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1 General Information

1.1 Duty of care by the operator

The *PCE Colour Blister Inspection* was developed for the production conditions of the pharmaceutical industry. The safety and quality requirements of this industry were taken into account in the design of the system.

The safety of the system in operation can therefore only be ensured if all of the necessary measures have been taken. It is therefore the duty of care of the system operator (licensee) to plan this measure and assure that they are implemented.

It is the responsibility of the operator to assure that

- the system is used only for the purposes for which it was designed
- the system is operated only when it is in perfect, fully functional condition,
- the instruction manual is always in a legible condition and readily available in complete form where the machine is installed,
- only qualified, authorized personnel operate and service the system,
- these personnel are instructed on a regular basis in all relevant work safety issues and that they are familiar with the instruction manual and the safety instructions it contains,
- all of the system’s safety features are carefully tested on a regularly scheduled basis.
- The greater the safety risks covered with this device, the more frequently regularly scheduled checks must be performed.
1.2 Basic safety measures

The following measures are required for the connected labeling and monitoring devices:

- The devices must be mounted on stable, permanently fixed mechanical supports.
- The cameras must be protected from outside light during operation.
- The cameras are designed to operate on a 24 V DC power supply system from an external source. All safety regulations required for this type of system must be observed.
- *PCE Colour Blister Inspection* may only be operated by trained, authorized personnel who are familiar with the instruction manual and who are able to operate the system accordingly.

To ensure safe operation, repeated inspections of all safety-related parts must be performed, with special attention to the aforementioned points and the instruction manual.

1.3 Requirements for the operating personnel

The system is safeguarded by a user administration with two authorization levels. Each level has different rights. The system may only be operated by the appropriate personnel.

The purpose of this documentation is to enable the user to set up and operate *PCE Colour Blister Inspection*.

*Under no circumstances, however, is it a substitute for installation and customer service by trained personnel!*

1.4 Transport

During transport, the equipment must be moved packaged moisture-free and impact-free.

1.5 Installation and Start-up

The safe operation of the system can only be ensured if installation and start-up are performed by appropriately trained professionals.

Installation in an industrial environment is generally carried out with the least load from dust, humidity, temperature and vibrations. Custom camera designs are available for environments with higher load levels.
2 Product description

2.1 Usage to the intended purpose

The *PCE Color Blister Inspection* is suitable for inspection of:

- tablets,
- capsules (also two color),
- transparent soft galantine capsules

in foil materials like:

- transparent PVC
- PVDC
- PP-foil
- Colored foil
- aluminium cold formed foil

The system recognizes the following errors, if clearly visible to the camera:

- fragments in cavity
- empty cavity
- breakage
- chipping
- double filling
- position fault
- foil defects
- color deviations
- stains

If the *PCE Color Blister Inspection* is not used to the intended purpose, a safe operation of the system cannot be assured.

Not the manufacturer, but the operator of the PCE image processing system is responsible for all damages to persons and property caused by use not in accordance with the intended use!
2.2 Function of Colour Blister Inspection

The system controls tablets/capsules, which are packed in blisters. The inspection results (good/bad) are shifted to the discard stations by a *shift register*.

For every blister group, which arrives at the optical control station, the electric inside the smart camera captures an image. The word capture means two things: Digitalization, which means that the video signal of the used camera gets transformed in numbers, which gets stored in defined memory. The image gets captured at a defined moment, so the blisters in the captured images have always nearly the same position.

After capturing the image the program calculates different characteristics of tablets, defined by the user. All calculated values are compared with reference values. In case of one or more of the compared values are out of tolerance-range, the blister with the defective tablet gets ejected.

Concerning the intuitive menu guidance the handling of the program is very easy.

3 Operation and Menu Structure

The PCE image processing system is operated by simple menu navigation directly on the touchable monitor. The input options are intuitive and therefore easy to use.

When the system is switched on the production run starts automatically.

By pressing the Menu-Button the production quits and the main menu appears.

The system contains of an automatic Teach-In which detects many parameters autonomously and sets most adjustments automatically.

In the following sections all menus will be introduced and their functionality will be discussed.
3.1 Menu overview

Main menu
- Production
- Format
- Statistics
- Batch record
- Acquire image
- Consecutive Error
- Service
- Change Password
- Logoff
- Zoom View

Format
- Select
- Create
- Modify
- Rename
- Copy
- Delete

Statistics
- Show faulty images
- Show error statistics
- Reset Statistics
- Reset shift register

Acquire Image
- Live image
- Use trigger

Service
- User Management
- Configure result signal
- Clock overflow
- Image transmission
- PLC communication
- Security delay
- Multi cycle mode
- Log-file
- Extras
- Debug
- Save Counters
- Language

Modify
- Adjust inspection window
- Foil inspection
- Inspection criteria and tolerances
- Shift register configuration
- Diagnose
- Training of product tolerances
- Set shutter value
- Intensity reference area
- Stains check
- Post-Processing
- Separation
- Tablet Orientation Variety

Stains check
- Stains check ON/OFF
- Minimum stain size
- Maximum stain size
- Select color channels
- Sensitivity of detection
- Test stains detection

Multi cycle mode
- Switch ON/OFF
- Number of sequent images

Log-file
- Show Log-File
- Print out Log-File
- Log-File ON/OFF
- Adjust system time

Extras
- Negative inspection
- Additional shift register
- Advanced teach-in process
- Multi product
- Packet-mode
- Empty pocket detection
- Multiple control
- Color correction for display
- White balance
3.2 The production run

The production run is the actual analysis mode of the camera. It is automatically executed after power-on. The PCE smart camera now waits for a trigger signal from machine control to record an image. Next, the analysis windows are checked for different features and the reading results are displayed on the status bar.

Products, which were controlled as good, get marked with a green frame. Defective products are marked with a red frame. Additionally the defective products can be marked with symbols for each parameter checked. Following parameters can be checked:

- Area A
- Width -
- Height |
- Position +
- Perimeter [ ]
- Roundness o
- Bulge Ratio b
- Oblongness L
- Contour quality Q
- Object error !
- Empty pocket X
- Fragments F
- Gray / Color values ^
- Colour value red R
- Colour value green G
- Colour value blue B
- Dispersion red RS
- Dispersion green GS
- Dispersion blue BS
- Hue H
- Saturation S

Details:

- **Area** - the area of the found product
- **Width** - horizontal dimension of the product
- **Height** - vertical dimension of the product
- **Position** - the position of the product
- **Perimeter** - the length of the products contour
- **Roundness** - the perimeter related to the area.
- **Bulge Ratio** - a ratio of notches and bulges.
**Oblongness** - the ratio of the longest and shortest side returns the oblongness.

**Contour quality** - the smoothness of a tablets contour

**Object error** - No valid product found that fits to the taught one.

**Empty pocket** - the cavity is considered to be empty.

**Fragments** - The whole area inside the product window without a reference to the found product in it. So the product can be fragmented.

**Gray/Color values** - Value of color channels red, green, blue, plus their dispersions, hue and saturation.

Right beside the proven image the mentioned parameters are listed. For each parameter also the tolerance (+/-) is listed. Only parameters are shown which are switched on. Counters for good and bad results are shown on top.

On the bottom a shift-register which displays the signal shift for every taught blister is visualized.

The production run can always be exited by pressing Menu. The main menu appears after security delay has run-off.
3.3 Format

3.3.1 Switch format

Switch between all articles in camera memory. 100 articles can be stored totally.

3.3.2 Create format

In order to proof articles, all control frames have to be set and reference values have to be taught in. To do so choose “Create article” from main menu, and choose whether you want to create a new article or to overwrite the existing one.

The teach-in of a new product is password protected. Only permitted personal is allowed to call this menu.

Step 1: Adjust shutter speed (brightness)

At the left bottom the shutter value is displayed (in milliseconds). This value can be modified with the slide control. A higher value means more brightness, a lower value less brightness. You should adjust the shutter speed in a way the objects have a good contrast to the background.

High values (>3ms) can result in a blurred picture if fast objects are controlled. Care for this! Values between 0.5ms and 2ms are recommended.
The shutter setting influences the inspection process!

Step 2: Acquiring a picture

Choose between two types of image acquiring: *Live image* or *image with trigger*. Select desired mode.

Step 3: Schritt: Create format

You can create a new format or overwrite the current one. If needed type in the new format name.

Step 4: Setting the number of product colors

Decide whether you have a *single* or a *double* color capsule. Each capsule half will be checked separately if *double* is chosen.

Step 5: Setting up the blister frame

Position and size of the blister frame (yellow) should contain the products generous. Blister frames should not cross each other.

The maximum blister number is 3. In every blister there can be a maximum of 40 products. If maximum has been reached during teach in, the procedure will finish automatically. The number of blister frames can rose up to 6 by using a optional PLC and activating the according menu point in the *Service* menu.
Change position and size of a frame via touch-interface:

The windows can be changed directly via touch screen (mouse). By pressing the centre of the window this can be moved, by pressing on the side next to the window the size of the window can be changed.

Furthermore the frame can be changed by using the control buttons:

- By choosing the centre button the active mode can be switched.
- In „scrolling“ mode the window can be shifted using the arrow keys.
- In „zoom in“ mode the window can be enlarged using the arrow keys.
- In „zoom out“ mode the window can be reduced using the arrow keys.

Step 6: Set a product frame

The product frame (green) should contain one product generous. Product frames should not cross each other.

If the horizontal and vertical orientations of the products are different, the correct orientations of the products will be found automatically in the sequent teach-in process.

If product positions vary during production, the frame size should be set larger, because only products inside the frames get checked!
**Step 7: Set color layer(s) (optional)**

If you are teaching a two-color product or if the *advanced teach-in* is activated, you must choose the color layer for the product detection. Please choose the layer (R, G, B, R-G, R-B or G-B) with the best contrast, e.g. a good brightness difference between the product and the background. If you are teaching a two color product you have to select the best layer for each capsule part separately and then you have also to care about a good contrast between the parts itself.

![Color layers examples](image)

In this case it is the best to choose layer R for the lower part and R-B for the upper part.

Instead of R-B you can also use B, but please keep in mind that you have to set two thresholds in this case.

The upper part is separated from background with a low threshold and from the brighter part with a higher threshold. Two thresholds consume more CPU-power, hence you should use one threshold if possible.

**Step 8: Set a threshold**

![Histogram example](image)

The optimal threshold should be found automatically. Please check the adjustments and modify those possibly. A so called histogram on the right side of the screen will help you:

A histogram should show two humps. The **threshold** is to set in a way that it is exactly between those humps.

If this isn’t so either the shutter has to be adjusted or an intuitive value has to be found, which guarantee the most tolerance. If the histogram contains 3 humps it can be preferable to use two thresholds.
For the other half there are two possibilities:

1. You chose layer R-B (the fastest and easiest way). Just ONE threshold.

2. You chose layer B. TWO thresholds.

If you have to set two thresholds, you will have an enshrouding border. The histogram shows three humps: the upper one representing the lower capsule half, the middle one is the upper capsule half (we want to separate) and the lower hump is the background.

Adjust both thresholds in a way that the enshrouding border is as thin as possible!

Setting two thresholds increase the evaluation time of the system. Therefore make sure that you won’t get the capsule half with one threshold in another R,G,B-layer.

If there were found more than one object inside the product frame although the threshold is set optimal, the correct product must be chosen.
Step 9: Product separation (optional)

If the *advanced teach-in* is activated you can choose whether you want to separate the product from the background artificially. This might be in particular necessary if the contrast between product and background is significantly bad, so that a separation just with a threshold isn’t possible.

Step 10: Choose product color (optional)

If the system finds more than one product inside the product frame you have to choose the product color. If the product appears brighter than the background on the screen, choose *brighter than background*, otherwise *darker than background*.

Step 11: Create a binary image for the whole blister

In this step, the threshold for the whole blister can be adjusted. If you have a 2 color product as in this case, the thresholds for the two halves will be set successively.

![Threshold adjustment interface](image)

The threshold should be found automatically. It will be used for the product finding algorithm.

![Adjusted threshold](image)

If the separation of the products seems to be impossible, the shutter value should be changed!
Step 12: Input of the product quantity

Enter the number of products inside the blister. By means of this value the system will find all other products autonomously.

Step 13: Amendment of found products

If the result of the automatic teach-in process is un-requested you can correct the result manually subsequent. In most cases there are only a few products found on the wrong position. Those can be corrected by selecting Individual. With Each all product frames can be corrected at the same time.

It is also possible to correct all settings at a subsequent time: “Modify article” → “Correct product window”

Step 14: Teach in of one more blisters

In order to teach in one more blister, select “Yes”.

Afterwards only step 6 will be repeated. If all blister frames are set correctly confirm with “No”.

Step 15: Set up a foil window (optional)

If the advanced teach-in is activated you can choose whether you want to set-up foil-windows, which inspect the space between the pocket windows for fragments.

A faulty object within a foil window will be detected as such if it has a certain size. This proceeding facilitates to ignore little defects. The size of an object is set in the unity PIXEL. To get an idea of the unity on the bottom of the screen are displayed size equivalent rectangles. Of course a faulty object is not always quadratic and therefore just a standard gauge. If a defect is detected all blister windows are labeled as „bad“.

You can set a consecutive error for this control afterwards.

To modify anything belonging to the foil inspection: „Modify format“ → „Foil inspection”.

Step 16: Set up a reference window for brightness compensation

In order to compensate slight illumination fluctuations it is possible to set a compensation-measurement-window onto a reference spot.

Step 17: Automatic calculation of article tolerances

At this point you have to set the number of cycles the system run to acquire tolerances.
It is very important that during the training cycles only good products get checked. Defective products forge the calculated tolerances and the following control. During the process the **GOOD signal** is suppressed independent from reading result, so the machine will eject all taught blisters.

It is possible to correct the tolerances later by setting them manually or by a new automatic training process: “Modify article” → “Training of product tolerances”.

### 3.3.3 Modify format

This menu helps changing specific article settings.

The modification of the formats is password protected. Only authorized users get access to this menu.

#### 3.3.3.1 Correct product windows

In this menu existing blisters and product frames can be modified. In addition blister windows can be enabled or disabled.

**Step 1: Select the desired blister**

Choose the blister frame that should be modified. Only the frame that is selected in the menu blister can be seen.

**Step 2: Modify selected blister**

Decide if you want to correct the blister frame itself (choose “**Whole blister**”) or if you just want to correct product frames (press “**Only pockets**”). Choose “**Delete**” to delete the current blister.

**Step 3: Modify products (optional)**

Decide whether you want to correct individual pockets or all pockets at once.

**Step 4: Refresh tolerances**

Because of the changes made, it is necessary to evaluate the tolerances again. The teach process can be skipped by pressing the Button.
3.3.3.2 Foil inspection

This menu allows to modify the foil inspection settings:

Modify foil window
Change the size and the position of the already set up windows.

Add foil window
Create a new window and set up position and size.

Erase foil window
Delete an already set up window.

Modify inspection color
Switch between dark and bright.

Configure consecutive error
Set the threshold for the consecutive error

Minimal size of faulty object
Set the minimal size in PIXEL of a faulty object

Many respectively large foil windows extend the evaluation time notable. Consider this with your configuration.
3.3.3.3 Inspection criteria and tolerances

Parameters can be switched on or off and tolerances can be modified.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BLISTER- ENABLED</th>
<th>TOLERANCE(-)</th>
<th>TOLERANCE(+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capsule H1</td>
<td>ON / OFF</td>
<td>CHECK</td>
<td>CHECK</td>
</tr>
<tr>
<td>Area</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
<tr>
<td>Height</td>
<td>ON</td>
<td>8%( 1%)</td>
<td>8%( 1%)</td>
</tr>
<tr>
<td>Width</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
<tr>
<td>Position</td>
<td>OFF</td>
<td>10P( 0P)</td>
<td>10P( 0P)</td>
</tr>
<tr>
<td>FERMETER</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
<tr>
<td>SHAPE</td>
<td>ON</td>
<td>11%( 4%)</td>
<td>11%( 4%)</td>
</tr>
<tr>
<td>CONTOUR QUALI</td>
<td>OFF</td>
<td>0%( 0%)</td>
<td>0%( 0%)</td>
</tr>
<tr>
<td>FRAGMENTS</td>
<td>OFF</td>
<td>10%( 0%)</td>
<td>10%( 0%)</td>
</tr>
<tr>
<td>RED LEVEL</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
<tr>
<td>GREEN LEVEL</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
<tr>
<td>BLUE LEVEL</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
<tr>
<td>RED DISPERSION</td>
<td>ON</td>
<td>11%( 4%)</td>
<td>11%( 4%)</td>
</tr>
<tr>
<td>GREEN DISPERSION</td>
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<td>12%( 5%)</td>
</tr>
<tr>
<td>BLUE DISPERSION</td>
<td>ON</td>
<td>11%( 4%)</td>
<td>11%( 4%)</td>
</tr>
<tr>
<td>HUE LEVEL</td>
<td>ON</td>
<td>9%( 2%)</td>
<td>9%( 2%)</td>
</tr>
</tbody>
</table>

In the column „TOLERANCE(-)” and „TOLERANCE(+)”, the according tolerance value can be modified. (Values) are the system measured values (expressed as percentage). They cannot be modified.

If two-color-capsules are taught in, on the left side an entry named “Capsule H1/H2” is displayed. Press it to switch between the Parameters of capsule half one and two.

The adjusted tolerances affect the inspection. The measured values should only be modified if the result of the automatic teach-in process is not acceptable.

For a list of all parameters which can be measured see the chapter production run.

3.3.3.4 Shift register configuration
At this point you can modify the shift register configuration.

The table has two different views. The kind of view depends on the status of “PLC communication” which can be adjusted in the “Service” menu.
### PLC communication: OFF

#### Configuration for shift registers

<table>
<thead>
<tr>
<th>TRACK</th>
<th>STATUS</th>
<th>CAMERA-OUTPUT</th>
<th>CONSEC. ERR.</th>
<th>---</th>
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<tr>
<td>TRACK 1</td>
<td>ON</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 2</td>
<td>ON</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 3</td>
<td>ON</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>ALL TRACKS</td>
<td></td>
<td>CAMERA-INPUT</td>
<td>CONSEC. ERR.</td>
<td>ADD-ERRORS</td>
</tr>
<tr>
<td>INPUT 1</td>
<td>OFF</td>
<td>0</td>
<td>0</td>
<td>- 0+ 0</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
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### PLC communication: ON

#### View: top

#### Configuration for shift registers

<table>
<thead>
<tr>
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<th>STATUS</th>
<th>CAMERA-OUTPUT</th>
<th>CONSEC. ERR.</th>
<th>---</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRACK 1</td>
<td>ON</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 2</td>
<td>ON</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 3</td>
<td>ON</td>
<td>50</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 4</td>
<td>OFF</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 5</td>
<td>OFF</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TRACK 6</td>
<td>OFF</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>FILL INHIBIT.</td>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL TRACKS</td>
<td>CAMERA-INPUT</td>
<td>CONSEC. ERR.</td>
<td>ADD-ERRORS</td>
<td></td>
</tr>
<tr>
<td>INPUT 1</td>
<td>OFF</td>
<td>0</td>
<td>0</td>
<td>- 0+ 0</td>
</tr>
</tbody>
</table>

#### View: bottom

#### Configuration for shift registers

| PLC-In 1 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 2 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 3 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 4 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 5 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 6 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 7 | OFF    | 0             | 0            | - 0+ 0 |
| PLC-In 8 | OFF    | 0             | 0            | - 0+ 0 |
| TIMER-IN | OFF    | 0             | ---          | - 0+ 0 |
The table shows the following parameters:

**Status**: TRACK 1, TRACK 2, TRACK 3, TRACK 4, TRACK 5, TRACK 6, FILL INHIBIT., INPUT 1, PLC-In 1...8, TIMER-IN

The track status depends on the amount of enabled blisters. Each blister belongs to one shift register. The status is then not alterable.

In contrast, the status of the fill inhibition and of all inputs can be switched on. The fill inhibition can be assigned to a certain input.

The **TIMER-IN** is a time depended input for the standstill in production, that is set after the specified time.

**CAMERA – OUTPUT** specifies the amount of cycles to the output. The higher the value the further to the left the camera is positioned and the longer the shift register will be. Maximum is 250 cycles.

**CONSEC. ERR.** can be deactivated with 0. Is the value greater than 0 it will be checked for exceeding.

**ADD.-ERRORS** (additional errors) can be assigned to every input. If such an input will be activated not just a single cycle but additional according cycles before and after the signal input will be tagged.

**INPUT/PLC-IN** is used to shift auxiliary signals by means of the camera (status: ON). The inputs can also be used for ejection-counter-check (status: ECC).

Whenever a modification is made it will be visualized beneath the table.

The fill inhibition is a separate output. A coupled input signal doesn’t go to the end of the shift register but to the position where it is set.
### 3.3.3.5 Diagnosis

Here you find a list of all parameters which can be displayed during production run. If all parameters are enabled, results will be traceable easily. If the processing time is critical in time most parameters should be deactivated, because visualization needs some time.

List of all parameters:

- **Faulty Pictures** saves a screenshot on false reading
- **Total Counter** shows total counter
- **Partial Counter** shows temporary counter
- **Shift Register** shows shift register
- **Only First Defect** only the first parameter fault is shown
- **Always draw object frames** all object frames will be shown, not only the faulty ones
- **Draw object contour** the detected contours of all objects will be shown (deactivation may increase Performance)
- **Area Defect** in case of defect, an icon is shown
- **Position Defect** in case of defect, an icon is shown
- **Width Defect** in case of defect, an icon is shown
- **Height Defect** in case of defect, an icon is shown
- **Perimeter Defect** in case of defect, an icon is shown
- **Roundness Defect** in case of defect, an icon is shown
- **Bulge Ratio Defect** in case of defect, an icon is shown
- **Oblongness Defect** in case of defect, an icon is shown
- **Colour Defect** in case of defect, an icon is shown
- **Fragments Defect** in case of defect, an icon is shown
- **Contour Quality Defect** in case of defect, an icon is shown
- **Result of Area** the result of the calculated parameter is shown
- **Result of Position** the result of the calculated parameter is shown
- **Result of Width** the result of the calculated parameter is shown
- **Result of Height** the result of the calculated parameter is shown
- **Result of Perimeter** the result of the calculated parameter is shown
- **Result of Roundness** the result of the calculated parameter is shown
- **Result of Bulge Ratio** the result of the calculated parameter is shown
- **Result of Oblongness** the result of the calculated parameter is shown
- **Result of Colour** the result of the calculated parameter is shown
- **Result of Fragments** the result of the calculated parameter is shown
- **Result of Countour Quality** the result of the calculated parameter is shown

### 3.3.3.6 Training of product tolerances

All tolerances will be evaluated again. You can choose between a complete new teaching or just an enlargement of the current tolerances.

After entering the amount of cycles (1 to 50), images will be acquired and processed.

A progress bar displays the progress.

After the number of defined cycles has been reached, a table displays the new calculated tolerances.
3.3.3.7 Set the shutter value

Adjust the image brightness. Values >3ms can result in a blurred image if fast objects are inspected. Values between 0.5 and 2ms are recommended.

3.3.3.8 Intensity reference area

Under certain circumstances it can be necessary to activate the reference area. For instance if there are fluctuations of brightness in successive image captures (illumination is not constant). In this case a frame (similar to a blister frame) has to be set, that may only enclose a part of the background. It should have about the size of a product and to be set on a metal splint (not to dark/not to bright area).

3.3.3.9 Stains check

With this feature the Blister Inspection is able to detect tiny stains on the surface of a tablet. Make sure the background image contains a typically stained product.

For the detection several settings have to be adjusted:

1) **Mode of detection**
   Specify whether to check for bright and/or dark stains. This feature depends on the color channel the stains are checked in. Keep in mind that checking only for dark or bright stains is less power consuming than to check for both.

2) **Minimal stains size**
   Stains smaller than the specified size (in pixel) are ignored.

3) **Color channel for stains detection**
   Specify the color channel in which the detection is being processed. This setting is directly connected to the mode of detection.

   ![Color Channels](image)

   In this case in channel R-G both stain types appear dark. It can also be a good idea to check one of the stains in the B channel, because the contrast in this case is quite good.
3.3.3.10 Post-processing
This feature is used to change the shape of the products. One possibility is to close the products, which means that holes, e.g. made by letters on the capsules surface, are being filled. The other possibility is to open the products, which means that non-separable products can be separated from the background anyhow.

3.3.3.11 Separation
You can choose whether you want to separate the product from the background artificially. This might be in particular necessary if the contrast between product and background is significantly bad, so that a separation just with a threshold isn’t possible.

3.3.3.12 Tablet Orientation Variety
If this mode is activate the camera can detect the orientation of each tablet in each inspection cycle. This mode is needed, when the tablets width and height must be precisely recognized, while being located in a blister foil, where their orientation can vary. The orientation angle of the tablet will be detected depending on the precision value (5 = maximum precision).

Be aware, that the activation of this parameter and the increase of the precision will also increase the calculation time.

3.3.4 Rename format
Rename a desired article. After selecting the article and choosing a new article name, the selected article will be copied with the new name and the original will be deleted. The new copy will be loaded as the current article.

3.3.5 Copy format
Copy a desired article. After selecting the article and choosing a name for the copy, the selected article will be copied and then loaded as the current article.

3.3.6 Delete format
Delete a desired article from the camera memory. The current article cannot be deleted.

3.4 Statistics

3.4.1 Show faulty pictures
Displays the last 4 faulty images (erased after a system reset).

When viewing a faulty image it can be printed out or saved on your connected PC by using the according button.

3.4.2 Show error statistics
During the production a faulty counter for every single parameter is recorded in background. They can be viewed for fault analysis.

3.4.3 Reset statistics
All counters are set to zero.

Counters can only be deleted if no batch record is active.
3.4.4 Reset shift register
The content of the shift register will be reset completely, that means all entries will be set to BAD.

3.5 Batch record

With a batch record progression of the production can be documented. The program automatically applies the time, the user name and the statistics to the batch record at batch start. During the whole production the record can be accessed and displayed. By pressing the according button in the batch record menu, the batch data can be printed out or saved by the connected PC.

3.6 Acquire image

This menu can be used to make adjustments according to the trigger position. In the main menu there are two options the user can choose from: Live image and Use trigger. Without trigger the camera acquires images continuously without any external signal. With trigger the camera acquires only a picture if an external trigger signal is detected.

In this mode no processing will be done.

3.7 Consecutive error

In this menu the consecutive error can be switched on or off independent from the shift register settings.

The settings refer only to the good/bad signals of the outputs not to the inputs or the foil windows!
3.8 Service
Calling up the "Service" menu, requires the password in order to access the service settings.
The PCE default password is '000'.
The administrator can protect every menu with a password.

3.8.1 User management
In this menu users can be created as well as rights and passwords can be applied by the administrator (admin).

An additional user is added to this list by selecting an unused slot. If the user already exists his rights and his password can be changed.

The admin-entry enables you not just to change the password but also to set a number of adjustments regarding the whole password handling:

In the configuration of password levels, all checked password levels (red) of the admin can later be secured. All unchecked levels (blue) are free to entry by all users.

Those levels can’t be modified after the first user is added to this list, you will then have to delete all users first!

To achieve a maximum of flexibility with distributing rights you should check all levels.

The minimum password length is used to restrict the length of the password to a minimal size.

The automatic log-off is used to log-off a user after a specified time if he is located in the main-menu.

The password expirations is used to invalid a password after the specified number of days and to ask for a new password.
3.8.2 Configuration of result signals
At this point the behavior of output signals can be adjusted.

If both Signal change and Pulsed signal are not active the good respectively the bad signal are applied until the result has turned back.

If Signal change it is active a constant good signal is applied to the output. Only during processing and after a fail reading the good signal is neutralized.

If Pulsed signal is active only a short good signal is applied for a defined time.

The mode of coupling the result which can be configured in the table changes the behavior of the signal if more than one blister is set. If OR is selected all blisters apply their own signal according to the result. If AND is selected all blister results have to be good for a good signal.

If Inspection is off the output signal will pass all blisters as good (OFF:OK) or as bad (OFF:NOK) on every trigger. No processing will take place.

An output of the camera (OUT3) can be used to send a DataValid signal. If this function is activated, the camera will set a positive signal on its DataValid output, approx. 2 ms after the Good/Bad Signal is set. This way an external machine comes to know, when the result signals are available.

This function is not available if using a PLC. DataValid can only work, if Signal Change or Pulsed Signal is activated too. The signal duration is according to this configuration.

With DataValid activated, there is one Blister output less available. So, the number of separately evaluated blister tracks is reduced to a maximum of 2.

All signal settings whose output signal length depends on the evaluation time (Nr.2, Nr.8) are not supported while the PLC communication is active and will result in a conflict.
## Signal overview:

### Signal setup

8 states:

<table>
<thead>
<tr>
<th>Setup</th>
<th>Good-Signal</th>
<th>0V/24V</th>
<th>Pulsed Signal (PULS)</th>
<th>on/off</th>
<th>Signal Change (SC)</th>
<th>on/off</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Good</td>
<td>24V</td>
<td>off</td>
<td>24V</td>
<td>24V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Good</td>
<td>24V</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Good</td>
<td>24V</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Good</td>
<td>24V</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Good</td>
<td>0V</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Good</td>
<td>0V</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Good</td>
<td>0V</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>off</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Good</td>
<td>0V</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PULS</td>
<td>SC</td>
<td>on</td>
<td>24V</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.8.3 Clock Overflow

If it is activated the camera checks the trigger input during production and *machine stop* is triggered if the input signal is detected.

3.8.4 Image Transmission

In this menu the image transmission quality can be changed. A reduction of the quality can reduce the usage of the CPU so there is more Power for other operations like the inspection process.

The setting only influences the display quality of the image, it does not affect the quality of the acquired and inspected image.

3.8.5 PLC communication

This mode may only be activated if an adequate PLC is connected to the camera. Otherwise an inspection is impossible!

By activating this option the number of blisters rise from 3 to 6 and the number of inputs signals rise from 3 to 11 (resp. 1 to 9). In addition a special output for the so called *fill inhibition* is provided. This option can be activated and assigned to one of the 11 inputs.

During the whole production the camera is in contact with the PLC through the RS232 interface. If a communication error occurs a machine stop will be triggered immediately and a message will appear on the screen.

3.8.6 Security delay

This parameter is responsible for the behavior of the program if a machine stop has to be reset or the production run is left.

The camera waits for the specified time and than performs the desired action.

This prohibits that the camera doesn’t get all trigger impulses when the machine doesn’t stop immediately exiting the production run.

The parameter accepts integer values in the range between 1s (default) to 20s.

3.8.7 Multi cycle mode

In this operation mode the camera can take up to 8 images consecutively without making an evaluation. This is needed for multi cycle machines like the *UHLMANN UPS2*.

The signal translation from the fast to the slow shift register is done by an according PLC (*Keyence KV16* or *Siemens S7-200*).

The larger the amount of *consecutive images* is set the longer the period between two image taking cycles has to be because the evaluation is done in this period.

Select if you want the last image to be always displayed, or the last fault image.
3.8.8 Log-file
All manipulations at the system will be recorded in the log-file in form of an Audit Trail. The changes are
documented with date, time and kind of change, old value/new value and name of the current user.

The log-file should be also used if communication errors occur too often between camera and PLC.

In this menu you can also adjust the date and the time of the camera.

3.8.9 Extras

3.8.9.1 Negative inspection
In this operating mode a good signal is generated as long as all products are classified as “bad”.

This mode is needed if all light is blocked by foil and product and the camera doesn’t see any products
but the light is coming through if the pockets are empty.

In this case the teach-in process has to be done with empty blisters.

3.8.9.2 Additional shift-register
This option can only used in combination with the PLC Siemens S7-200.
It allows a double-shifting of the result signals by a constant cycle number.

This feature is used for machines with charge-recovery (means 2 eject stations per track).

3.8.9.3 Advanced teach-in
If activated you must select the color channel for the product separation for yourself during the teach-
in-process, even if you teach a one-color product. In addition you can activate the post-processing,
which may be useful when teaching difficult products.

3.8.9.4 Multi product
If activated different products in different Blisters can be taught.

3.8.9.5 Packet mode
If activated sequent cycles inside the shift register are managed as one package of a specified size. If
just one cycle inside a package is bad, all cycles inside this package are automatically set bad.
3.8.9.6 Empty pockets control

There are 3 possible modes:

“**OFF**” – System will reject blisters with empty pockets as normal errors. In this mode the camera will still recognize if tablets are missing but it may not distinguish between missing or wrong tablet errors although it will of course reject in both cases.

“**Do not eject empty pockets**” - Empty pockets will be recognized as good products and not be rejected. Before, the empty pockets have to be teach-in.

“**Eject empty pockets**” - Empty pockets will be recognized as errors and will cause a Bad-Valuation. Empty pockets do not have to be teach-in.

“**Empty Blister Ejection (OUT2)**” - Empty pockets will cause a Bad-Valuation of the blister. If the blister is completely empty, an additional Empty Blister Signal will be set on the camera Output (OUT2). By using OUT2 for the Empty Blister Signal, there is only one Good/Bad-Output for blister tracks available. If the camera is using a (optional) PLC for output extension, every Blister Track will have an individual Output Signal for completely empty Blisters.

For teach-in of the empty pockets the format tolerances has to be determined again after the activation. Furthermore during the determination all pockets have to be empty at least once.

3.8.9.7 Color Correction for Display

This is a color correction only for the display of the acquired image. It does not affect the acquired image itself and has no influence to the inspection.

The intensity of the three color channels R, G, and B for the three fundamental colors Red, Green and Blue can be corrected by a percentage value. A value of 100% denotes an unchanged intensity, a higher value intensifies the particular channel, a lower decreases its intensity. If you just want to make the displayed image darker or brighter, change all three channel corrections to the same value.

3.8.9.8 White balance

The image color depends on the color of the illumination. A white diode illumination is mostly blue. So a white paper would appear blue on the screen. To eliminate this effect a white calibration must be performed.
3.8.10 Language

The language of the user interface can be changed here. The corresponding language files must be installed on the camera. In some cases the currently existing language files are only available upon request.

German = cbi_de.222, English = cbi_en.222, French = cbi_fr.222,

Dutch = cbi_nl.222, Turkish = cbi_tr.222,

3.9 Modify password

Every user can modify his password anytime by activating this menu point. Make sure you never forget it, otherwise the administrator must reset your account.

3.10 Log off

Log out currently logged-in user right now. Same effect as turning into production.

3.11 Zoom View

The Zoom View enables you to take a look at a chosen area of the cameras image in its full resolution. Normally the cameras image is scaled down to fit the displaying area.

Press on the position into the cameras image which one you want to see in full detail. Press again to see the whole down-scaled image again.
4 Appendix

4.1 Function errors and error messages

<table>
<thead>
<tr>
<th>Function errors</th>
<th>Fault elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>System does not start:</td>
<td>Switch the system off and on again.</td>
</tr>
<tr>
<td></td>
<td>Check the connection leads.</td>
</tr>
<tr>
<td>System cannot be operated using control panel:</td>
<td>Is the key in horizontal position?</td>
</tr>
<tr>
<td></td>
<td>Switch the system off and on again.</td>
</tr>
<tr>
<td>System cannot be operated via PC:</td>
<td>Check the interface cable.</td>
</tr>
<tr>
<td></td>
<td>Is the correct port selected at the PC?</td>
</tr>
<tr>
<td></td>
<td>Are the interface parameters set correctly? (9600,N,8,1).</td>
</tr>
<tr>
<td></td>
<td>Does the terminal program support the cursor keys?</td>
</tr>
<tr>
<td>System does not record an image:</td>
<td>Check the trigger signal.</td>
</tr>
<tr>
<td>The recorded image is not sharp:</td>
<td>Check the distance from camera to product.</td>
</tr>
<tr>
<td></td>
<td>Correct productive settings.</td>
</tr>
<tr>
<td>Good products are recognized as errors:</td>
<td>Check tolerances, teach-in product again, if necessary.</td>
</tr>
<tr>
<td>No or just wrong products found:</td>
<td>Avoid reflections, teach-in product again.</td>
</tr>
<tr>
<td>Fault readings while production</td>
<td>Analysis window or measuring beams incorrectly positioned, set the window again.</td>
</tr>
<tr>
<td></td>
<td>Background not evenly bright.</td>
</tr>
<tr>
<td></td>
<td>Reduce reflections.</td>
</tr>
<tr>
<td></td>
<td>Shield ambient light.</td>
</tr>
<tr>
<td></td>
<td>Check references entered.</td>
</tr>
<tr>
<td></td>
<td>Teach new tolerances.</td>
</tr>
<tr>
<td>Fault readings at high speed</td>
<td>Reduce machine clock cycle.</td>
</tr>
<tr>
<td></td>
<td>Check whether trigger signal bounces.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error notice</th>
<th>Fault elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;!! Password is incorrect!!&quot;</td>
<td>Enter correct password.</td>
</tr>
<tr>
<td>&quot;Passwords are not identical&quot;</td>
<td>The second password must be identical with the first password.</td>
</tr>
<tr>
<td>&quot;I Product memory is empty!&quot;</td>
<td>A product must be taught in first.</td>
</tr>
<tr>
<td>&quot;I Product memory is full!!&quot;</td>
<td>No additional product can be learned. Before new characters can be learned, old characters must be deleted first.</td>
</tr>
<tr>
<td>&quot;Error loading device data Default settings are used&quot;</td>
<td>No data available in the camera. Error message appears only during initial switch-on.</td>
</tr>
<tr>
<td>&quot;!!! Memory is full!!!!&quot;</td>
<td>MD memory is full; delete products that are not needed.</td>
</tr>
<tr>
<td>&quot;!!! Flash memory is full!!!!&quot;</td>
<td>Flash memory is full; delete products that are not needed.</td>
</tr>
<tr>
<td>&quot;The flash memory cannot be cleared.&quot;</td>
<td>An error occurred during the loading process. Repeat loading. Or product is not available.</td>
</tr>
<tr>
<td>&quot;Error while deleting the product! &lt;&gt;&quot;</td>
<td>Repeat deleting. Or product is not available.</td>
</tr>
<tr>
<td>Chosen language not found!!!</td>
<td>The chosen language is not installed.</td>
</tr>
<tr>
<td>At least one article has to be created!!!</td>
<td>To activate this menu point you have to teach a product first or to load one.</td>
</tr>
<tr>
<td>No defect images present yet!!!</td>
<td>Since camera start no faulty products have been inspected</td>
</tr>
<tr>
<td>Statistical not data present yet!!!</td>
<td>Since camera start no inspection has been done</td>
</tr>
<tr>
<td>Double article name!</td>
<td>A product with the same name already exists</td>
</tr>
<tr>
<td>Not all products could be adapted to the reference product.</td>
<td>Repeat teach-in or correct singel products</td>
</tr>
<tr>
<td>The article could not be created successfully</td>
<td>Teach-in has been interrupted.</td>
</tr>
<tr>
<td>Maximum number of blister windows reached !</td>
<td>3 (6) blister windows already set</td>
</tr>
<tr>
<td>Maximum number of product windows reached !</td>
<td>50 products already found</td>
</tr>
<tr>
<td>No product could be found.</td>
<td>In the selected window no product has been found. Adjust size of product frame or take another threshold.</td>
</tr>
<tr>
<td>PLC communication interrupted</td>
<td>Check all relevant connections and the power supply.</td>
</tr>
<tr>
<td>PLC-error: syn. cycle</td>
<td>PLC detected the lost of the synchronization signal in multi cycle mode</td>
</tr>
<tr>
<td>PLC-error: trigger signal</td>
<td>PLC detected the lost of the trigger signal in multi cycle mode. Check the number of sequent images.</td>
</tr>
<tr>
<td>PLC-error: punching cycle</td>
<td>PLC detected the lost of the punch-signal in multi cycle mode.</td>
</tr>
<tr>
<td>PLC-error: web loop</td>
<td>PLC received the loop-error-signal from the machine.</td>
</tr>
<tr>
<td>PLC-error: xxx</td>
<td>all kinds of this notices result in a complete RESET of the shift register and...</td>
</tr>
<tr>
<td>Error Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PLC-error: ejection control</td>
<td>PLC detected a problem with the ejection of a blister. (shift register will not be reset)</td>
</tr>
<tr>
<td>PLC-error: wrong blister quantity</td>
<td>PLC detected a wrong number of blisters in one cycle. (shift register will not be reset)</td>
</tr>
<tr>
<td>PLC-error: encoder</td>
<td>PLC detected a problem with the encoder device. (shift register will not be reset)</td>
</tr>
<tr>
<td>Clock overflow</td>
<td>Machine stop is triggered because the image taking has started before the evaluation of the last image has been finished! Check if the trigger signal bounce.</td>
</tr>
<tr>
<td>CONSECUTIVE ERROR</td>
<td>The maximal number of sequent errors has been exceeded.</td>
</tr>
<tr>
<td></td>
<td>The source of error appears below this message.</td>
</tr>
</tbody>
</table>

### 4.2 Care

The equipment was specifically designed for industrial requirements. For this reason, reliable operation under the standard conditions found at production sites, is ensured as long as trained personnel installed the equipment.

Fault-free functioning requires that the glass cover of the camera housing be cleaned in regular intervals. Only cleaning tissues and detergents specifically intended for this purpose may be used.

The equipment itself does not have any wear components and therefore, does not require any maintenance. If failures of the illumination unit occur, please contact the customer service.
4.3 Technical data

4.3.1 Software

General:

- Integrated menu interface
- Several control options in one camera
- Full image analysis: up to 1600x1200 pixel (UXGA)

Control of tablets:

- Check of tablets, soft galantine capsules und capsules
- Up to 15,000 tablets per minute
- Compensation of brightness variations
- Max. 50 tablets in each blister
- Max. 3 (optional 6) blisters
- Common Foil Width 100 – 330 mm

4.3.2 Hardware

Camera housing: customer related

Voltage: 24 V DC / ca. 300mA

Image processing: digital signal processor for image analysis;

Input / Output: 4 outputs 24 V DC galvanically isolated, Not short-circuit-proof, protection for ext. voltages up, to 30V, 4 inputs 24 V DC galvanically isolated (max. 30 V), and response threshold: High approx. 14 V, Low approx. 3V;

Communication interface: RS 232; Ethernet;

Illumination: top flashed white-LED lighting system

Objective: Optional (standard 12 optional 8/16/25 mm)

PLC: Optional (Siemens S7-200 CPU224)