



Operator's Manual



SCORPION
VISION SOFTWARE®

Evolving visions

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1 Introduction

Scorpion Vision Software® is software for configuration and operation of vision systems. Scorpion is targeting tasks as identification, sorting, robot guiding, assembly verification and quality control. It's designed to secure the quality of a production process. Scorpion is as easy to use as a vision-sensor still having the flexibility and power of a real vision-pc solution. The system is founded on top of a standard Windows PC platform.

Scorpion can identify units based on criteria like dimension, form, grey scale, colour, text and code. Quality control can be based on dimension, surface, flaw, assembly etc. Scorpion can also be used in factory automation to identify parts, sorting, robot guiding and automatic program selection.

To monitor the inspection result and the production process, Scorpion offers statistics and detailed result information. Scorpion offers the end-user a feature rich and functional graphical user interface with image display, result panels, image history list, real time trends, alarm management, event log, quality alarms, remote control, user configurable logging and rich configuration profiles.

The flexible and configurable communication line interface allows managing of control signals and data exposure through Profibus-DP, digital and analogue I/O, rs-232 and TCP/IP. The text based communication protocol, TdvCmdProtocol, is the kernel of the communication.

Scorpion contains an extensible set of configuration tools. They are categorized in Basic, Data, Edge, Geometry, Reference, Advanced and 3D tools. Combining these tools, Scorpion targets both the simple and the advanced inspection tasks.

Scorpion can simultaneously serve and communicate with multiple independent units like PLCs, robots and production lines.

Additionally Scorpion supports on-the-fly reconfiguring to handle different product variants within one single production line. A broad range of camera configurations are supported, including colour cameras.

A unique feature within Scorpion is the possibility to perform a complete offline system verification automatically or interactively using the integrated image history list or captured image data.

This operator's manual guides you through the Scorpion Vision Software operational interface, and gives you some hints and ideas on the way.

See the Scorpion User Manual for information on system configuration and service.



2 Start up and Operation

To start an inspection do as follows:

You must first start Scorpion with the correct profile.

1. Go to the Windows Start menu
2. Select *Start - Programs - Tordivel Vision Solutions - Scorpion*. A profile selection dialog is shown.
3. Select the wanted profile (your system) and press *OK*. Scorpion starts.

Scorpion is now ready to start the inspection.

- Press the *Start* main button and Scorpion is running.



- Press the *Stop* button to stop Scorpion.



For every new image an inspection is automatically executed. The image can either be triggered from an internal scheduler or an external system.

Start - starts automatic inspections

Stop - terminates automatic inspections

Setup - will activate/close Service / Settings configuration modes

Save - saves the profile

Snapshot - takes an image

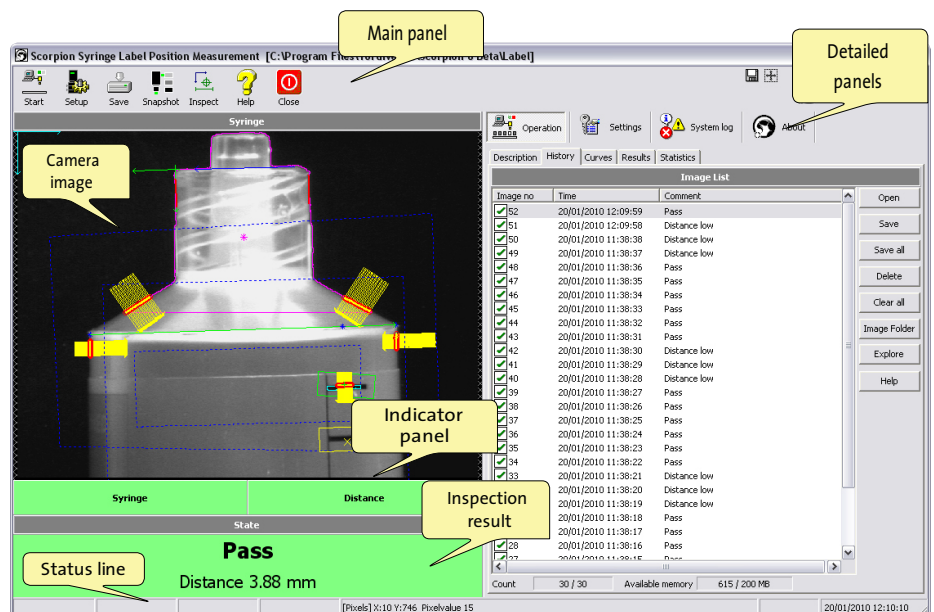
Inspect - performs an Inspection on the image

Help - activates Scorpion Help

Close - terminates the Scorpion application

Scorpion has three modes of operation:


- *Operation*
- *Settings*
- *Service*



Main window in normal operation mode

The screen picture under normal operation is shown on the previous page. The picture can roughly be divided in the following parts:

SHORTCUT SYMBOLS



At the upper right you find convenient shortcuts for often used functions. Move the mouse over the symbol and a descriptive text is shown.

- Save current image to disk
- Full image mode - only image and result panels are displayed

ICON SYMBOLS

Icon symbols are often used in detailed panels to indicate the state of for example an inspection, a tool or a system operation. Their meaning is as follows:

- Not run
- Ok
- Blocked by guard or reference
- Error or No result
- Not active
- The license is not covering the use of this tool
- M Manual execution

1. **Main buttons** (upper row, below the main window title). These buttons are used to *Start*, *Stop* and *Close* the system. Additionally there are two buttons to lock/unlock the password protected Settings and Service panels. *Snapshot* takes an image and you can do a manual inspection by pressing *Inspect*. Save the profile by pressing *Save*. If two or more systems are simultaneously running on the same machine, the *Next* button is used to toggle between the systems.

2. **Image** (left, below the main buttons). The camera images of the unit to be identified are shown here. Selecting and dragging the image can zoom in details. A simple click zooms back. You can choose to see one or all images at a time in systems using more than one image for classification. See the 'Camera image processing' chapter for a description of available camera image features.

3. **Inspection Result** (lower left) shows the running inspection results. The classification result is shown in text – we call it the state. Additionally you can display one or more result parameters in this field. (In the above example given by the 'Distance' parameter.) Right click the mouse over the field, and you see the menu to choose from. You need however to be authorized to change the result panel set-up. Normal conditions are usually indicated by a green background colour, other conditions by for instance yellow or red. You set the colour under Settings-States.

4. The **Indicator panel** is showing selected measured values calculated by Scorpion's logical tools. The inspection result is based on these values. On error, the representing indicator panel field changes colour to e.g. red to illustrate the cause of the error. If you are authorized, you can change the value to be shown as well as the title and colour of the indicator panel fields. Press the right mouse button over the field and select from the menu showing up. You can also extend the panel by adding more fields or remove fields from the panel.

5. **Detailed panels** (right), here you can choose different detailed information: history, curves, results or statistics. Closer descriptions of these panels are given below.

6. **Status bar** (bottom line) shows different indicators of the system status. From left to right:

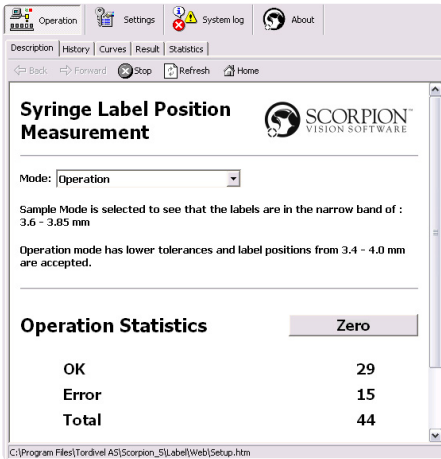
- Image trigger - status for ready signal from the production line
- Status for manual code signal from the production line Status for reset signal from the production line
- Status for quality alarm
- Row/column coordinates, pixel value and name of graphical image components. The values change when moving the mouse within an image.
- Date and time

2.1 Detailed information

When running in normal operation mode, the following detailed information is available:

- **Description** - Web page that contains a short description of the inspection task and buttons for operating the system
- **History** - displays the latest inspection results
- **Curves** - give a graphical view of measured values
- **Results** - show measured values of the latest inspection
- **Statistics** - give a periodical view of the inspection results
- **Camera image(s)**
- **Inspection result with indicator panels**

2.1.1 Web explorer



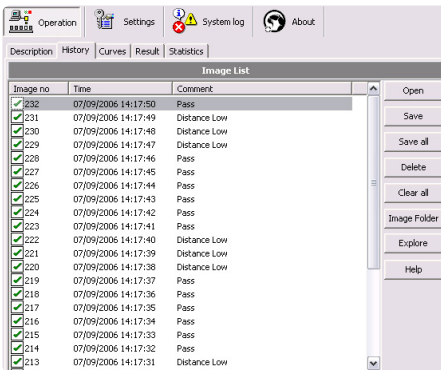
Operating the system from the web explorer

Here you find a web page with a short description of the inspection task. Buttons are available for operating the system. System parameters can be made available for changing from this page. In systems where i.e. limits are varying this can be very useful. In most cases you also have a simple statistics overview here.

Under Properties in the web page's tool panel you can, if you are authorized, change the page setup. You can decide which page to be the home page and if the tool panel with buttons and text, status line and page title shall be shown.

You make the page content with an editor, for example Microsoft FrontPage. You can relate Scorpion's commands and parameters to buttons and boxes on the web page.

2.1.2 History

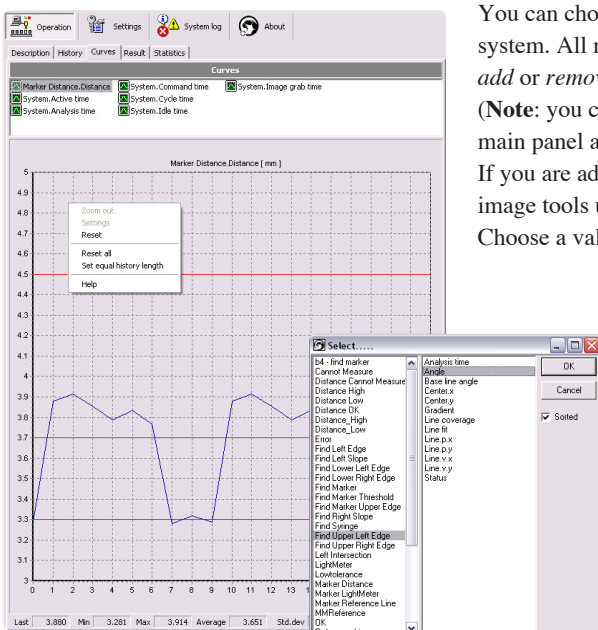


List of images with inspection result

The latest measurements are shown in the image list. A number identifies each image taken. The time and the classification result (the state) are additionally given in the list. By selecting an entry in the list, the image is displayed in the Image window to the left on the screen.

You can choose to save or delete all or single images, choose how many images to display in the list, open images from another folder and choose to show the buttons to the right. You can also do these operations with the buttons.

2.1.3 Curves

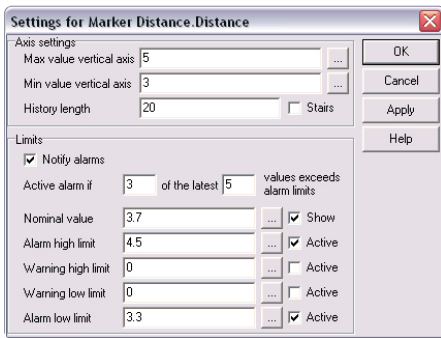


You can choose between numbers of curves illustrating different values calculated by the system. All measured values can be graphed. Right click the mouse to see a menu and select *add or remove curve*.

(**Note:** you can only add or remove a curve in Settings or Service mode. Select Settings in the main panel and give the password.)

If you are adding a curve, you get a list of all values available. The left column shows the image tools used in the analyses. The right column shows the values measured by the tool. Choose a value, click *Ok* and the value is graphed.

Right click the mouse over the curve, and you can reset this or all curves, open the settings panel (if you are authorized) or set the history length similar for all curves.

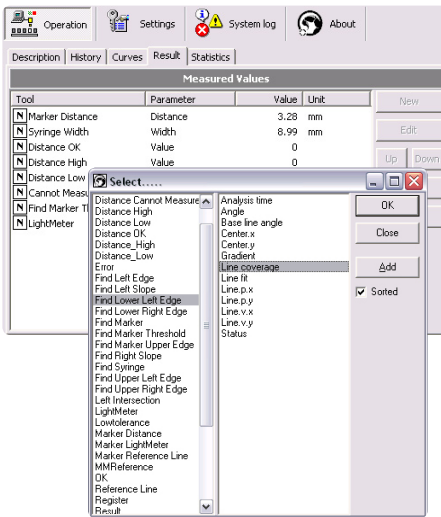


Curve adjustments

Adjustments of alarm limits and curve values can be done if you are in settings mode (click on Settings in the main menu and give the correct PIN code). Double click the curve name to see the adjustment parameters. You can adjust the curve axes and the alarm limits (alarm limits are here shown in red). The image to the left gives you an example.

The curves show if measured values are within given limits. This is useful e.g. to check the light conditions. Select the *Notify alarm* field if alarms are to be notified. Alarm limits are normally defined based on operator experience. There are two independent types of limits: operational and alarm limits. An event in the system log and a quality alarm are the results of an exceeded operational limit. If an alarm limit is exceeded you can make the system stop if the option for this is chosen (in Service-General).

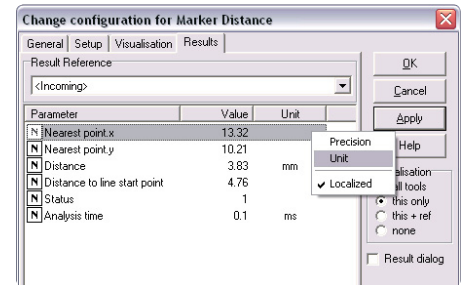
Supervise only the parameters that operator experience finds useful and give them realistic limits. You may lose overview, control and trust in the system if the number of supervised parameters and generated alarms are too large.



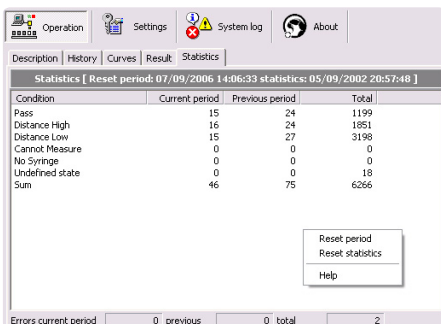
2.1.4 Results

Measured values of each inspection are shown in this panel. You can choose which parameters to display by selecting *New* and choose from the list coming up. The left column shows the image tools used in the classification. The right column shows the values measured by the tool. Choose a value, click *Add* (then the window stays open – smart if you want to add more values) or *Ok*, and the value is included in the overview.

You set the unit and precision of the measured values from the tool window in the Toolbox (to the right). The Toolbox is available in the Service panel.



Results



Statistics

2.1.5 Statistics

A periodical view of the inspection results is shown here. The table has one row for each classification state. The columns show the inspection result for this period, last period and the total.

By right clicking the mouse and selecting from the menu shown, you can manually reset the statistics. You can also choose to automatically save the statistics. The time and frequency for doing this is chosen under Scheduler in the Service panel.

With the system command *Statistics*, the following operations can be done either by the Scheduler, through the communication interface or at given system events:

- `Statistics;cmd=zero` resets the period statistics
- `Statistics;cmd=reset` resets all statistics
- `Statistics;cmd=save` saves the statistics to file

The statistics are saved if the system is terminated and is reloaded on restart.

2.6 Camera image processing

Scorpion supports many operations on the camera image. Right click the mouse over the image to activate the menu.

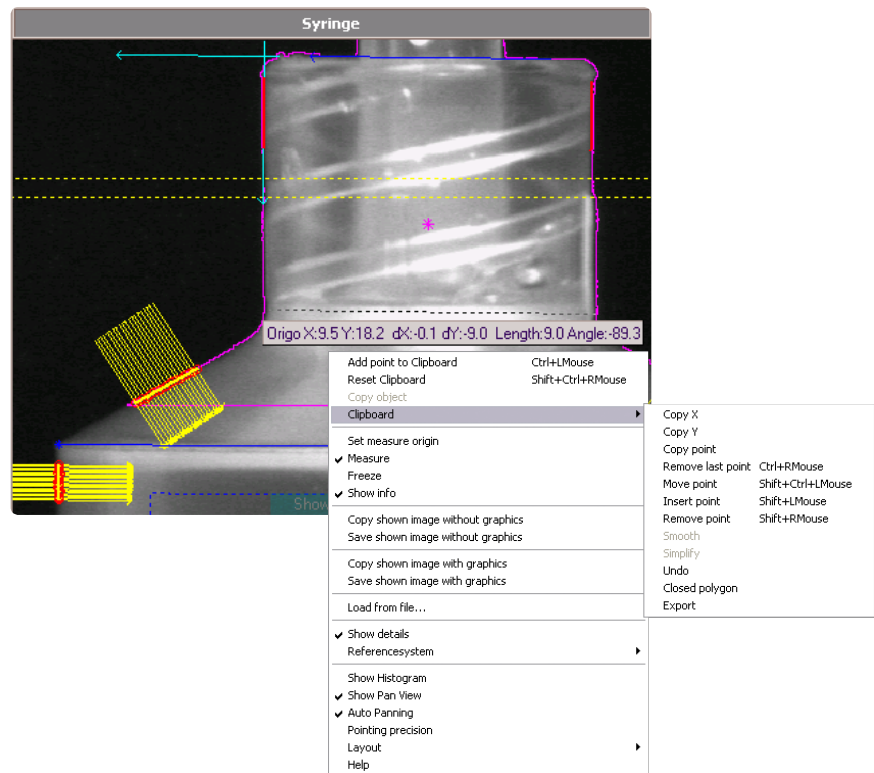


Image operations

2.6.1 Image zoom

Zoom in and out this way:

- Zoom in - click left mouse button and drag the cursor
- Pan the zoomed rectangle - while zooming in, press the Alt button
- Zoom out - left click the mouse in the image

Note: multiple zoom operations will create a stack of zoom levels - to completely un-zoom the image left click the mouse button repeatedly.

2.6.2 Measure intensity values

Click the right mouse button in the camera image, and see the menu as shown in the image above.

Select *Show info* and a text line with point information will follow the cursor.

2.6.3 Measure

You can measure distances and angles directly in the image by using the *Set measure origin*, *Measure* and *Freeze* commands. Click the right mouse button when starting (*Set measure origin*) and ending (*Freeze*). The measuring result is shown on the cursor text line. This value relates to the reference system chosen for the image.

You can make new reference systems with the Scorpion tools. These will show up under *Reference system* in the menu above. This is useful e.g. in robot vision systems where Scorpion can be set up to work in the same coordinate system as the robot. The default reference system is set using Reference system in the menu below. By default pixels are used to give the results.

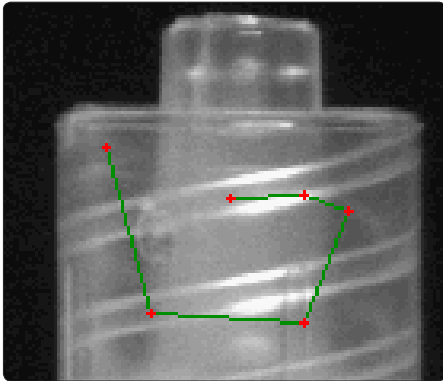
2.6.4 Polygons

You can draw and edit polygons on an image with the *Clipboard* operations. The purpose is to define lines and region of interests for image tools like PolyLineGapFinder and Blob2.

Open the pop-up menu on the right mouse button over the wanted point and select *Add point to Clipboard*. You will see the point marked in the image. Continue adding points and Scorpion will automatically draw lines between them. If you choose the *Closed polygon* option, a line will also automatically connect the first and last points. A shortcut to add point is pressing *Ctrl* and the right mouse button - points are removed by pressing *Ctrl* and the left mouse button. To the left such a line is shown.

These are the image operations:

- Add point to clipboard - Ctrl+LMouse - adds point to clipboard
- Reset Clipboard - Ctrl+Shift+RMouse - clears polygon on clipboard
- Copy objects - copies any overlay object into clipboard
 - useful when configuring polygon tools
- Clipboard - see screenshot on the previous page
 - Copy X - copies the x- cursor position to the clipboard
 - Copy Y - copies the y-cursor position to the clipboard
 - Copy point - copies x and y cursor position to the clipboard
 - can be used to paste the position into a tool
 - Remove last point - Ctrl-RMouse
 - Move point - Shift+Ctrl+RMouse - move selected point
 - it can be easier to remove and insert a new point than moving
 - Insert point - Shift+LMouse
 - Remove point - Shift+RMouse
 - Smooth - smoothes the clipboard polygon
 - Simplify - removes points on a straight line
 - Undo - will undo last operation
 - Closed polygon - will open or close polygon
 - Export - exports the polygon



Drawing lines and defining polygons on an image.

Note: The image operations combined with image zoom are useful to define lines and regions of interest.

2.6.5 Save and Copy

It might be useful to document the changes and additions you have made to an image. Use either *Copy shown image with graphics* (copies to the clipboard) and paste it in for example a document, or *Save shown image with graphics* for saving to file. Likewise use *Copy/Save shown image without graphics* to copy or save the image view itself without the image graphics.

When working without graphics the raw image is transferred, with graphics, a copy of the screen is transferred.

2.6.6 Pointing precision and Panning

You can set the *Pointing precision* to be a number of pixels between 3 and 10.

When *Show Pan View* is selected and you zoom in, a pan window is shown at the upper left corner of the image.

Auto Panning is useful if you work with polygons and have zoomed into the image. If you place a point outside the image border, the image view will automatically change to show the area where you pointed.

2.6.7 Layout

Layout configures the image layout and is only available in Service mode.

2.6.8 Help

Help activates the online help system.

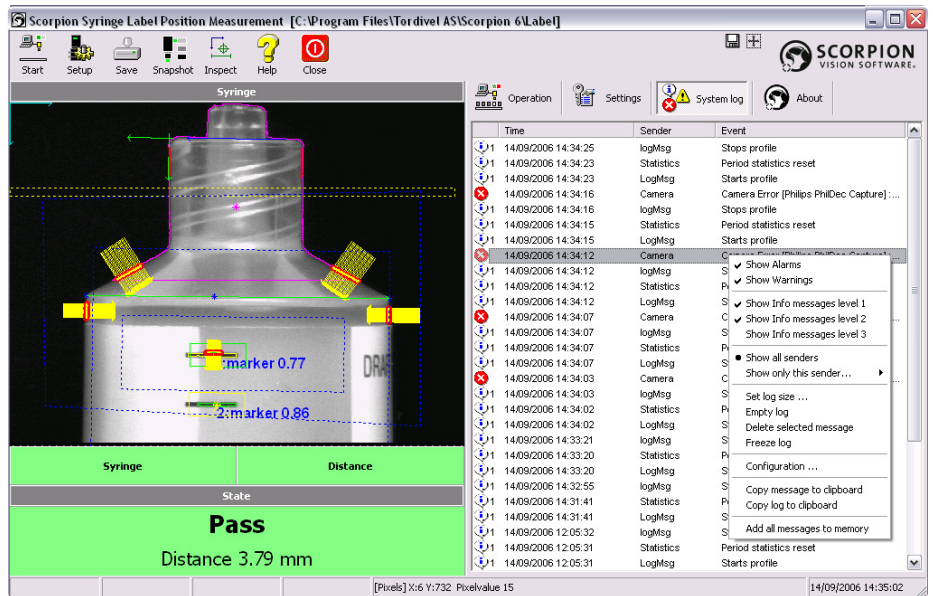
3 System log

The events are classified in five categories:

- Alarm
- Warning
- Information level 1
- Information level 2
- Information level 3

The system log menu has the following items:

- Show Alarms - activates display of alarm messages
- Show Warnings - activates display of warning messages
- Show Info messages level 1/2/3 - activates display of information message level 1, 2 or 3
- Show All Senders - display all senders - default
- Show only this sender - only selected source is visible
- Set log size - user defined log size is defined
- Empty Log
- Delete selected message
- Freeze log - stops updating system log
- Configuration - opens system log configuration - see below
- Copy message to clipboard
- Copy log to clipboard - copies all message to clipboard
- Add all messages to memory - add all levels to memory - this means that you will be able view message not visible when changing message visibility.



System events like quality alarms are shown in this window. By right clicking in the system log and selecting from the menu, the system log can be configured. The menu is shown in the example above.

The Scorpion System log is important in verifying correct system operation.

When debugging and developing Scorpion profiles, it is recommended viewing all categories. In a running system all information needed is available in the three first levels. Below a screenshot of the system log is shown.

The first column of the log shows an icon identifying the event category, the next column is the time, the third the source or sender of the message and the fourth the description or actual message.

3.1 Configuration

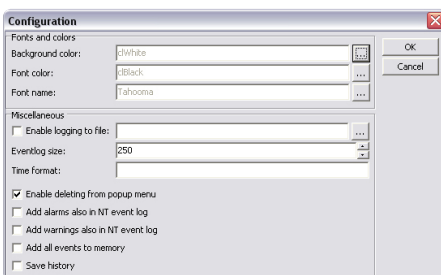
Under the menu item Configuration, you find the following:

Fonts and colours

- Background colour - sets the background colour - clWhite is default
- Font colour - sets the foreground font colour
- Font name - sets the font

Miscellaneous

- Enable logging to file - activates file logging of all events - ... activates a file browser
- Event log size - sets the size of the event log file
- Time format - specifies the time-format in the Time column - can be useful to display ms to verify system timing
 - h: hour, m: minute, s: second, z: ms
 - D: day, M: month, Y: year
 - hh:mm:ss.zz DD/MMM/YYYY yields 16:34:52.22 30/JAN/2008
- Enable deleting from popup menu
- Add alarms also in NT event log
- Add warnings also in NT event log
- Add all events to memory
- Save history - will save history when terminating Scorpion making the system log persistent

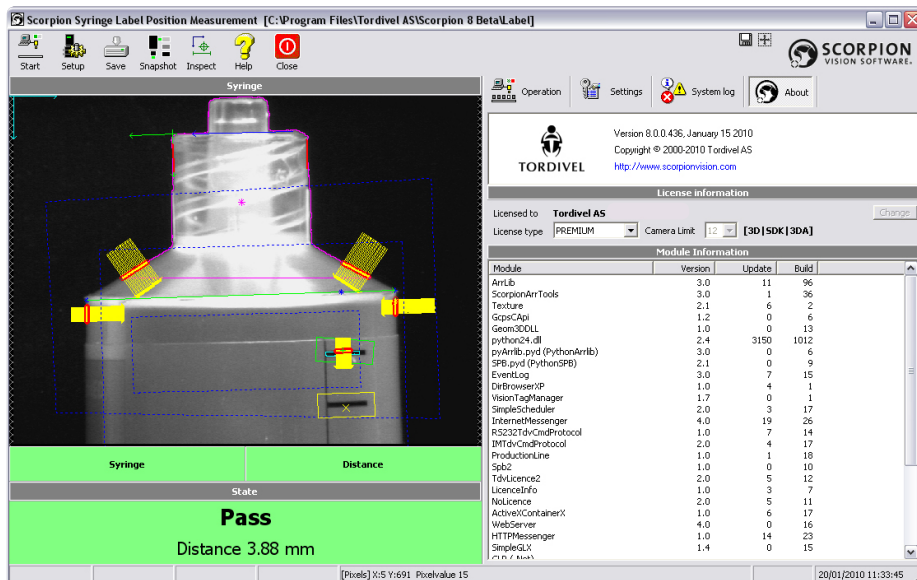


System log configuration

Note: Valid only for some browsers: Upon closing the browser this dialog may disappear. Press Alt-Tab to locate the hidden dialog.

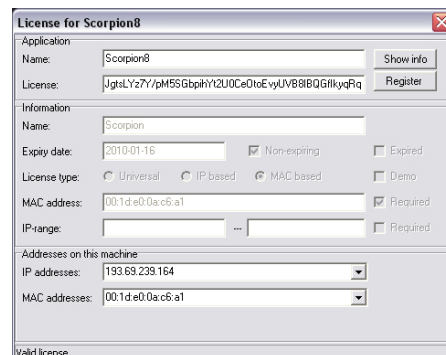
4 About

Here you find information about the Scorpion version and program components contained.



System information

Under *License information* you see the type of license that is valid on your computer. Press the *Change* button when the license needs modification. You see i.e. the license string itself and the expiry data.



License information

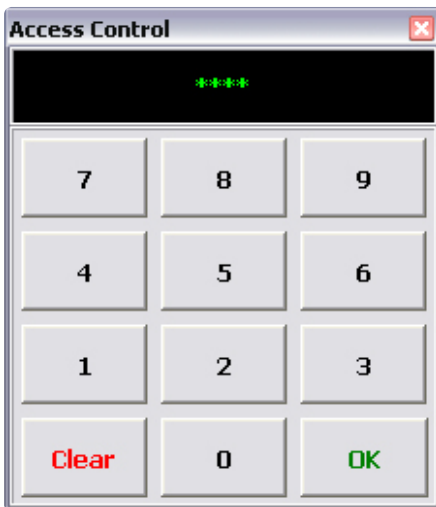
5 Settings and Service

The system has two different pair of settings. One for trained operators and the other for authorized service operators. Select the Setup button on the upper left of the screen, give the PIN code for settings or service and a corresponding panel is visible on the right side.

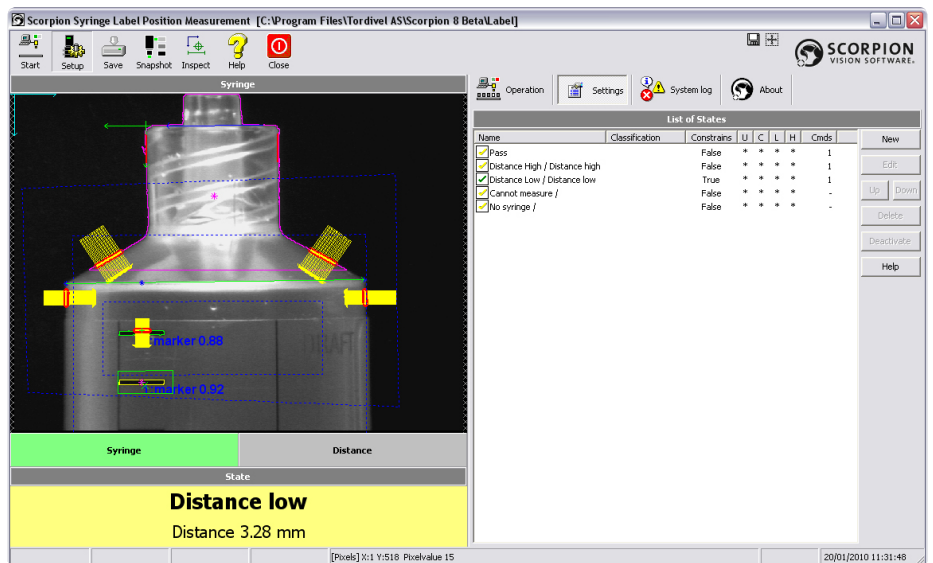
Use of the settings and service panels requires detailed information and training above the scope of this operator's manual.

The panels have buttons and menus for system configuration and service.

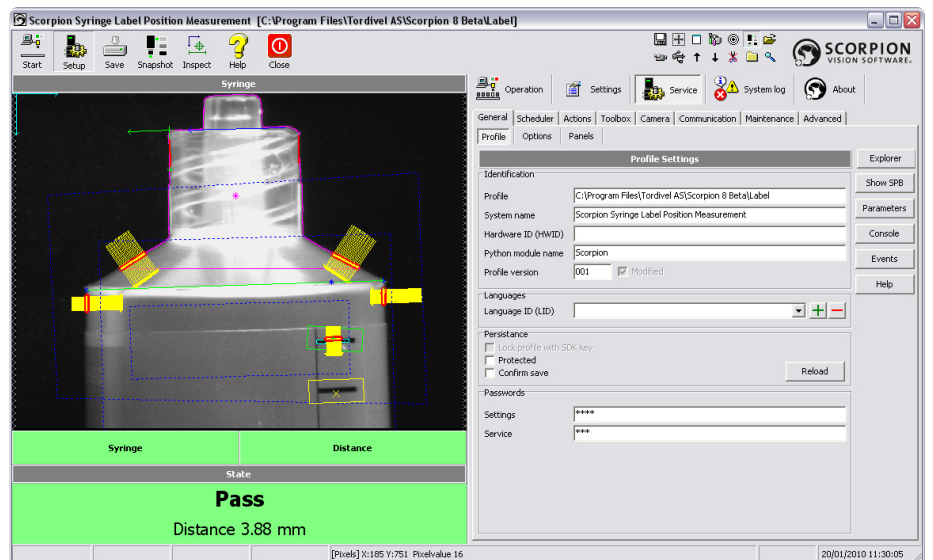
See the User Manual for more details.



The settings and service panels are protected by a PIN code, and cannot be changed until the correct code is given. The settings can however be read without applying the code.



Main window when configuring the system.



Main window in Service mode

6 Installation

Scorpion Vision Software® is distributed on a CD with the following contents:

- Scorpion Vision Software
- System requirements
- Scorpion setup program
- Demonstration profiles
- Camera drivers
- Documentation
- Support program

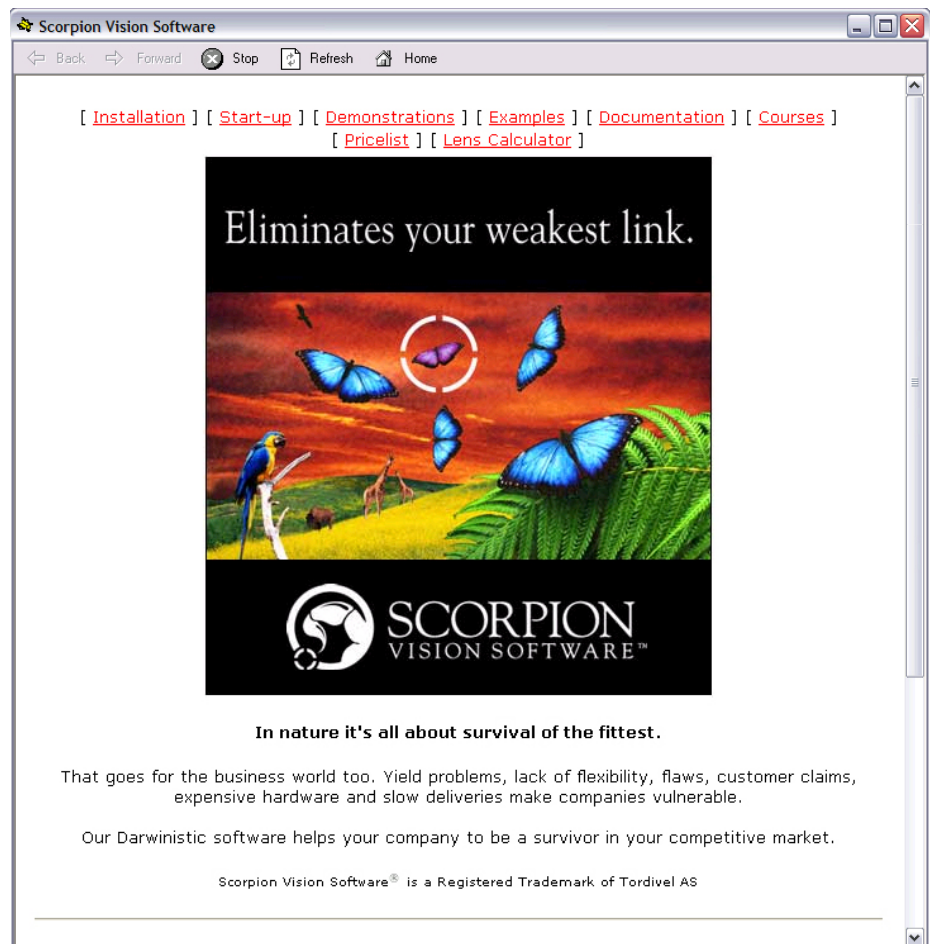
1. Turn on your computer. Insert the Scorpion Vision Software® CD-ROM disc into your CD-ROM drive. A window like the one below appears.

2. Select *Installation* to start the installation process. It is wise to read the *System Requirements* and the *ReadMe* file before installing Scorpion Vision Software.

3. Select *Install - Scorpion Vision Software*. Follow the instructions coming up.

4. Select *www.scorpionvision.com* and get a demonstration license. Copy the license code in the edit field when prompted. Read more about licensing in the “Licensing” chapter.

5. To learn about Scorpion, select *Start-up* and install the demonstration profiles using stored images. We highly recommend you to install and go through these demos.



CD-ROM start up

You find the Scorpion user documentation under *Documentation*. For live demonstrations select *Demonstrations*. More profiles are available under *Examples*. Choose *Courses* to see the Scorpion Vision Software Introduction and Advanced course content. Select *Support Applications* to get information on applications supporting the Scorpion Vision Software.

You also find camera drivers and links to Python used in some Scorpion profiles, on the CD. The *Lens calculator* finds the lens size and the appropriate field of view based on information you give.

7 Terms

Term	Description
Inspection	Term for the combined operations picture(s) taking and classification of a unit.
Inspection series	Series of inspections to identify a unit. The number of inspections in a series is configurable. k of n inspections in a series must conclude similarly to qualify an identification.
Camera trigger	Digital signal that activates a new inspection series.
Profile	Scorpion is a general inspection system. A profile makes it dedicated and special for an inspection task. The configuration done to perform an inspection task makes a profile.
ROI	Region Of Interest – the image area of interest for the analysing process.
Tool	A tool is used to make a calculation. When configuring a system the tools to use are decided and their parameters are given values. The parameters set the tool limits and are typically coordinates, search areas (ROI), reference points, min/max values, logical expressions, etc. When running the tool calculates a result in the form of one or more values in addition to (in most cases) a set of graphical elements for image visualization. The result is used to define the measured objects state. This again decides if any action is to be taken. The graphical elements are used to illustrate the result in the camera image on the screen.
Icon symbol	<p>Icon symbols are often used in detailed panels to indicate the state of for example an inspection, a tool or a system operation. Their meaning is as follows:</p> <ul style="list-style-type: none"> <input type="checkbox"/> <i>Not run</i> <input checked="" type="checkbox"/> <i>Ok</i> <input checked="" type="checkbox"/> <i>Blocked by guard or reference</i> <input checked="" type="checkbox"/> <i>Error or No result</i> <input checked="" type="checkbox"/> <i>Not active</i> <input checked="" type="checkbox"/> <i>The license is not covering the use of this tool</i> <input checked="" type="checkbox"/> <i>Manual execution</i>