

DATASENSOR

Smart Camera Sensor

SCS1TM
leopard



USEasyTM

QUICK OPERATION

DATASENSOR S.p.A. Via Lavino 265
40050 Monte S. Pietro - Bologna - Italy
Tel: +39 051 6765611 Fax: +39 051 6759324
<http://www.datasensor.com> e-mail: info@datasensor.com



DATASENSOR S.p.A. cares for the environment: 100% recycled paper.

DATASENSOR S.p.A. reserves the right to make modifications and improvements without prior notification.

83000015 rev.G

GENERAL INFORMATION

SCS1 is a smart camera sensor suitable to many industrial automation applications, including process and quality inspection, mechanical part verification, measurement and positioning, as well as filling and labelling control.

The sensor can be set either as stand-alone using the Teach-in function, or via PC graphic interface through the Ethernet port and thus fully exploiting the device's most advanced functions. During sensor configuration, 2 digital PNP outputs can be activated according to the required inspection.

SCS1 presents a standard M12 8-pole connector for power supply, switching outputs, hardware trigger, configurable I/O, RS485 or RS232, as well as a M8 4-pole connector for external illuminator control. Standard CS-mounting optics, available as accessories, provide flexibility in terms of operating distance and field of view, while integrated or external illuminators particularly suit all application lighting requirements. The installation of the compact 100x75x40 mm sturdy metal housing is easy and rapid, thanks to specifically designed fixing brackets that guarantee precise mounting.

This guide provides basic information necessary to power up the device and configure an inspection. It is a simple overview that does not provide the complete details of the all functions and options available. Please refer to the SCS1 instruction manual for further information.

AVAILABLE MODELS

SCS1 with integrated illuminator	SCS1 without integrated illuminator
1) with RS232 serial protocol	4) with RS232 serial protocol
2) with RS485 serial protocol	5) with RS485 serial protocol
3) with two supplementary digital inputs for inspection selection	6) with two supplementary digital inputs for inspection selection

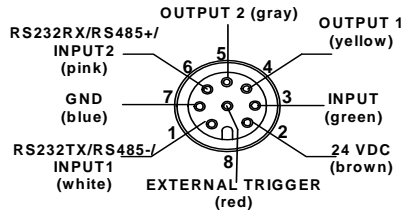
INSTALLATION

Check the following necessary components: SCS1 sensor, 16mm C-mount lens and adapter compatible with the sensor's CS-mount or alternatively any optics with CS mounting or C mounting with adapter, cable with M12 8-pole connector, 24 Vdc power supply, cable with M8 4-pole connector (if an external illuminator is used), Ethernet 10/100 Mbps cable (if the SCS1 graphic interface via PC is used).

Thread optics onto the sensor



Power the cable with the M12 8-pole connector.



Connect the M12 8-pole connector to the sensor.



Connect the sensor to the PC using the Ethernet 10/100 Mbps cable (optional).



Connect external illuminator to the sensor using the M8 4-pole connector (optional).



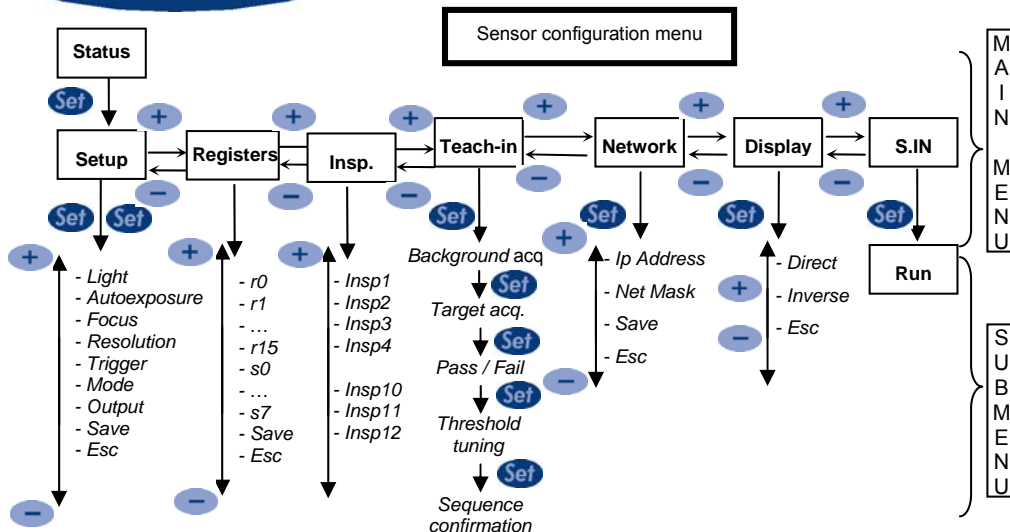
At powering, the device initialisation process lasts approximately 30 sec during which the "SCS1" text is visualised. During the initialisation the General Purpose Input (pin 3) must not be active, otherwise the push-buttons will be locked. In this case, re-boot the sensor.

SENSOR INTEGRATED USER INTERFACE



The sensor integrated interface consists in 3 push-buttons (+, -, Set) and a 4-digit display presenting 4 LEDs.

The menu options can be visualised using the (+) and (-) push-buttons. Press (Set) to select an option and the relative submenu is opened.



English

Step 1 - Set the inspection parameters

- 1) Press **Set** to access the main menu.
- 2) Select **SETP** to enter the Setup submenu.
- 3) Select **ESP** to begin the autoexposure process, assuring that the target-object is inside the field of view. If the display visualises **SUCC**, press **Set** and continue. If the display visualises **FAIL**, press **Set** to return to the Setup submenu and retry.
- 4) Select **FOCS** to focus the image. The user has to act on the sensor optics to increase the number that appears on the display. Press **Set** to continue.
- 5) Select **RES** to choose the necessary resolution. Two options are available:
 - VGA** full VGA (640x480 pixels);
 - SUVA** 1/4 VGA (320x240 pixels).
- 6) Select **TRIG** to choose the Trigger mode. The possible modes: **CONT** *continuous* or **EXT** *external*.
- 7) Select **MODE** to choose inspection method. The possibilities are given below:
 - blob** *Blob count*: counts blobs inside a specific area. Pressing **Set**, a number appears on the display that can be changed using **+** and **-**. The number corresponds to the number of objects that can be found during inspection. Press **Set** to continue.
 - PATC** *Pattern match*: counts the objects inside a specific area. Pressing **Set**, a number appears on the display that can be changed using **+** and **-**. The number corresponds to the number of objects that can be found during inspection. Press **Set** to continue.
 - CONT** *Contour match*: compares the template with the target-object according to the contour characteristics.
- 8) Select **SAVE** to save present configuration or **ESC** to exit without saving.

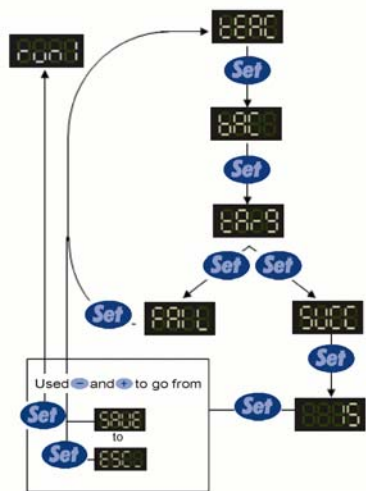
Note: the user can exit from all submenus without saving the changing by selecting **ESC**.

Step 2 - Teach-in

The device self-acquisition or Teach-in is activated by selecting "TEAC" and consists in the following steps:

- 1) **"BAC"**. Background acquisition. Press **Set** to acquire background and pass to next step.
- 2) **"TARG"**. Reference image acquisition. Position target-object in front of the sensor and press **Set** to acquire and then pass to next step.
- 3) **"SUCC"/"FAIL"**. Depending on the success or failure of the acquisition the "SUCC" or "FAIL" text is visualised. In case of failure press **Set** and return to main menu. In case of a positive result press **Set** to pass to next step.
- 4) **"Threshold"**. Regulation of the acceptance threshold. The value visualised represents the acceptance threshold that will be visualised during inspection. The lower the threshold, the more template and target-object have to correspond to reach a successful inspection. User **+** or **-** to change the threshold. Press **Set** to reconfirm the Teach-in sequence.
- 5) **"Confirm"**. Press SET to confirm Teach-in sequence.

The inspection can now be saved or exit from the menu pressing respectively **SAVE** or **ESCL** (using **+** and **-**).

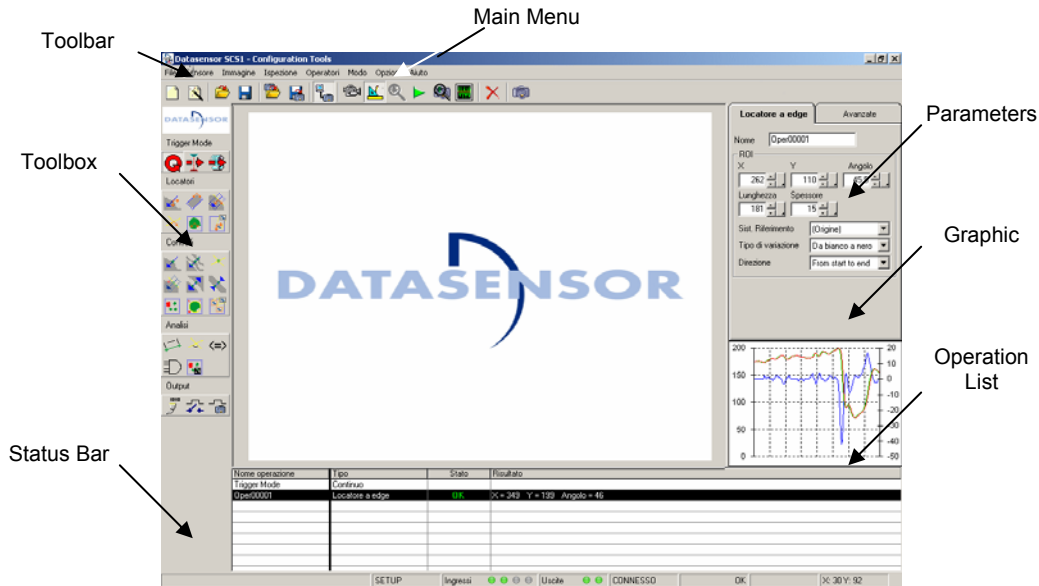


Step 3 - Running the inspection

Selecting **SAVE** from main menu, the configured inspection is saved and the sensor passes automatically in the *Run mode* and thus begins elaboration.

Select **S_in** from the main menu to exit without saving the changes.

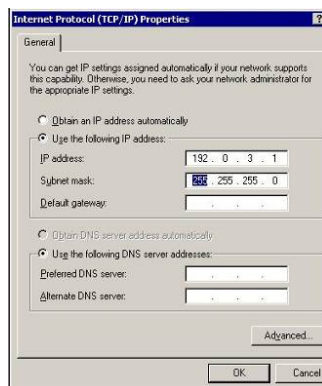
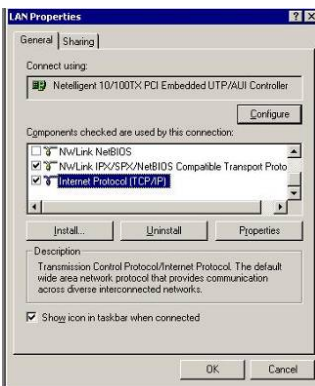
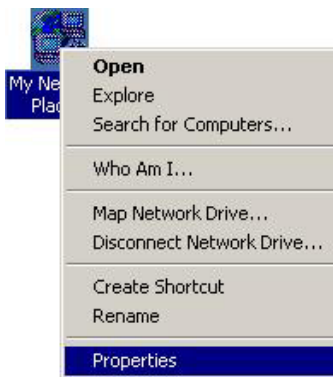
SCS1 GRAPHIC USER INTERFACE

*Step 1 – PC powering and SCS1 software installation*

To install the SCS1 graphic interface, insert the CD-ROM supplied with the sensor. The guided installation of the software will begin selecting “Install SCS1 Graphic User Interface”.




Step 2 – PC configuration

- 1) Open the “Network Neighbourhood” clicking on the desktop icon and select “Properties”.
- 2) Select “TCP/IP protocol” in the visualised window and click on “Properties”.
- 3) Change IP address to 172.27.101.1 and subnet mask to 255.255.0.0.
- 4) Click “OK” to continue.

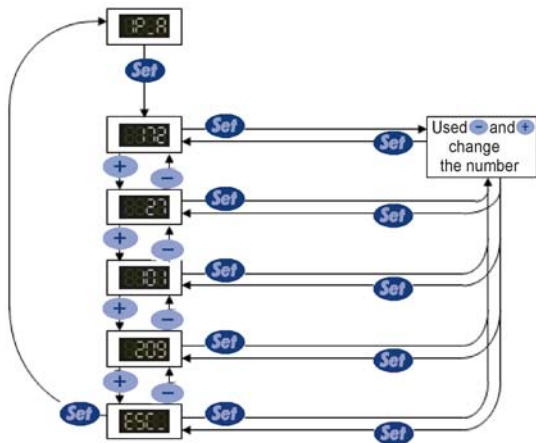


Step 3 – Sensor configuration

The sensor's default IP address is 172.27.101.209


The integrated push-button interface has to be used to configure the sensor's IP address. The options that appear on the display can be visualised using the  and  push-buttons, while  is used to confirm the option selected.

- Press **Set** to access the sensor configuration menu. The display visualises **SETP**, press **Set** again to access the Setup parameters. Scroll down using **+** or **-** until the **IP_A** text is visualised.
- Press **Set** to access the network parameters.
- Scroll down using **+** or **-** until the **IP_A** text is visualised and press **Set**.
- The display visualises a 3-digit number which represents the first field of the sensor IP address. The 4 fields of the IP address can be visualised by using **+** and **-**. The field currently visualised can be selected by pressing **Set**. Pressing again **+** and **-**, the numeric value of the selected field can be changed. A continuous pressure on the push-button allows to proceed more rapidly. Press **Set** to confirm changes.
- Once checked all 4 fields of the sensor's IP address, scroll down the menu until the **ESC** text is visualised on the display. Press **Set** to return to network parameter configuration menu.
- To save the changes made, scroll down menu using **+** or **-** until the **SAVE** text is visualised and press **Set** to return to main menu. Alternatively, if the new configuration does not have to be saved, scroll down until reaching **ESC** and press SET to exit without saving.



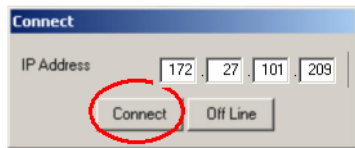
Note: the changes made are effective only after sensor re-booting.

Step 4 – Software launch

Start the SCS1 graphic interface using a double click on the  desktop icon or select SCS1 from the programme menu following the route: Start > Programmes > Datasensor > SCS1.


Sensor connection: specified the communication parameters, the user has to click on “Connect” to connect the sensor. The default parameters are given here aside:


Connection problem solution: before changing the communication parameters, please assure that the sensor is powered and the physical connection between the sensor and PC is correct. If properly installed, the sensor’s IP address compatibility with the PC’s IP address has to be then checked.









Step 5 – Inspection configuration

The inspection configuration can be carried-out in two ways:

 *Free new inspection creation* (for advanced users): all the available options are active and the user has complete freedom in developing inspections.

 *Wizard-guided new inspection creation* (recommended to new users): the SCS1 graphic interface suggests some steps to follow and guides the user in the creation of a new inspection.

The SCS1 graphic interface functioning is characterized by different operating modes (*Live mode, Setup mode, Test mode, Run mode, Monitor mode*). Each mode allows to carry-out specific functions. The creation of a new inspection follows a logic order that are summarised in the following table.

 Live Mode 1) Target positioning 2) Resolution selection 3) Lighting check 4) Exposure time setting 5) Image focussing 6) Test image saving 7) Output configuration 8) Reference image saving	 Setup Mode 9) Trigger selection 10) Locator insertion 11) Control insertion 12) Analysis tool insertion 13) Test tool insertion 14) Inspection saving
 Run Mode	 Monitor Mode
1) Check tool functioning	2) Inspection time check
 Test Mode	 Test Mode from telecamera
3) Visualises the last 10 images saved in the current script	4) Visualises the last image elaborated by the current script

Step 6 - Live mode

Selected the “New inspection”, the system passes automatically in *Live mode* status that visualises the images acquired by the sensor.

In the Live mode the user has to:

- 1) **Position the target-object** inside the field of view.
- 2) Select the image **resolution**: (640x480 pixels / 320x240 pixels).
- 3) Assure constant **lighting**, paying attention to reflective surfaces. The sensor is equipped with an integrated illuminator and external illuminators are available as accessories: both can be activated or deactivated selecting or not the option.
- 4) Set the **exposure time** (the longer the exposure time, the brighter the image and longer the processing time).
- 5) To maximise image **focus** turn the sensor lens' ring.



- 6) Two digital **outputs** are available to gather inspection information. These outputs can be configured as follows:
- *Normal functioning*: the output switches according to the inspection results (OK/Fail).
 - *Toggle mode*: the output switches each time the inspection cycle is completed.
 - *Monostable*: The output activate according to the results of the inspection at the end of the elaboration and returns to zero after a specified time
 - *Elab running*: The output switch to high at the start of the elaboration and go low at the end.
- 7) **Save the image**. Once the image has been saved, the system passes automatically in the Setup mode. The image elaboration tools can be included in this mode.

Step 7 - Setup mode


1) Trigger mode selection

- *Continuous mode*: the sensor acquires and processes images at the highest rate possible.
 - *Software trigger*: software tool that defines the image capture instant.
 - *Hardware trigger*: an external device triggers the sensor
 - *Ethernet trigger*: an external device connected through the Ethernet port triggers the inspections.
- 2) **Add locators**. Locators determine the position of objects inside the sensor's field of view (FOV). Generally, locators distinguish one point and supply the coordinates to be used in successive phases as references.
- 3) **Add controls**. Controls are tools used to determine the inspection specifications.
- 4) **Add Identification tools**. Tools to read barcodes, matrixcodes and text from the image.
- 5) **Add analysis tools** (if necessary). The analysis tools process the results of the previous tools to get distance and angle measures and calculate logical functions.
- 6) **Add Output (Serial – Digital)**. The Serial Output sends the associated tool results through the sensor serial port. The Digital Output activates one of the two configured outputs according to the status of the associated tool.
- 7) **Save Image**. Allows to save the image of the current inspection according to the status of the associated tool.




- 8) **Save the inspection.** Once inserted all the necessary tools, the inspection can be saved either on the PC () or on the sensor ()

Step 8 - Run mode

Select  to pass to the *Run mode*. The PC processes in real time the images acquired by the sensor. In this operating mode, the sensor acquires images only.

Step 9 - Monitor mode

After saving the inspection on the sensor, click  to pass to the *Monitor mode*. The sensor elaborates the acquired images and transmits obtained the results to the PC. During sensor functioning, tool information such as status, results and execution time is visualised on the screen.


Step 10 - Disconnection

Disconnect PC and sensor. Leave sensor in the stand alone operating mode.


Step 11 – Connection

Reconnect PC and sensor to enable the following two modes

Step 12 - Test Mode¹

Once saved the inspection in the device memory in order to consent image saving, click on  to visualise the last 10 images elaborated by the current script.

Step 13 - Test Mode from telecamera²

Once saved the inspection in the device memory in order to consent image saving, click on  to visualise the last image elaborated by the current script.

¹ Available only if you have chosen to save images in *Live mode*.

² Available only if you have chosen to save images in *Live mode* or if you have put a *Save Image* operator in the inspection.

TOOLTABLE

Tool	Description
Edge locator:	Distinguishes a transition point from white areas to black areas (negative edge) and from black areas to white areas (positive edge) of the image to inspect.
Composite locator:	Identifies the position of objects having approximately a rectangular shape and a certain background contrast.
Blob locator:	Tracks inside a specific area blobs with larger dimensions.
Pattern match locator:	Compares the similarity between the template and target-object to inspect.
Inclinometer locator:	Determines the angle of an object or part and supplies the reference to the successive inspection phases.
Intersection locator:	Calculates the intersection point between two lines.
Edge:	Tracks an edge position.
Intersection:	Tracks the intersection determined by the result of two previously used tools.
Inclinometer:	Evaluates the object angle respect to the X axis.
External/Internal calibre :	Measures distances between two edges.
Blob count:	Counts blobs inside a specific area.
Contour match:	Compares the template with the target-object according to the contour characteristics.
Pattern match Count:	Counts the objects inside a specific area.
Distance:	Calculates the distance between two points.
Angle:	Calculates the angle between two lines.

Tool Identification	Descrizione
Test:	Carries-out logic operations on the results obtained from the previously used tools. It is a fundamental tool as it associates the operating status to one of the sensor's outputs.
Output:	Sends to the serial output the associated tool results
Barcode Area	Reads the barcode in the specified area
Linear Barcode	Reads the barcode on the specified line
Datamatrix	Reads the datamatrix in the specified area
Fast Ocv	Verify a line of characters
Omidirectional Ocv	Verify a line of characters rotated arbitrarily
Fast Ocr	Reads a line of characters
Omidirectional Ocr	Reads a line of characters rotated arbitrarily
String Compare	Compare the result of two operators ocr,ocv,barcode,matrixcode.

TECHNICAL DATA

Power supply:	Without illuminator: 10...30 V With illuminator (integrated or external): 24 V DC \pm 10%
Ripple:	V _{pp} max with illuminator / 2 V _{pp} max without illuminator
Consumption (output current and illuminator excluded):	120 mA at 24 Vdc
Consumption with illuminator (it depends on the exposure time, t _{exp}):	< 170 mA per t _{exp} = 5ms < 350 mA per t _{exp} = 200ms
Outputs:	2 PNP outputs (shot-circuit protection)
Network interface:	Ethernet RJ45 - 10/100 Mbs
Serial interface:	RS232 / RS485
External illuminator interface:	M8 4-pole connector, 24 Vdc illuminator power supply, strobe signal (TTL)
Output current:	100 mA max
Saturation voltage:	< 2 V
Image sensor:	CMOS 6.61 mm x 4.97 mm (½") format, pixel size: 9.9 μ m x 9.9 μ m 200 fps max
Lenses:	Standard CS-mount or C-mount with adapter
Dimensions:	112.4 mm x 75 mm x 40 mm (without illuminator), 112.4 mm x 75 mm x 55 mm (with illuminator)
Indicators:	4-digit display, 3 green LEDs, 1 yellow OUTPUT LED
Setting:	SET push-button, + and - push-buttons Auxiliary Ethernet PC graphic user interface
Data retention:	Non-volatile FLASH memory, stores up to 4 inspections
Operating temperature:	-10 ... +55 °C
Housing material:	Aluminium alloy
Mechanical protection:	IP40 (TYPE 1 ENCLOSURE)
Weight (lenses excluded):	300 g without illuminator, 385 g with illuminator

FACTORY CONFIGURATION RE-SETTING

During sensor's initialisation there is the chance to re-set the factory configuration.

At powering, the display visualises **SCS1**. Press contemporarily + and – until the **inE** text is visualised. Keep the push-buttons pressed for 3 more seconds at least to start the factory configuration reloading phase. When the system reset is over, the display visualises **ERR** text.

MAINTENANCE

For correct system maintenance, the hardware must be kept free from dust and the SCS1 software must be updated when new releases are issued.

Remove dust or dirt accumulated on the sensor using a soft cloth, dampened with a neutral detergent solution if necessary. Use anti-static compressed air to remove dust for periodical maintenance or when necessary.

The latest SCS1 software release is available on the website: www.vision-sensors-illuminators.com.

CONTACT US

In presence of problems, please contact the DATASENSOR S.p.A Technical Support:

Technical Support

Tel.: 0039 051/6765611
Fax: 0039 051/6759324
E-mail: service@datasensor.com