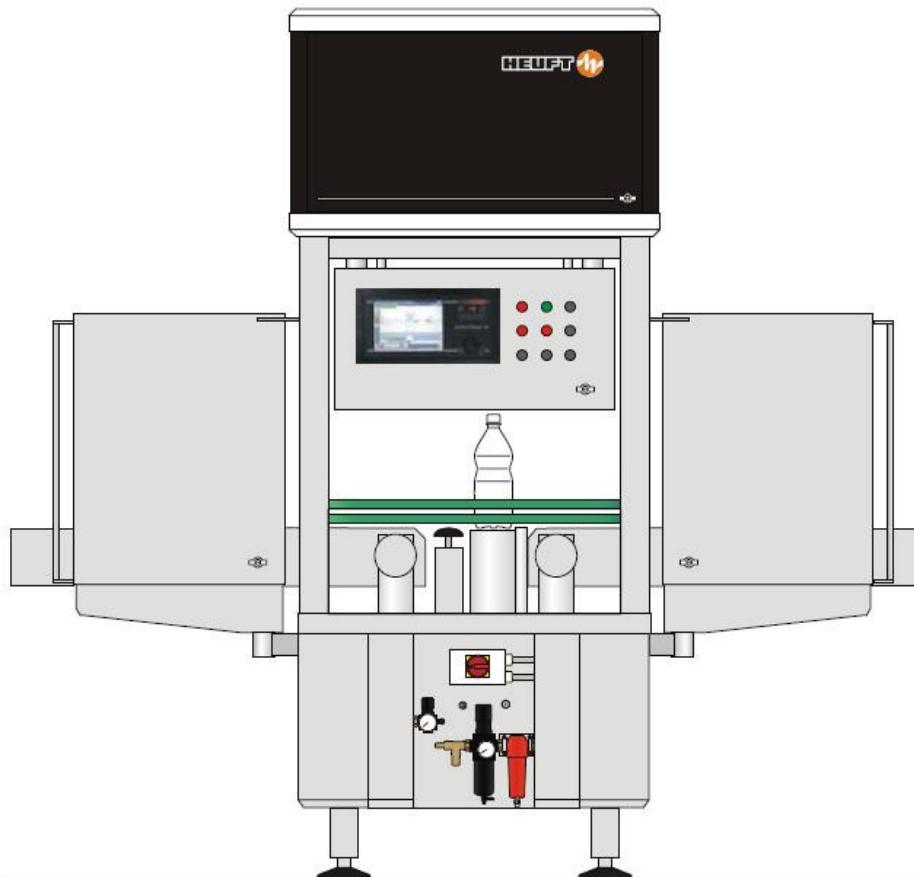


SPECTRUM TX

Inline Empty Bottle Inspector



Heuft USA, Inc.
2820 Thatcher Rd.
Downers Grove, IL 60515
TEL: (630) 968-9011 FAX: (630) 968-8767
WEB: www.heuft.com

Operator Training

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Operator Manual

Training Objectives

Upon completion of this course, the operator will be able to successfully perform the following:

1. Set up Spectrum for normal operation.
2. Shutdown the Spectrum
3. Navigate the Pilot display utilizing the Jog Shuttle.
4. Assess and clear counters
5. Perform a changeover to a different brand.
6. Utilize the Status Survey and Messages to locate system errors.
7. Locate the online documentation.
8. Perform all applicable forms of sampling.
9. Utilize the “statistics” functions.
10. Utilize the locator functions to locate faulty stations and serial faults.
11. Determine the reason for the last rejected container.
12. Locate and monitor inspection modules.

Introduction

Introduction

This training manual is designed to provide HEUFT customer's operator personnel the necessary knowledge to safely and efficiently operate the various HEUFT Spectrum TX systems. This operator's manual is divided into 4 sections:

- Introduction
- System Overview
- Operation
- Operational Troubleshooting

HEUFT System Benefit

Although production line equipment is designed and maintained to provide optimum performance, defects to the container can occur at any point in the process. Proper container filling, closing, labeling and packing processes require the containers to pass through multiple pieces of equipment. Physical punishment from line equipment, conveyor movement, temperature changes present real challenges to producing defect free containers. Quality control technology in general and the HEUFT SPECTRUM inspection systems in particular, provide the checks necessary to ensure proper filling closing labeling and packaging of the product. The result is that your company's products are produced at a higher speed and with no defects to your customers. Additionally rapid identification of defective containers and their associated diagnostic information allow production line personnel to more quickly fine tune equipment or diagnosis malfunctions, therefore, ultimately resulting in the increase effectiveness.

All Spectrum equipment uses 80% of the same parts. This reduces the amount of spare parts required to keep on hand. Training and maintenance of the equipment are easier due to its commonality. The theory of operation for a Spectrum is similar for all configurations of Spectrum systems.

Early Side Inspections

Container fill level inspection can be accomplished after the filler on the early side of the packaging line using High Frequency, Gamma Radiation, or X-ray technology. Misapplied caps, crowns, corks, and lids are checked by various technologies: optical, inductive, acoustic or laser.

Late Side Inspections

On the backside of the line, after the labeler, a HEUFT Spectrum could inspect for final fill levels, proper closures, and incorrectly applied labels. All these functions are accomplished without touching or damaging the container. An associated rejector removes the defective bottle from the packaging line.

After the cardboard boxes have been filled and sealed, a HEUFT Case Inspector could check the case for container presence and foreign object detection using gamma or x-ray technology. In addition, a damaged case would be detected by a set of photo-eyes or ultrasonic sensors.

System Overview

System Overview

Heuft Inspection Systems

The Heuft Spectrum system inspects bottles, cans, and cases on the production line. Various inspections modules are available and are installed in various packaging plants. The Heuft Full Container Inspector inspects containers for proper fill height, container pressure, proper closure, and correctly applied labels. The Full Case Inspector inspects cases for proper fill, wet cases, damaged boxes, and the presence of foreign objects. With the installation of specific inspection modules, the Heuft Spectrum system provides such features as production sampling, display of line efficiency data, and expanded error diagnostics.

Full Container Inspection

Container fill level inspection can be accomplished after the filler on the early side of the packaging line using High Frequency, Gamma Radiation, or X-ray technology. Misapplied caps, crowns, corks, and lids are checked by various technologies: optical, inductive, acoustic or laser. On the backside of the line, after the labeler, a Heuft Spectrum could inspect for final fill levels, proper closures, and incorrectly applied labels. All these functions are accomplished without touching or damaging the container. An associated rejector removes the defective bottle from the packaging line.

Case Inspectors

After the cardboard boxes have been filled and sealed, a Heuft Case Inspector could check the case for container presence and foreign object detection using gamma or x-ray technology. In addition, a damaged case would be detected by a set of photo-eyes or ultrasonic sensors.

Empty Bottle Inspection

On a return glass line or even new containers may contain defects and contaminates. The Heuft Empty bottle inspection device examines the containers inline with the production for common defects. This device uses camera based inspections, IR sensors, HF sensors technology for a high degree of accuracy in detecting defects.

Spectrum Family

All Spectrum equipment uses 80% of the same parts. This reduces the amount of spare parts required to keep on hand. Training and maintenance of the equipment is easier due to its commonality. The theory of operation for a Spectrum is similar for all configurations of Spectrum systems.

Component descriptions

The Heuft TX Spectrum Inspector system consists of seven major elements:

- SPECTRUM TX unit
- TX Display unit
- Trigger Photocell(s)
- Inspection Modules
- Inline Transport
- Rejector(s)
- Encoder

The Heuft TX Spectrum Inspector system components are located in close proximity to each other. The SPECTRUM TX unit and TX display are mounted on a stand over the container conveying system. The inspection units and one/some of the trigger(s) are mounted from the bottom of the Spectrum unit. The rejector is bolted to the conveyor downstream of the TX Spectrum unit. The encoder is also bolted to the conveyor frame at the main conveyor drive shaft for the production container conveyor transport device.

These elements contain many components shown in Figure 1.

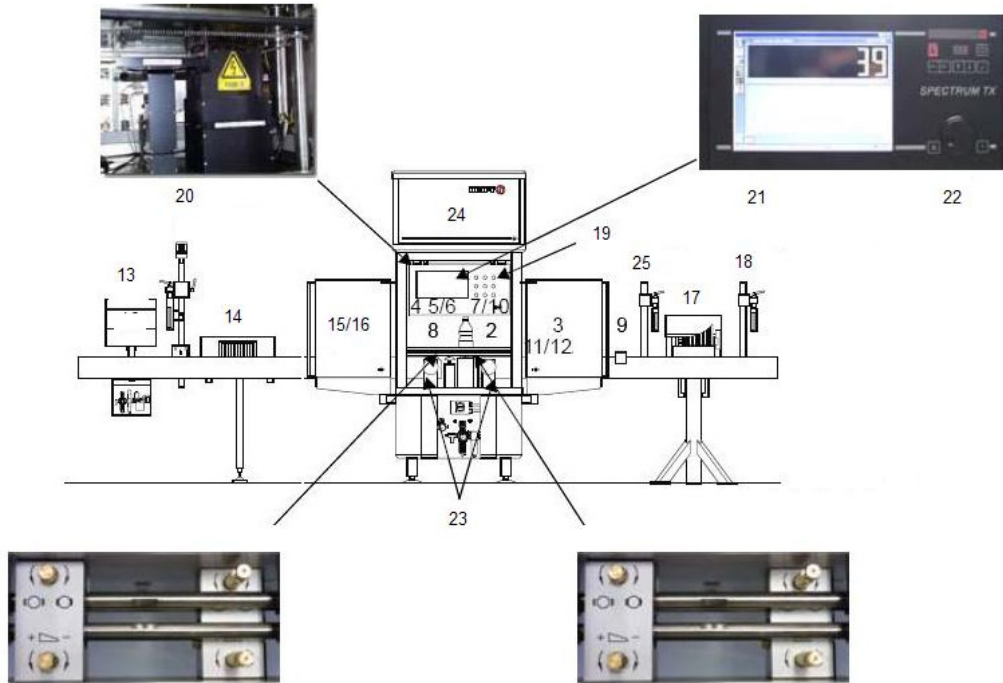


Figure 1

1	Infeed Check	14	Infeed Check Rejector (FW or Mono)
2	Test Bottle Detection	15	First Sidwall Inspection
3	2nd Sidwall Inspection	16	Double resolution Sidwall inspection
4	Finish Inspection	17	Inspection rejector (Delta-K or Mono)
5	Base Inspection	18	Reject Verification
6	Base Inspection for transparent faults	19	Machine Control
7	Inspection of Inner Sidwall	20	Optics Rack
8	Thread Inspection	21	Pilot Operating Surface
9	HF Residual Liquid Inspection	22	Operation Panel
10	IR Residual Liquid Inspection	23	Width adjustments of transport belts
11	Scuffing Inspection	24	Control Cabinet with Strobe power supplies
12	Mineral Ring/Transparent Sidwall Inspection	25	Additional Trigger
13	Thread blow-off device	26	Vertical Adjustment of the Transport Belts

Table 1

SPECTRUM TX Unit

The SPECTRUM TX unit controls the overall operation of the Heuft TX Spectrum Inspector system and is the communication interface for all sensors and the rejector. This unit is the real time processing unit that performs the inspections and rejections. Some of the functions, which may be performed at the Spectrum TX unit include:

- Device switch-on and switch-off
- Display and clearing of counters
- Program change
- Message display and confirmation



Figure 2

TX Display Unit

The LCD displays system consists of an industrial computer containing a hard drive, processor, LCD monitor screen and a network interface. The TX Display unit can allow changes to program parameters and permits expanded error diagnostics. TX display selections are made using the jog shuttle.

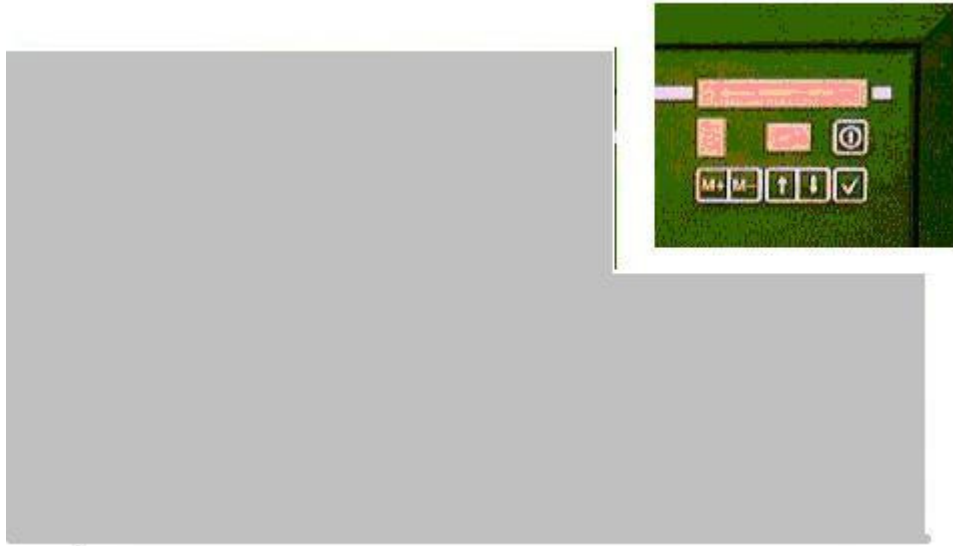


Figure 3

The list below represents some of the more important operating functions of the TX display unit:

- Change of operator level
- Display of counter data of the individual inspection devices
- Message display and confirmation
- Change of programs
- Clearing of the data counters
- Change of inspection parameters

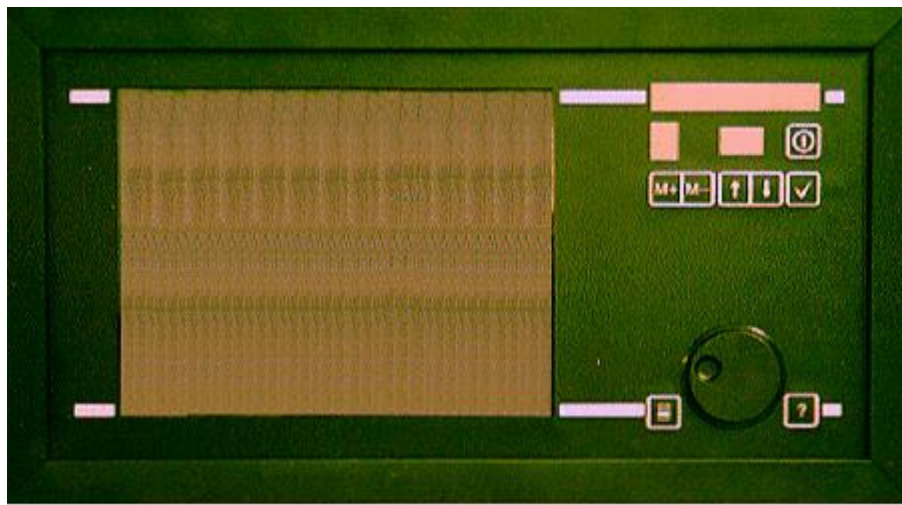


Figure 4

Heuft SPECTRUM System Status Lights

Like the other Heuft Spectrum TX units and Heuft SPECTRUM units, three status lights may be mounted on top of the SPECTRUM TX unit: green, yellow, and red. During a fault condition with the

Heuft SPECTRUM TX system, status lights will change from green to yellow or red to indicate the problem to the operator.

Triggers

The trigger is a through-beam device that shines across the production conveying line (See Figure 1). Trigger activation occurs when the photocell beam is interrupted. This trigger performs two functions: it determines the location of the container and it signals the SPECTRUM TX unit that a container is entering the inspection area. The Heuft TX Inline has multiple triggers.

Common triggers are listed below.

- Infeed Check trigger
- 1st Sidewall trigger
- Finish Inspection trigger
- Base Inspection trigger
- Blower Trigger
- 2nd Sidewall Trigger
- Reject Verification Trigger

Depending on the application, one or more triggers will be installed as part of the tracking system on the conveyors. These could be mounted on before or after the trigger under the Inline unit depending on container handling needs.

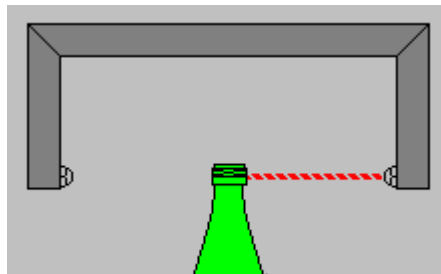


Figure 5

Inspection Modules

Inspection and data analysis features commonly utilized on production lines could include:

- Infeed Check
- Base Inspection
- Sidewall Inspection
- Finish Inspection
- Thread Inspection
- HF Residual Liquid Inspection
- Test Bottle Check
- Test Bottle Analysis

Infeed Check

The infeed check is used to identify containers which may cause damage to the downstream inspector or interfere with the container flow. The infeed check generates a stop signal or a control signal for a Heuft rejector located immediately behind the infeed check when a fault is detected.

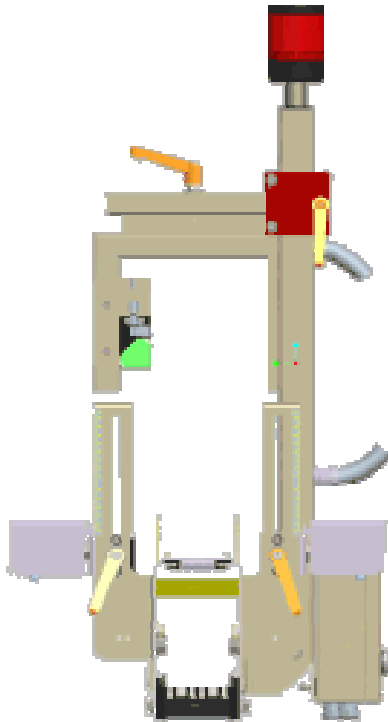


Figure 6

The following faults are detected:

- Undersized containers
- Oversized containers
- Fallen containers
- Tilted containers
- Containers that are too thick
- Containers that are too thin
- Containers with metal closure (optional)

Infeed check without a rejector

The infeed check generates a stop signal when a fault is detected. This stops the conveyor and activates the red warning light of the infeed detection. After the faulty containers have been removed, the conveyor can be restarted with the reset button of the infeed detection and the red warning light extinguishes.

Infeed check with a Delta-FW Rejector

The faulty containers detected by the infeed check are rejected by the rejector. A signal can also be emitted to stop the conveyor after a number of tilted containers in order to prevent a series of containers being rejected into a bin.

Infeed check with Mono Rejector

This module is selectable between rejecting or generating a stop pulse in the case of small, broken, lying, tilted or extremely asymmetrical containers. The mono rejector does not have the same rejection qualities as the Delta-FW rejector, therefore a stop pulse might be the best selection for lying containers. If a switch-off pulse is activated, this module generates a signal to stop the conveyor and activates the red light. After removing these containers the conveyor is restarted with the reset button of the infeed check and the red warning light is extinguished.

Base Inspection

The inspection module checks the container bases with a high degree of accuracy for contamination and damage. Figure 7 shows an “original picture” and a “contrast picture” of a bottle with a defect on the base.

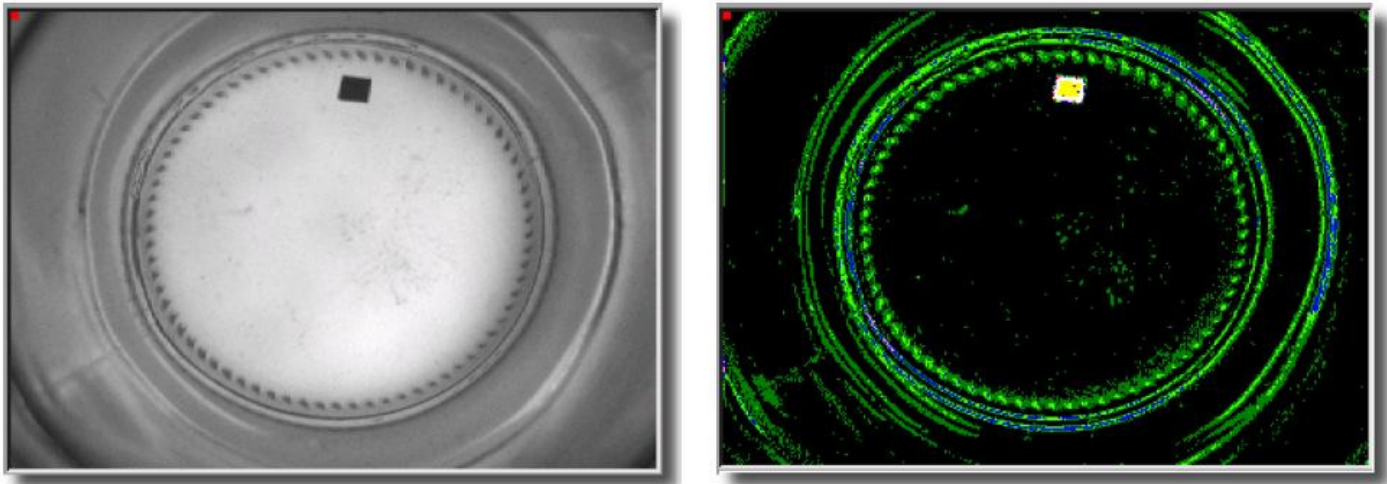


Figure 7

In addition the inspection module checks large parts of the inside of a container for the presence of foreign objects and the container neck for obstruction for example by a closure.

Following configurations are available:

- Base 1 – Available on standard Inline devices
- Base 2 – An optional feature inspecting for transparent faults and objects such as cigarette package cellophane.

- Inner Sidewall – An optional feature for detecting defects of the interior of the glass sides.

Basic Function

An "image processing system" consisting of a camera, lighting and an image processing unit is used by the inspection module.

The trigger electronics generates a signal in order to illuminate the container for a short time by means of a strobe light. At the same time a CCD camera takes a picture of the container via a special optics module. The image processing unit analyses the picture and evaluates the container as good or faulty depending on the programmed tolerances.

The inspection modules use a common strobe and a common optics module. The optics module distributes the container view to the CCD cameras optionally available.

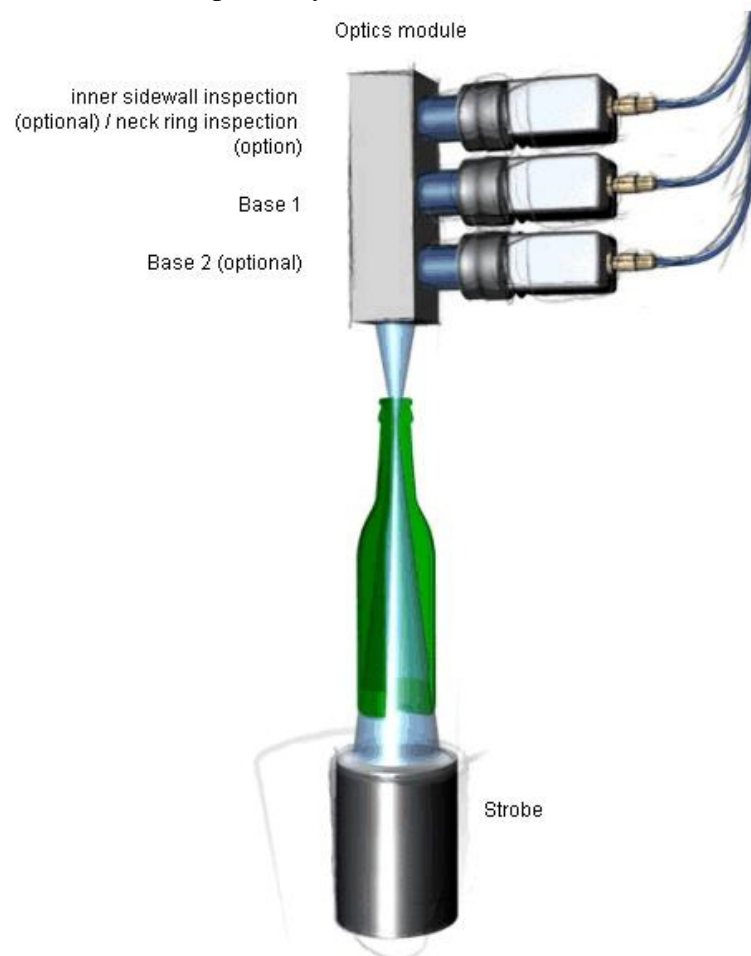


Figure 8

Cameras

The following illustration shows the open camera case. The optics module is marked red. The optics module is equipped with three cameras in this example.

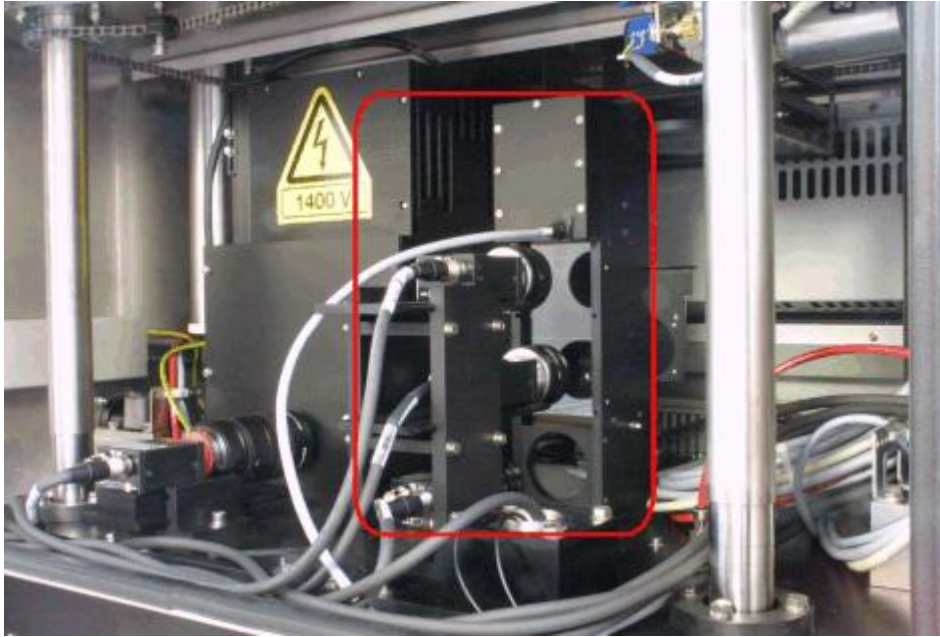


Figure 9

Strobe

The bottle is illuminated from below. This illuminates all the features in the base of the bottle including defects.



Strobe

Figure 10

Base Blower

Prior to the taking of the picture a base blower cleans the container bases from lubricants and water.



Figure 11

Sidewall Inspection

The sidewall inspection(s) detect defects with a high degree of accuracy in and on the sidewalls of the bottles. Shown in Figure 12 are an “original picture” and a “contrast picture”.

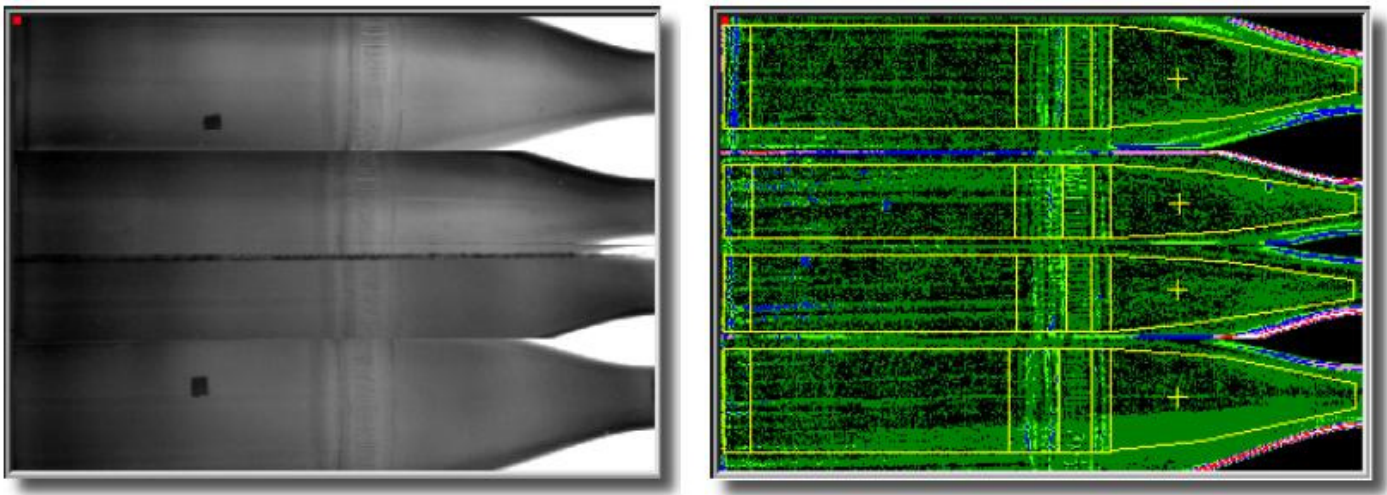


Figure 12

There may be one or several sidewall inspections in the device depending on the device version. Two sidewall inspection modules are usually used for each device. There is a sidewall inspection at the infeed of the inspector and one at the outfeed of the inspector. The sidewall inspection at the infeed examines up to 70 % of the container circumference (this depends on the container diameter). The sidewall inspection at the outfeed also inspects 70% of the container circumference. The container is rotated approximately 90° between the sidewall inspection at the infeed and the sidewall inspection at the outfeed in order to ensure an

all-around inspection of the container. This rotation is achieved by means of two conveyor belts which run at different speeds.

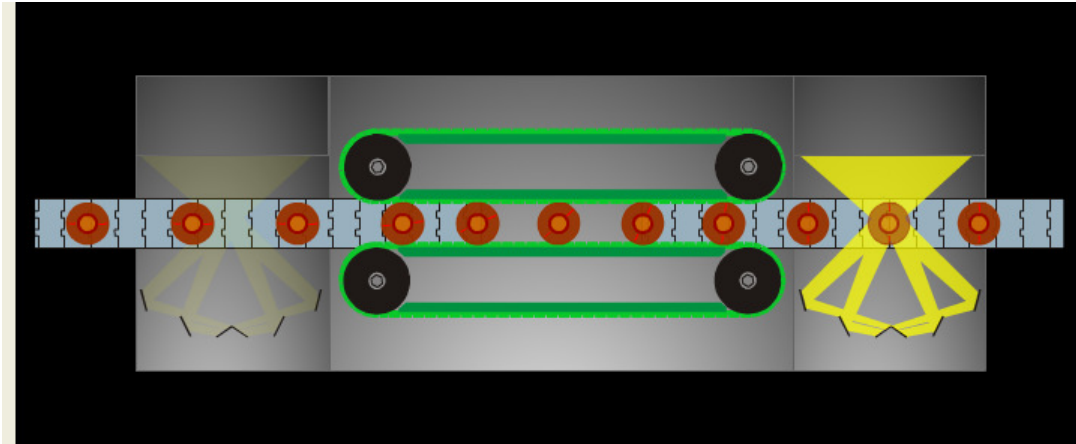


Figure 13

Basic Function

An “image processing system” consisting of a camera, lighting and image processing unit is used by the inspection module.

The trigger electronics generate a signal in order to illuminate the container for a short time by means of a strobe light. At the same time a CCD camera takes a picture of the container via a special optics module. The image processing unit analyses the picture and evaluates the container as good or faulty depending on the programmed tolerances.

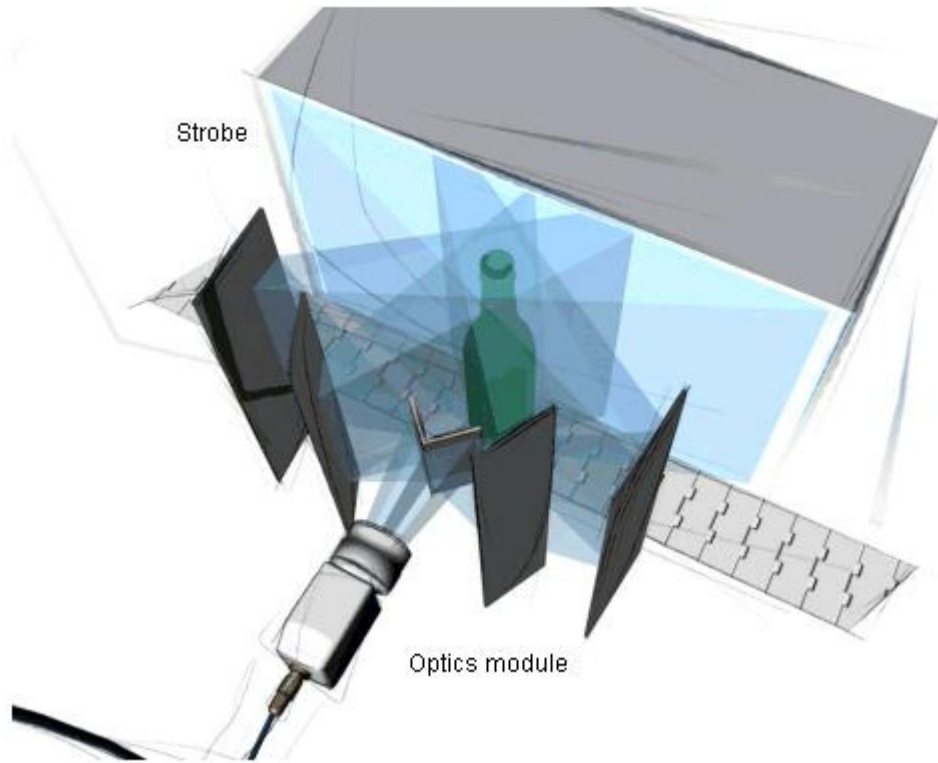


Figure 14

The following illustration shows the open sidewall inspection module on the camera side of the conveyor. The mirrors and the camera can be seen.

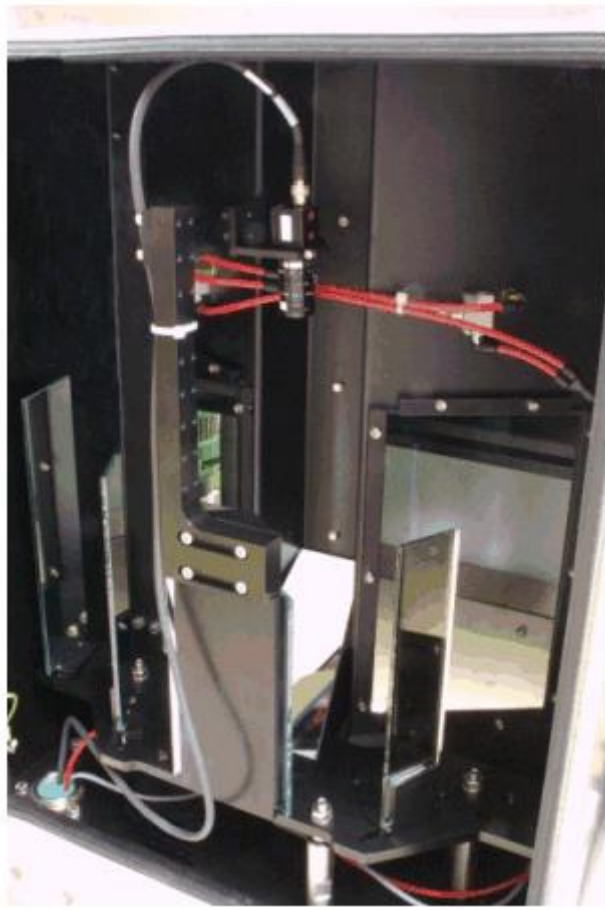


Figure 15

The following shows the open sidewall inspection module on the strobe side.



Figure 16

Finish Inspection

During the finish inspection the sealing surface of containers are examined with a high degree of accuracy for: the following defects:

- Missing sealing surface of the finish
- Chips on the sealing surface

Finish Surfaces

The sealing surface of the finish is made visible in the camera picture using special lighting procedures. The lighting procedure chosen is dependant on the actual structure of the sealing surface. This surface structure is designed for particular closures. The common closures of containers are crowns, corks, screw on caps, roll-on closures and lids to jars (Figure 17).

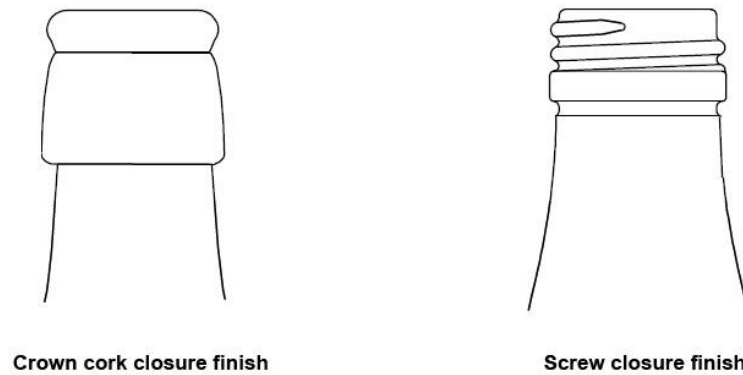


Figure 17

The flash strobe is triggered when the bottle is in the correct place under the light source and camera. The bottle is tracked to this location with a high degree of accuracy by the use of the trigger photo eye and conveyor encoder. The light from the strobe is sent through various optical devices to create the exact desired light property results (Figure 18). The light reflects of the sealing surface of the container and is directed into the camera by a mirror. Then the camera image is send to the image processing components.

Black and White Finish Inspection

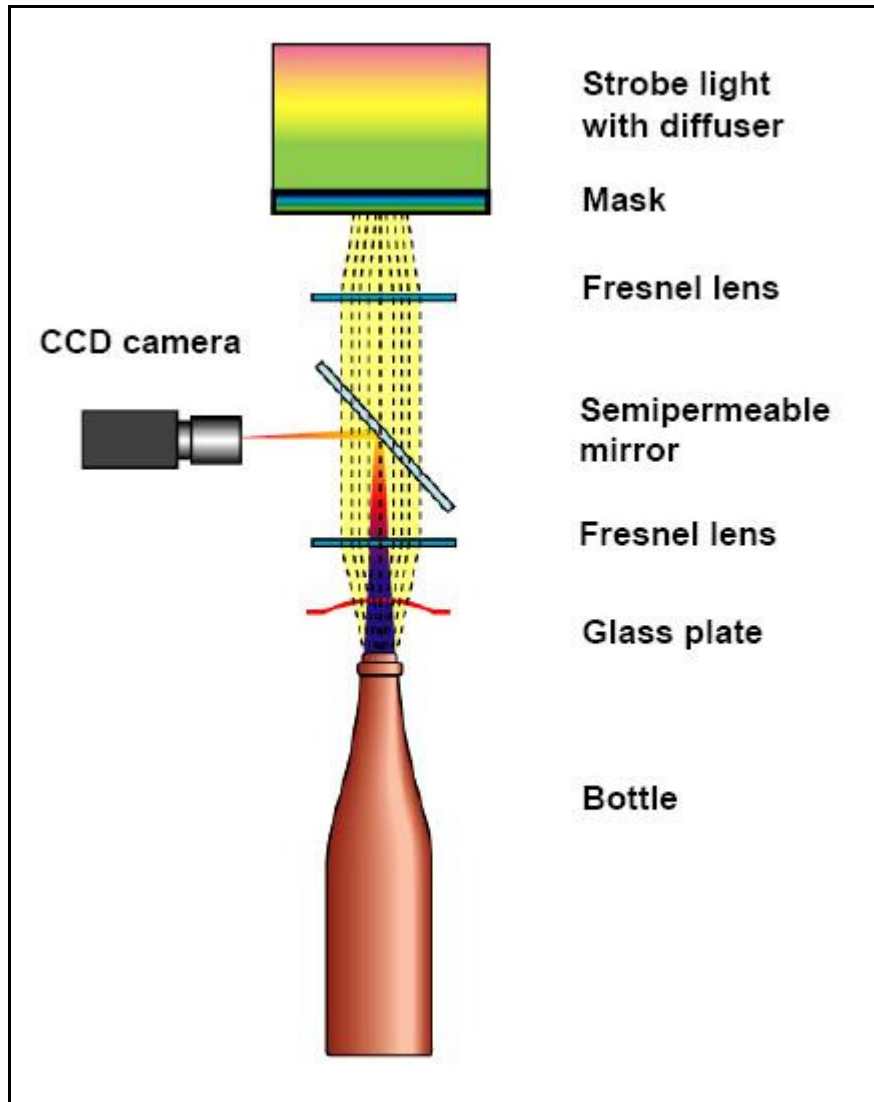


Figure 18

The crown and cork finishes are round on top while screw-on crowns and roll on closures are flat. This structural difference impacts the behavior of light on the surface. The light behavior can be described by The Angle of Incidence = Angle of Reflection Law. Thus, the reflected light from the sealing surface is reflected in an upwards direction.

In the case of crown/cork finishes this means that the lighting arrives from the side and in the case of screw closure finishes from above (Figure 19).

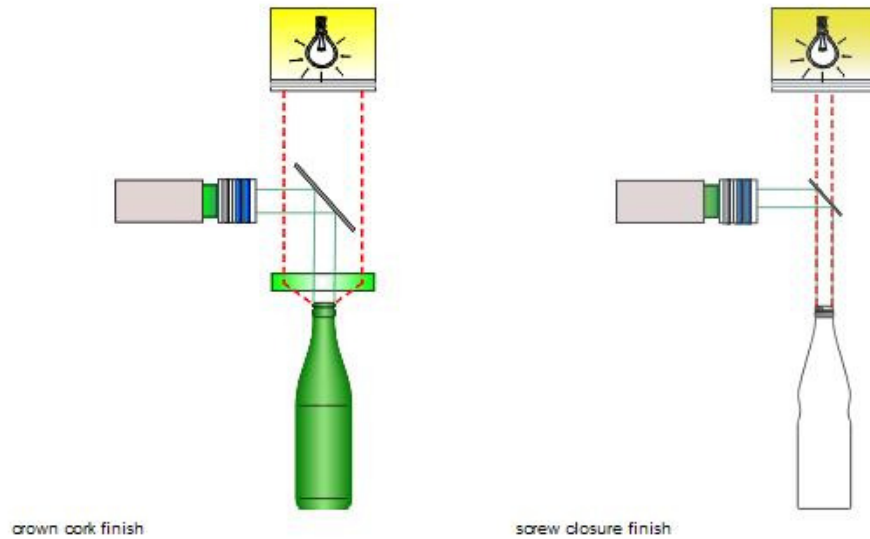


Figure 19

A circular reflection ring appears in the camera picture. The control of the lighting procedure (light directly from top / light laterally from top - optical path via the conical mirror) occurs by means of an optical exchange rack.

The optical exchange rack to be used depends on the type of closure (Figure 20). The optical exchange rack slides into a slot in the finish camera box.

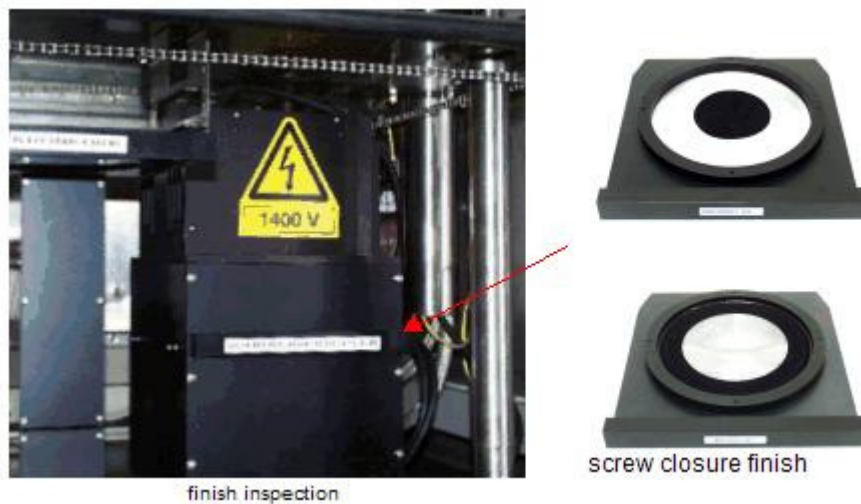


Figure 20

The optical exchange rack for the crown/cork bottles has a mask in the center. This prevents direct light from illuminating the finish. Only light that comes at an angle will illuminate the flat finish. The light will return at an angle to the camera (Figure 21).



Figure 21

The optical exchange rack for screw on closures has no mask blocking the light. Curved glass will change the direction of the light so it strikes the finish at the desired angle. The light will reflect back to the camera at an angle (Figure 22).



Figure 22

If the TX Spectrum device also includes a thread inspection module, other optical exchange racks will be used for screw-on closures containers.

The reflection ring is closed when the sealing surface of the finish is undamaged. The reflection ring is broken when the sealing surface is damaged or shows other irregularities.

Crown/Cork Finish

Since the surface is curved on crown/cork bottles the angled light reflects back to the camera. The light reflected back to the camera appears as a ring. The reflection ring is a complete closed circle when the sealing surface of the finish is undamaged. If the finished is damaged or incomplete, the reflection is a broken ring (Figure 23).

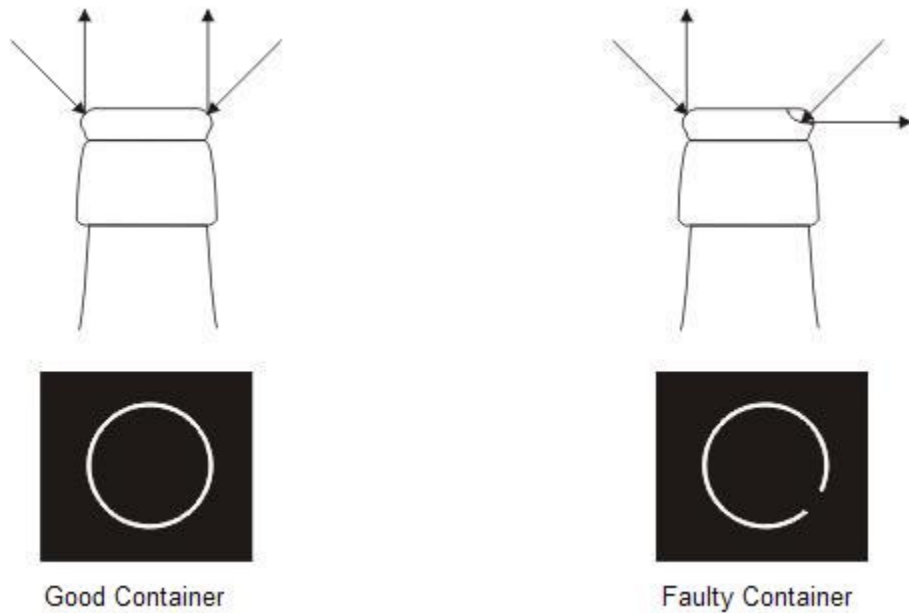


Figure 23

Screw-On Closure Finish

Since the surface is flat on screw-on closure bottles the straight light reflects back to the camera. The light reflected back to the camera appears as a ring. The reflection ring is a complete closed circle when the sealing surface of the finish is undamaged. If the finished is damaged or incomplete, the reflection is a broken ring (Figure 24).

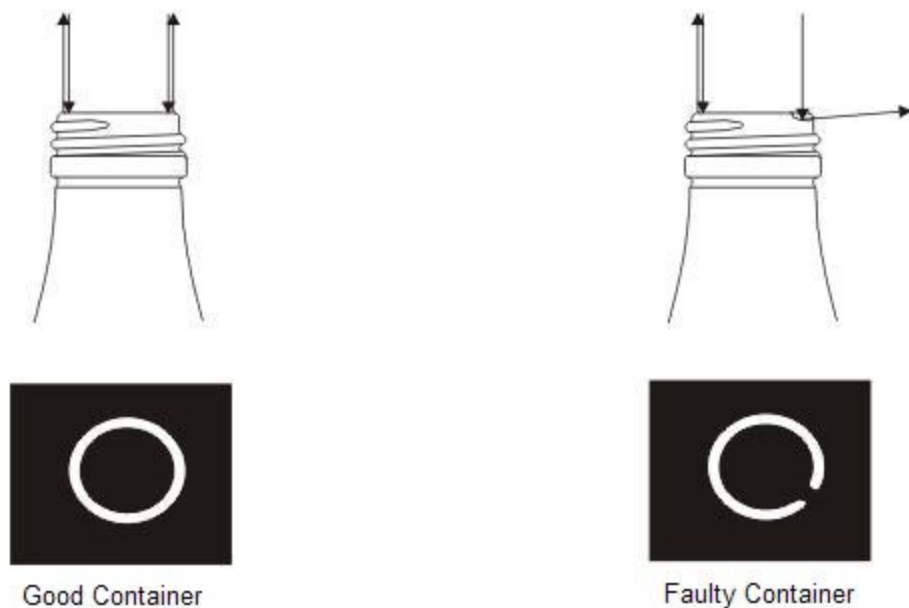


Figure 24

Color Finish Inspection

The crown cork and screw closure finishes of containers are inspected with a high level of accuracy for chips and cracks on the sealing surface of the finish using the finish inspection. A new optional finish inspection is available with the introduction of Release 11 which represents a further development of the existing finish inspection.



Figure 25

The illustration shows the LED strobe and the camera of the finish inspection.

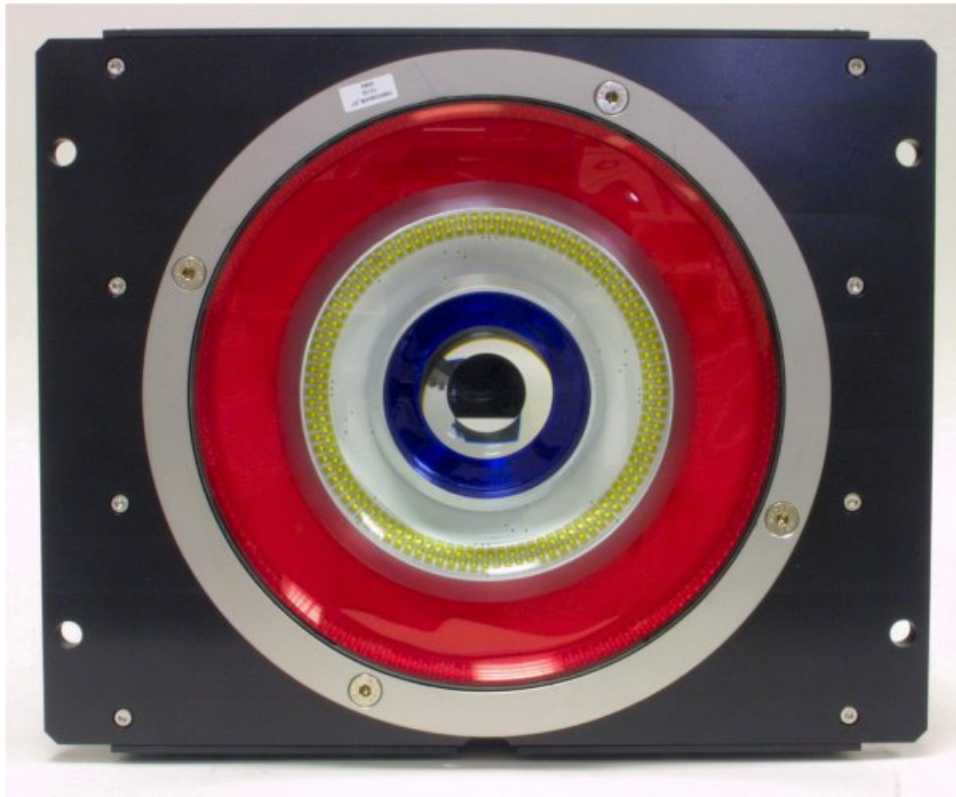


Figure 26

The illustration shows the underside of the LED strobe.

The new finish inspection works more precisely but the basic principle of the inspection has been kept. However the flash tube has been replaced by a lighting source comprising several rows of LEDs arranged in a circle with conical mirrors in the case of the new finish inspection. As a result different colored reflection rings occur on the sealing surface of the finish in the case of the strobe adjustment used as standard for inspecting crown cork bottles. These reflection rings are analyzed by means of a color camera. The sealing surface is illuminated from different directions so that a wider area of the sealing surface can be recorded and examined for damage (chips). The lighting works with different colors (red, green and blue) in order to prevent a "reflection pulp" occurring in the camera picture which the image processing cannot evaluate meaningfully. Each illumination direction has its own color. As a result up to four narrow reflection rings occur in the camera picture which can be neatly separated for the specific picture evaluation due to their different colors. Damage on the sealing surface appears as an interruption to one or more of these colored reflection rings. Furthermore the color of a reflection ring, in the case of a chip, can reach into the area of another reflection ring. These additional colors can be identified as too many pixels. The inspection area of the sealing surface and with it the detection accuracy is therefore increased but the compact design of the inspection module and the basic principle of the evaluation are retained.



Figure 27

The picture shows the LED lighting unit with conical mirrors.

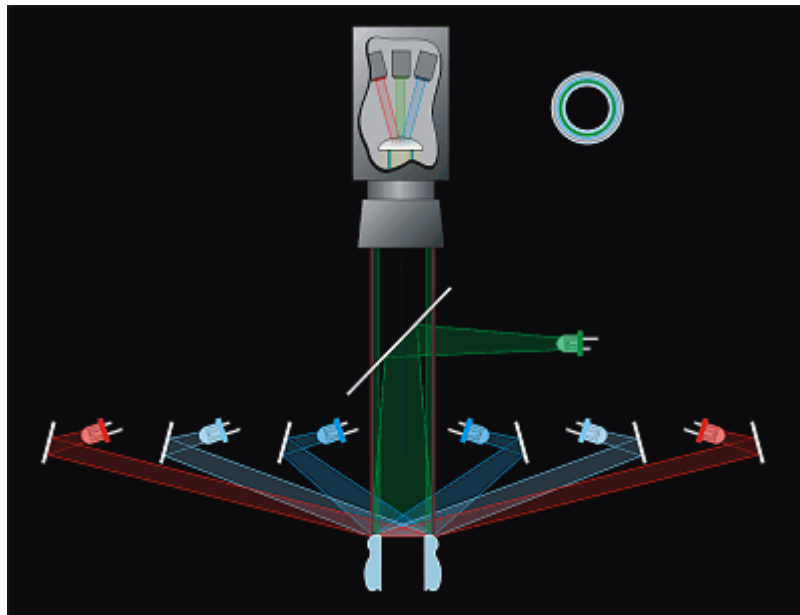


Figure 28

The illustration shows the basic design of the finish inspection with color camera and LED lighting with conical mirrors.

The LED lighting with conical mirrors throws colored light and white light onto the container finish due to the use of special foil. The light of the LED lighting is reflected back from the finish in the respective colors (this is red and blue in the case of crown cork finishes). The reflections can be inspected using a color camera.

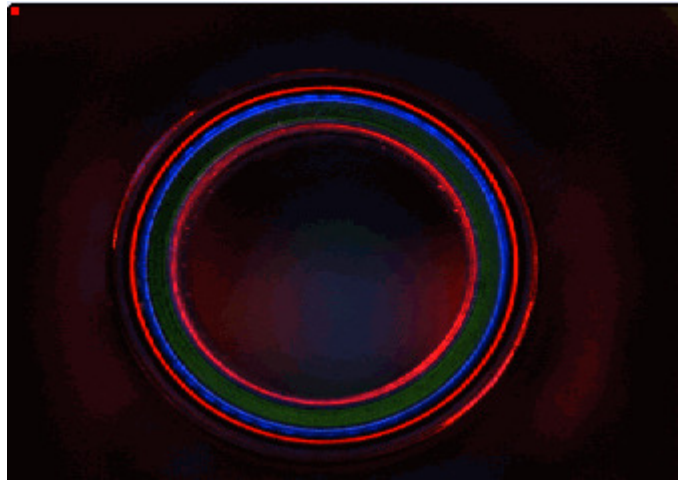


Figure 29

The illustration shows the camera picture of the color camera.

Thread Inspection

The complete thread turn is checked for damage during the full thread inspection.

Damage to the thread is undesirable because it calls the tightness of the closure into question, opening the closure is difficult or even impossible and drinking directly out of the bottle can be dangerous.

There must not be any water on the thread. This is accomplished by the blowing device supplied which is installed before the inspector if there is a possibility of water on the threads.

The thread is illuminated at an angle from above by the finish strobe via a conical mirror.

Blue light is used for illuminating the sealing surface and red light for illuminating the thread so that the finish inspection and the full thread inspection do not influence each other.

An exchange rack is used to divide the light up into red and blue. The quantity of light for the thread illumination is also controlled by these exchange racks.

The exchange rack to be used depends on the color of the container. In this way it is possible to operate the cameras used in the inspection modules with a uniform aperture setting.

Thread Faults

The picture on the left shows examples of thread gap faults while the picture on the right shows damaged threads (Figure 17).



Figure 30

The flash strobe is triggered when the bottle is in the correct place under the light source and camera. The bottle is tracked to this location with a high degree of accuracy by the use of the trigger photo eye and conveyor encoder. The light from the strobe is sent through various optical devices to create the exact desired light property results (Figure 18). The light reflects off the sealing surface of the container and is directed into the camera by a mirror. Then the camera image is sent to the image processing components.

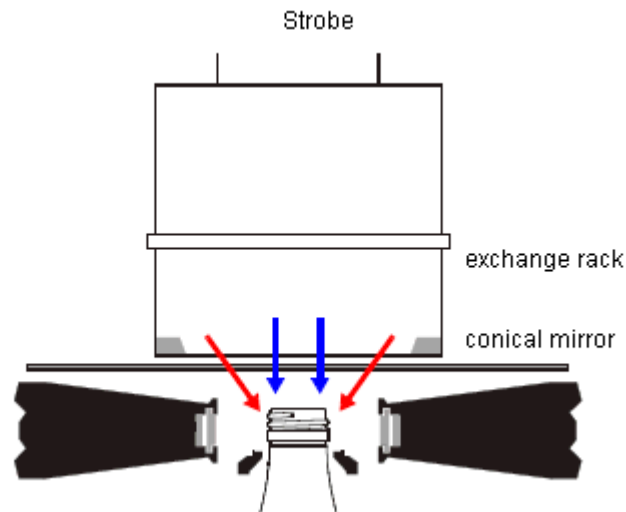


Figure 31

Four views of the thread are taken by a CCD camera by means of two optics modules arranged to the side of the direction of movement. Each separate view is staggered by 45° - each view shows more than 45°. A complete inspection of the thread is possible with these eight overlapping views. The container is evaluated either as good or faulty depending on the fault limit value adjustment. The result of the evaluation is entered on the container data sheet (Figure 19).

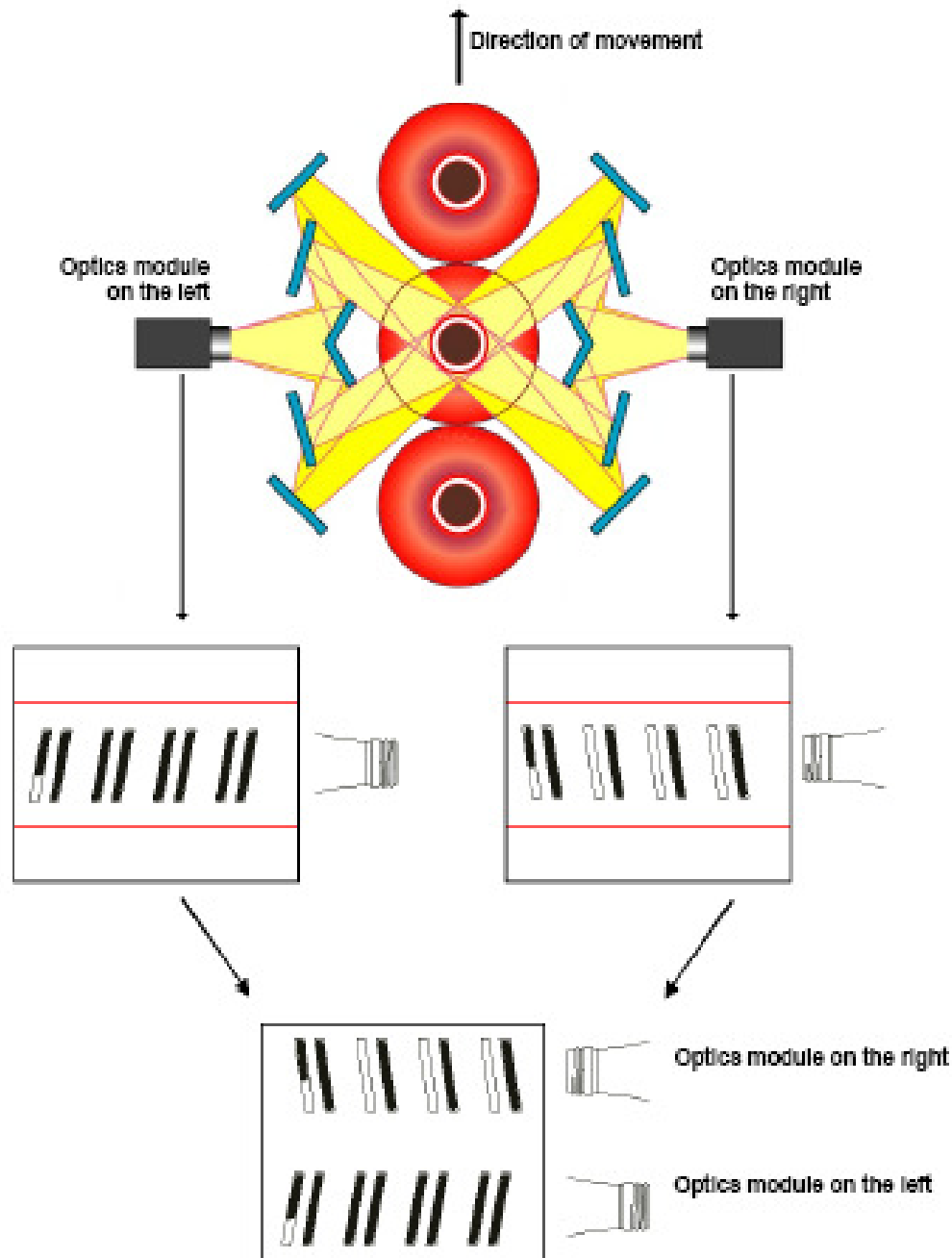


Figure 32

A circular reflection ring appears in the camera picture. The control of the lighting procedure (light directly from top / light laterally from top - optical path via the conical mirror) occurs by means of an optical exchange rack.

The optical exchange rack to be used depends on the color of bottle (Figure 33). The optical exchange rack slides into a slot in the finish camera box.

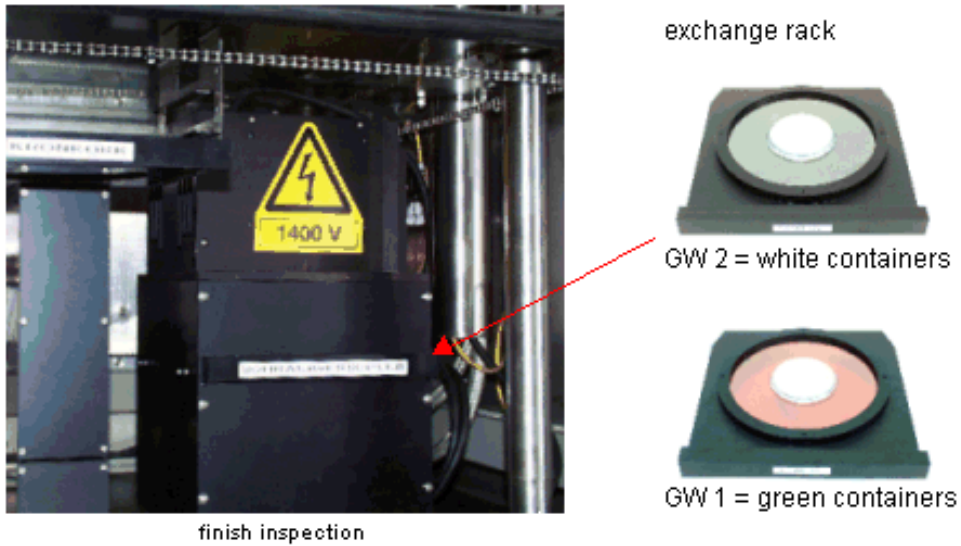


Figure 33

HF Residual Liquid Inspection

HF Residual liquid module checks non metallic containers with a high degree of accuracy of the presence of very small liquid remaining in the bottle after being washed.

Two measuring sensors, an emitter and a receiver, are mounted on both sides of the conveyor at the height of the base. The High Frequency transmitted between the two sensors is measured. When a container with residual liquid passes between these measuring sensors, it changes the signal characteristics. The amount of the change is measured and compared to preset values.

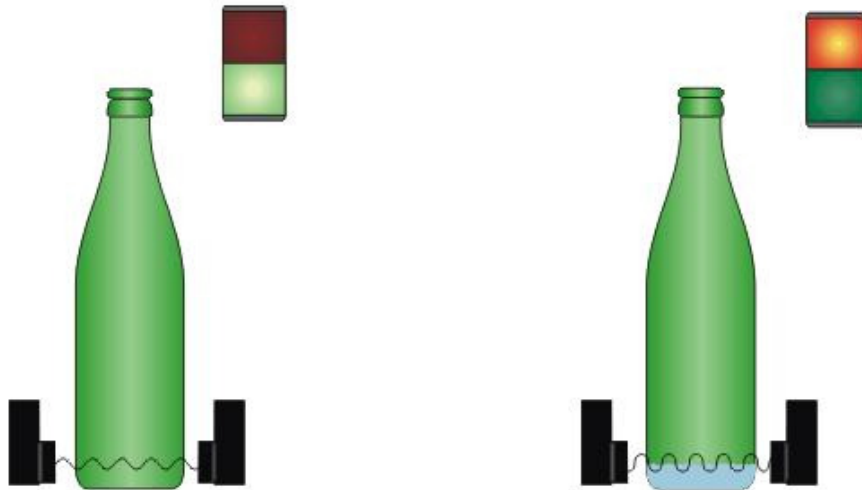


Figure 34

Test Bottle Check

The test containers are used to check the individual detection functions of the inspector at regular intervals. Also during these checks of the inspection modules, the system checks the continual quality of the adjustments. If the quality is no longer sufficient, the device generates a switch-off pulse which stops the entire production line.



Figure 35

Specially prepared test containers are used for the check. The test containers are prepared by using new containers material and applying faults. These faults must be detected by the inspection and detection modules.

The request for test containers can be made automatically or manually by different means:

- Manual input via a key switch
- When the counters are cleared
- After a programmed container interval
- After a programmed time interval
- After switching on the power
- Via the operating terminal
- After reducing the sensitivity of an inspection module

Test Bottle Analysis

Test analysis bottles are used to check the quality of the inspection and detection modules at regular intervals. These bottles are different than the *test check bottles*. If the inspection quality falls below a programmable limit value, the inspector emits a warning. If the inspection quality is no longer sufficient, the system generates a switch-off pulse which stops the entire production line.

Specially prepared test containers are used for the analysis. Test containers (usually two) are selected from new glass and are prepared with faults in each zone (Figure 36). These faults are detected by the individual inspection modules. These containers are taught in and one measuring valve for each inspection zone is stored in the system as a reference.



finish faults



sidewall fault



base faults

Figure 36

INLINE Transport

The inline container transport is two sets of parallel belts. These belts have two purposes:

1. First to transport the container over an open conveyor section so the base inspection can occur. The base strobe is below the base on the container. The container is supported by the pressure of the belts on the side of the container only.
2. The belts run at a slightly different rate. This will rotate the bottle 90 degrees. When used in conjunction with 1st and 2nd sidewall inspection the entire container is seen in 360 degrees. Each inspection evaluates the container in over 180 degrees. So by rotating the bottle 90 degrees the uninspected by the 1st sidewall inspection is inspected by the 2nd sidewall inspection.



Figure 37

These container transport belts are driven by the conveyor system. The Inline does not have a motor driving these belts. The transport belts can be adjusted laterally and vertically to accommodate different size bottles.

Rejectors

Defective containers are removed from the production conveyor line by the rejector. Rejectors installed on the container conveyors lines are located in close proximity to the inspection modules they serve. Four different models are commonly used to reject containers from the production lines: Delta-FW, Mono, Pusher, and Delta-K. Depending on the characteristics of the container and the rejection criteria with determine the rejector used. A Rejector Disable (work/rest) switch is also part of the rejector system and is installed on the conveyor in close proximity to the rejectors.

Multi Segment Rejection Theory

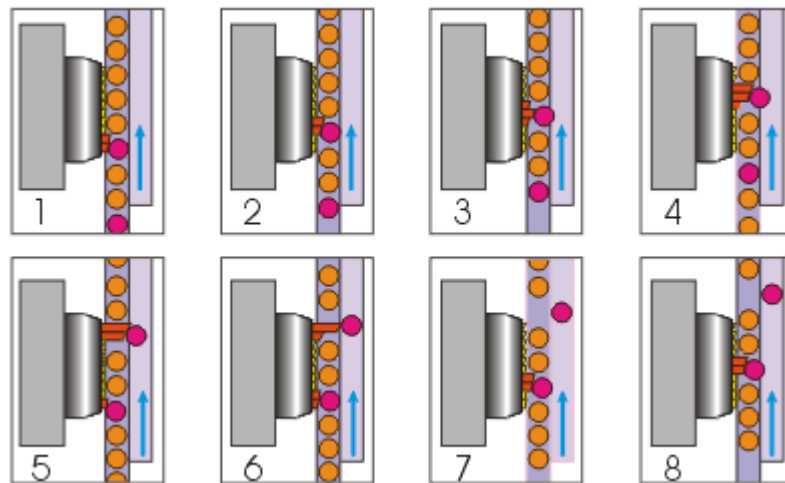


Figure 38

On the Delta FW and Delta K rejectors, the segments extend just prior to the container to be rejected and form a curve guide rail. Then the segments retract and allow the next good container to be produced.

Single Segment Rejection Theory

The segment extends and pushed the container one diameter on to a reject conveyor.

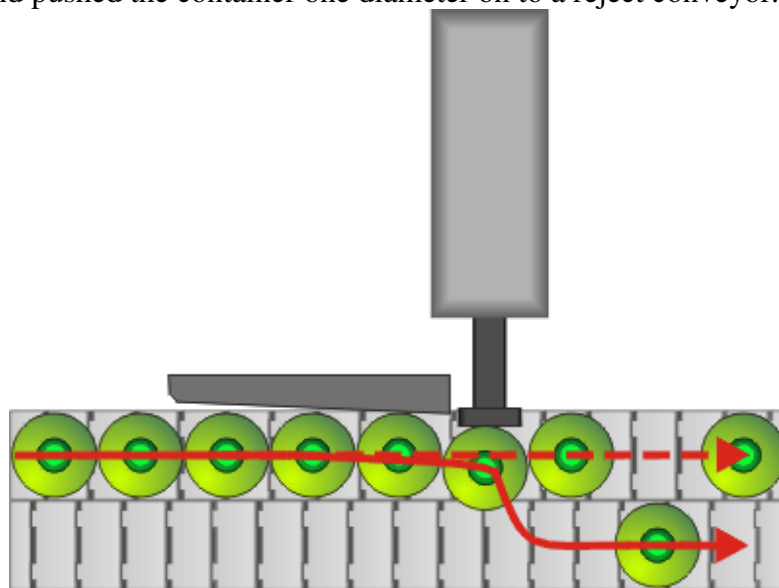


Figure 39

Delta-FW

Figure 40 shows the Delta-FW rejector, which removes containers from the production line standing up. During the rejection process, the successively switched segments of the rejector head form a curved guide rail to guide the container from the line to a parallel conveyor. The segments are extended or retracted horizontally by high-speed pneumatically controlled cylinders. Depending on the container diameter, rejector is available in two variations: 10 segments and 16 segments.



Figure 40
Mono

This rejector is a single segment device that removes containers to a parallel conveyor or into a receptacle. The rejection segment gives the container to be rejected a defined push by a high-speed pneumatically controlled cylinder (see Figure 41).



Figure 41

Delta-K

This rejector removes containers from the production line standing up. During the rejection process, the successively switched segments of the rejector head form a curved guide rail to guide the container from the line to a parallel conveyor. The segments are extended or retracted vertically by high-speed pneumatically controlled cylinders. Depending on the container diameter, rejector is available in two variations: 14 segments and 16 segments. This unit is available with lateral and horizontal adjustment variations. (See Figure 42)



Figure 42

Encoder

A pulse encoder will be mounted on the drive shaft of the container conveyor system. The encoder sends pulses to the SPECTRUM TX unit. Each pulse represents a distance (approximately 0.020”) the conveyor has traveled. This information, combined with the trigger signal, allows the Heuft SPECTRUM TX system to track each container as it travels through the inspection area and reaches the rejector. (See Figure 43)

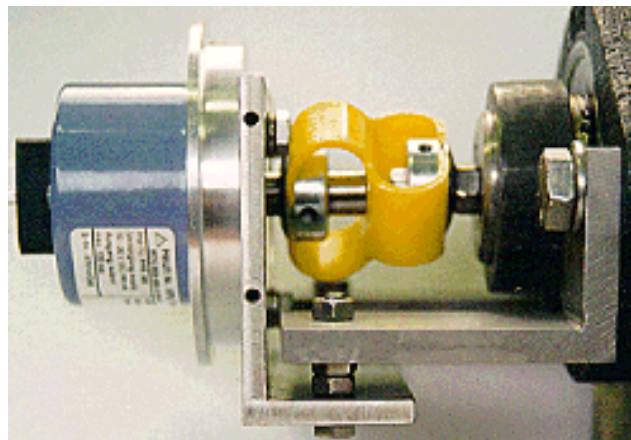


Figure 43

Safety

Safety is an important aspect to using equipment wisely. Heuft Spectrum TX units have general safety considerations and radiation safety might apply if radiation based inspections are utilized in the system.

General Equipment Safety

General safety precautions associated with the Heuft SPECTRUM TX Inline Inspection system include:

- Make sure all safety guards and shields (if applicable) are properly installed before operating the system.
- Beware of pinch points where the bottle passes through the Heuft SPECTRUM TX system and measuring bridges.
- High voltage components are used inside the SPECTRUM TX unit during operation. Do not operate the system with the covers open. Turn power off before opening the covers for any reason.
- Keep all water and moisture out of the SPECTRUM TX unit and monitor by closing the access covers securely at all times.
- DO NOT disconnect any electrical connections or boards while the system power is on.
- The internal electronics of this equipment are sensitive to electrostatic discharge. Proper precaution must be adhered to when handling any electrical components.
- During equipment wash down, the sensing units must be covered to prevent damage.
- Beware of pinch points on the rejector assembly.
- Air pressure inside this machine should be 60 psig for Delta-FW, and Mono. Air pressure inside for 40 psi for the Delta-K. Plant air supply pressure is approximately 80 psig. Use caution to prevent injury from the pneumatic components.

Operation Section

Operational Switches and controls

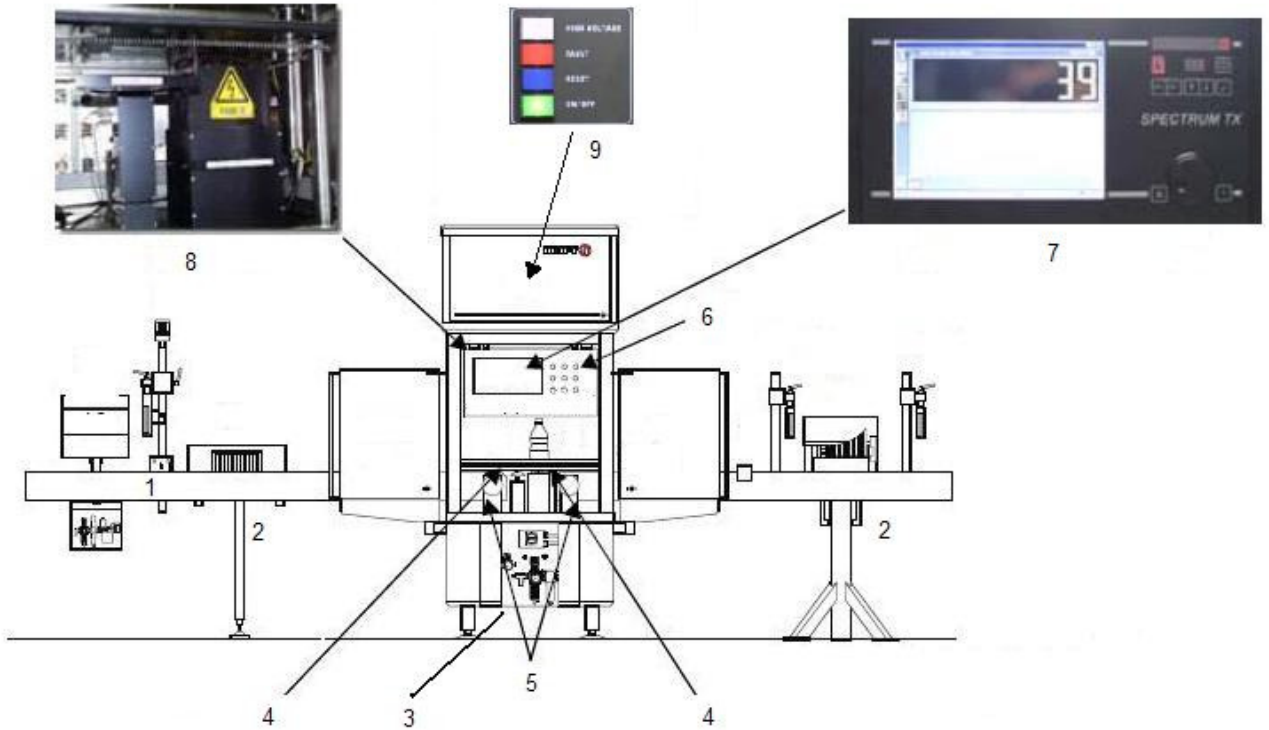


Figure 44

1	Infeed check reset
2	Rejector air regulator
3	Main power, strobe cooling valve, compressed air valve
4	Belt height adjustments
5	belt width adjustments
6	Operator control panel
7	Pilot Terminal
8	Optics rack
9	DSD switches

Table 2

Switches and Regulator/Valves

Main Power Switch

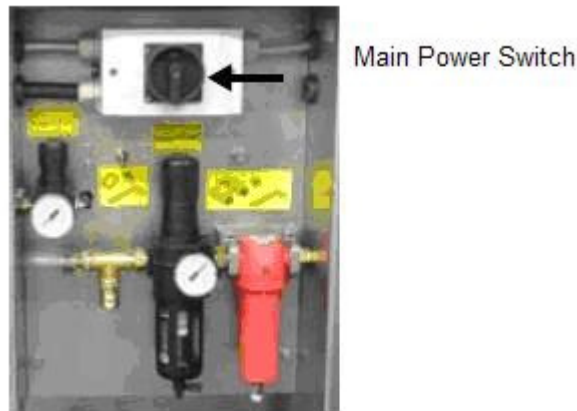


Figure 45

The main power switch enables power for the entire device. It is located center bottom of the Inline housing. It is rotated clockwise to turn the device to “on”. The switch is turned counterclockwise to turn the device “off”. This switch has a hole for a lock for lockout/tag out.

Infeed Check Reset Button



Figure 46

The reset button is used in installations where no infeed rejector is installed. It is located on the top of the infeed check terminal box. When a container is detected that will cause damage to the Inline device the infeed check generates a stop pulse signal to the line control. Pressing this button resets the switch-off pulse.

Compressed Air Valve



Figure 47

The supply of the compressed air is controlled by this regulator valve. This assembly consists of a water separator and fine filter. This should be set to the valve on the sign adjacent to the regulator for proper base blower operation.

Strobe Cooling Valve



Figure 48

The device has a separate valve for the air supply for the strobe cooling. This unit is located on the Inline housing center bottom. Set the strobe cooling to 22 psi (1.5 bars).

Rejector Air Regulator Valve

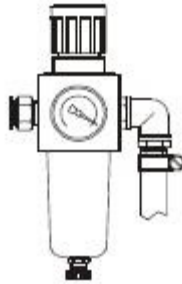


Figure 49

The compressed air is supplied to the rejectors by a regulators located below the device.

- Delta-FW rejectors set to 58 psi (4 bars)
- Delta-K rejectors set to 44 psi 9 (3 bars)
- Mono rejectors set to 58 psi (4 bars)

Operator Panel

The Inline is interfaced to the line control. Since the transport belts are driven by the conveyor motors, the device becomes part of the conveying system. The operating panel contains switches for the line control interface (Figure 50).



Figure 50

Start Button

Push button - switches on the drive unit. Light



Figure 51

Stop Button

Push button - switches off the drive unit.



Figure 52

Test Bottle Request

This enables the manual start of the test bottle program. This is an optional feature and is only included if the Test Bottle Check and/or Test Bottle Analysis is purchased.



Figure 53

Manual/Automatic/Jog Button

This is a three position switch. The normal setting for production is “automatic.



Manual for constant conveyor speed



Automatic for normal production



Jog for slow, step by step conveyor operation.

Hold the switch in the jog position for as long as it should run.

When the switch is released it returns to the center position (Manual)

**Manual
Automatic
Jog**



Figure 54

Emergency-Off Button

This E-Stop button is integrated into the Emergency stop system for the line control. The switch illuminates when the E-stop system for the line has been activated. If this button is depressed to initiate an E-stop, the reset the button must be pulled out and the “reset/jog” button depressed.

**Emergency
Off**



Figure 55

Speed Switch

Selection of preprogrammed speed of an optional conveyor control system.



Figure 56

Creep Speed

This switch is for the manual start of the creep (very slow) speed for the adjustment and set-up of vertically adjustable transport belts. As soon as the key is switched to the “1” position the transport belt system moves at a very slow speed. The “0” position is the correct setting for normal production.



Figure 57

Frequency Drive Malfunction Indicator

This blue light indicator illuminates when there is a problem with the frequency drive. The frequency drive is an optional feature for driving the belt transportation. This is used when the rotation angle needs to be adjusted with different bottle types. Typically the transport belts are mechanically linked to the conveyor.



Figure 58

Pilot Navigation

Pilot navigation can be handled in two ways; through the touch screen or by utilizing the Jog Shuttle located on the lower right corner of the front panel. When utilizing the Jog Shuttle, to move the cursor (box highlighted in yellow), rotate the jog shuttle in either direction. To select an item once it is highlighted, gently press the jog shuttle in at the detent on the Jog Shuttle. In the case of numeric adjustments, once the box is clicked (jog shuttle depressed), the box is highlighted in green. The number may now be adjusted by rotating the jog shuttle slowly in either direction (depending on whether you wish to increase or decrease the number). Once the number is at the desired level, depress the jog shuttle again (box again highlighted in yellow). The change is saved automatically.

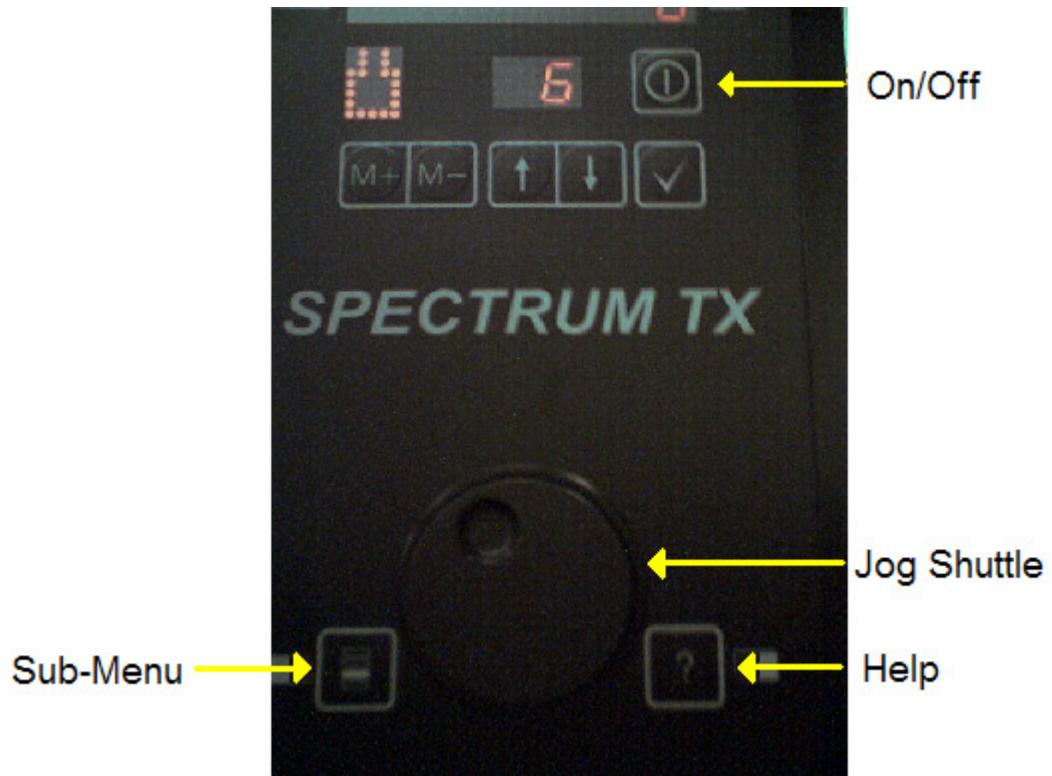
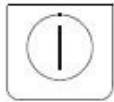


Figure 59

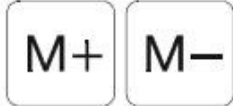


Operating terminal

Figure 60



Switching the *SPECTRUM TX* on and off
(operating system and operating terminal)



Selecting a module
e.g. container program



Selecting within a module
e.g. selecting the program number



Clearing counters or confirming message
This function depends on the module selected.



Selecting the online help



Selecting pop-up menus, if available
e.g. program selection

Display with touch screen (optional)

The *PILOT* surface can be operated by gently touching the screen.



Jog shuttle (optional)

Rotating knob with switch function for operating the *PILOT* surface for the entry of parameters

» **Selection/confirmation with the jog shuttle**

A yellow focus marks the selected position
which is selected or confirmed by pressing the jog shuttle.



Info Page

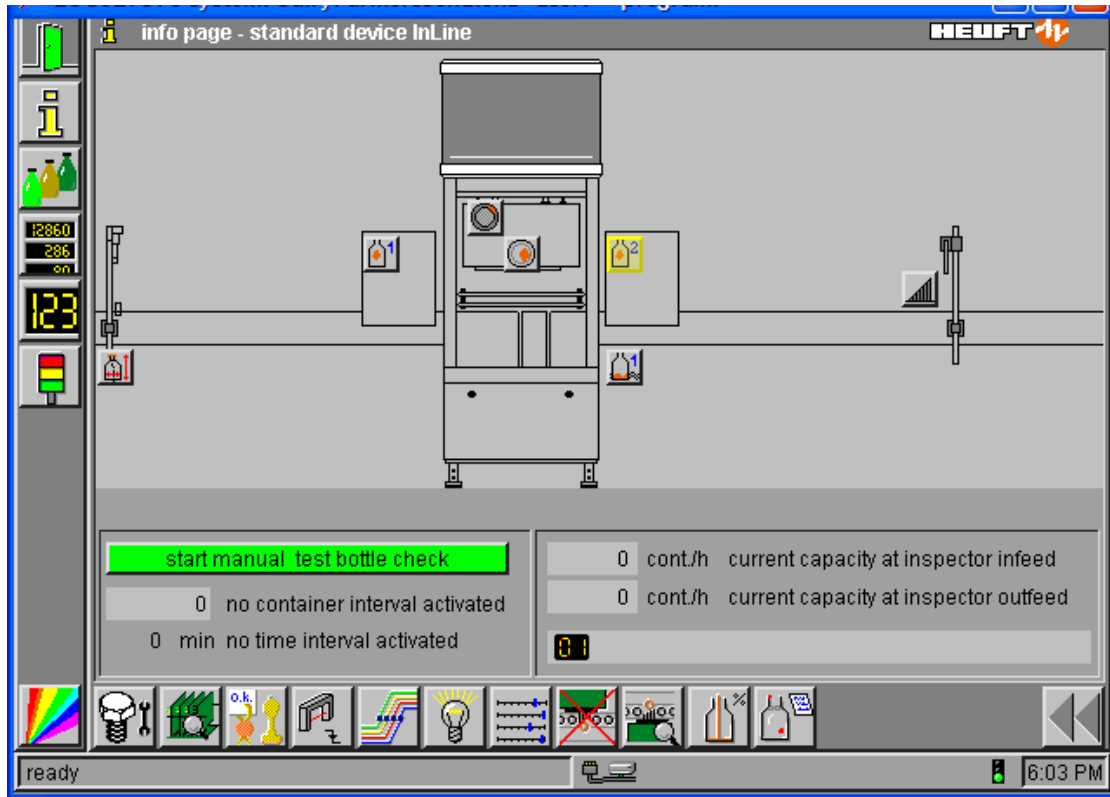

















Figure 61

Table 3

 - LOG-IN/LOG-OUT	 - RED LIGHT STATUS
 - INFO PAGE	 - YELLOW LIGHT STATUS
 - BRAND CHANGE	 - GREEN LIGHT STATUS
 - COUNTER READINGS	 - WRENCH STATUS
 - LARGE COUNTER	 - NETWORK CONNECTION
 - MESSAGE/STATUS	 - COMMUNICATION FAILURE
 - SYSTEM MENU	 - COMMUNICATION OK
 - BACK	

The top bar displays several pieces of information which is seen on every page.



Figure 62

- Device serial number
- Device name
- Current access level (log in)
- Current program selected

Online Help

Help Flags

When the cursor stops on an icon, a context help flag appears with the name of the icon. In Figure 63, the yellow cursor has stopped on a blue box called “width of guide rails at the infeed, back”.

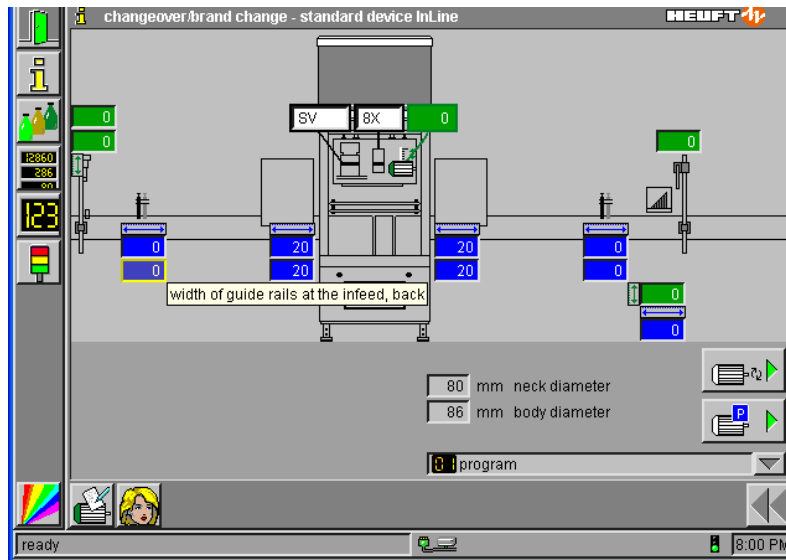


Figure 63

Help Boxes

Help boxes are available in a few different ways. A help box for the icon to move the motors is shown in Figure 64.

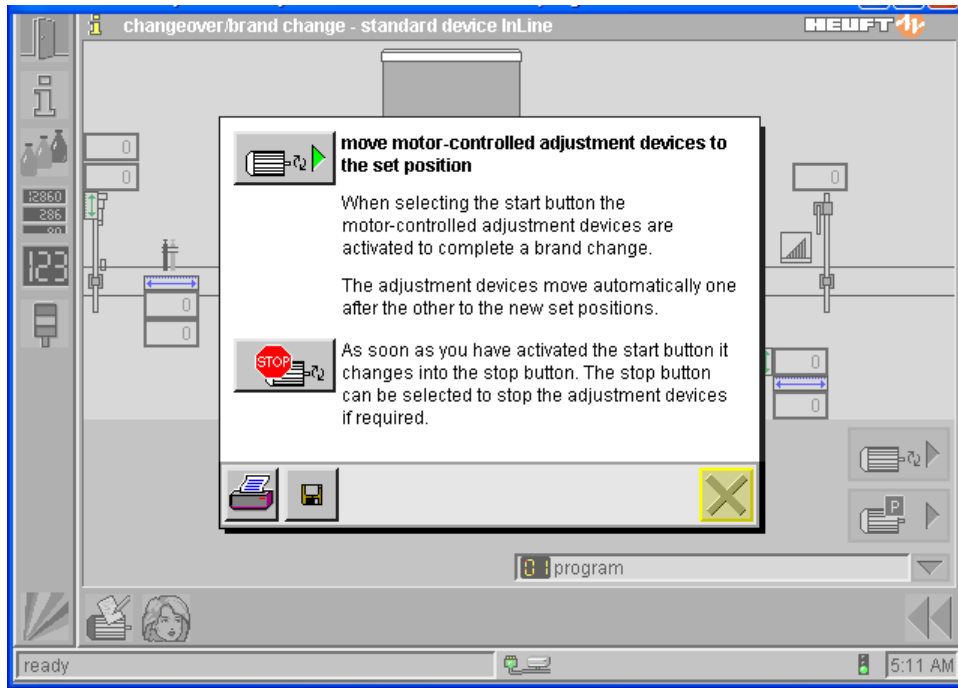
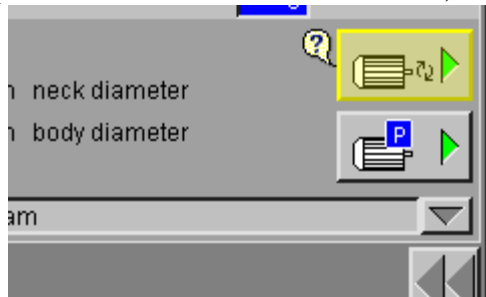
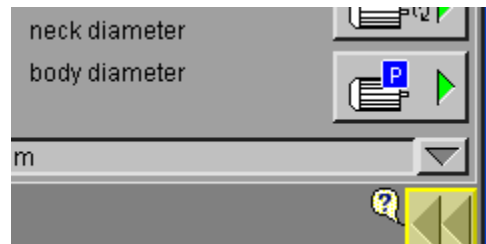


Figure 64

1. If question mark appears when a cursor is over an icon, then a help box exists for that icon.



2. If a question mark appears on the double arrow icon, then the help box is for the complete page.



3. Question mark icons appear on some pages. This has a help box information that relates to a portion of the page.



Online Documents

From the “system menu” the online manual is accessible. Open the menu tree to the lowest level to display the information. Also selecting the “?” button front the front panel will open the online documents if the icon the cursor is on is not connected to a help box.

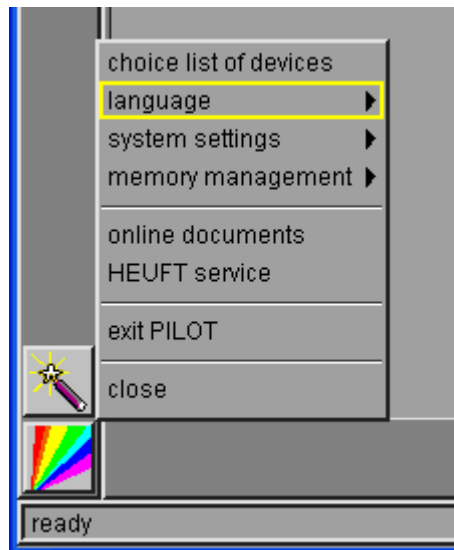


Figure 65

Log In/Out

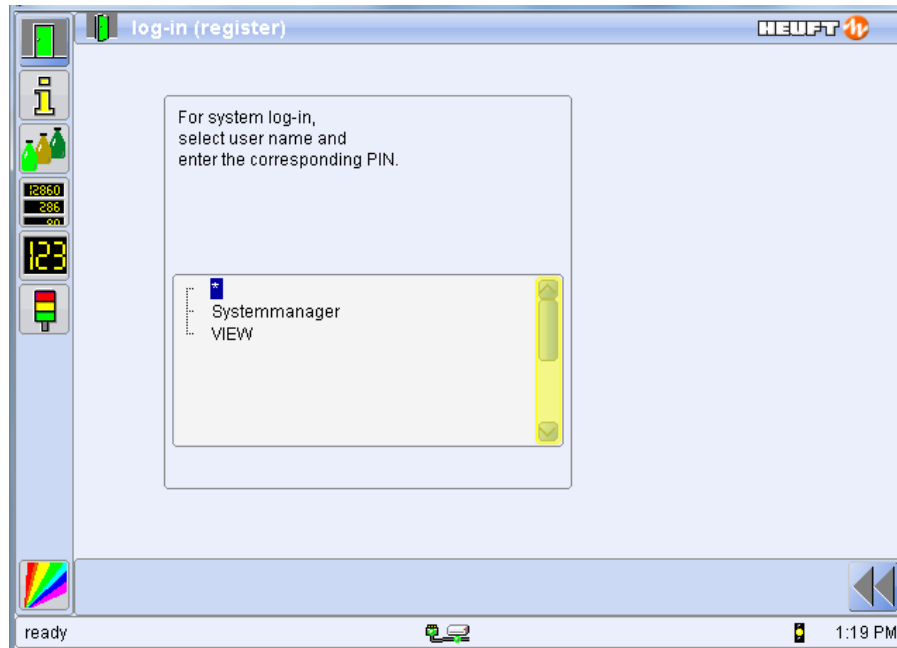



Figure 66

The TX Spectrum device is protected against unauthorized access by passwords. The System Manger can set up multiple levels with various permissions. In the above picture, three user levels have been established: “*” (operator level), Maintenance, and Systemmanager. The “*” user level is automatically entered when the system is turned on. This user level cannot be deleted.

Logging in/Logging out –

1. Press the jog shuttle on the  icon 3 times slowly – knock on the door.
2. Highlight the correct user level
3. Press the jog shuttle.

If the selected user level is password protected, then a numeric keypad will display

4. Enter the 4-digit numerical password (if applicable).

Changeover/Brand Change

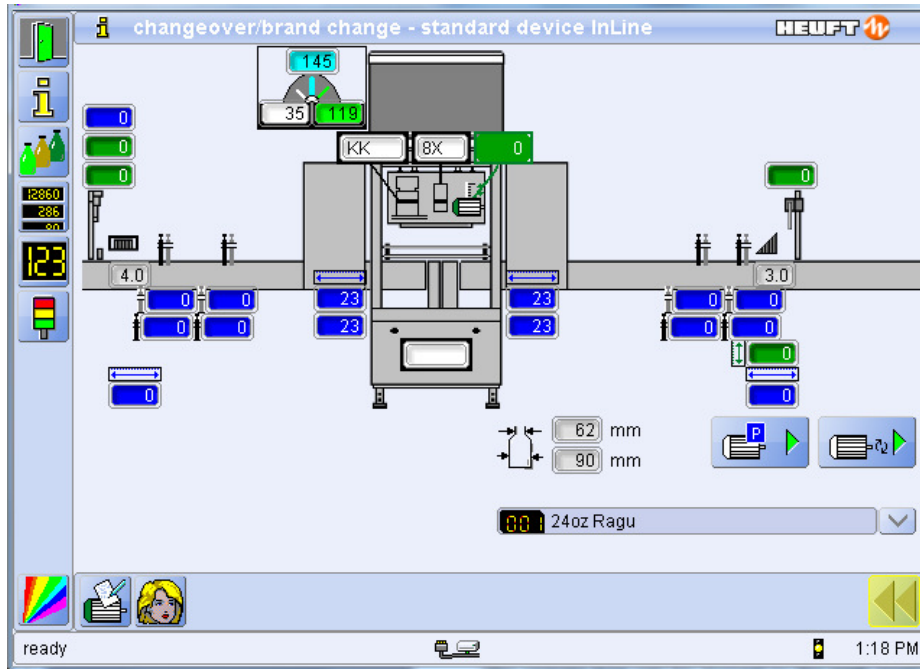


Figure 67

The Changeover screen is used to select the program to run and also to be used as a reference to adjust the bridge heights, rails, optics to the correct settings. For the adjustment procedure please see the operator tasks section.

The green boxes are for vertical adjustments. The blue boxes are for lateral adjustments, and the white boxes are change parts designation. When a program is switched electronically the height adjustment references change. The camera box is automatic height adjustment. It will change to the correct height after confirming a few confirmation boxes.

The camera box can be moved to the park position which is all the way to the top. This allows access to the protective glasses for cleaning

Counter Readings

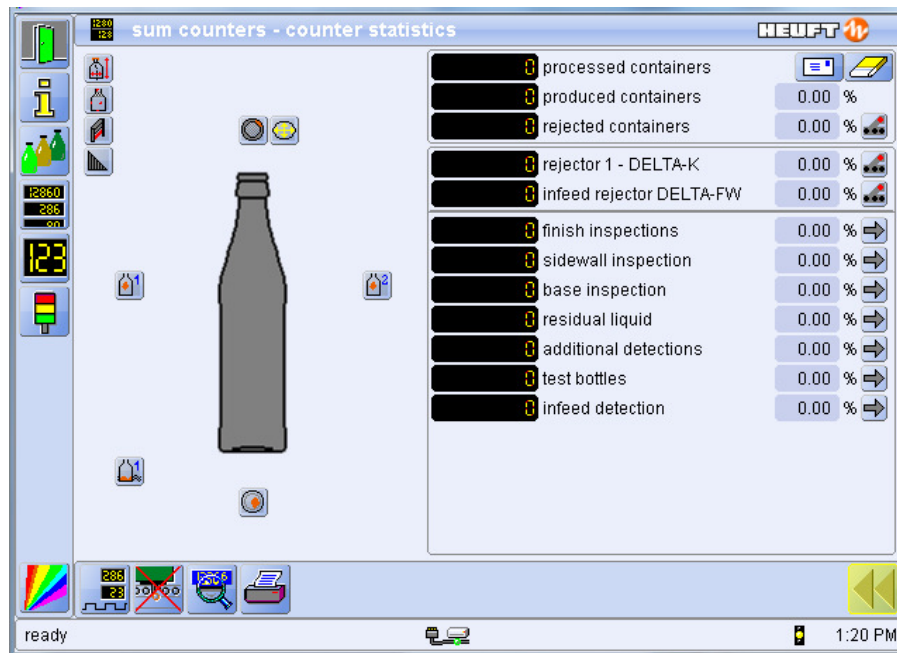


Figure 68

Processed Containers – the total number of containers that passed the main trigger.

Produced Containers – the total number of good containers passed by the rejector.

Rejected Containers – the total number of rejected containers.

The icons around the bottles will open the inspection parameter page with the associated sub counters. The arrows icons will display additional counter pages associated with the areas. For example, the arrow next to sidewall inspection will show an additional page with all the sidewall inspection sub counters (i.e., infeed sidewall, and outfeed sidewall etc) (Figure 69).

The counter readings page also enables the operator to clear all counters simultaneously. This includes: processed, produced, rejected, inspections faults, etc.

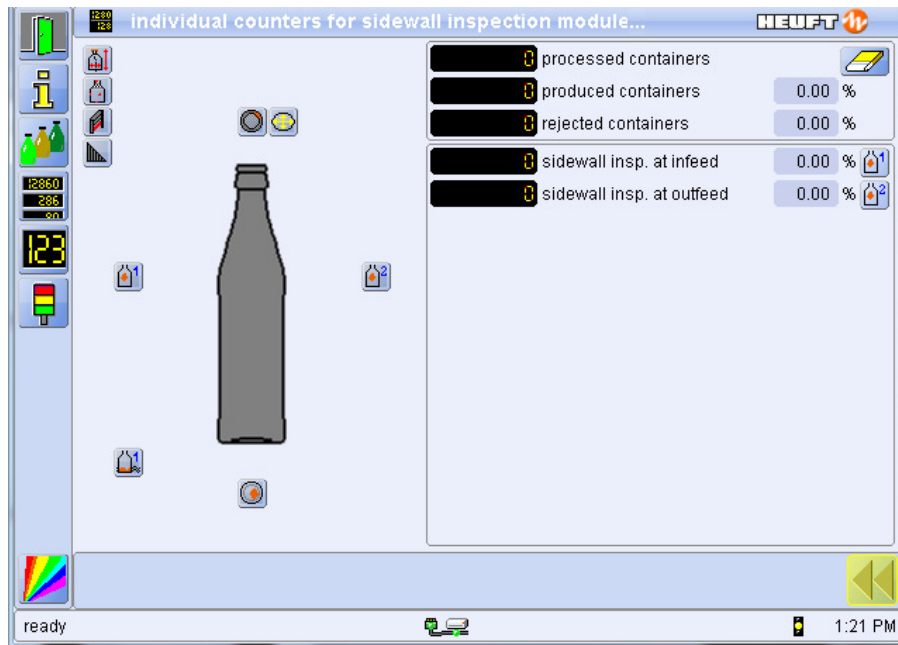



Figure 69

Clearing of Counters

1. Select the  icon.
2. Click on the Eraser button. A page will display – “really clear counters?”
3. Answer “OK” to clear ALL counters or “Cancel” to abort.

Pictures of the Last Rejected Containers

The pictures from all the detections relating to a faulty container are displayed on this page together (Figure 70). This makes a clear and complete display of all the detections possible. All the pictures of a container are managed under a joint picture number. The pictures of another faulty container are displayed by changing the picture number.

- The pictures are also shortcut icons to the related inspection module. For example if you click on a “finish fault” picture the system will take you to the clipboard page of the finish inspection.
- When a picture from a clipboard is displayed, all the detections which evaluated the inspection as faulty are displayed with a red boarder.
- Pictures are on the clipboard are temporary. The pictures will be lost if the unit is shut off.
- To retain a picture permanently one must save the picture to the image storage.

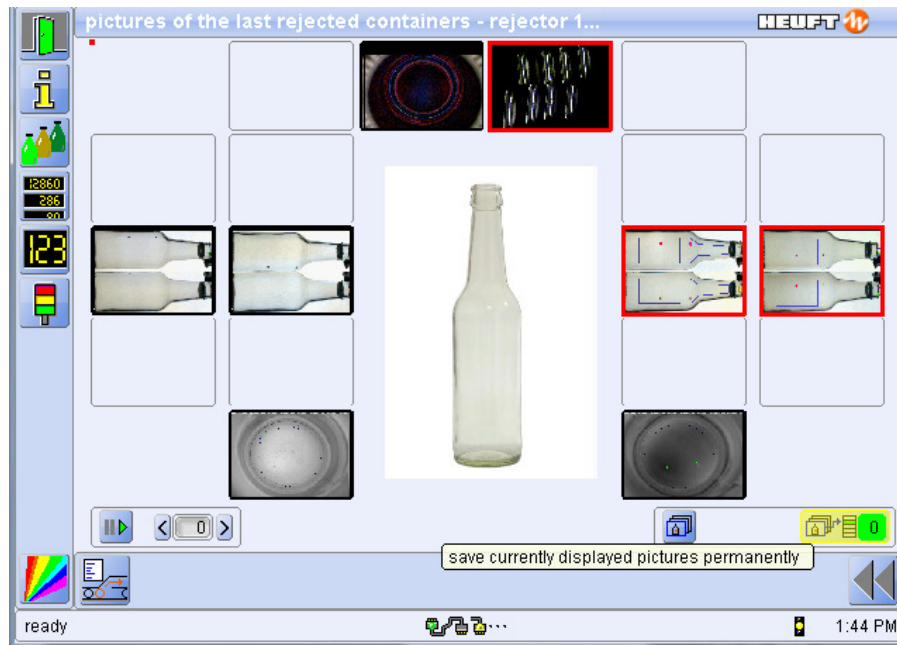
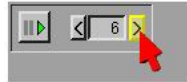


Figure 70

How to Save Pictures to the Image Storage

1. Select the picture number of a container from the clipboard which you wish to save permanently. The pictures of the currently selected container are displayed.



2. Deactivate the picture recording to the clipboard by selecting the red “stop recording” icon.

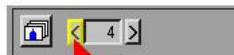


Note: A new picture could be added to the clipboard while you are saving the image. This alters the numbering of the pictures. Deactivating this prevents the number changing from occurring.

3. Change the display to “view pictures from image storage”.



4. Select the image storage position where the picture should be saved. It can be selected to over write and image or to a new location. The new locations have a black image.



5. Change the display to “view pictures from the clipboard”.



6. Confirm by clicking on the “OK” icon.

7. Turn the recording back on by clicking on the “green recording” icon



Large Counter

123

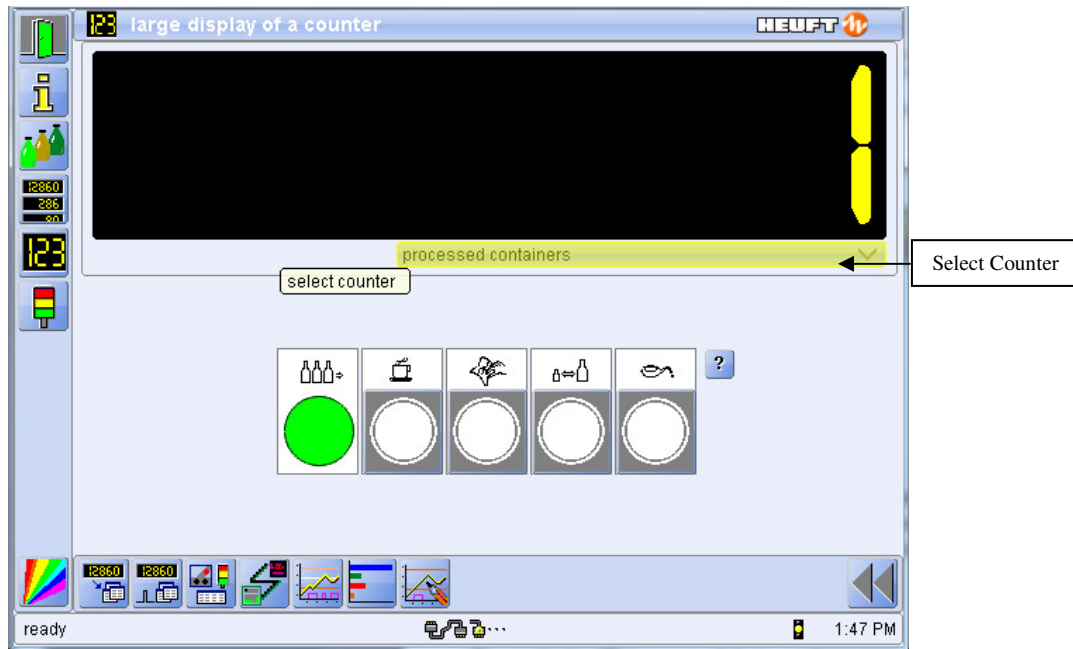


Figure 71

The large counter display is used to be able to monitor the counters without being right next to the machine. All of the counters available on the Counter Readings page are available for selection. However, only one may be displayed at a time. This is selectable via the drop down menu shown in Figure 71.

Efficiency

The analysis efficiency module is used to acquire production times and efficiency of an installation. The Spectrum TX device obtains various data from the produced containers per unit of time. The data covers up to 20 hours.

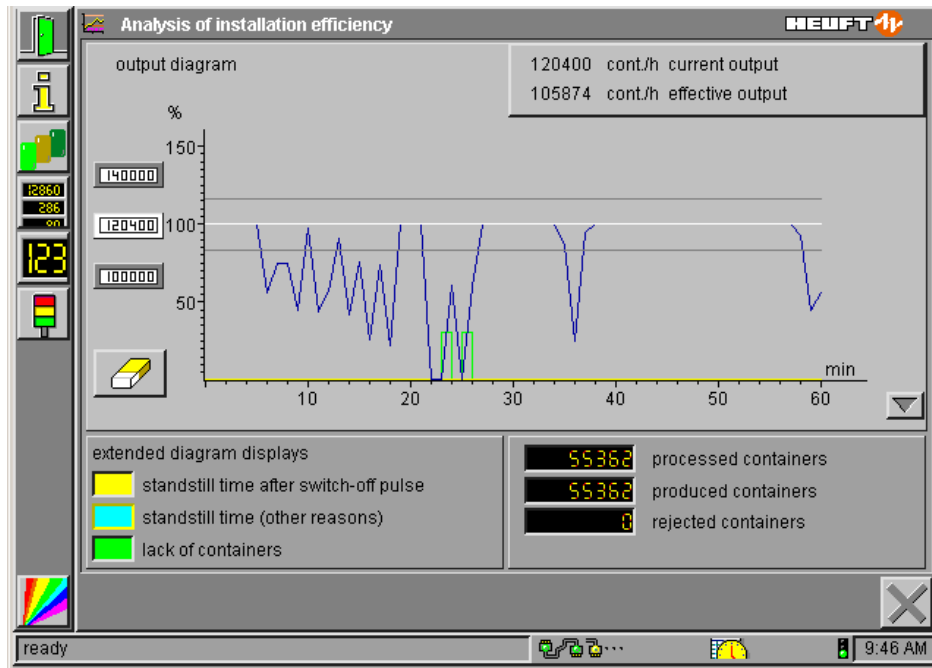


Figure 72

The time periods are selectable from last 60 minutes, last 2.5 hours, last 5 hours, and last 20 hours.

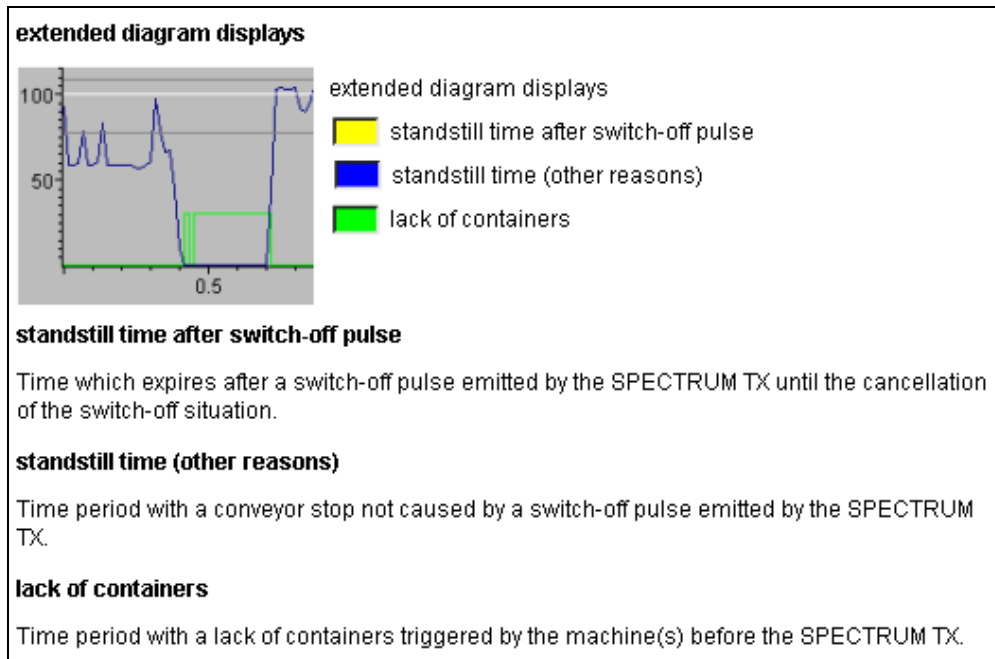


Figure 73

The total time, the effective operating time, the disturbance (interruptions) times are displayed as line graphs. The about of time and percentage of the time is listed for every line. The working time is always set to 100%. This is comprised of two parts operating time and disturbance (interruptions) time. The total of these two components times will equal the working time.

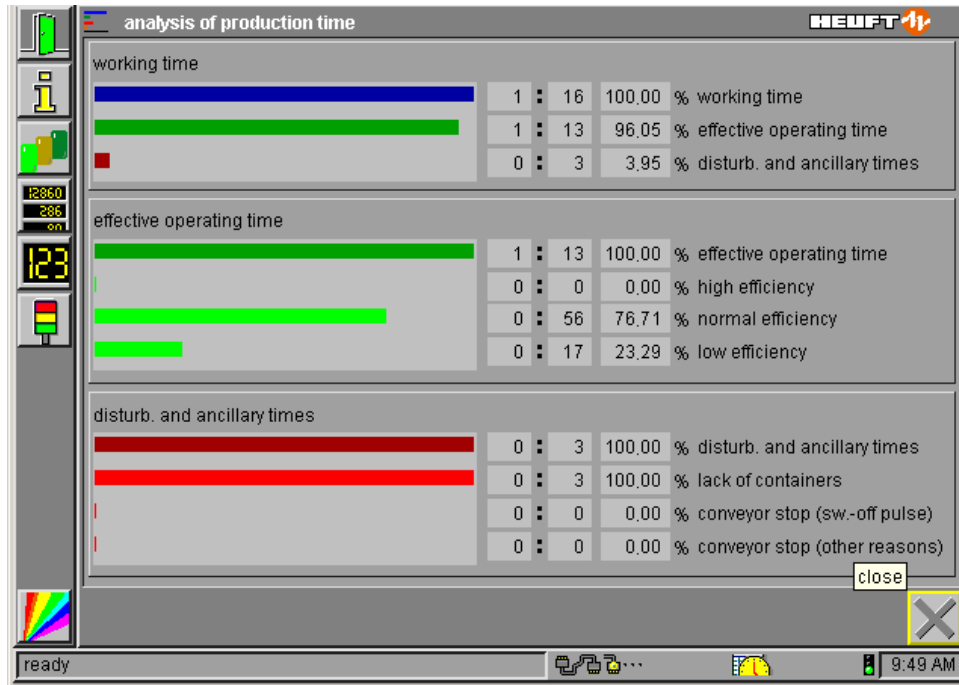


Figure 74

To prevent routine operations, which stops production, from negatively impact the efficiency data send to a Heuft Profiler or Strategy Gate, the operator can select a reason the line has stopped from the Production Data Acquisition (PDA) operation icons.

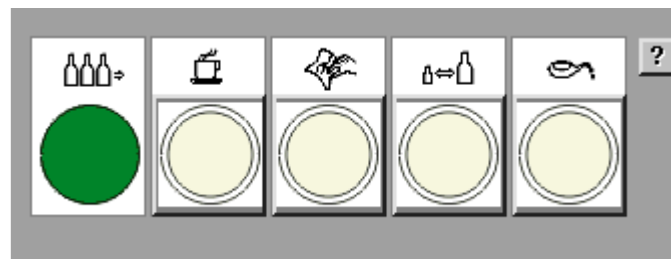


Figure 75

-  production
-  PDA break
-  PDA cleaning
-  PDA changeover

Status Survey/Messages

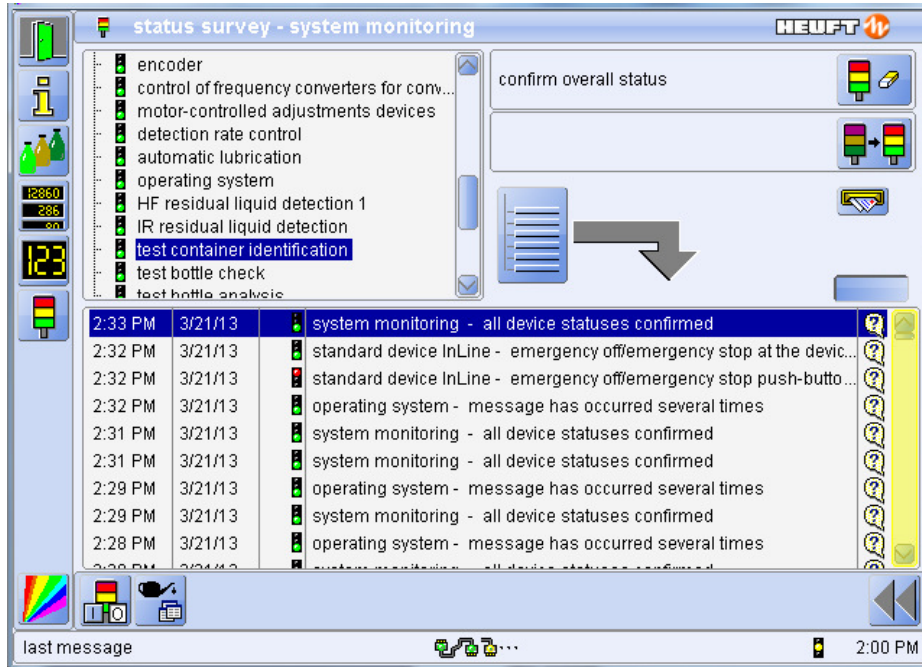
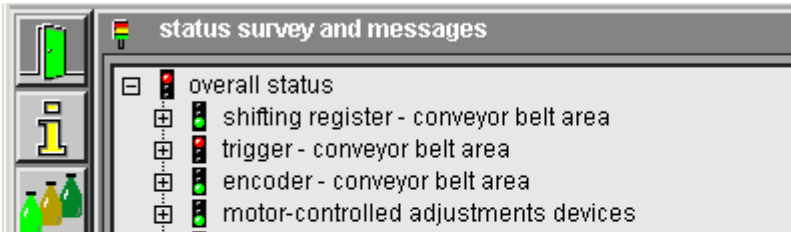


Figure 76

The status survey and message stack is used to determine the cause of yellow/red fault status lights. The overall system status is shown in the lower right portion of the screen, next to the time (yellow, green, or red). If the light is yellow or red, then the part of the system (in the upper left display) that corresponds to the fault will also be yellow or red (see Figure 77). The message stack displays all messages relating to the status of the machine (newest on the top) with an 8-digit fault code and a date/time stamp (Figure 78). To manually confirm whether the error still exists, click on the small eraser shown in the upper right portion of the screen.

The page provides a summarised survey of the current as well as the former device status and offers several possibilities to search purposefully for faults and messages.



All the function modules available in the device are listed at the top on the left. Each function module has a separate warning light symbol which indicates the current status of the function module.

The corresponding warning signal is displayed next to the function module in which a malfunction occurs.

The message stack is used for purposeful trouble shooting. It can be found in the lower area of the page and saves all the messages of the SPECTRUM device in a chronological order.

Figure 77






System Status	System Operation Capability
	Normal Production
	Device Function Impaired – faults evident, production unimpaired (i.e. serial fault or other non-critical fault)
	Device Function Failed – important device functions failed or switched off (i.e. work rest pressed, shutter closed)
	Service – hardware failure detected, contact maintenance
	Communication Error – pilot display no longer communicating with the Spectrum (i.e. no counters update, cannot sample, etc.)

Table 4

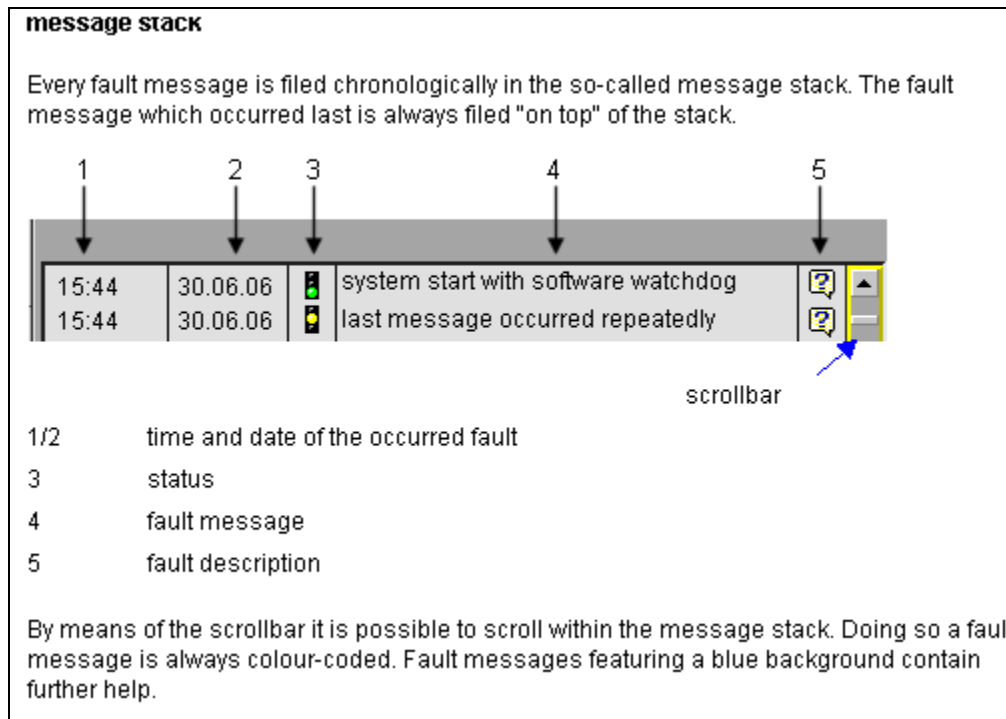


Figure 78

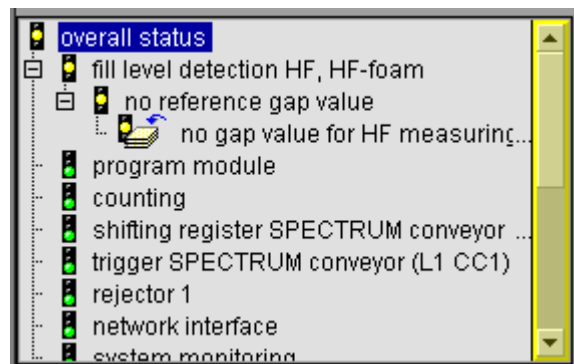
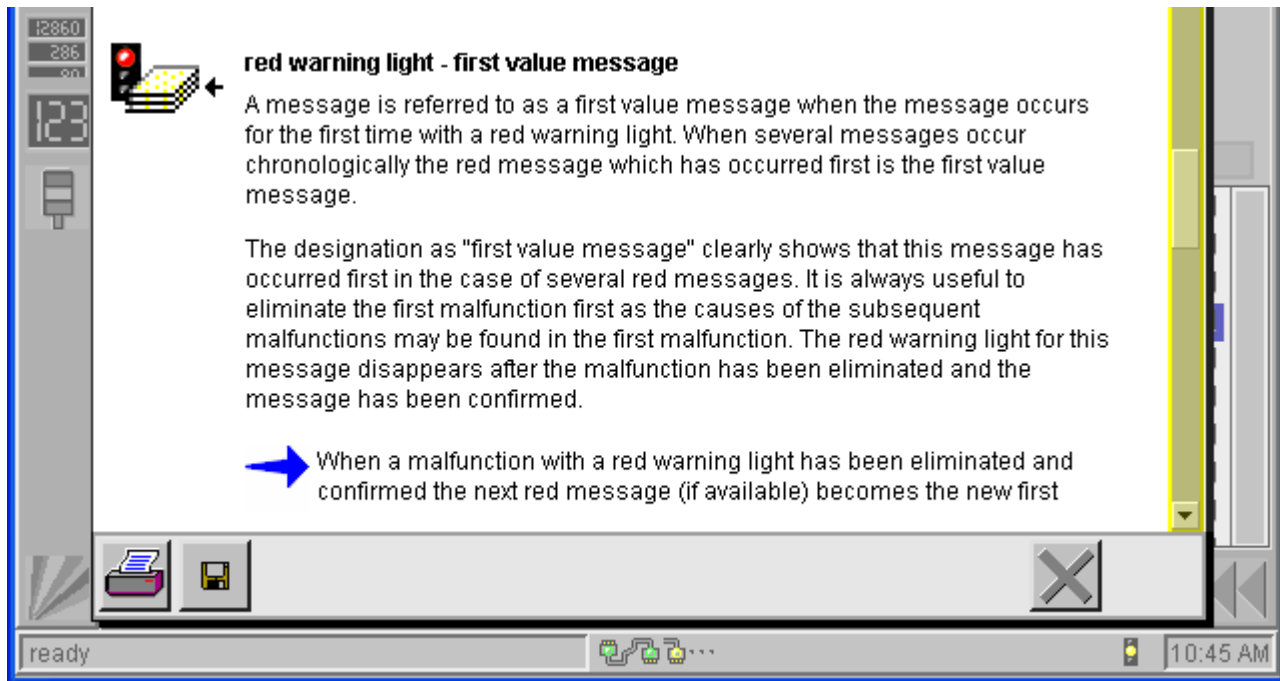


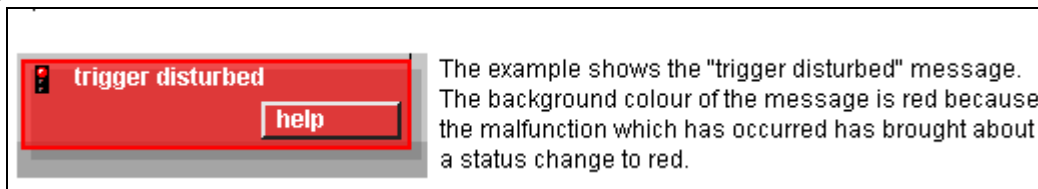
Figure 79

“Red Warning Light – First Value Message” – A message is referred to as a first value message when the message occurred for the first time with a red warning light. When several messages occur, chronologically the red the red message which has occurred first value message.



The Spectrum TX system is equipped with an extensive self-diagnosis which detects malfunctions independently and displays them user friendly help box is available for each message which has been generated in this way.

The help box of a message can be open from many positions. The on the info page is supplemented by a "help button".



The help box contains further information which makes it easier to locate the failed/distributed component.

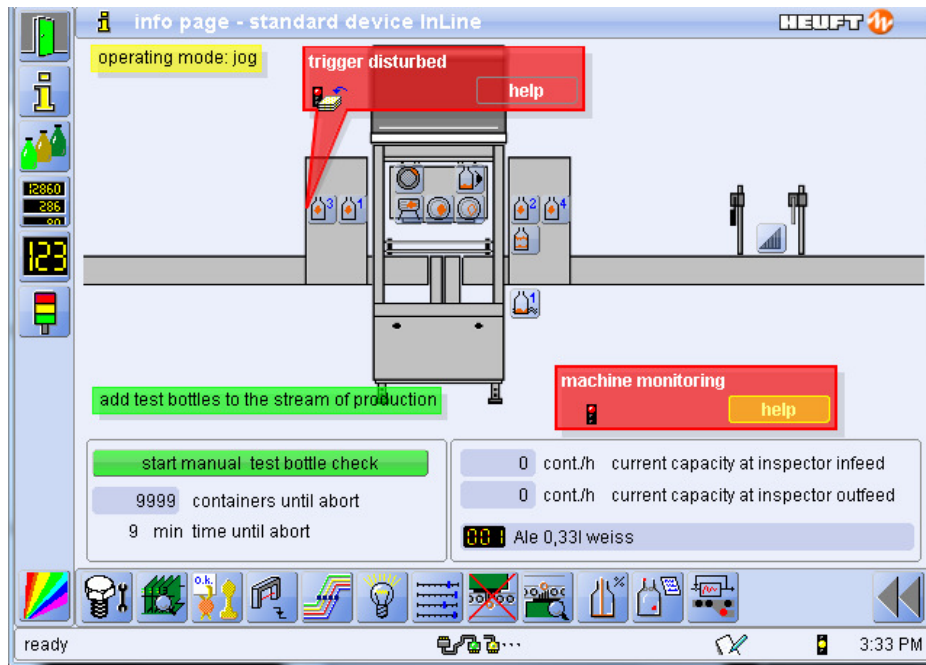


Figure 80

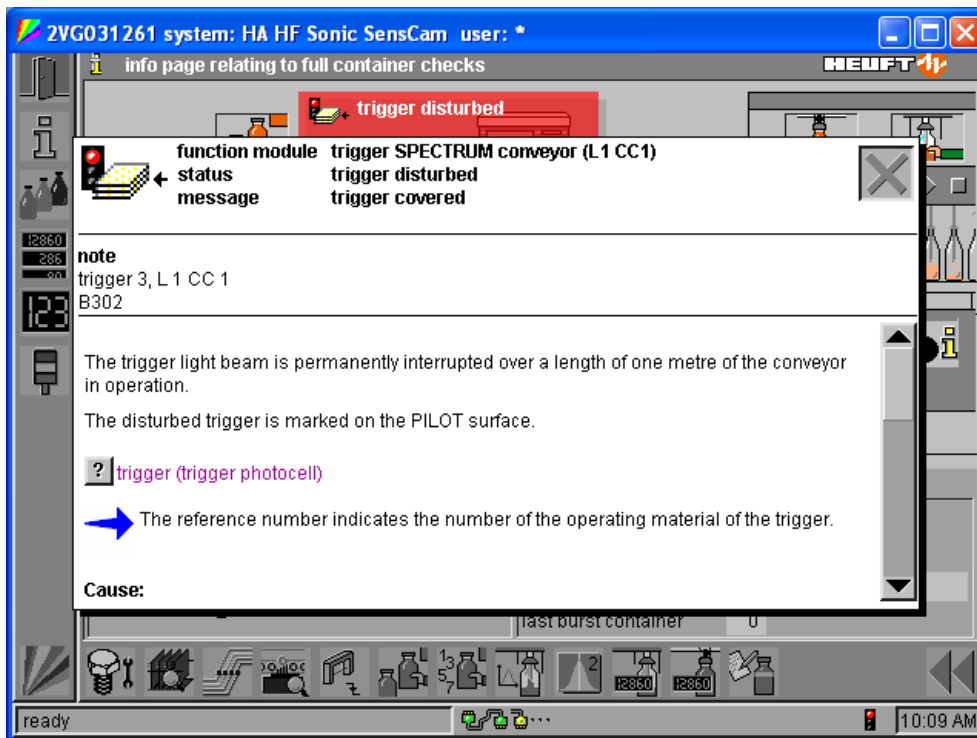


Figure 81

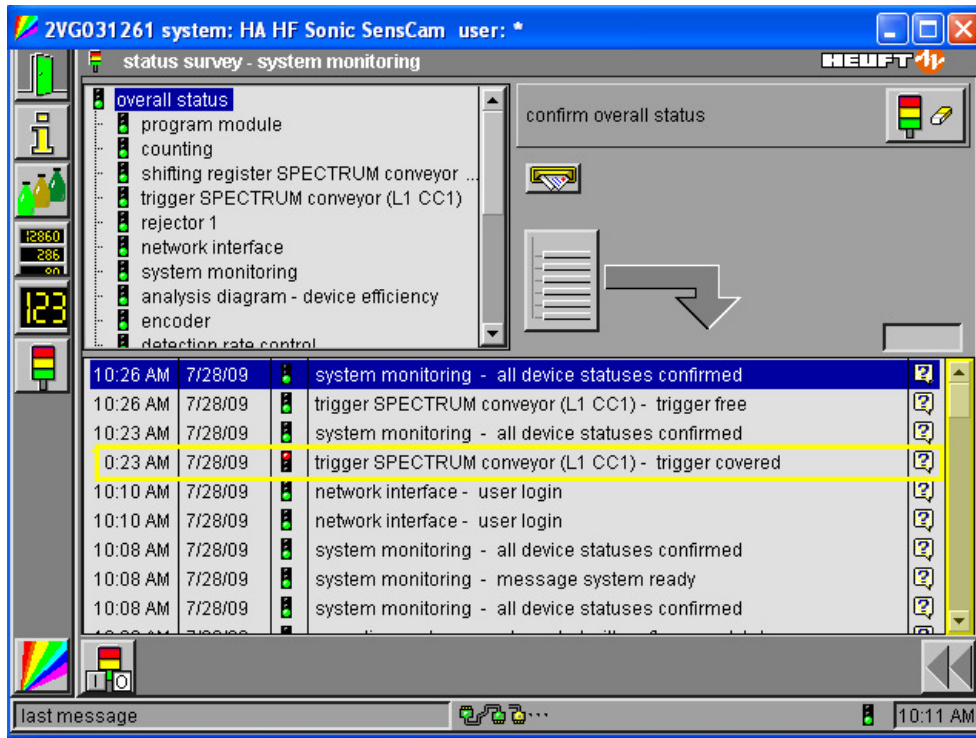


Figure 82

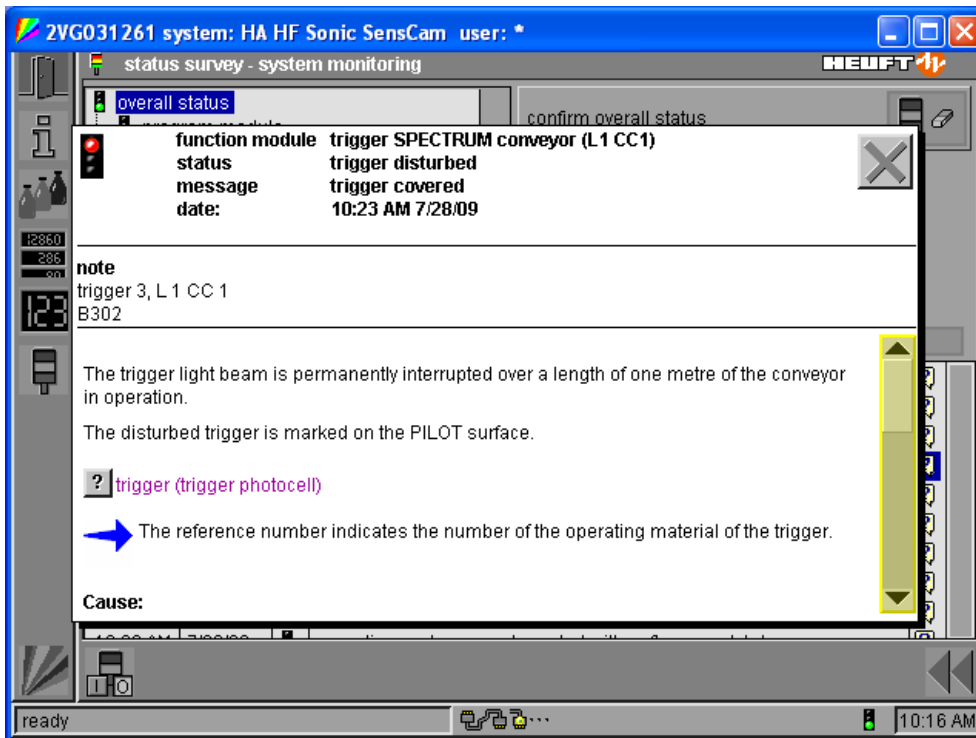


Figure 83

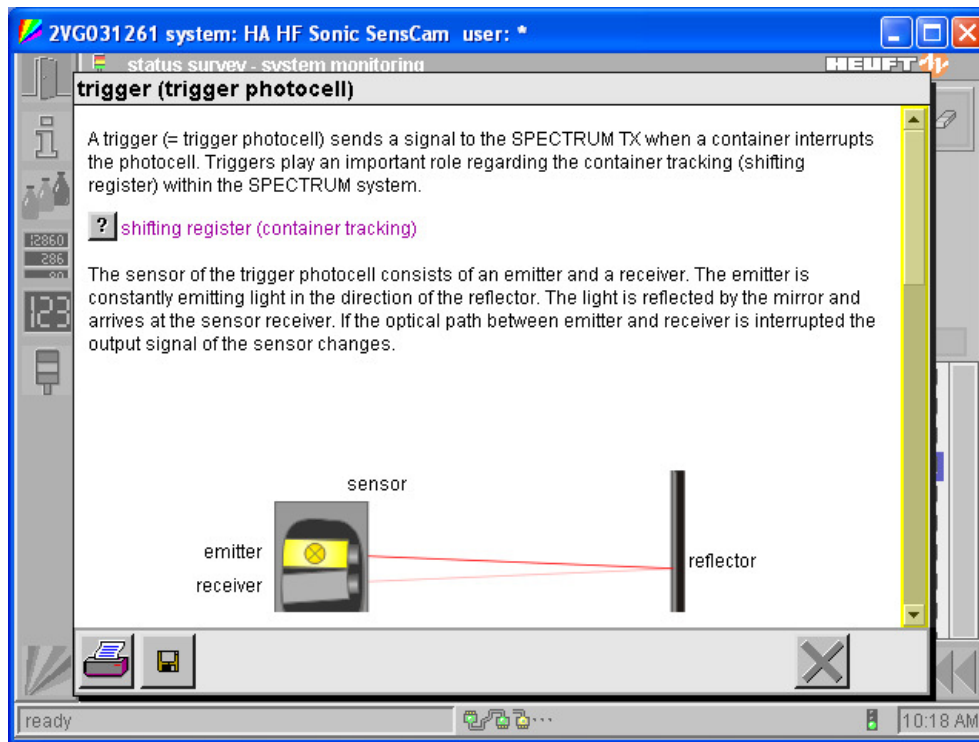


Figure 84

In addition an overview of all possible messages in the system can be found on the online help page. The Help box for the message can be opened by selecting the message. The reset messages are marked with a symbol in the message tree. The reset messages (meaning no more faults) with a few exceptions do not have help boxes because the troubleshooting and the elimination of the faults have already been described in the original fault message. Further information regarding the location of a component can not be displayed in the message tree because the message tree can only display an overview and does not have a current reference to a malfunction.

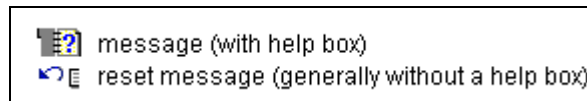


Figure 85

Test Bottle Check

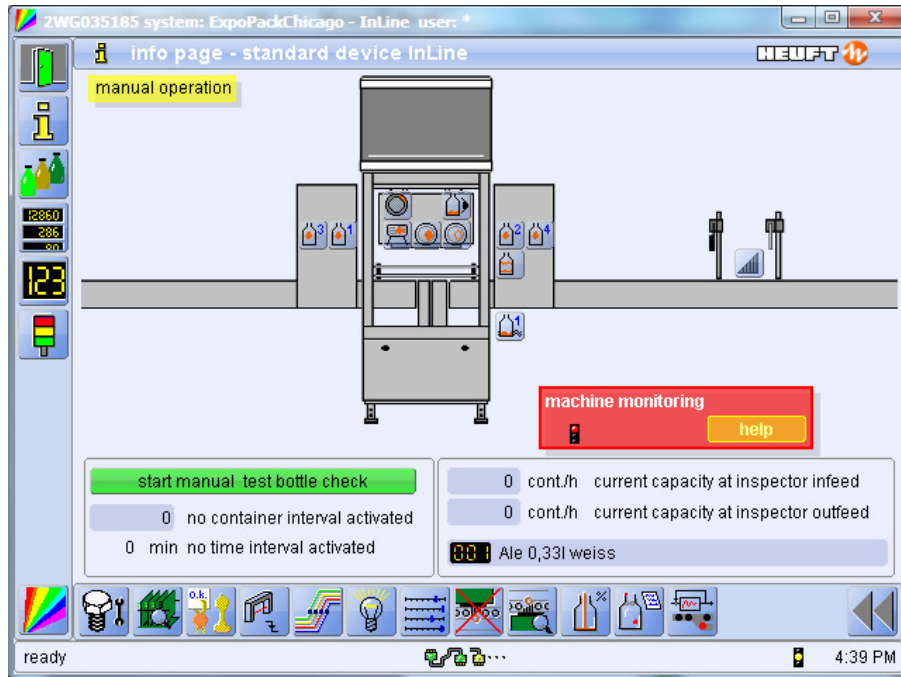
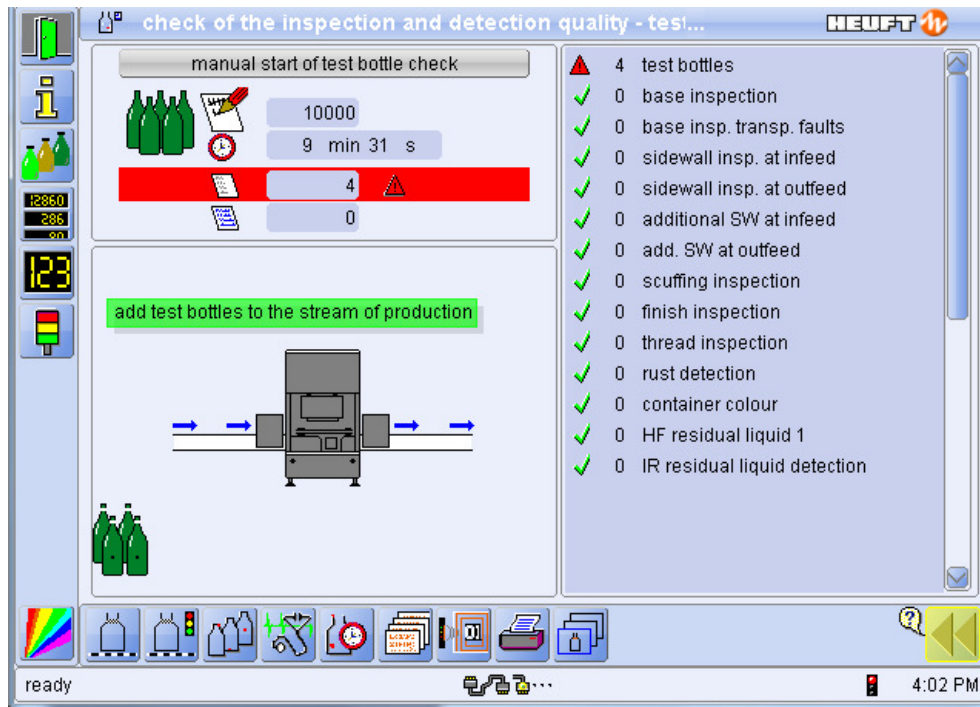


Figure 86

The system can notify the operator when challenge bottles need to run based on several configurable factors.

- Change over
- After switch-on
- After a container interval (1,000-999,999)
- After a time interval (0- 255 minutes)
- Manually started via the info page start icon.
- Started with the key switch
- After clearing counters
- After making a slider adjustment



Once the test bottle check has been requested, a timer counts down to the programmed time limit to run all the containers. The status of the test bottle defect is displayed.

