help* tab.



Information on the system is shown on the *Info* tab. The illustration is an example and does not pertain to the current version!



A form for online support is available on the *Support* tab. You have the option of attaching images and jobs to your support inquiry or accessing a log file.

With this button you have the option to hide the help.

With this button, you can show the hidden Help again.

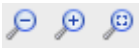
NOTE

To improve clarity, the Help window is shown lightly grayed out when the mouse pointer is not over it.

8 Image display options

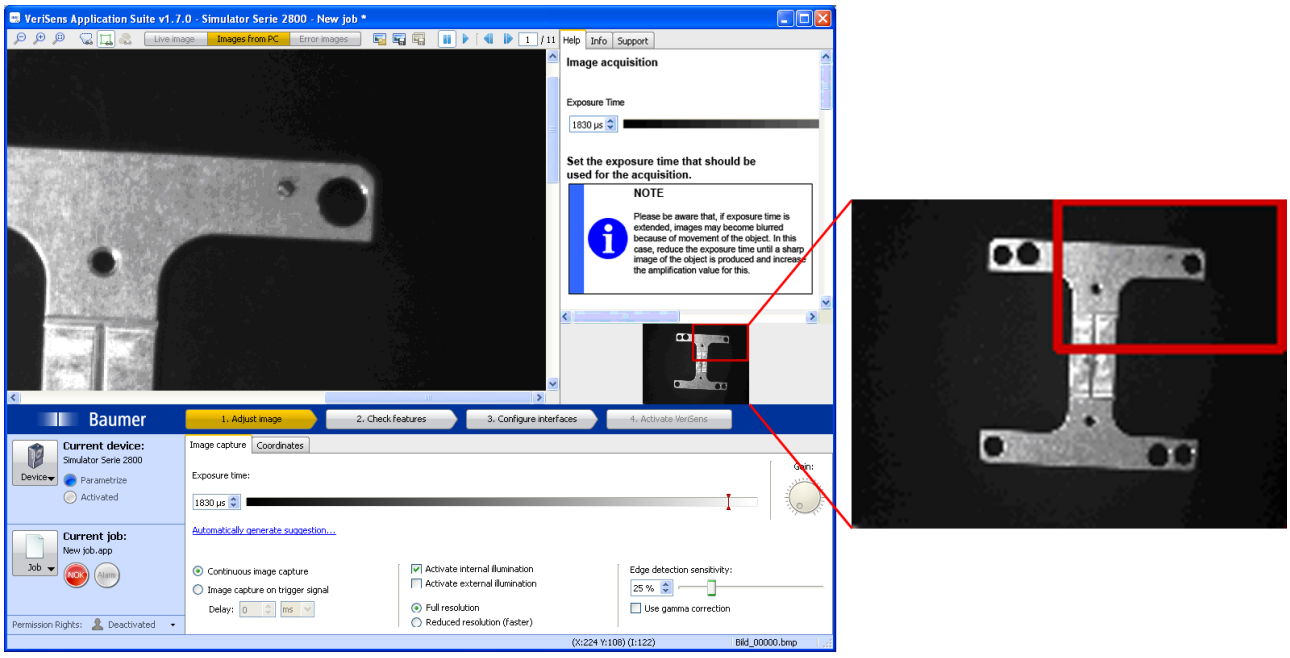
- ► Images from PC
- ► Fault images
- ► Loading, saving and recording images

The following display options are available:



You can zoom into or out of the displayed image using the magnifier and adjust the image to fit the window.

If the image has been enlarged and can no longer be seen as a whole, you can select another clip by moving the area marked in red. The overview is only displayed if the entire image is not visible.



You can switch with this Buttons:

contour points

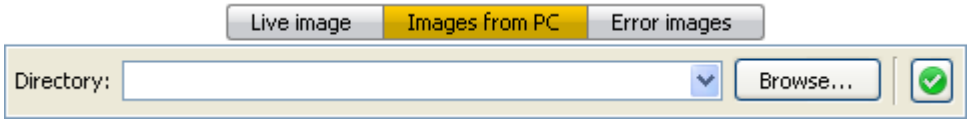
the working areas

the working areas and the model in the display.

Click on this button to display the current vision sensor image.

8.1 Images from PC

Here you can load images for evaluation that you have saved previously from your computer. Click on Images from PC.



Click on the green tick to hide the selection.

Click on *Browse* to select the directory that contains the images.

You can view the images that you have loaded here.

8.2 Error images

VeriSens® can store up to 32 fault images in *activated* mode. The last fault images to occur are stored.

Click on fault images to load the fault images.

You can see the last fault images to occur (max. 32) here.

Use this button to save the single exposure currently being displayed to your PC.

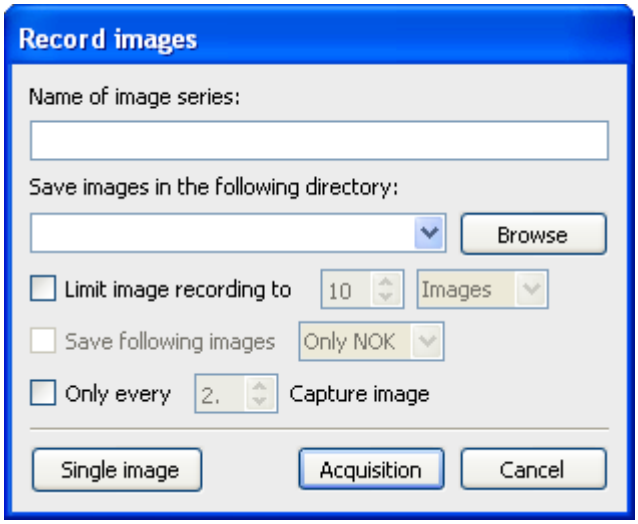
Use this button to save all fault images to your PC.

8.3 Loading, saving and recording images

Use this button to load images saved on your computer for further processing.

Use this button to save the image currently being displayed to your PC.

Use this button to record live images. The “Record images” dialog box opens after clicking.



Make the settings required for the image series in this dialog box.

Use the *Single image* button to save just one image in the selected directory. Use the *Acquisition* button to keep acquiring images until you click on *Finish* or have limited image acquisition.

8.4 Job features

The *Application Suite* helps you to create, manage and test jobs and to configure them for operation. Each test assignment is processed by *VeriSens*® in the course of a job. For each job required an image will be acquired in which you mark the features to be checked. A pass/fail result will then be determined.

The following individual steps are used to create a job:

1. **Adjust Image**: Each inspection with the *VeriSens*® is based on image data. The image quality depends on the internal camera settings, the illumination settings and lens adjustments. Here, you can set all parameters concerned with the primary image acquisition and its control.

2. **Check features**: Checking the features is the actual evaluation. Each sensor task operates in a working area, determines one or more values and compares the result with preset switching points. In a second step, you can link the results of the sensor tasks to produce a result.

Configure interfaces: This includes settings for digital outputs (output time and duration of output, among other settings) and configuration for datagrams of the process interface. You can also set which feature checks and functions can be used via the web interface.

This information is saved separately for each job, while pin assignment for the digital I/Os is set in the device settings.

9 Creating a job

Jobs are created in three main steps, using the “Job bar”. The individual parameters can be set in this bar.

9.1 Adjusting the image

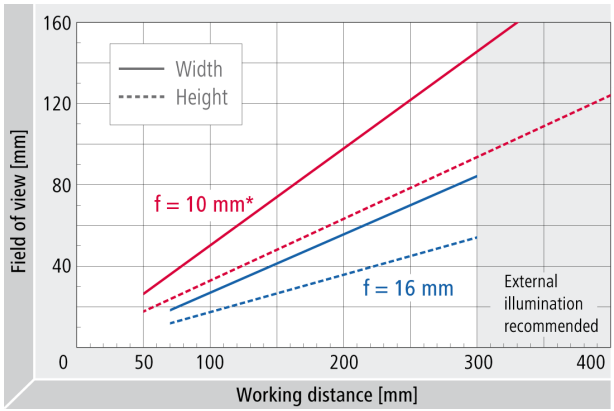
To implement reliable inspection with the *VeriSens*® vision sensor, the features to be inspected must be clearly visible.

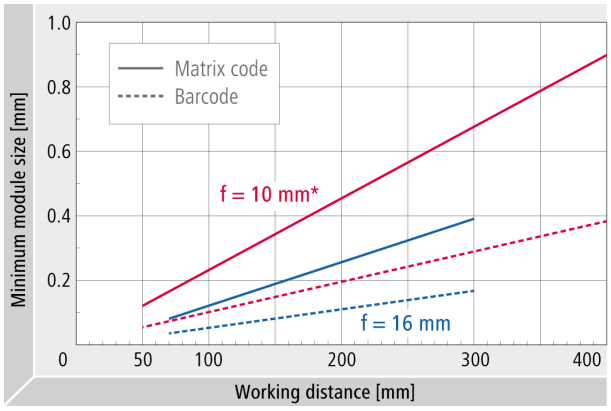
Set the image focus with an inbus key on the *VeriSens*® vision sensor installed at the testing site. The corresponding inbus screw can be found on the sensor’s LED panel.

In the XC series, the image focus is set on the installed lens.

NOTE

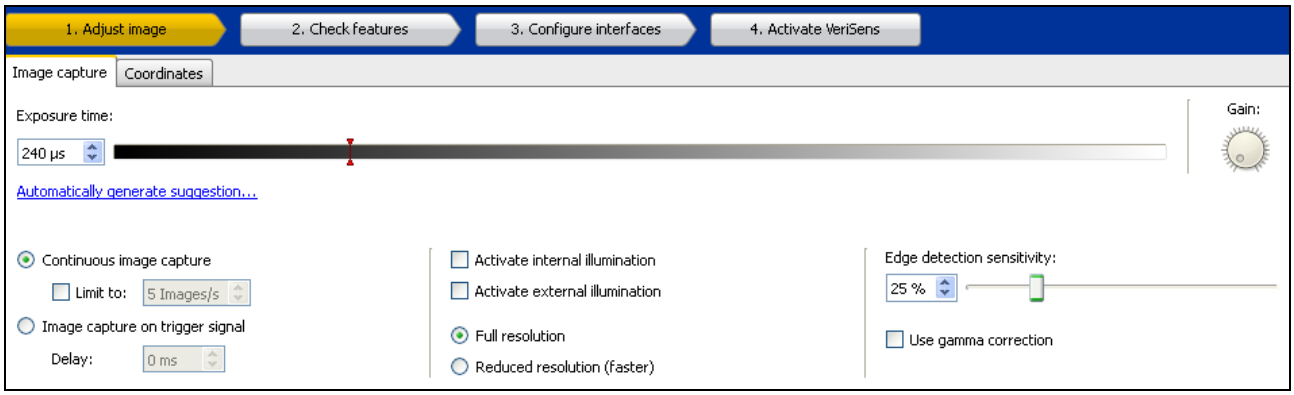
The field of view and the minimum module size for the XC-100 / XC-200 depend on the lens installed.

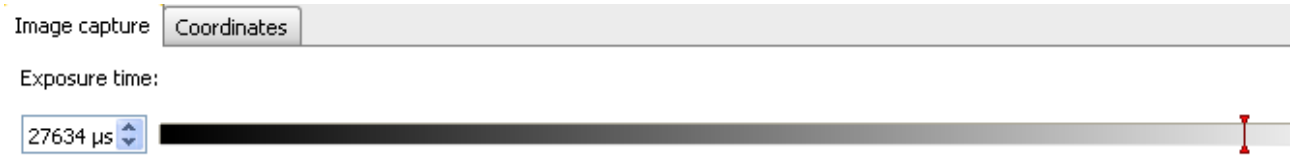




*Working distances > 400 mm possible

9.1.1 Image acquisition





Set the exposure time that should be used for the acquisition.

NOTE

Please be aware that, if exposure time is extended, images may become blurred because of movement of the object. In this case, reduce the exposure time until a sharp image of the object is produced and increase the amplification value for this.

(XC-100 / XC-200 only)

NOTE

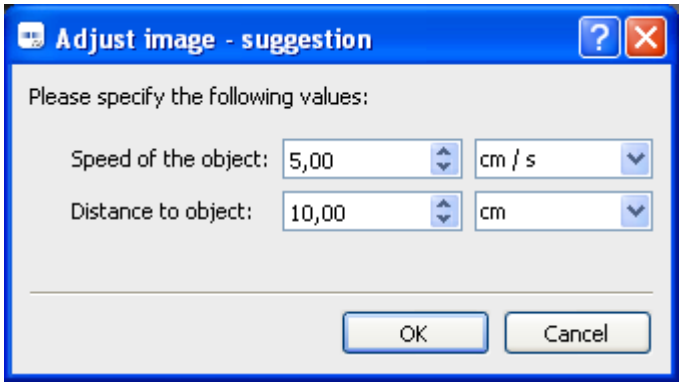
The *reduced resolution* (binning mode) setting can be used for identical exposure time, which allows for higher grey levels than with full resolution.

The image can also be brightened using the control gain.

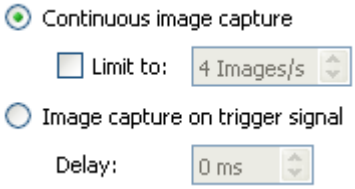
NOTE

Higher amplification values result in increased image graininess and make stable analysis more difficult. If sufficient image brightness is not achieved, use external illumination.

Click on *Generating automatic suggestion* ... to view a suggestion for illumination settings.

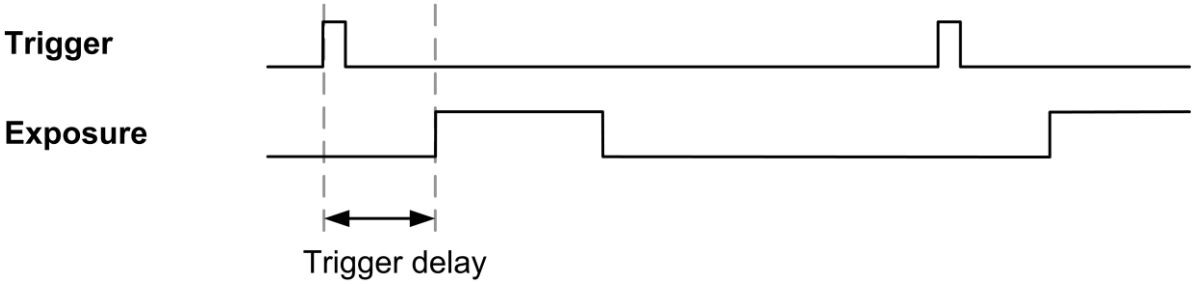


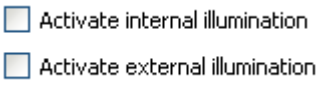
Enter the speed of the objects, and their distance from the camera, during inspection. The *Application Suite* automatically calculates the associated parameters. If the image is then still too dark or bright, you can adjust this using the brightness control.



Continuous image capture: A new image acquisition is made as soon as an image analysis is complete. You can also limit the number of images per second as a function of the exposure time.

Image capture on trigger signal: A new image is acquired upon the occurrence of a corresponding external event.
You can also specify the delay time or distance, if an encoder is connected, between the trigger signal and the actual image acquisition. Any other trigger signals received during this period are ignored!
If necessary, activate the “invalid trigger” entry (trigger during image acquisition or job switching) in Device settings, so that the alarm output is activated in such cases.

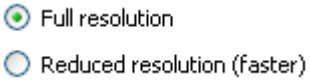




With the illumination settings, you can switch off the internal illumination and possibly activate external illumination with the *Flash sync output*. If you wish to use the external *Flash sync output*, this must be chosen accordingly in the Digital I/O menu. You can also activate both type of illumination.

(XC-100 / XC-200 only)

Click on *Configure external illumination…* to make the settings for a connected external illumination system or a flash controller.



You can choose between two *VeriSens*® resolutions.

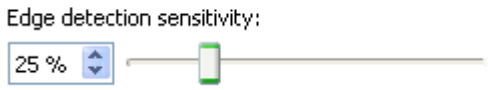
NOTE

When using the *reduced resolution* setting, 2 x 2 pixels are always grouped (binned) together. The time for image acquisition decreases correspondingly. Select the mode in which your inspection feature is clearly visible.

NOTE

Only use contour recognition sensitivity when all of the other image settings have been performed successfully.

(only CS-100 / XF-100 / XF-200)



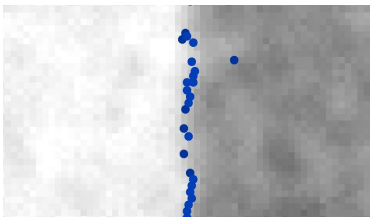
To ensure consistent evaluation, all contours must be calculated consistently. This means that the image is sharply focused and no overbiases occur.

For critical objects, it may be appropriate to adjust the sensitivity of edge detection manually. Set the Edge detection sensivity to a value where the feature to be inspected is clearly recognizable.

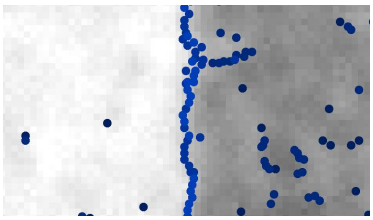
Make sure that the contours of the test object are consistently obtained and that not too many “pseudo-contours” are created.

You can make the contours visible using the following button from the image display options.

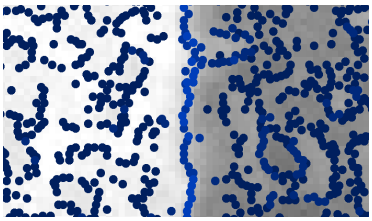
Example images of contours



Too few contours
(Edge recognition sensitivity must be reduced)



Good contours
(Optimum edge recognition sensitivity)



Too many outlines
(Edge recognition sensitivity must be increased)

NOTE

Error message: "Too much contour points! Please reduce the number of contour points “

You may avoid this error with the following corrective actions:

- Adjust the application setup:
  - For example, change the position of the object being examined so that interfering structures that create unnecessary contour points are outside the image area.
  - Cover up the interfering structures.
- Adjust the edge detection sensitivity.
- Reduce the image noise using lower amplification and correspondingly longer exposure or stronger illumination.

(only XF-100 / XF-200)

☐ Use gamma correction

Activate the function “Use gamma correction” if you wish to emphasize contours in dark areas of the image. This option may also be appropriate to reduce the effects of reflections when the image is acquired. This makes the sensitivity of the acquisition non-linear, brightening darker areas of the image and diminishing the contrast of brighter areas of the image.

NOTE

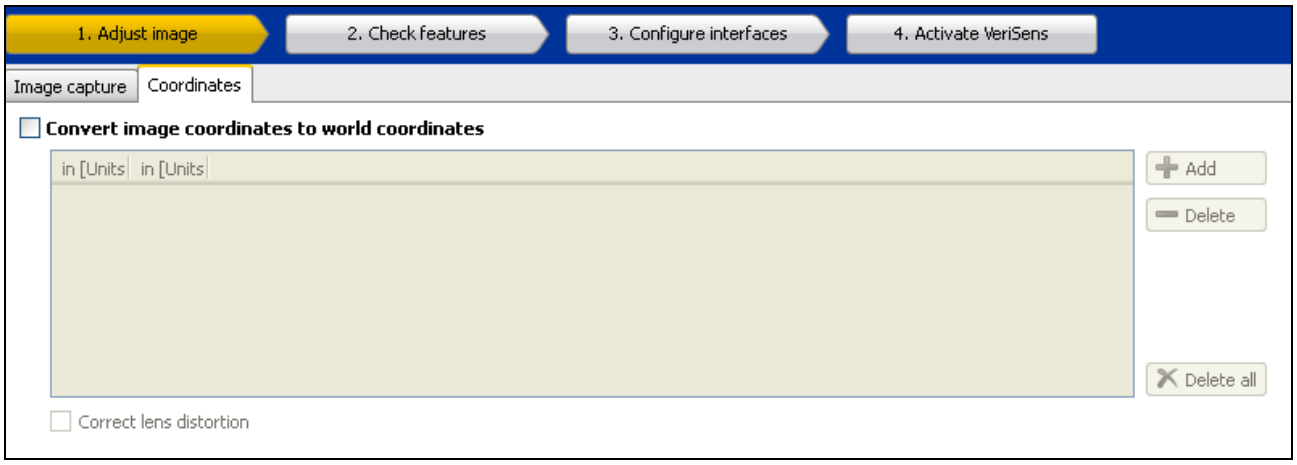
When using gamma correction, only limited use of the “reference area” function is possible in the individual sensor tasks (e.g. Brightness, ...)!

The following values can be set via the process interface.

Input value	Data type
exposure time	Number (Integer)
ampflification	Number (Integer)
sensitivity of edge detection	Number (Integer)

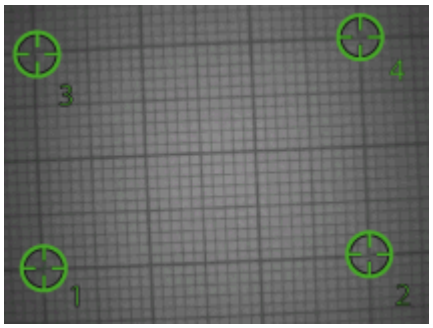
9.1.2 Coordinates (only XF-100 / XF-200)

With *VeriSens*®, it is possible to convert the internal image coordinate system into a user-defined coordinate system. To do this, it is necessary to specify the real coordinates for a few data points in the image referenced to a world coordinate system.



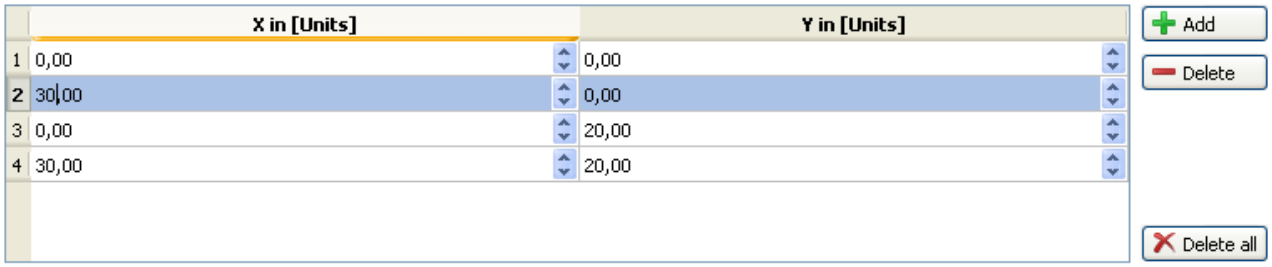
Convert image coordinates to world coordinates

If you want to convert the coordinates, activate this option.

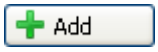


Then, you must mark at least four data points in the image. To achieve high conversion accuracy, pay attention that the points:

- are positioned in the image as precisely as possible,
- are uniformly distributed throughout the image and
- do not lie on one line.



Assign the points in the table to the corresponding real coordinates. Keep in mind that the coordinates must be specified with respect to a right-handed coordinate system.

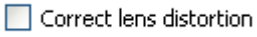


Use the *Add* button to add additional data points to increase the accuracy of the conversion.

Delete individual points using the *Delete* button.

The *Delete all* button deletes all coordinates.

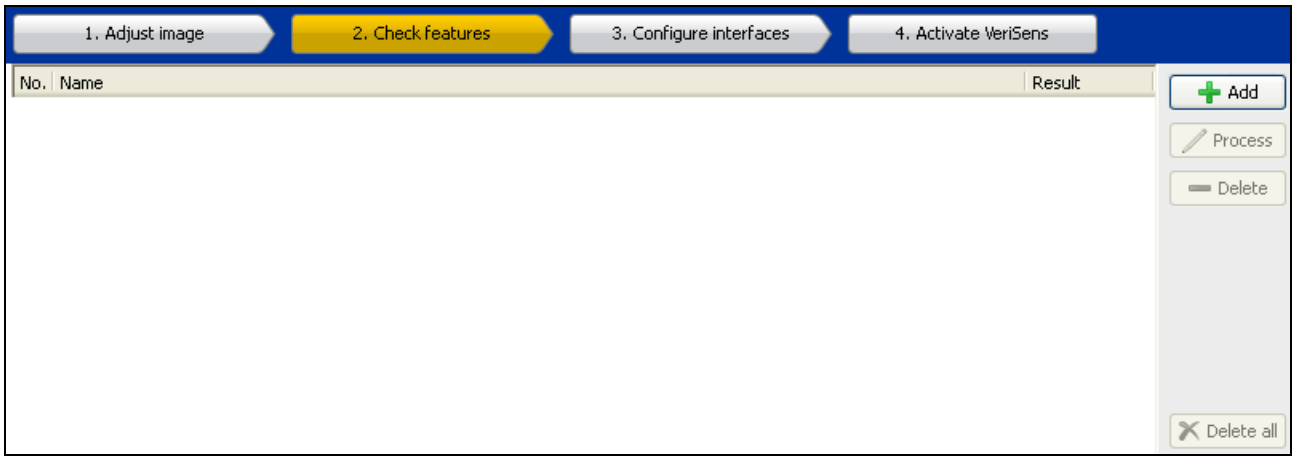
During the coordinate conversion process, the individual points are checked for validity. Points whose real coordinates deviate too greatly from the calculated position following conversion are marked in yellow or red. In this case, check all points for the correctness of position and of the coordinates. If necessary, shift the points or adjust the entered coordinates. A small line indicates the direction in which the point should be shifted.



To increase the precision of the calculated coordinates, you can also correct for the distortion of the camera lens. In this case, you will need at least eight points.

9.2 Checking features

The features to be checked are composed and their parameters set in this step.



NOTE

Please note that even the best sensor task can only calculate a satisfactory result if the associated feature is clearly visible in the image.

If necessary, check the parameters for the image exposure again to obtain an optimum image quality for your task.

NOTE

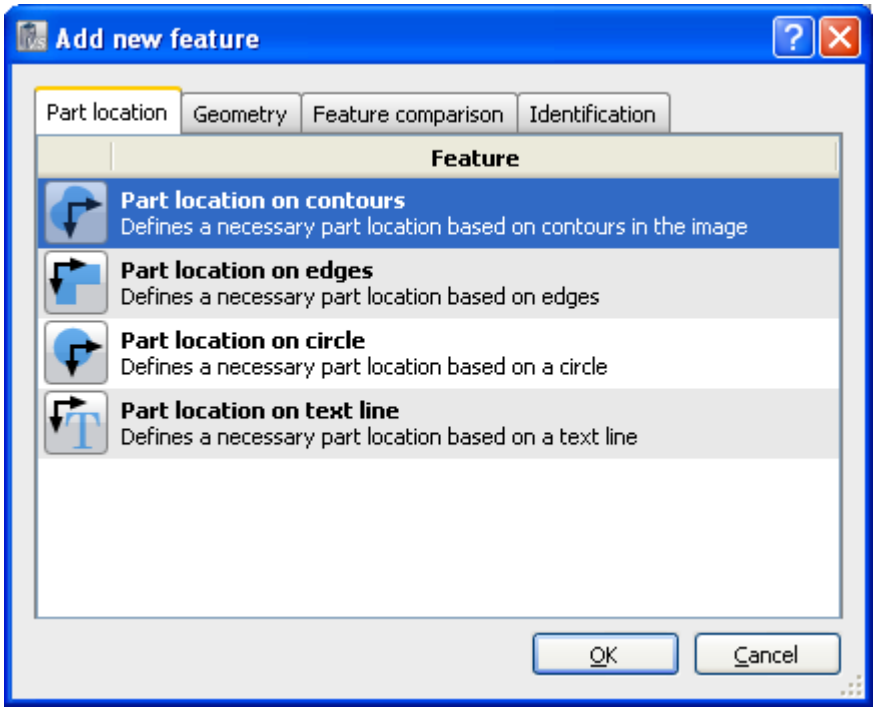
As each inspection process has tolerances with regard to the position of the test object, most jobs begin with part location. The part location searches for the reference edges of the test object and aligns all subsequent sensor tasks to these reference edges.

Add opens the dialog *New sensor task*. In this, a list of all available sensor tasks is presented. When a feature to be checked has been selected, this appears automatically in the feature list, with its current result and the associated status.

A previously selected sensor task is edited here.

Deletes a selected sensor task from the list of features.

Deletes all sensor tasks from the list of features.



Each feature is optimized for just one inspection task and supplies a Pass or Fail result. Partial results (e.g. brightness - mean brightness) can also be delivered via the process interface.

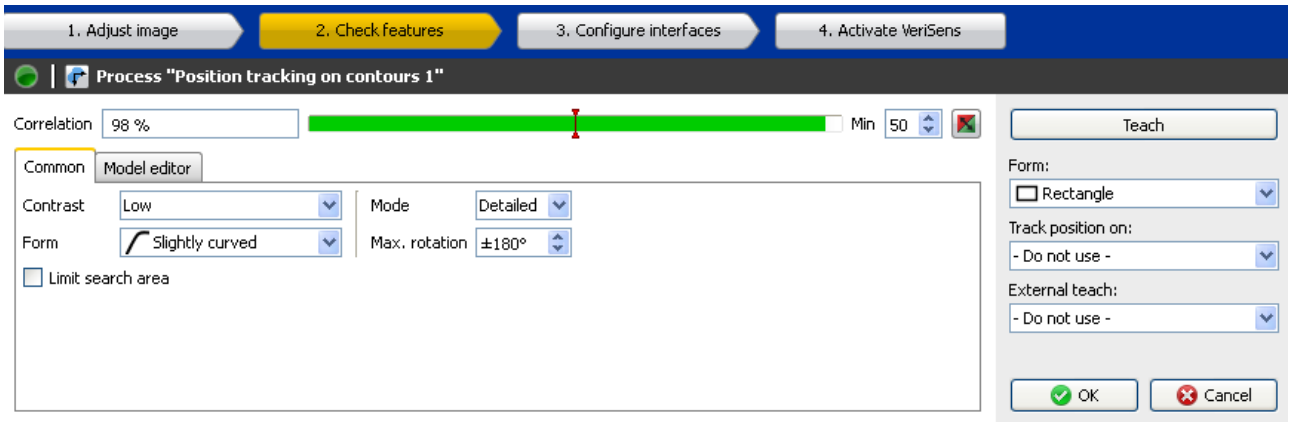
NOTE

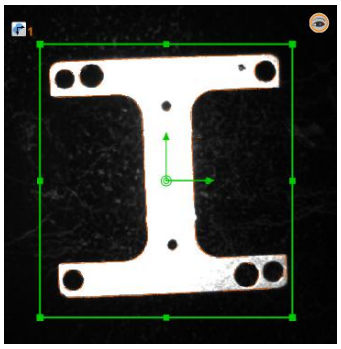
The results can be linked at a later time (XF-100 / XF-200 / XC-100 / XC-200).

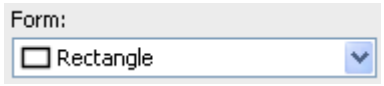
Examples: Feature comparison brightness with part location on contours:

Part location on contours:

With this sensor task, the position of an object is determined using contours.



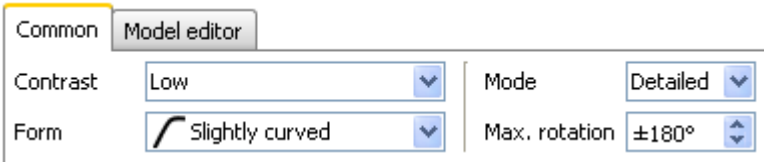




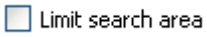
- Choose the shape of the area from which the contours are adopted.

Adopt the contours by pressing *Teach*. A search is then made for the object in the entire image.

- The match of the contours with the found object in the image is displayed here.
- Using the appropriate switching points, set how good the match must be so that the object is found. The button on the extreme right inverts the set point.

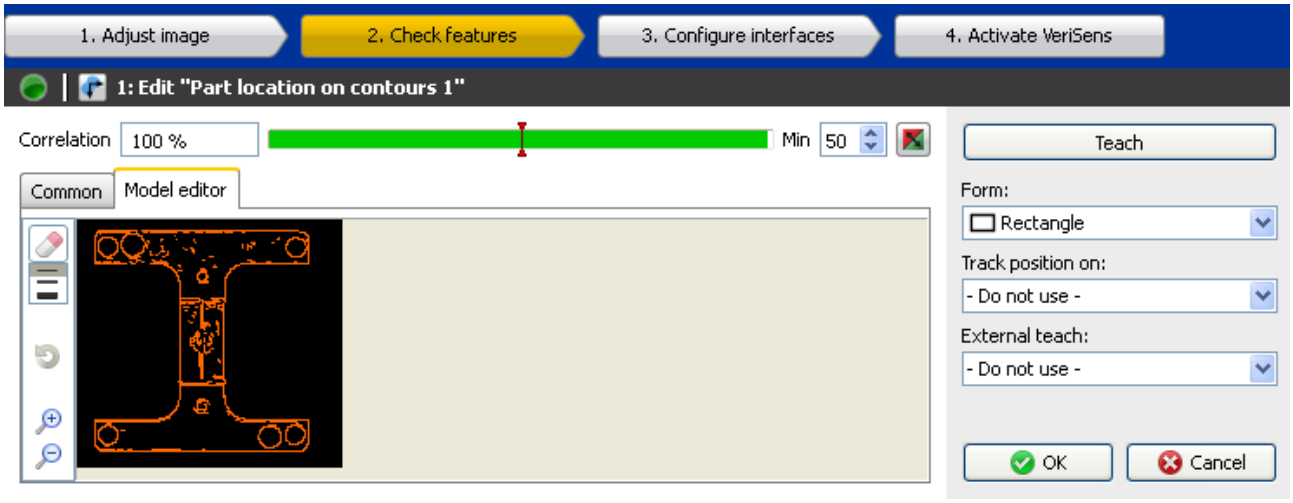


- **Contrast:** Set the minimum contrast of the contours that should be adopted in the model.
- **Form:** Select the shape of the contour that corresponds to the test object and that should be adopted in the model.
- **Mode:** Set the amount of detail to be used in the inspection. (The more detailed the mode, the higher the computation time.)
- **Max. rotation:** If you want to find the object only in a limited angular range, you may specify the maximum rotational position here. (Limiting the angular range reduces computing time.)



- If you do not wish to search for the object in the entire image, set the tick and then limit the search area.

Model editor tab



- With the displayed model, you can now use the mouse to delete contours which clearly do not belong to the reference object.

- Use this button to restore the model to its original state.

- You can use these two buttons to enlarge or reduce the model.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel*.

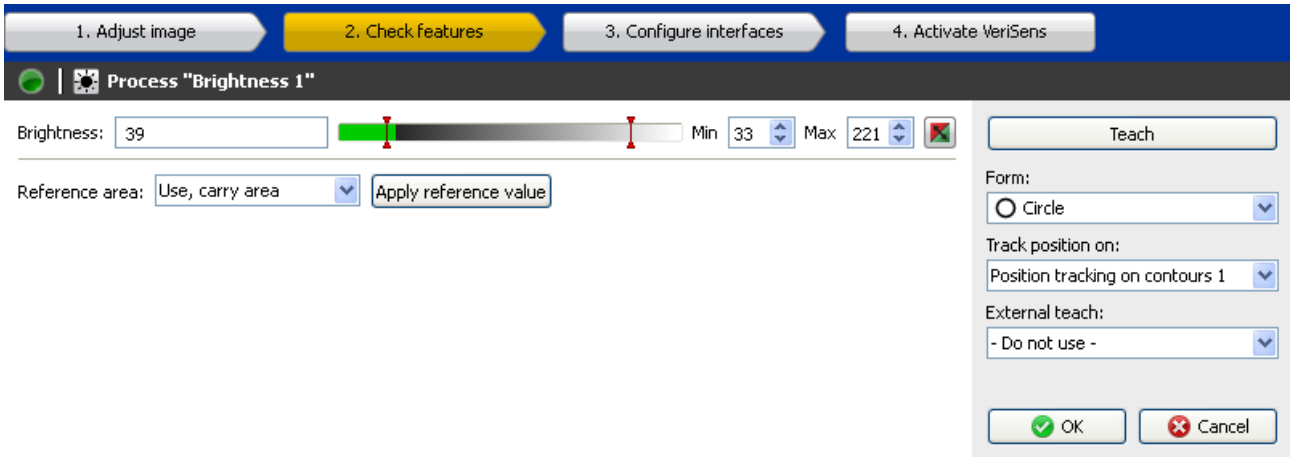
This sensor task has the following output values for the datagram at the process interface:

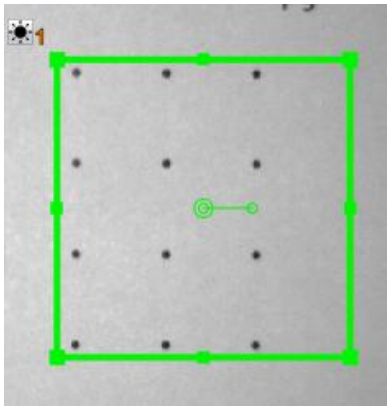
Output value	Data type	Description
Result	”P“ (Pass); “F“ (Fail)	Result of the sensor task
Center of object	X – *separator* – Y (Foat-Point)	Position of the object in the image (px)
Angle of object’s rotation	Number (Float)	Angle of the object (degrees)
Conformity	Number (Integer)	Match of the model (%)

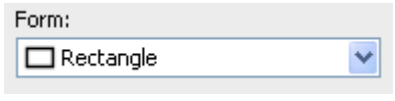
Sensor task Brightness

This sensor task measures the mean brightness in a working area and compares the result with the specified switching points.

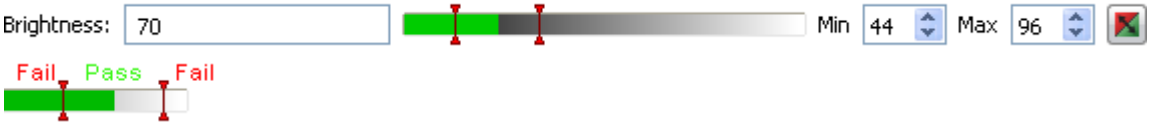
This sensor task supports external teach-in. The switching points are adjusted as an absolute to the current measured value.







- Select the shape of the working area. A circle, a rectangle and a freely definable polygon, a circular ring and a circular ring sector are available.
- Adjust the working area by holding the left mouse button depressed. You can rotate the rectagon by dragging with the mouse on the lever at the center.

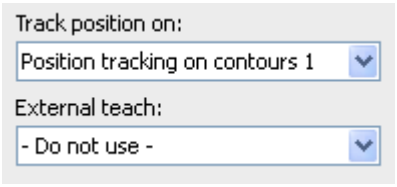


- The current result for lightness is shown as a mean grey scale value. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.

- In order to be independent of fluctuations in the ambient light for photometric measurements, the *VeriSens*® offers a means of correcting the measured value with a reference value. For this purpose, the reference is also chosen in the working area, for example by attaching a white label to the edge of the conveyor belt. The mean brightness in the working area of the reference area should exceed a gray scale value of 128 to ensure reliable operation.

NOTE

If “Use, carry area” cannot be selected, then you have not defined part location.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

NOTE

The new setting is always stored only until the active job is changed. Jobs 1 to 16 are exceptions from this and retain their settings until the device is switched off, if these jobs were programmed by external teach-in.

When the job is loaded, you always receive the settings with which the job was saved when the parameters were stored. Any changes to parameters made by external teach-in are lost!

A detailed description of how the parameters of the sensor tasks are adjusted can be found in the overview of the sensor tasks.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel*.

This sensor task has the following output values for the datagram at the process interface:

Output value	Data type
Result	“P” (Pass); “F” (Fail)
Brightness	Number (Integer)
Reference area brightness	Number (Integer)

NOTE

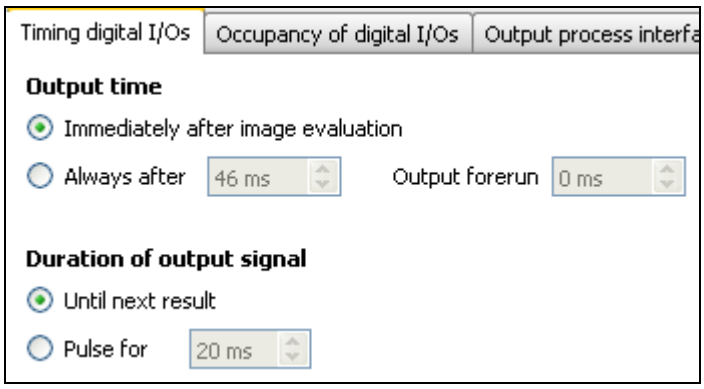
The *Application Suite* CD features a range of application examples that provide you with typical solutions for various jobs and the use of the individual sensor tasks. The examples can be found in the directory

`\Programme\Baumer\VeriSens Application Suite\AppSuite\samples`

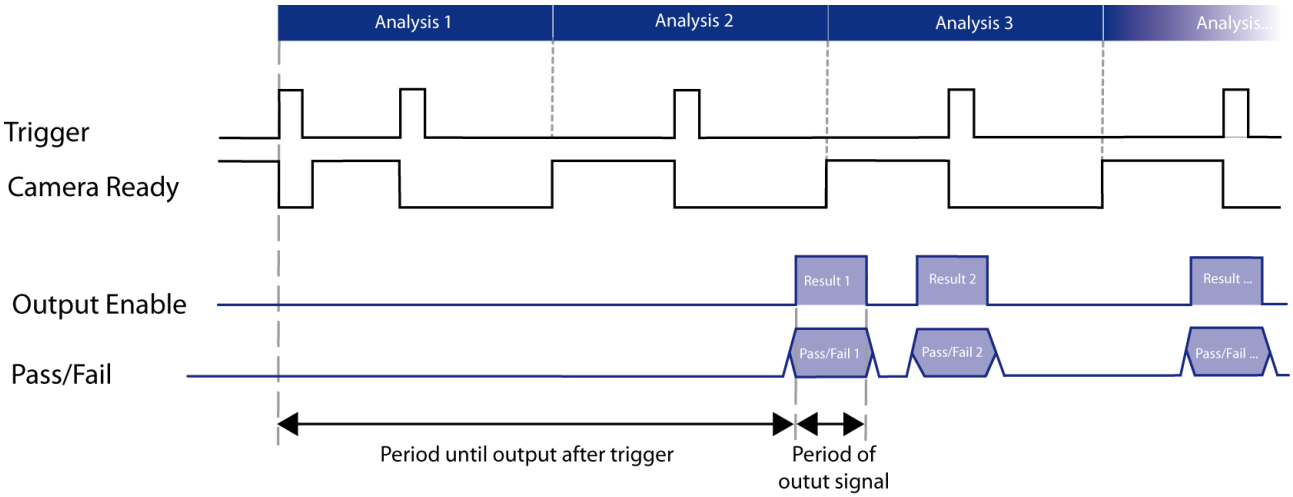
on your PC after successful installation.

9.3 Configuring interfaces

9.3.1 Timing digital I/Os



In this dialog, you can define when the output time is reached and how long the output is to be.



The *Camera Ready* signal is deactivated following image acquisition. The *Camera Ready* signal is activated again at the end of image acquisition and another image acquisition operation is possible immediately.

The Pass/Fail signal then switches at the set output time even if additional analyses have already been performed. The *Output Enable* signal is active during this time.

A maximum of 64 results can be temporarily saved.

NOTE

When the set output time has been reached prematurely, the calculation in the vision sensor is aborted. The Total result and all Partial results are then NOK.

The duration of the output signal is used to specify for how long the output signal (Result valid, Pass/Fail, Alarm) should be issued. Depending upon the setting, this signal is either maintained reset following the duration of the set pulse, or switched with the next result.

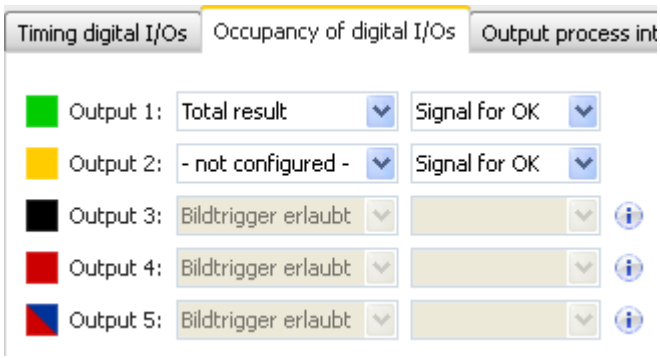
NOTE

If you have connected an encoder, you may set the output time and duration as a distance.

In addition, you can specify an "output run-up" in milliseconds to activate the Pass/Fail signal before reaching a specific position. This option is available if an exact output time (the earliest and latest output times are identical) has been specified and this is specified as a distance.
Keep in mind that, in this case, the belt speed must be constant!

9.3.2 Occupancy of digital I/Os

You can make the settings for the digital interface in this dialog page.



NOTE

Please keep in mind that, during job switching, the device is not active and the "Camera Ready" output is deactivated. Please wait with the next image analysis operation until the "Active" state is displayed again by this signal. If the switch could not be performed, for example, because the job number was invalid, an alarm signal is also output until the next trigger.

Output 1-5

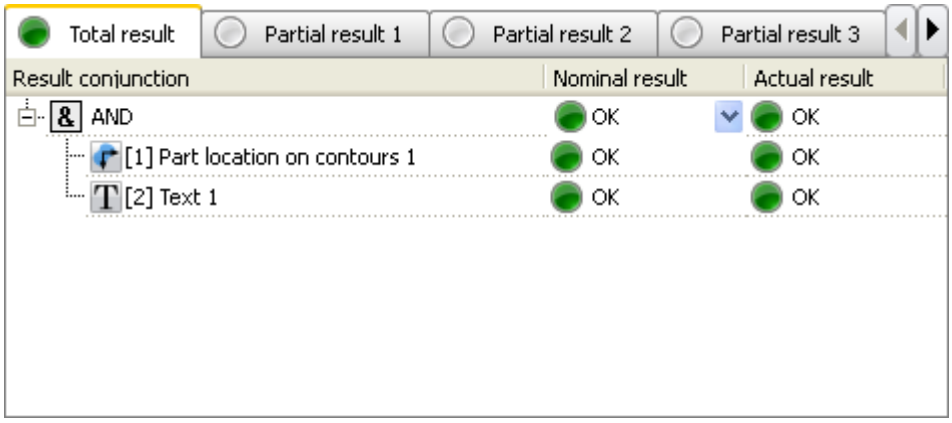
Enter how the outputs are to be activated here. You may select between three options in this process: Total result, Partial result, Alarm. For the results output, you may also choose whether you want a signal to switch for a pass or a fail result.

You may output the Total result and the Partial results via the digital interfaces. To do so, configure the required output in Device menu.

Flexible result linking (XF-100 / XF-200 / XC-100 / XC-200 only):

In this dialog, you can specify how the sensor task results are to be logically linked together to produce the result of the job.

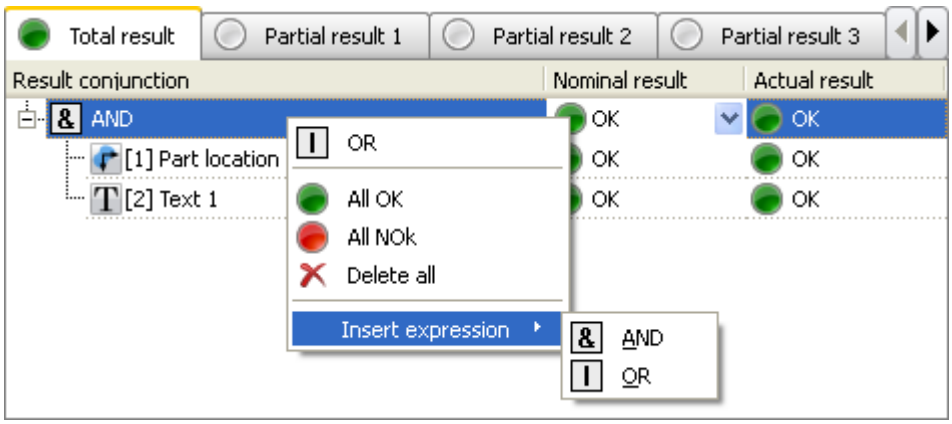
You can specify one Total result and several Partial results for each job. In addition, it is possible to use the Partial results for the configuration of the Total result.



It is possible to link the results with the following operations for configuration:

- AND (“The results of all sensor tasks are OK.”)
- OR (“The result of at least one sensor task is OK.”)

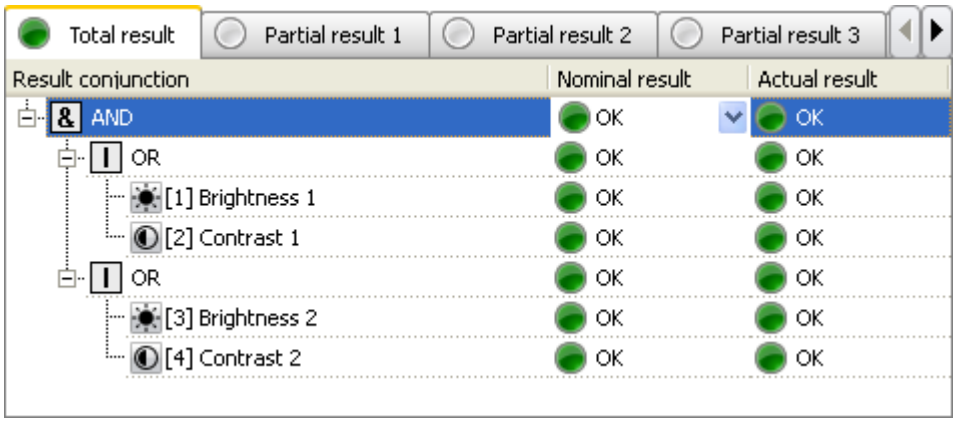
You can also invert and ignore the result of a link by selecting the entry “NOK” or “Ignore” in column “Nominal result”.



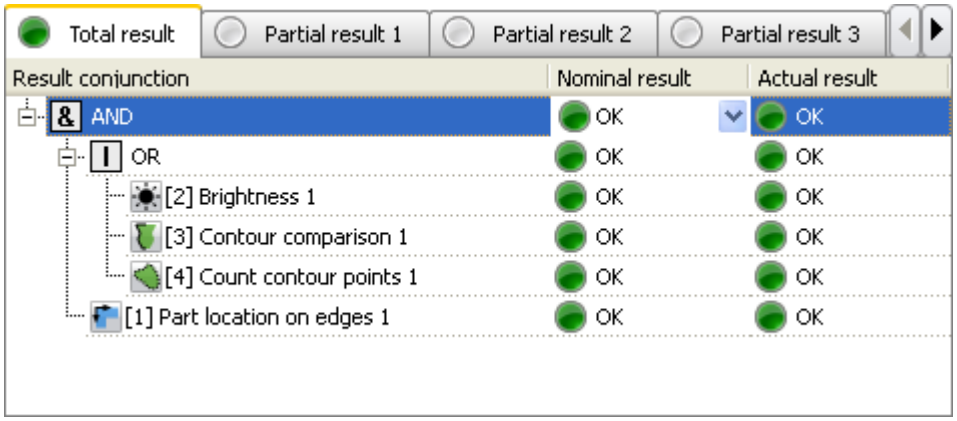
It is possible to nest the links to any desired depth to achieve even more complex expressions. You can insert new levels by selecting the “Insert expression” value in the context menu and then the appropriate type of link. For each sub-link, you can now select the corresponding sensor tasks to be used for the evaluation. Each sensor task can appear any number of times in the overall expression, but only once at each level.

Examples

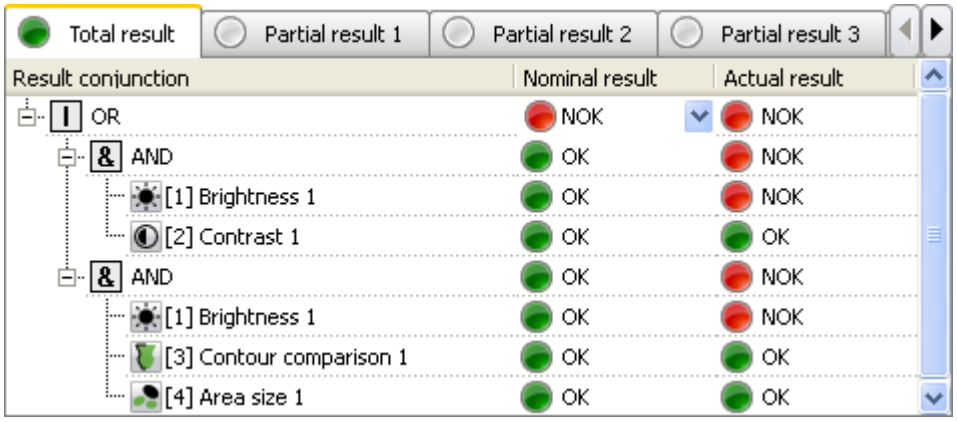
(Brightness 1 OR Contrast 1) AND (Brightness 2 OR Contrast 2)”



Part location at edges 1 AND (Contour comparison 1 OR Count contour points 1 OR Brightness 1)



NOT (Brightness 1 AND Contrast 1) OR (Brightness 1 AND Area size 1 AND Contour comparison 1)



Digital inputs in result linking (only XF-100 / XF-200 / XC-100 / XC-200)

You can also include the states of the digital inputs in the total result. They can be nested just like the other feature checks.

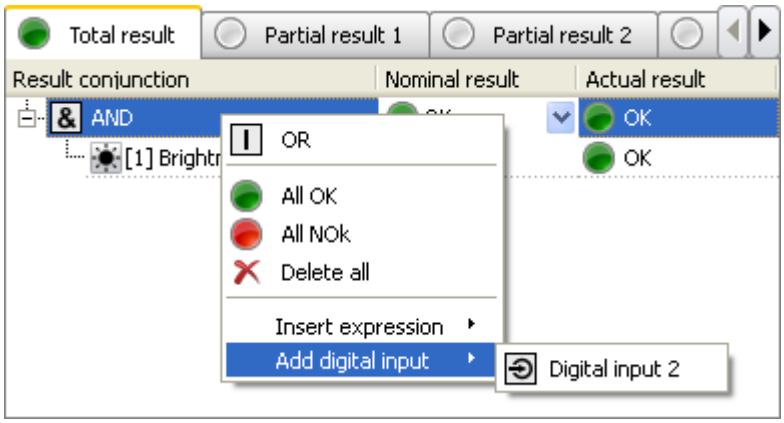
The states of the digital inputs are captured at the trigger point or at the start of image acquisition.

The states of the digital inputs alone cannot be linked; there must be at least one feature check!

NOTE

To use the digital inputs in the result linking, you must select ***External Sensor*** in the device settings for the corresponding input.

Device → Device Settings → Digital I/Os

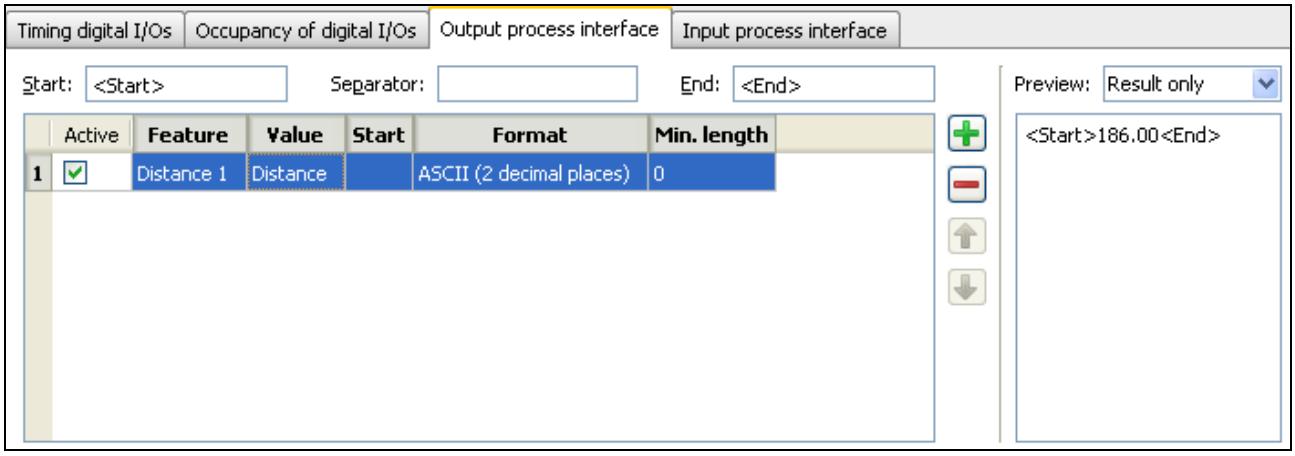


9.3.3 Output process interface (excluding CS-100)

This dialogue page enables you to configure the data output via the process interface.

A detailed description of the process interface can be found in the section Communications via the *VeriSens*® process interface.

You can set the technical parameterization of this interface in the VeriSens device page.



In this dialog box, you can set how the data are to be transferred via the process interface. You can set the technical configuration of this interface in the *VeriSens*® device page.

You may select as many entries for the transfer as you wish in the table.
With the + and – buttons, you may add a new line or erase the currently selected line, respectively. Using the arrow keys, the currently selected line can be moved upward or downward thereby changing the data sequence in the data packet.

General settings

Parameter	Meaning
Start	Character string as a start sequence preceding the data block
End	Character string as an end sequence concluding the data block
Separator	Character string included as a delimiter between the results of each sensor task

NOTE

To enter binary characters, you may use the \ symbol in the text. The value can then be specified in hexadecimal format. To add a backslash, enter \\. The character `\00` cannot be used.

Example:

`\09`	correspondents to a tab
`\0D\0A`	corresponds to <CR><LF>

Data table

The following items are selected in the table:

Column	Meaning
Active	If this entry is marked, the desired value is entered in the data telegram.
Features	The setting or the sensor task from which a value is to be transferred is selected here.
Value	The result of the sensor task that is to be transferred is selected here. The "Result" selection (for the OK/NOK result of the sensor task) is always available. All other results depend on the respective sensor task. If a value consists of several components (e.g., one point consists of the X and Y coordinates), these are delimited using the separator set in the general configuration.
Start	This character string is prefixed to the result be transferred and can facilitate interpretation for the receiver or even make the data packet easier to read for a human.
Format	The format used to represent the data to be transferred is set here. The options available are, in principle, dependant on the values available. Customarily, the following possible options are offered: • ASCII (2 decimal places) • ASCII (exponent) • Decimal • Binary (Little Endian) • Binary (Big Endian) **NOTE** With this format, the data packet may contain characters that are usually used as control characters for serial interfaces or in the protocol! This setting is only recommended if the operating conditions are appropriately secured!
Min. Length	The minimum length of the values is adjusted here. • If the value is larger than the set minimum length, the length will be extended accordingly. • Adjustment of the length depends on the data type, for example a binary value is 4 bytes long. • Adjustments are made by adding zeros or spaces (according to data type).

The following table explains the meaning of different settings for features and values.

Parameter		Meaning
Feature	**Value**	
Time	Image acquisition	Time of the image acquisition in milliseconds after the device was switched on
Result Result	Total result Partial result	If this selection is activated, the Total result or the Partial result of the job is transferred. • **Total result (2 characters):** 1st character: "P" or "F" for a Pass or Fail result 2nd character: "A" or a blank for "Alarm occurred" or "No alarm occurred." • **Partial result (1 character):** "P" or "F" for a Pass or Fail result, "I" if a Partial result was not specified in the job
Statistics Statistics	Total result Partial result	If this selection is activated, the statistics for the result are added. Here, the total number of images, the number of OK images and for the total result the number of images with an alarm are transferred with each individual value being delimited by a separator.

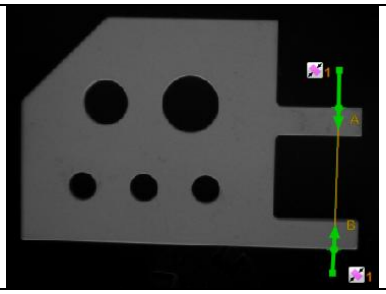
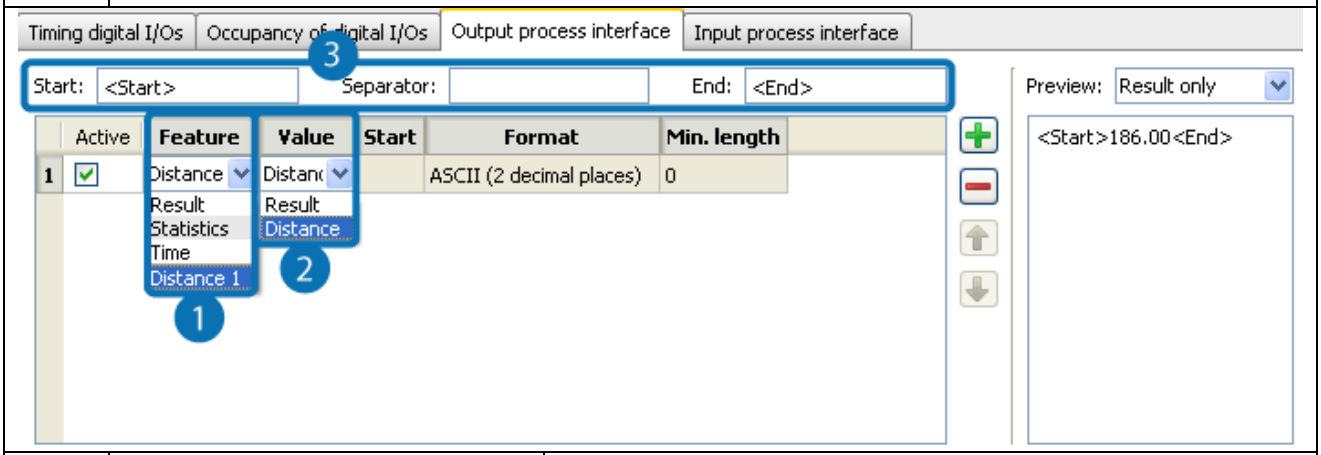
NOTE

In the descriptions of the individual feature checks, there is a table at the end containing the values that can be produced via the process interface.

Example

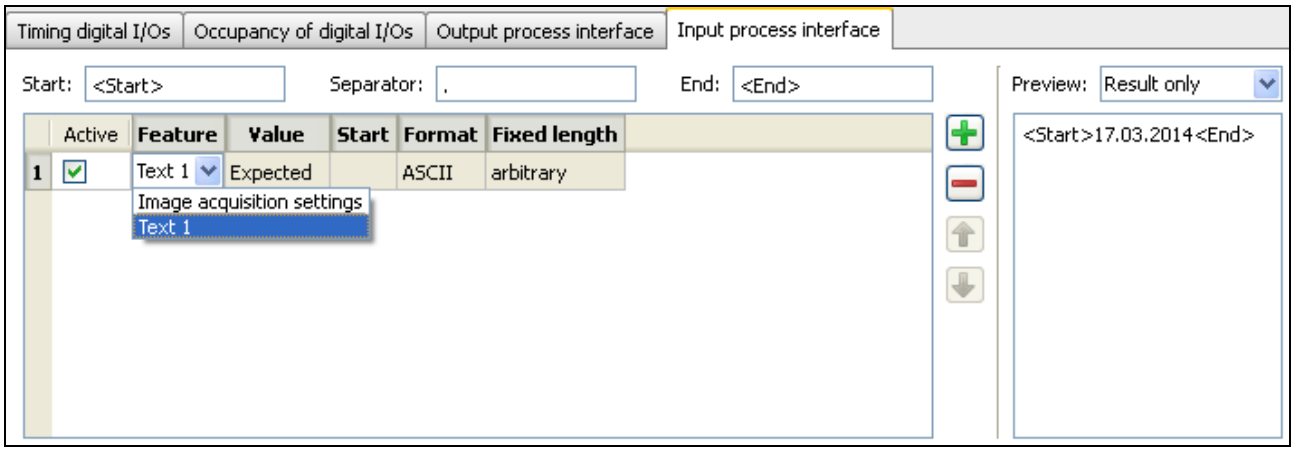
Data output for the *Distance* feature check via the process interface.

> **NOTE**
>
> The effects your settings have on the transferred data are shown live in the preview window on the right.

1.	Configure the *Distance* feature check.	
2.	Go to “Configure interfaces” → “Output process interface“	
3.	Configure all the settings in the overview for the data output (see settings data table). (1) Select the feature you require. (2) Select which value to produce. (3) Set the start marker, separator and end marker for the datagram.	
		
4.	In the preview window on the right, you will see how the data is produced via the process interface. The RD (Response Data) and the number of characters (4 Byte ASCII-Hex) are also shown (see Response RD).	`<Start>186.00<End>`
5.	In this case, the *VeriSens*® would send this to the control system:	`RD0012<Start>186.00<End>` (Note: $0012_{HEX} = 18_{DEC}$, length is therefore 18 characters)

9.3.4 Input process interface (excluding CS-100)

In the *Input process interface*, you can use the SP (“Set parameter”) command to set expected values for identification feature checks (barcode, matrix code, text). You can also set the parameters for image acquisition.



You may select as many values for the transfer as you wish in the table.

With the + and – buttons, you may add a new line or erase the currently selected line, respectively. Using the arrow keys, the currently selected line can be moved upward or downward thereby changing the data sequence in the data packet.

General settings

Parameter	Meaning
Start	Character string as a start sequence preceding the data block
End	Character string as an end sequence concluding the data block
Separator	Character string included as a delimiter between each individual result of the sensor task

NOTE

To enter binary characters, you may use the \ symbol in the text. The value can then be specified in hexadecimal format. To add a backslash, enter \\. The character `\00` cannot be used.

Example:

`\09` correspondents to a tab
`\0D\0A` corresponds to <CR><LF>

Data table

The following items are selected in the table:

Column	Meaning
Active	If this entry is marked, the desired value is entered in the data telegram.
Feature	The setting or the sensor task from which a value is to be transferred is selected here.
Value	The result of the sensor task that is to be transferred is selected here. The "Result" selection (for the OK/NOK result of the sensor task) is always available. All other results depend on the respective sensor task. If a value consists of several components (e.g., one point consists of the X and Y coordinates), these are delimited using the separator set in the general configuration.
Start	This character string is prefixed to the result be transferred and can facilitate interpretation for the receiver or even make the data packet easier to read for a human.
Format	The format used to represent the data to be transferred is set here. The options available are, in principle, dependant on the values available. Customarily, the following possible options are offered: • ASCII (2 decimal places) • ASCII (exponent) • Decimal • Binary (Little Endian) • Binary (Big Endian) **NOTE** With this format, the data packet may contain characters that are usually used as control characters for serial interfaces or in the protocol! This setting is only recommended if the operating conditions are appropriately secured.
Fixed Length	The fixed length of the values is adjusted here. Missing characters are replaced with zeros (numbers) or spaces (text).

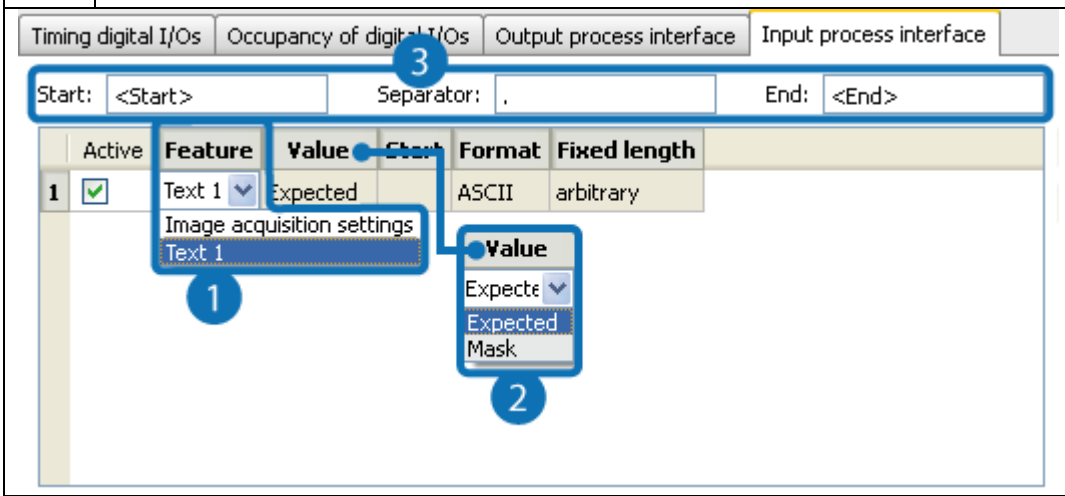
NOTE

In the descriptions of the individual feature checks, there is a table at the end containing the values that can be entered via the process interface.

Example

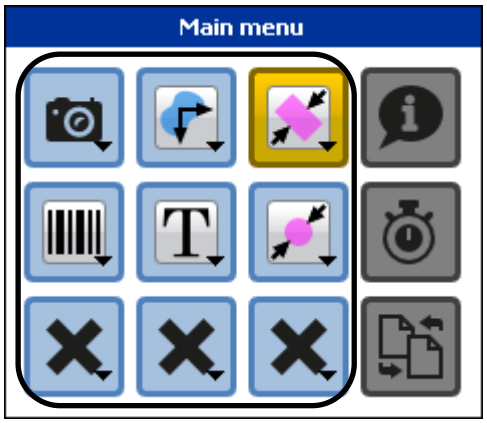
Setting an expected value for the *Text* feature check via the process interface and using the necessary commands.

> **NOTE**
>
> The effects your settings have on the transferred data are shown live on the preview window on the right.

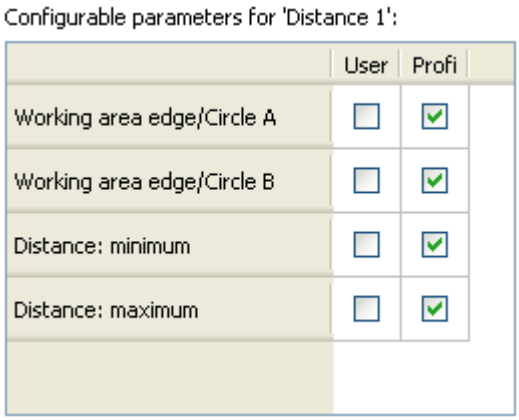
1.	Configure the *Text* feature check.	
2.	Go to *Configure interfaces → Input process interface*	
3.	Configure all the settings in the overview for the data input (see settings data table). (1) Select the feature you require. (2) Select which value to produce. (3) Set the start marker, separator and end marker for the datagram.	
		
4.	In the preview window on the right, you will see the current set value. The SP (Start Parameter) and the number of characters (4 Byte ASCII-Hex) are also shown (see SP command)	`<Start>17.03.2014<End>` **NOTE** If no value is set as “expected“ during configuration of the feature check, no value will be displayed in the preview window!
5.	The command to set the expected value of the *VeriSens*® to this date is:	`SP0016<Start>17.03.2014<End>` (Note: $0016_{HEX} = 22_{DEC}$, length is therefore also 22 characters)

9.3.5 Web interface

Here you have the option to assign functions to the 9 buttons on the left of the web interface view.



You can apply every previously configured feature check and the button for *Parameters for image acquisition* to the buttons.

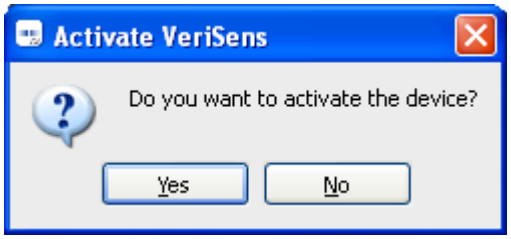


Once a button has been assigned a function, you can set via the web interface, which user level can adjust which parameters of this function. If no user level is set, the *Profi* column will be used and the *User* column will be greyed out.

If you assign a button this function, you can set parameters for image acquisition (exposure time, amplification, edge sharpening, gamma correction) via the web interface.

9.4 Activating *VeriSens*®

Click on *Activate VeriSens.*

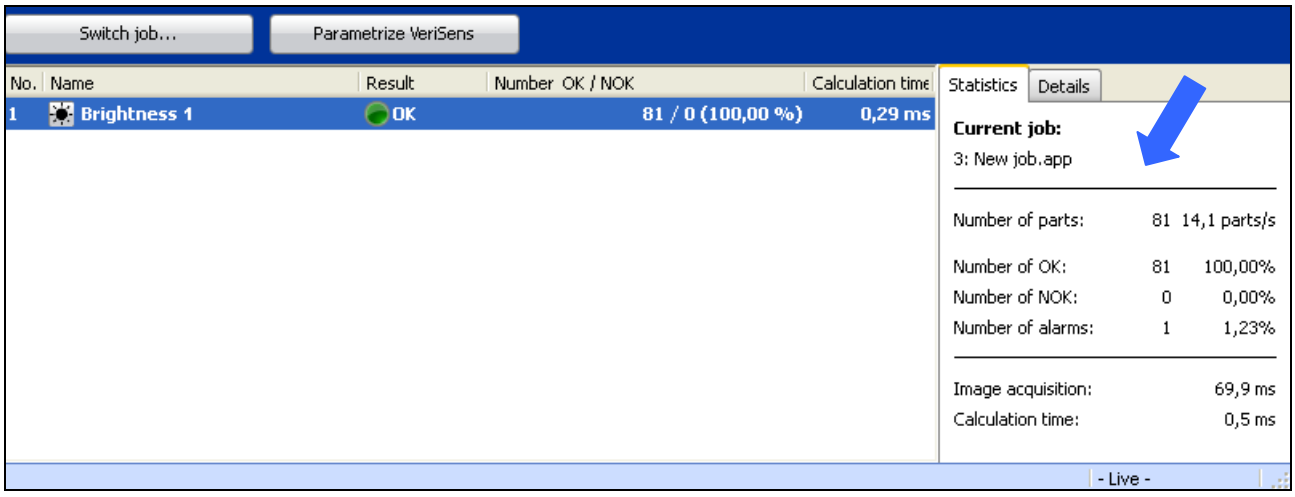


Confirm the question with *Yes*.

VeriSens® Vision Sensor is now in *Activated* mode and processes the created job. The Statistics / Details is shown on the right of the parameter area.

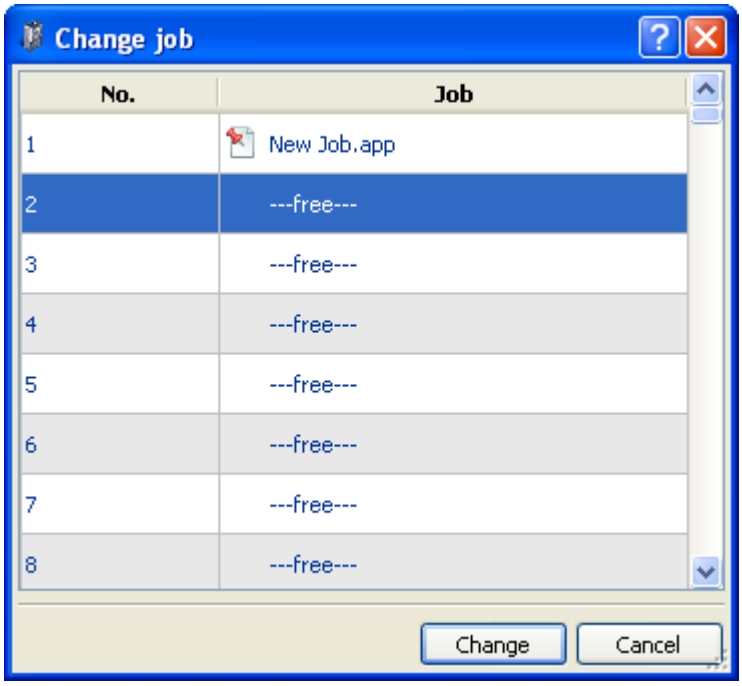
NOTE

While the VeriSens® Vision Sensor is processing the job, you may continue to retrieve fault images and to save images.



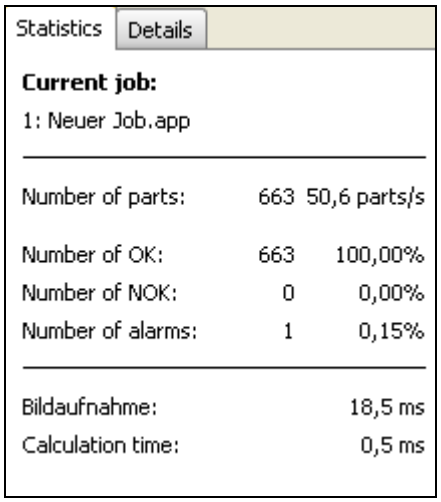
Click on *Switch job...,* to change to a different job stored in the *VeriSens*® Vision Sensor.

Click on *Parametrize VeriSens* to return to *Parameter settings* mode and to make new settings.



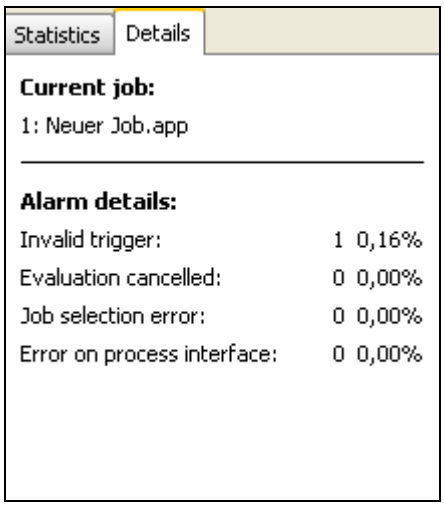
Select a job and click on *Change.*

9.4.1 Statistics / Details



The statistics window displays the following values:

- Name of the job that is currently being processed
- Total number of parts tested; part per second
- Number of passed parts (OK) (number/percent)
- Number of failed parts (NOK) (number/percent)
- Number of alarms (number/percent)
- *VeriSens*® computing time in ms (per image, incl. acquisition)



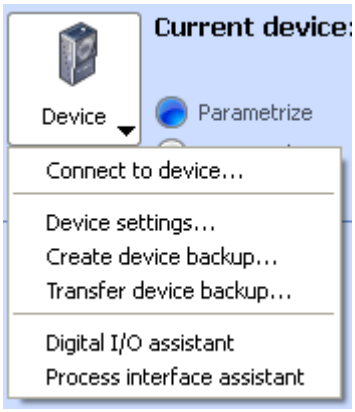
The details window displays the following values:

- Name of the job that is currently being processed
- Invalid trigger: Alarms due to mistimed triggering (number/percent)
- Analysis aborted: Aborted operations due to timeout (number/percent)
- Error selecting job: Alarm during job selection (number/percent)
- Errors at process interface: Errors at process interface (number/percent)

10 Device menu

In the *VeriSens*® device menu, the basic parameters are set which apply equally to all jobs.

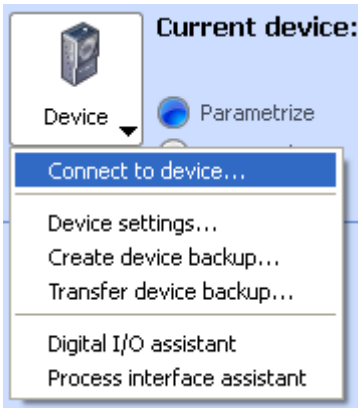
You can find the *VeriSens*® device menu when you click on *Device*.



NOTE

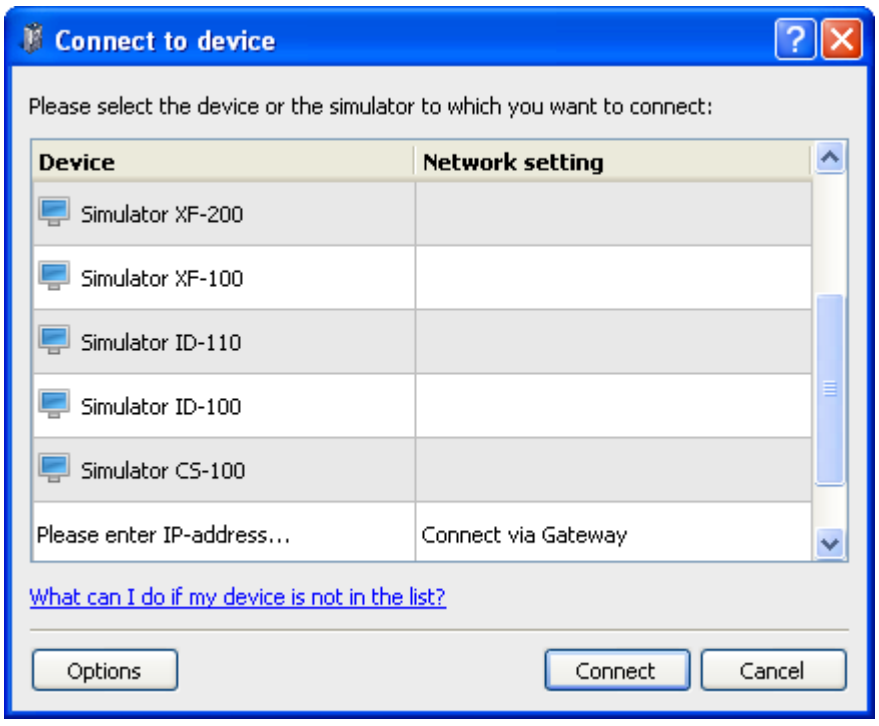
Please observe that it may be necessary to readjust the parameters of the stored jobs if you change these settings.

10.1 Connect to device



Click on *Connect to the device.* Now, a list of all connected *VeriSens*® Vision Sensors and Simulators is displayed with the corresponding IP address and availability marked in color.

VS XF200M03W10EP	The device is available in the network
VS XF200M03W10EP (connected)	You are connected to this device
VS XF200M03W10EP (reserved)	The device is in use
Simulator XF-200	Simulator



NOTE

You can connect to one of the simulators to simulate a *VeriSens*® Vision Sensor and to make job settings without connecting to an actual Vision Sensor.

Connect: Create a connection to the selected sensor.

Options: Here you have the option of limiting the address area in which Vision Sensors are searched and of selecting an alternative port for communication.

NOTE

You can launch the Application Suite using a command line parameter and automatically connect to a *VeriSens*® by way of the IP address.

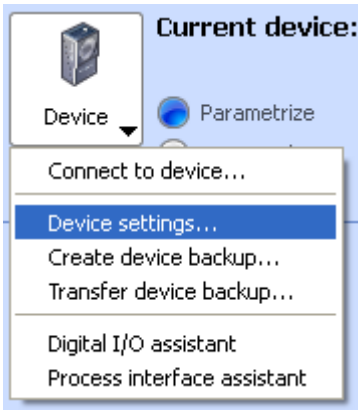
Example: `appsuite2.exe /ip=192.168.0.250` (default IP address)

You can also use a command line parameter to launch the Application Suite in different languages.

/l=de (German)
/l=en (English)
/l=fr (French)
/l=zh (Chinese)

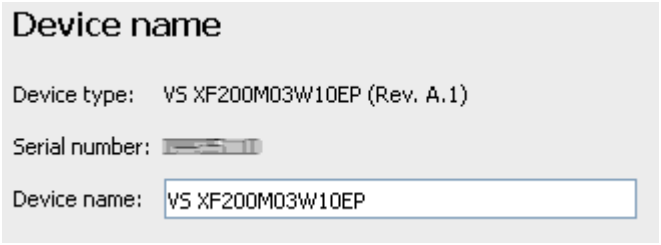
Example: `appsuite2.exe /ip=192.168.0.250 /l=en` (Launch the Application Suite in English with the default IP address)

10.2 Device settings



The following generally applicable settings are made under the menu option *Device settings*.

10.2.1 Device name



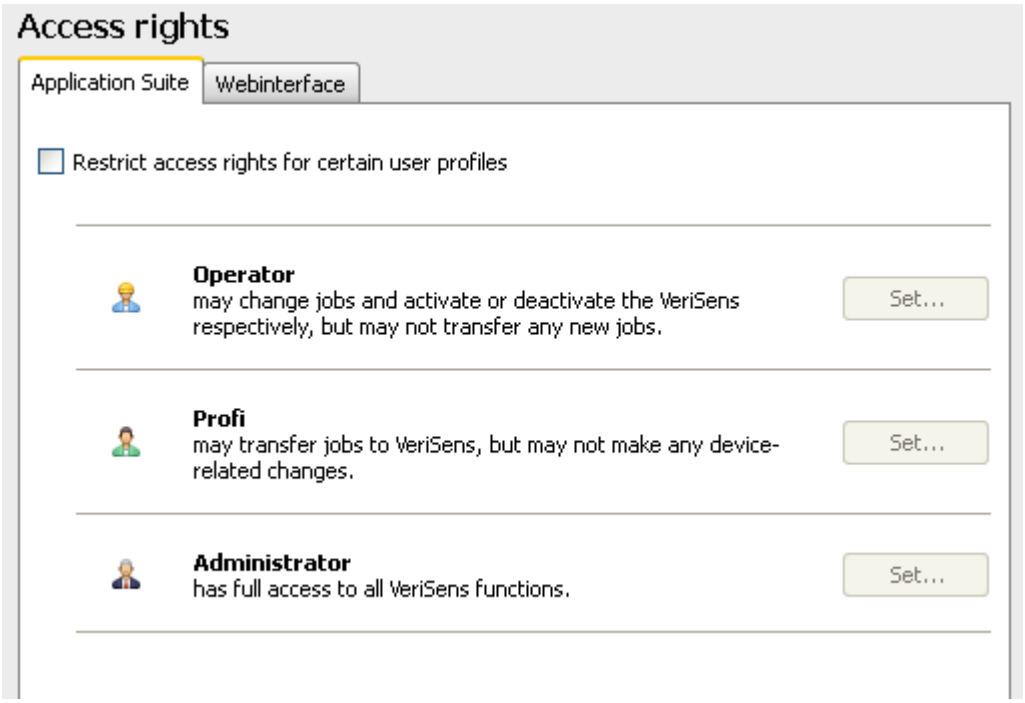
The device type and serial number are permanently stored in the *VeriSens*® and are only displayed. You can allocate a name to *VeriSens*® and confirm by clicking *OK*. This is then shown in the device status. The illustration is an example and does not pertain to the current version!

10.2.2 Access rights (ID-100 / ID-110 / XF-100 / XF-200 / XC-100 / XC-200 only)

10.2.2.1 Application Suite

Three user levels are available for you to avoid unauthorized changes on the device. The individual privileges for these levels are set as follows:

Function	Operator	Expert	Administrator
Activate / deactivate device	+	+	+
Change the active job	+	+	+
Store and transfer the job to *VeriSens*®		+	+
Process interface wizard		+	+
Change device settings		+	+
Firmware update			+
Backup / restore device			+
Password management / encryption			+

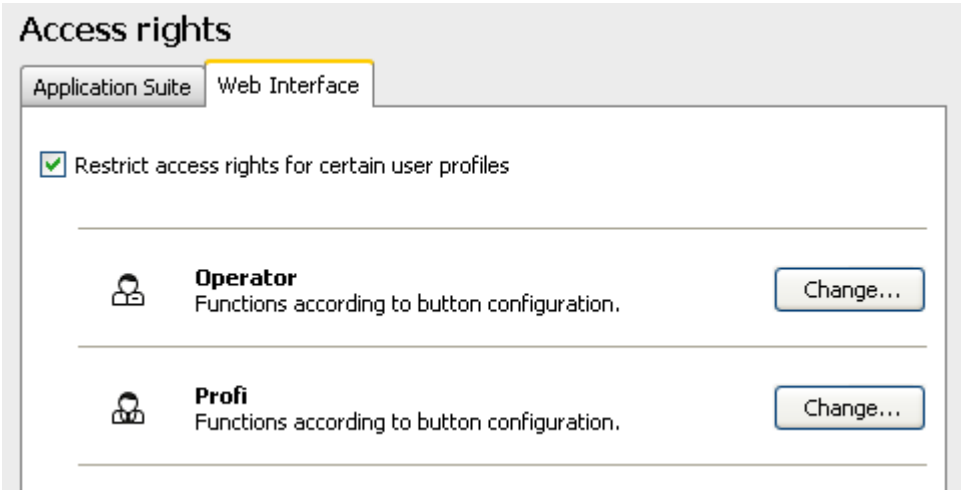


Activate the option *Restrict acess rights for certain user profiles* for using user profiles.

10.2.2.2 Web interface

There are two user profiles that you can use to limit unauthorised access via the web interface.

The user profiles for the web interface are independent of, and can be configured differently from, those for the Application Suite.



Activate the option *Restrict acess rights for certain user profiles* for using user profiles.

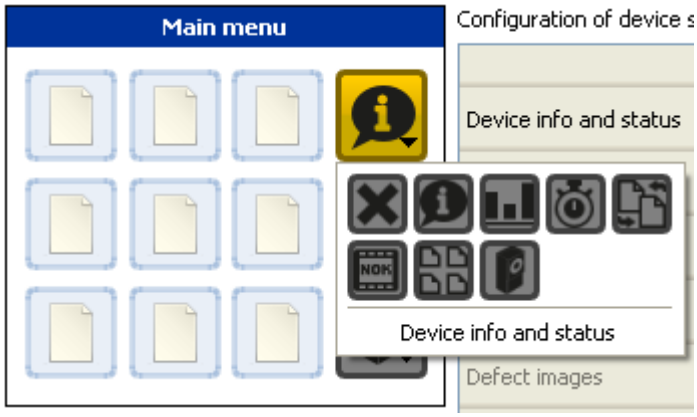
NOTE

You can set the rights to change individual functions for a job during job creation by clicking. *Configure interfaces → Web interface.*

You can set rights for device specific functions in *Device → Device settings → Configure web interface.*

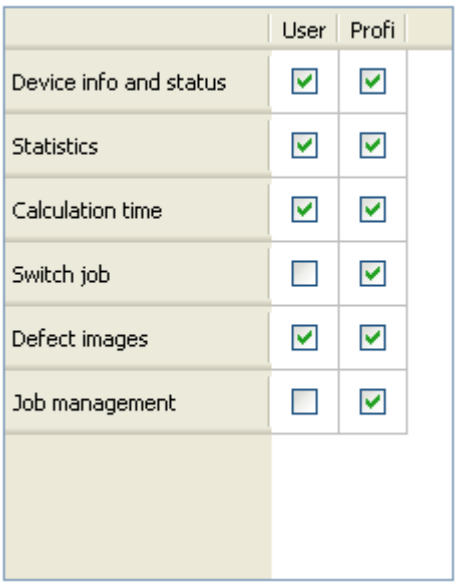
10.2.3 Customizing web interface

On this dialogue page, you can assign device specific functions to the three buttons on the right of the web interface view.

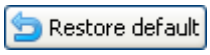


Icon	Description
	Button has not been assigned a function.
	Device info and status
	Statistics
	Calculation time
	Switch job
	Defect images
	Job management
	Device specific functions (Allows access to all device specific functions through an additional menu level)

Configuration of device specific functions:



You can also set the rights for each user group for the chosen device specific function via *Configuration of device specific functions*.

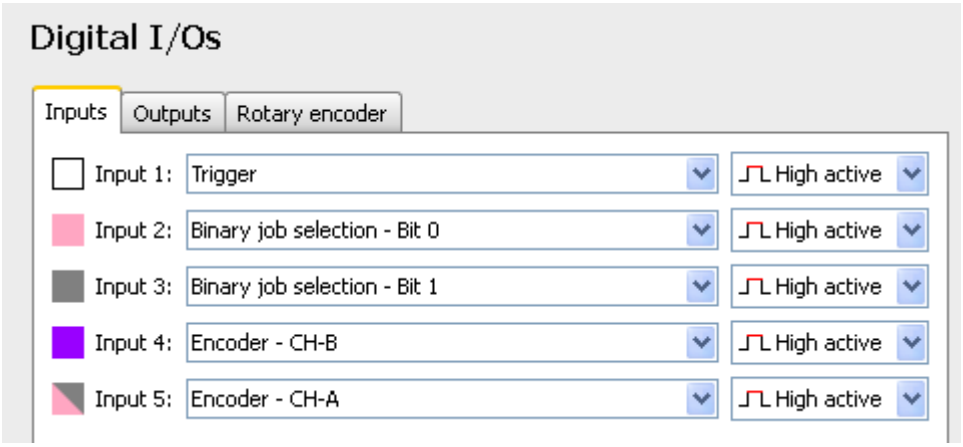


Using this button, you can restore the original settings.

10.2.4 Digital I/Os

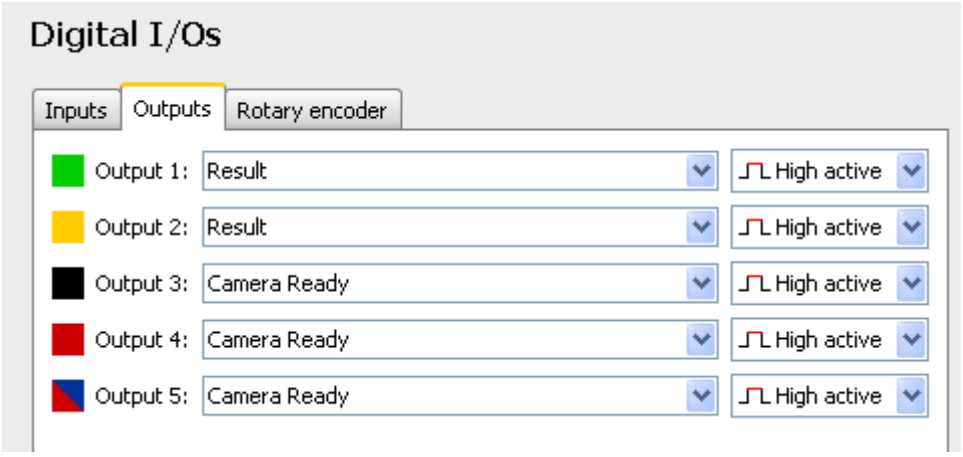
You can make the settings for the digital interface in this dialog page. You can also configure an encoder and specify the polarity of the digital inputs and outputs.

Inputs



Input 1 is reserved for the trigger. For other inputs you can specify how you want to switch the active job. It is also possible to connect an encoder to the Inputs 5 (CH-A) and 4 (CH-B).

Outputs

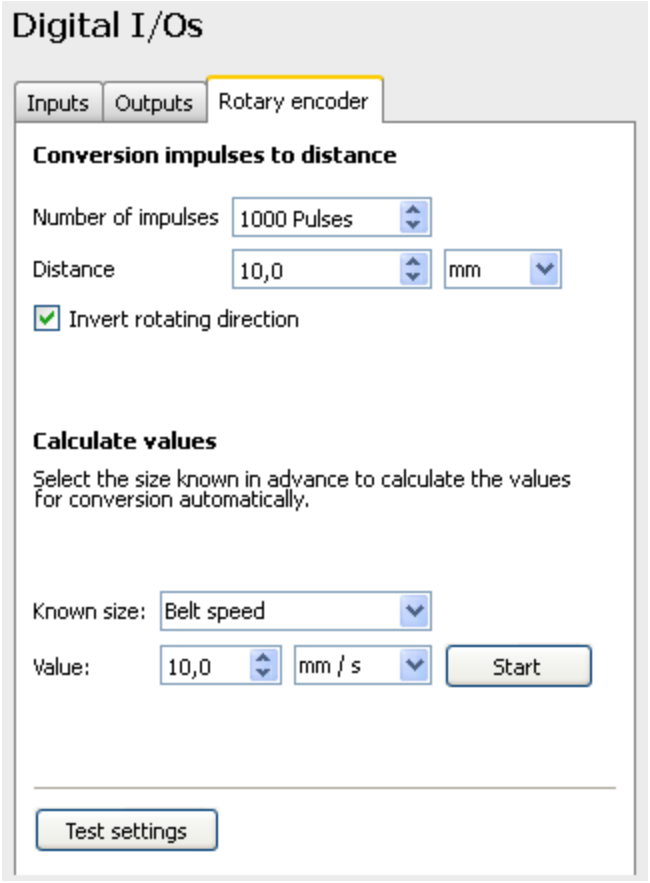


Enter how the outputs are to be activated here. You can output hardware signals (Flash Sync, Alarm, Camera Ready, Result is valid) for each output or configure the output for outputting job results.

NOTE

Only three outputs can be configured in the ID-100!

Rotary encoder



If an encoder is connected, you must also set the factor between the distance traveled and the number of pulses from the encoder.

To determine this factor, either you must know the belt speed or you must move the conveyor belt over a defined distance.

Determine the conversion factor as follows:

- Select the known quantity and set the corresponding value.
- Activate pulse measurement by pressing the Start button.
- Move the conveyor belt by the set value.
- Terminate the measurement using the Stop button.

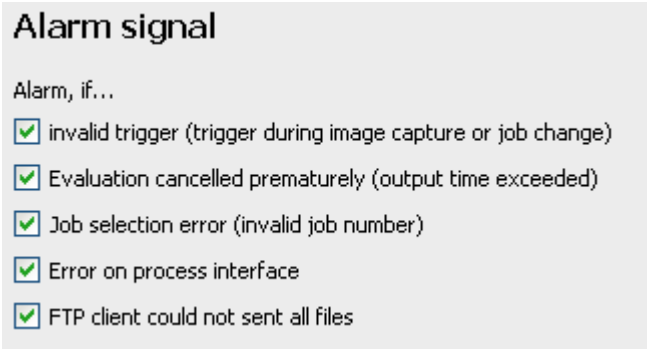
Press the *Test* button to check the current setting.

NOTE

All specifications during configuration refer to the forward motion of the conveyor belt. Invert the direction of rotation, if necessary, for the correct mode of operation of the *VeriSens*®.

Make sure that Inputs 4 and 5 are set up correctly if you are using an encoder. If not, operation of the *VeriSens*® may be impaired.

10.2.5 Alarm signal

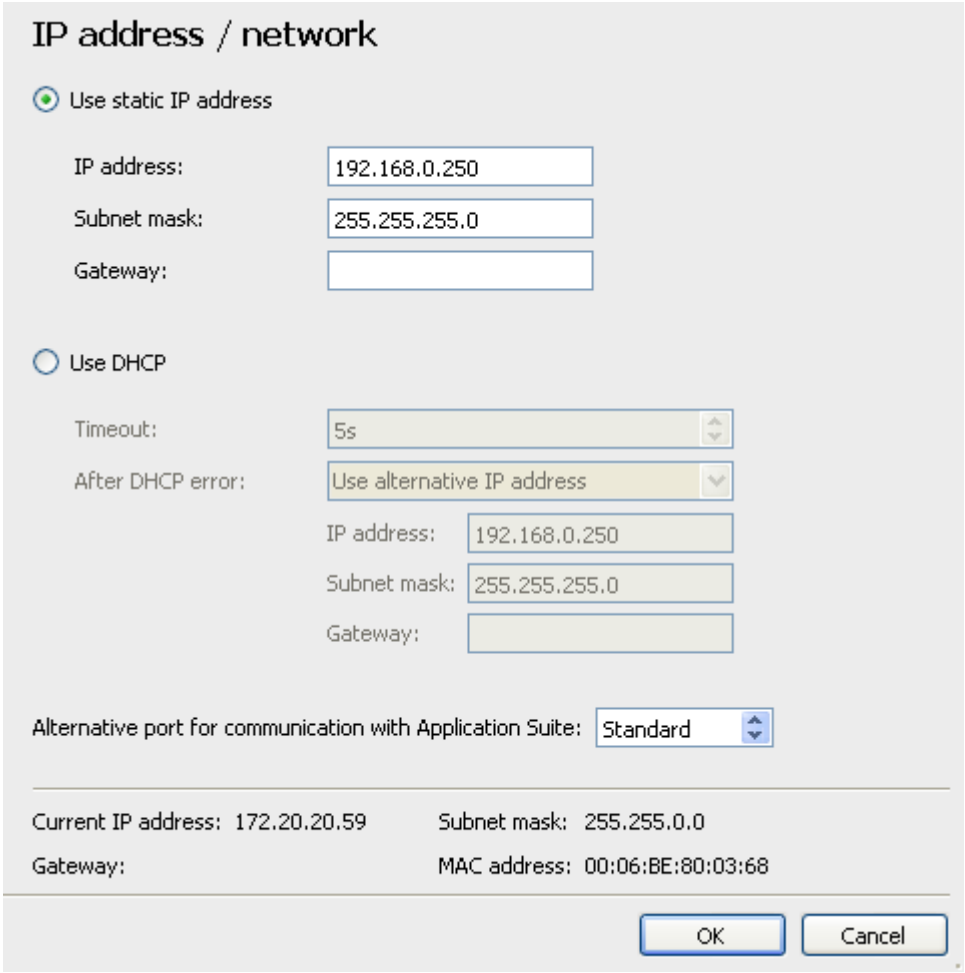


You can define the conditions which cause an alarm to be initiated here. Alarm signals indicate that an irregularity has occurred in the sensor.

The following causes may trigger the alarm:

invalid trigger (trigger during image capture or job change)	Trigger during image acquisition, job switching or during parameter setting via the process interface (“SP” datagram)
Evaluation cancelled prematurely (output time exceeded)	The result of computing was not present at the latest output time.
Job selection error (invalid job number)	Invalid job number or job could not be loaded, e.g. because it is not correctly configured.
Error on process interface	An error has occurred during data transfer at the process interface, e.g. an invalid command has been received.
FTP client could not send all files	An error occurred while transferring the images via the FTP client. Possible causes might be: The *VeriSens*® or the server is already at full load, incorrect log-on data, or the server is unreachable.

10.2.6 IP address / Network



You set the IP address of the *VeriSens*® here. There are two choices for this.

- **Static IP address**
  VeriSens® uses a permanently set IP address.

- **DHCP (Dynamic Host Configuration Protocol)**
  If you have integrated a DHCP server in your network, the IP address is obtained there. If this does not happen within a specific time and a timeout occurs, you can choose whether:

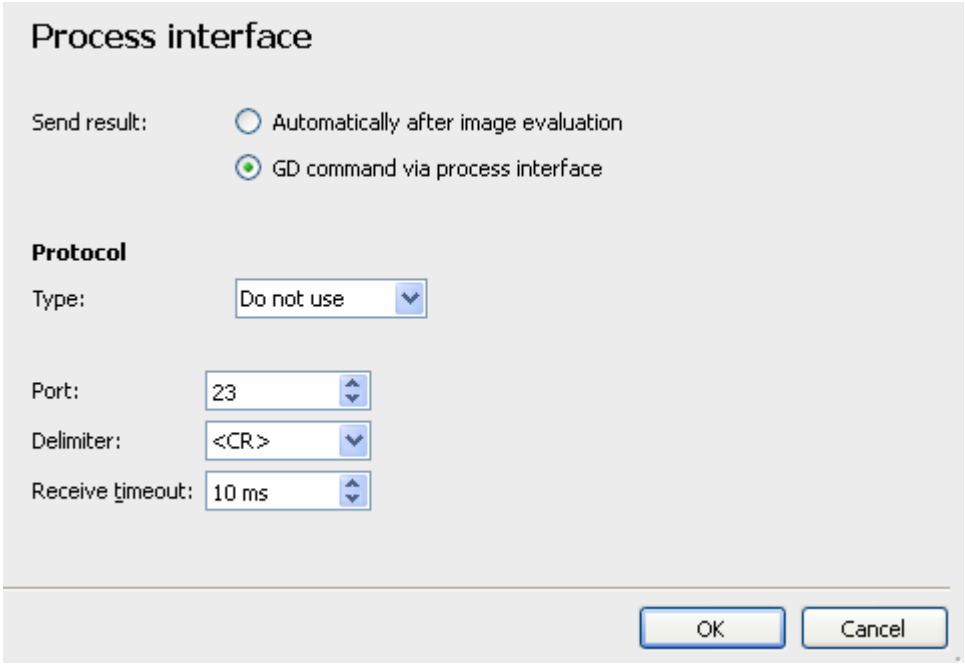
  - the last IP address obtained via DHCP is used
  - another fixed IP address is set

If the port 51.972 (standard) is already being used in your network, you may specify a different port for communication between the connection of *VeriSens*® and the *Application Suite*.

NOTE

This port must also be set in the dialog Connect to device - Options, in order to create a connection.

10.2.7 Process interface



Send result

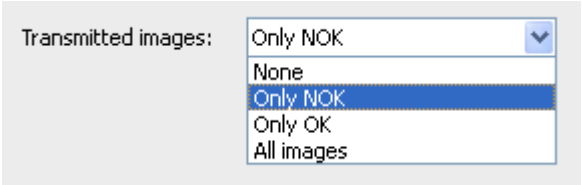
Automatically after image analysis: *VeriSens*® sends the datagram independently.
Command GD via process interface: The result of the *VeriSens*® is called up on request with the GD command.

Protocol

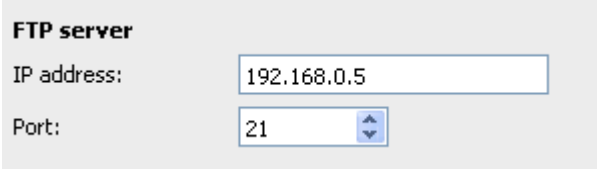
Type: Set the protocol here (TCP / UDP / RS485).
Port: Set the Port for the *VeriSens*® Ethernet interface here.
Receipt timeout: You can set the time after which receipt is aborted here.
End identifier: Specifies which control character is expected or sent at the end of each datagram.

10.2.8 FTP

Using the FTP function, you can save selected images on an FTP server during production.

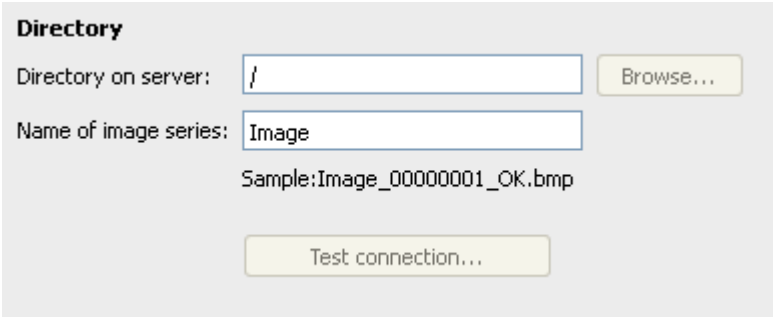


Select the images to be stored on the FTP server.
(Only NOK = all images with overall result Fail)
(Only OK = all images with overall result Pass)



Add the IP address and the port that *VeriSens*® uses to communicate with the FTP server. The *VeriSens*® and the FTP server must be in the same subnet.

Add the log-on data for your FTP access here.

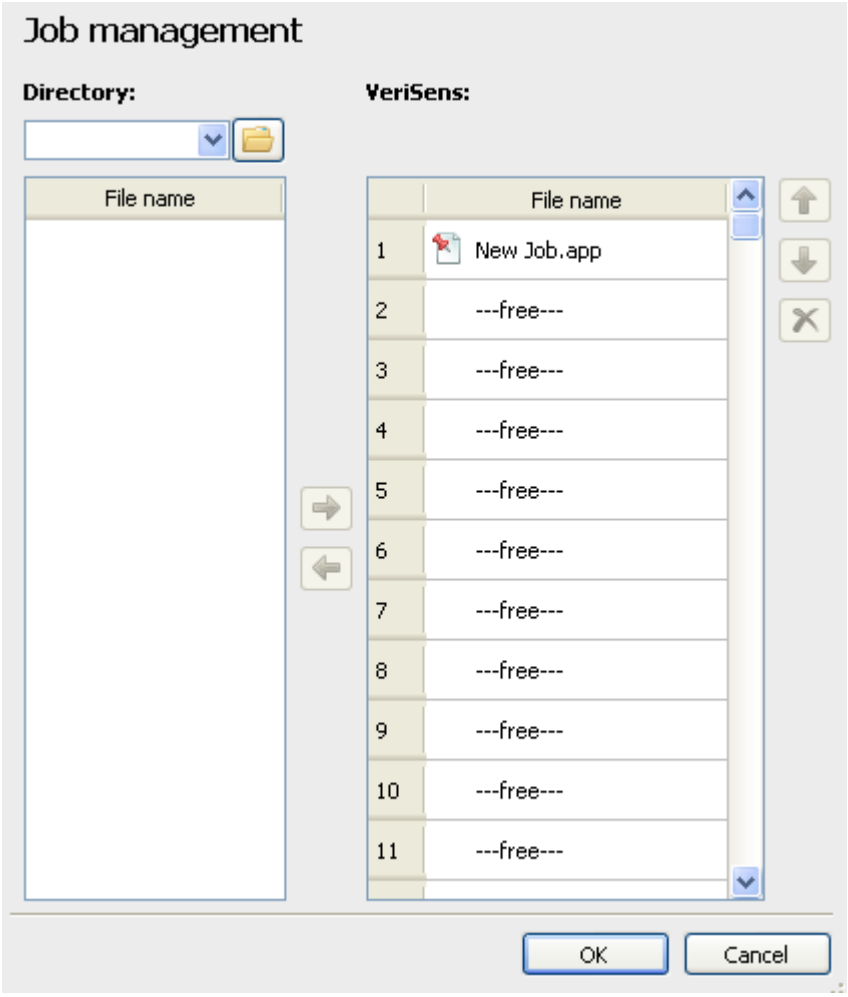


Specify a directory on the FTP server where the images are to be saved and name the image series.

You can check the settings using *Test connection…* .

Confirm your settings using *OK*.

10.2.9 Job management



With this dialog, you can easily and conveniently copy your jobs between a folder on your computer and the *VeriSens*® vision sensor.

Choose the folder on your computer with:

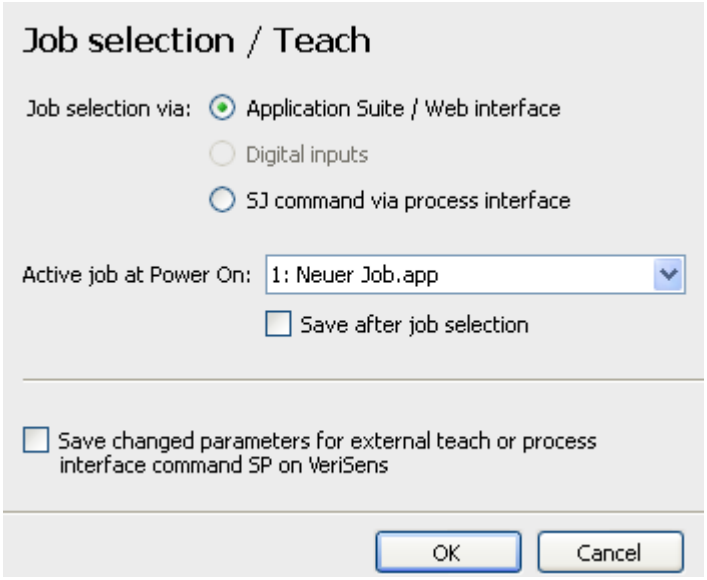
The jobs available in this folder are then displayed on the left hand side.

The jobs on the *VeriSens*® vision sensor and their job number are displayed on the right hand side. Observe that the job number directly corresponds to the binary code with which the jobs are selected in Real time mode via the Job selection via digital inputs.

Transfer the jobs using the horizontal arrows and move jobs to the corresponding storage locations in the VeriSens® vision sensor with the vertical arrows. Use the cross to delete jobs.


This Job is active at Power on.

10.2.10 Job selection / Teach



Here you can basically set how you want to make the job selection.

Job selection via:

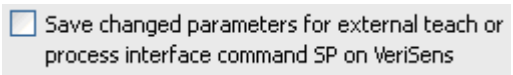
***Application Suite* / Web interface:** The job can only be changed manually via the *Application Suite* or via the web interface.

Digital inputs: Job selection is conducted via the digital inputs 2 and 3 (binary or bit serial)

Command SJ via process interface: Jobs are selected via the process interface.

Active job at Power On: Here you can also choose which job will be loaded when the vision sensor is switched on. This Job will marked with this icon.

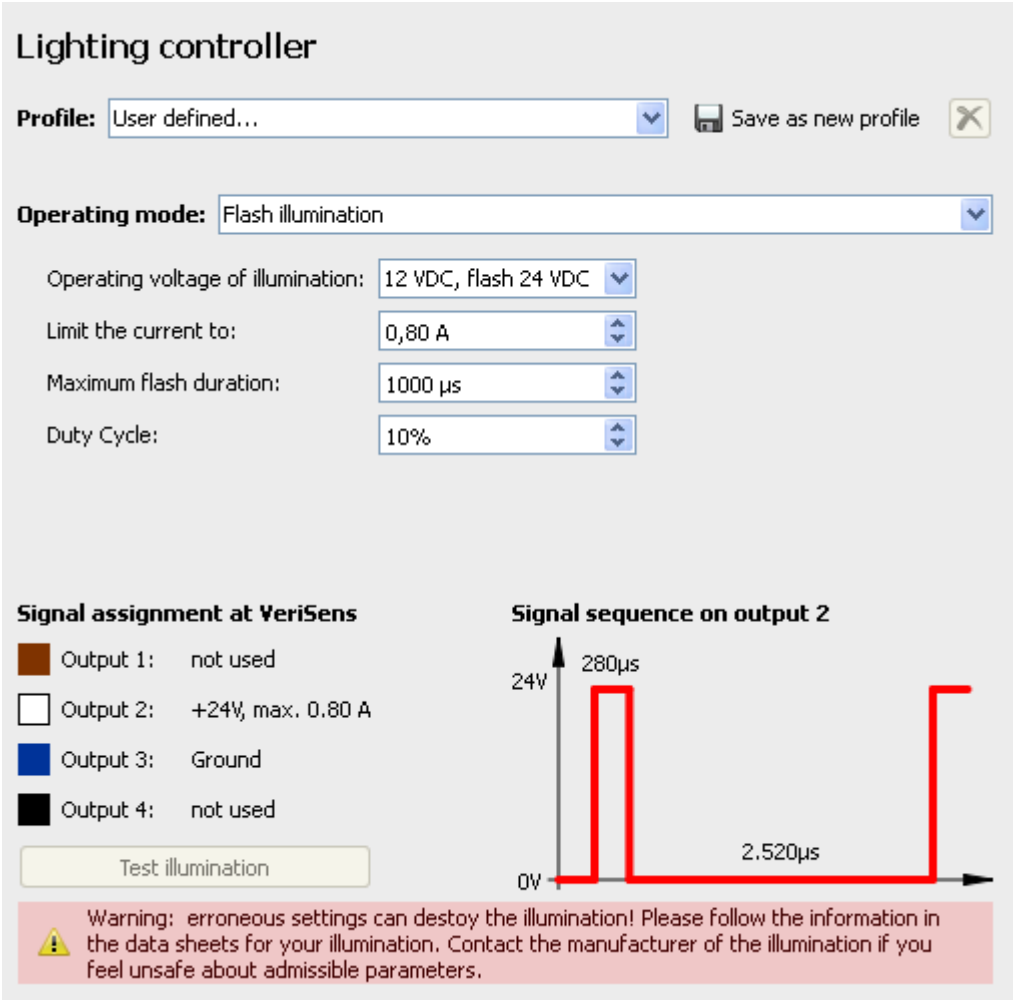
If you activate this option, the last active job will be activated the next time the device is started.



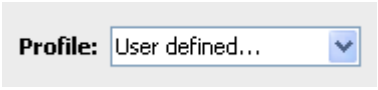
If this option is activated, changes resulting from external teach-in or process interface commands in the job are saved to VeriSens. If this option is not activated, changes are discarded when VeriSens is rebooted. In this case, the originally saved job is executed.

When jobs are switched by the binary method via the digital inputs, no job is active when the device is switched on. In this case, the desired job is selected using the levels present at the inputs.

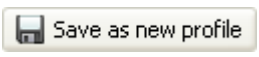
10.2.11 Lighting Controller (only XC)



Using the illumination controller, you can make the settings at the outputs of the illumination port. In this way, you can control an external illumination system or an external flash controller.

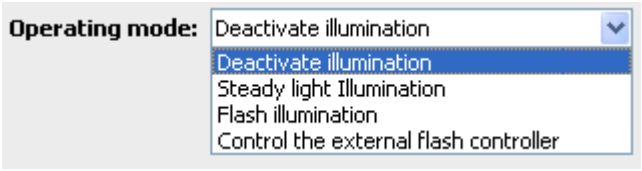


As soon as you have saved a profile that you created, it is available here.



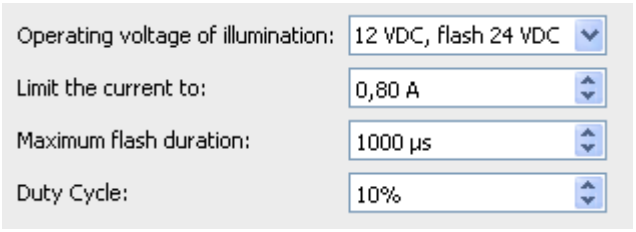
If you have made your own settings, you may save them as a new profile.

Using this function, you can delete a profile that you created.

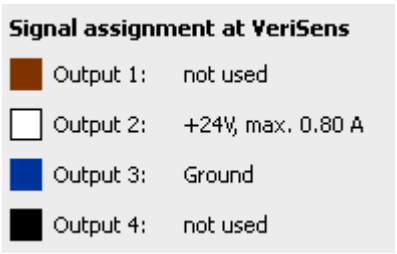


You have various operating modes available.

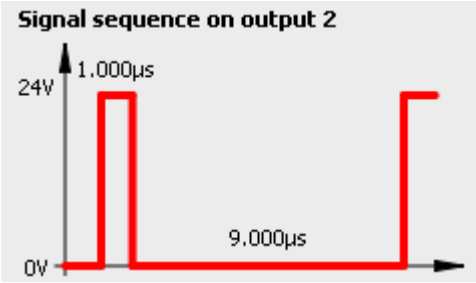
Operating Mode	Description
Deactivate iliumination	No settings possible / illumination port deactivated
Steady light illumination	Settings possible (limit operating voltage/current)
Flash illumination	All settings possible
Control the external flash controller	No settings possible, flash sync active



Function	Setting Possibilities
Operating voltage of illumination:	12VDC/24VDC
Limit the current to:	Steady light illumination 0.1A…0.8A (increments of 0.1A) Flash illumination 0.1A…4.0A (increments of 0.1A)
Maximum flash duration:	1µs…1000µs
Duty Cycle:	1%...10%



This view shows how the signals at the 4 outputs of the illumination port are connected for the current settings.



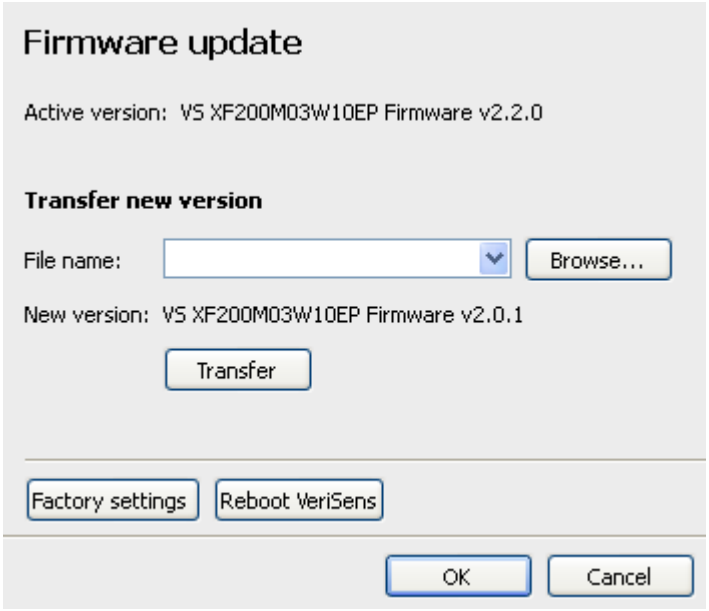
This diagram shows the current waveform at output 1 and output 2.

ATTENTION!

Erroneuous settings can destroy the illumination! Please follow the information in the data sheets for your illumination. Contact the manufacturer of the illumination if you feel unsafe about admissible parameters.

With the button *Test illumination* you can test your settings with a connected illumination system.

10.2.12 Firmware update



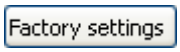
This dialog provides support in the installation of new firmware.

ATTENTION!

Only use the most recently released version of the firmware for updating. You may wish to ask Baumer Support before updating firmware. Create a device backup of your *VeriSens*® Vision Sensors before updating firmware!

Click on the button *Browse* and select the firmware file to be transferred.
(File extension *.vsf).

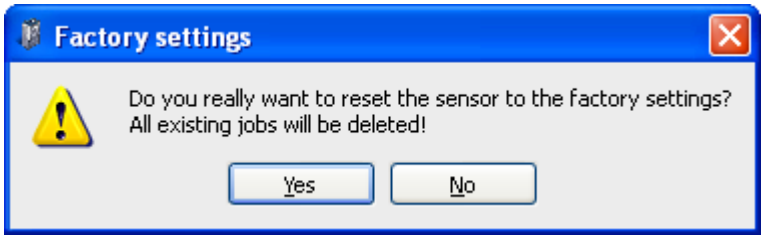
Click on the button *Transfer* button to carry out the update.



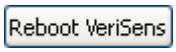
The *Factory settings* button permits the factory settings to be restored. The current firmware will be retained.

NOTE

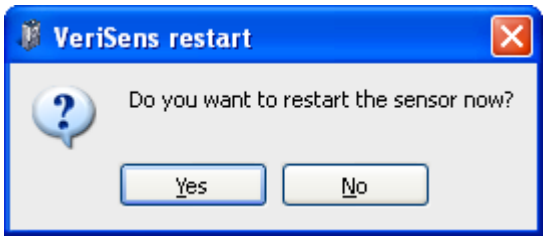
Restoring the factory settings deletes all of your previous settings and jobs.



Confirm the request with *Yes* to restore the sensor to the factory settings.

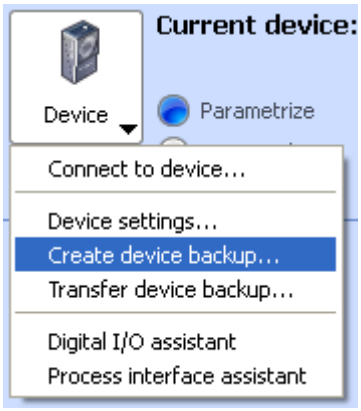


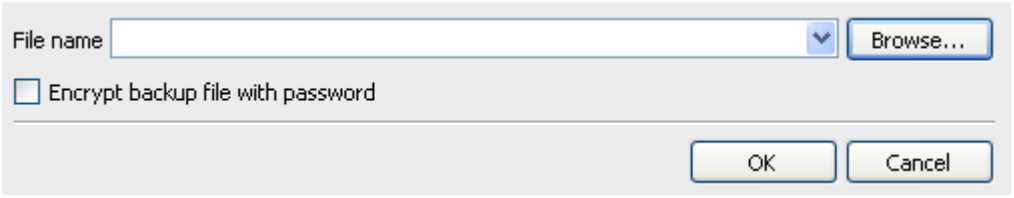
With the *Reboot VeriSens* button the *VeriSens*® restarts. The function is equivalent to switching the power supply off and back on.



Confirm the request with *Yes* to restart the sensor.

10.3 Create device backup





This dialog page supports you in making a complete device backup of your *VeriSens*®. Here device settings, jobs and firmware are saved in a file. Activate the option “Encrypt backup file with a password” if the backup file is to be stored in protected mode.

NOTE

The device backup cannot be reloaded without knowing the password!

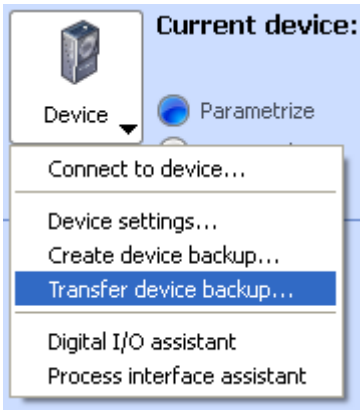
Browse...

Specify a storage path and a file name for the backup file or click on *Search.*
The file extension must be *.vsb.

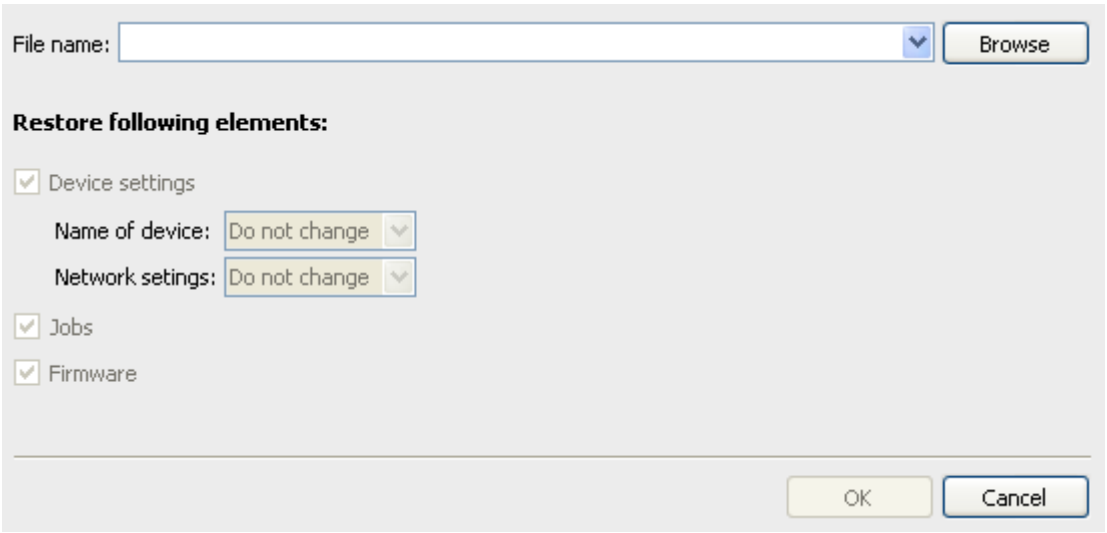
OK

Click on *OK*. The required file is created. During this process, all device settings and jobs are transferred. This process may take a few minutes.

10.4 Transfer device backup

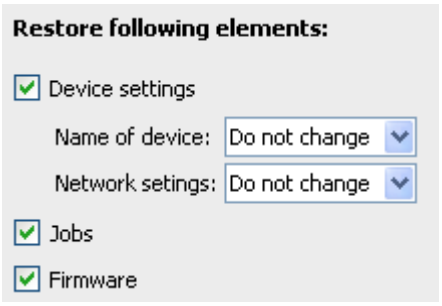


Use this dialog page to transfer a device backup file to *VeriSens*®.



Specify the storage path of the backup file or click on *Browse.* The file extension must be *.vsb.

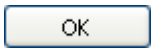
If this is a protected backup file, you must then enter the password.



Here you select what components are to be transferred during the restore process.

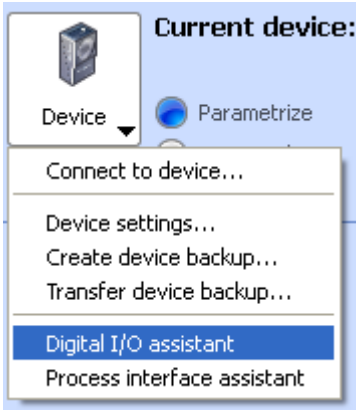
NOTE

If you restore the factory settings of the Vision Sensor, all unsaved files will be lost!



Now transfer the selected settings and jobs to *VeriSens*® with *OK*. This process may take a few seconds.

10.5 Digital I/O Assistant



With the Digital I/Os assistant, you can test whether all cables are connected correctly to the digital inputs and outputs. To use the assistant, *VeriSens*® must be in Setup mode. If the menu option is still grayed, your device may have the wrong firmware version.

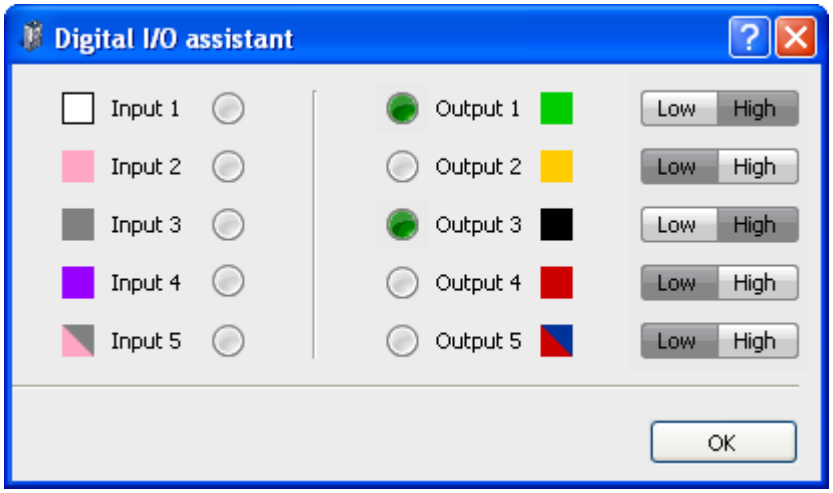
ATTENTION

If your Vision Sensor has already been permanently integrated into your system, it is advisable during initial testing to check the outputs with a meter. Keep in mind that switching of the outputs will be transmitted to any connected controllers!

NOTE

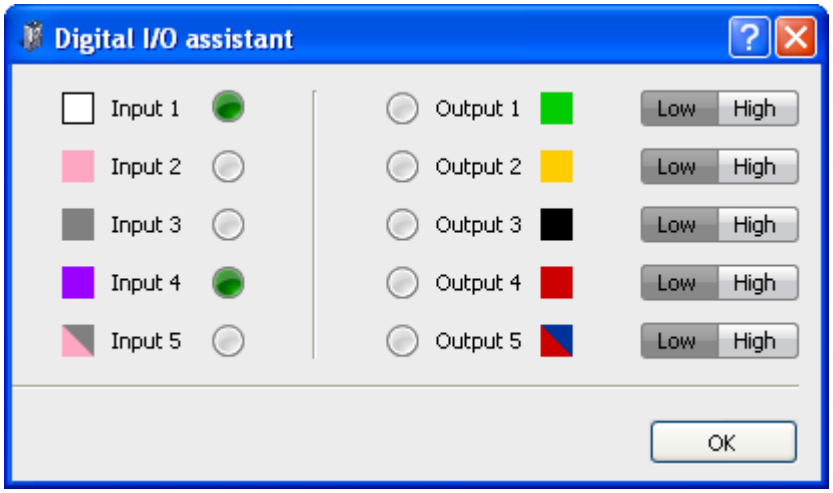
If encoders are defined for the inputs 4 and 5, you cannot test these using this assistant! You can change the settings under: *Device → Device settings → Digital I/Os*.

Example using outputs



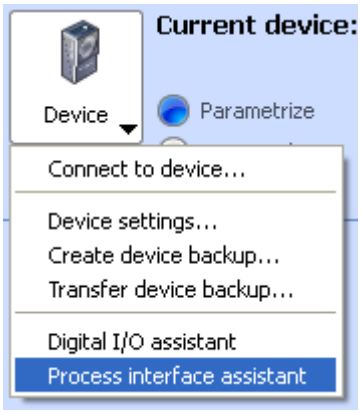
Set the appropriate output on or off using the Low/High button. In the example, Output 1 and Output 3 are set. This means that power is now applied to Output 1 and Output 3.

Example using inputs



In the example, applied power is registered on Input 1 and Input 4.

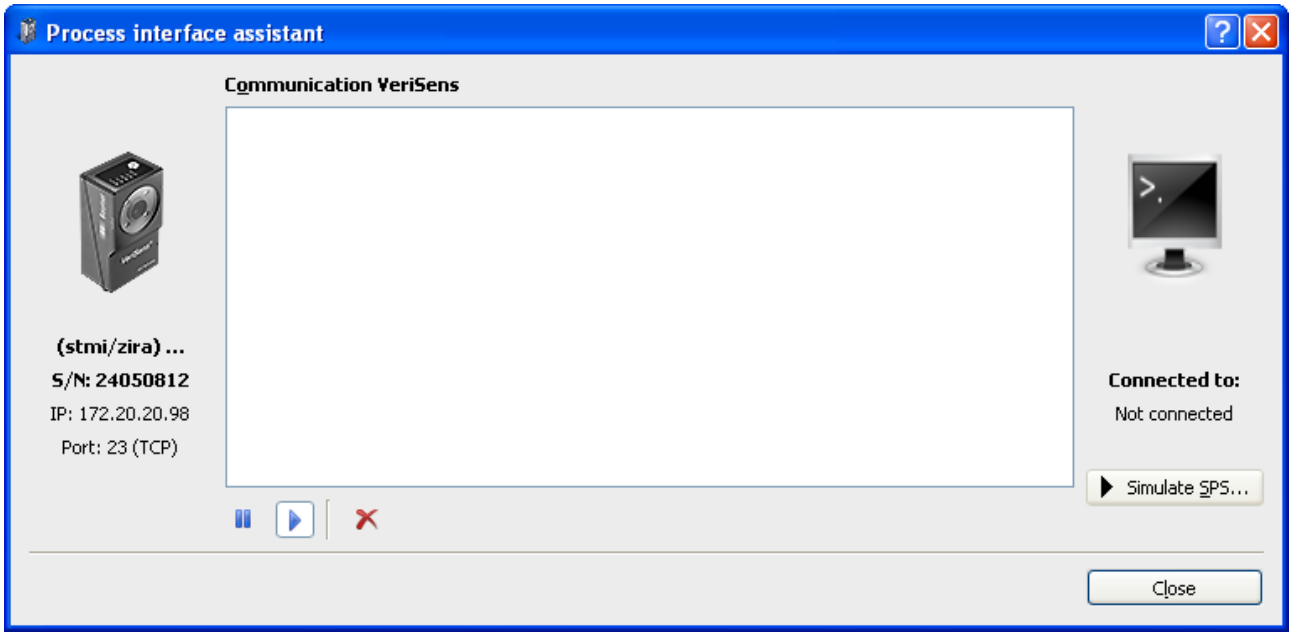
10.6 Process interface wizard (not CS-100)



You can use the process interface assistant to check what data is being sent and received via the *VeriSens*® process interface. It appears in chronological order in the *VeriSens*® *Communication field.*

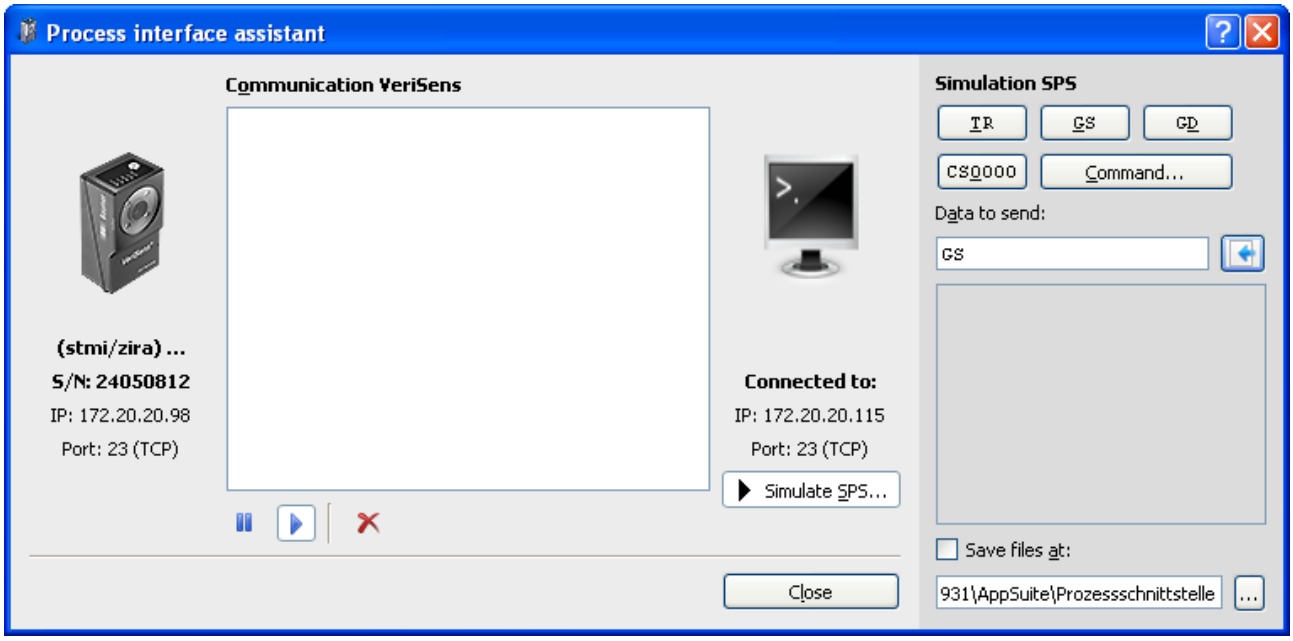
This window is updated immediately when a datagram is transferred through the process interface, regardless of whether it was sent from your SPS or PC.

You can use the corresponding buttons to pause the window, resume a paused image and delete.



You can also use this dialogue page to send commands without connecting a physical SPS.

To do this, click the *Simulate SPS* button....



On the right, you will now see buttons to select common commands, a field to amend the commands or enter your own, and a protocol field showing the data transfer for the simulation.

You can use the *Command...* button to select your chosen command from a list, and then add arguments before using the *Send* button to transfer it to the connected device.

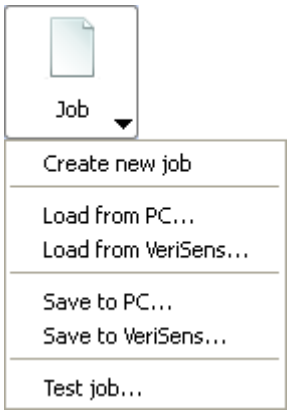
You can also access data (images, jobs, backups) and select where they should be stored. To do this, activate the *Store data at:* option.

10.7 Operating mode display

The current **operating data** of your *VeriSens*® Vision Sensor are displayed here:

- Device name
- Operating mode (*Parametrize, Activated)*

11 Job menu

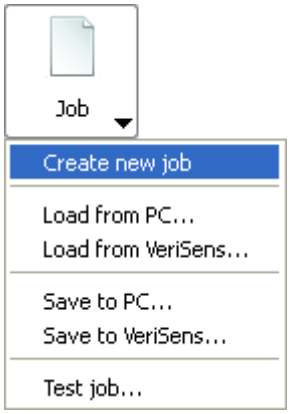


Actions are performed in this menu that affect jobs. Here you can create new jobs and load and save jobs from different sources. You can also test jobs.

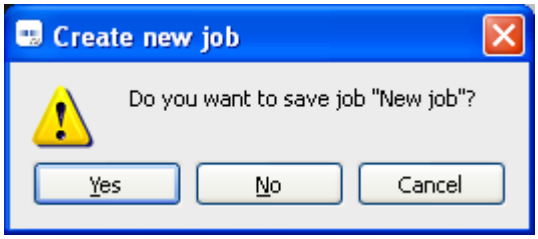
NOTE

Use job management to copy jobs between your computer and *VeriSens*®.
It is located at *Device menu → Device settings → Job management.*

11.1 Create new job



This menu option is used for creating a new job.

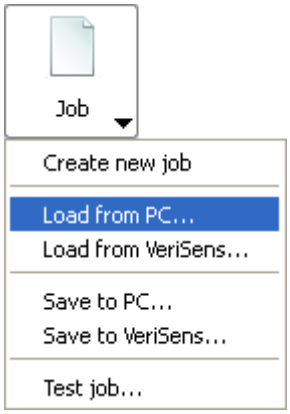


Decide whether you want to save the current job.

Give the job a name and save him.

You can now set the parameters for the job.

11.2 Load from PC



This menu option is used for loading jobs that have already been saved from the PC for processing.

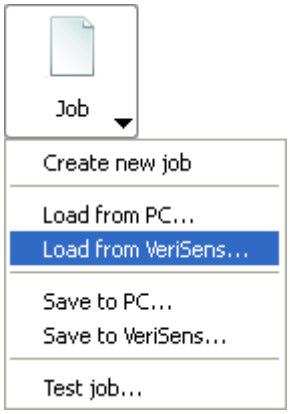
Select the saved file and click on *Open*.

NOTE

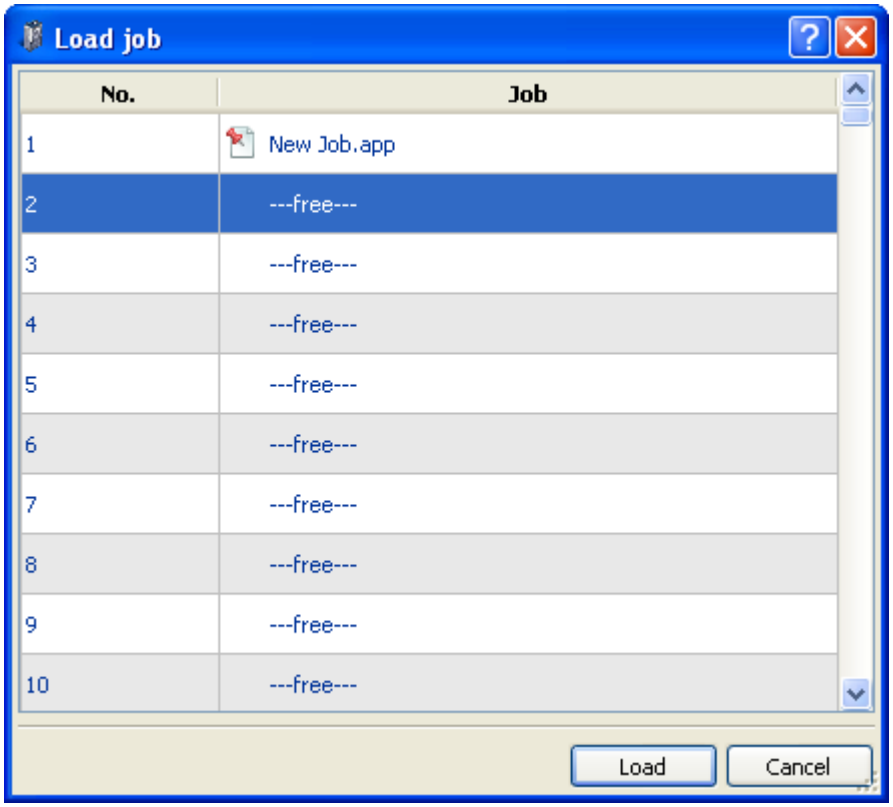
Password-protected files cannot be loaded if the password is not known!

You can now process the loaded job.

11.3 Load from *VeriSens*®



This menu option is used to load a job that has already been saved on the *VeriSens*® Vision Sensor for processing in the *Application Suite*.

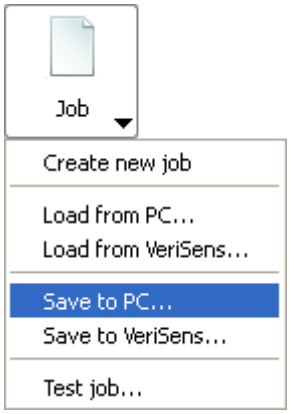


Select the job and click on *Load.*

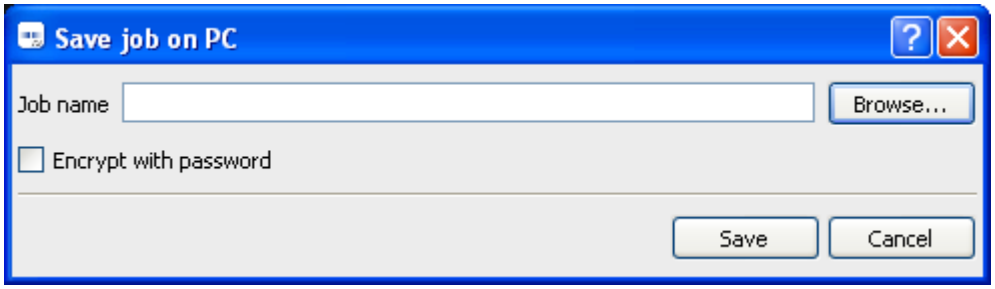
NOTE

Password-protected files cannot be loaded if the password is not known!

11.4 Save to PC



This menu option is used for save a job created with the *Application Suite* to the PC.



This dialog page is used for saving a job to your PC.

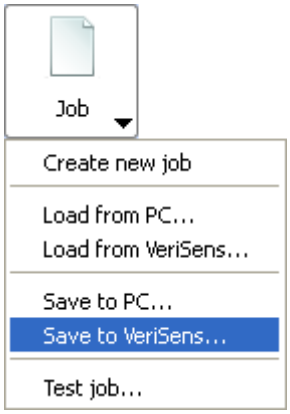
Activate the option *Encrypt with password* if the file is to be saved in protected mode.

NOTE

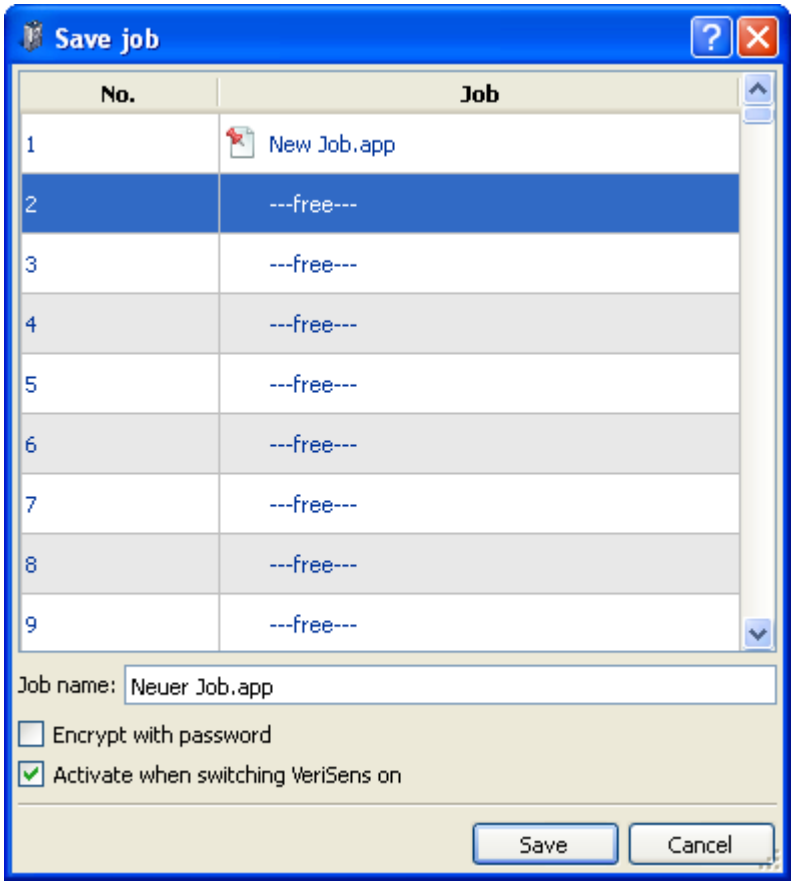
The file cannot be reloaded afterward without knowing the password!

Click on *Save* to create the file.

11.5 Save to *VeriSens*®



This menu option is used for save a job created with the *Application Suite* to the *VeriSens*® Vision Sensor.



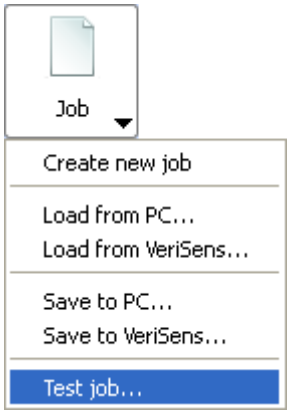
Enter a name for the job into the Job Name field and click on *Save.*

Encrypt with password Activate this option if the file is to be saved in protected mode.

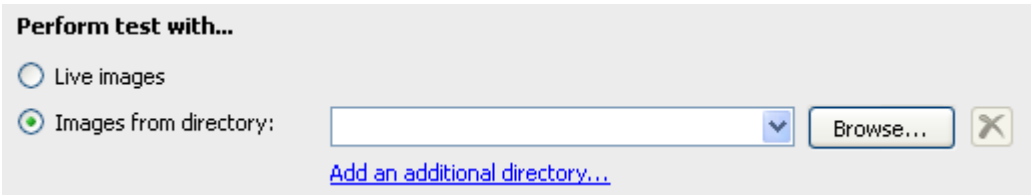
Activate when switching on VeriSens: Activate this option if you want to activate the saved job when you switch on the Vision Sensor.

This Job is active at Power on.

11.6 Test job



Here, you can test your job using live images or images from one or more sample directories.



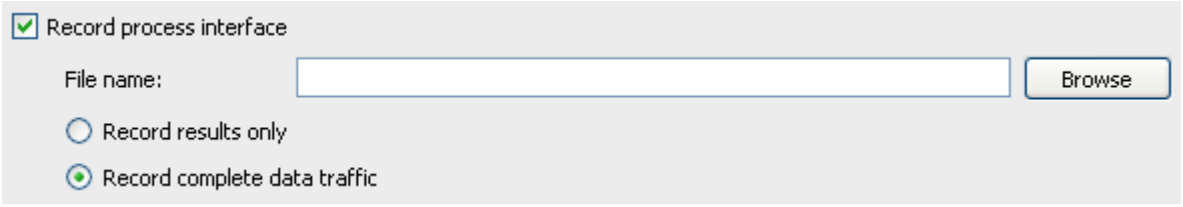
If you wish to use images from a folder for the test, you must select the appropriate folder with *Browse.*

Using *Add an additional directory…* you may add additional directories containing images to be tested. You may remove the added directories again by clicking on the X icon.

During the test you have the option of saving only certain images. This is related to the results of the sensor tasks. Choose between “NOK only, OK only and All".

Specify the directory where the pre-selected images will be saved by using *Browse*.

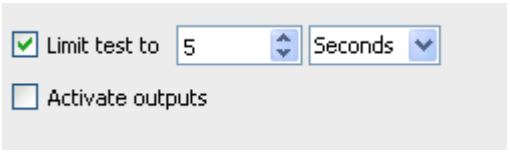
Give a name to the image series to be recorded.



You have the option of recording the output of the process interface. Select a directory using *Browse* to determine where the file will be saved.

Record results only: If you only want to save the actual result data, select this option.

Record complete data traffic: Check this option if you want to record all data traffic. Here all data that is actually transferred is recorded and the file will remain empty if no data is transferred!



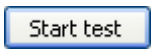
You can limit the duration of the test. Select a value and choose between seconds and images. You can also activate or deactivate the outputs.

NOTE

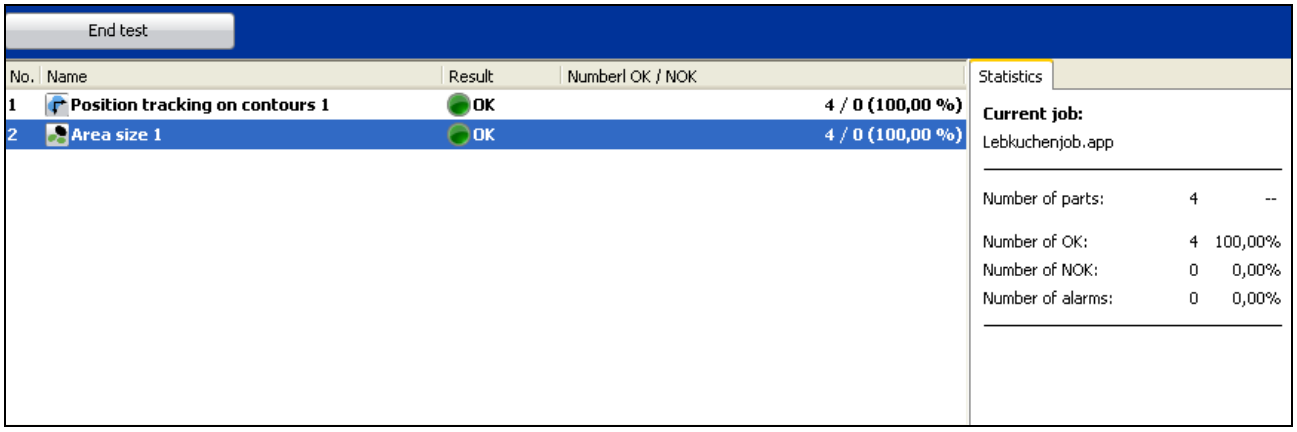
If you do not limit the test sequence you may terminate the test at any time using the *Finish* button.

ATTENTION!

If your vision sensor is already integrated in your machine, it is often advisable to deactivate the outputs during the first tests to avoid incorrect behavior of your machine.



The test is activated with the *Start test* button. In the list of features you will see the current results of the sensor tasks and the statistics window will give an overview of the results.

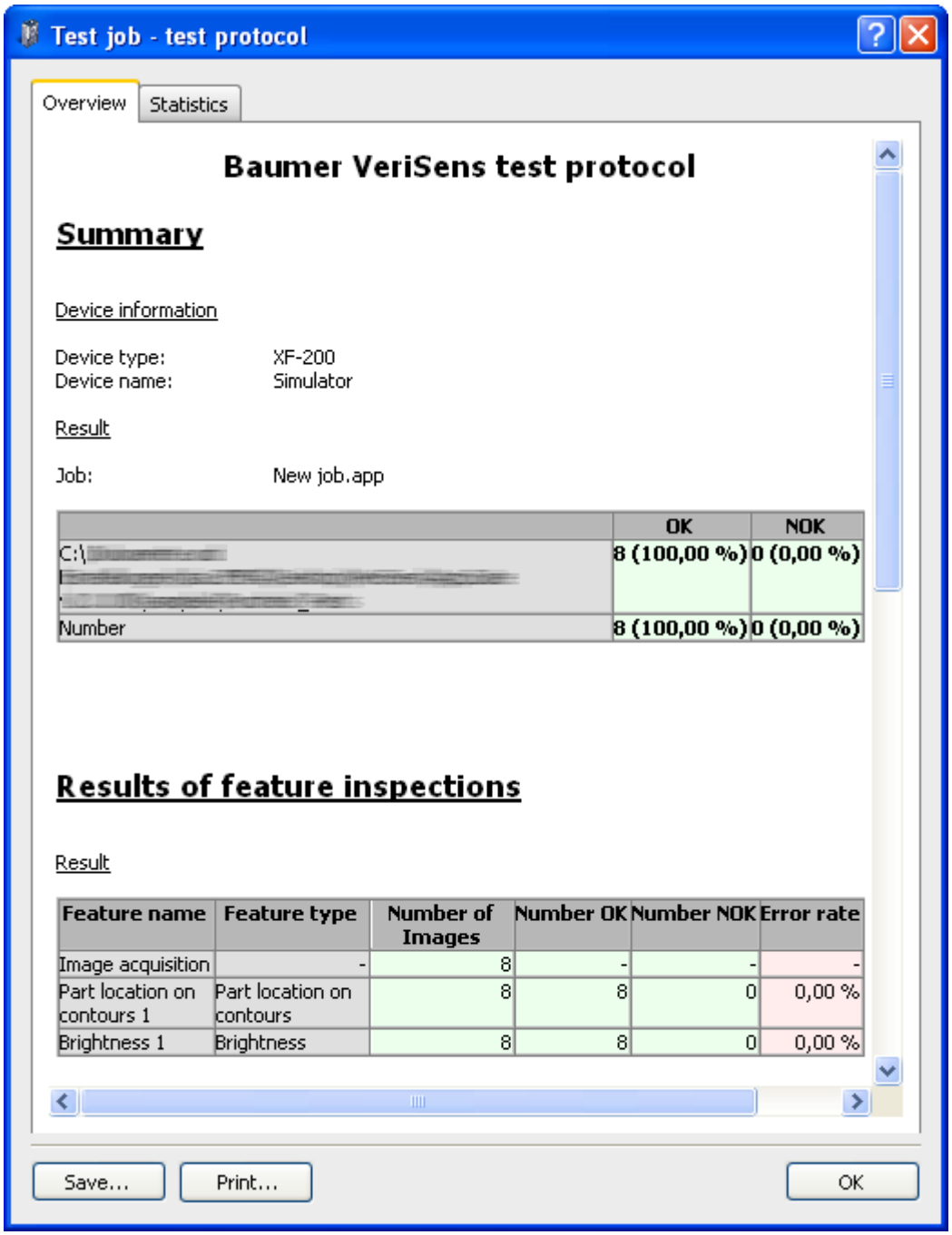


Click on *End test* when you want to end the test.

11.6.1 Test Protocol – Overview

When the test has been completed, the results are displayed in a test protocol, which you can save and print.

When you have completed the the test wie pictures from different directories, in the test protocol are indicated in different colors.

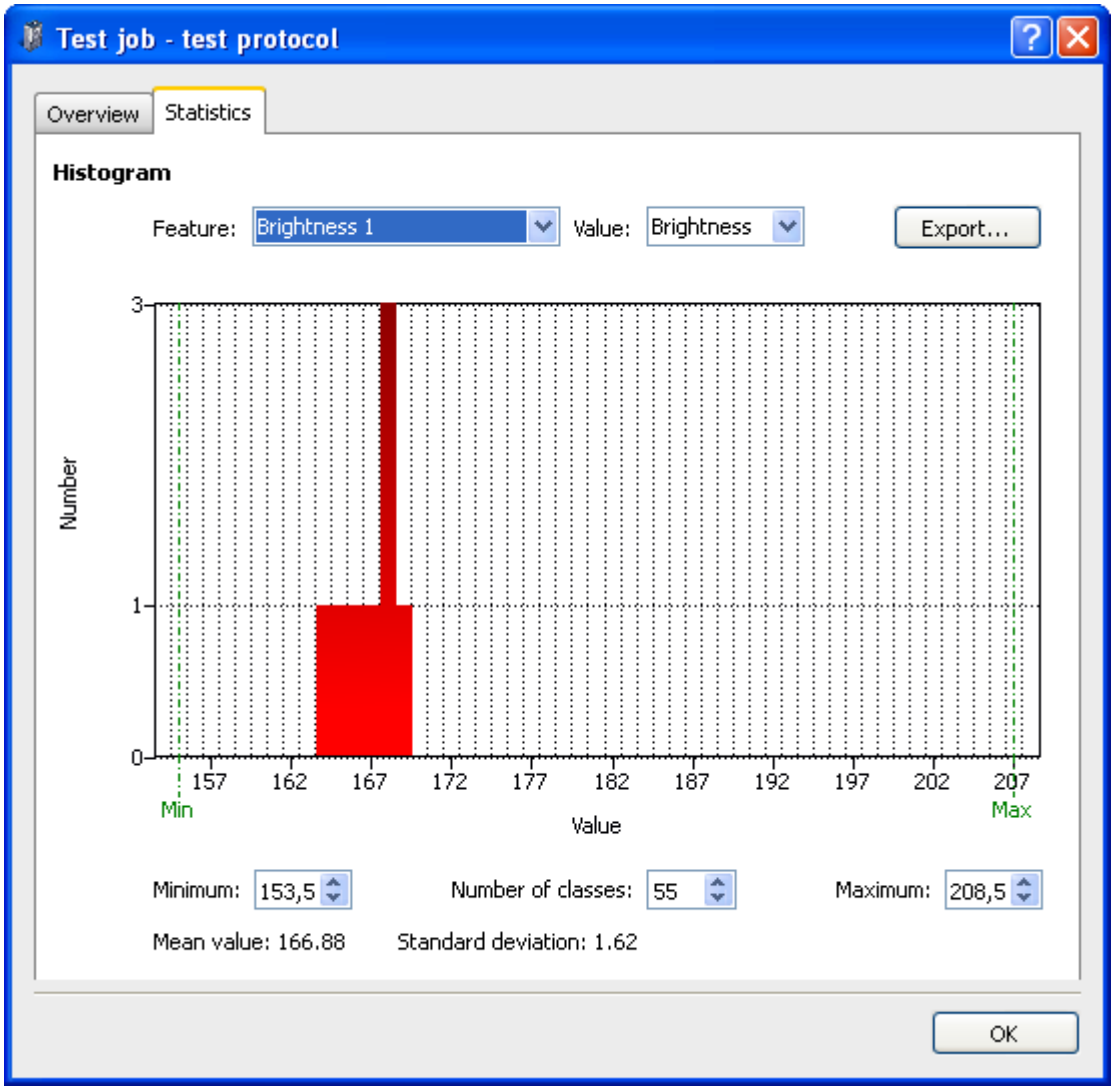


11.6.2 Test Protocol – Statistic

On the Statistics tab, you can even evaluate the job just tested using its individual feature checks according to various criteria. The results are displayed graphically using a histogram.

The currently displayed result can be exported as a *.csv or *.txt file.

Under *Feature,* select the feature of the tested job or the entire job (number of OK/NOK) to be evaluated. Under *Value,* you may evaluate the numerical results of the feature check (the angle of the object's rotation in the event of a part location).

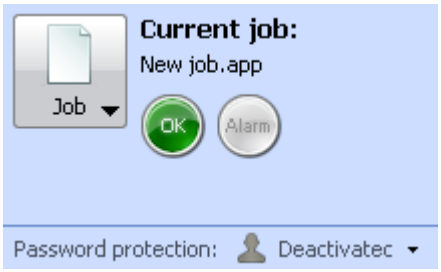


Minimum: Set the minimum of the range of values here.
Number of classes: You can set the scaling between the Minimum and Maximum here.
Maximum: Set the maximum of the range of values here.

If you move the mouse pointer over the histogram, a tool tip appears containing the values of the current mouse pointer position.

The average and the standard deviation of the evaluation are displayed in the lower region.

11.7 Result and user display



The current **job information** of your *VeriSens*® Vision Sensor is displayed here: The information consists of:

- Job name
- OK, NOK or Alarm
- Currently logged-in user (only XF-100 / XF-200 / ID-100 / XC-100 / XC-200)

12 Sensor tasks

All feature checks are described below. Note that not all feature checks are supported by all devices.

Please see the *Correct use* section for information as to which devices support which feature checks.

NOTE

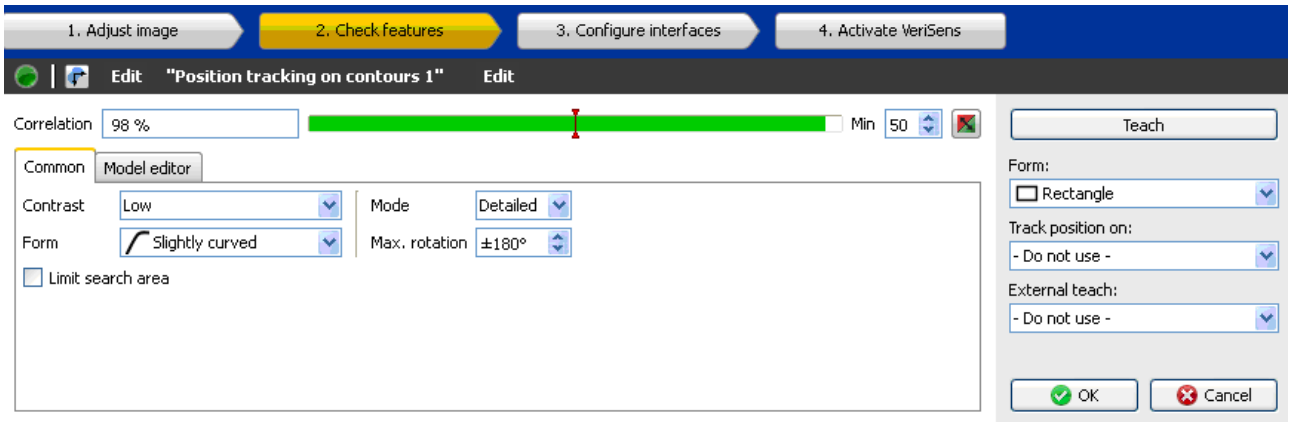
The *Application Suite* CD features a range of application examples that provide you with typical solutions for various jobs and for the use of the individual sensor tasks. After successful installation, the examples can be found in the subdirectory:

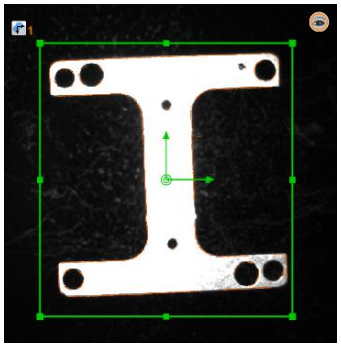
`\Programme\Baumer\VeriSens Application Suite\AppSuite\Samples`

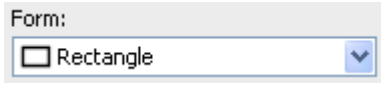
of your PC.

12.1 Part location on contours

With this sensor task, the position of an object is determined using contours.



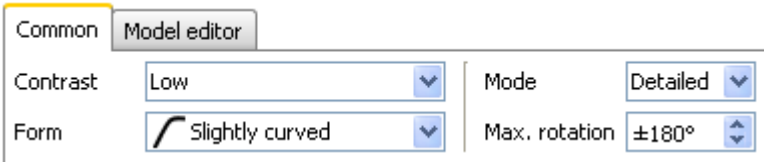




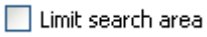
- Choose the shape of the area from which the contours are adopted.

Adopt the contours by pressing *Teach*. A search is then made for the object in the entire image.

- The match of the contours with the found object in the image is displayed here.
- Using the appropriate switching points, set how good the match must be so that the object is found. The button on the extreme right inverts the set point.

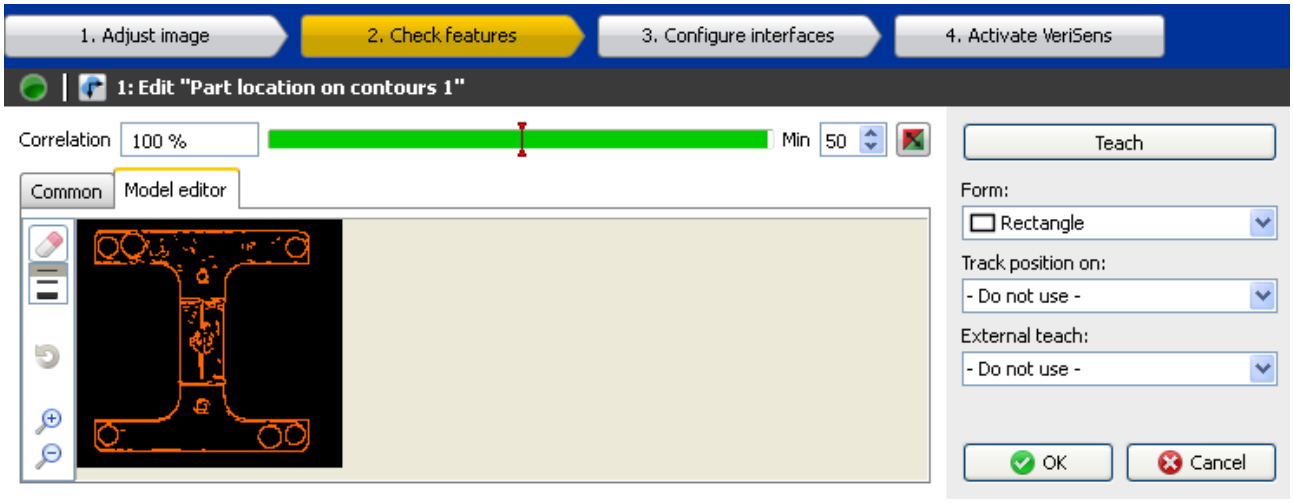


- **Contrast:** Set the minimum contrast of the contours that should be adopted in the model.
- **Form:** Select the shape of the contour that corresponds to the test object and that should be adopted in the model.
- **Mode:** Set the amount of detail to be used in the inspection. (The more detailed the mode, the higher the computation time.)
- **Max. rotation:** If you want to find the object only in a limited angular range, you may specify the maximum rotational position here. (Limiting the angular range reduces computing time.)



- If you do not wish to search for the object in the entire image, set the tick and then limit the search area.

Model editor tab



- With the displayed model, you can now use the mouse to delete contours which clearly do not belong to the reference object.

- Use this button to restore the model to its original state.

- You can use these two buttons to enlarge or reduce the model.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel*.

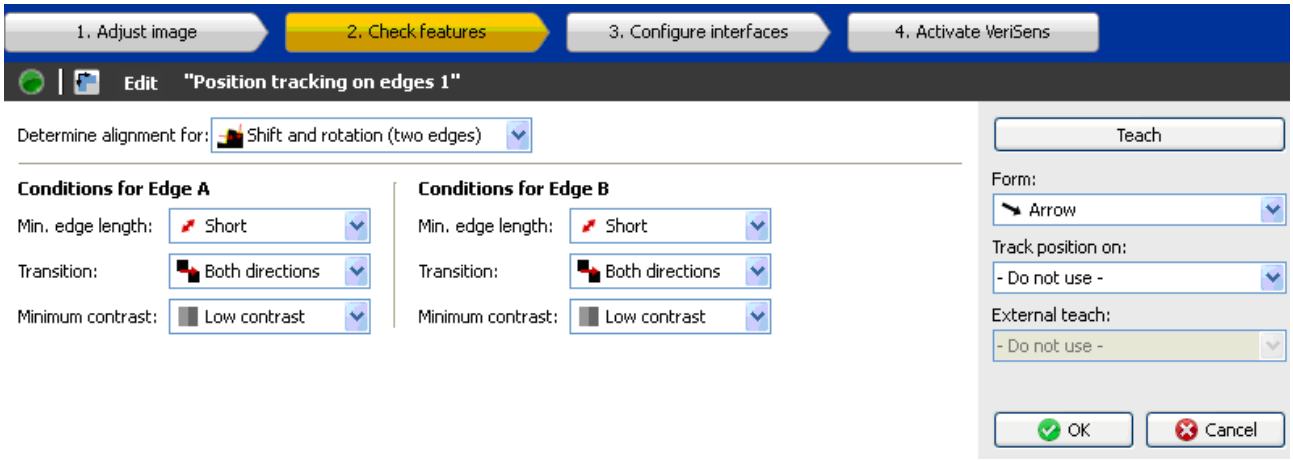
This sensor task has the following output values for the datagram at the process interface:

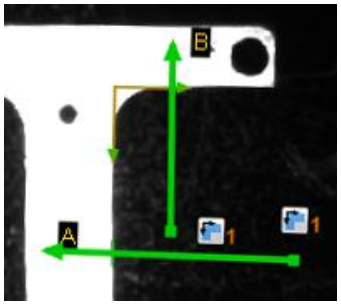
Output value	Data type	Description
Result	”P“ (Pass); “F“ (Fail)	Result of the sensor task
Center of object	X – *separator* – Y (Float-Point)	Position of the object in the image (px)
Angle of object’s rotation	Number (Float)	Angle of the object (degrees)
Conformity	Number (Integer)	Match of the model (%)

12.2 Part location on edges

This sensor task localizes an object using edges. The detected position is used as a reference for the subsequent sensor tasks. In this way, tilted or displaced objects can also be examined. All working areas and search beams for which part location is activated are corrected according to the current position of the test object.

This sensor task does not support external teach-in. If a teach-in procedure is still executed, the parameters set will be maintained.

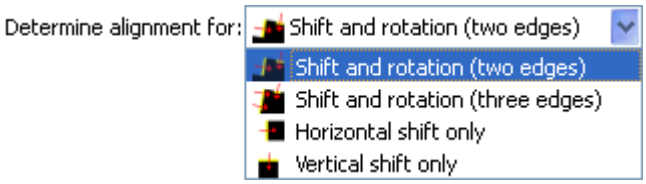




In this example, two edges of a test object are found, with a horizontal and a vertical search line, and the reference point for part location is determined at the intersection of the detected edges.

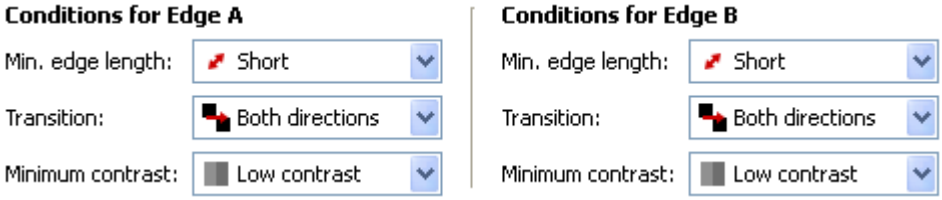
- If you wish to change the reference position of the part location, press the ***Teach*** button and the new position will be adopted.

Set the parameters of the part location as follows:



-
- **Determine alignment for:** Select the type of part location. You can determine either offset and rotation on two edges, offset and rotation on three edges, only horizontal or only vertical offset. A shorter computing time is required with fewer edges.

- Depending on whether you wish to align to one or two edges, you must then draw the search lines directly in the image using the mouse. Hold the left mouse button depressed during this.
- Position the search lines such that the sought contour is intersected as closely as possible to the middle. The first contour is detected which intersects the search line along the search axis. You can correct the positioning at any time.
- With long edges it is advisable to search the main reference edge with two search lines.



Enter the criteria:

- **Min. edge length:** You must also specify whether a short, medium or long edge is to be sought. Using User defined, you may manually enter the length of an edge (5-1000 pixels)**.**
- **Transition:** For each edge, you must specify whether the edge progresses from bright to dark or from dark to bright.
- **Minimum contrast:** Specify whether you are searching for an edge with sharp or weak contrast.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel*.

This sensor task has the following output values for the datagram at the process interface:

Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Center of object	X – *separator* – Y (Float-Point)
Angle of object´s rotation	Number (Float)
Edge A	1. Start point X – *separator* (Float) 1. Start point Y – *separator* (Float) Rising of edge Δx – *separator* (Float) Rising of edge Δy – *separator* (Float)

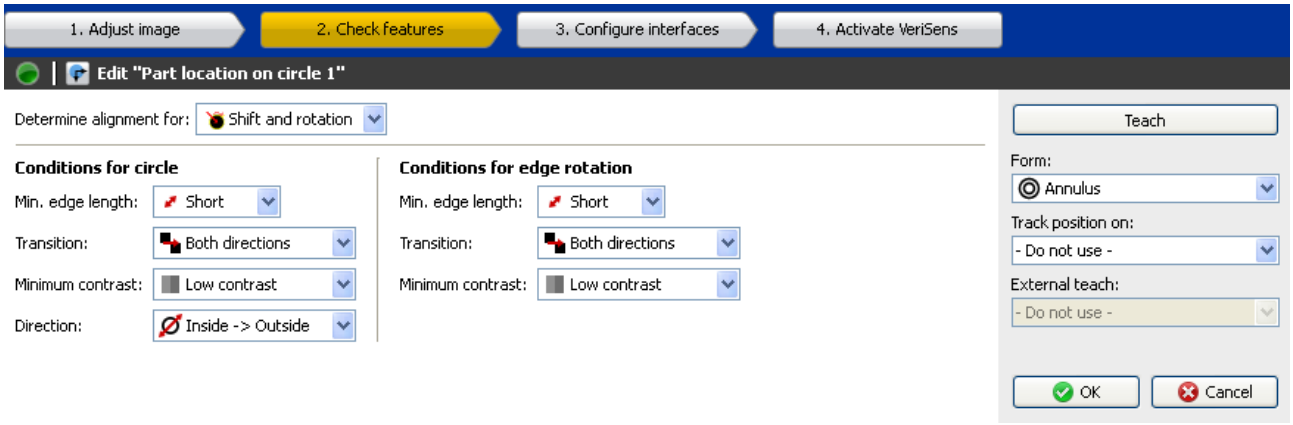
Output value	Data type
Edge B	1. Start point X – *separator* (Float) 1. Start point Y – *separator* (Float) Rising of edge Δx – *separator* (Float) Rising of edge Δy – *separator* (Float)

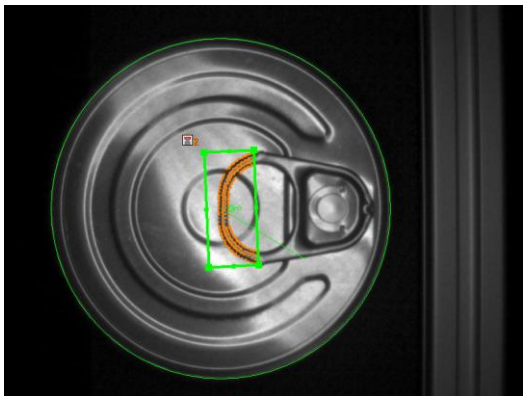
12.3 Part location on a circle

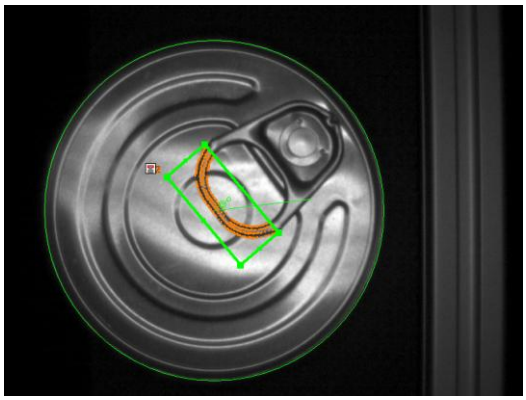
With this sensor task, you can align a round object with regard to its center. It is also possible to correct the angle of rotation on the basis of an edge along the object.

In this example, the shape of the ring-pull on a drinks can is examined. The angle of rotation is determined and corrected by the soft sensor “Part location in a circle”.

This sensor task does not support external teach-in. If a teach-in procedure is still executed, the parameters set will be maintained.

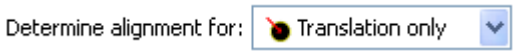




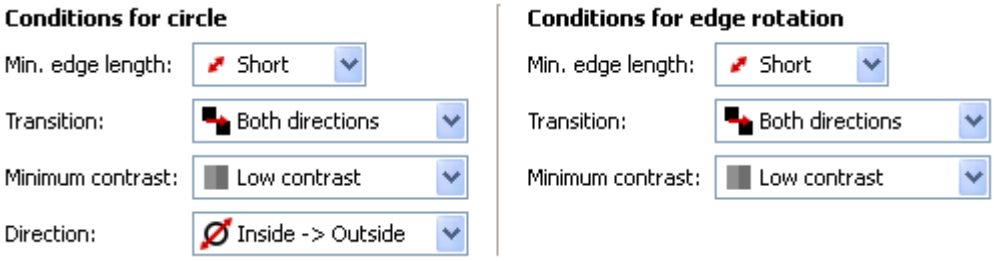


Set the parameters for part location on a circle as follows:

- Select the shape of the working area. A circular ring and a circular ring sector can be chosen.
- Draw the inner and outer reference circles with the mouse.
- The inspection of a circle is always conducted along the individual segments from circle A to circle B and in the direction indicated by the blue arrows.
- Adjust the edge length, transition type and contrast until the circle is reliably detected.



- Select the type of part location. You can either search for a circle and thereby compensate displacement or also detect rotation of the object by an edge in close proximity.
- Draw the arc with the mouse to search for the associated edge.



Enter the criteria:

- **Min. edge length:** You must also specify whether a short, medium or long edge is to be sought. Using User defined, you may manually enter the length of an edge (5-1000 pixels)**.**
- **Transition:** For each edge, you must specify whether the edge can progress from bright to dark or from dark to bright or in both directions.
- **Minimum contrast:** Specify whether you are searching for an edge with sharp or weak contrast.
- **Direction:** Select the direction of the search

- If you wish to change the reference position of the part location, press the ***Teach*** button and the new position will be adopted.

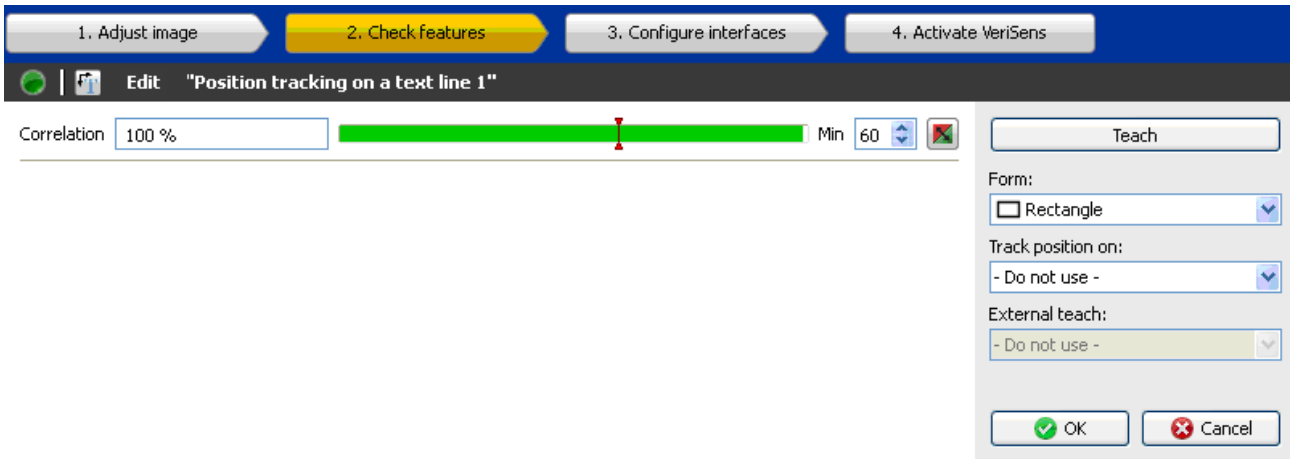
- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*.

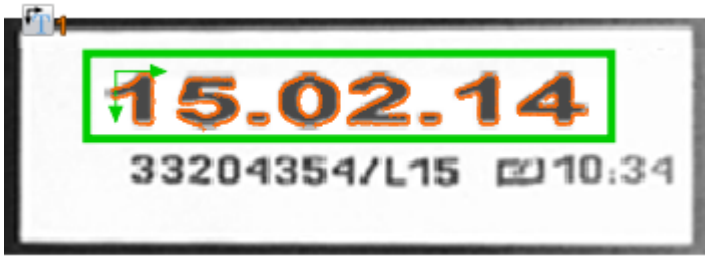
This sensor task has the following output values for the datagram at the process interface:

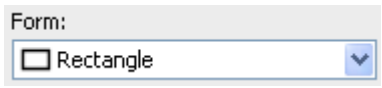
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Circle center	X – *separator* – Y (Float-Point)
Circle diameter	Number (Integer)
Edge (for rotation correction)	1. Start point X – *separator* (Integer) 1. Start point Y – *separator* (Integer) Rising of edge Δx – *separator* (Integer) Rising of edge Δy – *separator* (Integer)

12.4 Part location on text line

With this sensor task, the position of the text within a working area can be determined. To do this, the working area must be positioned roughly parallel to the text with deviations of +/-15 degrees being tolerated . The background of the text should be homogeneous to achieve a stable analysis. The position found can then be used to align other sensor tasks, for example, the "Text" sensor task.







- The conformance of the current object with the taught-in model is displayed directly. You can set the associated switching point in the graphic display.
- The button on the extreme right inverts the set point.
- The switching point *Min* can also be edited manually.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel*.

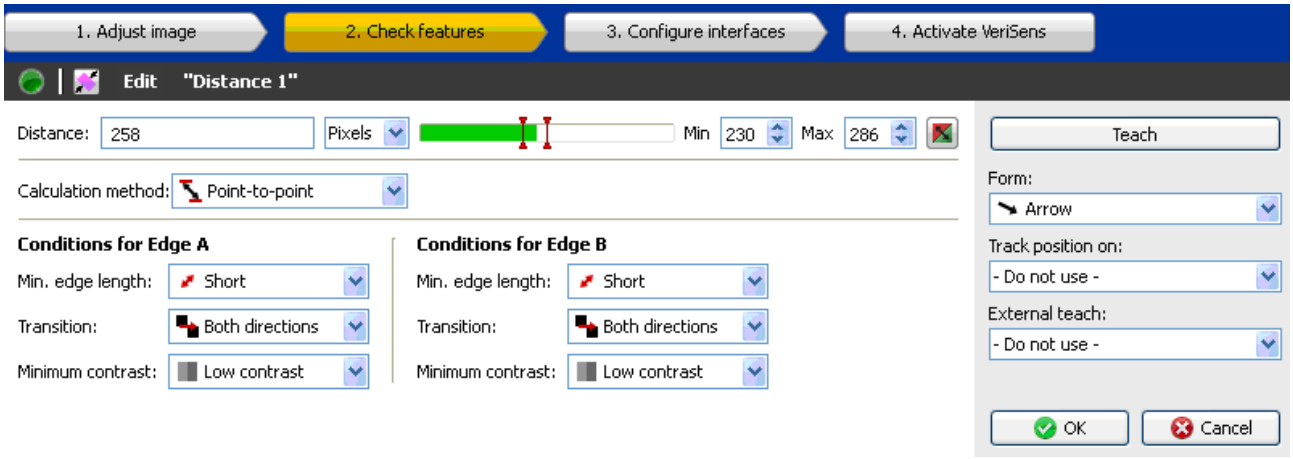
This sensor task has the following output values for the datagram at the process interface:

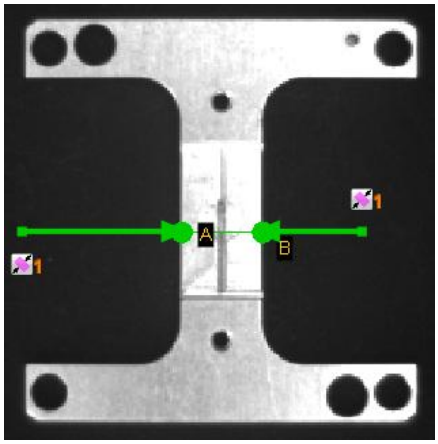
Output value	**Data type**	**Description**
Result	“P” (Pass); “F” (Fail)	Result
Conformity	Number (Integer)	Match between the current object and the taught-in model (%)
Text position	X – *separator* – Y (Float-Point)	
Text angle	Number (Float)	

12.5 Distance

This sensor task determines the distance between two points, the right angular distance between two points and the distance of an edge in relation to a reference edge (a taught-in edge) and compares the distance found with the associated switching points.

This sensor task supports external teach-in. The switching points are adjusted as a percentage to the current measured value.

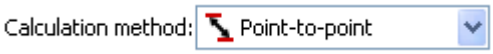




- Select the shape of the working area. A search line and an arc can be chosen.
- Adjust the working area by holding the left mouse button depressed.

In this example, two points on a test object are detected with one search line each. The distance between the intersections is indicated directly in the display.

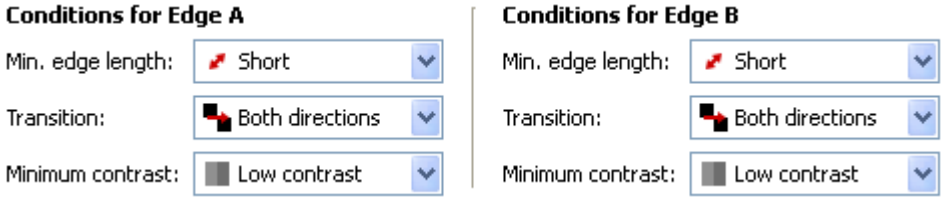
- The current result is displayed directly in the dialog as the distance. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



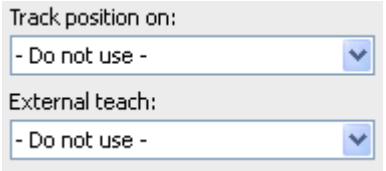
Select the computation method.

- **Point-to-point:** Distance between two points
- **Rectangular distance:** Right angular distance between two points
- **To reference:** Distance to a reference edge
- **Edge to circle:** distance from one edge to the center of a circle
- **Circle to circle:** distance between the centers of two circles

- Click on Teach to retrain a new reference.



- **Min. edge length:** With short, medium or long, select the anticipated length of the sought contour to achieve a consistent result Using User defined, you may manually enter the length of an edge (5-1000 pixels)**.**
- **Transition:** For each edge, you must specify whether the edge progresses from bright to dark or from dark to bright.
- **Minimum contrast:** Specify whether you are searching for an edge with sharp or weak contrast.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

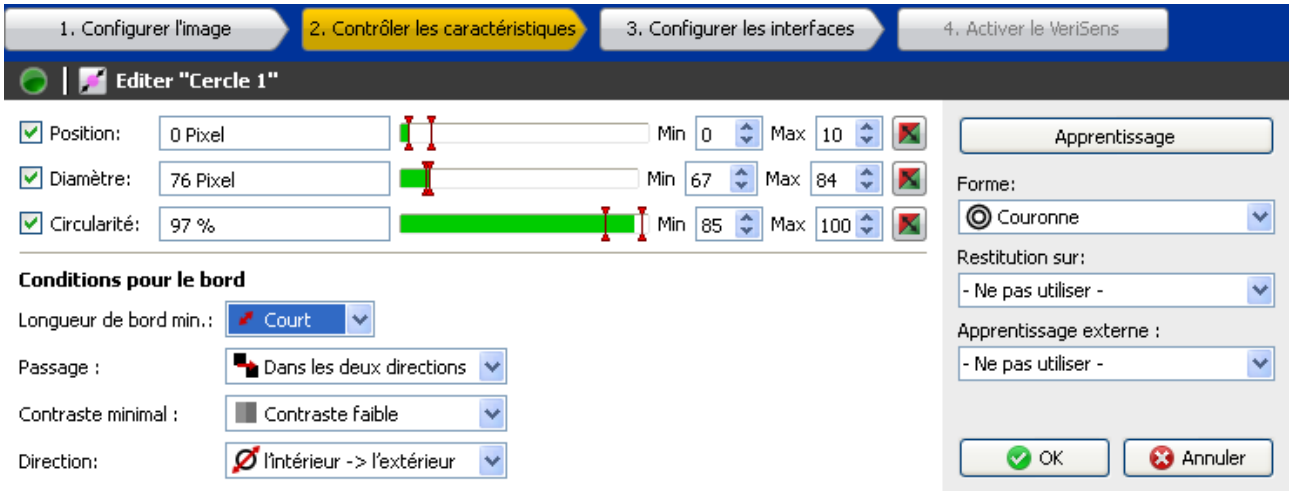
This sensor task has the following output values for the datagram at the process interface:

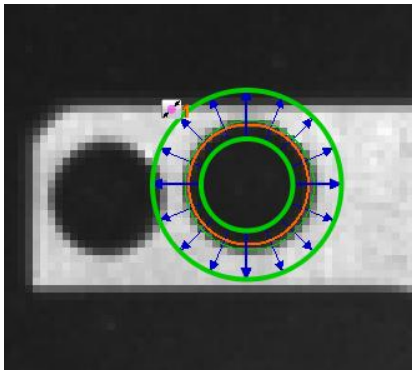
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Distance	Number (Float)

12.6 Circle

This sensor task determines the position, the diameter and the circularity of a circle in comparison to a reference circle that is taught in. The search area for a circle is defined by selecting a minimum inner circle and a maximum outer circle. Both the position and the diameter of the detected circle are compared with switching points.

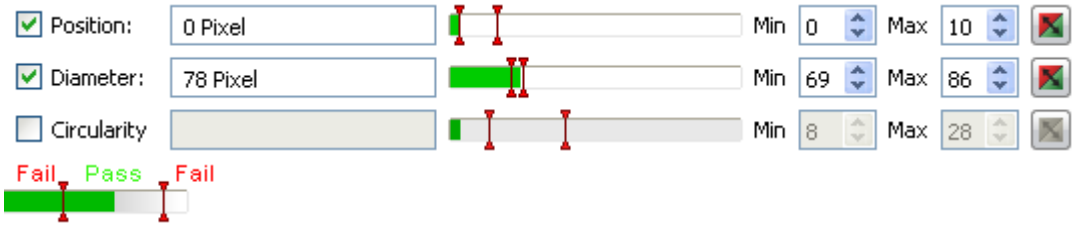
This sensor task does not support external teach-in. The switching points for the diameter are adjusted as a percentage to the current measured value. The thresholds for the distance remain unchanged as the newly programmed circle is adopted as a reference and the distance reverts to zero.





- Select the shape of the working area. A circular ring and a circular ring sector can be chosen.
- Adjust the working area by holding the left mouse button depressed.

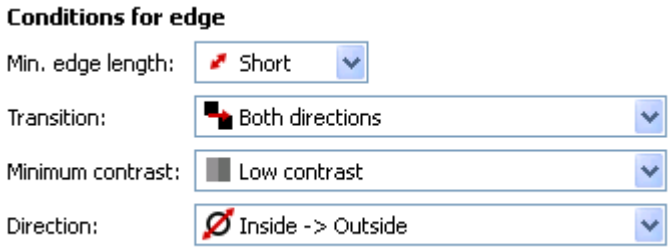
In this example, the diameter, position and circularity of a hole are determined by measuring from the outer circle towards the inner circle. Both results appear directly on the display.



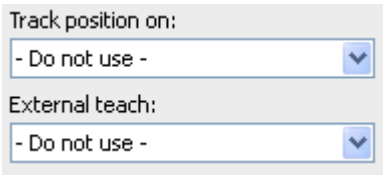
- **Position:** Determine the switching points of the position.
- **Diameter:** Determine the switching points for the diameter.
- **Circularity:** Determine the switching points of the circularity.

The right button is used to invert the result of the sensor task.

- If you wish to change the reference position of the center of the circle, simply press the **Teach** button and the new position will be adopted.



- **Min. edge length:** With short, medium long or user defined, select the anticipated length of the sought contour to achieve a consistent result. Using User defined, you may manually enter the length of an edge (5-1000 pixels)**.**
- **Transition:** For each edge, you must specify whether the edge progresses from bright to dark or from dark to bright.
- **Minimum contrast:** You can also specify whether you are searching for an edge with sharp or weak contrast.
- **Direction:** Select the direction of the search.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

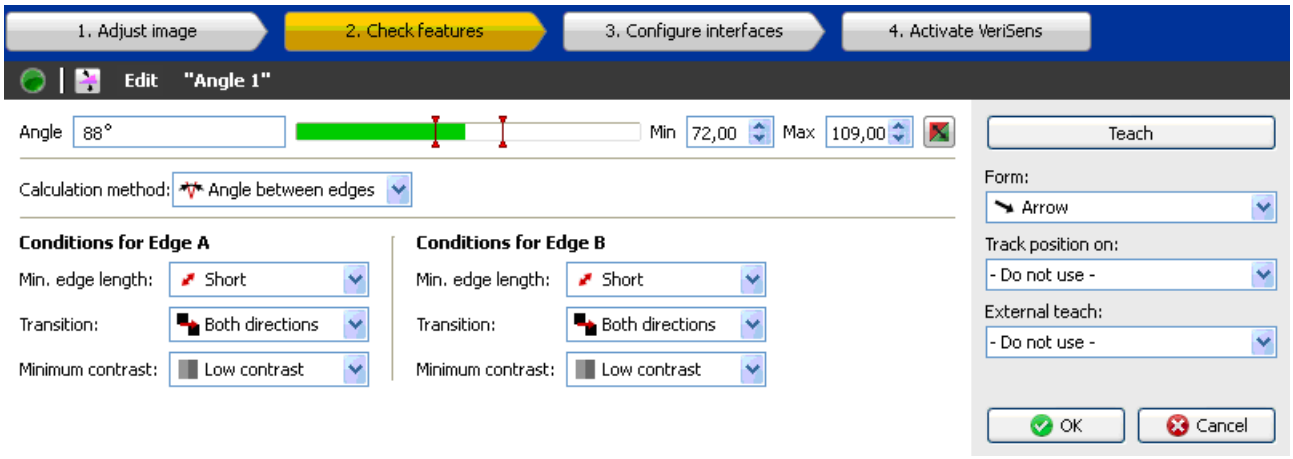
This sensor task has the following output values for the datagram at the process interface:

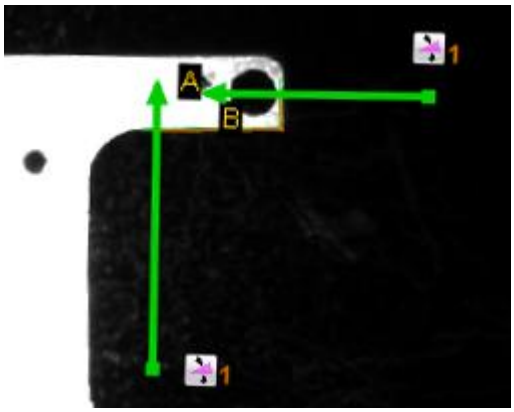
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Circle center	X – *separator* – Y (Float-Point)
Circle diameter	Number (Float)
Distance of the center to the reference	Number (Float)
Difference of the diameter to the reference	Number (Float)
Circularity	Number (Integer

12.7 Angle

This sensor task determines the angle between two edges or to a reference. The angle is compared with the associated switching points.

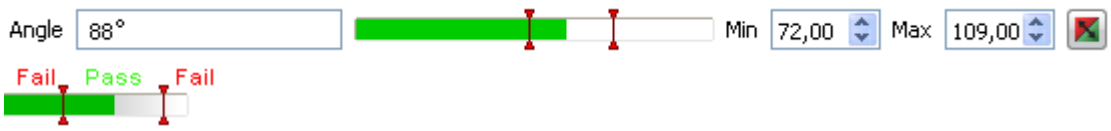
This sensor task does not support external teach-in. The switching points are adjusted as an absolute to the current measured value.





- Select the shape of the working area. A search line and an arc can be chosen.
- Adjust the working area by holding the left mouse button depressed.

In this example, the angle between two vertical edges of a test object is determined by one horizontal and one vertical search line each. The angle between the detected edges is indicated directly in the display.



- The current result is displayed directly in the dialog as the angle. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.

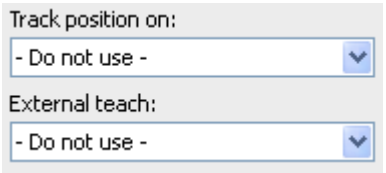
Select the computation method.

- **Angle between edges:** Angle between two edges
- **Angle to reference:** Angle to a reference edge

- You can teach in a new reference with this button.

Set the parameters of the sensor as follows:

- **Min. edge length:** With short, medium or long, select the anticipated length of the sought contour to achieve a consistent result. Using User defined, you may manually enter the length of an edge (5-1000 pixels)**.**
- **Transition:** For each edge, you must specify whether the edge progresses from bright to dark or from dark to bright.
- **Minimum contrast:** You can also specify whether you are searching for an edge with sharp or weak contrast.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.
-

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

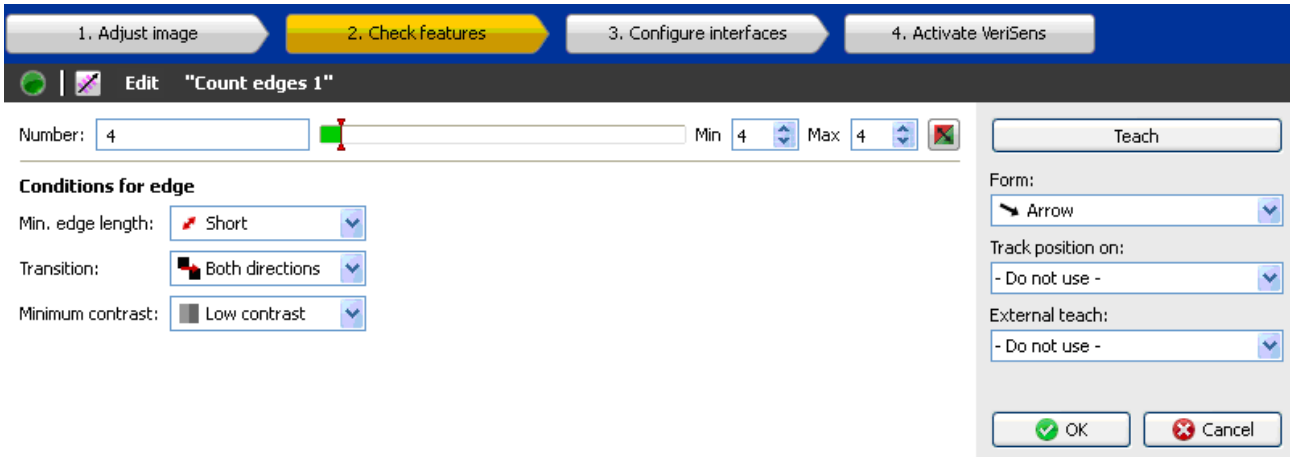
This sensor task has the following output values for the datagram at the process interface:

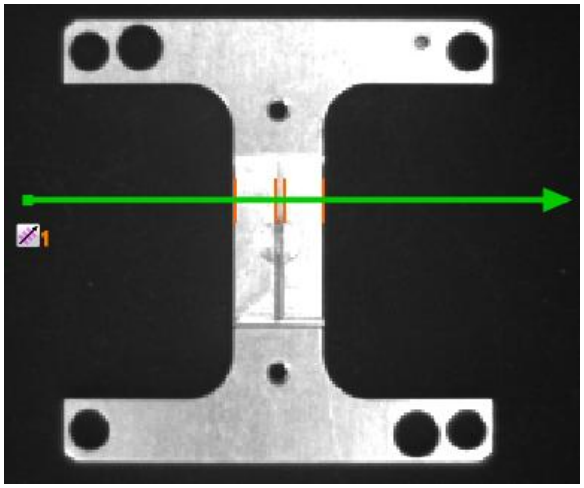
Output value	Data type
Result	“P” (Pass); “F” (Fail)
Angle	Number (Float)

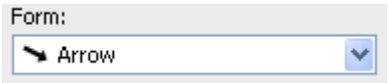
12.8 Count edges

This sensor task inspects the number of edges along a search beam.

This sensor task does not support external teach-in. The switching points are adjusted as an absolute to the current measured value.







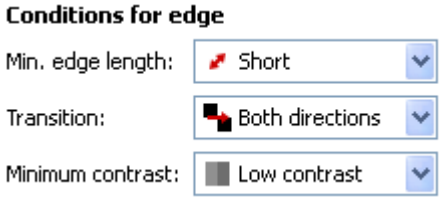
- Select the shape of the working area. A search line and an arc can be chosen.
- Adjust the working area by holding the left mouse button depressed.

In this example, the edges of a test object are detected at both the bright/dark and the dark/bright transitions. The number of detected edges is indicated directly in the display in *Number*.

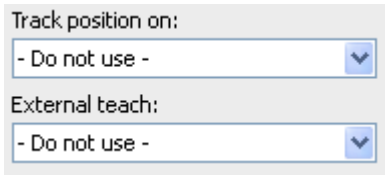
- The current result is displayed directly in the dialog as the *Number*. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.

Set the parameters of the sensor as follows:

- Position the search line by holding the left mouse button depressed in the image.



- **Min. edge length:** With short, medium or long, select the anticipated length of the sought contour to achieve a consistent result. Using User defined, you may manually enter the length of an edge (5-1000 pixels)**.**
- **Transition:** For each edge, you must specify whether the edge progresses from bright to dark or from dark to bright.
- **Minimum contrast:** You can also specify whether you are searching for an edge with sharp or weak contrast.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

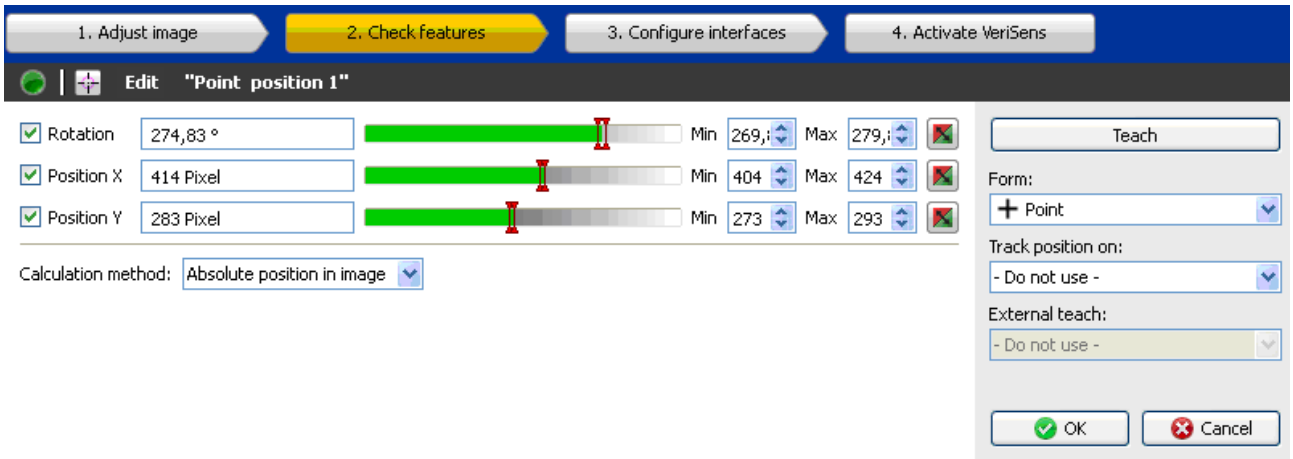
This sensor task has the following output values for the datagram at the process interface:

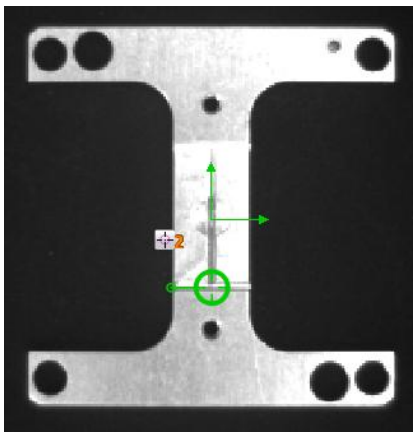
Output value	Data type
Result	“P” (Pass); “F” (Fail)
Number of edges	Number (Integer)

12.9 Point position

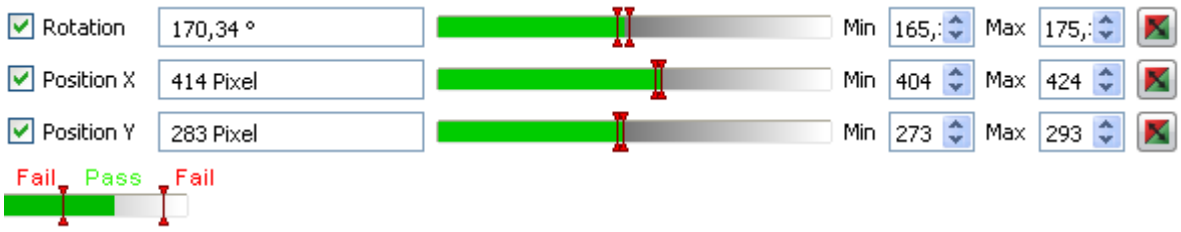
This sensor task determines the position and rotational position of a point, as an absolute in the picture or relative to a reference. It is therefore advisable that it is only used with part location. This sensor task can, e.g. be used to determine the grasp position for robots (pick and place).

This sensor task supports external teach-in. The switching points are adjusted as a percentage to the current measured value.





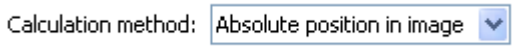
- Set the point on the position to be determined. You may need to rotate it with the lever.



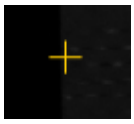
Select the features that should be checked.

- **Rotation:** Determine the switching points of the rotation.
- **Position X:** Determine the switching points of the X position.
- **Position Y:** Determine the switching points of the Y position.

The right button is used to invert the result of the sensor task.



- **Calculation method:** Absolute position in image (If you set this, you will get the coordinates of this point.) Relative to reference (show the deviations to the teached point.)



The reference point set using Teach-in is identified with a cross.

- Here, select the part location with which the sensor task should be corrected.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*.

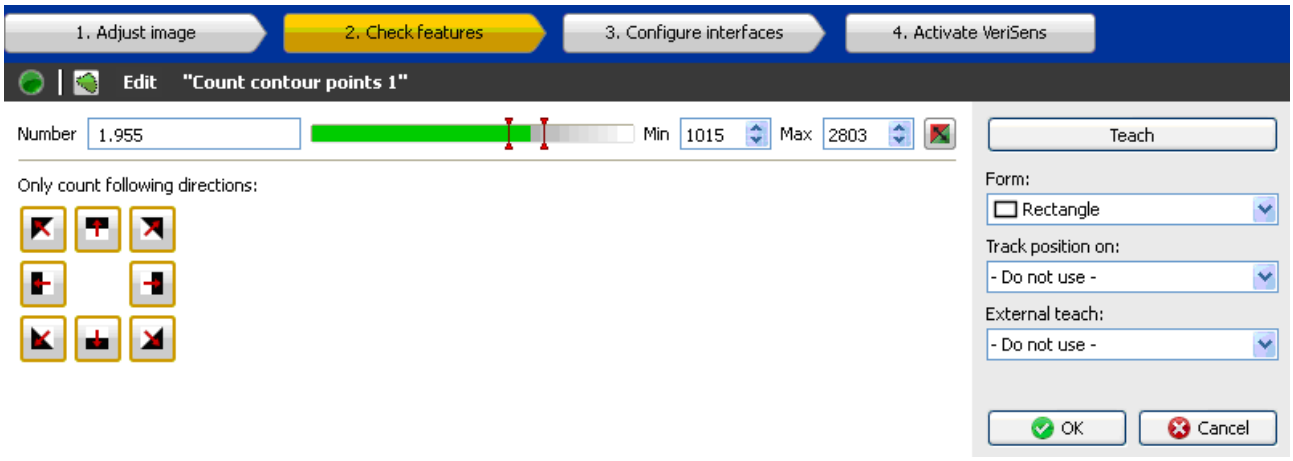
This sensor task has the following output values for the datagram at the process interface:

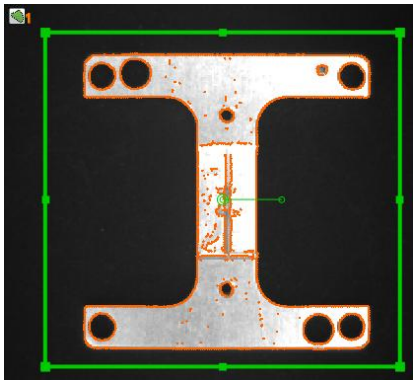
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Rotation	Number (Float)
Position X	Number (Float)
Position Y	Number (Float)

12.10 Count contour points

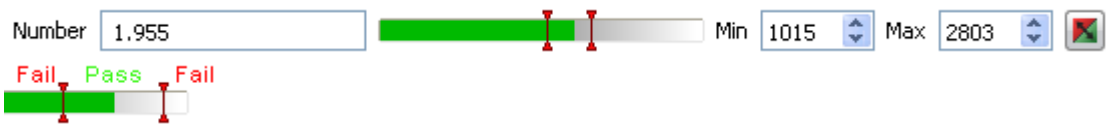
This sensor task examines the number of contour points within the working area.

This sensor task supports external teach-in. The switching points are adjusted as a percentage to the current measured value.

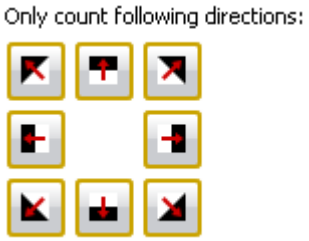




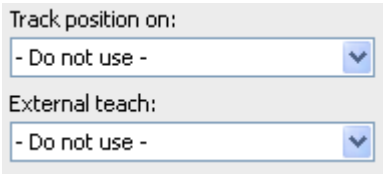
- Choose the shape of the working area in this menu.



- The current result is displayed directly in the dialog as the *Number*. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- Determine the direction of the contour points that should be taken into consideration.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

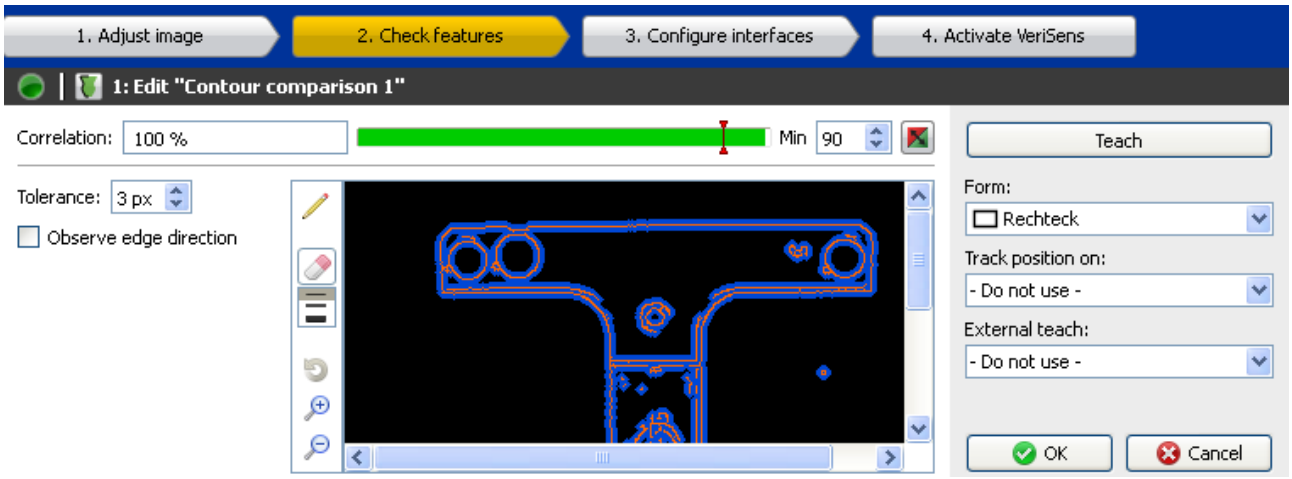
This sensor task has the following output values for the datagram at the process interface:

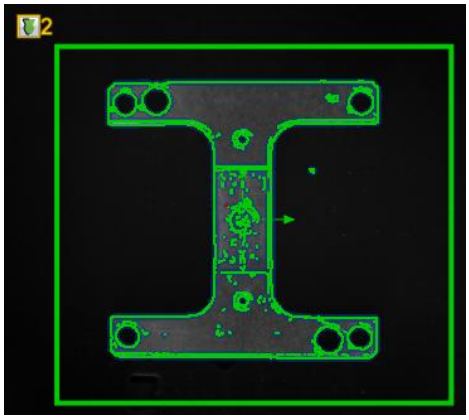
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Number of contour points	Number (Integer)

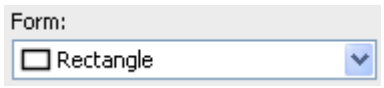
12.11 Contour comparison

This sensor task compares the contour of a taught-in object with the contour of the current object. In the comparison, adjacent pixels are counted and correspondence is determined on the basis of switching points. To use this sensor task to its best effect, it is highly advisable to combine it with part location.

This sensor task does not support external teach-in. Here all of the contours will be adopted in the model, but the switching points remain unchanged.

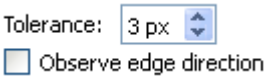






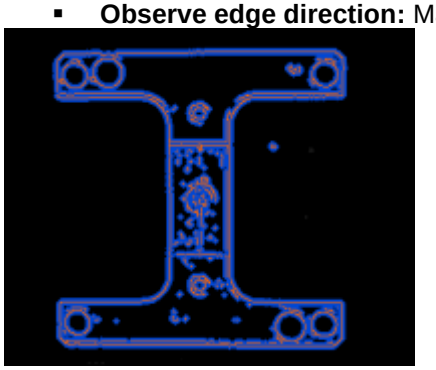
- The working area must firstly be defined.

- The corresponding object is then taught in.



- **Tolerance:** Now adjust the size of the pixel field in which a pixel-by-pixel search is conducted for adjacent pixels. *Distance* specifies the search area size in each direction up/down and right/left.

- **Observe edge direction:** Mark this option to increase accuracy during the examination.

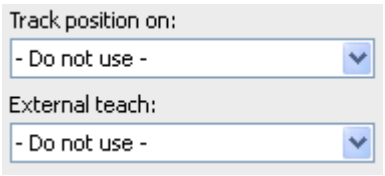


- With the displayed model, you can then use the mouse to delete pixels that clearly do not belong to the reference object or to supplement missing contour areas.

- This button resets the model to its default state.

- You can use these two buttons to enlarge or reduce the model.

- The current result is displayed directly in the dialog as the *Match*. The switching point designated **Min** is adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

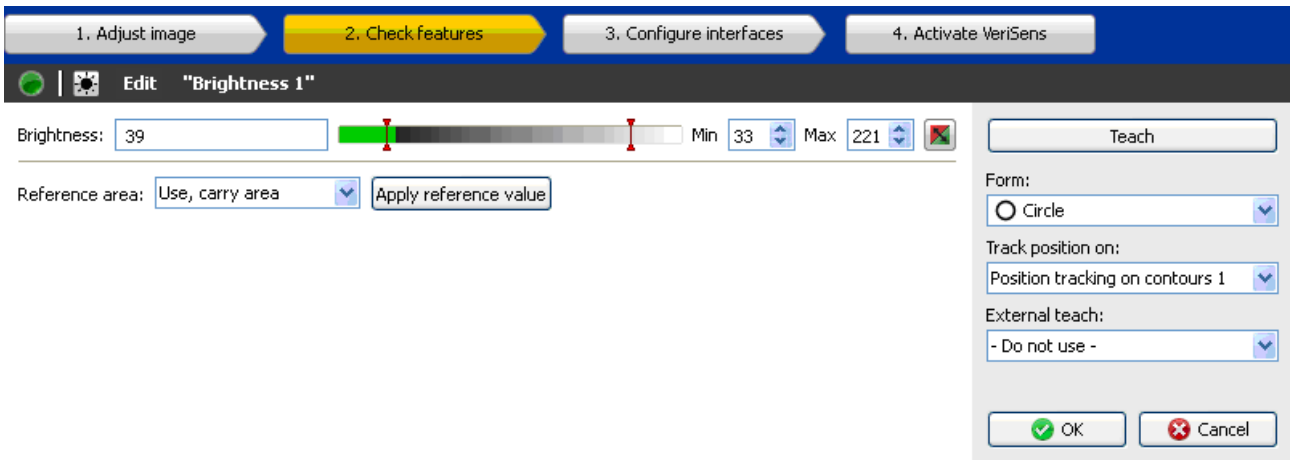
This sensor task has the following output values for the datagram at the process interface:

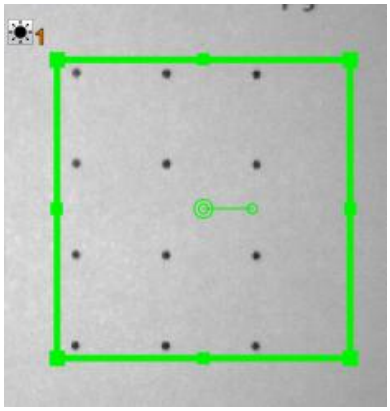
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Conformity	Number (Integer)

12.12 Brightness

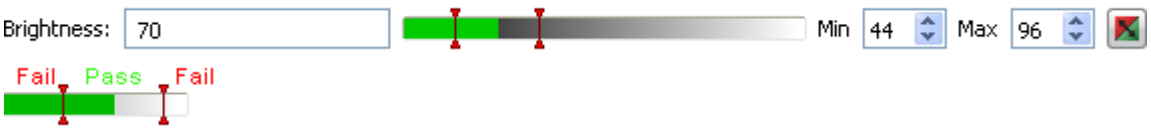
This sensor task measures the mean brightness in a working area and compares the result with the specified switching points.

This sensor task supports external teach-in. The switching points are adjusted as an absolute to the current measured value.

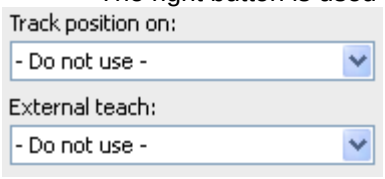




- Select the shape of the working area. A circle, a rectangle and a freely definable polygon, a circular ring and a circular ring sector are available.
- Adjust the working area by holding the left mouse button depressed. You can rotate the rectagon by dragging with the mouse on the lever at the center.



- The current result for lightness is shown as a mean grey scale value. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- In order to be independent of fluctuations in the ambient light for photometric measurements, the *VeriSens*® offers a means of correcting the measured value with a reference value. For this purpose, the reference is also chosen in the working area, for example by attaching a white label to the edge of the conveyor belt. The mean brightness in the working area of the reference area should exceed a gray scale value of 128 to ensure reliable operation.

NOTE

If “Use, carry area” cannot be selected, then you have not defined part location.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

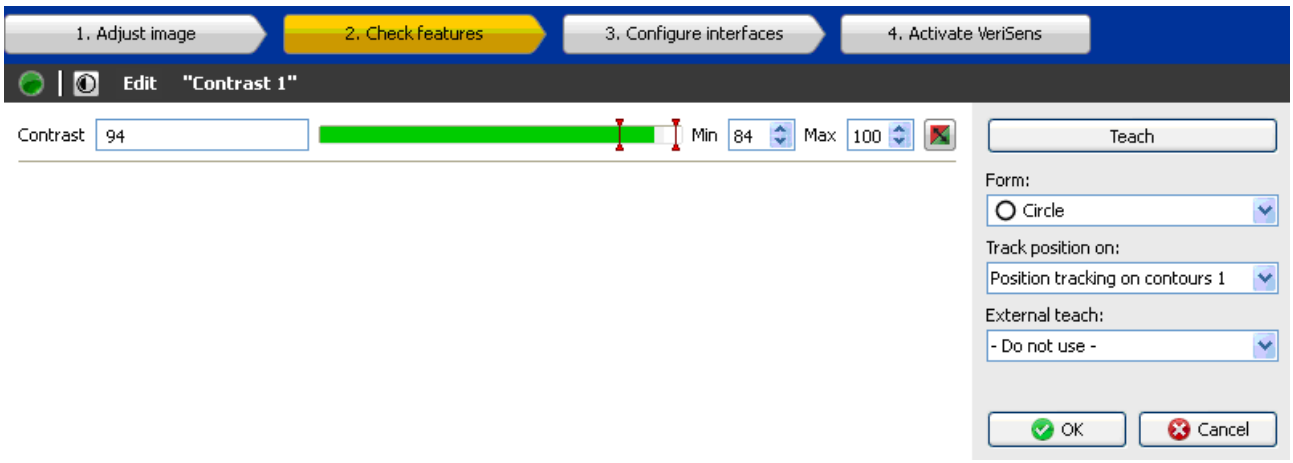
This sensor task has the following output values for the datagram at the process interface:

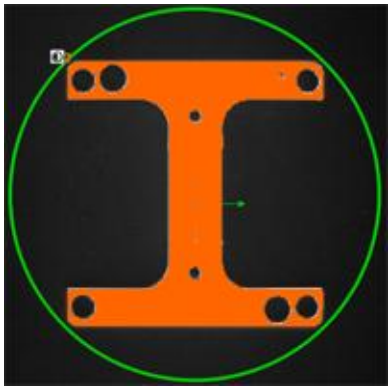
Output value	Data type
Result	“P” (Pass); “F” (Fail)
Brightness	Number (Integer)
Reference area brightness	Number (Integer)

12.13 Contrast

The sensor task measures the contrast in a working area and compares the result with the specified switching points.

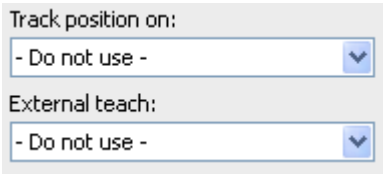
This sensor task supports external teach-in. The switching points are adjusted as an absolute to the current measured value.





- Select the shape of the working area. A circle, a rectangle and a freely definable polygon, a circular ring and a circular ring sector are available.
- Adjust the working area by holding the left mouse button depressed. You can rotate the rectagon by dragging with the mouse on the lever at the center.

- The current result of the contrast sensor task is displayed directly in the dialog as the *Contrast*. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

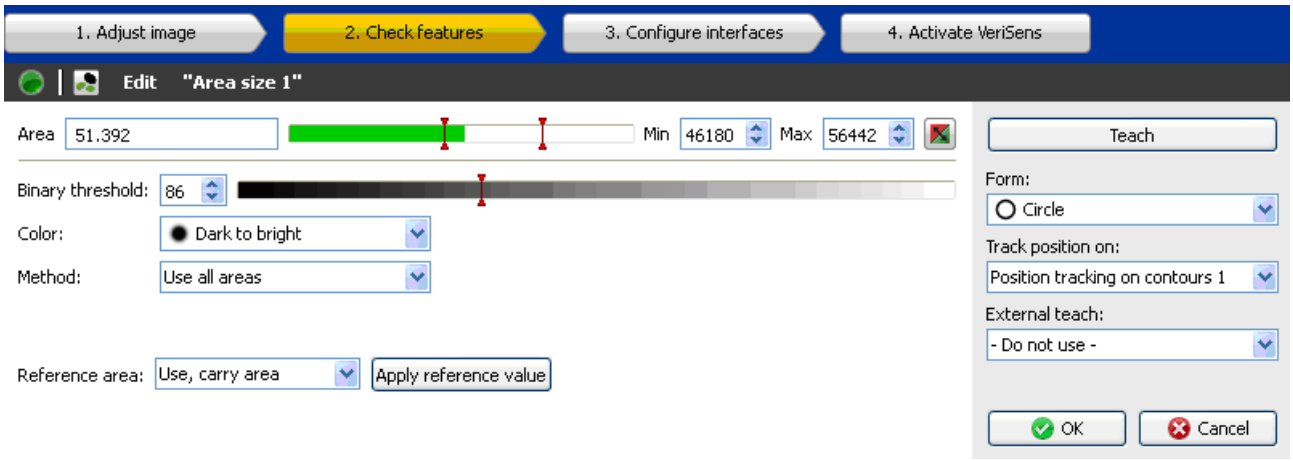
This sensor task has the following output values for the datagram at the process interface:

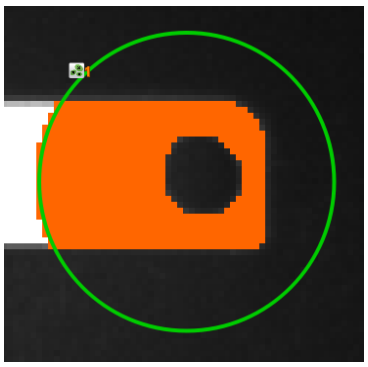
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Contrast	Number (Integer)
Reference area brightness	Number (Integer)

12.14 Area size

The sensor task calculates the number of bright or dark pixels in a working area and compares the result with specified switching points.

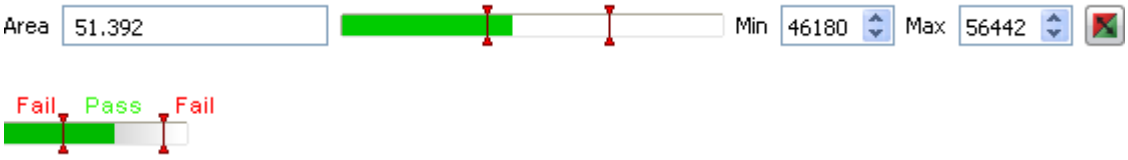
This sensor task supports external teach-in. The switching points are adjusted as a percentage to the current measured value.



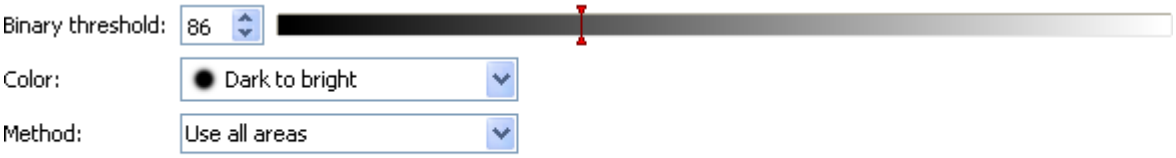


Proceed as follows for configuration:

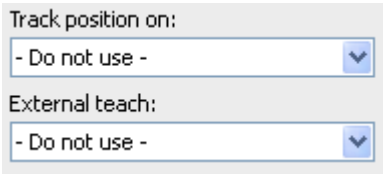
- Select the shape of the working area. A circle, a rectangle and a freely definable polygon, a circular ring and a circular ring sector are available.
- Adjust the working area by holding the left mouse button depressed. You can rotate the rectagon by dragging with the mouse on the lever at the center.



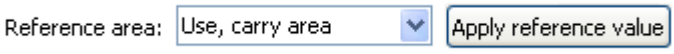
- The current result of the sensor task is displayed directly in the dialog as the *Area*. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- **Binary switching point:** Set the switching point between 0 and 255, from which bright or dark pixels will be counted.
- **Color:** You can also decide whether the *dark* or the *bright* pixels in a working area are to be counted.
- **Methods:** Choose whether you want to count all areas or just the largest related areas.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.



- In order to be independent of fluctuations in the ambient light for photometric measurements, the *VeriSens*® offers a means of correcting the measured value of the sensor task with a reference value. For this purpose, the reference is also chosen in the working area, for example by attaching a white label to the edge of the conveyor belt. The mean brightness in the working area of the reference area should exceed a gray scale value of 128 to ensure reliable operation.

NOTE

If “Use, follow area” cannot be selected, then you have not defined part location.

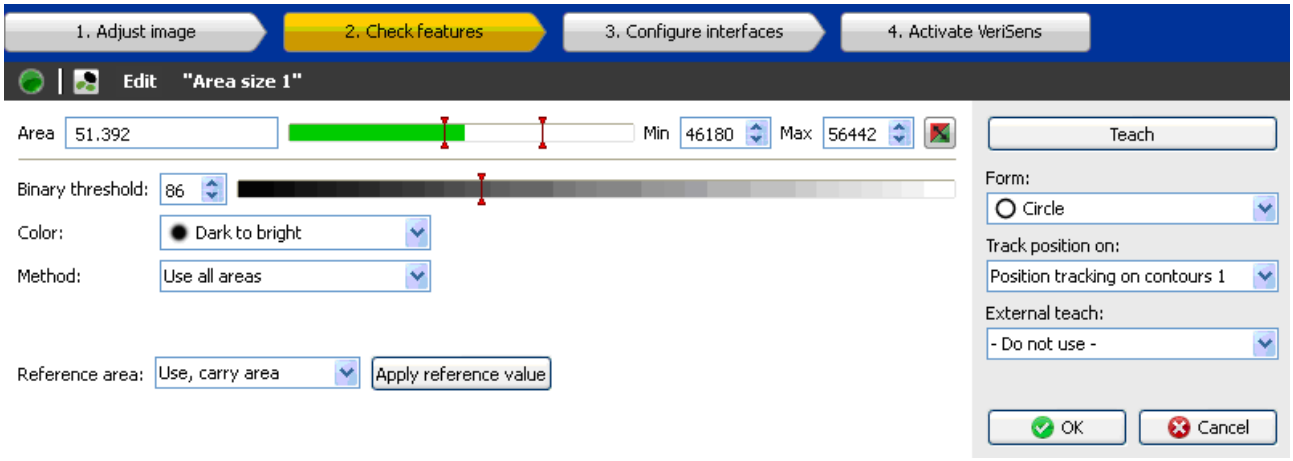
- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

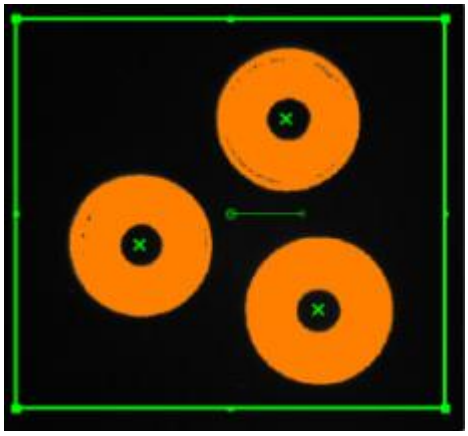
This sensor task has the following output values for the datagram at the process interface:

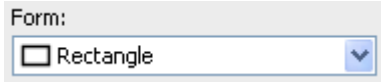
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Area	Number (Integer)
Reference area brightness	Number (Integer)
Core area	X – *separator* – Y (Integer-Point)

12.15 Count areas

With this sensor task, associated areas in the search area are counted.
This sensor task supports external teach-in. The switching points are adjusted as an absolute to the current measured value.

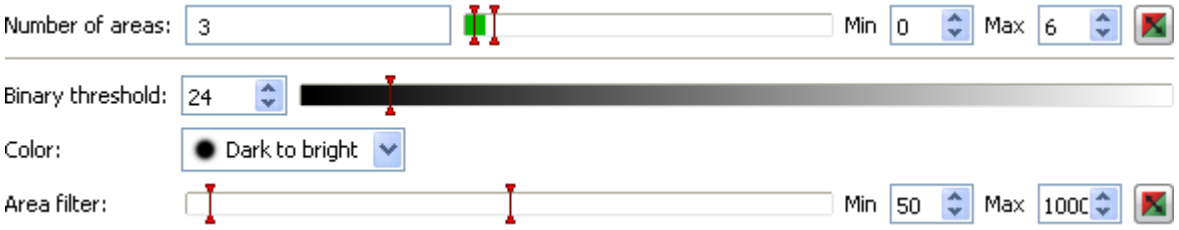




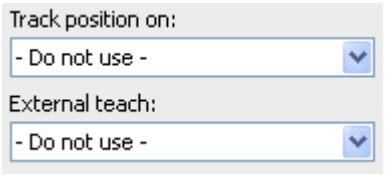


- Choose the search area.

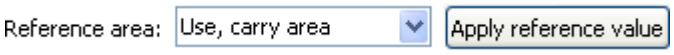
- The current result is displayed directly in the dialog as the *Number of areas*. The switching points designated **Min** and **Max** are adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- **Binary thereshold:** Set the binary switching point at a value between 0 and 255.
- **Color:** Choose whether bright or dark objects are to be counted.
- **Areas filter:** Adjust the minimum and maximum number of pixels of the counted areas. You can invert the result using the right button.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.



- In order to be independent of fluctuations in the ambient light for photometric measurements, the *VeriSens*® offers a means of correcting the measured value of the sensor task with a reference value. For this purpose, the reference is also chosen in the working area, for example by attaching a white label to the edge of the conveyor belt. The mean brightness in the working area of the reference area should exceed a gray scale value of 128 to ensure reliable operation.

NOTE

If “Use, follow area” cannot be selected, then you have not defined part location.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

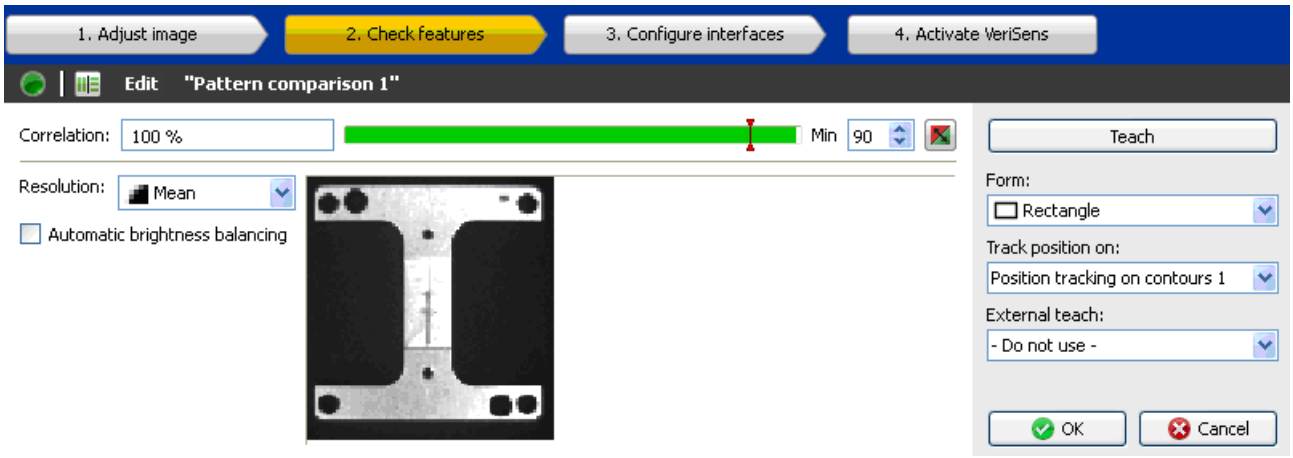
This sensor task has the following output values for the datagram at the process interface:

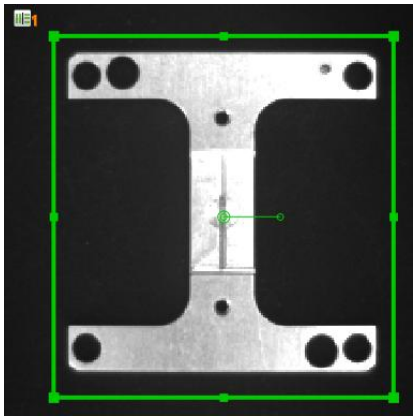
Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Number of objects	Number (Integer)
Reference area brightness	Number (Integer)
List of centers	Number – *Delimiter* – Per object: (X – *Delimiter* - Y) (Float-Point)
List of areas	Number – Delimiter – Per object: (Number – *Delimiter*) (Integer-List)
List of structure values	Number – *Delimiter* – Per object: (Number – *Delimiter*) (Integer-List)

12.16 Pattern comparison

This sensor task verifies the presence of a taught-in pattern.

This sensor task supports external teach-in. The current image area is adopted in the model, but the switching points remain unchanged.



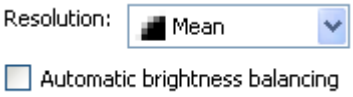


Proceed as follows for configuration:

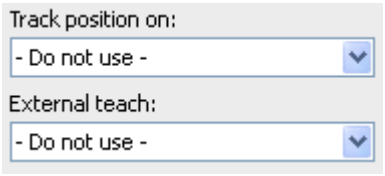
- The working area must firstly be defined.

- Teach in a new pattern using this button.

- The current result is displayed directly in the dialog as the *Match*. The switching point designated **Min** is adjusted on the right hand side. A graphic display is located in the middle, in which the positions of the switching points are displayed and where they can be changed.
- The right button is used to invert the result of the sensor task.



- **Resolution:** You can choose the calculation accuracy and thereby the required computing time.
- **Automatic brightness balancing:** You can choose an automatic brightness correction to increase the stability of the sensor task under ambient conditions. Brightness correction corrects the brightest and darkest grey scale values in the image and thereby adjusts all other grey scale values to the corresponding level.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

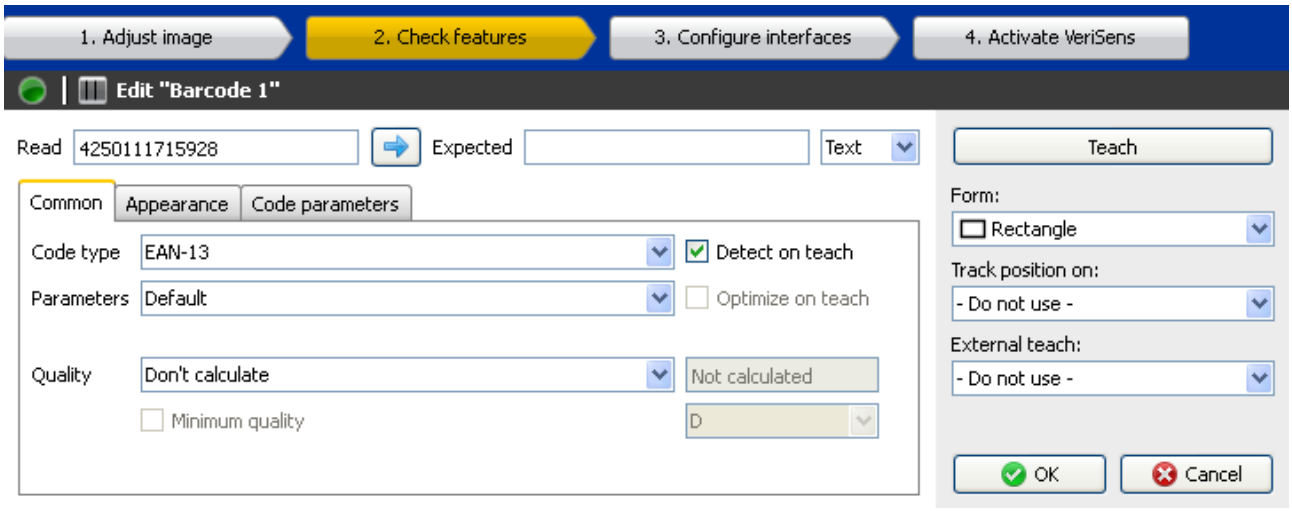
This sensor task has the following output values for the datagram at the process interface:

Output value	**Data type**
Result	“P” (Pass); “F” (Fail)
Conformity	Number (Integer)

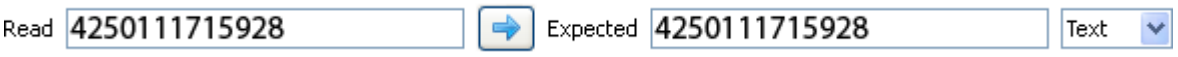
12.17 Barcode

With this sensor task barcodes can be read. In addition, the quality of the barcode can be determined according to ISO/IEC 15416.

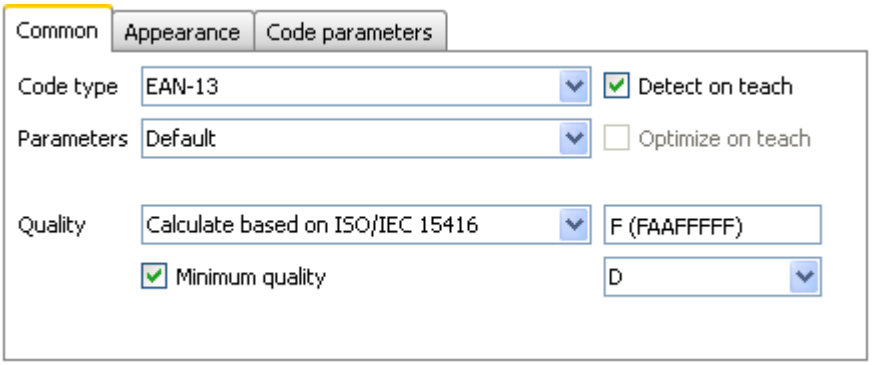
This sensor task supports external teach-in. Here the parameters are adjusted for the identification and the expected value adopted.



- Choose the search area.



- **Read:** The read result is displayed here.
- **Arrow:** Using the arrow, you can accept the current result as the new expected value.
- **Expected:** In addition, you may specify an expected value.
- **Text/binary:** Change the display between *Text* (ASCII) and *Binary* (hexadecimal).

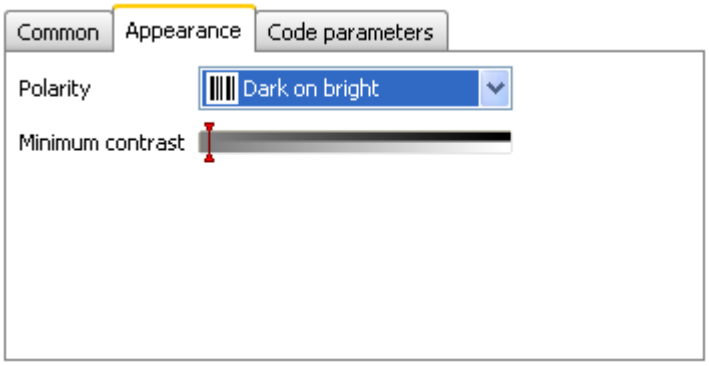


- **Code type:** Select the type of barcode in the image.
- **Detect on teach:** Using the *Detection on teach* option, you can have the code type automatically determined during external teach-in.
- **Parameters:** Select the search parameters used to search for the code. *Standard* and *User defined* are available. In the case of the user-defined search, you can manually set the parameters for the display and the code.
- **Optimize on teach:** Using the *Optimize on teach* option, you can have the parameters automatically adjusted for the code search during the external teach-in. This is only necessary if you have set the search parameters in the User-defined option.
- **Quality:** If you also wish to check the code quality, you may activate the *Calculate per ISO/IEC 15416* option. However, this also increases the computing time!
- **Minimum quality:** Activate this box if you want to specify a minimum quality.

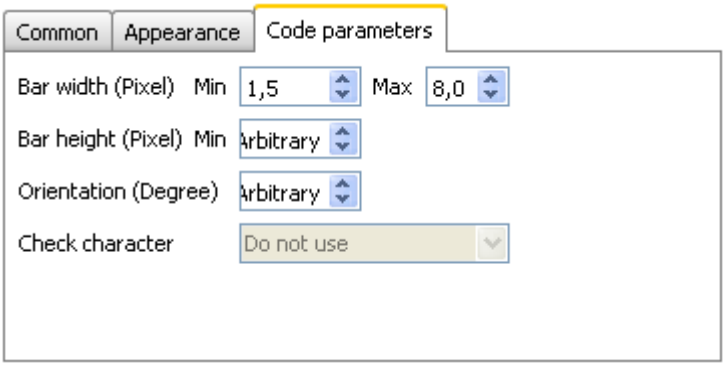
- The code quality is specified as follows:
  A - F (A = High quality ; F = Poor quality)
- The first parameter corresponds to the overall code quality.
- A total of 8 features are specified:
  Decodability, symbol contrast, minimal reflectance, edge contrast, modulation, defects, decodability, additional code-specific parameters.
- You can find more details on the quality characteristics at Appendix: Quality characteristics for barcodes and matrix codes

NOTE

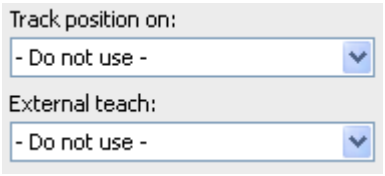
In order to be able to make the settings "Appearance" and "Code parameters" on the tabs, you must set the Parameters on the “Common" tab to *User defined.*



- **Polarity:** Specify whether the code is brighter or darker than the background.
- **Minimum contrast:** Specify the minimum contrast of the barcode.



- **Bar width (pixel):** Specify the minimum width of one bar of the barcode.
- **Bar height (pixel):** Specify the height of one bar of the barcode.
- **Orientation (Degree):** To reduce computing time, you may restrict the barcode orientation. To do this, specify the maximum deviation with respect to the position of the working area.
- **Check character:** Specify whether you want to use a check digit.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

This sensor task has the following output values for the datagram at the process interface:

Output value	Data type	Description
Result	“P” (Pass); “F” (Fail)	Test passed or failed
Read code	Text (Text)	Read result
Quality	Text (Text)	Overall quality
Quality (details)	Text (Text)	Individual quality characteristics
Center	X – separator – Y (Float-Point)	Center of the code

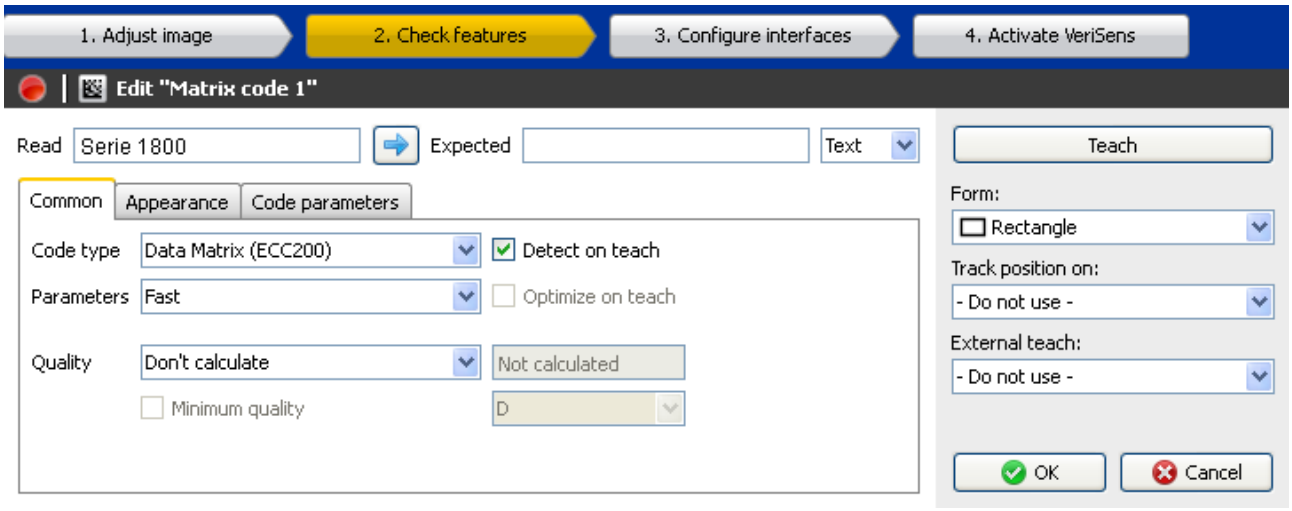
The following value can be set via the process interface:

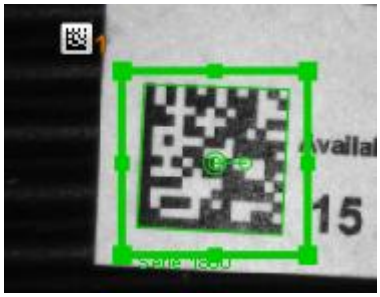
Input value	Data type	Description
to expected code	Text (Text)	expected code

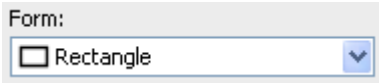
12.18 Matrix code

Matrix codes (ECC 200, QR, PDF417) can be read using this sensor task. In addition, the quality of the barcode can be determined according to ISO/IEC 15415 or AIM DPM-1-2006.

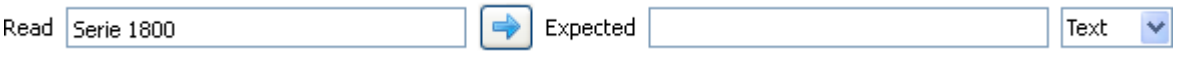
This sensor task supports external teach-in. In this process, the parameters for identification are adjusted and the expected value is accepted if an expected value has already been set.



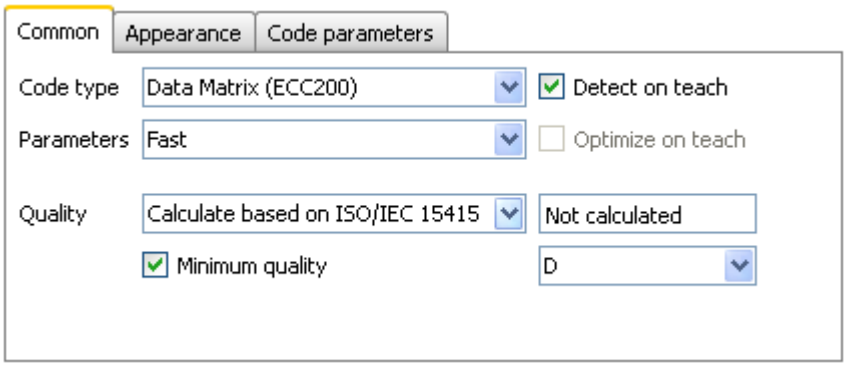




- Choose the search area.



- **Read:** The read result is displayed here.
- **Arrow:** Using the arrow, you can accept the current result as the new expected value.
- **Expected:** In addition, you may specify an expected value.
- **Text/binary:** Change the display between *Text* (ASCII) and *Binary* (hexadecimal).



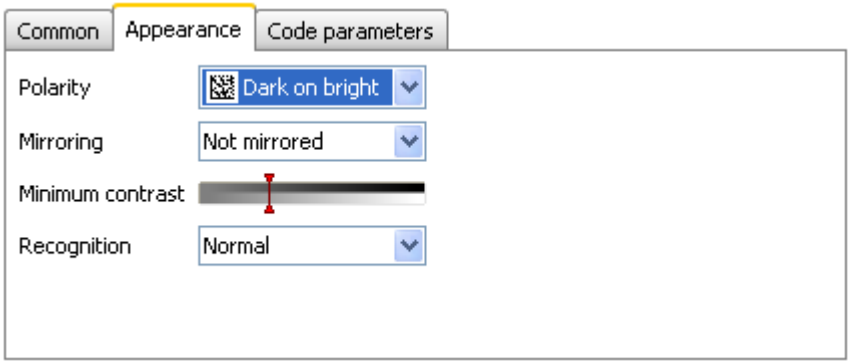
- **Code type:** Select the type of matrix code in the image.
- **Detect on Teach:** Using the *Detection on teach* option, you can have the code type automatically determined during external teach-in.
- **Parameter:** Select the search parameters used to search for the code. *Fast*, *Robust*, *Maximum* and *User defined* are available. In the *Robust* or *Maximum* modes, codes are found even with more demanding backgrounds. However, this places a burden on the computing time.
  In the case of the user-defined search, you can manually set the parameters for the display and the code.
- **Optimize on Teach:** Using the *Optimize on teach* option, you can have the parameters automatically adjusted for the code search during the external teach-in. This is only necessary if you have set the search parameters in the User-defined option.
- **Quality:** If you also wish to check the code quality, you may activate the *Calculate based on ISO/IEC 15415* or *Calculate based on AIM DPM-1-2006* option. However, this also increases the computing time!
- **Minimum quality:** Activate this box if you want to specify a minimum quality.

  The code quality is specified as follows:
  A - F (A = High quality ; F = Poor quality)
  The first parameter corresponds to the overall code quality.
  In the *ISO/IEC 15415* mode, various characteristics are determined:
  - ECC200 / QR code:
    Contrast, modulation, pattern damage, decodability, axial non-uniformity (evaluation of width and height), grid non-uniformity (evaluation of slope angle), unused error correction
  - PDF417:
    Reflection properties of the start/stop pattern, decoded codeword yield, unused error correction, modulation, decodability, defects

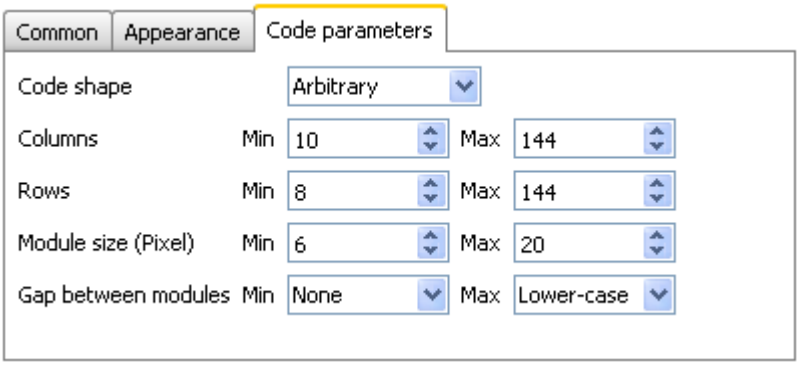
  In the *AIM DPM-1-2006* mode, a total of 8 characteristics are determined (for ECC200 / QR code only):
  Cell contrast, cell modulation, fixed pattern damage, decodability, axial non-uniformity (evaluation of the width and height), grid non-uniformity (evaluation of the slope angle), unused error correction, mean gray value of the light modules

NOTE

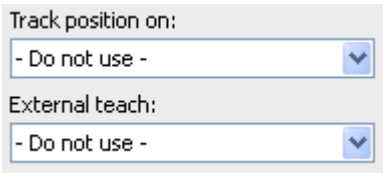
In order to be able to make the settings "Appearance" and "Code parameters" on the tabs, you must set the Parameters on the “Common" tab to *User defined.*



- **Polarity:** Specify whether the code is brighter or darker than the background.
- **Mirroring:** Specify whether the code is mirrored.
- **Minimum contrast:** Specify the minimum contrast of the matrix code.
- **Recognition:** If the outer contour of the code exhibits disturbances, you should activate "Tolerant" recognition. Otherwise, "Normal" recognition is sufficient.



- **Code shape:** Specify the shape of the code to be found (rectangular, square, arbitrary).
- **Columns:** Specify the number of columns of the module.
- **Rows:** Specify the number of lines of the module.
- **Module size:** Specify the size of a module.
- **Gap between the modules:** Specify whether gaps may occur between the modules.



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor task. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

This sensor task has the following output values for the datagram at the process interface:

Output value	Data type	Description
Result	“P” (Pass); “F” (Fail)	
Read code	Text (Text)	Read result
Quality	Text (Text)	Overall quality
Quality (details)	Text (Text)	Individual quality characteristics
Center	X – separator – Y (Float-Point)	Center of the code

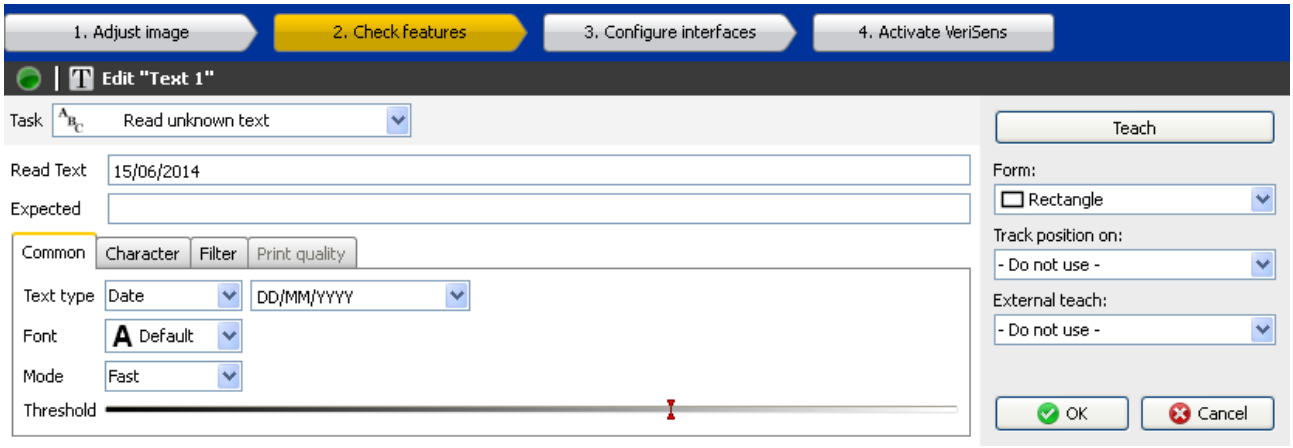
The following value can be set via the process interface:

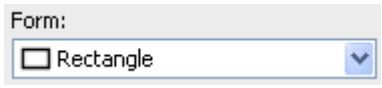
Input value	Data type	Description
to expected code	Text (Text)	expected code

12.19 Text

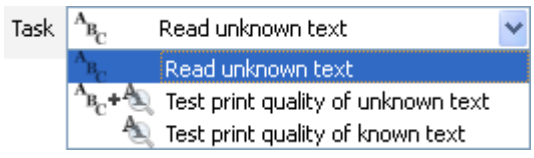
You can read date specifications, numbers and words using this sensor task. In addition, it is possible to compare the result to an expected value. You can also check the print quality of text.

This sensor task supports external teach-in. Here, the value actually read is adopted as a new expectation value.





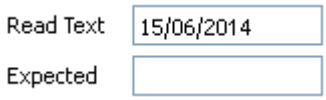
- Select the area containing the text.
- Always mark only one line. If the text covers multiple lines, you must use several sensor tasks. Make sure that the text is marked as precisely as possible.
- If the text fluctuates in its location in the image, you can use the “Alignment to text line” sensor task for part location.



- **Read unknown text:** Select this option if you want to read unknown text.
- **Test print quality of unknown text:** Select this option if you want to check the print quality of unknown text.
- **Test print quality of known text:** With this function, you can compare the print quality to a taught value.

Read unknown text

If you have selected *Read unknown text*, the read text is displayed. You can also enter the text expected in the *Expected* field. You can make settings on the *Common*, *Appearance* and *Filter* tabs.



Check the print quality of unknown text

If you have selected *Check the print quality of unknown text*, you can compare the print quality of unknown text to previously taught reference characters. To use this function, you have to teach in the reference characters on the *Print quality* tab. You can also make settings on the *Common*, *Appearance* and *Filter* tabs.

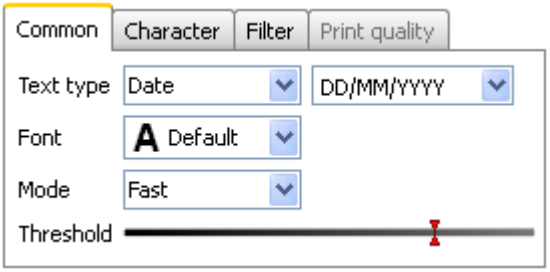
Check the print quality of known text

If you have selected *Check the print quality of known text*, you can compare the read text to previously taught characters and set it as a reference using external teach-in.

NOTE

Using teach-in, only the text contents are read and not the text format (e.g., date)!
All characters to be read must be taught in advance using the Print quality tab!

You can teach in the reference characters on the *Print quality* tab. You can also make settings on the *Common*, *Appearance* and *Filter* tabs.

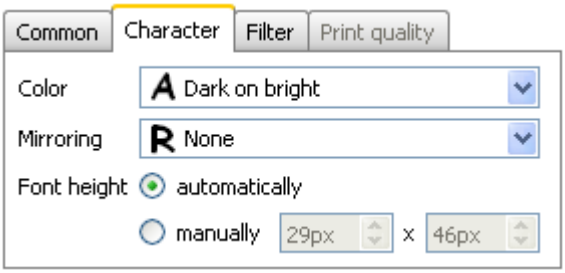


- **Text type:** Set the type of the text. You may select *Date*, *Numbers*, *Hexadecimal characters*, *Letters*, *Mask* and *Time*. You can describe the text type exactly on the right side, which is then displayed in accordance with the selected type.
- **Font:** Select the *Standard* font if you want to recognize Sans-serif writing (e.g., Arial, Verdana, Univers and OCR-B). Select the *Dot-Print* font if you want to recognize dot-matrix fonts.

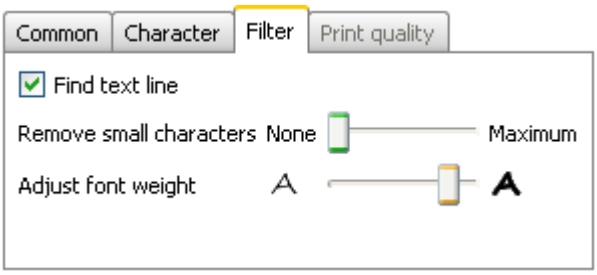
NOTE

With the Dot-Print font, lower case letters cannot be read.

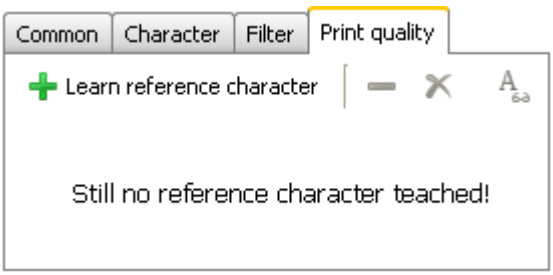
- **Mode:** The selected mode determines the computing time required to process the sensor task. The *Robust* mode requires the longest computing time but makes more stable read results possible if the print format is not optimal.
- **Thershold:** Set the threshold for the separation of background and characters. For optimal recognition, the background should have as little structure as possible!



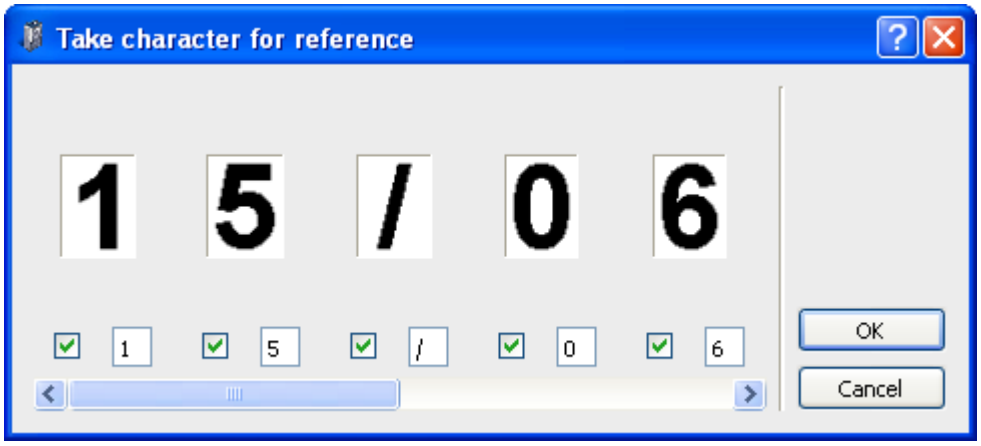
- **Color:** Specify whether the text is brighter or darker than the background.
- **Mirroring:** Specify whether the text is mirrored.
- **Font height:** Choose whether the character size is automatically recognized or whether it should be entered manually. With manual entry, you may enter this value or draw a frame in the image around one individual character

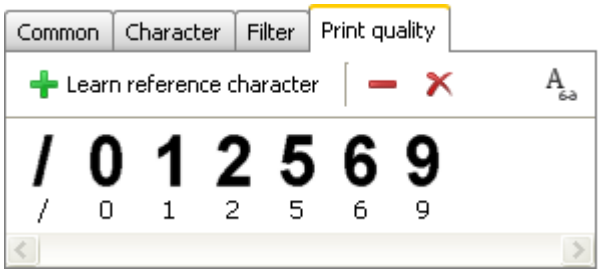


- **Find text line:** Activate the *Find text line* option if structures are present below or above the text and these structures are to be automatically masked.
- **Remove small characters:** In addition, you can set a minimum size for the characters to remove very small characters.
- **Adjust font weight:** It is also possible to reduce or increase the line thickness of the characters found.



- **Learn reference character:** Click on the + to teach in reference characters. The window below opens where you can assign values to the characters read.

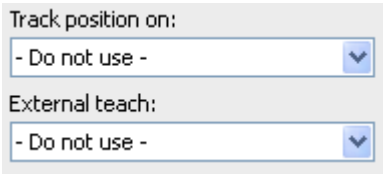




Delete the individually marked reference character

Delete all reference characters

Show/hide characters that have not been taught in



- If the sensor task is to be corrected by the result of the part location, you can choose this option here. External teach-in also makes it possible to retrain the sensor. Select the appropriate option for this purpose.

- Confirm your settings and return to the sensor list with *OK*. Return to the sensor list without making any changes with *Cancel.*

This sensor task has the following output values for the datagram at the process interface:

Output value	Data type	Description
Result	“P” (Pass); “F” (Fail)	Result of sensor task
Read text	Text (Text)	Read result

The following value can be set via the process interface:

Input value	Data type	Description
mask	Text (Text)	Masking of the expected text
to expected text	Text (Text)	expected text

12.20 Appendix: Quality characteristics for barcodes and matrix codes

Numerous quality characteristics are defined for the various code types. These characteristics are described in more detail in the following. Keep in mind that lighting arrangements and quality requirements are defined on the image for these standards so that the values determined cannot be directly mapped to your installation situation!

Barcode quality characteristics (ISO/IEC 15416)

Designation	Description
Legibility	A = Code legible F = Code not read
Symbol contrast	Difference between the maximum and minimum gray scale value of the symbols
Minimum reflection	A = Minimum gray scale value ≤ 0.5 * maximum gray scale value F = Other
Edge contrast	Minimum contrast between two symbol elements
Modulation	Amplitude between symbol elements
Defects	Irregularities in the gray scale profile of a symbol
Decodability	Deviations in the width of symbol elements
Additional code-specific parameters	Depending on code type, for example, evaluation of the width of the quiet zones or ratio of symbol widths

PDF 417 (ISO/IEC 15415) quality characteristics

Designation	Description
Reflection characteristics Start/stop pattern	Evaluation of the reflection characteristics and the bar widths of the start/stop pattern
Portion of the decoded code words	Relative portion of the decoded code words
Unused error correction	Proportion of the unused error redundancy
Modulation	Amplitude between symbol modules
Decodability	Deviations in the width of symbol elements
Defects	Irregularities in the scan profile within the modules

Data matrix (ECC200) and QR code (ISO/IEC 15415 + AIM DPM-1-2006) quality characteristics

Designation	Example	Description
Contrast		Difference between the maximum and minimum gray scale value of the modules
Modulation		Amplitude between data code modules (dependent on error correction!)
Pattern damage		Disturbances in the frame pattern (finder pattern)
Legibility		A = Code legible F = Code not read
Axial non-uniformity		Evaluation of the width and height of the modules
Grid non-uniformity		Evaluation of the incline angle (perspective distortion)
Unused error correction		Proportion of the unused error redundancy
Gray scale value of the light modules		Average gray scale value of all light modules of the Data matrix or QR code

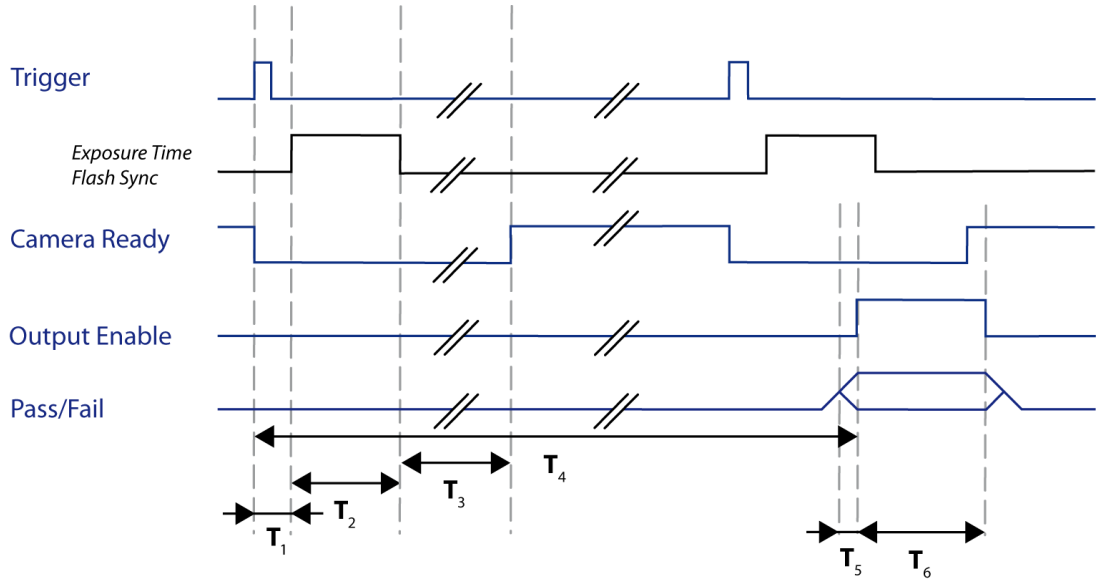
13 Digital interfaces

13.1 Explanation of terms from the timing diagram

Alarm	Indicates that an irregularity has occurred that should be investigated more closely by an expert.
Trigger	Input signal that triggers image acquisition
Flash Sync exposure time	Output signal for triggering external illumination
Camera ready	Indicates that a new image acquisition can be triggered. A new image can be acquired with *VeriSens*® before the evaluation in progress is complete. An internal image store for two images is available for this purpose.
Output enable	Indicates that the result can be read at the outputs (pass/fail).
Pass	Sensor task passed
Fail	Sensor task failed
T	Time

13.2 Timing when an external trigger is used

The sequence of the individual signals and their designation are indicated in the diagram below:



Signal		Full resolution		Reduced resolution (only XF-100 / XF-200 / XC-100 / XC-200))	
		min.	max.	min.	max.
Exposure time trigger delay T_1		20 µs plus preset trigger delay			
Exposure time T_2	Internal illumination[1]	35 µs	10 ms	35 µs	5 ms
	External illumination	35 µs[1] / 10 µs[2]	65.5 ms	35 µs[1] / 10 µs[2]	65.5 ms
	Lighting controller[2]	10 µs	1 ms	10 µs	1 ms
Image acquisition T_3		16 ms	20 ms	8 ms	11 ms
Output time (min / max) T_4		20 ms		11 ms	
Run-up output T_4		50 µs	2 ms	50 µs	2 ms
Result retention time T_5		1 ms	1 s or next result	1 ms	1 s or next result

)[1] ID, CS, XF ;)[2] XC

The *Camera Ready* signal is deactivated following image acquisition. The *Camera Ready* signal is activated again at the end of image acquisition and another image acquisition operation is possible immediately.

The Pass/Fail signal then switches at the set output time even if additional analyses have already been performed. The *Output Enable* signal is active during this time.

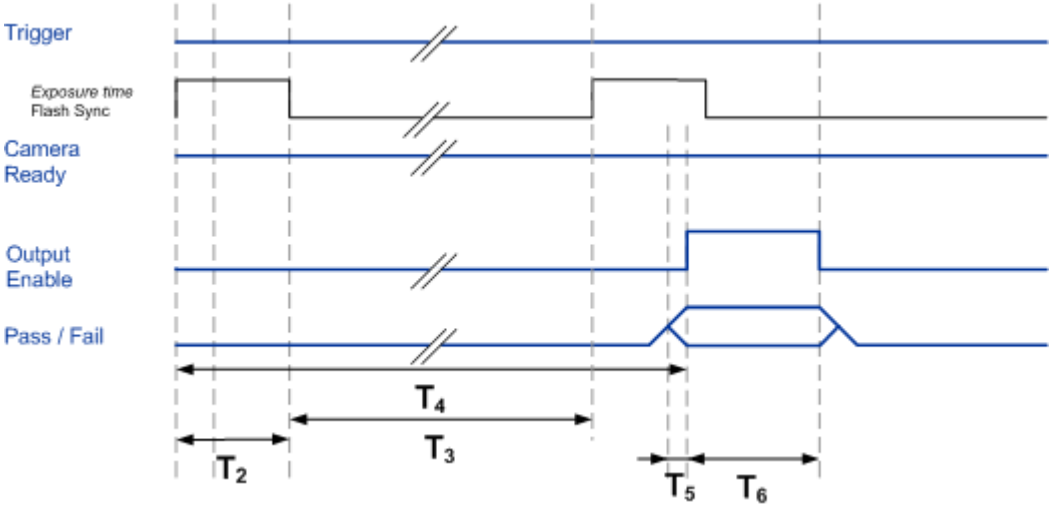
NOTE

If you have connected an encoder, you may set the output time and duration as a distance.

In addition, you can specify an "output run-up" in milliseconds to activate the Pass/Fail signal before reaching a specific position. This option is available if an exact output time has been specified and this is specified as a distance.
Keep in mind that, in this case, the belt speed must be constant!

13.3 Timing for continuous image acquisition

The sequence of the individual signals and their designation are indicated in the diagram below:



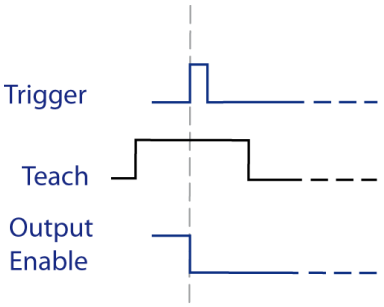
Signal		Full resolution		Reduced resolution (only XF-100 / XF-200 / XC-100 / XC-200))	
		min.	**max.**	**min.**	**max.**
Exposure time T_2	Internal illumination[1]	35 µs	10 ms	35 µs	5 ms
	External illumination	35 µs[1] / 10 µs[2]	65.5 ms	35 µs[1] / 10 µs[2]	65.5 ms
	Lighting controller[2]	10 µs	1 ms	10 µs	1 ms
Image acquisition T_3		16 ms	20 ms	8 ms	11 ms
Output time (min / max) T_4		20 ms		11 ms	
Run-up output T_4		50 µs	2 ms	50 µs	2 ms
Result retention time T_5		1 ms	1 s or next result	1 ms	1 s or next trigger

)[1] ID, CS, XF ;)[2] XC

If continuous image acquisition is set in the job, the image acquisition operation occurs as soon as the previous image acquisition is complete. The *Camera Ready* signal is continuously activated during this time. The Pass/Fail signal is switched at the end of image analysis but no earlier than the set output time. You can recognize this time by a rising edge of the *output enable* signal.

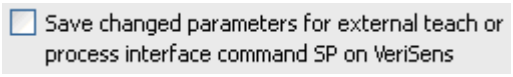
13.4 External Teach

External Teach adjusts the switching thresholds and models in the feature checks so that the evaluations have OK as the result. External Teach is used if the product changes or there are new product versions.



The digital input "Teach-in" must be in the "active high" state at the trigger point.

To use external Teach, **External Teach: Use** must be activated for the corresponding feature checks. External Teach-in is then triggered simultaneously for all appropriate feature checks.

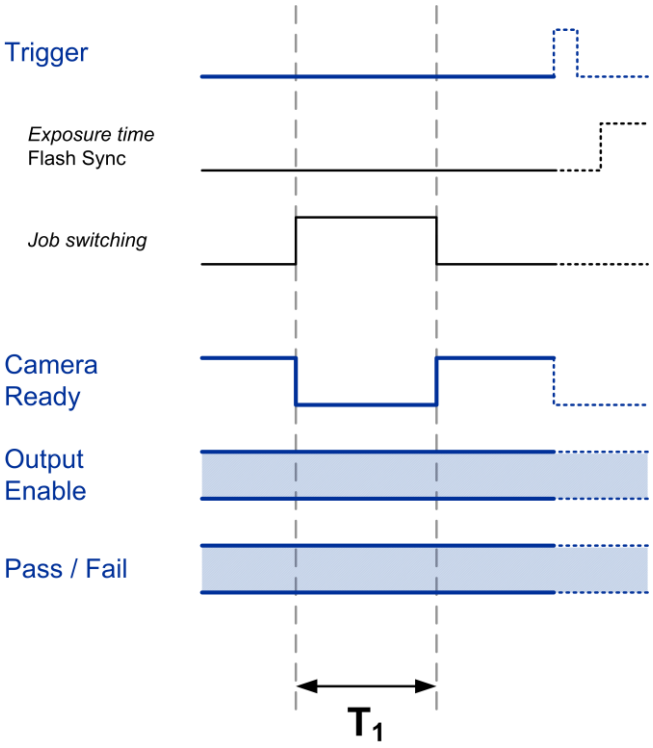


Job changes are only stored temporarily until the device is deactivated. If you want to retain the settings, you must activate the option "*Store changed parameters from External Teach-in or process SP interface command to the VeriSens*."

(*Device → Device settings → Job selection/Teach-in*)

13.5 Job switching

The jobs saved in the *VeriSens*® can be activated by the corresponding switching signals with the digital inputs or via the process interface. The selected job is always processed with the next trigger.



Signal	CS-100 / XF-100 / XF-200 / ID-100 / ID-110 / XC-100 / XC-200
Run-up program selection T_1*	Jobs 1-16: 5 ms Jobs 17-255: typically < 1 s (plus the set exposure time)

During program selection (T_1), the device is not active, and the *Camera Ready* signal is deactivated. Please wait with the next image analysis operation until the "Active" state is displayed again by the corresponding signal.
If the switch could not be performed, for example because the job number was invalid, an alarm signal is also output until the next trigger.

NOTE

If a job is selected again by way of Job switching, and this job is already active, the *Camera Ready* signal is not deactivated!

The *Output Enable* and *Results* signals are still switched in accordance with the settings of the previous job.

13.6 Job selection via digital inputs

There are two ways of switching the active job of the *VeriSens*® via the digital inputs:

- **Binary:** The active job can be selected directly by a combination of the levels at the digital inputs.
- **Bit serial:** The stored jobs can be selected directly using a clock and data line.

Switching between jobs is only possible when the sensor is set to Run mode. Switching between jobs is not possible in any other modes. Observe that you must activate the option **Activate job selection via digital inputs** in the Job management to execute job selection by this means.

You can also switch the active job by transferring corresponding commands via the process interface.

13.6.1 Binary job selection

For *VeriSens*® maximum of four digital inputs are available for job selection.

It is possible to quickly switch between jobs 1 to 16 in this way.

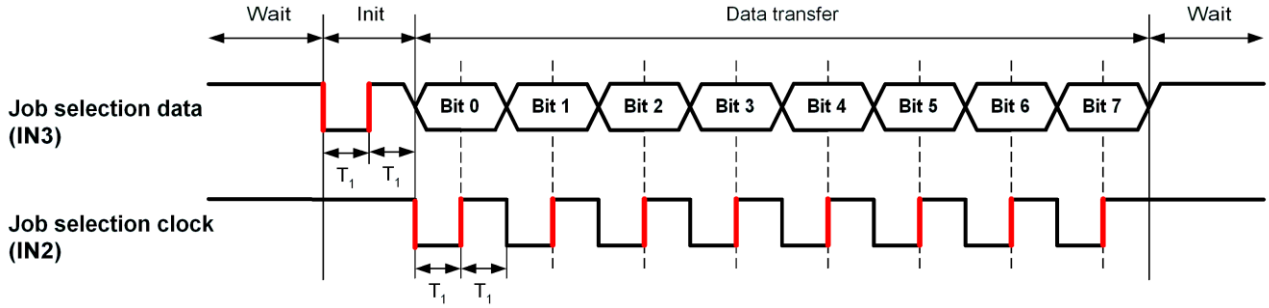
The allocation of the levels to the selected job is as follows:

	Binary job selection – Bit 0	**Binary job selection – Bit 1**	**Binary job selection – Bit 2**	**Binary job selection – Bit 3**
Job 1	Low	Low	Low	Low
Job 2	High	Low	Low	Low
Job 3	Low	High	Low	Low
Job 4	High	High	Low	Low
Job 5	Low	Low	High	Low
Job 6	High	Low	High	Low
Job 7	Low	High	High	Low
Job 8	High	High	High	Low
…				
Job 16	High	High	High	High

NOTE

Please observe that this table relates to the configuration of the inputs as “active high”. If you have configured an input as “active low”, you must invert the specified levels for this input in the overview.

13.6.2 Bit serial job selection



	Signal applied to the input	
	min.	**max.**
Result retention time T_1	10 ms	1,000 ms

Two digital inputs are required for bit serial job switching: the digital inputs IN2 (“Bit serial job selection – Clock“) and IN3 (“Bit serial job selection – Data“). When inactive, high levels are applied to both lines. The levels of the data line are set briefly to low and then returned to high to start the transfer.

The desired job number can then be transferred as a series of bits. The respective bits must be transferred with the following levels on the data line:

Value	Level on the data line
0	High
1	Low

As soon as a **rising** edge is detected on the clock line, the corresponding bit is read on the data line. The status of the data line must be held constant for the result retention time T_1 and may only change when a low level is set on the clock line.
When all 8 bits have been transferred in this way, the inactive state is restored.

We recommend that switching to the next bit on the data line should be done simultaneously with activation of the falling edge on the clock line.

NOTE

This description applies when the parameters of the inputs are set to "active high”. If you have configured an input as “active low”, you must invert the specified levels for these inputs in the description.

You should also make sure that you have made the following settings for bit-serial job selection:

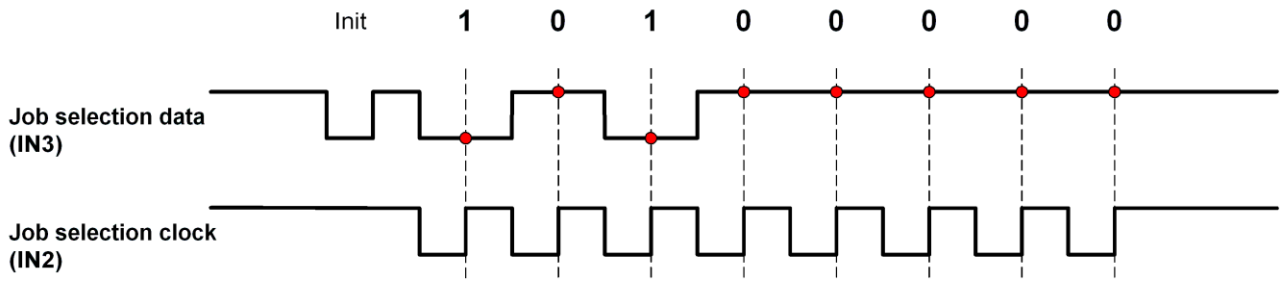
- In Job management you must set the source “Digital inputs”.
- For digital I / Os the parameters for the digital inputs 2 and 3 must be set as “Bit serial job selection – Clock“ or “Bit serial job selection – Data“.

Transfer the desired job number in this manner.

	Data to be transferred
Job 1	10000000
Job 2	01000000
Job 3	11000000
	...
Job 8	00010000
	...
Job 255	11111111

Examples: Activation of job 5

You must switch the two digital inputs as follows to activate job 5:



13.7 Alarm signal

The alarm signal is activated under the following conditions in **parallel with the Pass/Fail signal** of the **current image acquisition/analysis operation**:

- Invalid trigger (trigger during image acquisition or job switching)
- Analysis aborted prematurely (output time exceeded)
- Error in job selection (invalid job number)
- Error at process interface
- FTP Alarm (An error occurred while transferring the images via the FTP client.)

If image analysis is not being performed at this time, the alarm signal is activated in parallel with the Pass/Fail signal of the **next image acquisition/analysis operation** if an error occurs.

NOTE

This output time for the alarm signal is not necessarily the next (seen chronologically) Pass/Fail signal if you are using the *Camera Ready* or *Output Enable* signals.

The alarm signal is activated **immediately** under the following circumstances and maintained **until the next trigger or until a successful job switch**:

- Job switching
  - if a job is selected that is not completely configured
  - if a job is selected that is not present

- Device activation
  - if an active job was not selected at Power On

14 *VeriSens*® web interface

VeriSens® includes an integrated web server. This enables operation and reconfiguration (e.g. of machine control) via the web browser. The web interface can be adapted to suit the application by configuring the 9 buttons in the main menu. Sub-functions and access rights for up to two user profiles can also be set.

In the web interface, you will be able to access the functions you have configured during job creation (*Configure interface → Web interface)* and in the device menu (*Device → Device settings → Configure web interface).*

HINWEIS

It is possible, but not essential, to use the web interface at the same time as the Application Suite.

14.1 Supported browsers

The following browsers are supported:

- Internet Explorer® 8/9 (except on Windows CE 5.0)
- Firefox 3.6.28
- Firefox 13

Due to differences in browser technology, there may be some difference in appearance between browsers.

NOTE

To use the web interface, you must activate JavaScript and Cookies!

Using pop-up blocker tools may result in the web interface not being correctly displayed. In this case, deactivate the pop-up blocker!

Users of Windows Internet Explorers® (IE7) must also activate the use of ActiveX. You will find this setting under “Tools > Internet Options > Security > Security level for this zone > Run ActiveX controls and plug-ins”.

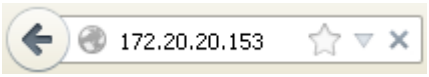
If necessary, add the IP address of the *VeriSens*® to the “Local Intranet” zone. You can find this setting under “Tools → Internet Options → Security → Local Intranet → Sites → Extended”

14.2 Connecting tot he web interface

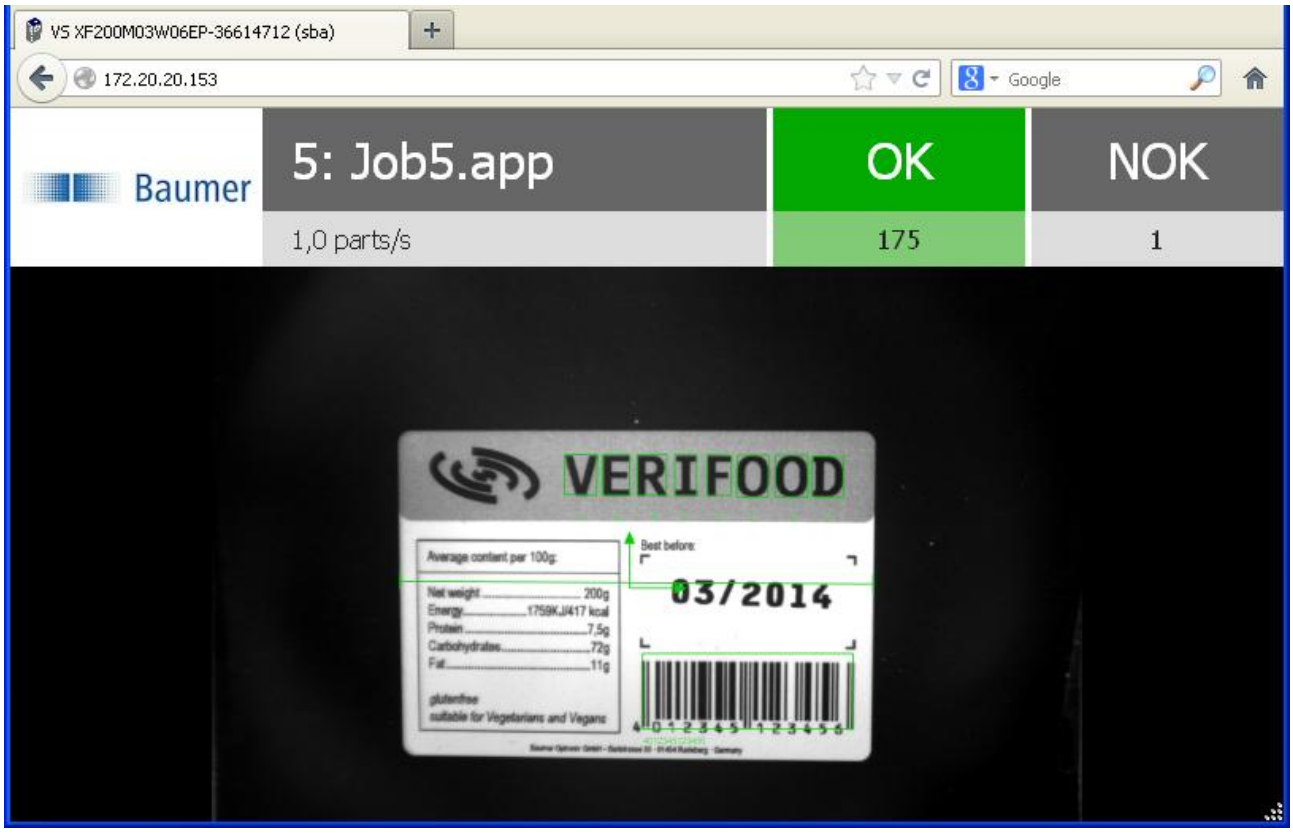
Launch a supported browser and enter the *VeriSens*® IP address into the address bar.

NOTE

Your *VeriSens*® IP address can be found on the *Info* tab next to the *Help* tab in the *Application Suite.*



The following screen is displayed when the *VeriSens*® is activated:



Click on the value to change the unit of measurement.

- Parts/ s → Parts/min
- OK (Parts → Percentage)
- NOK (Parts → Percentage)

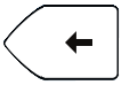
14.3 Device specific functions

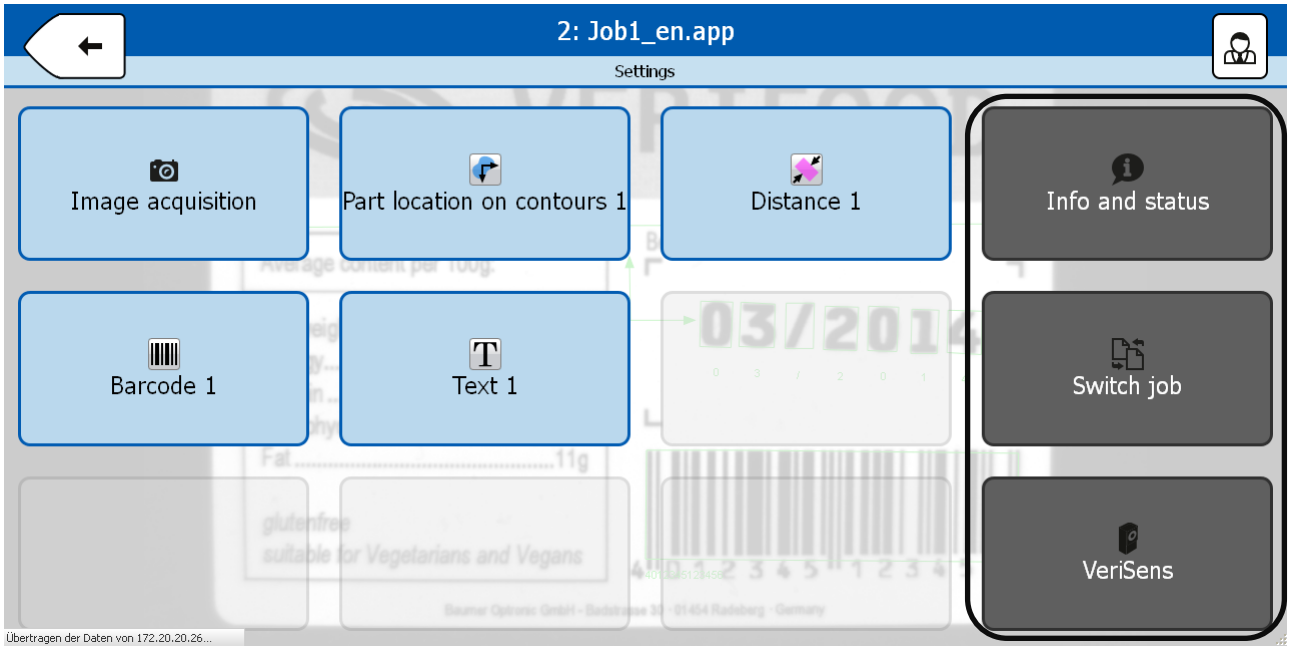
The device specific functions that can be operated via the web interface are described below.

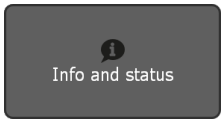
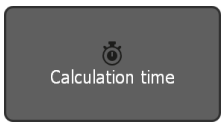
NOTE

You can set the availability of settings options and the corresponding rights through *Device → Device settings → Configure web interface.*

Navigation

				
Back to drop-down menu	Back to start view	Back to device specific settings	Update values	User profile. (Only shown when user profiles are activated)



Icon	Inhalt
	• Device name • Device state • Device type • Firmware version • *VeriSens*® serial number
	• Name of job currently processing • Total number of checked parts • Number of parts marked good (OK) • Number of parts marked bad (NOK) • Number of alarms • All feature checks for the job with results (Number of OK/NOK)
	• *VeriSens*® processing time in ms (Parts/s) • Processing time and results for current feature check
	In this menu, you can change the active job. You can select any job on the *VeriSens*®. The chosen job will activate immediately once selected.
	On this dialogue page you will see the current saved defect images. You can save these images in full resolution using your browser's context menu.
	Under job management you have the following options: ▪ Copy job (Copy the job from one save location on the *VeriSens*® to another) ▪ Delete job (Delete job from the *VeriSens*®) ▪ Access job (Download a job from the *VeriSens*® to your computer) ▪ Transfer job (Transfer a job from your computer to the *VeriSens*®) ▪ Job on Power on (Set which job should be active when the *VeriSens*® is switched on) ▪ Change job name (Change the name of a job on the *VeriSens*®) ▪ Change job location (Save the job to a different location)

14.4 Job specific functions

The job specific functions that can be used via the web interface are described below.

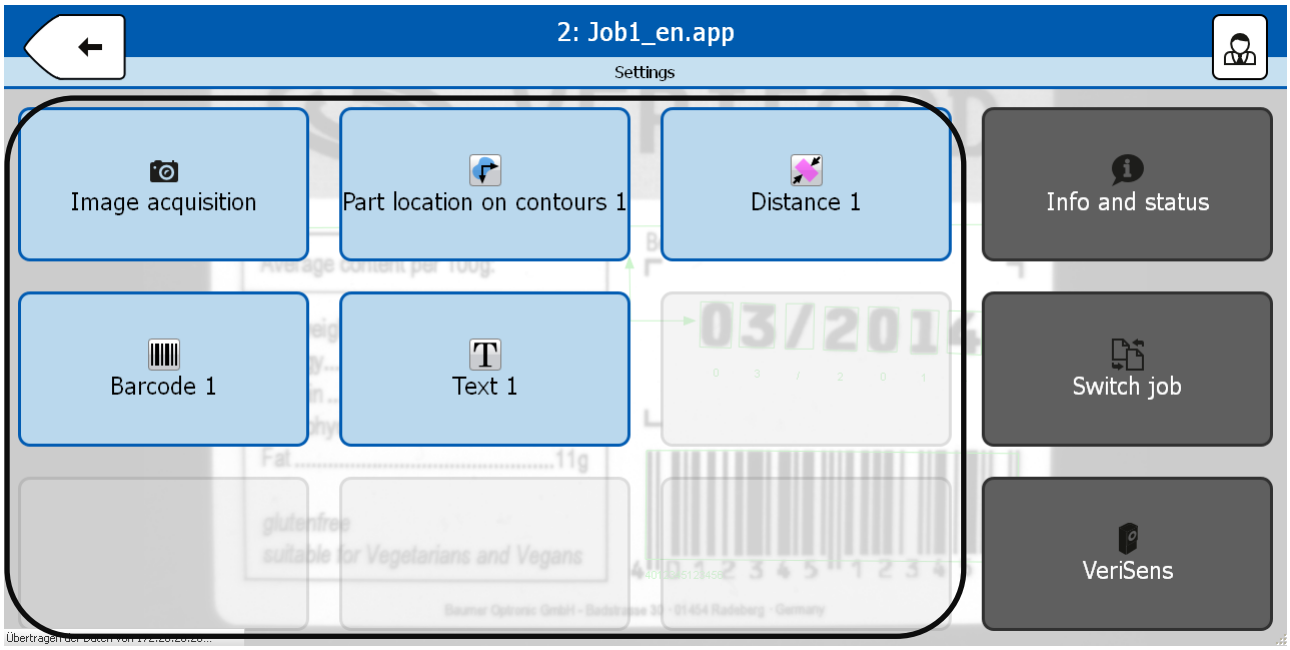
NOTE

You can set the availability of settings options and the corresponding rights for the feature check under:

Configure interface → *Web interface* tab

Navigation

Permanently save changes and go back	Back	Apply settings and go back	Cancel



14.4.1 Image acquisition

Function	Icon	Adjustable parameters
Image acquisition		• Exposure time • Amplification • Edge sharpness • Gamma correction

14.4.2 Part location

Function	Icon	Adjustable parameters
Part location on contours		• Field of view • Minimum conformity • Contrast • Maximum rotation
Part location on edges		• Field of view edge A • Field of view edge A2 • Field of view of edge B
Part location on circle		• Field of view circle • Field of view edge for rotation
Part location on text line		• Field of view • Minimum conformity

14.4.3 Geometry

Function	Icon	Adjustable parameters
Distance		• Field of view edge/circle A • Field of view edge/circle B • Distance: Minimum • Distance: Maximum
Circle		• Field of view of circle • Distance: Minimum • Distance: Maximum • Diameter: Minimum • Diameter: Maximum • Circularity: Minimum • Circularity: Maximum
Angle		• Field of view edge A • Field of view edge B • Angle: Minimum • Angle: Maximum

Count edges		• Field of view edges • Number of edges: Minimum • Number of edges: Maximum
Point position		• Field of view • Rotation: Minimum • Rotation: Maximum • Position: X: Minimum • Position X: Maximum • Position Y: Minimum • Position Y: Maximum

14.4.4 Feature comarison

Function	Icon	Adjustable parameters
Count contour points		• Field of view • Number: Minimum • Number: Maximum
Contour comparison		• Field of view • Conformity; Minimum • Tolerance
Brightness		• Field of view • Brightness: Minimum • Brightness: Maximum
Contrast		• Field of view • Contrast: Minimum • Contrast: Maximum
Area size		• Field of view • Area: Minimum • Area: Maximum • Colour (bright/dark) • Binary threshold
Count areas		• Field of view • Number of areas: Minimum • Number of areas: Maximum • Colour (bright/dark) • Binary threshold • Area filter: Minimum • Area filter: Maximum
Pattern comparison		• Field of view • Conformity: Minimum

14.4.5 Identification

Function	Icon	Adjustable parameters
Barcode		• Field of view • Expected code • Type of code • Parameter set • Bar width: Minimum • Bar width Maximum • Bar height: Minimum • Polarity • Minimum contrast • Rotation tolerance
Matrix code		• Field of view • Expected code • Code type • Parameter set • Polarity • Minimum contrast • Recognition
Text		• Field of view • Expected • Mode • Colour (bright/dark) • Threshold • Change character density

14.5 Functions selectable via the adress bar

14.5.1 Languare selection

The web interface will automatically launch in the same language as your operating system. However, you can change the language via the address bar.

Web interface in German:

```
http://[IP adress VeriSens]/?lang=de
```

Web interface in English:

```
http://[IP adress VeriSens]/?lang=en
```

Web interface in French:

```
http://[IP adress VeriSens]/?lang=fr
```

Web interface in Chinese:

```
http://[IP adress VeriSens]/?lang=zh
```

14.5.2 Live image

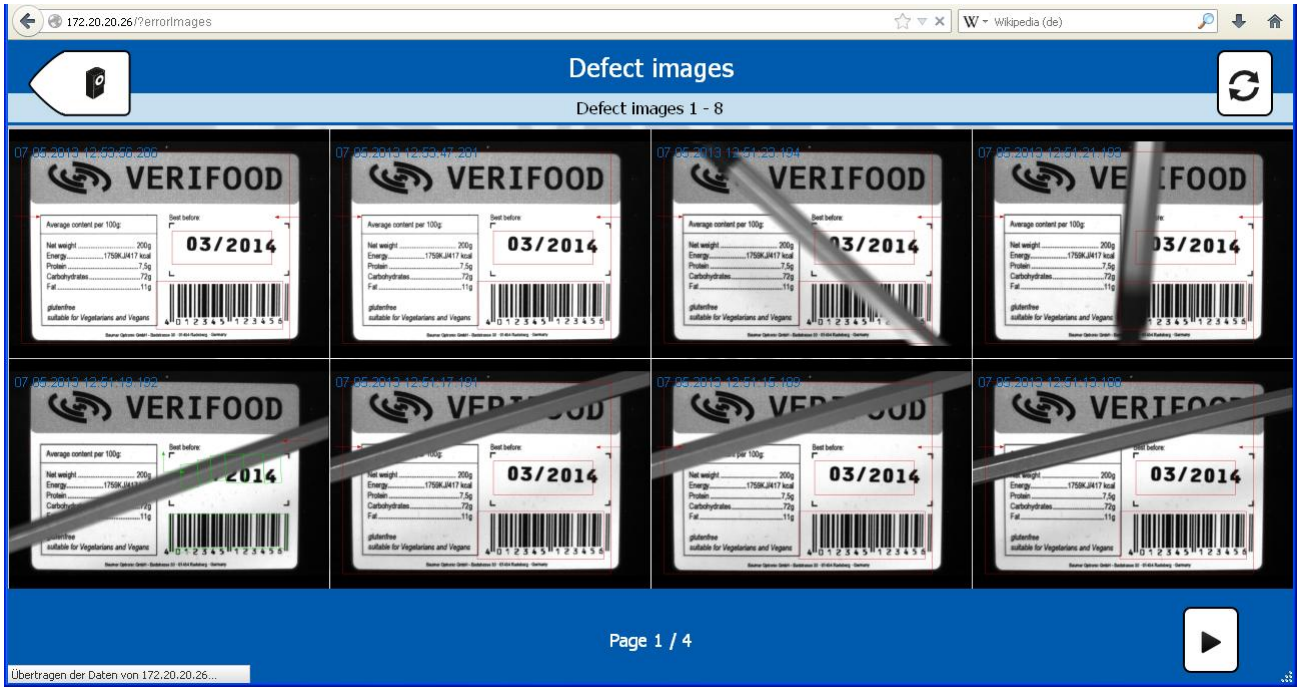
View the live image in the full browser window via the browser's address field. If the *VeriSens*® is activated, the feature checks will be displayed.

```
http://[IP adress VeriSens]/?liveImage
```

14.5.3 Defect images

Access defect images via the browser's address field. You can save these images in full resolution using your browser's context menu.

```
http://[IP adress VeriSens]/?errorImages
```



14.5.4 Static images

You can access a single image without displaying the feature checks using the address field of the browser:

```
http://[IP adress VeriSens]/live_image.bmp
```

You can also display a single image showing the feature checks using the address field of the browser:

```
http://[IP adress VeriSens]/live_image.bmp?results=1
```

14.5.5 Setting the display screen

By default, the current image is refreshed as quickly as possible. If you want a constant image refresh rate, say to reduce network traffic, you can change this rate using a parameter on opening the *VeriSens*® web interface:

```
http://[IP address VeriSens]/?refreshTime=t
```

The cycle time t is specified in milliseconds. A value of 0 means that the images are to be transferred as quickly as possible.

If display errors result when using a fixed image refresh rate, please increase the cycle time value.

NOTE

It is possible that the device is transferring image data via the web interface while simultaneously being linked to an *Application Suite*. In this case, the image data are preferably transferred to the *Application Suite* with the image frequency on the web interface being correspondingly reduced.

You can check in the *Status* area whether the device is linked to an *Application Suite*.

15 Communication via the *VeriSens*® process interface

This chapter provides an overview of the *VeriSens*® process interface.

NOTE

The *VeriSens*® CS-100 does not support any communication via the process interface..

15.1 Adjustments Ethernet

15.1.1 Configuration of the Ethernet interface

The *VeriSens*® is integrated via the process interface using an Ethernet connection and port 23 (“Telnet”). For this purpose, connect the device with your machine and set the parameters, in particular the configuration of the IP address, using the *Application Suite*.

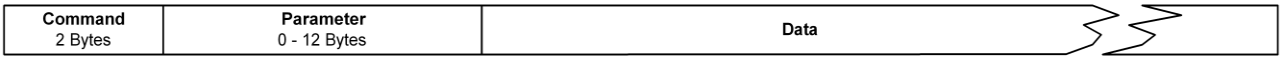
The following parameters are also required to control the logical transfer of the process data:

Parameter	Description	Values
Result	Time of result transfer	On request Continuous
Receive timeout	Maximum duration between two characters	10 – 2,000 ms
Response delay	Duration between reception of a command and transmission of the response	Min: 0 – 2,000 ms Max: 500 – 10,000 ms

The transfer of the datagrams can occur at two different times:

- The vision sensor transfers the telegrams *on request*, i.e. as a response to the command “GD“. This mode is designated “Polling mode”.
- The vision sensor transfers data *continuously* after each image has been transferred. This mode is designated “Continuous mode”.

15.1.2 Protocol structure – Ethernet



After you have established a connection with *VeriSens*® via the set port, you can request data from the device or transfer commands. To do this, you may use the *VeriSens*® protocol. This consists of a 2-byte command code followed by the parameters and the actual data.

The datagrams may also be terminated with the following control characters:

- `<CR>` (Hex: 0D, Escape-Sequenz: `\r`)
- `<LF>` (Hex: `0A`, Escape-Sequenz: `\n`)
- `<CR><LF>` (Hex: `0D 0A`, Escape-Sequenz: `\r\n`)
- No characters

15.2 Adjustments RS485(ID-100 only)

15.2.1 Configuration of the RS485 interface (ID-100 only)

The integration of the *VeriSens*® via the process interface is made with an RS485 connection. For this purpose, connect the device with your machine using the pins provided and set the RS485 parameters using the *Application Suite*.

The following parameters are available with which the physical transfer is controlled:

Parameter	Description	Values
Baud rate	Transfer speed	9600, 38400, 57600,115200, 230400 bps
Parity	Control of the parity bit	none, even, odd
Data bits	Number of bits per character	8
Stop bits	Number of stop bits as end code	1

The following parameters are also required to control the logical transfer of the process data:

Parameter	Description	Values
Device number	Address in the bus protocol	1 – 254
Protocol	Protocol type	Point-to-point Bus without checksum Bus with checksum
Result	Time of result transfer	On request Continuous
Receive timeout	Maximum duration between two characters	10 – 2,000 ms
Response delay	Duration between reception of a command and transmission of the response	Min: 0 – 2,000 ms Max: 500 – 10,000 ms

The transfer of the datagrams can occur at two different times:

- The vision sensor transfers the telegrams *on request*, i.e. as a response to the command “GD“. This mode is designated “Polling mode”.

- The vision sensor transfers data *continuously* after each image has been transferred.
  This mode is designated “Continuous mode”.

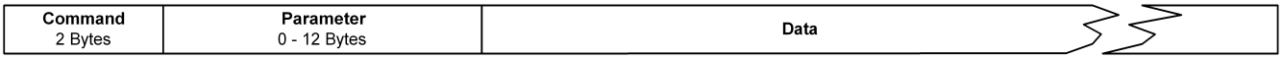
15.2.2 Protocol structure - RS485 (ID-100 only)

Two means of data transfer are available for the operation of the process interface:

- **Point-to-point protocol**
  This protocol is a shortened form of the bus protocol. It provides no means of addressing or verification with a checksum. This protocol is suitable when fast reaction times and low data volumes are concerned and transfers are verified by other means.

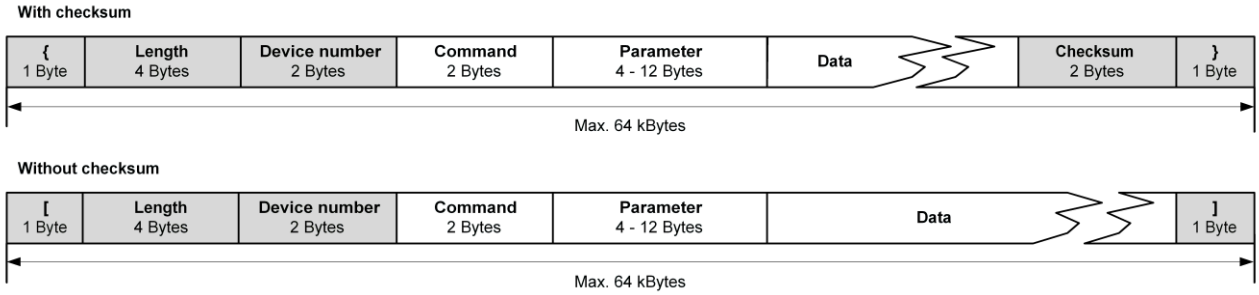
- **Bus protocol**
  This protocol permits up to 254 *VeriSens*® devices to be accessed on one RS485 bus. Communication security is ensured by the use of synchronization signals and an optional checksum The formatting of the data is also more strictly defined in this protocol, simplifying further processing.

Point-to-point protocol:

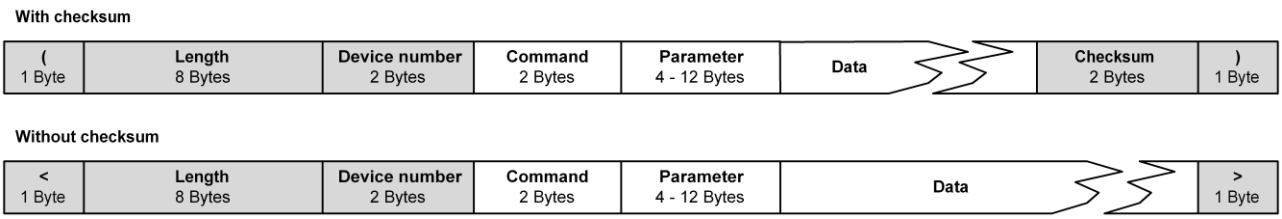


The point-to-point protocol consists of a 2-byte command designator followed by the parameters and the actual data. No control codes are used. Synchronization can be achieved using receive timeout.

Bus protocol:



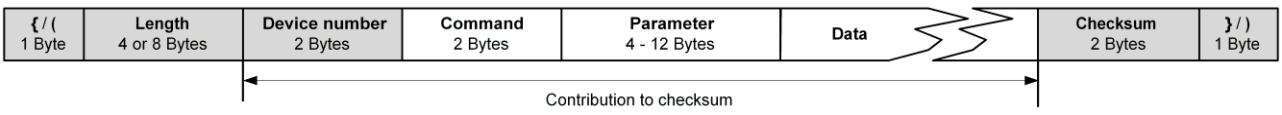
If you wish to transfer more than 65,535 bytes, e.g. jobs, you can extend the length to 8 bytes (sufficient for 2^{32} bytes). This changes the start and end codes:



This protocol has a defined format:

Element	Size	Meaning
{ / [(/ <	1 byte	These codes are used for synchronization of the transfer. If you specify the length in 4 bytes, use the code “{“ (telegram with checksum) or “[“ (telegram without checksum). If you specify the length in 8 bytes, use the code “(“ (telegram with checksum) or “<” (telegram without checksum).
Length	4 or 8 bytes ASCII-Hex	The length is equivalent to the number of transferred bytes from the device number (inclusive) to the end of the data, i.e. without any checksum. If the telegram exceeds a length of 65,535 bytes and you require 8 bytes for the length, you must use the start code “(“ or “<”.
Device number	2-byte ASCII hex	Each connected *VeriSens*® device has its own device number in a range from 1 (“01“)-254 (“FE“). Number 0 is reserved to address the bus master (PLC, PC ...). Device number 255 (“FF”) can be used to send commands to all connected devices simultaneously.
Command	2 byte	Command designation
Parameter	4-12 bytes	Each command has a parameter block at least 4 bytes in length, some of which remain unused.
Data	variable	Optional data section, which may contain result or job data.
Checksum	2-byte ASCII hex	The checksum is produced by linking all characters beginning with the device number to the end of the data byte for byte with XOR. The checksum must only be specified if the start code “{“ or “(“ is used, otherwise this entry is omitted.
} /]) / >	1 byte	These codes are used as the end codes of the command blocks. If you specify the length in 4 bytes, use the code “}” (datagram with checksum) or “]” (datagram without checksum). If you specify the length in 8 bytes, use the code “)” (datagram with checksum) or “>” (datagram without checksum).

The following section is used to calculate the checksum:



If you use the RS485 bus protocol (device number: 6), the formats change as follows:

Example (Retrieve the last feature check)

NOTE

You can set the structure of datagrams for input and output via the process interface during job creation under *Configure interface*.

{	0	0	0	8	0	6	G	D	0	0	0	0	0	5	}
Start	Length 8 Byte				Device No.		Command		unused				Checksum		End

Retrieve a result

{	0	0	1	6	0	6	R	D	0	0	0	E	S	T	P		,	P		,	0	1	2	5	E	T	7	5	}
Start	Length 22 byte				Device No.		Command		Length 14 byte				Start Data		Overall result			Result Intensity 1			Brightness Intensity 1				End Data		Checksum		End

Response datagram

15.3 General Information

15.3.1 General description of data formats

It is important to distinguish between primitive data types (integers, floats, text) and composite data types (integer points, float points, lists) as well as the format of the corresponding data type (ASCII-dec, binary, ASCII-2 decimal places).

15.3.1.1 Integer

This data type is a whole number value and can also be negative.

Example: 234

Format	Text representation	Transferred value (process interface)
ASCII-Hex	“EA“	\45 \41
ASCII-Dec	“234“	\32 \33 \34
Binary	Cannot be represented	\00 \00 \00 \EA

15.3.1.2 Float

This data type is a floating value and can also be negative.

Example: 10.02

Format	Text representation	Transferred value (process interface)
ASCII (2 decimal places)	“10.02“	\31 \30 \2E \30 \32
ASCII (Exponent)	“+1.002E+01“	\2B \31 \30 \30 \32 \45 \2B \30 \30 \31
Decimal	“10“	\31 \30
Binary (Little Endian)	Cannot be represented	\EC \51 \20 \41
Binary (Big Endian)	Cannot be represented	\41 \20 \51 \EC

15.3.1.3 Text

This data type can contain both printable and non-printable characters.

Example: “MHD“

Format	Text representation	Transferred value (process interface)
ASCII	“MHD“	\4D \48 \44
Binary	“MHD“	\4D \48 \44

15.3.1.4 Composite data type: Integer point

This composite data type is formed of two integer values, the x-coordinate and the y-coordinate.

Available format: Analogue integer

Represented as: x-coordinate <separator> y-coordinate

Example: Value (234, 123), Separator: “;”

Format	Text representation	Transferred value (process interface)
ASCII-Hex	“EA;7B“	\45 \41 \3B \37 \42
ASCII-Dec	“234;123“	\32 \33 \34 \3B \31 \32 \33
Binary	Cannot be represented	\00 \ 00 \00 \EA \3B \00 \ 00 \00 \7B

15.3.1.5 Composite data type: Float point

This composite data type is formed of two float values, the x-coordinate and y-coordinate.

Available format: Analogue float

Represented as: x-coordinate <separator> y-coordinate

Example: Value: (234.02, 123.03), Separator: “;”

Format	Text representation	Transferred value (process interface)
ASCII (2 decimal places)	"234.02;123.03“	\32 \33 \34 \2E \30 \32 \3B \31 \32 \33 \2E \30 \33
ASCII (Exponent)	“+2.3402E+02;1.2303E+02“	\2B \31 \30 \30 \32 \45 \2B \30 \30 \31
Decimal	“234;123“	\31 \30
Binary (Little Endian)	Cannot be represented	\1F \05 \6A \43 \3B \5C \0F \F6 \42
Binary (Big Endian)	Cannot be represented	\43 \6A \05 \1F \3B \42 \F6 \0F \5C

15.3.1.6 Composite data type: List

This composite data type is a list of values of arbitrary type.

Available format: analog used data type

Represented as: number <separator> <1. value corresponding data type> <separator><2. Value corresponding data type><separator>…<separator><last value corresponding data type>

Example: (Data type Integer):
Values: (123,234,245), Seperator: „;“

Format	Text representation	Transferred value (process interface)
ASCII-Hex	„03;7B;EA;F5“	\30 \33 \3B \37 \42 \3B \45 \41 \3B \46 \35
ASCII-Dec	„3;123;234;245“	\33 \3B \31 \32 \33 \3B \32 \33 \34 \3B \32 \34 \35
Binary	nicht darstellbar	\00 \00 \00 \03 \3B \00 \00 \00 \7B \3B \00 \00 \00 \EA \3B \00 \00 \00 \F5

15.3.2 Numeric values in commands

Various commands require numeric values as parameters or return numeric values. For example, when switching the current job, the corresponding job number must be specified and the new job number is returned in the status telegram.

Numerals are always entered as ASCII Hex information in the command data. Observe that the Hex values must be specified in upper case letters!

NOTE

Numerals are always entered as ASCII Hex information in the command data. Observe that the Hex values must be specified in upper case letters!

For example, the Hex numbers below result from the following values:

Value	2-byte ASCII hex	4-byte ASCII hex
1	01	0001
10	0A	000A
100	64	0064
255	FF	00FF
1000	-	03E8

15.3.3 Conversion Table Decimal ↔ Hexadecimal ↔ Character

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
00	00	NUL	32	20	SP	64	40	@	96	60	`
01	01	SOH	33	21	!	65	41	A	97	61	a
02	02	STX	34	22	“	66	42	B	98	62	b
03	03	ETX	35	23	#	67	43	C	99	63	c
04	04	EOT	36	24	$	68	44	D	100	64	d
05	05	ENQ	37	25	%	69	45	E	101	65	e
06	06	ACK	38	26	&	70	46	F	102	66	f
07	07	BEL	39	27	'	71	47	G	103	67	g
08	08	BS	40	28	(	72	48	H	104	68	h
09	09	HT	41	29	)	73	49	I	105	69	i
10	0A	LF	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	48	30	0	80	50	P	112	70	p
17	11	DC1	49	31	1	81	51	Q	113	71	q
18	12	DC2	50	32	2	82	52	R	114	72	r
19	13	DC3	51	33	3	83	53	S	115	73	s
20	14	DC4	52	34	4	84	54	T	116	74	t
21	15	NAK	53	35	5	85	55	U	117	75	u
22	16	SYN	54	36	6	86	56	V	118	76	v
23	17	ETB	55	37	7	87	57	W	119	77	w
24	18	CAN	56	38	8	88	58	X	120	78	x
25	19	EM	57	39	9	89	59	Y	121	79	y
26	1A	SUB	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	62	3E	>	94	5E	^	126	7E	~
31	1F	US	63	3F	?	95	5F		127	7F	DEL

Example: GB – access device backup

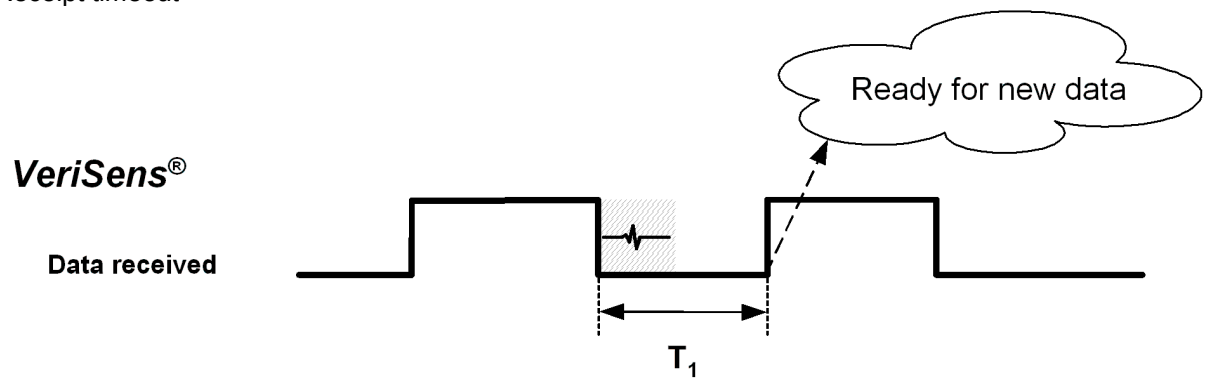
Command

Char	G	B	0	0	0	0
Dec	71	66	48	48	48	48
Hex	0x47	0x42	0x30	0x30	0x30	0x30

Response

Char	R	B	0	0	0	0	0	0	0	4	F	6	1	6	…
Dec	82	68	48	48	48	48	48	48	48	52	70	54	49	54	Data
Hex	0x52	0x44	0x30	0x30	0x30	0x30	0x30	0x30	0x30	0x34	0x46	0x36	0x31	0x36	

Receipt timeout

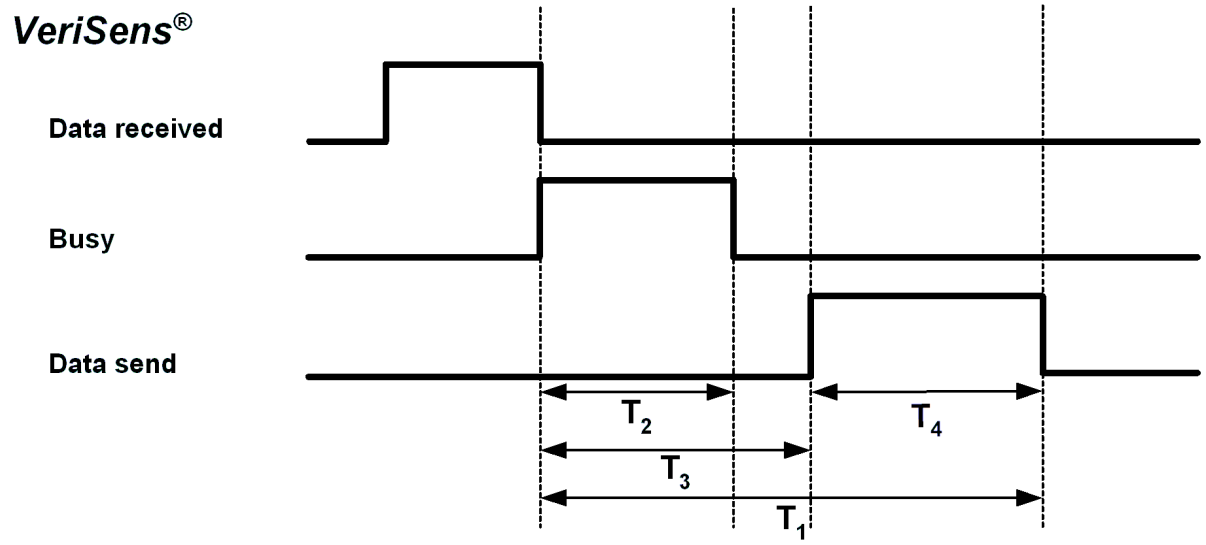


Signal	Duration	
	min.	max.
Receive timeout T_1	10 ms	2000 ms

If errors occur in the communication, receiving is terminated after a defined time. The data received to this point is then discarded. The possible error causes may be:

- The cable was unplugged or mechanically damaged during the transfer.
- Transmission of the data was prematurely terminated due to a technical fault.
- An error occurred in the transfer of the length information, so that the information is incorrectly transferred. The *VeriSens*® then presumes an incorrect overall length of the data.

15.3.4 Response delay



Signal		Duration	
		min.	max.
Response time T_1 No further commands must be transferred during this time!		0 ms	Max. { T_2, T_3 } + T_4
Reaction time T_2	Ethernet	1 ms	5 ms
	RS 485 (only for *VeriSens*® ID-100)	1 ms	5 ms + 2.5 ms per 128 bytes data
Response delay T_3		T_2	10,000 ms
Transfer time T_4		Dependent on the transfer parameters and the length of the data	

The transfer of the data begins not before time T_2 or the value set by the user.

If the time of the maximum response delay is exceeded without data being transferred, the possible response is discarded and you can transfer further commands.

Please observe that the received command will be processed in any case, even if no response datagram has been transferred due to the elapse of the maximum response time. For example, it is possible that this time could be exceeded when switching the active job. In this case, you will receive no confirmation, although the active job has been changed. If necessary, query the device status if you have received no confirmation.

15.4 Available commands

15.4.1 CS command –reset statistics

This function enables you to reset the statistics for individual jobs.

Example

Structure oft he comand SPS ➡ *VeriSens*®							
Command		Parameter					
C	S	0	0	0	0		
Clear **S**tatistics		4 Byte ASCII-Hex job number 0000 = active job 0001 – 0010 = Job number 1-16 0011 – 00FF = invalid					

Structure oft he response SPS ⬅ *VeriSens*®							
Response							
R	C	0	0	0	0		
Response Statistics **C**leared		4 Byte ASCII-Hex job number 0000 = active job 0001 – 0010 job number 1-16 0011 – 00FF = invalid					

15.4.2 GB command – access device backup

This function enables you to access a backup of the *VeriSens*® or the job as well as the device settings.

Example

Structure oft he command SPS ➡ *VeriSens*®						
Command		Parameter				
G	B	0	0	0	0	
Get **B**ackup		0000 = Backup with firmware 0001 = Only jobs and device settings				

Structure oft he response SPS ⬅ *VeriSens*®														
Response														
R	B	0	0	0	0	0	0	0	4	F	6	1	6	…
Response **B**ackup		4 Byte ASCII-Hex parameters of the GB-command Error messages: F001 = Device is not deactivated F004 = Backup is already called away F008 = Password protection acivated				8 Byte ASCII-Hex data length (32bit) At fault ist he length 0.								Data

15.4.3 GD command – retrieve last result

This function enables you to retrieve the result of the last feature check.

NOTE

You can set the content of the datagram for output via the process interface during job creation under *Configure interface* → *Output process interface*.

Example

Structure of the Command SPS ➡ *VeriSens*®	
Command	Parameter
G D	
Get **D**ata	None

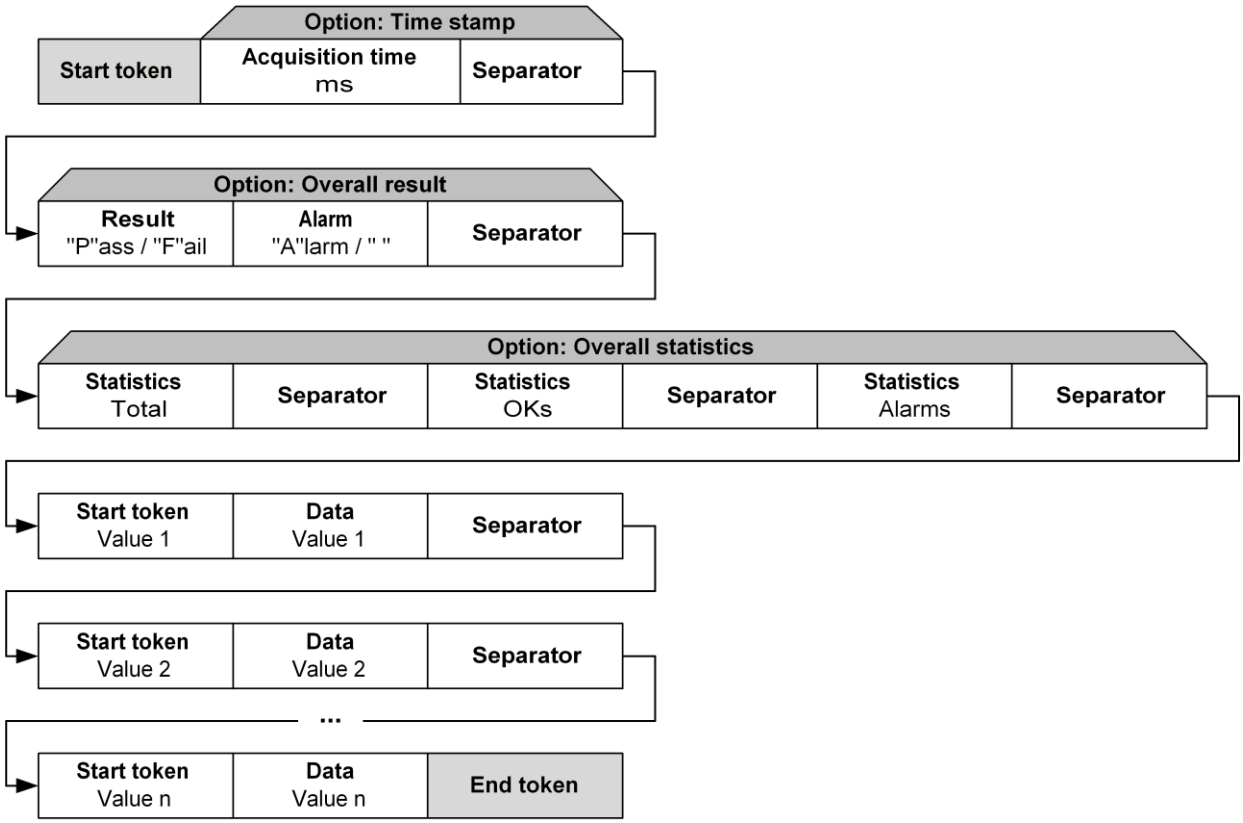
Structure of the Response SPS ⬅ *VeriSens*®							
Response							
R	D	0	0	0	E	…	
Response **D**ata		4 Byte ASCII-Hex Length of the result data				Data	

Parameters of the “RD” datagram response

The datagram contains the results of the last image analysis.

NOTE

You can set the content of the datagram for output via the process interface during job creation under *Configure interface → Output process interface*.



The time stamp in the datagram consists of 8 ASCII characters which specify the number of milliseconds since the system start of the *VeriSens*® device as a hexadecimal number. This value reverts from 4,294,967,295 ms to the value 0 ms after about 49.7 days.

Numbers in datagrams can be represented in different ways:

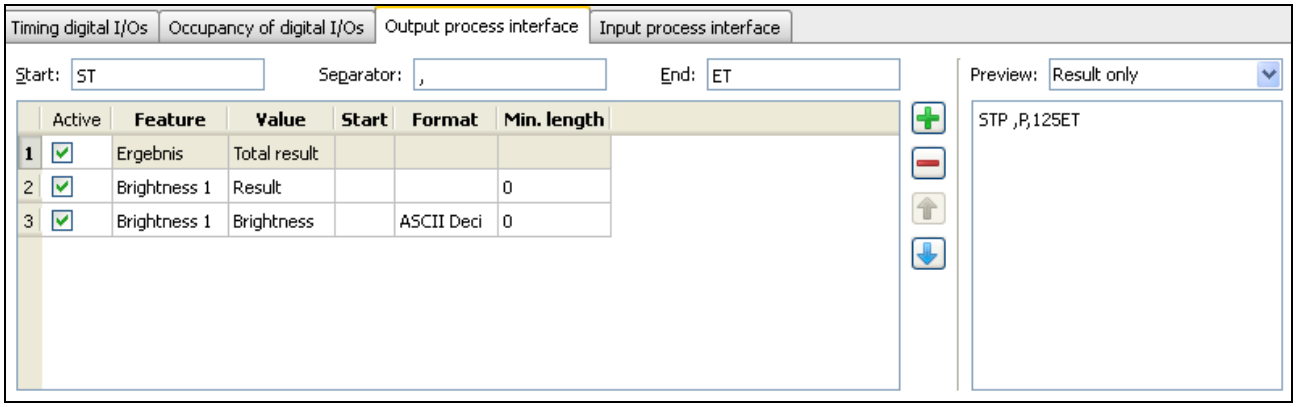
Representation	Description
ASCII decimal	Decimal notation of the number. Negative numbers are represented with “-”. „123“, „78“, „89“, „-123“
ASCII hexadecimal	Hexadecimal notation of the number. Negative numbers are represented as a complement. “7B”, “4E”, “59”, FF85
binary	Binary output of the number. Measured value 123: Characters output `0x00, 0x00, 0x00, 0x7B`

NOTE

In ASCII decimal, the sign is included in the length. For example, if a length with the value of 4 is set, this results in a range of values from –999 to 9999.

Example for the transfer of result data

The configuration of the datagram is set as shown in the illustrations:



A possible response from the *VeriSens*® device would be: `RD000ESTP ,P ,0125ET`
This is assembled as follows:

Structure of the Response SPS ⬅ *VeriSens*®																		
Response																		
R	D	0	0	0	E	S	T	P		,	P		,	0	1	2	5	E	T
Response **D**ata		4 Byte ASCII-Hex length of the data				Start Data		Overall result			Result Brightness			Brightness				End Data	

Each sensor task's result is represented within 1 Byte. The inspection result is described by "P" (result OK) or "F" (result NOK).

An interpretation of this datagram produces:

The overall result of the last image analysis was OK. The value 125 was measured in the working area of the sensor task "Brightness". The individual result of this sensor task was also OK.

15.4.4 GF command – access individual data on the device

This function enables you to access individual data on the device.

Example

Structure oft he command SPS ➡ *VeriSens*®							
Command		Parameter					
G	F	0	0	0	0		
Get **F**ile		0000 = List of all jobs 01nn = Access a job (nn 2-byte ASCII hex job number) 02nn = Call a job using the job name (nn:2-byte ASCII hex length of the file name + file name) 0300 = Access Logging					

Structure of the Response SPS ⬅ *VeriSens*®																		
Response																		
R	F	0	0	0	0	0	0	0	0	0	0	0	0	F	1	2	3	...
Response **F**ile		4 bytes ASCII-hex, mirrored parameters oft he GF reques				2 bytes ASCII hex: Error code 00 = No error 01 = Not in setup or IDLE mode 02 = File not found 04 = Working with previous GF command FF = internal error		2 bytes ASCII hex Reserved		8 bytes ASCII hex Length of the following data								Data

15.4.5 GI command – access an image (only via Ethernet)

This function enables you to access live images and defect images with and without the field of view.

Example

Structure of the command SPS ➡ *VeriSens*®						
Command		Parameter				
G	I	0	0	0	0	
Get **I**mage		2 byte ASCII hex 00 = live image 01 = live image with working area 80 = fault image 81 = fault image with working area		2 byte ASCII hex image number 00 = last image, 01 = next-to-last image, 02 = …		

Structure of the Responset SPS ⬅ *VeriSens*®														
Response														
R	I	0	0	0	0	0	0	0	4	F	6	1	6	…
Response **I**mage		2 byte ASCII hex 00 = live image 80 =fault image		2 byte ASCII hex image number		8 byte ASCII hex length of the image data								Image data in the BMP format

15.4.6 GM command – access information about the device

This function enables you to access information about the connected device.

Example

Structure of the Command SPS ➡ *VeriSens*®						
Command		Parameter				
G	M	0	0	4	0	
Get **M**odel Information		4 byte-ASCII hex Acess single elements 0001 = Device type 0002 = MAC address 0004 = Serial number 0008 = Firmware version 0010 = Hardware version 0020 = Device name 0040 = Manufacturer 0000 = All (in the order given above)				

Structure of the Response SPS ⬅ *VeriSens*®										
Response										
R	M	0	0	4	0	0	0	1	4	Baumer Optronic GmbH
Response **M**odel Information		4-byte ASCII hex mirrored parameters of the GM request				4-byte-ASCII hex For each element: Length of the result data				Data

15.4.7 GP command – access the current configuration of the SP command

This function enables you to access the current configuration of the SP command (setting the parameters for the feature checks).

Example

Structure of the ´Command SPS ➡ *VeriSens*®		
Command		Parameter
G	P	
Get **P**arameter		none

Structure oft he Response SPS ⬅ *VeriSens*®														
Antwort														
R	G	0	0	0	8	1	5	.	0	2	.	1	4	
Response **G**et Parameter		4 byte ASCII hex Length of the result data				Data The content of the data corresponds to the expected values currently set for the feature check, for example a date, or a combination of expected values for different feature checks.								

NOTE

You can set the content of the datagram for output via the process interface during job creation under *Configure interface → Output process interface*.

15.4.8 GS command – request status

This function enables you to access current status information for the *VeriSens*®.

Example

Structure of the Command SPS ➡ *VeriSens*®	
Command	Parameter
G S	
Get **S**tate	None

Structure of the Response SPS ⬅ *VeriSens*®										
Response										
R	S	0	0	8	5	0	0	1	A	
Response **S**tate		4 byte ASCII hex status				4 Byte ASCII-Hex Number of the active job				

Parameters of the “RS” command – Current status information

The current status information consists of 8 characters, of which the first 4 characters describe various states in a bit mask and the other 4 characters contain the current job number.

Bits							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1. Status (ASCII)				2. Status (ASCII)			
Internal error	**Backup** OK	**Backup** Error	**Backup** Active	**Acquisition** Trigger possible	**Job Update** OK	**Job Update** Error	**Job Update** Active
3. Status (ASCII)				4. Status (ASCII)			
Mode Run Mode	**Mode** Test Mode	**Mode** Setup	**Mode** Recovery	**Acquisition** continuously	**Acquisition** External trigger	**Protocol** Continuous Mode	**Protocol** Polling Mode
1. Job number (ASCII)				2. Job number (ASCII)			
Number of active job							
3. Job number (ASCII)				4. Job number (ASCII)			
Number of active job							

When a job is being transferred via the process interface, the current status of this action can be queried by the PLC. The corresponding bit “Job update active” is set during the data transfer period. This bit remains set until the job has been completely transferred and stored or an error has occurred. The success of the action can then be assessed by the corresponding bits “Job update – OK” and “Job update – error”. These flags are retained until the next transfer of a job.

If the sensor is in *Activated* mode, the current job number is entered in the datagram. 0000 is entered here in all other operating modes.

Here are two examples of possible states of the device:

Character string	Meaning	
0 0 8 5 0 0 1 A	0 0 8 5 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 1	Current inspection mode: *Activated* Acquisition: External trigger Protocol: Polling mode Active job: 26 (Hex: 1A)
0 0 2 9 0 0 0 0	0 0 2 9 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1	Current inspection mode: *Parameters set* Acquisition: Continuous Protocol: Polling mode Active job: -

15.4.9 SJ command – change to a different job

This function enables you to change to a different job.

To use this function, you must first activate the option *Command SJ via process interface* in the device settings. (*Device → Device settings → Job selection / Teach*).

Example

Structure of the Command SPS ➡ *VeriSens*®						
Command		Parameter				
S	J	0	0	1	A	
Switch **J**ob		4 byte ASCII hex desired job number				

Structure of the Response SPS ⬅ *VeriSens*®										
Response										
R	S	0	0	8	5	0	0	1	A	
Response **S**tate		4 byte ASCII hex Status				4 Byte ASCII-Hex Number of the active job				

NOTE

Further explanation of the parameters of the RS response can be found under “Request status (GS / RS)”.

15.4.10 SM command – change operating mode

This command enables you to change the operating mode for the device as well as the parameters for data exchange.

Example

<table>
<tr><th colspan="4">**Structure of the Command** SPS ➡ *VeriSens*®</th></tr>
<tr><td colspan="2">Command</td><td colspan="2">Parameter</td></tr>
<tr><td>S</td><td>M</td><td>M</td><td>R</td></tr>
<tr><td colspan="2">**S**witch
Mode</td><td colspan="2">2 byte-ASCII hex

DC = **D**ata transfer – **C**ontinuous Mode
The result data is autonomouslytransferredafter each analysis in RunmodeActivated via the process interface. You must set the parameter “ Activate outputs” during job testing.

DP = **D**ata transfer – **P**olling Mode
In Run mode Activate dand in Parameter settings mode, the result data is only transferred after the GD command has been received.

MR = Mode switch – Modus *Aktiviert*
The device is activated.
Data is only transferredautonomously if the Continuous mode is activated as described above.

MS = Mode switch – Modus *Parametrieren*
The device is switched to *Parameter settings*mode.
No result data is transferred.</td></tr>
<tr><td colspan="2"></td><td colspan="2">For Ethernet only</td></tr>
<tr><td colspan="2"></td><td colspan="2">CC = **C**ommand delimiter – **C**arriage return
Data packets of the process interface are terminated using <CR> (Hex: 0D, Escape-Sequenz: <code>\r</code>)

CL = **C**ommand delimiter – **L**ine feed
Data packets of the process interface are terminated using <LF> (Hex: 0A, Escape-Sequenz: <code>\n</code>)

CB = **C**ommand delimiter – **B**oth carriage return + line feed
Data packets of the process interface are terminated using <CR><LF>

CN = **C**ommand delimiter – **N**o sequence
Data packets of the process interface are not terminated using a sequence</td></tr>
</table>

Structure of the Command SPS ➡ *VeriSens*®					
Command		Parameter			
S	M	M	R		
Switch **M**ode		2 byte ASCII hex Modus			
		For RS485 only			
		Point-to-point protocol	Bus-protocol		
		PP	PP	**P**rotocol mode – **P**oint-To-Point Changes the employed protocol to point-to-point protocol.	
		PB	PB	**P**rotocol mode – **B**us without checksum Changes the employed protocol to bus protocol without checksum.	
		PC	PC	**P**rotocol mode – Bus with **C**hecksum Changes the employed protocol tobus protocol with checksum.	

Structure of the Response SPS ⬅ *VeriSens*®										
Response										
R	S	0	0	8	5	0	0	1	A	
Response **S**tate		4 byte ASCII hex Status				4 Byte ASCII-Hex Number of the active job				

NOTE

Further explanation of the parameters of the RS response can be found under “Request status (GS / RS)”.

15.4.11 SP command – set parameters for the feature checks

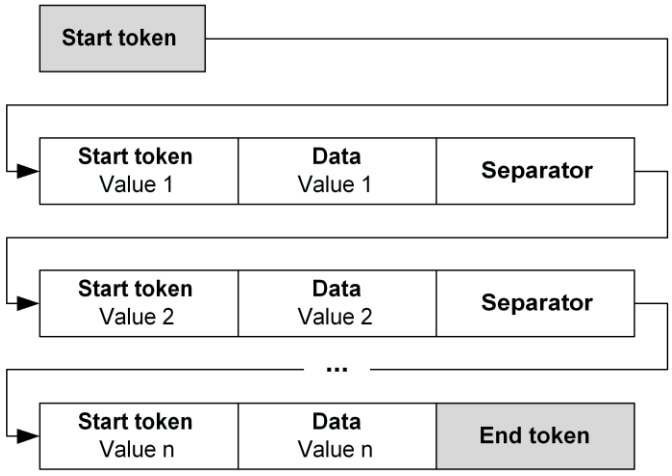
This function enables you to set the expected values for the feature checks of Identification (Barcode, Matrix Code, Text).

NOTE

You can set the content of the datagram for output via the process interface during job creation under *Configure interface* → *Output process interface*.

NOTE

When setting the exposure time for the job, the “Camera ready” signal must be active before the next image can be acquired.



Example

Structure of the Command SPS ➡ *VeriSens*®																
Command		Parameter														
S	P	0	0	0	8	1	7	.	0	3	.	2	0	1	4	
Set **P**arameter		4 byte ASCII hex Length of the result data				Data e.g. a date, or a combination of expected values for different feature checks.										

Structure of the Response SPS ⬅ *VeriSens*®										
Response										
R	P	0	0	0	0	0	0	0	0	
Response **P**arameter		4 byte ASCII hex Status 0000 = OK 0001 = Data errors in data packet 0002 = Device not in RUN mode 0003 = Out of range 0004 = No datagram defined in the job sonst = internal fault				4 byte ASCII Hex Error position				

15.4.12 TE command – use next image for external teach

This function enables you to use the next image for an external teach-in. However, image acquisition will not be triggered.

Structure of the Command SPS ➡ *VeriSens*®	
Commando	Parameter
T E	
TEach Image	None

Structure of the Response SPS ⬅ *VeriSens*®	
Response	
R T	
Response **T**each	

15.4.13 TR command – request image acquisition and response datagram

This function enables you to immediately acquire an image and response datagram. The response datagram will only be sent if the result is set to send automatically following image analysis and if data is defined.

Example

Structure of the Command SPS ➡ *VeriSens*®	
Command	Parameter
T R	
TRigger Image	None

Structure of the Response SPS ⬅ *VeriSens*®							
Response							
R	D	0	0	0	E	…	
Response **D**ata		4 Byte ASCII-Hex Length of the result data				Data	

NOTE

Further explanation of the parameters can be found under *Retrieve last result (GD / RD).*

15.4.14 UD command – transfer backup data (only for Ethernet)

This function enables you to transfer backup data to the *VeriSens*®.

NOTE

The device must be restarted following use of the UD command and successful transfer of a backup, for example via the VB0000 command.

Example

Structure of the Command SPS ➡ *VeriSens*®																		
Command		Parameter																
U	D	S	1	9	2	.	1	6	8	.	0	0	0	.	2	5	0	
Update **D**evice		IP Adress S = static D = DHCP	15 characters ASCII IP-Adresse															➔

Parameter																		
2	5	5	.	2	5	5	.	2	5	5	.	0	0	0				➔
15 characters ASCII Subnetmask																		

Parameter																		
0	0	0	.	0	0	0	.	0	0	0	.	0	0	0				➔
15 characters ASCII Gateway																		

Parameter																		
1	1	V	S	X	F	2	0	0	M	1	0	W	E	-	T	E	S	T	➔
2-Byte ASCII Hex Length of device name		Device name																

Parameter									
0	0	B	6	B	B	4	6	…	
8 byte ASCII hex Length of the data								Data	

NOTE

If using DHCP, you can set what happens following a DHCP timeout as follows:

Use DHCP and in case of DHCP failure, use the last IP address
`UDD000.000.000.000000.000.000000.000.000...`

or

`UDD255.255.255.255000.000.000000.000.000...`

Use DHCP, set an alternative IP address
e.g. `UDD192.168.000.250255.255.255.000000.000.000.000...`
(In this case, the alternative IP address is `192.168.0.250`)

Structure of the Response SPS ⬅ *VeriSens*®				
Response				
R	U	0	0	
Response **U**pdate	2 byte ASCII hex 00 = received OK 01 = device not in SETUP mode 02 = invalid job number 03 = job could not be loaded 04 = job update still active 05 = invalid network settings 06 = invalid device name 07 = backup file device type not identical to *VeriSens*® 08 = user management is active 09 = device file is password protected 10 = File could not be opened for writing 11 = File write error 12 = Incompatible backup 13 = Only the firmware cannot be imported other = internal fault			

15.4.15 UJ command – transfer a new job

This function enables you to transfer a new job to the *VeriSens*®.

Example

Structure of the Command SPS ➡ *VeriSens*®													
Command		Parameter											
U	J	0	0	0	3	0	0	0	4	F	9	E	2	…
Update **J**ob		4 byte ASCII hex job number				8 byte ASCII hex job size								job as binary data

Structure of the Response SPS ⬅ *VeriSens*®				
Response				
R	U	0	0	
Response **U**pdate	2 byte ASCII hex 00 = received OK 01 = device not in SETUP mode 02 = invalid job number 03 = job could not be loaded 04 = job update still active 05 = invalid network settings 06 = invalid device name 07 = backup file device type not identical to *VeriSens*® 08 = user management is active 09 = device file is password protected 10 = File could not be opened for writing 11 = File write error 12 = Incompatible backup 13 = Only the firmware cannot be imported other = internal fault			

15.4.16 VB command – restart device

This function enables you to restart the VeriSens® or put it into recovery mode. This command does not send a response.

Example

Structure of the Command SPS ➡ *VeriSens*®							
Command		Parameter					
V	B	0	0	0	0		
VeriSens Re**B**oot		4 byte ASCII hex 0000 = Restart FFFF = Recovery mode					

16 Cleaning

Due to its compact design, the *VeriSens*® is characterized by almost maintenance-free operation.

When used for the intended purpose, it is possible that the optical surfaces may need to be cleaned from time to time.

Clean optical areas are required for the consistent and reproducible operation of the *VeriSens*®.

Ensure that the glass cover of the *VeriSens*® is protected as well as possible against dust. If your application does not permit this, the glass cover must be cleaned at longer or shorter intervals as necessary.

ATTENTION!

Ensure that no residues of the cleaning agent or scratches remain on the glass. These can permanently damage the reproducibility of the results from the *VeriSens*® Vision Sensor.

For cleaning, use a soft, non-linting cloth to clean the area of the glass cover without scratching.

To clean stubborn dirt, commonly available window cleaning agent is recommended.

17 Technical data

17.1 *VeriSens*® devices and accessories

Item no.	Type description	Product description	Lens	Interface	Resolution
Vision sensors					
11048500	VS CS100M03W10EP	*VeriSens*® CS-100 / White	10 mm	Ethernet	752 x 480 px
11089900	VS CS100M03I10EP	VeriSens® CS-100 / Infrared	10 mm	Ethernet	752 x 480 px
11076261	VS CS100M03W16EP	*VeriSens*® CS-100 / White	16 mm	Ethernet	752 x 480 px
11093026	VS CS100M03I16EP	VeriSens® CS-100 / Infrared	16 mm	Ethernet	752 x 480 px
11048489	VS ID100M03W10RP	*VeriSens*® ID-100 / White	10 mm	Ethernet, RS485	752 x 480 px
11076263	VS ID100M03W16RP	*VeriSens*® ID-100 / White	16 mm	Ethernet, RS485	752 x 480 px
11048484	VS ID110M03W10EP	*VeriSens*® ID-110 / White	10 mm	Ethernet	752 x 480 px
11089896	VS ID110M03I10EP	VeriSens® ID-110 / Infrared	10 mm	Ethernet	752 x 480 px
11039658	VS XF100M03W10EP	*VeriSens*® XF-100 / White	10 mm	Ethernet	752 x 480 px
11102229	VS XF100M03I10EP	*VeriSens*® XF-100 / Infrared	10 mm	Ethernet	752 x 480 px
11039659	VS XF100M03W16EP	*VeriSens*® XF-100 / White	16 mm	Ethernet	752 x 480 px
11039656	VS XF200M03W10EP	*VeriSens*® XF-200 / White	10 mm	Ethernet	752 x 480 px
11089899	VS XF200M03I10EP	VeriSens® XF-200 / Infrared	10 mm	Ethernet	752 x 480 px
11039657	VS XF200M03W16EP	*VeriSens*® XF-200 / White	16 mm	Ethernet	752 x 480 px
11086398	VS XC100M03X00EP	*VeriSens*® XC-100 / integrated flash controller	C-Mount	Ethernet	640 x 480 px
11086399	VS XC100M12X00EP	*VeriSens*® XC-100 / integrated flash controller	C-Mount	Ethernet	1280 x 960 px
11086410	VS XC100M20X00EP	*VeriSens*® XC-100 / integrated flash controller	C-Mount	Ethernet	1600 x 1200 px
11086175	VS XC200M03X00EP	*VeriSens*® XC-200 / integrated flash controller	C-Mount	Ethernet	640 x 480 px
11086176	VS XC200M12X00EP	*VeriSens*® XC-200 / integrated flash controller	C-Mount	Ethernet	1280 x 960 px
11086177	VS XC200M20X00EP	*VeriSens*® XC-200 / integrated flash controller	C-Mount	Ethernet	1600 x 1200 px
11086398	VS XC100M03X00EP	*VeriSens*® XC-100 / integrated flash controller	C-Mount	Ethernet	752 x 480 px
Cables					
11048452	ESG 34JP0200G	Connecting cable, M12/12-pin, screened, straight plug, 2m			
11043780	ESG 34JP0500G	Connecting cable, M12/12-pin, screened, straight plug, 5m			
11048455	ESG 34JP1000G	Connecting cable, M12/12-pin, screened, straight plug, 10m			
11048456	ESW 33JP0200G	Connecting cable, M12/12-pin, screened, angled plug, 2m			
11043785	ESW 33JP0500G	Connecting cable, M12/12-pin, screened, angled plug, 5m			
11048458	ESW 33JP1000G	Connecting cable, M12/12-pin, screened, angled plug, 10m			
11048502	KSG 34A/KSG45AP0200G/E	Ethernet cable, M12, screened, straight plug / RJ-45, 2m			
10165276	KSG 34A/KSG45AP0500G/E	Ethernet cable, M12, screened, straight plug / RJ-45, 5m			
11051929	KSG 34A/KSG45AP01000G/E	Ethernet cable, M12, screened, straight / RJ-45, 10m			
11048592	KSW 34A/KSG45AP0200G/E	Ethernet cable, M12, screened, angled plug / RJ-45, 2m			
11048594	KSW 34A/KSG45AP0500G/E	Ethernet cable, M12, screened, angled plug / RJ-45, 5m			
11051950	KSW 34A/KSG45AP01000G/E	Ethernet cable, M12, screened, angled plug / RJ-45, 10m			

Installation Accessories		
10159905	Straight bracket	Straight bracket for *VeriSens*®, screws
10159906	Fastening bracket, angled	Fastening bracket 90° for *VeriSens*®, screws

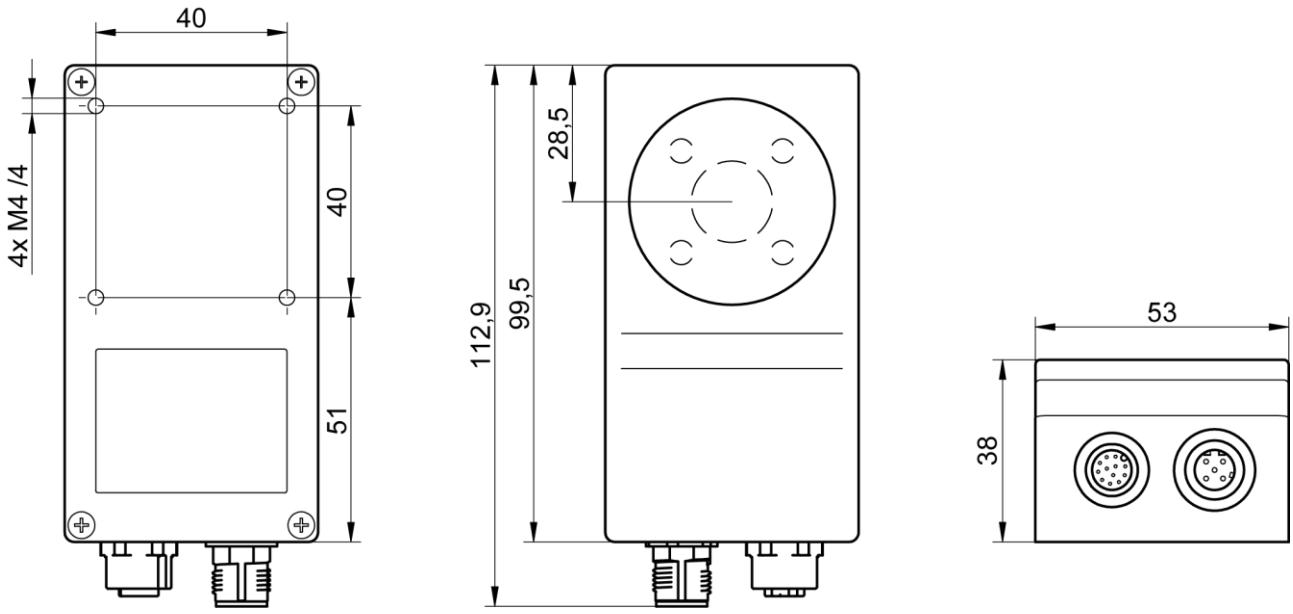
Overview of sensor tasks

Sensor tasks	ID-100	ID-110	CS-100	XF-100 XC-100	XF-200 XC-200
Part location					
Part location on contours			360°	360°	360°
Part location on edges				+	+
Part location on a circle				+	+
Part location on text lines		+		+	+
Geometry					
Distance			+	+	+
Circle			+	+	+
Angle				+	+
Edge counting				+	+
Point position				+	+
Feature comparison					
Count contour points			+	+	+
Contour matching		+	+	+	+
Brightness			+	+	+
Contrast				+	+
Area size				+	+
Counting areas				+	+
Pattern matching				+	+
Identification					
Barcode	+	+			+
Matrix code	+	+			+
Text		+			+

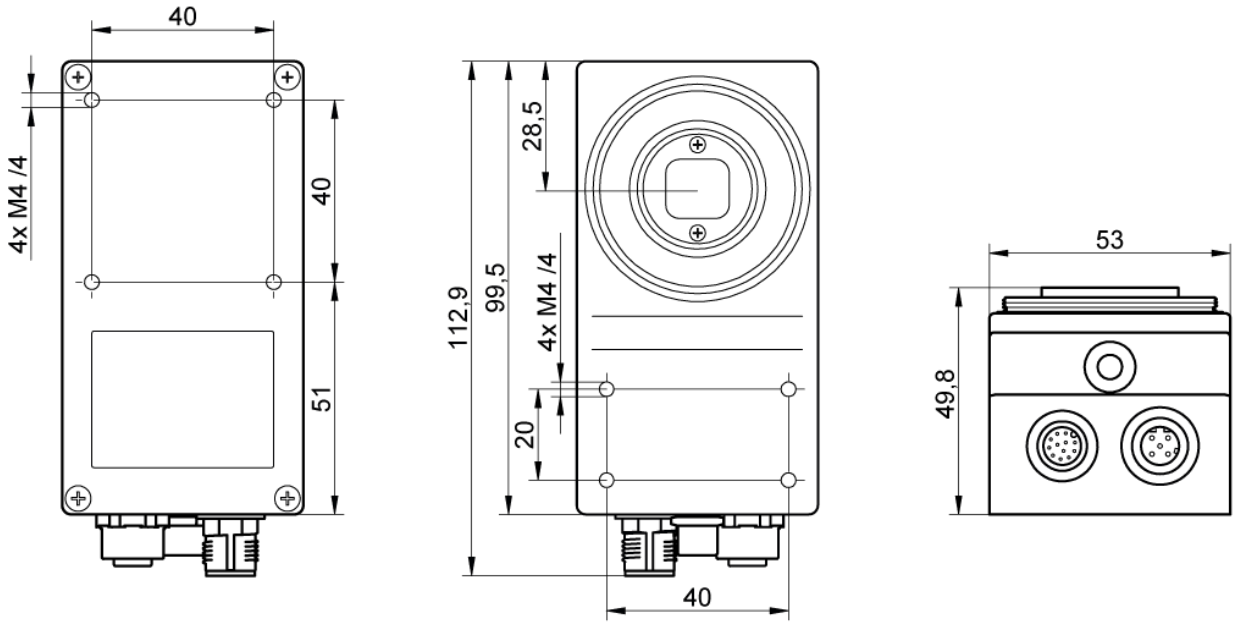
Features

Features *VeriSens*®	XC-100	XC-200	XF-100	XF-200	CS-100	ID-110	ID-100
Optics: 10 mm | 16 mm | C-mount	-|-|●	-|-|●	●|●|-	●|●|-	●|●|-	●|-|-	●|●|-
Illumination: White | Infrared (daylight filter integrated) | Integrated flash controller for external illumination	-|-|●	-|-|●	●|●|-	●|●|-	●|●|-	●|●|-	●|-|-
Configurable web interface (live image, job switching, retrieving defect images)	●	●	●	●	●	●	●
Save images via FTP	●	●	●	●	●	●	●
Configuration via Ethernet	●	●	●	●	●	●	●
Process linkage: Digital I/Os	5 | 5	5 | 5	5 | 5	5 | 5	5 | 5	5 | 5	5 | 3
Process interface: Ethernet | RS485	●|-	●|-	●|-	●|-	-|-	●|-	●|●
Baumer **FEX**® image processor	4.0	4.0	4.0	4.0	3.5	3.5	3.5
FEXLoc® (360° part location)	●	●	●	●	●		
User administration / Password protection	●	●	●	●		●	●
Coordinate conversion	●	●	●	●			
Flexible result conjunction	●	●	●	●			
Identification functions: Code | Text	-|-	●|●	-|-	●|●	-|-	●|●	●|-
High-speed mode	●	●	●	●			
Gamma correction	●	●	●	●			

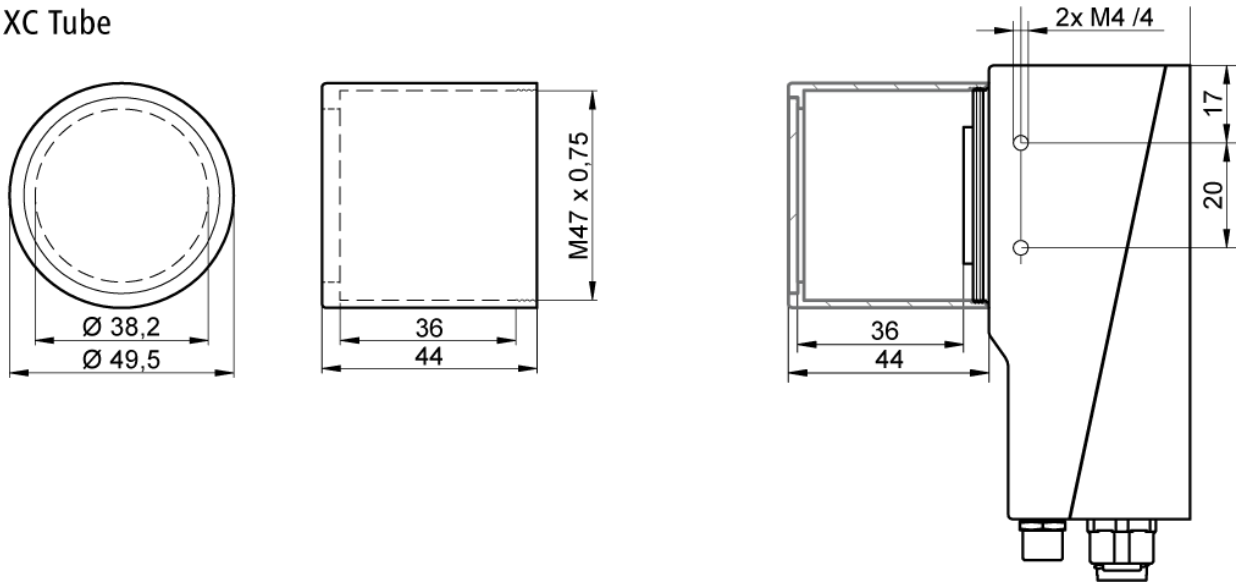
17.2 Technical drawing of *VeriSens*® Vision Sensor (except XC-100 / XC-200)



17.3 Technical drawing of *VeriSens*® C-mount Vision Sensor (only XC-100 / XC-200)

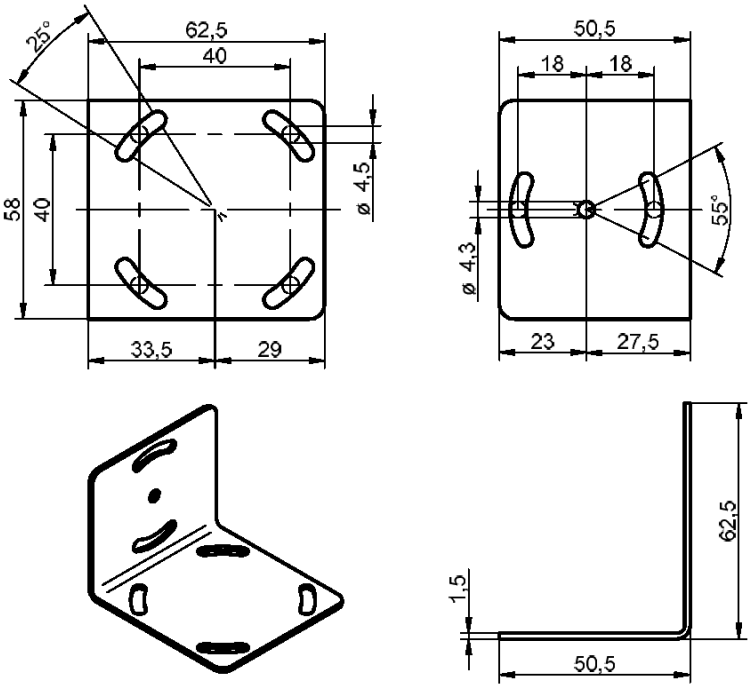


XC Tube



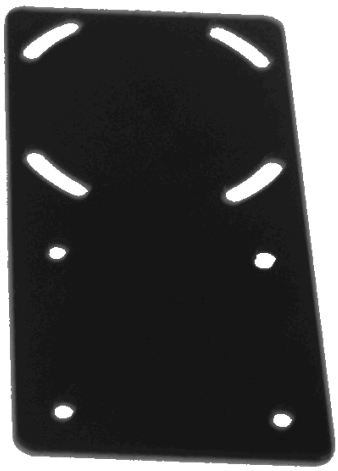
17.4 Fastening bracket, 90 degree

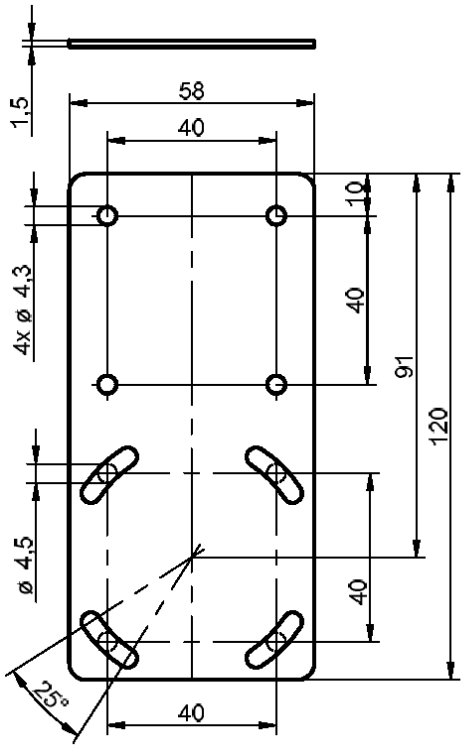
- Color: Black
- Material: Powder-coated steel



17.5 Fastening bracket, straight

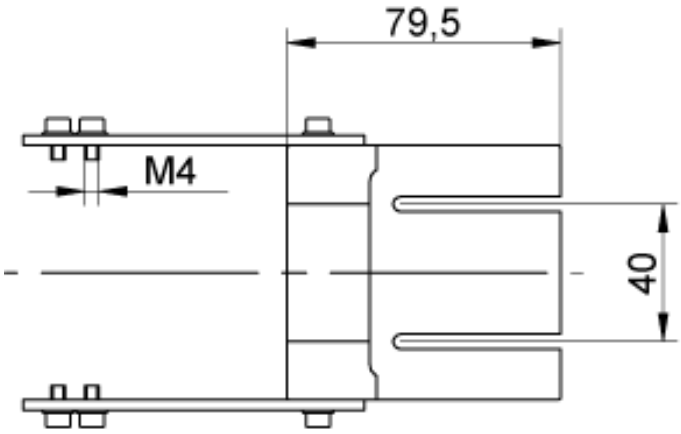
- Color: Black
- Material: Powder-coated steel

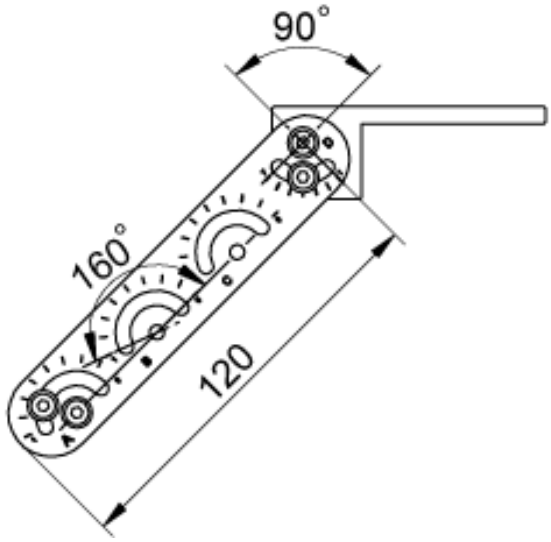


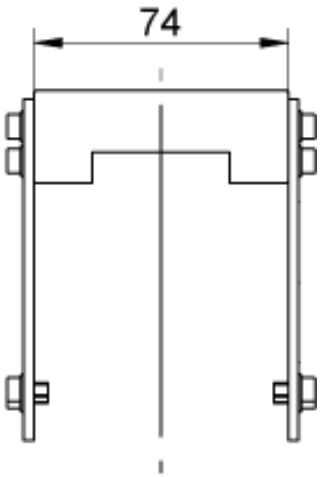


17.6 Lighting mount “VB Fix Kit Bar Light 74”

- Color: Black
- Material: Powder-coated aluminium
- suitable with illumination “VB Bar Light 74” (Art.No. 11081785)







17.7 Technical data

General data	XC series			XF series | CS series | ID series	
Resolution	640 × 480 px	1280 × 960 px	1600 × 1200 px	752 × 480 px	
Sensor (monochrome)	CCD (1/4“)	CCD (1/3“)	CCD (1/1.8“)	CMOS (1/3“)	
LED illumination	Integrated flash controller for external illumination			White (LED class: Risk group 1 low risk, EN 62471:2008) Infrared (LED class: free group risk-free, EN 62471:2008)	
Lens	Changeable lens (C-mount)			f = 10 mm (integrated)	f = 16 mm (integrated)
Min. object distance	Depending on changeable lens			50 mm	70 mm
Max. object distance	Depending on changeable lens			∞	300 mm
Speed High-resolution mode High-speed mode (Binning 2 × 2)	Max. 50 insp. / sec. Max. 100 insp. / sec.	Max. 12 insp. / sec. Max. 25 insp. / sec.	Max. 7 insp. / sec. Max. 15 insp. / sec.	Max. 50 insp. / sec. Max. 100 insp. / sec. (XF series only)	
Defect image memory	32	8	4	32	
Number of jobs	Up to 255 on the device (can be exchanged via process interface)				
Features per job	32				

Electrical data	XC series	XF series | CS series | ID series
Power supply	⎓ +18 … 30 VDC	
Power consumption	Typical 5 W (I_{max} = 1.5 A at 24 V)	Typ. 5 W (I_{max} = 1 A at 24 V)
Inputs	8 … 30 VDC	
Outputs	PNP 100 mA	
Digital input	Trigger, Job selection, External teach-in, Encoders (CH-A, CH-B) 500 kHz	
Digital output	Pass / Fail 1-5 [1], Flash Sync, Alarm, Camera Ready, Output Enable [1] ID-100: 1-3	
Communication Initial setup Process interface	Ethernet (10 Base-T / 100 Base-TX) TCP/IP (Ethernet) [2], RS485 [3] [2] except CS-100 [3] ID-100 only	

Integr. flash controller	XC series	XF series | CS series | ID series
Voltage (permanent) Voltage (pulsed)	⎓ 12 VDC or ⎓ 24 VDC ⎍ 24 VDC or ⎍ 48 VDC	–
Current (permanent) Current (pulsed)	I_{max} = 800 mA at ⎓ 24 VDC (+/-10 %, at least +/- 100 mA, at 25 °C) I_{max} = 4 A at ⎍ 48 VDC (+10/-20 %, at least +/- 100 mA, at 25 °C)	–
Flash time	Max. 1 ms (Duty Cycle max. 1:10)	–

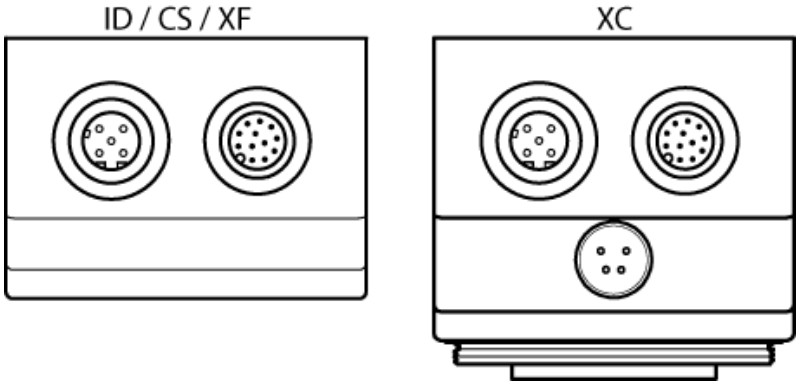
Operating conditions	XC series	XF series | CS series | ID series
Operating temperature	+5 … +50 °C	
Humidity	0 … 90 % (non-condensing)	
Protection class	IP 67 (XC series: with tube)	
Vibration load	IEC 60068-2-6, IEC 60068-2-64	
Mech. shock resistance	EN 60068-2-27	

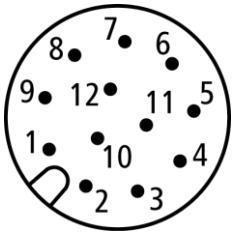
Mechanical data	**XC series**	**XF series | CS series | ID series**
Width × Height × Depth	53 mm × 99.5 mm × 49.8 mm (without lens / tube)	53 mm × 99.5 mm × 38 mm
Material	Housing: Aluminum, Cover glass tube: PMMA	Housing: Aluminum, Cover glass: PMMA [4)]
Weight	300 g (without lens / tube)	250 g

Code types / OCR	**Model: XC-200**	**Models: XF-200 | ID-110 | ID-100**
Barcode [5)]	2/5 Industrial, 2/5 Interleaved, Codabar, Code 39, Code 93, Code 128, PharmaCode EAN 8, EAN 13, UPC-A, UPC-E: Base code + variants Add-On 2, Add-On 5 GS1 DataBar (RSS): Limited, Expanded, Expanded Stacked GS1 DataBar (RSS-14): Base code + variants Truncated, Stacked, Stacked Omnidir GS1 128	
Matrix code [5)]	DataMatrix (ECC 200), GS1-DataMatrix, QR, PDF417	
Font [6)]	Many font styles (recommended: sans serif, proportional), Dot Matrix, Characters: A-Z a-z 0-9 + -. : / ( )	

[4)] for XF-200, XF-100, CS-100, ID-110 with infrared illumination: daylight filter integrated
[5)] incl. quality rating of all barcodes according to ISO / IEC 15416 as well as all matrix codes according to ISO / IEC 15415 or AIM DPM-1-2006
[6)] XF-200, XC-200, ID-110 only

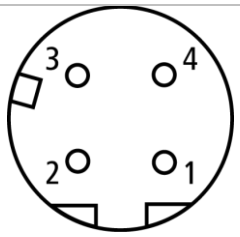
17.8 *VeriSens*® Electrical Connection (View on Device)





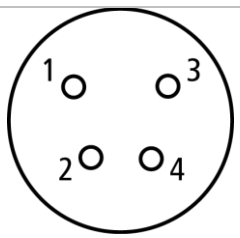
Pin assignment of the Device

Pin	Designation
1	Power (⎓ + 18 - 30 VDC)
2	Ground
3	IN1 (Trigger)
4	OUT 1 (PTC-protected)
5	IN 2
6	OUT 2 (PTC-protected)
7	OUT 3 (PTC-protected)
8	IN 3
9	OUT 4 / (RS 485+, only ID-110), (PTC-protected)
10	IN 4
11	IN 5
12	OUT 5 / (RS 485-, only ID-110), (PTC-protected)



Pin assignment of the Ethernet interface

Pin	Designation
1	TD+
2	RD+
3	TD-
4	RD-



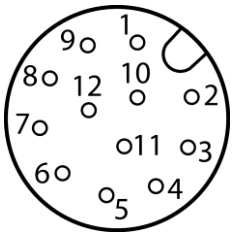
Supply for external lighting (only XC)

Pin	Designation
1	⎓ +24V or ⎓ +48V Flash
2	⎍ +12V or ⎍ +24V Flash
3	Ground
4	Flash Sync [1)], (100 mA PNP)

[1)] voltage according to power supply
voltage outputs configurable by software

FCC depending on model

17.9 Power Cable *VeriSens*® M12 / 12-pin



Pin assignment of the power cable

Pin	Designation	Color code
1	Power (⎓ + 18 - 30 VDC)	brown
2	Ground	blue
3	IN1 (Trigger)	white
4	OUT 1 (PTC-protected)	green
5	IN 2	pink
6	OUT 2 (PTC-protected)	yellow
7	OUT 3 (PTC-protected)	black
8	IN 3	grey
9	OUT 4 / RS 485+ (PTC-protected)	red
10	IN 4	violet
11	IN 5	grey-pink
12	OUT 5 / RS 485- (PTC-protected)	red-blue