



DeCoSystem

Spectro

Supervisor's manual
Rev. 4.0



Note: *The information in this manual is provided for informational purposes only and it is subject to change without notice. The pictures in this guide are purely indicative. Values in the dialogues displayed in this manual are indicative.*

This manual is referred to a standard version of the software used with a linear camera.

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1. Introduction

This manual describes the video inspection system SPECTRO.

It is divided into two parts: the first part (from Chapter 1 to 6) contains very important safety instructions the operator needs to know before using the system and instructions about transport and system installation; the second one (from Chapter 7) describes how to use the software.

The maintenance of the system SPECTRO is only permitted to personnel aware of all safety precautions that are necessary in order to preserve their own physical safety, otherwise threatened by an improper use of the system.

Therefore it is necessary to read carefully the safety instructions treated in this manual.

Any change or replacement of the software of the system must be carried out by DeCoSystem staff or by personnel previously authorized by DeCoSystem.



Note: *All values and figures in the dialog windows are only an example unless otherwise instructed.*

Legend:

***Note:** Note for WARNING and general notes.*



***Note:** Note for ATTENTION.*



***Note:** Note for DANGER.*

2. Safety

This chapter describes the safety rules, in accordance with the law T.U. D.Lgs. 81/2008, as subsequently amended and supplemented.

The *SPECTRO* 100% real-time inspection system must be commissioned, used and serviced in compliance with these safety instructions.

2.1. Warnings



DANGER

Immediate situation of risk

Failure to abide by this warning can result in serious physical injury or death



ATTENTION

Potential situation of danger

Failure to abide by this warning can result in serious physical injury or death



CAUTION

Potential situation of danger

Failure to abide by this warning can result in slight or moderate physical injuries



WARNING

Indicates a situation which could result in damage to the materials

Always abide by the safety rules in these user instructions and the general safety requirements of standards EN ISO 13857:2008, EN 349:2008 and the specific safety regulations of the sector (T.U. D.Lgs. 81/2008 as subsequently amended and supplemented) when using the SPECTRO 100% real-time inspection system.

A failure to abide by the safety rules given below can result in physical injury or damage to the SPECTRO 100% real-time inspection system.

2.2. Operation



ATTENTION

Use of the 100% real-time inspection system in potentially explosive environments

Can result in mortal injury or death.

The *SPECTRO* 100% real-time inspection system is not ATEX certified.

Do not use the SPECTRO 100% real-time inspection system in potentially explosive environments.

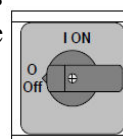
**ATTENTION****Dangerous voltage**

risk of electrocution: can cause serious physical injury or death.

Unplug the system before carrying out any maintenance or repairs.

- Turn off the power at the yellow/red service switch on the control unit.

To do so, turn the service switch to its **OFF** position. Take measures to prevent the service switch from being reactivated.



- Turn off the automatic switch in the control panel.

Turn the switch to its “O” position (bottom position of the switch). Take measures to prevent the automatic

- switch from being reactivated.
- Wait **10 minutes** for dangerous residual voltage to dissipate in the network filters and condensers.



Only then is it possible to proceed with the following operations. It is not sufficient to simply turn off the system!

If work needs to be carried out on live parts with the device open, only the degree of protection IP 00 is guaranteed. Increased risk due to mains voltage!

- Make sure the system is no longer live.
- Connect the system to the earth.
- Protect the nearest live parts or seal them in a cover.

**ATTENTION**

Glare due to the radiation of LED lighting (LED class 2)
can harm eyesight.

- Do not look directly at the lighting unit of the camera modules.

Looking into an LED light can cause temporary blinding and lingering images can cause (depending on the situation) irritation or disturbance, reduced sight or even injury. If the lighting units are not fully covered by the strip of material, the operator must take appropriate measures (e.g. assembling a plate) to prevent the light from radiating out freely.

**WARNING****Unauthorized opening of the housing of the camera modules**

can cause damage to the camera modules due to dirt or to the loss of adjustment.

Never open the housing of the camera modules. The camera modules contain highly sensitive electronic and optical parts set up with precision at the factory.

Loosen the connections of the cables between the various components of the *SPECTRO* real-time 100% defect detection system only when the system is disconnected from the mains. Violation of this rule will invalidate the warranty.

2.3. ESD safety devices

CAUTION

Electro-static discharge (ESD)



can damage the electronic components.

The device contains electronic components that pose a potential risk of electro-static discharge. Electrostatically charged people or objects can suffer permanent damage due to contact which can cause the loss of power, malfunctioning or destruction of certain parts.

- Open the housing of the parts of the system only at a work station suited to electrostatic discharge (work station for ESD compliant with DIN EN 61340-5-1). When there are no suitable work stations, it is strictly necessary to implement safety measures in accordance with DIN EN 61340-5-1 to divert the electro-static discharge in a controlled manner.
- For the return of electronic units or components, comply with the provisions of standard DIN EN 100 015 “*Protection of equipment sensitive to electrostatic discharge*”.
- For transport, use only duly marked ESD electrically conductive packaging.

DECOSYSTEM srl does not accept responsibility for damage attributable to the failure to abide by the safety measures described in this document.

2.4. Qualification of personnel

ATTENTION



Assembly, installation, commissioning, control and maintenance carried out by unqualified personnel

can cause serious physical injury or death.

- The SPECTRO 100% real-time inspection system must be assembled, installed, commissioned, controlled and serviced by personnel who are both qualified and specialized.

The SPECTRO 100% real-time inspection system must be transported, assembled, connected, commissioned, used and serviced only after reading the instructions on use and only by personnel who are qualified, specialized and duly trained!

Qualified, specialized and duly trained personnel are people:

- Who have received professional training in relation to their work
- Who have received in-depth training in the operation and operating conditions of the inspection systems
- Who are familiar with the health and safety standards, rules, provisions and standards in force
- Who are familiar with the electro-technical standards in force
- Who are trained in the use and servicing of appropriate safety equipment
- Who have been instructed under the supervision of electrical technicians
- Who are able to recognize and avoid dangers

The specialized personnel must be authorized to carry out their work by the safety manager of the plant on which the system has to be installed.

Suitably trained specialist personnel must only carry out work within their field of competence.

3. Description

3.1. Use in compliance with the rules

The *SPECTRO* 100% real-time inspection system inspects the quality of printing on cylindrical objects and pieces of other shapes rotated by a print machine.

The objects used for analysis must contrast sufficiently with the background, otherwise the analysis and results will be of little or no use.

The *SPECTRO* 100% real-time inspection system can be assembled in another machine or connected to other devices in a machine in compliance with Directive 2006/42/EC (Machine Directive). Before the system is commissioned, the user/manager must ensure the machine in which the system is assembled complies with the provisions of this Directive.

The *SPECTRO* 100% real-time inspection system must be used only with the components of the system. *DECOSYSTEM Srl* is not liable for damage attributable to use with other components.

Never install or use the *SPECTRO* 100% real-time inspection system in potentially explosive environments!

The inspection systems are designed according to the technology available at the time and the applicable technical safety rules. The use of these can, however, still pose potentially mortal danger to the user or third parties, or result in damage to the *DECOSYSTEM* inspection systems or other materials. The *DECOSYSTEM* inspection systems must, therefore, be used only in perfect technical conditions and in absolute safety. Worn or damaged parts must be replaced immediately using only original spare parts. In the case of non-original spare parts, it cannot be guaranteed that these have been designed and produced according to the requirements and the required level of safety. The use of these invalidates the warranty covering the *DECOSYSTEM* inspection system.

All work involving the *DECOSYSTEM* inspection systems (including assembly, commissioning, control, maintenance, etc.) must be entrusted to qualified, well trained personnel. Proper use also requires compliance with all the instructions on use. Any other use is in breach of the rules. *DECOSYSTEM Srl* is not liable for damage attributable to improper use.

3.2. Disclaimers

No claim can be made when the defect is attributable to non-compliance with one or more of the following points:

- Do not install any antivirus programs, firewalls or similar on DECOSYSTEM Srl's products. No antivirus programs or other scanning or interfering programs should be able to access DECOSYSTEM's products via the network.
- Do not write, cancel or edit the data and files on DECOSYSTEM's products via the network. Exception to the above is made on *DECOSYSTEM Srl's* recommendation during assistance.
- Do not access DECOSYSTEM's products via the network by means of third-party software.
- Memory sticks used with DECOSYSTEM's products must not contain any harmful virus software.
- Never make arbitrary changes to the products or software provided by *DECOSYSTEM Srl*.

Equally, claims cannot be made when the defect is attributable to one or more of the following causes:

- Violation of the rules on use, maintenance or installation
- Inappropriate, incorrect or abusive use of the product
- Use of the product in an unsuitable environment
- Use of the product with disregard for the safety regulations in the area of installation
- Failure to comply with the instructions and safety rules in the product documentation
- Use of the product in insufficiently safe conditions
- Malfunctioning due to the interference of external devices either connected to or in the vicinity of the product
- Natural disasters and acts of God
- The customer's carelessness or negligence
- Natural wear and tear
- Servicing of the product by the customer or third parties
- Faults due to the use of unsuitable equipment and inappropriate spare parts, or the presence of chemical, electro-chemical or electrical devices

In the above cases, *DECOSYSTEM Srl* cannot be held liable except in the event of the criminal intent or serious misconduct of *DECOSYSTEM Srl* or of its legal representatives or collaborators, or damage due to personal injury caused by the negligence of *DECOSYSTEM Srl* or of its legal representatives or collaborators, or damage which, in certain conditions, can be covered by the obligatory third party insurance generally required by *DECOSYSTEM Srl*. This applies, in particular, to requests for compensation for misconduct before or during stipulation of the contract, the violation of secondary obligations and requests for non-permitted use; exception is made for requests by virtue of the laws on responsibility for the product and the warranty.

DECOSYSTEM Srl's conditions on licensing also apply. The software provided but not created by *DECOSYSTEM Srl* is subject to the terms of responsibility and licensing of the relative manufacturer.

3.3. General Information

The *SPECTRO* 100% real-time inspection system efficiently recognizes occasional and recurrent print defects. The system detects and automatically classifies the print defects according to type. The system also distinguishes between four common types of print defect (dirt, structure, lines and tones).

When setting up a new job, the user saves a reference picture of the print job and defines the areas of the format to be checked for defects. For each area to be inspected, it is possible to choose between five levels of sensitivity for the detection of print defects.

Inspection mode also offers specific inspection functions for detailed visual inspection of the current print and comparison with the saved reference picture.

The Defect History provides a detailed overview of all the print defects detected by the system during the course of a job.

The system *SPECTRO* to control the printing quality is made up of a control unit (CNT UNIT) and an acquisition unit (ACQ UNIT). The CNT UNIT elaborates the images and gives the result good or rejected piece depending on the selected tolerances. The ACQ UNIT consists in a led or neon lighting system and one linear RGB camera. The system can detect many kinds of defects like:

- ➔ LACKS OF PRINTING
- ➔ JOINTS AND COLOR RELEASE
- ➔ COLOR VARIATIONS

- ➔ MISREGISTRATION
- ➔ SCRATCHES AND DIRT
- ➔ SURFACE DEFECTS

3.3.1. System's composition

The composition of the system can depend on the type of installation carried out; if the system is installed directly on the printing machine, it will be made up of Camera Unit and encoder, while if the system is installed stand-alone, it will be made up of Camera Unit, encoder, Control Rack and Touch Screen monitor.

Let's now see the single parts that make up the system SPECTRO.

Control Rack

Inside the control rack there are the PC, the UPS continuous unit, a service multi-socket and the switchboard.

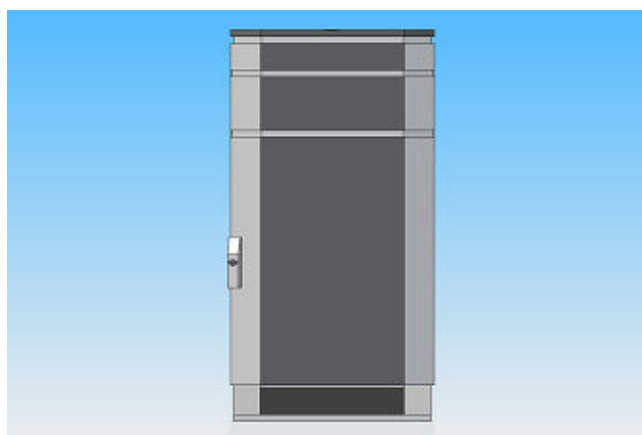


Fig. 1: Frontal view of the rack

The rack is insulated so as to be inaccessible during the live working of the system: the operator is enabled to access only opening the back door. This is equipped with a locking device that cuts off the feeding of the system when the operator opens it.

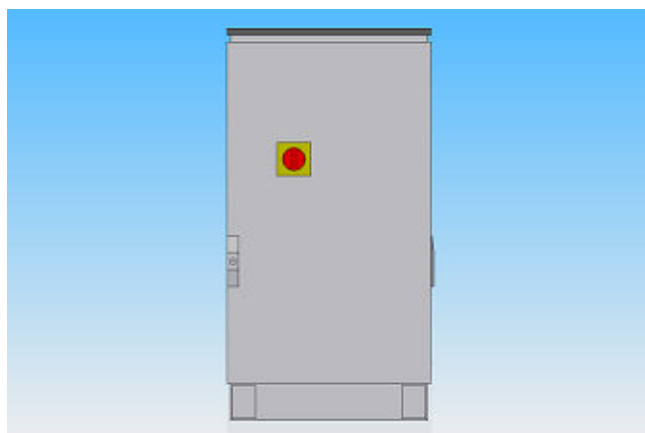


Fig. 2: Back view of the rack

On the upper surface of the rack there is a Touch Screen monitor that enables a complete use of the system without using keyboard or mouse. These accessories are anyway supplied and the user can find them in the drawer of the rack in case of malfunctioning of the function touch screen or if the operator prefers the use of different means (in particular of the mouse).

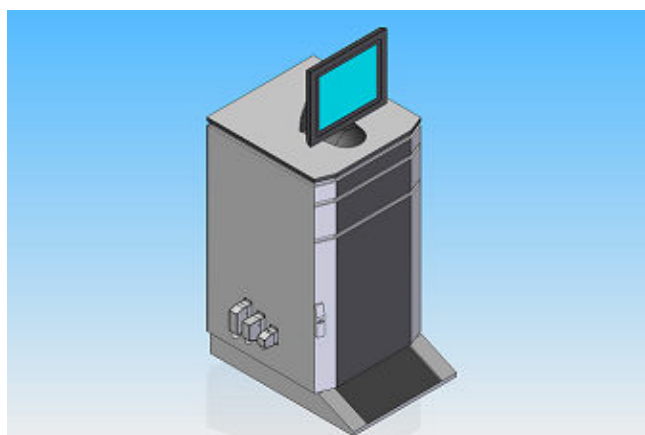


Fig. 3: Touch screen and rack



***Note:** It is strictly forbidden to open the door of the electric board without having cut off the tension of the control rack!!!*

Camera Unit



***Note:** The service socket can be used only for service and not for external uses; USB ports can be used only for data-exchange and not for other purposes.*

The camera unit includes the camera box and the lighting block. The lighting system enables the operator to control the defects in light field and/or in dark field: depending on the field a different neon will be switched on.

Inside the camera box there is a fan that is necessary in order to avoid a too high temperature inside the box.

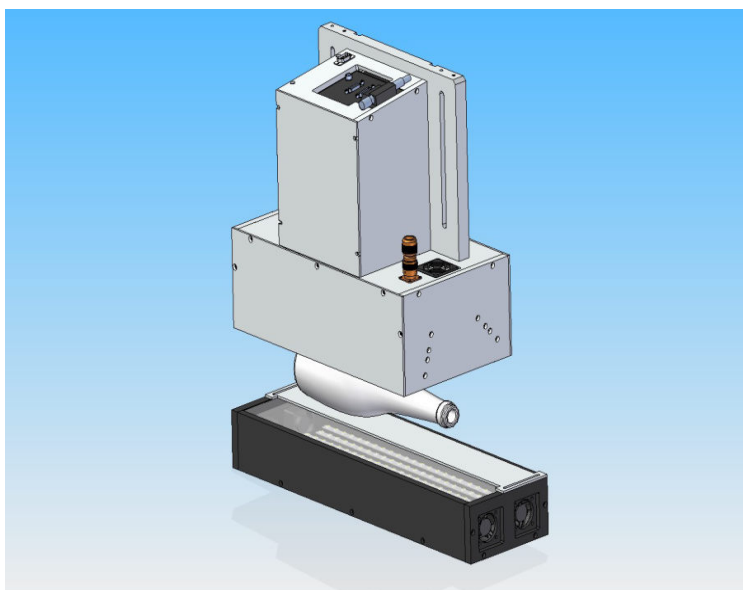


Fig. 4: Back of the box camera

3.3.2. Safety instructions

The system SPECTRO can be installed on different machines according to the directive 2006/42/CE (Rules on machinery). The system SPECTRO will not be allowed to work until the other machine will be in accordance with this directive.

During the installation of the system on the machinery it is necessary to abide by the safety instructions according to the rules DIN EN 294, DIN EN 349 and to the accident-prevention rules of the sector (T.U. D.Lgs. 81/2008 as subsequently amended and supplemented):

- ➔ Safety distance between DECOSYSTEM machine and the machine installed by the client.
- ➔ Correct laying of the connecting cables (no tensions, no hindrances, not close to interference sources, etc...)
- ➔ The system is not ATEX homologated and therefore cannot be installed in places where there is danger of explosion.



***Note:** The installation of the system must be carried out only by specialized personnel.*



***Note:** Before every work of maintenance it is necessary to cut off the tension of the system (put the door locking device on OFF)*



***Note:** Don't look inside the lighting unit.*

3.3.3. Data plates

Each DECOSYSTEM system has a data plate bearing: the serial number of the system, the type of system, a description of the system, the year of manufacture, the CE marking and the address of the manufacturer.

 DeCoSystem www.decosystem.com	
Serial Number	0619C0712
System Type	Spectro-L Color 4k
Description	Print Inspection System
Year of manufacture	2012
DeCoSystem Srl via F. Petrarca 35 50041 Calenzano Firenze - Italy	
	

4. Technical data

4.1. Environmental conditions

- | | |
|---------------------------------|-----------------------|
| ○ Ambient operating temperature | min. 5°C – max 45°C |
| ○ Storage temperature | min. -10°C – max 55°C |
| ○ Power supply | 100-240V, 50-60 Hz |

4.2. RoHS conformity

We certify that the SPECTRO 100% real-time inspection system does not exceed the limit values for the hazardous substances specified by directive 2011/65/EU*.

** EU directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment "RoHS 2 Standard" (Restriction of Hazardous Substances).*

4.3. Protection of the environment

The product contains lead batteries which must be disposed of in accordance with the applicable local regulations in force.



The batteries feature the logotype

Pb

The battery can be removed from the product for disposal in a clean manner and in accordance with these rules.

5. Transport, unpacking and storage

5.1. Transport

The SPECTRO 100% real-time inspection system can be installed on a print machine.

The system is provided either as an integral part of the print machine or as a standalone product with the following components already assembled:

1. Camera unit
2. Control panel (inclusive of control unit)
3. Encoder
4. Connecting cables

The various components of the system must be put in their original DECOSYSTEM packaging for transport.

To carry out this kind of operations, follow the safety rules in accordance with the law T.U. D.Lgs. 81/2008 as subsequently amended and supplemented

WARNING



Wrong transport!

It can cause damage of system components.

- Transport the packing material only in the position indicated.

Avoid to damage the packaging. In case of damage, replace the packing material damaged with a new suitable packaging, to prevent further damages.

DECOSYSTEM Srl cannot be held liable for damage to the 100% real time inspection system caused by inappropriate packaging for transport!

5.1.1. Manual Transport by one or more workers

ATTENTION



Potential danger for transport employees

The falling of loads can cause serious injuries (e.g. crushing and fractures).



Danger of material overturning

Follow these instructions on the manual transport of the components of the system.

- It is necessary to follow a suitable technique to raise the component up, as indicated in the following picture.



- Lifting heavy components can pose health risks. The weight of loads lifted for short periods should not exceed 15 kg for women or 25 kg for men. If the weight is greater than the thresholds, it is recommended to employ more operators and to use support tools.
- Put the load down carefully to avoid damage.
- Use suitable individual protection devices.



- Lift the camera modules only by means of the bracket handles in the seat.

5.1.2. Transport with fork-lift truck

ATTENTION



Potential danger for transport employees and men in the vicinity

If the transport is carried out using a forklift truck, there is a potential danger of overturning of the component.



Danger of overturning of component during the transport

Follow these instructions on the transport of the components of the system with a fork-lift truck:

- Secure the load to prevent it from moving unexpectedly.
- Use appropriate straps for fastening the load and protection around the edges
- Make sure the fork-lift truck is of sufficient weight-bearing capacity to transport the load safely.
- Use individual protection devices (work gloves, safety footwear).



5.1.3. Transport with crane/hoist

WARNING

Danger suspended loads



Risk of falling materials

Follow these instructions on the transport of the components with a crane/hoist:

- Make sure the crane/hoist is of sufficient weight-bearing capacity to transport the load safely.
- Try to put the load in a stable position.
- Fasten the load lifting device to the crane/hoist using only suitable harnesses of appropriate size.
- Secure the lifting straps to prevent these from sliding and the load from falling or tipping over.

5.2. Unpacking

When you receive the package, check immediately that the material is complete and undamaged.



WARNING

Damaged packaging

can cause damage to the components of the system.

- Remove the damaged packaging in the presence of a person employed by the transport firm and check the contents for signs of damage.

Unpack the components just before assembly in a dry, covered area.

The size of the package depends on the material ordered.

- Before assembly, check all the components required are present. To do so, spread out all the packs/cartons provided. Open one pack/carton at a time and remove the packaging and parts with care. Be especially careful with any metal parts like cables and additional parts in the packs/cartons.
- Check all the components for signs of damage (e.g. dents, scratches, loose parts, defective cables, etc.). Defective or damaged components must be replaced immediately because their efficiency cannot be guaranteed.
- If you need to return any of the components, make sure you keep the original packaging. Components must be returned in their original packaging. Otherwise, dispose of the packaging material in compliance with local legislation.

5.3. Storage

The components must be kept in a dry environment until they are about to be assembled.

Storage conditions: Temperature: -10°C to 55°C max

Air humidity: 20 - 80%, without condensation

6. Installation



***Note:** The installation of the vision system SPECTRO must be carried out only by specialized personnel. DECOSYSTEM does not assume any risk of damages caused by disregard of this advice.*

6.1. General Information

Following there are some general rules that are very important to guarantee a successful installation:

- ➔ Secure the camera box so as to make vibrations on this unit as slight as possible
- ➔ The camera box must be placed in an environment with free air circulation so as to guarantee the correct working of the cooling fan that is on the box.



***Note:** The disregard of this rule can cause a malfunctioning of the camera due to a too high temperature.*

- ➔ The positioning of the cables must be carried out as carefully as possible. They can't be put in tension and/or in a position of hindrance creating danger for the usual traffic of people: if it is impossible to avoid it, you will have to use the suitable cable straps and to put up the relating signals.

7. Employment of the system

7.1. GUI

The SPECTRO system has a graphic interface easy to use. The graphic interface or MMI can be divided into functional zone. Every zone contains useful information about the correct use of the software.

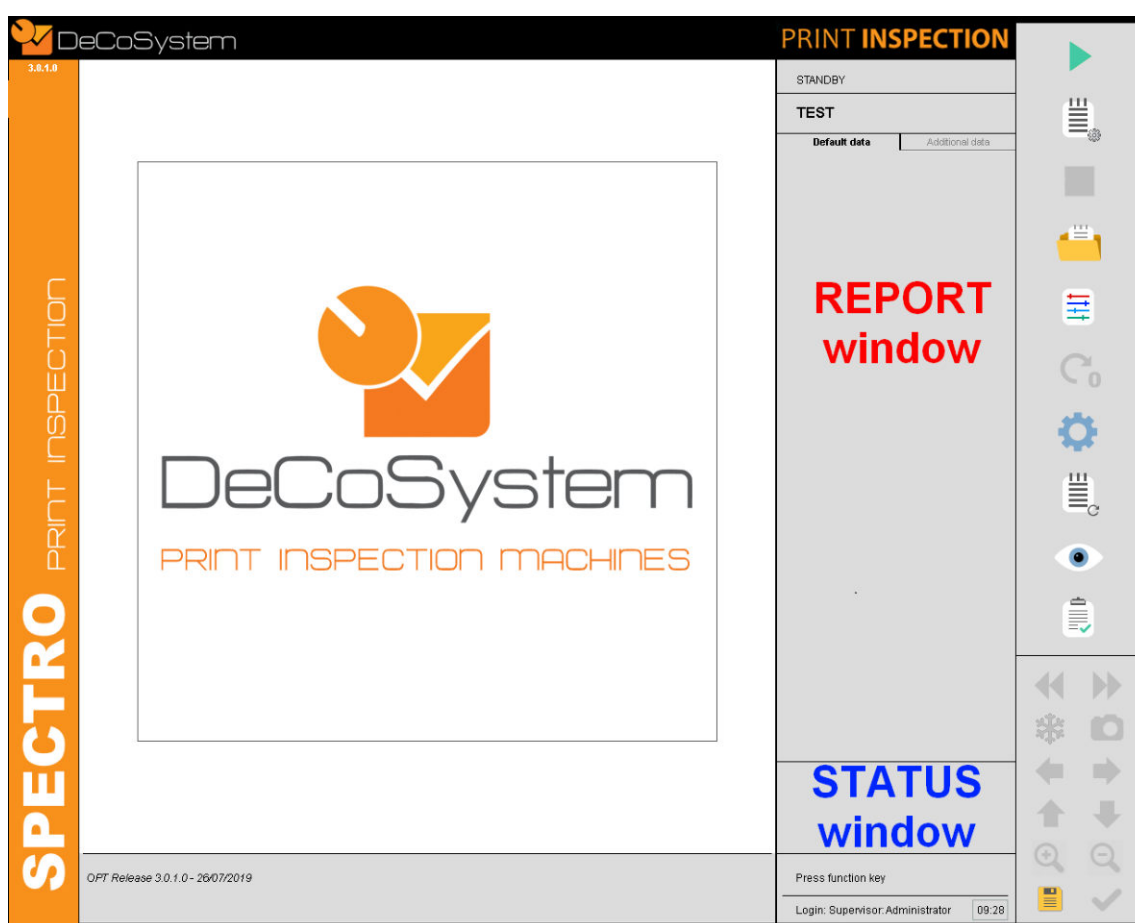


Fig. 5: Main window in STOPPED: report and status windows are highlighted.

REPORT WINDOW: the software contains all the information relating to the production control and all information related to actions that can be undertaken at each stage of software use. The information in this part of the MMI guides the operator to the proper use of the system SPECTRO.

STATUS WINDOW: The status window shows information about the state of the system and action to be taken.

7.2. Working phases

The software can be subdivided into five working phases:

1. **START UP:** it is the starting phase of the program. There is the hardware and software initialization of the system. If the phase comes correctly, the system automatically goes to the *Stopped* phase.
2. **STOPPED:** in this phase the system always waits for the operator's instructions. It is possible to enter every functionality of the system: during the Stopped phase the user can change some parameters of the configuration, carry out a Set-Up or recall a Set-Up already stored on disk.
3. **SET UP:** the system acquires the master image and selects all the necessary parameters for the control; this procedure is described in the following chapter.
4. **RUNNING:** during this phase the system carries out the control; this working phase is described in chapter *Running*.
5. **SHUT DOWN:** it is the phase of the automatic switching off of the system

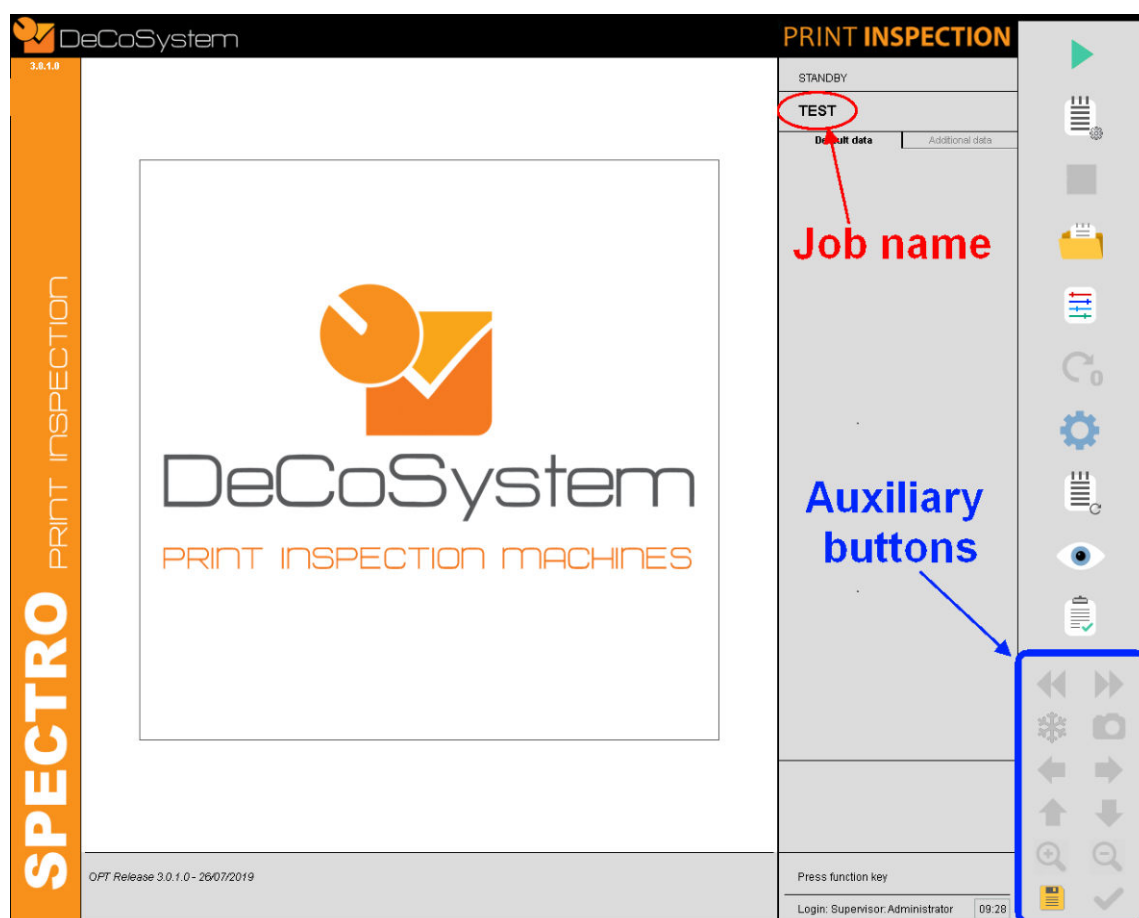


Fig. 6: Main window in STOPPED: job name and auxiliary buttons are highlighted.

Following there is a short description of available functionalities and auxiliary buttons.

7.3. Available functionalities

	RUNNING phase (quality control)
	SETUP phase (learning a good piece)
	STOP phase (system waits for instructions)
	Setup selection (loading an old job)
	Control tolerances
	Reset control counters
	Configuration menu
	Automatic model acquisition / Fast Setup / Remaster
	Test phase / Live
	Report and display of statistic

7.4. Auxiliary buttons

 	When the display is frozen, they permit to move back and forth among the images with defects during RUNNING; in LIVE modality they increase/decrease step for brightness change
 	Button on left: to freeze display / Button on Right: Esc
   	Arrow keys to move image or a selected area / to edit tolerances during RUNNING (see related paragraph for more details); Arrow up and down: during LIVE they increase/decrease brightness
 	Zoom in / Zoom out
 	Button on left: to take a screenshot / Button on right: Return (The screenshot is saved automatically into the directory C:/ or in the last hardisk connected)



***Note:** Follow instructions on report window to find all functionalities of the buttons during each phase.*

8. Image processing: Setup and Running

SPECTRO is a comparing tool. That means the user needs to define two entities that the system is able to compare. These two entities are:

- reference or golden;
- “to-be-checked” object.

The software has two different procedures: *Setup*, to define the reference model, and the *Running*, to acquire the image of the “to-be-checked” object from the camera, getting comparison results.

8.1. Setup procedure

The first step consists in the definition of a reference image. The user can choose to load a new reference, or to reuse an existing setup.

8.1.1. Use of an existing setup



With this button it is possible to select a SetUp previously stored on the hard drive as starting base for the new setup and then the user can go to the *Running* procedure.

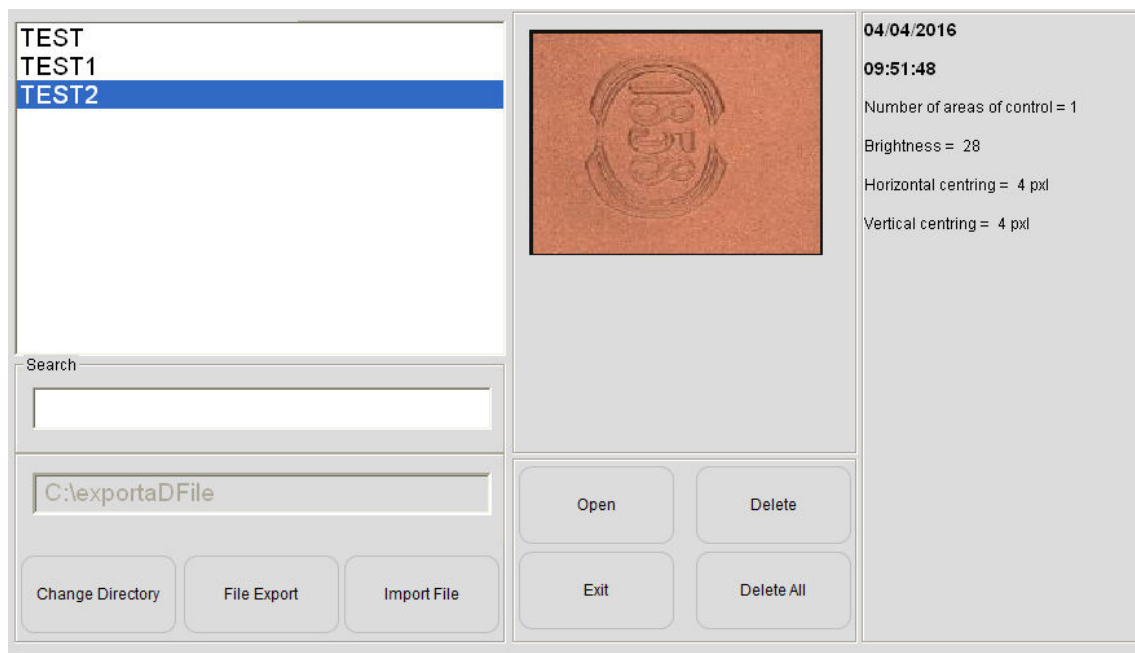


Fig. 7: Old Setup dialog

8.1.2. New Setup



With this button the user can acquire a new setup job from the camera. The setup procedure is composed of several steps. During these steps, described in the following paragraphs, the operator is asked to provide all necessary information for the system for defect detection.

During Setup, the system stores the image of the model for the later comparison to control.



Note: A new setup is always carried out on the base of the last setup loaded. That means that information as number of control areas, position of control areas and all other setup parameters are kept as starting point for the new setup procedure and can be changed to be adapted to the new setup.

Definition of job name

In the first step of the setup procedure the operator is asked to provide a name for the new job. The system shows the name of the last Setup loaded; this name can be confirmed (in this case the system asks if the old data have to be overwritten) or changed in order to store the data for a completely new job.

In more recent versions, the software may not ask for anything; in case of confirmation of the last Setup name, a red box is shown next to the name box.

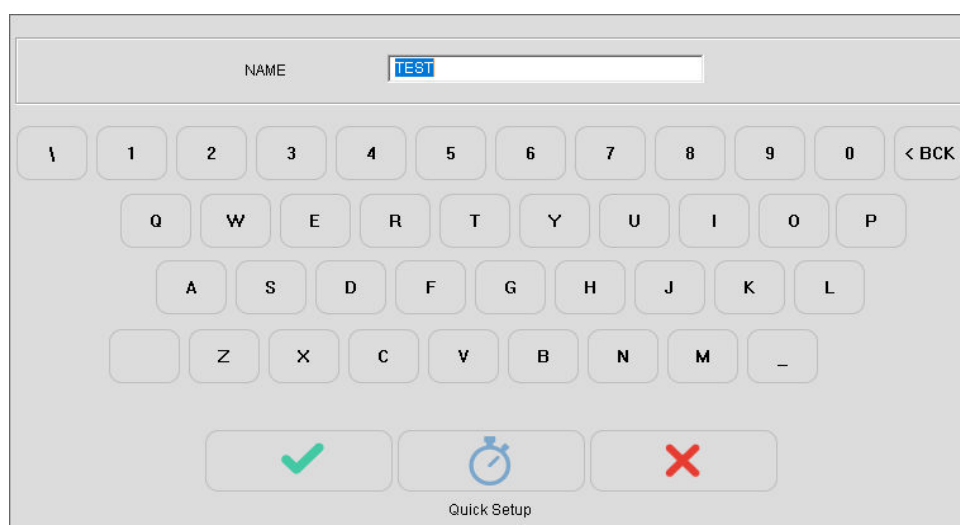


Fig. 8: Job name definition

Object diameter measurement

In this step the system asks the operator to provide the diameter of the cylindrical piece to inspect.

On the base of this information the system is able to compute the longitudinal resolution.

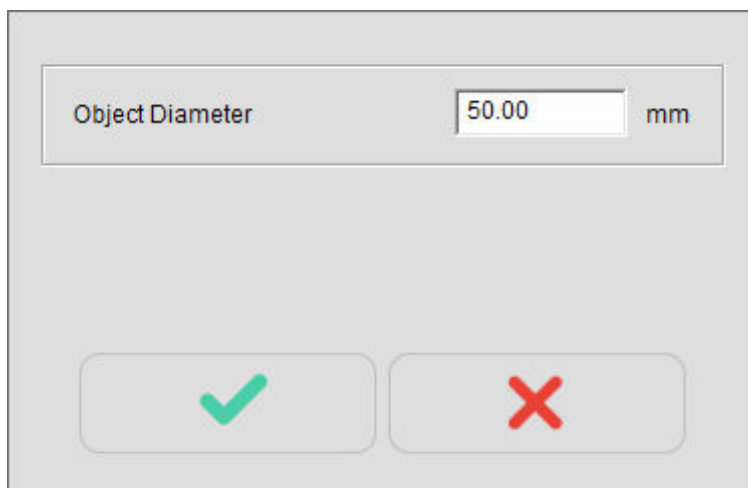
The image shows a software interface for entering object diameter. It consists of a light gray rectangular window. Inside, at the top, is a horizontal box containing the text 'Object Diameter' on the left, a white input field with the number '50.00' in the center, and the text 'mm' on the right. Below this box, there are two rounded rectangular buttons. The left button contains a green checkmark, and the right button contains a red 'X'.

Fig. 9: Object diameter

Setting of Setup parameters

The next step of the Setup procedure is the definition of parameters concerning the image and the areas of control.

The parameters are:

- **Number of Control Areas:** number of the areas that the user wants to create. The control is carried out inside these areas.
- **Image Brightness:** value of the image brightness. The brightness level can be set from the function *Live* too (the value set in *Live* is saved for the next setup).
- **Notes:** strings of characters that are displayed in *Stopped* when the user selects the relative SetUp file.

Parameter of Areas		Range
Number of areas of control	1	1 - 66
Number of masters	1	1 - 10

Image Parameters		Range
Brightness	28	10 - 97
Step of encoder	2	1 - 256

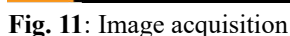
Control of Lights

- ☐ Switch On Light 1
- ☐ Switch On Light 2
- ☐ Switch On Light 3
- ☐ Switch On Light 4
- ☐ Switch On Light 5

Notes

Fig. 10: Setup parameters

After having completed the introduction of the values of the different parameters it is necessary to carry out the acquisition of the new image; the system is now in pending state and displays the image of the last setup. It is now possible to confirm the image previously acquired (for example: if there is a new job with the same product but different control parameters), to carry out a new acquisition or to stop the *setup*.



Definition of object rotation surface

In this step, the dimension of the side surface of the rotating object has to be defined in order to be able to check the whole surface of the piece itself.

The operator is asked to check the position of the green line displayed within the image. The displayed image is longer than the length of the rotated piece, therefore the graphic displayed on the top of the image, should be repeated just below the green line.

If the green line matches the position of the image beginning, the operator has only to confirm the position. If a correction is needed the operator can modify the position of the green line; once he confirmed, he can get to the next setup step.

After the confirmation of the selection, the software evaluates the part of the image displayed from the beginning to the green line as a round angle (360 degree) of the rotating object.



Fig. 12: Definition of the image length

Selection of control area parameters

During this phase the operator has to choose the typology of the control area. This must be carried out as many times as the number of areas previously set in the box *Number of control areas*.

The screenshot shows a software interface for configuring control areas. It consists of several sections:

- Area characteristics:** Contains a text field for 'Setup file name' with the value 'TEST', and a numeric field for 'Number of area' showing '1 / 1'.
- Choice of area typology:** Features a dropdown menu currently set to 'Rectangular Area' and a 'Delete' button.
- Tolerances:** Includes three input fields for 'Max. number of Error windows' (Blue, White dots, Red), each with the value '1', and a 'Tolerances' button.
- Bottom controls:** Two large buttons with a green checkmark and a red X, likely for confirming or canceling the configuration.

Fig. 13: Selection of the area type

There are different typologies of areas:

- **Rectangular area:** rectangular area.
- **Polygonal Area:** it is possible to draw a polygon on the screen to obtain a control area with no regular shape. Every time the left button is pressed, a vertex will appear on the screen. To close the polygon the user has to press the *Esc* button.
- **Colour Monitoring Area:** it focuses on control of color tone of area selected
- **Ellipse Area:** elliptical area
- **Controlled Rectangular Area:** it is an area where user can define a minimum size and a maximum size of the rectangle selected.
- **Exclusion Area:** In this kind of area a *zone* can be excluded from the control. This can be a *rectangular area* or an *elliptic area* or an entire part of the image made up of a series of *Under-threshold windows*, for example a whole area of the image that is dark compared with what the user wants to control. With this area it is possible to exclude all the regions belonging to the related zone.

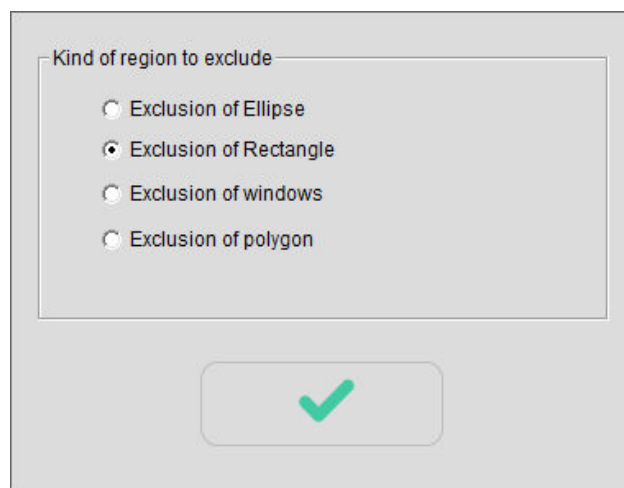


Fig. 14: Selection of the exclusion area type



Note: it is possible to choose the exclusion area only if at least one area has been defined before. This means that the user has to confirm the type of the first area, then he has to draw the area on the image confirming the tolerance values and finally he can choose the exclusion area typology for the second area.

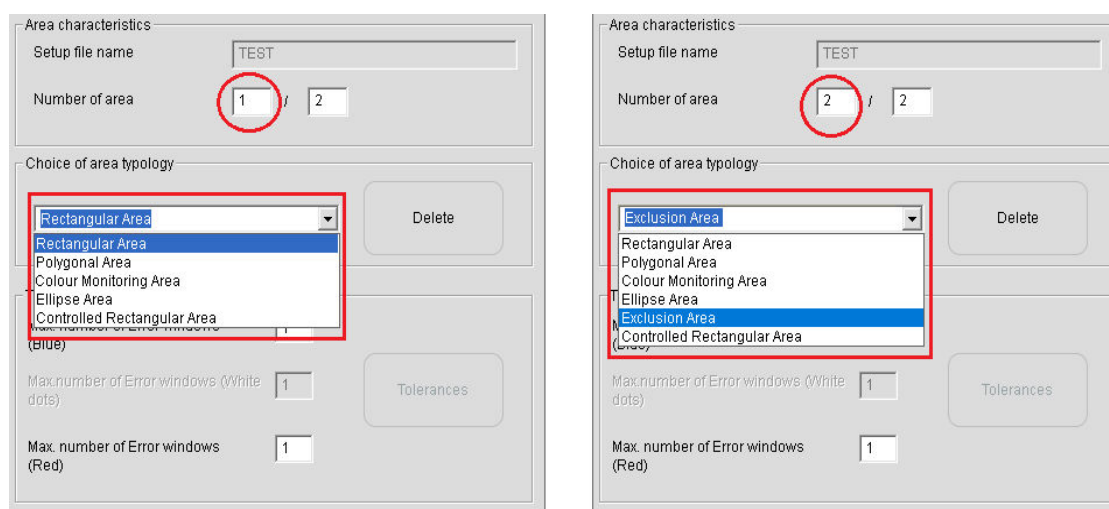


Fig. 15: Selection of an exclusion area. The option is visible only if more than one area is selected.

Selection of control surface

Using the keyboard and/or the touch screen the user has to select or to modify the area he wants to control. Follow the instructions on the report window, to learn all available functionalities of this step.

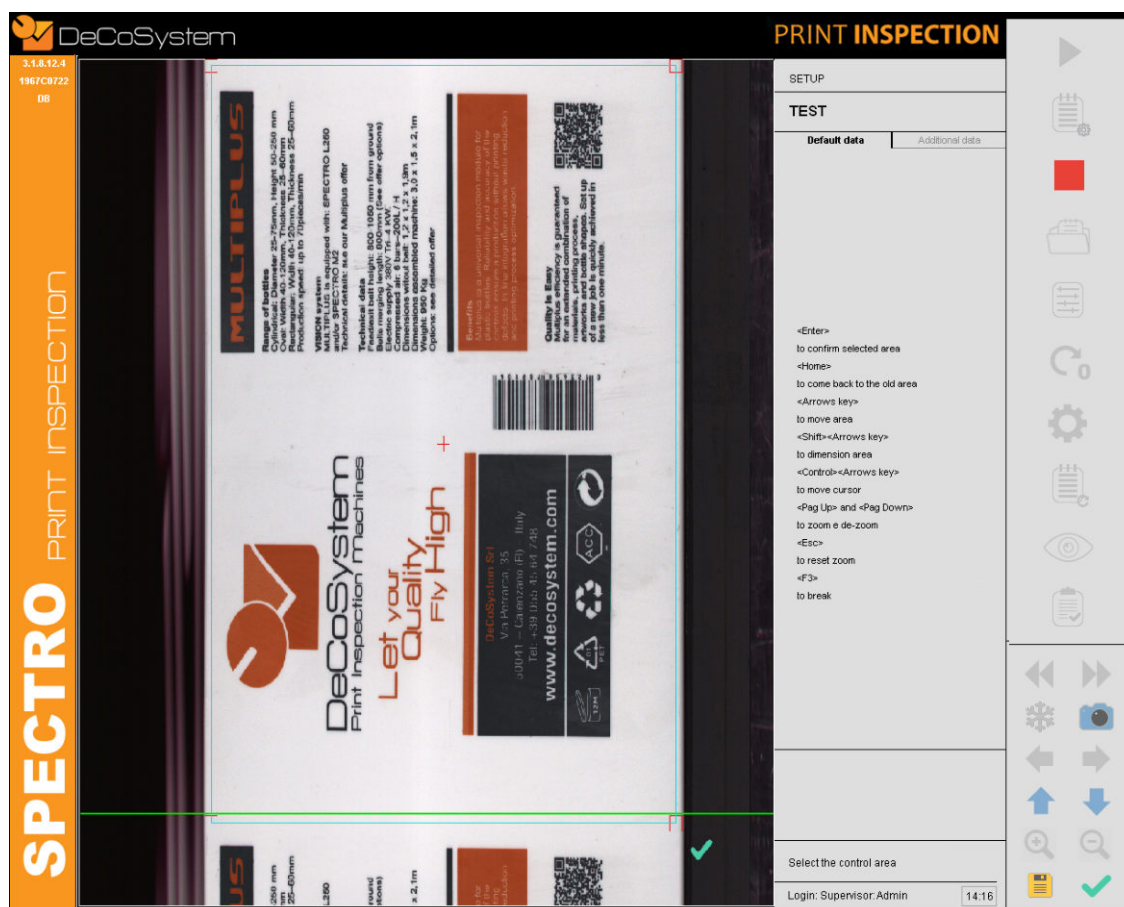


Fig. 16: Definition of control area



Note: By standard working procedure the control area must cover the surface of the label entirely; by particular jobs it will be necessary to use several areas with different control parameters.

Control tolerances setting

When the area has been drawn, the system requires the user to set the control tolerances. If the flag “Simplified Tolerances” is checked in the configuration menu, the simplified dialog will be displayed (Fig. 17); otherwise, the default dialog (Fig. 18) will appear.

Once tolerances have been selected, it is possible to go to the running phase.

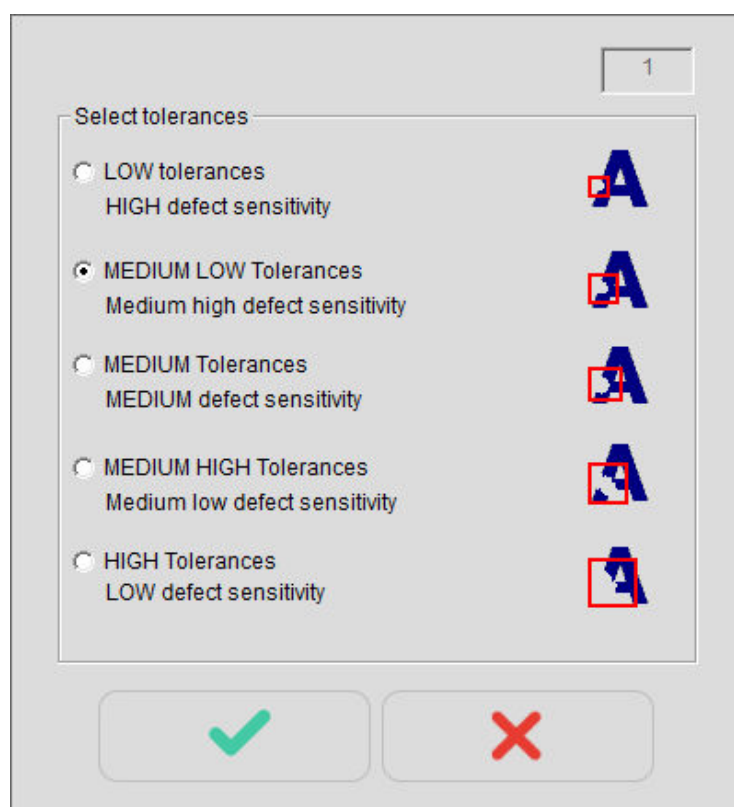


Fig. 17: Simplified Tolerances dialog

Setting of tolerances of area number: 1

Red windows (blur, smear, out of register)

 ☒ Activate

TOL. MIN. 0 255 20 DN

TOL. MAX. 0 255 40 DN

Lacks - Excess

☒ Light writing on dark background

☐ Dark writing on light background

Excess [0 - 1] 0 2 1.00

Blue windows (lacks, spot, dirt)

 ☒ Activate

TOL. MIN. 0 255 40 DN

TOL. MAX. 0 255 60 DN

Clear/Dark Weight

Clear 0 2 1.00 Dark

Low variation of uniformity (Tone variation)

 ☒ Activate

Difference of tone 0 25 6.0 DeltaE

High variation of uniformity (streaks, dirt, scratch)

 ☒ Activate

Difference of tone 0 255 60 DN

DIMENSION 0 100 12 %

Positioning control

 X tolerance 0 3.30 3.30 mm

Y tolerance 0 5 2.00 mm

Default Tolerances

LOW MEDIUM LOW MEDIUM MEDIUM HIGH

Fig. 18: Default Tolerances dialog

8.1.3. Fast Setup



Use this button during the Stopped phase to perform a fast Setup.

When a Fast Setup is started, the system simply acquires a new reference image and performs all setup computations maintaining all other job settings unchanged.

Once the Fast Setup procedure has been completed, it is possible to go to the Running phase.

8.1.4. Quick Setup



In more recent versions the user can do a Quick Setup. He can decide to perform a Quick Setup at the beginning of a new Setup. In the Quick Setup the user can acquire and scroll a new reference image and change some job parameters as the brightness.

8.2. Running

This is the procedure concerning the to be controlled object.



With this button the running procedure starts. During the RUNNING phase the system carries out the control: the processing is made comparing the model image with the acquired image.

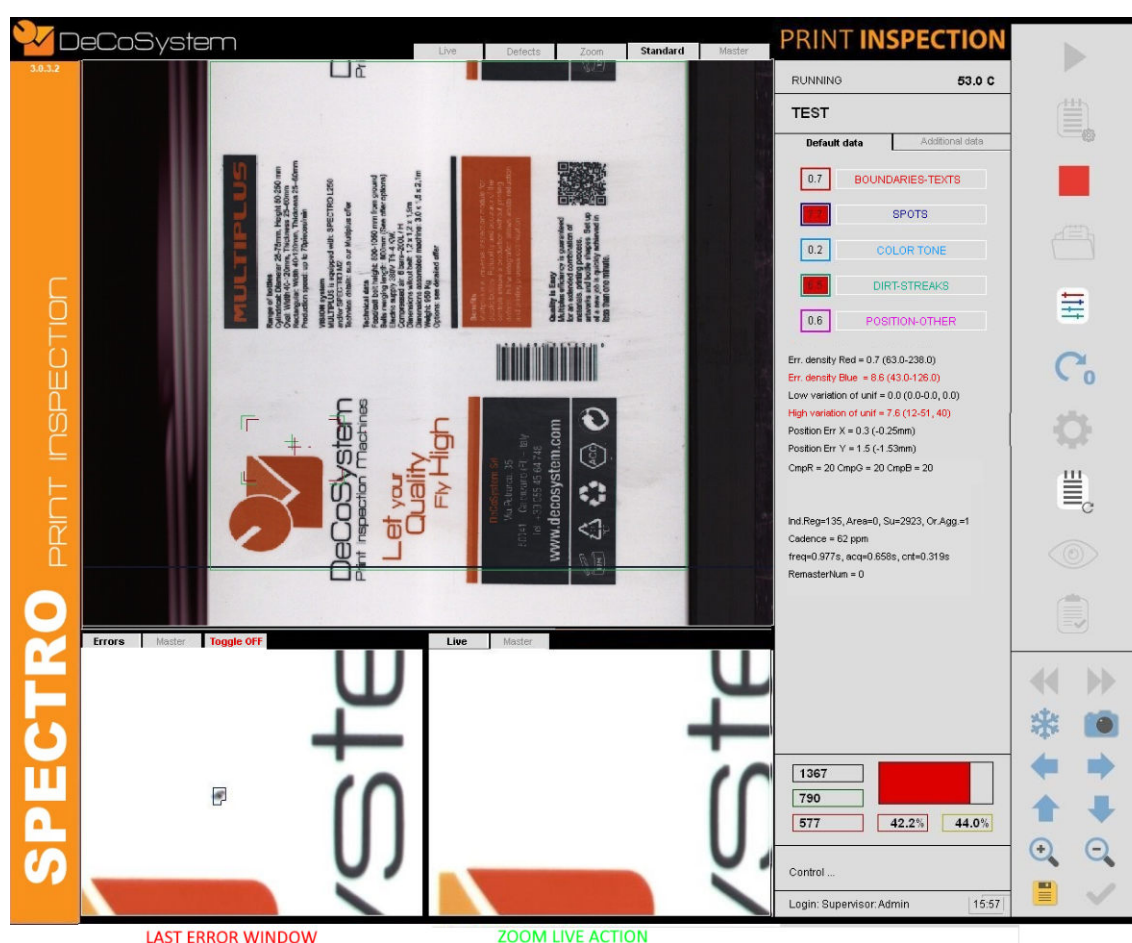


Fig. 19: Running phase display

If a parameter exceeds the tolerance thresholds we'll have an error signal. In the dialog window on the right of the image the user can see all information about the control parameters of the selected camera: the values of the errors are displayed for each acquisition.

If the values are below the value 6, it means that the error is below the set tolerance. If one of the displayed values is beyond 6, it means that the relating tolerance has been exceeded and therefore the piece will be rejected.

If the system is equipped with a 16:9 display, the main visualization in Running will be more detailed. In the right part of the screen, the last 10 defects found will be shown, as it is highlighted in the following picture.

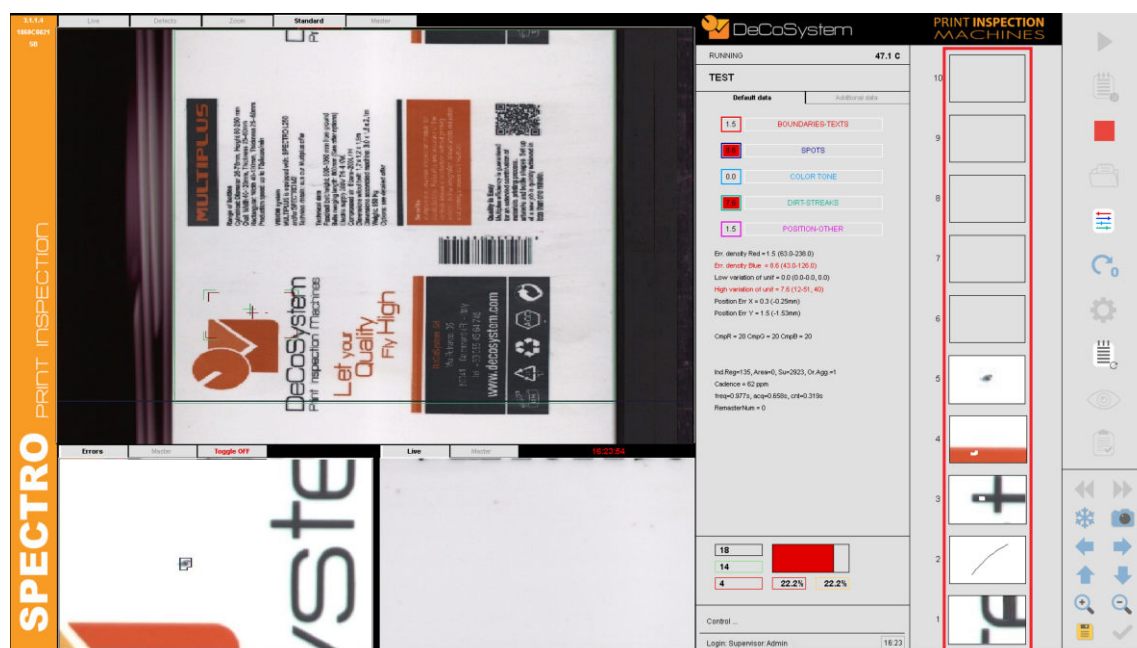


Fig. 20: 16:9 Display - Visualization in Running

8.2.1. Semaphore

RED: the result of the control is KO – BAD PIECE



Fig. 21: Semaphore

GREEN: the result of the control is OK – GOOD PIECE

GREEN - YELLOW: the result of the control is OK but the values are very close to the reject

RED - YELLOW: alarm for consecutive rejects or for frequent rejects

8.2.2. Edit of tolerances during Running



Pressing this button, the user can change the control tolerances during the Running phase. The standard user is able to edit tolerances during RUNNING only if the flag in the configuration window “Enable Running Sensitivity” is checked. Only supervisor can view and modify this menu.

This feature is useful to change the sensibility in running without change the default tolerances and without stop the control.

This means that the user can modify the tolerances around setup parameters. Each single step on the bar can be set in configuration menu (System parameters window; it is disabled for standard user!).

On the upper part four indicators will be seen. They are related to the sensitivity for the different control typologies.

Pressing the arrow-keys these sensitivities can be changed. Using <Arrow Up> and <Arrow Down> the user can move from one sensitivity to the other; pressing <left arrow> and <right arrow> the user can increase or reduce the sensitivity activated at that moment (indicator in a red rectangle).

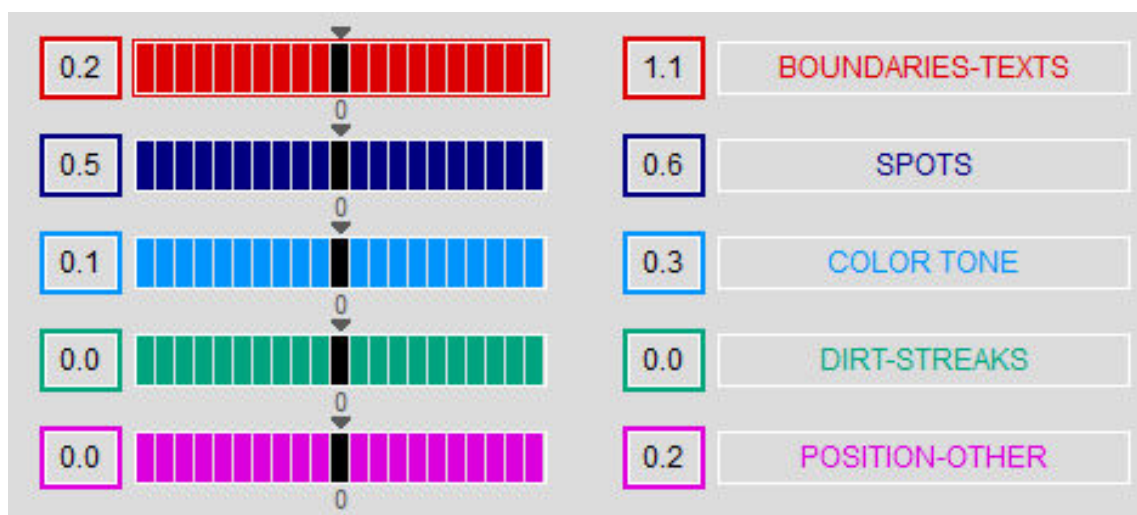


Fig. 22: Running sensitivity

8.2.3. Reset



If the user wants to reset the report of the results and the counter, the user can do it pressing the button shown on the left, during the Running phase.

8.2.4. Remastering



The Remastering feature is enabled during the Running Phase, and allows the user to add to the setup model additional regions. Every time the button is pressed a defect region will be stored.

This feature is useful when there are some print-model inconsistencies during the production especially if these inconsistencies are repetitive in one part of graphics.

Use this feature with the option *display only errors* to understand which region will be remastered. It is possible to see which regions have been remastered with a dedicated display called *Master*.

8.2.5. Freeze visualization



This button freezes the visualization of the controls (the control remains active in background) and it enables the rewind/fast forward keys. With these keys, it is possible to check the past errors. Pressing again the Freeze button the system comes back to the visualization of the current production.

9. Tolerances modification



Pressing the button in figure from the main menu, it is possible to change the tolerances for each area. Only the supervisor is enabled to change the tolerances and so a password and a login are required.

The operator can modify the tolerances of each control area defined during the setup. The following dialog will be displayed as many times as the number of control area defined during the setup. By clicking on the button *Tolerances*, the standard or the simplified dialog of tolerances will be displayed, basing on the configuration menu setting (see *Control tolerances setting*).

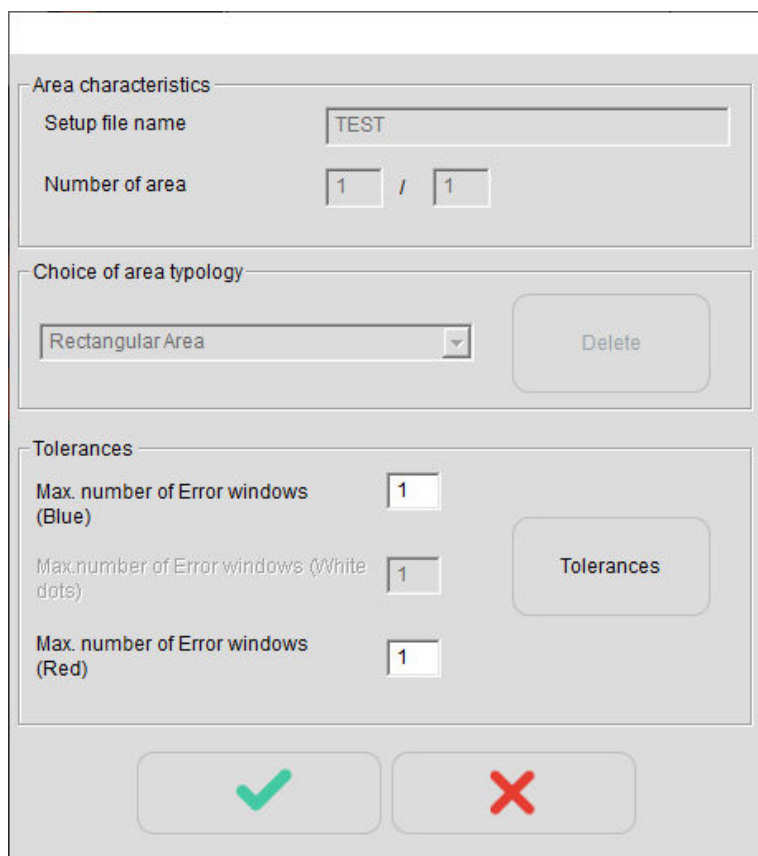
A dialog box titled 'Area characteristics' with three main sections. The first section, 'Area characteristics', contains a text field for 'Setup file name' with the value 'TEST' and a 'Number of area' field showing '1 / 1'. The second section, 'Choice of area typology', has a dropdown menu set to 'Rectangular Area' and a 'Delete' button. The third section, 'Tolerances', contains three rows of input fields for 'Max. number of Error windows' for 'Blue', 'White dots', and 'Red', each with the value '1'. A 'Tolerances' button is to the right of these fields. At the bottom are two large buttons: a green checkmark and a red 'X'.

Fig. 23: Area characteristic dialog

Following, the meaning of every control are described in detail.

The system first distinguishes two different categories of control windows:

- **Blue Region (Uniform window)**: these windows control the area of the image that is without any writing or any significant colour variation.
- **Red Region (window with Edges)**: area of the image with writings or significant colour variations (structured area).

After this first distinction the system carries out different kinds of control. Each kind of control is suited to control areas with particular characteristics.

Tonality Control

- **Light Uniformity Variations**: a light variation of Uniformity is used to locate large defects with a low contrast level (grey levels), for example a light lack of colour.



Note: For this kind of control it would be better to use very low contrast levels (15-30 lev.).

- **High Uniformity Variations**: the elevated Uniformity variation is used to detect high-contrast defects of little dimension (typical is a black spot on a light surface).



Note: Usual values are 70-120 lev. and as percentage the one of the area of the error we want to detect.

Density Control

- **Uniform windows (blue)**: control of the local colour density inside the structured areas. The operator has to set two tolerance values (min. and max.). According to the conditions of brightness and contrast, the system automatically chooses which one of the thresholds could be the best in order to optimize the control.



Note: Usual values are 30-40 for the min. tolerance and 50-70 for the max. tolerance.

- **Non uniform windows (red):** control of the local colour density on the edge of the structure. The operator has to set min. and max. values of tolerance.



Note: usual values are 20-80 for the min. tolerance and 40-100 for the max. tolerance

- **Lacks - Surplus:** in this kind of control the operator can choose to give more importance to colour lacks or surplus. If the operator wants the machine to be more sensitive to detect colour lacks, he has to set the variable *Weight* to a value between 1 and 2. If, on the contrary, the operator wants the machine to be more sensitive to detect colour surplus, he has to set the variable *Weight* to a value between 0 e 1.



Note: First the operator has to set the colour of the writing enabling as one of the two following writings: "Light writing on dark background" or "Dark writings on light background"

Control of the position of the regions

The position error is calculated in mm with respect to the box (or under-box) and to the references. The introduce parameter is the position tolerance; within this value the system doesn't detect the error.

9.1. Simplified modality

It is possible to set a simplified modality for the management of tolerances. The operator will be enabled to select only a tolerance among the set levels (see paragraph *Control tolerances setting*).

- ➔ LOW TOLERANCES: High defect sensitivity.
- ➔ MEDIUM LOW TOLERANCES: Medium High defect sensitivity.
- ➔ MEDIUM TOLERANCES: Medium defect sensitivity.
- ➔ MEDIUM HIGH TOLERANCES: Medium Low defect sensitivity.
- ➔ HIGH TOLERANCES: Low defect sensitivity.

10. Live



Selecting this button, the modality *Live* is enabled.

This functionality allows the user to see the image real-time and it is very useful if the user has to find the right setting of the system when it isn't carrying out the control.

It is possible to find the most suitable brightness for this kind of process. The operator can use rewind/fast forward keys to increase/decrease the step to edit brightness and the arrows keys (up and down) to increase/decrease brightness.

For example, considering the Step is 2, and brightness 26, if the operator increases the brightness, it will be equal to 28.

The value will be stored and will become the default value of a new setup. During this phase it is also possible to check the right working of the light devices and to adjust the focus of the cameras.



Note: *The focusing of the camera must be carried out by specialized personnel. You have to work directly on the ring that is on the objective.*

11. Report



Pressing the statistics key during the *stopped* phase a menu managing the reports will be seen (Fig. 24).

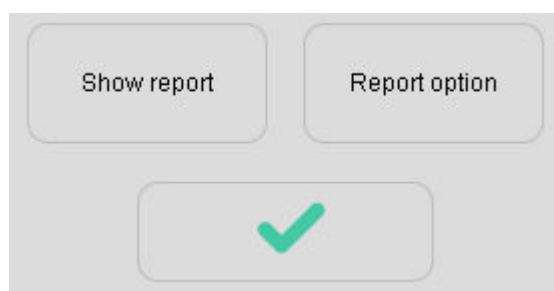
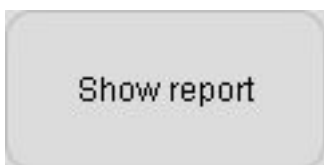


Fig. 24: Report options



Show report: it allows the user to open or delete all report files on the hard disk.

- **Open:** it opens the selected report
- **Delete:** it deletes the selected report
- **Delete all:** it deletes all reports
- **Exit:** it exits the current dialog

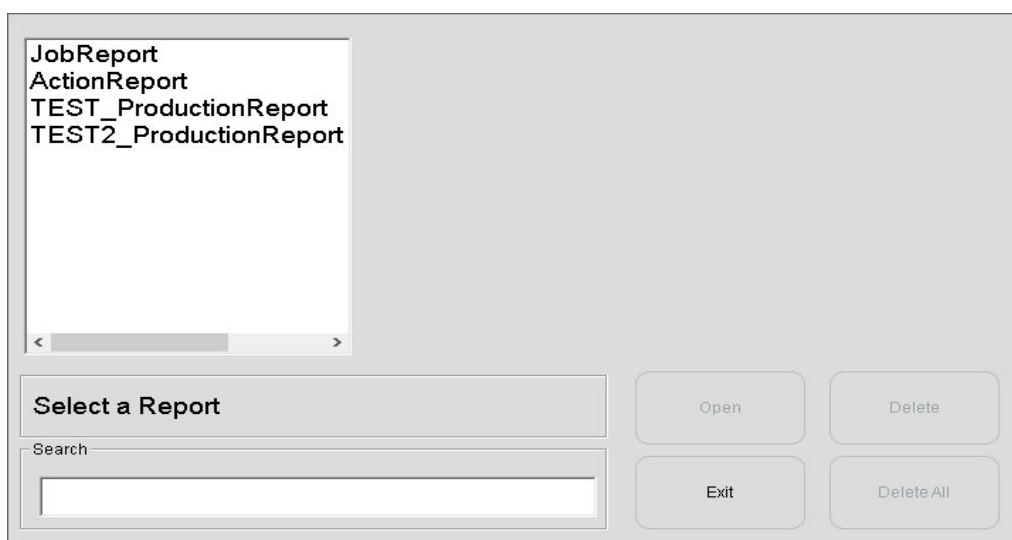
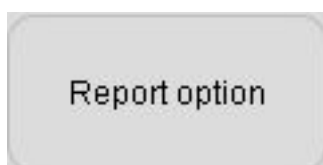


Fig. 25: Show report window



Report option: it allows access to statistics options.

- **Enable Production Report:** it enables the storing of the production report. It is a daily report that contains information about the job (i.g Setup name and data); in particular it shows all counters and a table reporting the number of rejected pieces for each production hour. In the *.html format the details of each defect (Fig. 28) are available clicking on a range, highlighted in red in Fig. 27. The production report is saved: each time you click RESET (the report's filename will contain the word "RESET"), each time you click STOP, each hour and after the time indicated by the parameter "Storing stat. Every". The user can choose his favourite extension between .xml and.html. The filename is composed of: JobName_Date_TypeOfReport_Counter and the extension. Each production report (same type of report) with the same job name and same date are saved with a progressive number ("Counter") each time counters are reset. (E.g: *TEST_2017_01_11_ProductionReport_00.html*)
- **Enable Events Report:** the event report shows all the actions performed by the system (e.g: Start up/Shutdown of the system, Start production). The report is

updated each time an event occurs. It is a weekly report: it starts each Monday at 6.00 a.m.. It is possible to select an extension between *.xml and *.html. The filename is composed of Date_TypeOfReport and the extension. (E.g: 2017_01_09_ActionReport.html).

- **Enable job report:** this report shows the statistical data for each production hour. This file is automatically saved each hour or any time the system goes in Stop. The file extension could be *.csv or *.html, according to option selected by user. The filename is composed of JobName_TypeOfReport and the extension (E.g: TEST_JobReport.html). With the *.html format the user can go directly to the last row (containing the sum and the average of values, the maximum and the minimum) clicking on “Show summary of the results”, as indicated by the blue arrow in Fig. 30. This feature is particularly useful in case of table with many rows (same job used for several days).
- **Html Report – Enable Error Saving:** if this flag is checked, in the *.html report you can click the range of rejected pieces to view more details about the defects;
- **Storing stat. Every NN Minutes:** the report is stored automatically every NN minutes. If this value is set to 0, the automatic saving of the statistics is disabled;
- **Delete report files every NN days:** the report is deleted automatically every NN days; if this value is set to 0, the automatic deletion of the statistics is disabled;
- **Export report files before delete:** if this flag is checked, reports will be exported automatically in the *Export folder*;
- **Enable writing of details:** enables the reporting of additional statistical data such as the number of defects per region, etc..

Statistic data options

Output file

☒ Enable Production Report Html Html Report - Enable Error Saving ☒

☐ Enable Events Report Html Automatic report print ☐

☐ Enable Job Report Html

Automatic report options

Storing stat. every 0 Minutes

Delete report files every (0 off) 0 days

Export report files before delete ☐

Manual report options

Confirm counters loading after setup ☐

Enable writing of details ☒

Insert report name ☐

Enable order code ☐

Export folder

C:\testexport Change Directory Reset Path

Last clean up of the folder = 11/07/2018

Days to clean up = 0

Action Report Folder

Change Directory Reset Path

✓ ✗ Options

Fig. 26: Report options



DECOSYSTEM PRODUCTION REPORT

Job: VIC At 22/07/2016 17:58:59

Global Counters

Daily Counters	
Number of controls	18
Good parts	7
Bad parts	11
Ratio KO	61.1%
Prerejections	0
Ratio of Prerejections	0.0%
Additional data	
Boundary Rejects	0
Spots Rejects	4
Colour Tone Rejects	0
Streaks Rejects	8
X-Y Shift Rejects	0
KO for large errors	0
KO for error of centering	0

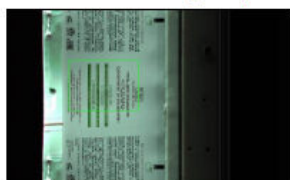
Overview of the defects per hour

0 am - 1 am	1 am - 2 am	2 am - 3 am	3 am - 4 am	4 am - 5 am	5 am - 6 am	6 am - 7 am	7 am - 8 am
8 am - 9 am	9 am - 10 am	10 am - 11 am	11 am - 12 am	12 am - 1 pm	1 pm - 2 pm	2 pm - 3 pm	3 pm - 4 pm
4 pm - 5 pm	5 pm - 6 pm	6 pm - 7 pm	7 pm - 8 pm	8 pm - 9 pm	9 pm - 10 pm	10 pm - 11 pm	11 pm - 12 pm
	1-11						

Fig. 27: Production Report: the details of each defect are available clicking on the range, highlighted in red in the figure.

DECOSYSTEM DEFECT HISTORY

Defects overview between 5 pm and 6 pm



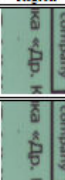
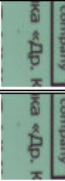
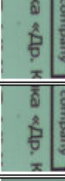
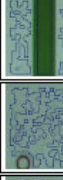
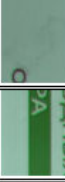
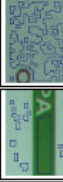
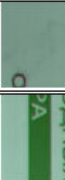
Defect Number	Check Number	Golden Region	Defect Region	Mandrel Number	Error Type
1	7			8	Spots Rejects
2	8			9	Spots Rejects
3	9			10	Spots Rejects
4	10			11	Spots Rejects Scratches Rejects
5	11			0	Scratches Rejects
6	12			1	Scratches Rejects
7	13			2	Scratches Rejects
8	14			3	Scratches Rejects
9	15			4	Scratches Rejects
10	16			5	Scratches Rejects
11	17			6	Scratches Rejects

Fig. 28: Details of defects



DECOSYSTEM EVENTS REPORT

Action	Job Name	User	Date	Hour	Rejection	Number of controls	Perfect part	Reject parts
Startup	VIC	User	2016-08-01	14:45:15	OFF	56	44	12
Startup	VIC	User	2016-08-01	14:48:39	OFF	56	44	12
Load Setup	TTT	DeCoSystem	2016-08-01	14:49:37	OFF	0	0	0
Load Setup	VIC	DeCoSystem	2016-08-01	14:49:51	OFF	56	44	12
Load Setup	TTT	DeCoSystem	2016-08-01	14:50:37	OFF	0	0	0
Load Setup	VIC	DeCoSystem	2016-08-01	14:50:48	OFF	56	44	12
Autostore for Reset	VIC	DeCoSystem	2016-08-01	14:55:30	OFF	4	0	4

Fig. 29: Events Report



DECOSYSTEM JOB REPORT

[Show summary of the results](#)

Date	Hour	Good parts	Bad parts	Total	Max parts per hours
2017-01-11	14:00	0	30	30	7200
2017-01-11	13:00	0	3	3	7200
2017-01-11	14:00	2593	7	2600	7200
2017-01-11	15:00	4801	6	4807	7200
2017-01-11	16:00	1060	205	1265	7200
2017-01-11	17:00	5102	25	5127	7200
2017-01-12	08:00	409	0	409	7200
2017-01-12	09:00	5610	0	5610	7200
2017-01-12	10:00	0	9	9	7200
2017-01-12	11:00	33	5	38	7200
2017-01-12	14:00	1789	17	1806	7200
2017-01-12	15:00	1616	4	1620	7200
2017-01-13	14:00	2	0	2	7200
2017-01-13	15:00	2359	0	2359	7200

SUM:	25374	MIN:	0	MAX:	5610	AVG:	1812.4
-------------	-------	-------------	---	-------------	------	-------------	--------

Fig. 30: Job report

12. Configuration menu



By clicking on the button shown on the left, it is possible to load the configuration menu.

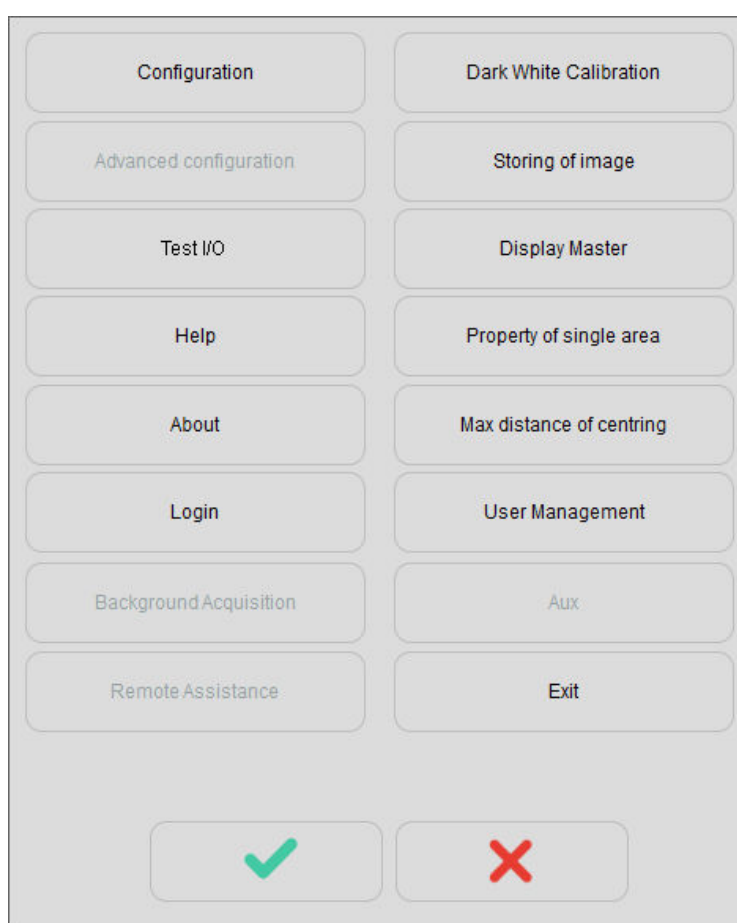
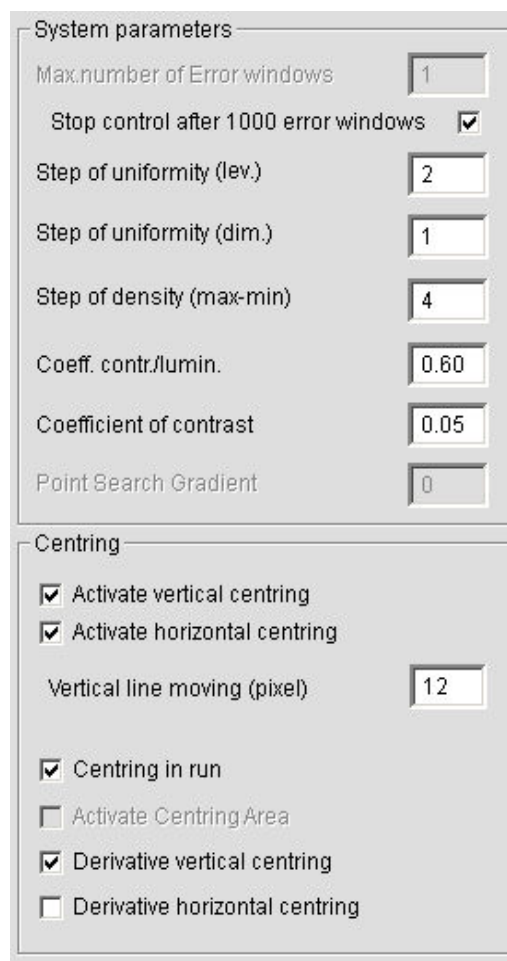


Fig. 31: Main menu dialog

12.1. Configuration window

12.1.1. System parameters and centering



System parameters

Max.number of Error windows

Stop control after 1000 error windows ☒

Step of uniformity (lev.)

Step of uniformity (dim.)

Step of density (max-min)

Coeff. contr./lumin.

Coefficient of contrast

Point Search Gradient

Centring

☒ Activate vertical centring

☒ Activate horizontal centring

Vertical line moving (pixel)

☒ Centring in run

☐ Activate Centring Area

☒ Derivative vertical centring

☐ Derivative horizontal centring

Fig. 32: System parameters and centering

- **Max number error windows:** parameter with fixed value set to 1.
- **Stop control after 1000 err. windows:** this parameter enables you to optimise the control time in case of widespread error. If this flag is enabled, the control will stop after a limited number of windows (1000).

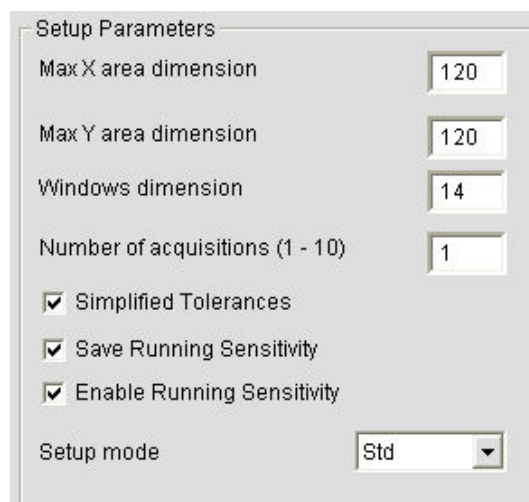
- **Uniformity pitch (lev.):** coefficient used to change the sensitivity in the calculation of uniformity errors. This parameter influences on the tonality difference.
- **Uniformity pitch (dim.):** coefficient used to change the sensitivity in the calculation of uniformity errors. This parameter influences on the dimension.
- **Density Pitch (max.-min.):** coefficient used to change the sensitivity in the calculation of density errors, just for the blue windows as for the red ones.



***Note:** Starting from the tolerances set during the SetUp phase it is possible to change the sensitivity in Running (pressing the function key F5) of the system according to the three parameters just described. If you want to disable the sensitivity variation function (variation of the tolerances using +/-) you only have to set the values = 0.*

- **Coeff. Contr./Lumin:** parameter with fixed value set to 0,6.
- **Coefficient of contrast:** parameter with fixed value set to 0,05.
- **Enable vertical recentering:** it enables the vertical recentering of the acquired image respect to the model.
- **Enable horizontal recentering:** it enables the horizontal recentering of the acquired image respect to the model.
- **Centring in run:** this flag enables the automatic relocation of the area in the global image during RUNNING; if it isn't checked the relocation will be performed using rules
 - **Derivative centring:** these flags permit to obtain more details
- **Vertical line moving pixel:** value (in pixel) of the retrieval made by the vertical ruler to the global image re-locking (valid if the flag *Centring in run* isn't checked)

12.1.2. Setup parameters



Setup Parameters

Max X area dimension 120

Max Y area dimension 120

Windows dimension 14

Number of acquisitions (1 - 10) 1

☒ Simplified Tolerances

☒ Save Running Sensitivity

☒ Enable Running Sensitivity

Setup mode Std

Fig. 33: SetUp Parameters

The first two parameters are used during the SetUp phase to determine the max dimension of a single area:

- **Max dim. Area along X:** this parameter fixes the max accepted dimension for an area along X; exceeding this value the system will automatically subdivide the area into more regions
- **Max dim. Area along Y:** this parameter fixes the max accepted dimension for an area along Y; exceeding this value the system will automatically subdivide the area into more regions.
- **Windows Dimension:** this parameter fixes the dimension (in pixel) of the windows that constitute each control region.



***Note:** The reduction of the max dimensions of the areas and of those of the windows improves the global locator but it makes the system slower in the calculation and therefore it reduces the max speed of “running”.*

For that reason the values of these parameters will be reduced only under exceptional circumstances by specialized personnel.

- **Number of acquisitions:** this parameter fixes the number of samples memorized as model by the system. It is possible to set a value in the range 1÷10; if a value out of the range is defined, the system will replace it automatically with the nearest value in the range.
- **Simplified tolerances:** this parameter enables the simplified dialog tolerances instead of the default dialog
- **Enable Running Sensitivity:** if this flag is checked, the user is able to modify tolerances during Running, pressing the specific button on the main menu; if this flag isn't checked the button will be disabled for the user.
- **Save Running Sensitivity:** the tolerances set will be saved
- **Setup mode: Auto, Standard, Step:** if this flag is set to *auto* there will be an automatic acquisition of the model: the operator is not required a confirmation. If it's set to *standard*, confirmation will be required only after the acquisition of the image. If it's set to *step*, confirmation will be required for each operation.

12.1.3. Parameters of the control unit

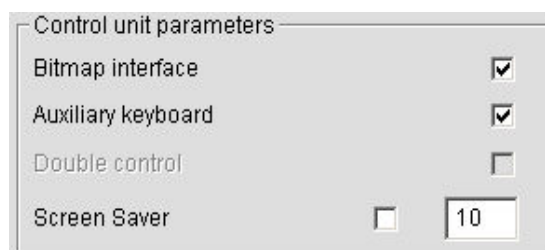


Fig. 34: Control unit parameters

- **Auxiliary keyboard:** this parameter enables the automatic introduction of a software keyboard that allows the enter of data using the mouse or the touch screen.
- **Bitmap interface:** this parameter enables the display of the user's interface with bitmap, instead of the function keys.
- **Screen Saver:** if this flag is checked, the display will show a Screen Saver after an inactivity time indicated in the near box (value expressed in minutes)

12.1.4. Control of print machine job

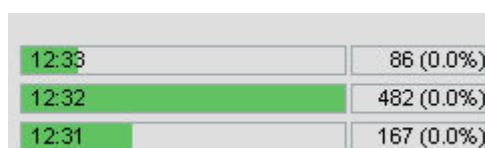


Parts/min	120	p/m
Retention period statistics	30	min

Fig. 35: Print machine parameters

This box is useful to control how much the print machine works. In the box above, the user can define how much parts (*Parts/min*) the machine has to produce in a given period (*Retention period statistics*).

Finally the software shows the results (Fig. 36) in the *Additional data* tab during RUNNING.



12:33	86 (0.0%)
12:32	482 (0.0%)
12:31	167 (0.0%)

Fig. 36: Result of print machine job control

12.1.5. Display

With this option the user chooses the view for the running phase. Although, he can choose another display during the running phase. The various display options are described following.

- **Live Image:** real-time display of the image and of all the control boxes.
- **Standard:** in this case the display is divided into three different boxes: in the upper main box you can see the acquired image displayed real time, while in the two lower boxes you can see the possible detected defect (on the left) and a portion of image (on the right): its position and zoom can be selected by the user. Furthermore, in the left box the user can enable *Toggle* (only clicking on the string "Toggle OFF") to activate the toggle between the model image and the control image, if there are some errors.
- **Errors:** display of image only in case of error.

- **Zoom (of errors):** the user can have the display with zoom only for the pieces that are considered rejects.
- **Master:** with this tab (displayed only during Running), regions subjected to *Remastering* process are displayed.

12.1.6. Language

The messages provided with the machine are shown in the selected language; available languages are: English, Italian, French, German, Portuguese, Spanish, Polish, Chinese and Russian.

12.1.7. Setting of directories

- **Job directory:** the SetUp files are saved in the subdirectory “code”. It is possible to create a new job subdirectory setting a name in the over-mentioned string.
- **Mirroring Dir:** all the files stored in the directories “code” and “data” are copied in another Back Up directory by the system.



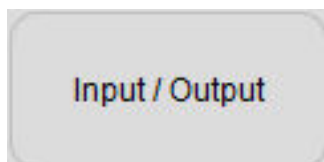
Note: Both the fields can be empty.

12.1.8. Machine (line) code

It is a unique code for each system.

12.1.9. Dedicated configuration menus

Input/Output



It allows the setting of the input/output parameters.

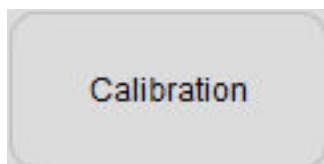
- **Addresses:** values of the addresses of the I/O card.

- **Input/output signals:** you can activate and/or deactivate the input signal (piece presence) as the output one (ok signal).
- **Polarity of the reject signal:** you can select the polarity of the reject signal.
- **Delay:** delay in the acquisition starting and delay in the reject signal (in millimetres or positions).
- **Activate Encoder:** this parameter enables the acquisition of every line of the image via a signal coming from the encoder.
- **<ESC> to activate acquisition:** this flag allows the user to establish the acquisition time
- **INPUT 1:** it allows the user to define the type of input to take the control image.

Address Card Address 50 InputAddress 50 N° Pulses of Encoder 5000 Rejection Signal Duration 0.0		Delay Delay of input signal 0 Delay of rejection (step) 1 1 Delay of rejection (mm) 0.00	
Camera frequency Hz (max diam) 10000 Hz Object Diameter 50.00 mm		Mandrel Speed 1.50 g/s	
Input/output signal ☐ Activate signal of start acquisition ☒ Activate rejection signal ☐ Enable Mandrel Control (Latest area)		☒ <ESC> to activate acquisition ☒ Activate Encoder ☐ Not reject if the machine is stopped	
Polarity of rejection signal ☒ KO active on high ☐ OK active on high		INPUT 1 ☒ Absence piece ☐ Presence piece	
 			

Fig. 37: Input/Output configuration dialog

Calibration



The system displays a window (see below), where you have to set the values of the calibration (millimetres-pixel ratio relating to the X and Y resolution) and the values of overlay between the utilized cameras.

Sight field X dimension: 220.00 mm Y dimension: 84.00 mm	Colours Calibration CCD 1 Analogue Gain Red: 2.00 Analogue Gain Green: 2.00 Analogue Gain Blue: 2.00	Colours Calibration CCD 2 Analogue Gain Red: 1.00 Analogue Gain Green: 1.00 Analogue Gain Blue: 1.00
Calibration X resolution: 0.055000 mm Y resolution: 0.031416 mm Fixed Resolution: 0.031416 mm	RGB Offset Correction Offset between colours: 0.0 pixel Offset between colours fixed resolution: 0 pixel Offset between colours SW: 0 pixel ☐ Horizontal Correction: Red 2.5 (0.0 - 3.0) Object Diameter: 39.0 mm Object Diameter: 1.00 mm	
Calibrations Overlapped zone Cam1-Cam2: 0 pixel Overlapped zone Cam2-Cam3: 0 pixel Overlapped zone Cam3-Cam4: 0 pixel Overlapped zone Cam4-Cam5: 0 pixel Overlapped zone Cam5-Cam6: 0 pixel Overlapped zone Cam6-Cam1: 0 pixel		
✓ ✗		

Fig. 38: Calibration parameter window

Default tolerances**Default Tolerances**

It enables you to set the various parameters of low, medium and high default tolerances values.



Note: The configuration parameters must be set during the installation of the machine. They can't be changed except for particular reasons and anyway according to the qualified personnel's directions.

Red windows (blur, smear, out of register)

	TOL. MIN.	DN	6	20	16	20	40	0 - 255
	TOL. MAX.	DN	30	40	60	80	110	0 - 255

Blue windows (lacks, spot, dirt)

	TOL. MIN.	DN	30	40	40	50	70	0 - 255
	TOL. MAX.	DN	40	60	60	70	90	0 - 255

Low variation of uniformity (Tone variation)

	Difference of tone	DeltaE	5.00	6.00	6.00	6.00	6.00	0 - 25
--	--------------------	--------	------	------	------	------	------	--------

High variation of uniformity (streaks, dirt, scratch)

	Difference of tone	DN	40	60	60	60	60	0 - 255
	DIMENSION	%	6	12	12	12	18	0 - 100

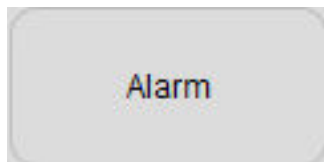
Positioning control

	X tolerance	mm	3.30	3.30	3.30	3.30	3.30	0 - 3.30
	Y tolerance	mm	2.00	2.00	2.00	2.00	2.00	0 - 5.00

Green checkmark button: Red X button:

Fig. 39: Default tolerances

Alarms



This button allows the user to manage the system alarms.

- **Alarm 1 - Max. rejection:** Max number of consecutive rejects. When this number is reached the system signals the alarm
- **Alarm 1 - Number of printing unit:** number of printing units
- **Alarm1 - Number of mandrels:** number of mandrels
- **Alarm 2 - Max. Pre-rejects:** Max number of consecutive pre-rejects indicated by yellow/green lighting. When this number is reached the system signals the alarm.
- **Alarm 3 – Alarm Rate:** when the number of rejects results in higher percentage compared with the value set for the alarm.
- **Alarm 3 - Test after:** when this number of controls is exceeded the system carries out a test on the reject percentage.
- **Alarm 3 – Total pre KO + KO:** it indicates the sum of units in the yellow range (near to error) and units in the red range (error)
- **Max control time:** max value for the control time. If this value is exceeded, an alarm will be signalled.
- **Duration of alarm signal:** the user can define the duration of the alarm signal; after this time, the alarm will be reset automatically

Alarm	
Alarm 1	
Max. rejection	1000
Number of printing unit	1
Number of mandrels	1
Max. # sequential rejections	1000
Alarm 3	
Test after	50
Ratio of rejection to give alarm	101.00
Total pre KO + KO	101.00
Ratio of rejection to give alarm	101.00
Alarm 2	
Max. pre-rejection	100000
Max control time	s. 10.00
Duration of the alarm signal	s. 1.00

Fig. 40: Alarms

Serial configuration (RS232)



It allows the configuration of the variables used in the RS-232 data transmission

12.2. Test I/O

The TestIO button opens a dialog window where the status of all hardware inputs and outputs is displayed and can be managed.

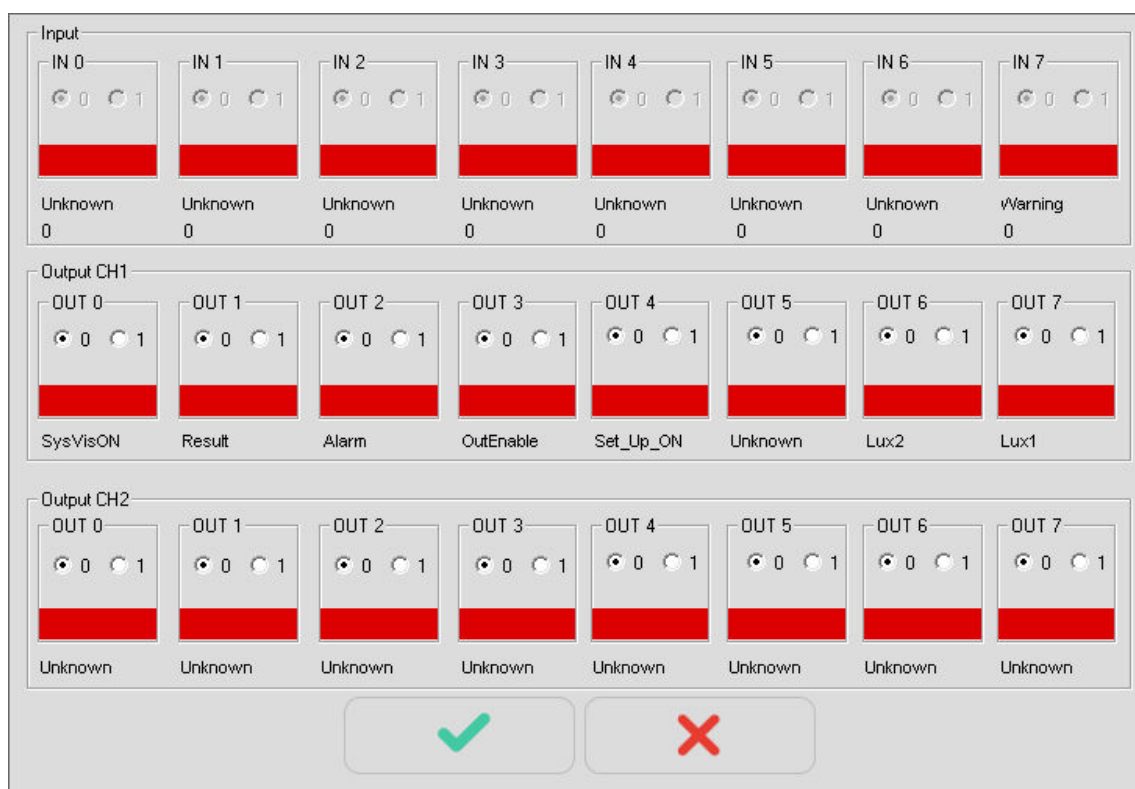


Fig. 41: Test IO dialog

In the upper row the status of each single input is reported. If the semaphore is reported as red, the signal is low, if it is reported as green the signal is active.

In the lower part of the dialog it is possible to set the outputs managed by the system. When an output is enabled, the semaphore is turned from red to green.



Note: this test interface is useful to check if all inputs and outputs are working properly. The LED sequence on the IO hardware modules on the electrical panel, has to match the IO configuration set and reported in the TestIO dialog.

12.3. Help

This button displays the User Guide.

It is possible to close the user guide by the stop button.



***Note:** the feature looks for pdf files in the /help folder. To be sure that the right user guide is displayed, delete all unwanted pdf files from the /help folder and verify that the unique pdf file located in the folder is the requested guide.*

12.4. About

The about button displays information about the software version and provider.



Fig. 42: About dialog

12.5. Login

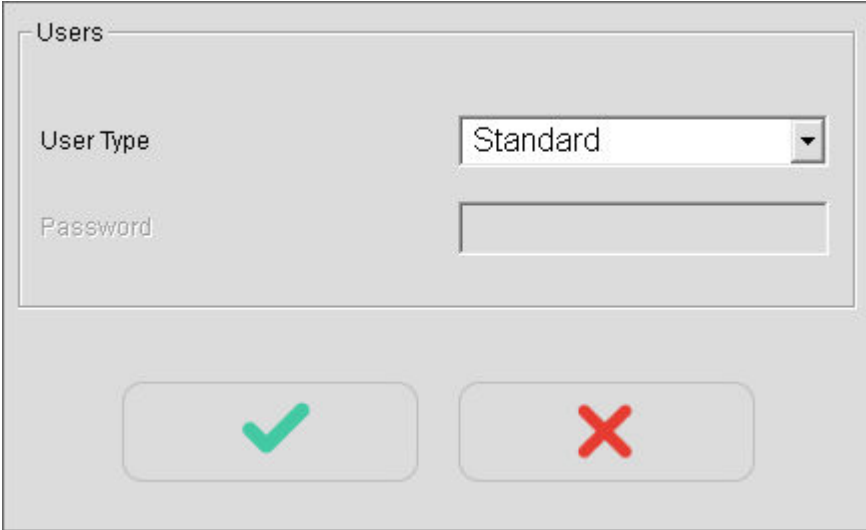
The image shows a login window titled "Users". Inside the window, there are two labels: "User Type" and "Password". Next to "User Type" is a dropdown menu with "Standard" selected. Next to "Password" is an empty text input field. Below these fields, there are two buttons: one with a green checkmark and one with a red X.

Fig. 43: Login screen

Opening the login screen it is possible to choose the user type, and consequently the user rights, to login on the system.

If it is set, a valid password must be provided to be able to log on the system.

12.6. Remote assistance

This button enables the remote assistance tool.

If the PC is connected to the network and it is possible to access the internet from it, the remote support tool TeamViewer is able to login the service server.

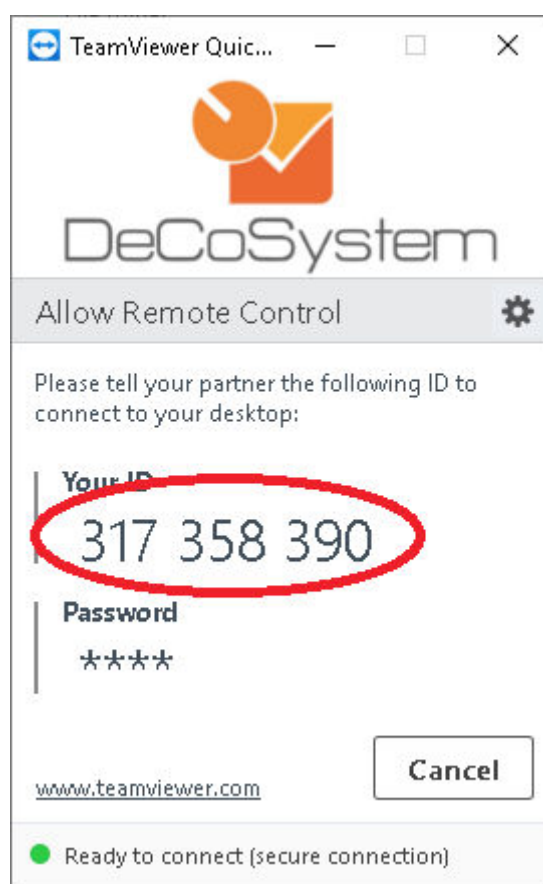


Fig. 44: TeamViewer remote support tool

If the TeamViewer tool is able to reach the server, it displays the system ID as shown in the red circle in the reported image.

This ID number has to be notified to the support to be able to connect on the system.

It is then possible to connect to the system for support and maintenance operations.



Note: if the TeamViewer tool doesn't display the system ID and the status string is not "Ready to connect", it is not able to reach the external server. In this case the PC connectivity should be checked.



Note: the "Remote Assistance" button is grayed out if the TeamViewer tool is not configured properly and located at the proper position. The TeamViewer.exe file has to be placed in the /help sub folder.



Note: if it is not possible to connect the PC directly to the internet, but other connection modes are used (i.e. VPN, common PSTN line, etc.) it is not possible to use the TeamViewer tool for support. In this case the installation of additional software is required.

12.7. Storing of image

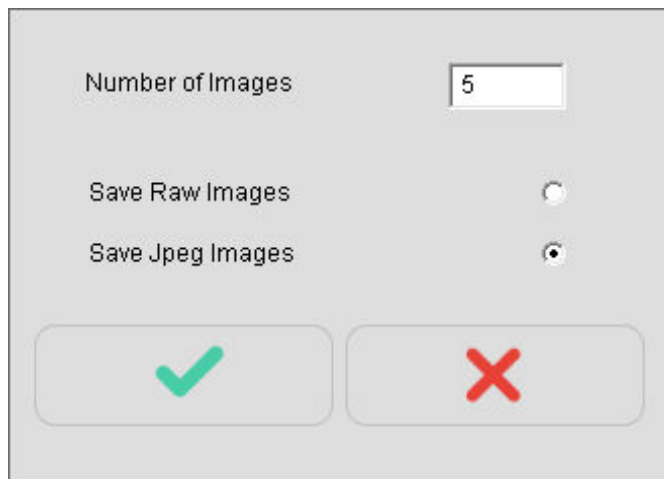


Fig. 45: Storing of images window

This feature enables to store a raw image, directly acquired by the camera, on the hard disk or on an external usb stick.



Note: Depending on the type of configuration, it is possible to choose in the first step, the type of image (jpeg, raw) to be stored.

In the next step, it is possible to acquire the image by the acquisition button.



Note: Depending on the configuration, the image is then saved into the /IMG or the /SHARED folder.

12.8. Display master

Enabling this button the reference image (master) of the loaded setup is displayed.
The control areas are also reported directly on the displayed image.

12.9. Property of single area

Control areas are divided into regions. Every single region is independently managed by the system. Every parameter, as for example, locator stroke, position of the locator regions, control tolerances, can be changed region after region from the *Setting* menu selecting “*Property of single area*”.

If you write the region number in the appropriate window and press the key “*Apply*”, you will see the required region on the left-upper part of the screen; now you can change the locator regions pressing the relative key “*Change region of centring*” or you can change the region tolerances pressing the key “*Tolerance of single area*”.

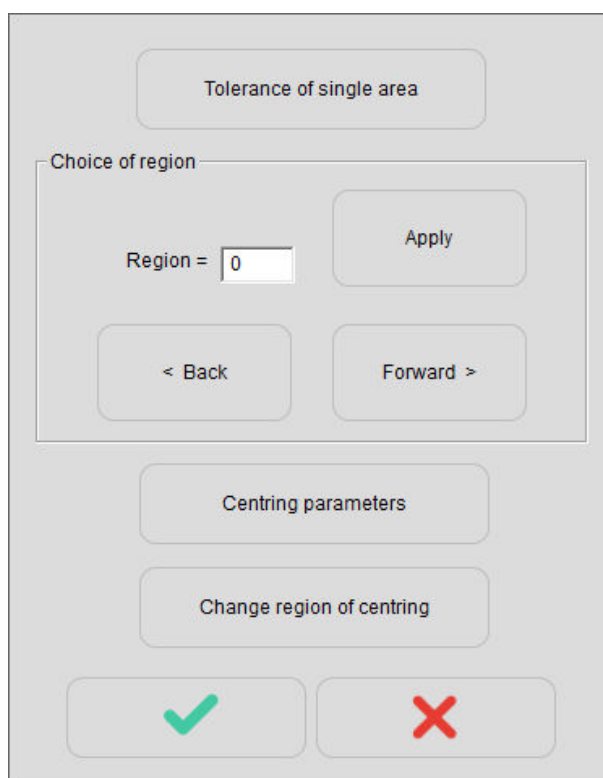
The image shows a software interface for configuring a single region. At the top is a button labeled "Tolerance of single area". Below it is a section titled "Choice of region" which contains a text input field labeled "Region =" with the value "0" entered, an "Apply" button to its right, and two buttons below: "< Back" and "Forward >". Below the "Choice of region" section are two more buttons: "Centring parameters" and "Change region of centring". At the very bottom are two large buttons: a green checkmark and a red X.

Fig. 46: Single region properties window

12.10. Centering distance settings

The strokes of the locator windows can be changed all together (i.e. all the existing regions) selecting “*Max distance of centring*” from the menu.

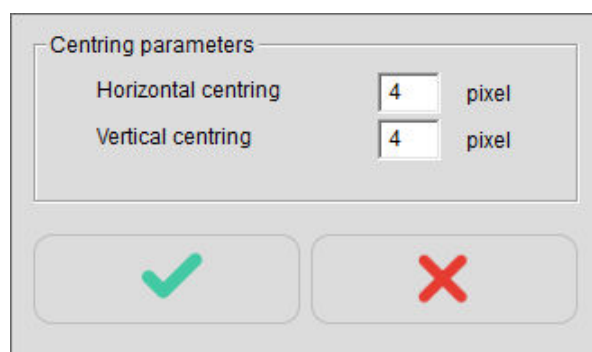
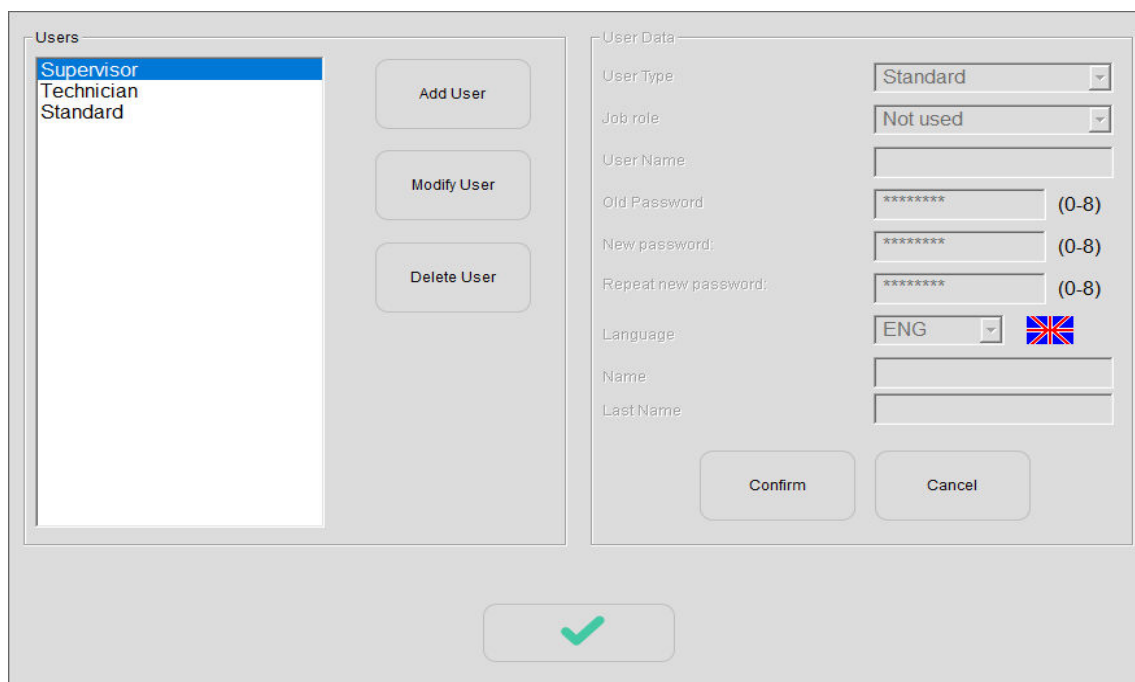


Fig. 47: Centring distance parameter window



Note: *The parameters concerning the regions must be modified only by specialized personnel*

12.11. User management



The screenshot shows the 'User management' main screen. On the left, under the 'Users' header, there is a list box containing 'Supervisor', 'Technician', and 'Standard'. To the right of this list are three buttons: 'Add User', 'Modify User', and 'Delete User'. On the right side of the screen, under the 'UserData' header, there are several input fields: 'User Type' (a dropdown menu set to 'Standard'), 'Job role' (a dropdown menu set to 'Not used'), 'User Name' (a text input field), 'Old Password' (a masked text input field with '(0-8)' next to it), 'New password:' (a masked text input field with '(0-8)' next to it), 'Repeat new password:' (a masked text input field with '(0-8)' next to it), 'Language' (a dropdown menu set to 'ENG' with a UK flag icon next to it), 'Name' (a text input field), and 'Last Name' (a text input field). At the bottom right of the 'UserData' section are 'Confirm' and 'Cancel' buttons. At the very bottom center of the screen is a large green checkmark button.

Fig. 48: User management main screen

It is possible to manage different users and different access rights for each user.

Add User

A new user is added. The properties fields are enabled and it is possible to set the following properties for each new user:

- ➔ User type: users can create only other users with lower access rights.
- ➔ User name: it has to be unique within the system.
- ➔ Old password: not used creating a new user.
- ➔ New/repeat password: password used by the user to log in the system.
- ➔ Language: language used for messages on the GUI when the user is logged on the system.
- ➔ Name: optional information.
- ➔ Last name: optional information.

Modify user

If a user in the list is selected and the logged user has the necessary access rights, this button enables the user properties field in order to modify them.

To confirm the new properties, use the OK button.

Delete user

If a user in the list is selected and the logged user has the necessary access rights, this button enables the deletion of the selected user.

12.12. Exit

The system can be switched off cutting off the general power supply from the machine. Thanks to an electric continuous unit the system carries out the automatic shut down of the software and the exit from *Windows*.

The software can be exited by accessing the menu and selecting the “*Exit*” button in the main menu.

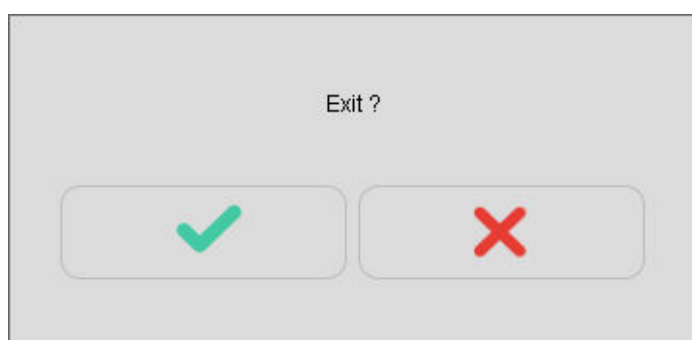


Fig. 49: Confirm exit software window

13. Appendix A - Troubleshooting

With error messages

Below the possible cases of error message shown on the screen are listed.

MESSAGE	PROBABLE CAUSE	ACTIONS
Camera disabled	The camera is turned off	Check that the power LED on the camera is on . Check that the differential in the system rack is on .
	The data cable between the camera and the PC is not connected properly.	Check that the data cable is connected to both the camera and the processor.

Without error messages (troubleshooting guide, warnings)

There can be cases where the system malfunctions but no messages appear on the user interface.

Following there are the possible cases and the steps to take to diagnose the problem.

MISSED ACQUISITION PROBLEM	PROBABLE CAUSE	NOTES	ACTIONS
The system does not acquire the signal and gives the message “Awaiting signal”	The “Awaiting piece” trigger signal is absent.	The system does not receive the acquisition trigger (piece presence) signal required to proceed with acquisition.	Check that the LED on the HW I/O module turns on when the machine provides the piece presence signal.
	Incorrect configuration of the trigger signals.	The system has to be configured to activate the piece presence signal and the encoder (when applicable), and to deactivate the ESC key (acquisition).	In the configuration: <i>Menu</i> → <i>Configuration</i> → <i>Input/Output</i> check that the options Activate encoder , Presence piece are enabled and the option <ESC> to activate acquisition is disabled .
The system does not acquire the signal and gives the message “Acquiring...”	No encoder signal	This occurs only in the case of systems with encoder.	Check the connection and efficiency of the encoder device .

WRONG ACQUISITION PROBLEM	PROBABLE CAUSE	NOTES	ACTIONS
The system acquires an image completely black .	Defective lighting device.	Check that the product to be checked is lit up by the lighting devices.	If the lighting devices do not work, contact the technical assistance service
	The brightness set during the Setup phase is too low	It is possible to set the brightness of the image in <i>Live</i> mode and in Setup properties.	Start Live mode , increase the brightness of the image and check that the image on the screen changes
	The camera has moved out of position	The reading point of the camera has moved out of the lit area because the camera box has moved.	
The acquired image is deformed (stretched/compressed).	Acquisition without encoder.	Acquisition occurs without synchronization of the encoder device	In the configuration menu: <i>Configuration</i> → <i>Input/Output</i> check that the option Activate encoder is enabled

14. Appendix B - Maintenance

ATTENTION

Before carrying out any kind of maintenance, disconnect the master switch that is on the back of the control rack and disconnect the socket from the electric network.

Camera Unit

The camera unit doesn't require particular maintenance, except of a periodical (3 months) cleaning of the lens using an 'anti bobbles' cloth; the frequency of this cleaning depends on the conditions of the working environment.

Objective

It is necessary a half-yearly check of the screws that fasten the adjustment rings of the *diaphragm* and of the *focus*.

Control the fastening of the objective with the camera.

Camera box

It is necessary a half-yearly check of all the screws of the box and of all the screws that fasten the box to the printing machine.

Good ventilation is required in the cooling area of the box. Check the fan (when applicable) is not obstructed by any mechanical parts and that the filter is clean, to ensure the correct flow of air (this inspection must be done once every 3 months, or more often, depending on the conditions of the work environment).

Encoder (Only if it's present)

The encoder works by belt coupling on toothed wheel. Therefore it is necessary to check these parts. Check also the absence of any slip.

Lighting device

The lighting devices use LED technology and do not require any specific maintenance.

It is advisable, however, to check these work correctly during use.

If any difference in performance is noted, contact the specialized personnel.

15. **Appendix C - Calibrating Elotouch Screen**

The Tool Tray application offers a convenient way to access commonly used functions of the driver from the operating system desktop.

To display the Tool Tray icon in the taskbar, it must be enabled from the Control Panel in the Mode tab. To remove the icon it must be disabled from the Control Panel.

The Tool Tray application is launched with a single left or right click and pops up a menu with several selectable functions.

Clicking on *Align* the user can start the procedure to align the touchscreen.

Video alignment or calibration as it is also called, ensures that the mouse cursor appears at the position of touch.

Elo uses a three-point calibration sequence that will accept touchscreens with any orientation of the X or Y axis, in landscape or portrait mode.

Once calibrated, the touchscreen will be ready to use automatically each time the system is restarted.

Running the Alignment Program

When the user runs EloVA, he has to touch the three targets as they appear.

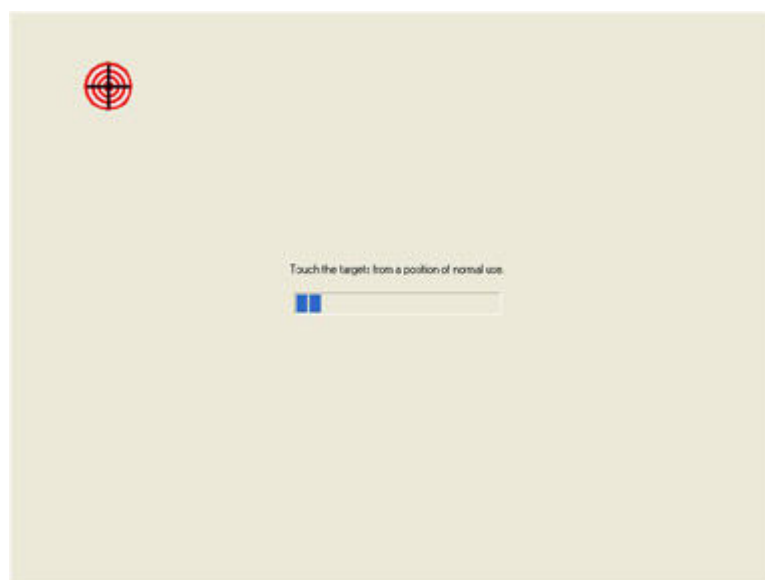


Fig. 50: Calibration windows

The user will then be asked to touch various points on the screen to verify that the cursor appears at the position touched. If the cursor appears at the position touched, click the green arrow. If the cursor does not appear at the position touched, click the blue curved arrow and the alignment program will run again.

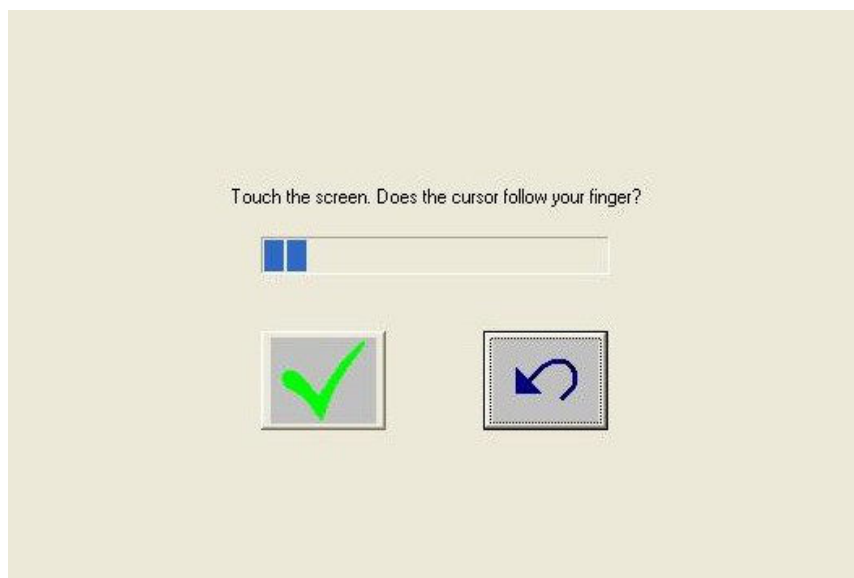


Fig. 51: Confirmation window

If the user is using multiple monitors, the alignment program will run on each individual monitor. If one of the monitors is not a touch monitor, Press the Esc key on the keyboard and the alignment program will advance to the next monitor, or wait until the program times out as indicated by completion of the progress bar.

Other options to Launch the Align

The video alignment program may be launched six different ways:

- During setup a checkbox may be selected to run the alignment program automatically after setup is completed.
- Via the Elo Control Panel application by selecting the General tab and clicking the alignment program icon.
- Via the Elo Control Panel application by selecting the Properties tab for the individual monitor and clicking the alignment program icon.
- By clicking the Elo icon in the window task bar at the bottom right of the display and selecting the video alignment option from the dialog list.
- By double clicking the Elo icon in the Windows task bar at the bottom right of the display. This will bring up the Elo Control Panel application and the alignment program may be run via option two or three listed above.
- By running EloVa.exe directly from the Windows command line or \Windows\System32 directory.
- By calling EloVa.exe directly from an application.

16. Appendix D – 16:9 Display

The system SPECTRO can be equipped with a 4:3 or 16:9 display.

The systems with 16:9 display provide a more detailed view, because the right part of the screen shows always the last 10 defects found.

The last 10 defects are always visible during each working phase: SETUP, RUNNING, STOP and LIVE.

Following, there are some examples of the visualizations.

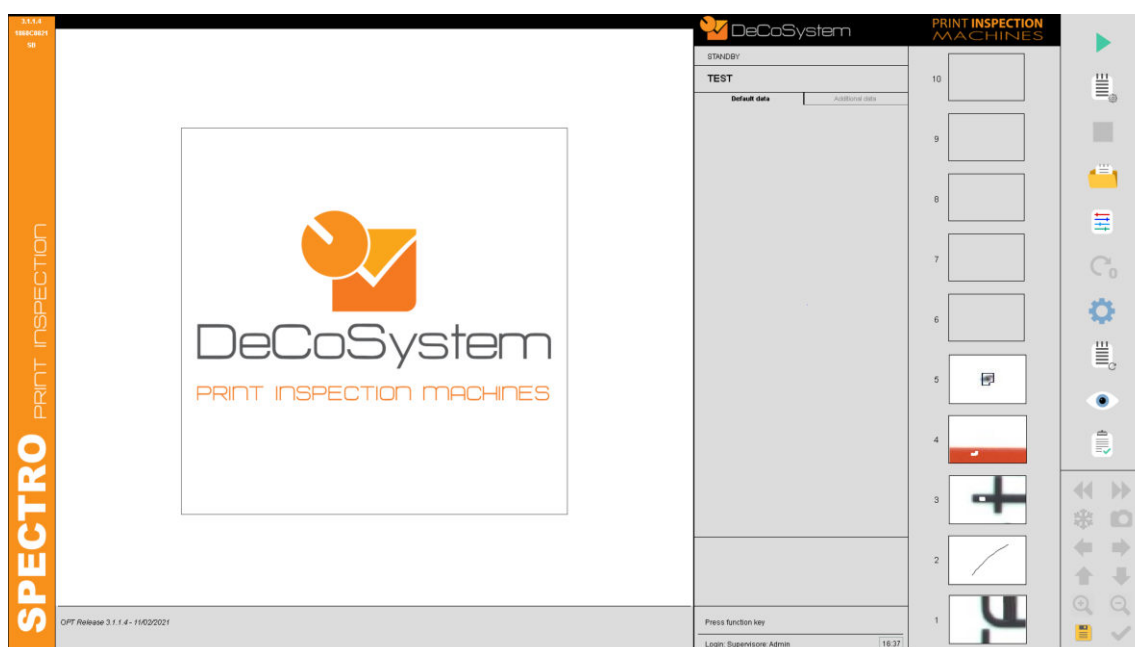


Fig. 52: 16:9 Display – Main window in STOPPED

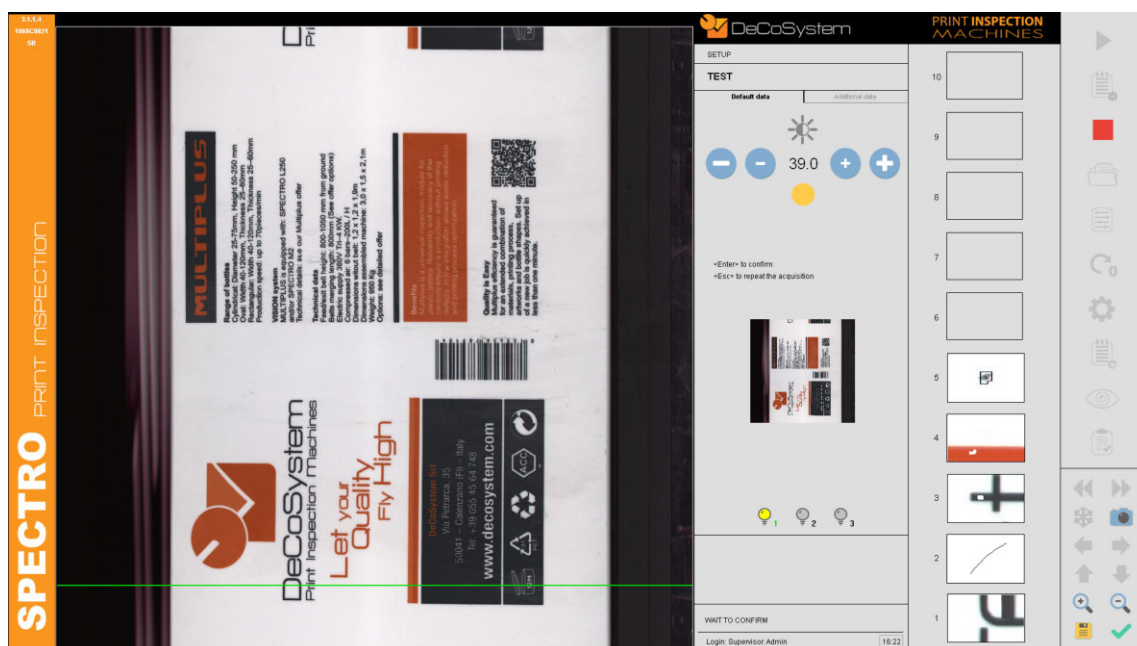


Fig. 53: Setup – Image acquisition

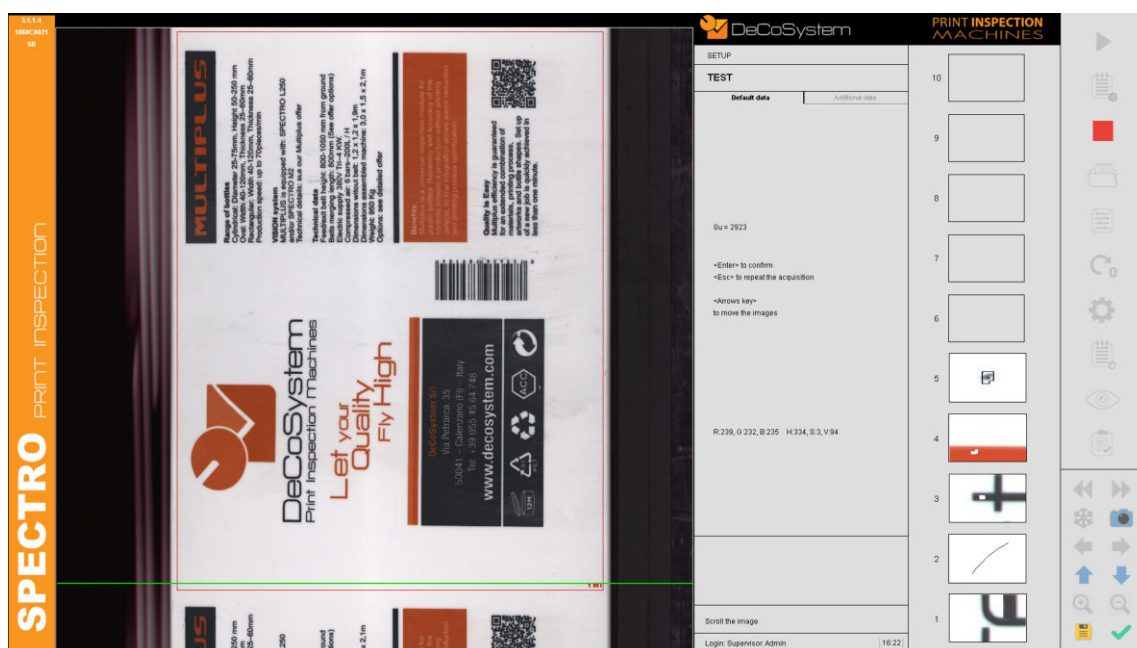


Fig. 54: Setup - Definition of the image length

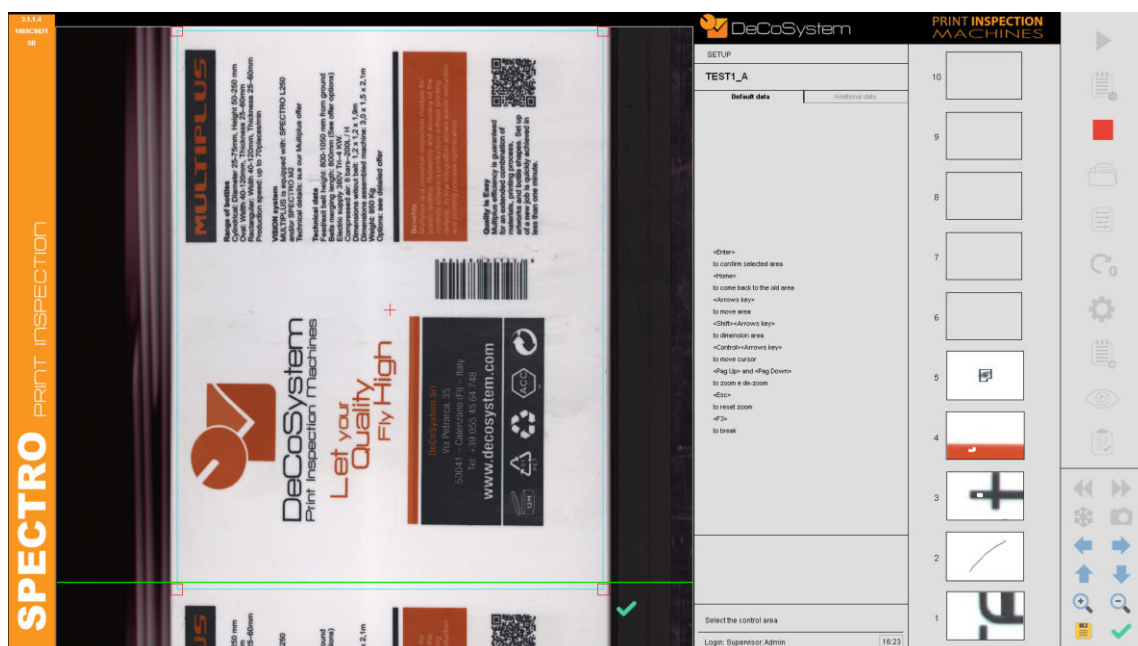


Fig. 55: Setup - Definition of control area

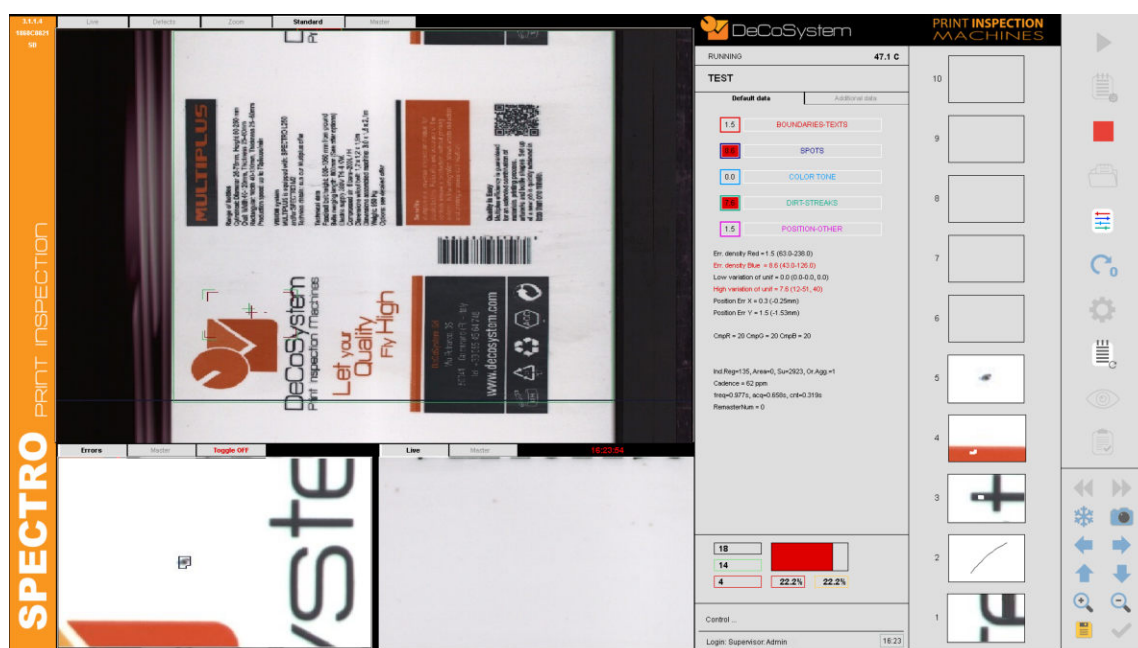


Fig. 56: Visualization in Running