PRE-INSTALLATION FAX BACK CONFIRMATION CHECKLIST

Please return this completed form back to **BEST$_{nv}$** by fax, after the pre-installation of the **GENIUS Compact**
→ fax number : + 32 16 396 390

FROM : ……..……..…….(your company)

GENIUS Camera Sorter with serial number ……...was delivered at our premises on ……..…(date).

ITEM	**STATUS** YES / NO
- packed equipment : visible damage from the outside?	☐ ☐
- equipment unpacked?	☐ ☐
- unpacked equipment: visible damage?	☐ ☐
- all items from packing list present?	☐ ☐
- **GENIUS Compact** sorter unit mechanically installed?	☐ ☐
- optical laser box (option) mounted?	☐ ☐
- infeed shaker positioned?	☐ ☐
- accept/reject shaker(s)/belt(s) positioned?	☐ ☐
- infeed shaker electrically wired to **GENIUS Compact**?	☐ ☐
- accept/reject shaker(s)/belt(s) electrically wired to **GENIUS Compact**?	☐ ☐
- electrical connection 3 x 400V (+neutral and earthing) available?	☐ ☐
- separate electrical connection cooling unit available? (option)	☐ ☐
- piping air pressure supply: 3/4” (inch) connection?	☐ ☐
- piping water supply (for optional bull nose)?	☐ ☐
- piping cooling water to/from optional cooling unit: 3/4” (inch)?	☐ ☐
- infeed conveying equipment installed?	☐ ☐
- accept conveying equipment installed?	☐ ☐
- reject conveying equipment installed?	☐ ☐
- mechanical test of production line?	☐ ☐
- product available?	☐ ☐

Responsible person in the factory during installation : ……...

I, …… hereby declare that the above status description is correct and that the **GENIUS Compact** is ready for commissioning by the **BEST$_{nv}$** Service department on: ……..…… (date).

date & signature :……..……..

Pre-installation checklist/

Confirmation fax

We would be most grateful if you could please fax this checklist to us when all relevant items have been taken care of.

The installation engineer can only leave for your company after we have received this completed and signed checklist, confirming that all is ready for the installation.

If you have any question or problem concerning this checklist,
or any other item having to do with the pre-installation for which the answer cannot be found in the Pre-installation Guide (chapter 2),
do not hesitate to contact our service department.

BEST n.v.
Belgian Electronic Sorting Technology

Compact Version

GENIUS
Optical Sorter

OPERATORS & MAINTENANCE MANUAL

Version 0.1 UK

This Machine is a Product of BESTnv.

Copyright

Dear User,

You are now the proud owner of a new, state of the art **GENIUS** *Optical Sorter and we at* **BESTnv** *would like to congratulate you on your latest purchase. We are convinced the* **GENIUS** *will constitute a serious contribution to improving the final quality of your products and increasing your competitive position on the international market.*

We, the people at **BESTnv***, feel that selling a sorter is not simply the happy end of a story, we consider it as the beginning of a long relationship between our two companies, based on trust and professionalism. Even after the contracts have been signed, our sales team will remain fully at your disposal. Please do not hesitate to contact us in case you have any further questions or remarks.*

We strongly believe that the professional and trustworthy relationship between our two companies, gradually built up by our sales people during the negotiations, will be adopted by our after-sales team and our service engineers. Their customer-oriented problem-solving attitude reflects the philosophy that can be found everywhere at **BESTnv** *and constitutes the central core of our strategy: "A real professional treatment does not end when the customer has signed the contract, this is merely a starting point."*

We hereby wish you and your company a very successful future and are proud that we have been able to contribute our share.

Bert Van der Auwera
Director Sales & Marketing

0. Table of Contents

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Safety

Preface A: General Safety

This manual contains all user information for the **GENIUS Compact** Optical Sorter. Included herein is support for operating, maintaining and servicing the **GENIUS Compact** Optical Sorter.

Read this manual carefully before operating the GENIUS Compact Optical Sorter for the first time. Special attention should be given to the material in:

- Preface B, Electrical safety:
describing all the safety features and the safety measures to be taken with regards to a safe use of the electrical installation.

- Preface C: General & Mechanical Safety:
describing all the safety features and the safety measures to be taken with regards to a safe use of the general & mechanical installation, and especially the moving parts.

If this GENIUS Compact configuration is equipped with a laser box (only for GENIUS Compact-L(aser) and GENIUS Compact-D(ual) configurations):
- Please check the Laser Safety part of Chapter 10, describing all the electrical safety features and the safety measures to be taken with regards to a safe use of the laser box.

Adapting safety features, wrong use of controls, or performance of procedures other than those specified in this manual, can result in unsafe situations that can be harmful for workers and/or sorter installation. (a.o. hazardous radiation exposure if laser box is present)

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Preface B:
GENIUS Compact Electrical Safety

Electrical Safety

- The **GENIUS Compact** Sorter uses AC and DC voltages, all power requirements can be found in chapter 2 under **2.3. Technical Data**.

- Service should be provided by qualified personnel, authorized by **BESTnv**.

- Always follow the electrical safety procedures when handling the electrical installation (see **Basic Electrical Safety Procedure** and **Main Power Safety Procedure** later in this chapter).

Basic Electrical Safety Procedure

During maintenance and service of the electrical installation and when repairing or adapting the electrical installation, all power to the installation should be cut, except to the main power switch installation.

Picture: Main power switch OFF

In order to ensure the safety of the maintenance and service personnel the power should be cut by pressing the Emergency button and locking the main power switch in the OFF position, using a padlock with a shackle of 6 to 8mm thick in cross section, as indicated in the picture above (see also Main Power Switch Safety label).

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Main Power Safety Procedure

When installing the **GENIUS Compact** sorter or when replacing the main power switch installation, all power to the installation, including the main power switch, must be cut, in order to ensure the safety of the maintenance and service personnel.

In order to accomplish this, all power connections to the sorter and related machinery should be cut, either by use of circuit breakers or by removing the appropriate plugs from their sockets. In order to be absolutely safe, it might be advisable to check, using a voltmeter, that the main power switch or any other part of the installation is not charged.

Emergency Stop

In case of emergency press one of the Red/Yellow buttons (see picture) on the sorter. The electrical power to all moving parts on the machine and to the lighting installation will be cut immediately.

Attention: ***- Do not use the Emergency Stop for routine shutdown!***
- Frequent use of the Emergency Stop may result in damaged equipment or premature failures of certain electrical or electronic components (see Emergency Stop Label underneath).

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Preface C:
GENIUS Compact General & Mechanical Safety

General Safety:

To ensure the safety of all users: operators, cleaning and maintenance personnel, it is important that all safety measures the **GENIUS Compact** Sorter has been equipped with (such as Emergency buttons, fixed or removable guards, safety switches, warnings signs, etc...) are present and functioning. Never tamper with any of these safety measures.

Emergency buttons should be pushed immediately whenever something may be going wrong, either with the installation, or with one of the workers nearby. When the machine is stopped this way, it can not accidentally be restarted, but must be started with a deliberate sequence of actions (see chapter 4).

It is generally advisable to give access to the machine only to those people who are aware of all safety risks involved and are trained to operate such machinery.

It is recommended to always wear protective clothing when entering a production area and always take all hygienic guidelines and rules into account.

Mechanical Safety:

A number of simple rules should be taken into account when working with the **GENIUS Compact** sorter installation:

- Always check everyone is at a safe distance before switching on the detection belt, the infeed shaker and/or the return system(s).

- Verify that no loose objects are lying on the detection belt, infeed shaker and/or return system.

- Before switching on any part of the sorter installation, make sure nobody is working on, in or under any part of the machinery, including infeed shaker and return system.

- Never touch, or put objects on the detection belt, the infeed shaker or the return system when these are functioning.

- When working with or near the sorter unit, never wear loose clothing or other loose attire that might get caught between any belt and drive drums or return axles or could wind itself round rotating objects, such as background drums, etc... .

All maintenance and cleaning activities (see chapters 6 & 7) should be performed with the machine switched off, except if specifically indicated otherwise.

When in doubt, or when special and complicated procedures are required, please do not hesitate to contact **BESTnv** for advice or to arrange a visit by an experienced service engineer.

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Attention!

- Non-compliance with safety instructions on the machine or in this manual may cause severe injury to personnel and major damages to the installation.

- Make sure all personnel that works with or in the vicinity of the* GENIUS Compact *is properly instructed and up to date on all safety and operating instructions.

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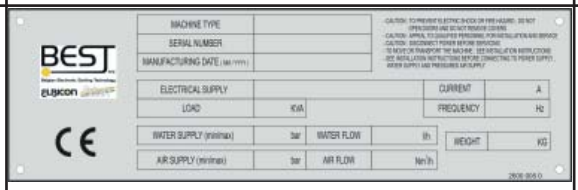
Preface D:

GENIUS Compact Safety Labels

Below you will find a list with pictures of all safety labels located on the **GENIUS Compact** installation. For more info on the exact position of the labels, consult the pictures on the pages following the list.

Nr.	Label name	Picture	Position
000	Identification plate		1- Left side of sorter unit.
013	Electricity Label (large)		1- In the middle of all doors and cabinets containing electrical installations.
014	Gear wheel Label (large)		1- On all doors and/or cabinets containing moving parts (e.g. gears, etc...).
015	Electricity Label (small)		1- Next to the electricity racks inside the cabinet of the sorter unit.
016	Gear wheel label (small)		1- On the covers of smaller gear boxes (e.g. background drum gears).
017 UK	Lock Main Power Switch		1- Underneath main power switch on sorter unit.

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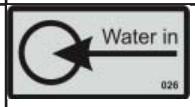
018 UK	Hibernation		1- Upper corners of sorter unit doors on both sides.
019 UK	Emergency Stop		1- Underneath every Emergency stop on the sorter unit.
021 UK	Doors closed		1- In the centre of every door of the sorter unit, next to the lock.
022 UK	No welding		1- Top or bottom of sorter unit doors on both sides. 2- Both sides of shaker pan.
023 UK	No high pressure		1- Above Touchscreen display on door of sorter unit.
025 UK	Service Label		1- Inside door of sorter unit.
026 UK	Water in		1- Next to water connections underneath or on top of sorter unit.
027 UK	Water out		

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030 UK	Main Power Switch		1- Above main power switch on sorter unit.
031 UK	No step		1- On top of rejection unit. 2- On top of Laser box (if present).
044	CE-label (only in EU)		1- On identification plate on sorter unit.

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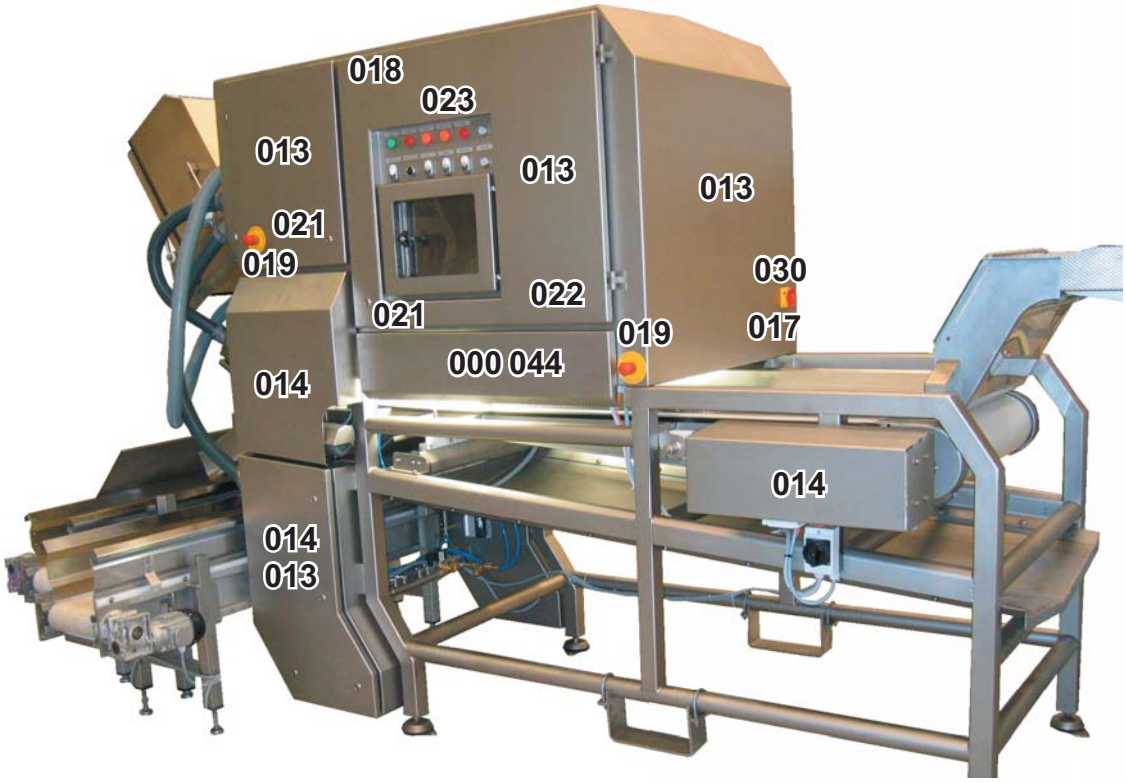
THE POSITION OF THE DIFFERENT LABELS

Picture: Left front view **GENIUS** Compact installation (with laser box)

Picture: Left rear view **GENIUS** Compact installation (with laser box)



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Preface E:

GENIUS Compact optical sorter Warranty & Responsibility

If not otherwise agreed in writing, the following rules apply to claim warranty :

- The warranty is limited to the warranty period mentioned in the contract.
- Failures caused by lightning, floods, storm or other environmental events are excluded from warranty.
- Failures during warranty period have to be reported to the Vendor within 24 hours.
- During warranty period the defective parts must be returned to the Vendor within 30 days after the report of the problem in order to claim warranty.
- Warranty excludes the loss of production caused by the failure of the machine.
- Failures resulting from an error made by the operator are excluded from warranty.
- Damages caused by the Purchaser while moving the machine are excluded from warranty.
- No changes to the electrical wiring can be done without written permission of the Vendor.
- No mechanical adaptations can be done without written permission of the Vendor.
- No electronic adaptations can be done without written permission of the Vendor.
- All cleaning detergents have to be approved in writing by the Vendor.
- The machine cannot be installed in corrosive environments.
- User is at all times responsible for the quality of water, compressed air and electricity.
- Components damaged by over-voltage are not covered by warranty.
- Environmental temperature has to be within the limits described in the technical annex attached to the contract or if different it must be specified at the moment of the order.
- No welding may be done on or near the machine.
- If something has to be mounted on the machine, clamps have to be used instead of fixing holes or welding.
- To claim warranty the maintenance program, as described in paragraph **8.2 Essential maintenance tasks**, under Weekly, Monthly, Yearly and Preventive Maintenance, must be applied to the **GENIUS Compact** optical sorter.

BESTnv cannot be held responsible for unsafe situations, accidents, failures or damages which are caused by disregard for warnings and prescriptions as indicated in this manual.

- Laser box (if present) may not be opened without explicit written permission of the Vendor.
- The **GENIUS Compact** can only be used for the purpose it has been sold for, as described in the contract.
- The Vendor cannot be held responsible for failures caused by the use of other spare parts than those approved by the Vendor.
- The Vendor cannot be held responsible for safety hazards caused by the Purchaser as a result of removing or adapting the safety circuits and/or components.

A distinction is being made between normal daily use (operator), normal maintenance and service. This distinction was made because of the different requirements to be met by service personnel, maintenance personnel or operators.

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I. Introduction

1.1. The GENIUS Optical Sorter Platform

The **GENIUS** optical sorter is an extremely versatile and efficient sorter platform that can be adapted by means of different configurations and combinations to sort a large variety of products, including fresh and frozen vegetables, potatoes and chips, up to shrimps and prawns.

The basic sorting system has been developed in the year 2000 and has since been continuously updated and redesigned, using state of the art optics and electronics, sturdy and reliable mechanics, combined with stable and user friendly software solutions.

The **GENIUS** platform can be equipped with camera's in different positions and configurations and to top it all off, a laser box can be added, giving the **GENIUS** all the advantages of a state of the art camera sorter combined with all the advantages of the newest laser sorters.

The **GENIUS** platform is equipped with the new **POLLUX** operating system, consisting of state of the art electronic hardware, including a dependable industrial computer and touchscreen display, and specifically developed software with conveniently arranged and user-friendly menu structures containing numerous options and special algorithms for different product types.

The latest version, the **GENIUS Compact,** a smaller and more compact version of the original **GENIUS** platform, can even be equipped with a state of the art **BESTnv** laser box to further improve its sorting capabilities.

Picture 1.1: the **GENIUS Compact** optical sorter (T-version)

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1.2. Reliable operation and performance

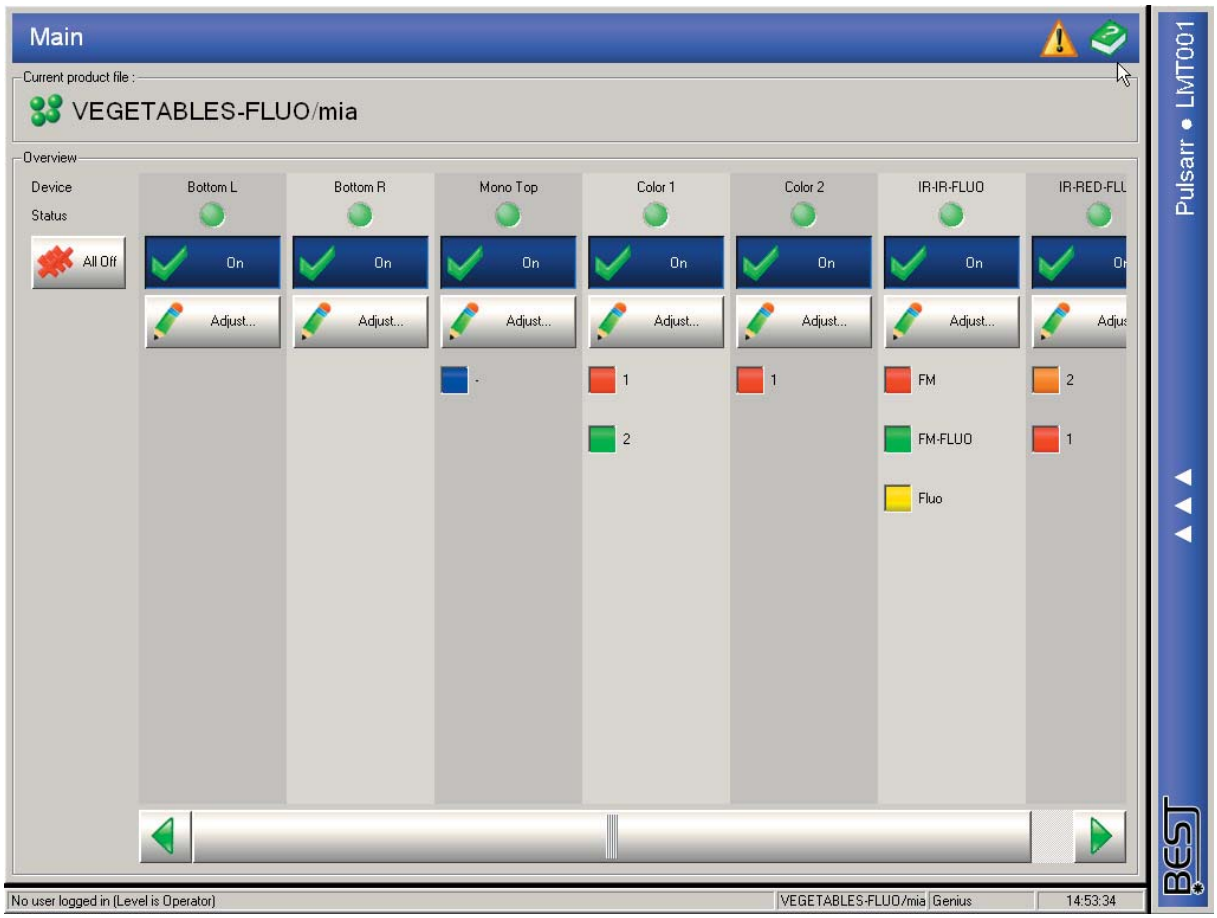
Industrial production operators and quality control managers alike depend on their electronic sorters to provide a clean unpolluted product under a wide variety of operating conditions. This is why **BESTnv** makes easy operation and reliable performance the top priorities when designing its sorters. The use of the most advanced electronics and high-tech optical and electrical techniques integrated in a dependable mechanical feed system makes the **GENIUS** a very robust and user-friendly production workhorse.

Production and quality assurance departments will achieve a decidedly superior quality, thus increasing the value of the finished product and improving the market position of their company, day after day, year after year.

1.3. Easy to set and operate

Apart from switching the power to the machine and certain specific parts on and/or off, the **GENIUS** is operated entirely via touchscreen, the **GENIUS** is operated via touchscreen, featuring the new **POLLUX** operation program, with a very user-friendly and conveniently arranged structure. This makes it very easy to operate, even for those possessing no computer skills whatsoever.

Picture 1.3: Touchscreen main menu



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1.4. Flexibility in Optical and Mechanical Configurations

The **GENIUS** platform can be equipped with 1 to 6 cameras in different positions and combinations. The high resolution monochromatic or RGB colour camera's enable the **GENIUS** to do full colour sorting to remove blemishes, defects and a certain amount of foreign objects. Depending on the product and the specific needs of the customer, a number of special camera options are available, such as: full surround view, angular & perpendicular positioning, shape sorting, etc. ...

The laser box option can be equipped with Colour, Infrared or Fluo laser technology, which allows added colour sorting, structural sorting through the light diffusion technique and Fluo sorting. Thanks to these different options and different combinations of laser and cameras, high quality sensors and high quality electronics and computers, the **GENIUS** can detect up to very small differences in colour, shape, structure and/or fluorescence, in order to separate the inevitable impurities and foreign material from the good product in a production line, in accordance with the customer's wishes.

At the moment there are several basic configurations of the **GENIUS Compact**. Each available with specific optical and mechanical options, and each specifically developed for its ability to detect those defects, or sort those products, that are especially suited to your unique situation.

1.5. Principles of operation

A feed shaker spreads the product uniformly on the high-speed conveyor belt over a width of 640 or 1200 mm. The **GENIUS Compact** is available in several configurations with different types of acquisition systems and illumination sources.

In the inspection zones, which can be either on the belt or in flight, the product will be scanned along with the defects. The defects will be identified and evaluated, as determined by the customer in advance, with simple and efficient settings. A few milliseconds later the defects are hit by a precise, yet powerful burst of air from one of the high-speed air valves in the rejection zone. This causes the defects to be diverted from their natural trajectory and end up in the reject, while the good product continues its way.

Separation of good product and reject is complete at this point and further transportation of the product can easily be arranged as required by the customer's production flow.

The **GENIUS** is a very user-friendly sorting platform. Replacing the belt, for instance, will only take about ten minutes.

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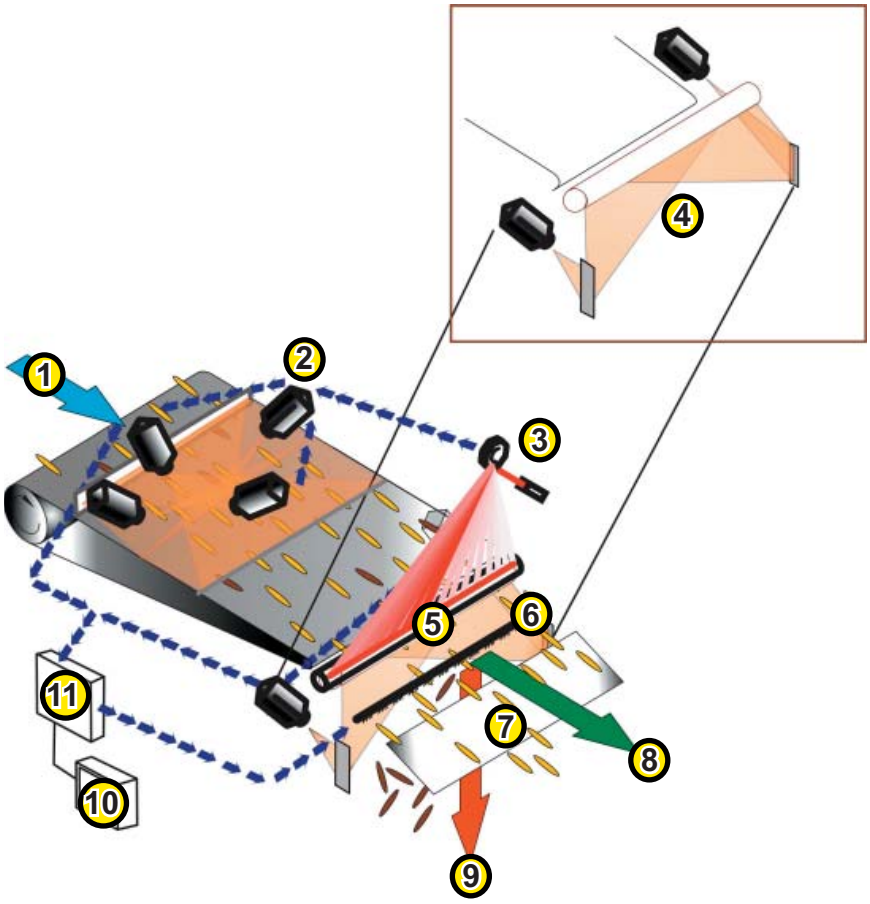
Picture 1.5: Principle of operation



1. Product Infeed Area
2. 4 cameras (Optics zone 1: 1 to 4 camera's)
3. Laser box (Optics zone 2: 2 camera's or laser box)
4: 2 bottom camera's (Optics zone 3)
5. Reference Drum
6. Rejection Unit: High Speed Air valves
7. Separation Plate
8. Accept Flow
9. Reject Flow
10. Touchscreen Operation Panel
11. Sorting Computer

1.6. Minimum maintenance

In order to make this machine as user-friendly as possible the maintenance work is reduced to an absolute minimum. Apart from the moving parts (i.e. the belt system) and some optical components (especially windows) that have to be cleaned and checked regularly, the **GENIUS** needs very little maintenance. The electrical components are virtually failure proof and a diagnostics system monitors the integrated circuits at all times. Alarm messages will appear on the touchscreen whenever anything is out of order.

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GENIUS Compact Optical Sorter

Pre-installation Guide

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II. Unpacking and placing of GENIUS Compact *sorter*

2.1. Unloading and unpacking

The **GENIUS Compact** optical sorter and any other equipment delivered will be unloaded and unpacked by the Purchaser. If while doing so the Purchaser detects any damage, he will inform **BESTnv** within three working days from receipt. He will also take all necessary measures to be able to prove the nature and extent of such damage (by taking photographs or recording on video). If the Purchaser detects any freight damages, he will make a reservation on the carrier's waybill (CMR - document).

**Please contact us if you notice any damages,
either on the plastics covering the parts (if present)
or on the outside of the machine parts.**

Attention:
**In case any parts are damaged,
please take pictures and
describe the visible damage and
send the information to:**

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Marinus van Meelweg 20,
5657 EN, EINDHOVEN,
THE NETHERLANDS**

**General tel. +31 (40) 292 2622 -
Service tel. +31 (40) 292 2620 -
Fax. +31 (40) 292 2633 -**

Email: service.pulsarr@bestnv.com

or

**BESTnv
Research Park Haasrode
Romeinse straat 20
B-3001 HEVERLEE
BELGIUM**

**General tel.: +32 (0)16 396 396
Service tel.: +32 (0)16 396 386
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Email: info@bestnv.com**

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2.2. Machine parts

The machinery will normally be loaded directly on the truck. It may be packed in crates depending on the mode of transport (by boat). Certain additional parts and spare parts may be sent along with the **GENIUS Compact** sorter unit.

Table 2.1a: GENIUS Compact 640

Machine Part	max. Dimensions (mm/inch)			Weight (kg/lbs)
	Length	Width	Height	
GENIUS C unit	3345 (131.7)	1279 (50.4)	2317 (91.2)	max. 1800 (4000)
Infeed Shaker	1800 (70.9)	650 (25.5)	1268 (50)	max. 750 (1650)

Table 2.1b: GENIUS Compact 1200

Machine Part	max. Dimensions (mm/inch)			Weight (kg/lbs)
	Length	Width	Height	
GENIUS C unit	3345 (131.7)	1930 (76)	2317 (91.2)	max. 2200 (4850)
Infeed Shaker	1800 (70.9)	1300 (51)	1268 (50)	max. 1000 (2200)

List of parts on the crates:

1 **GENIUS Compact** optical sorter + 4 Adjustable Feet
1 Infeed Shaker + 4 Adjustable Feet
1 Accept Shaker/Belt (sometimes mounted on sorter frame) Optional
1 Reject Shaker/Belt (sometimes mounted on sorter frame) Optional
Return system (shakers/belts for DRS or ARS system) Optional
1 Set of door keys
Background Drums (if necessary) Optional
2 **GENIUS Compact** Manuals
1 Standard Spare Parts Box (see list below) Optional

List of standard spare parts (recommended):

1 Power Supply Astec MVP1, 100V - 240V, 15A
1 Power Supply Astec MVP4, 100V - 240V, 7A
1 Power Supply Omron S82K - 10024, DC 24V, 0.1A - 4.2A
1 Airco Filter
4 Air Gun Valves

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2.3. Technical data

On the location where the GENIUS Compact will be placed in the production line, the necessary piping for water and compressed air and the wiring for electricity have to be provided by the Purchaser.

For information on the correct position of each connection, please check the pictures further in this chapter:

Electrical requirements

Voltages	: 3 phase 400V (+ neutral & earthing)
Electrical power	: 4 kVA
Frequency	: 50 (or 60 Hz USA)

For an incoming electrical supply of 3 x 400V a fuse of 25A will have to be used, with 4 mm² (14 AWG) wires. The fuse needs to be at least CLASS C, with a switch-off current of 10 to 14 times the nominal current.
If these voltages are not available in your factory, a separate transformer can be provided by **BESTnv** on specific demand.
The water cooling unit (optional) requires a separate power supply, for more info, please check the cooling manual in the Attachments chapter of this manual.

Compressed air requirements

Pressure	: 6-7 bar (90-100 PSI) (on the sorter connection)
Typical consumption	: 400/1500 L/min (14/53 cfm) depending on configuration
Max. consumption	: 10000 L/min (177 cfm)
Quality	: filtered 40 µm oil, water and dust free
Connection	: 3/4” (3/4 inch) (Gaz)
Tubing	: 2” (2 inch) tubes

Nitrogen specifications : N_2 - Grade 5.0

Purity (vol/vol%)	: 99.999
Cylinder size-contents	: B50 - 10 m³
Outlet nitro bottle must be	: G 1/2” (inch) x 14, male

Attention! ***- It may be necessary for the Purchaser to buy a coupling piece if the connections of local nitrogen bottles do not match these requirements.***

Water requirements

Water pressure	: between 1 and 3 bar (15 to 45 psi)
Temperature	: between 5°C and 12°C (41°F to 54°F)
Max. consumption	: +/- 500 l/h (132 gal/h)
Connection cooling water	: 14 mm (0.55”) inside, inlet and outlet
Connection bottom clean	: 3/4” (3/4 inch) (Gaz) inlet
Quality	: lime-free and reusable (add glycol if necessary, see cooling manual). When using distilled or demineralized water, please pay attention to the compatibility with the materials and to the minimum conductivity that lever sensor may relieve (80 µS). See Cooling Manual in Attachments.

There are several water connections on the **GENIUS compact** sorter, depending on the configuration: on top of the sorter unit (cooling in/out), underneath sorter unit (cleaning bottom unit and cleaning belt). For more information on the exact position of the different connections, please check the pictures on the next pages and the electrical schematics in the Attachments chapter.

Technical schematics and pictures are always seen in the same direction as the product stream, please take this into account when interpreting left or right in this manual.

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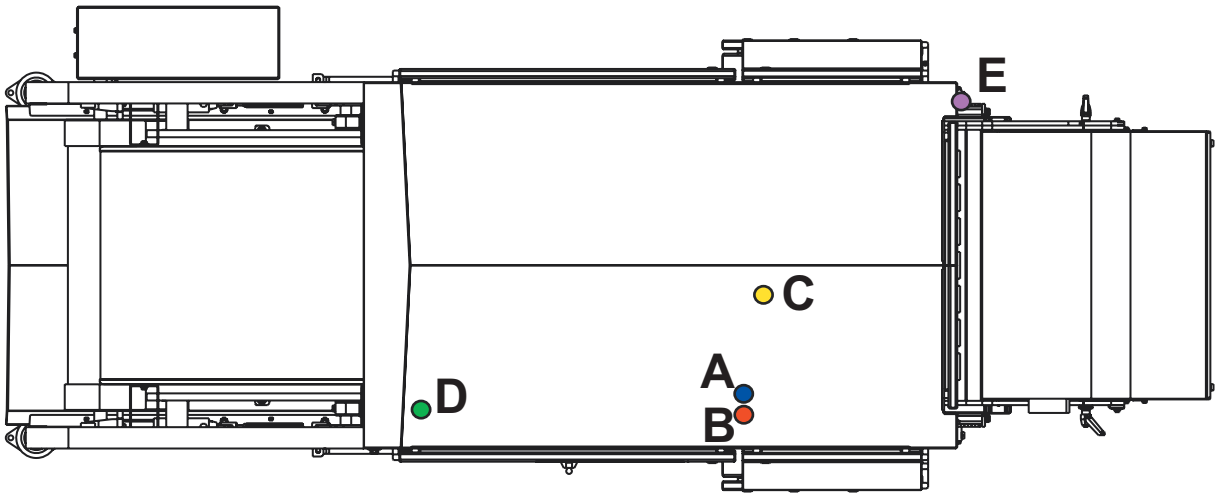
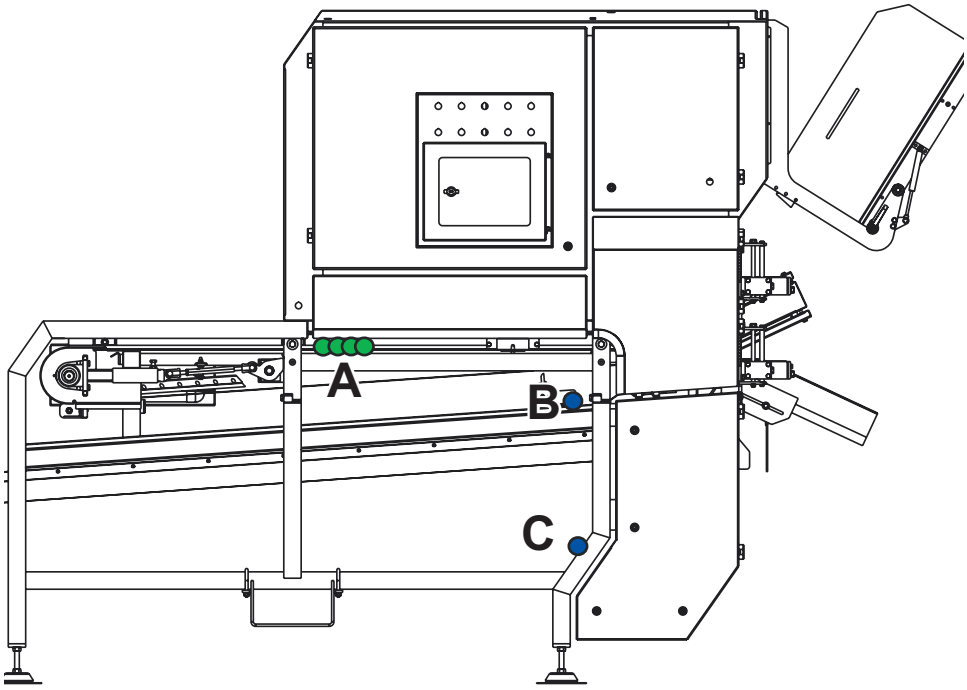
Picture: Top view Genius 640: water, electricity, nitrogen & compressed air connections



A: **Water input; from cooling unit (14 mm / 0.55” inside)**
B: **Water exit; to cooling unit (14 mm / 0.55” inside)**
C: **Compressed air supply (3/4” Gaz)**
D: **Electricity supply sorter**
E: **Nitrogen connections (only with laser box option)**

Picture: Side view Genius 640 water for cleaning & connections for belt and shaker motors



A: Connections to Belt motor & Shaker motors (usually on same side as belt motor).
B: Water connection for belt cleaning system
C: Water connection for cleaning syst. FSV unit (option) underneath sorter (3/4” Gaz)

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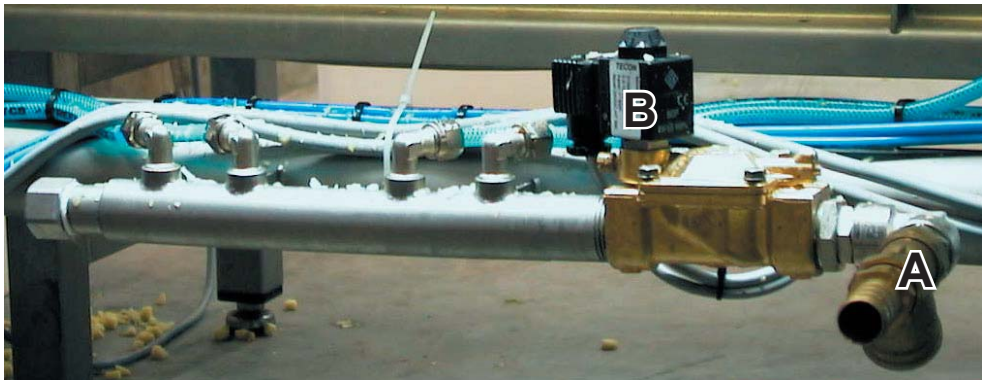
Picture: Water supply for cleaning system FSV unit (option) underneath sorter unit



A: Water input for cleaning system FSV unit (option)
B: Electronic water valve

Picture: Belt cleaning system underneath belt, with water connections on both sides

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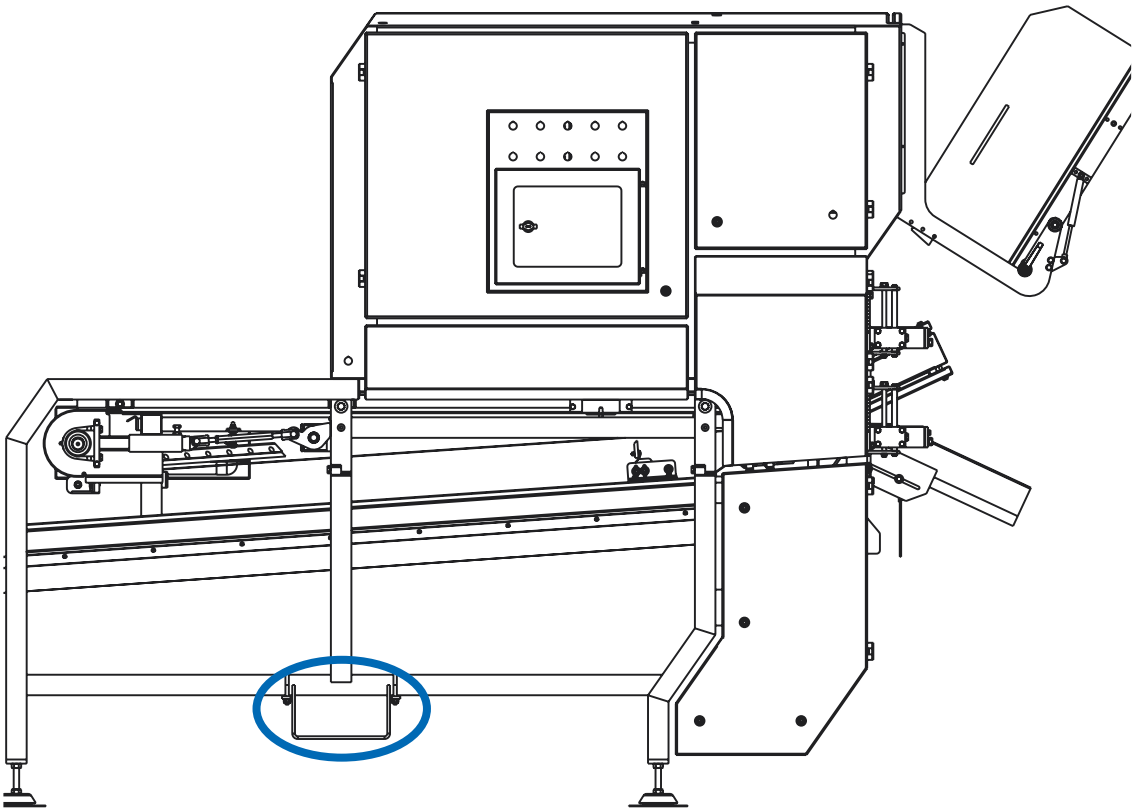
2.4. Installation

2.4.1. Lifting the GENIUS Compact sorter unit

Always use proper lifting equipment adequate for lifting a machine of this size and weight. The **GENIUS Compact** sorter unit weighs maximum 2200 kg / 4850 lbs (1200 mm type) or 1800 kg / 4000 lbs (650 mm type). Please, be aware of the fact that the **centre of gravity is NOT in the middle of the machine**.

When using a forklift to lift the **GENIUS Compact** sorter unit, please note the lifting handles that have been mounted on the frame for this purpose. Put the one part of the fork of the forklift in the handles, and the other underneath the cabinet, to ensure the weight of the unit is properly divided. These handles can be removed by the customer. When moving the sorter unit, please first place back the lifting handles.

Picture 2.4.1: Lift sorter unit using the handles on tube frame underneath the sorter unit



After the sorter unit has been placed in the production line, it must be placed level. This is very important, especially for the rotating parts such as the drive drum and the return axle of the conveyor belt. It should be sufficient to check the position of the tube frame underneath the sorter unit. Adjustments can be made using the adjustable legs underneath the machine.

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2.4.2. Placing the different units

Once the **GENIUS Compact optical sorter unit** (see **2.5.2. The GENIUS Compact optical sorter unit**) has been placed in the production line, lift the shaker unit and turn in the adjustable feet (see pictures).

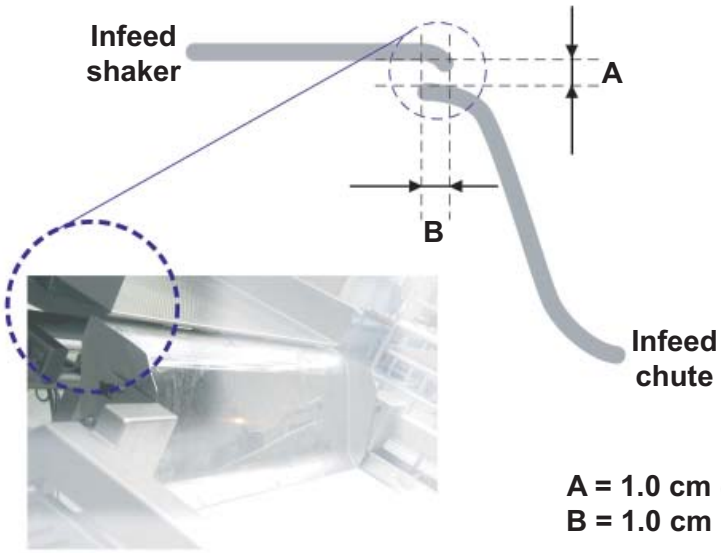
- Move the shaker up against the front of the sorter unit:
  With infeed chute: the gap between the infeed shaker nose and the infeed chute of the sorter unit should be no more than 1.0 cm (0.4") in height. The nose of the shaker should overlap the beginning of the infeed chute by approximately 1.0 cm (0.4").

  Without infeed chute: the gap between the infeed shaker nose and the belt drive drum should be no more than 1.0 cm (0.4") in height. The nose of the shaker should overlap the highest point of the belt drive drum by approximately 1.0 cm (0.4").

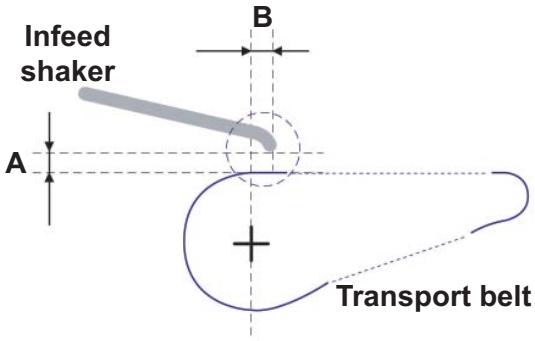
(For further details see **2.5.3. The Infeed shaker**).

Picture 2.5.11: Relative position of infeed shaker

(sorter with infeed chute)



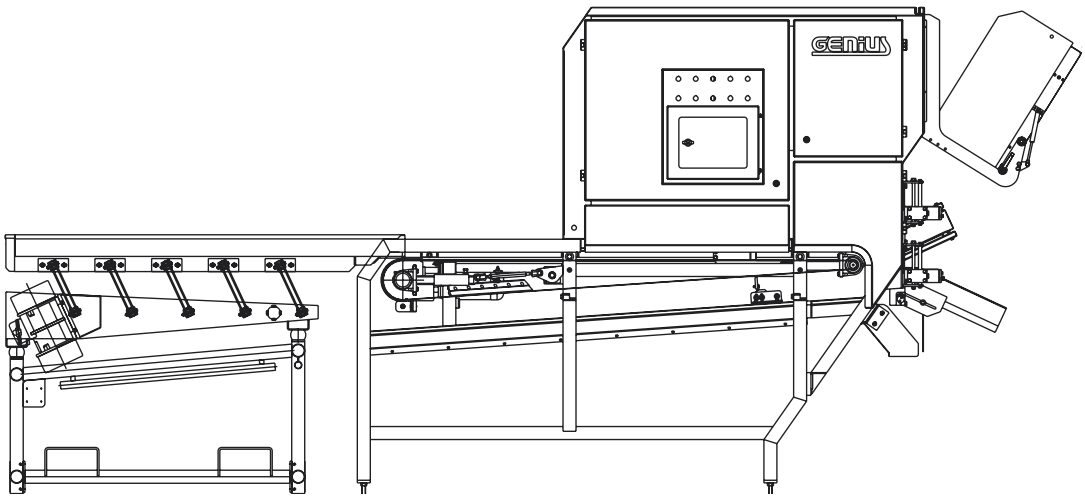
(sorter without infeed chute)



A = 1.0 cm (0.4")
B = 1.0 cm (0.4")

Attention: ***- Do not fix the sorter unit or the shaker frame to the ground before the final position has been determined and approved by* BESTnv*'s service engineer during the commissioning.***

Picture: Placing the shaker unit



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Next the **Accept/Reject Shaker(s) / Belt(s) (optional)** should be placed underneath the sorter unit.

- In some cases the accept/reject shakers/belts have already been mounted and fixed underneath the sorter unit in the factory before the sorter installation is shipped.

- When the shakers/belts still have to be installed, please go to subchapter **2.5.4.: Accept/Reject Shakers/Belts (optional)** for more info. It is always advisable to place the output sides of shakers/belts on the side of the touchscreen, so as to enable the operators to easily check the accept and the reject (e.g. the percentage of good product in the reject) while setting the sensitivities.

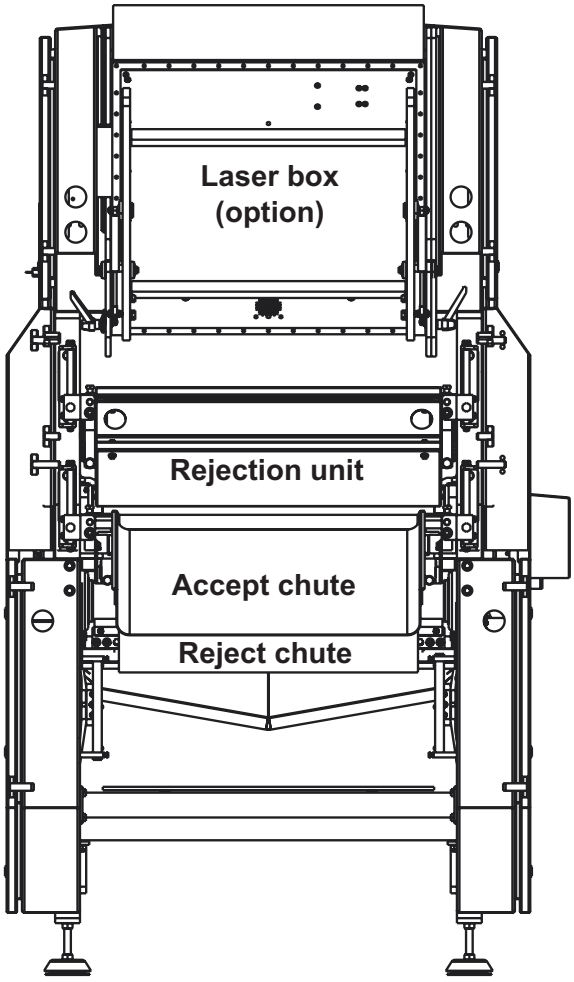
And finally, all extra optional equipment that may be necessary, such as cooling unit, compressor, etc..., should be placed.

When the optical sorter unit, the infeed shaker, the accept/reject belt(s) (optional), and all other optional equipment have been placed in the production line, they should be placed level.

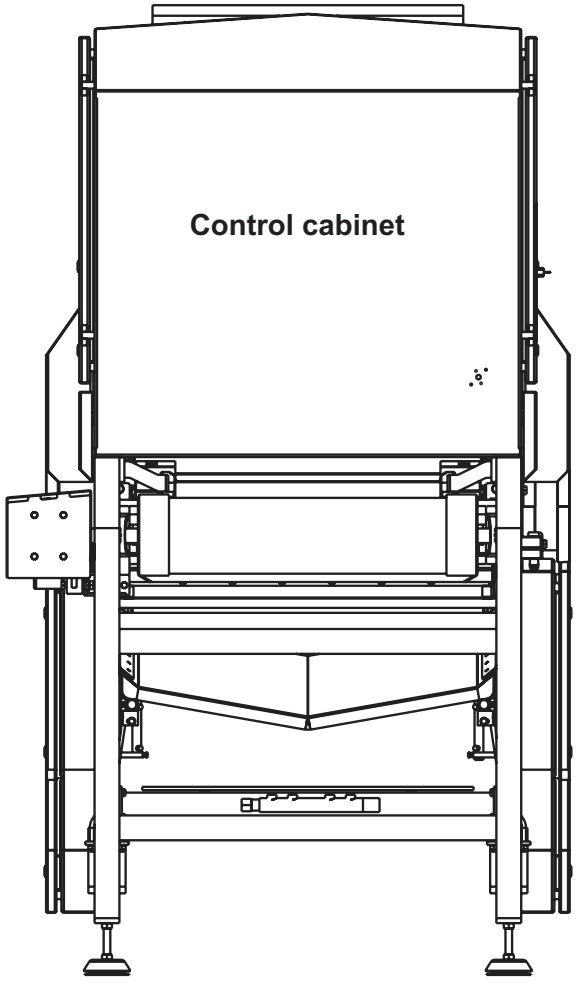
Remark: ***- It may be advisable to make sure the infeed shaker is placed slightly sloping towards the sorter unit, to prevent water from remaining in the shaker pan (better hygiene).***

The following pictures present an overview of the positions of the different units from different viewpoints.

Picture: Front view **GENIUS Compact** unit



Picture: Rear view **GENIUS Compact** unit



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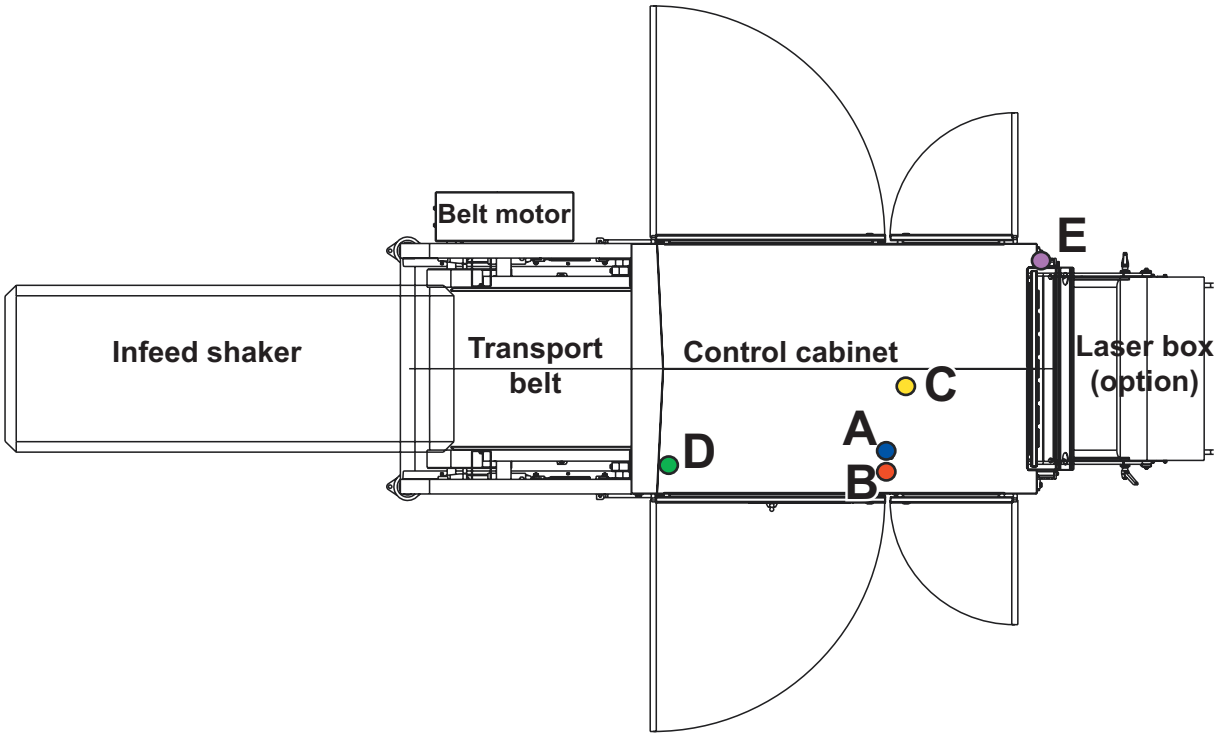
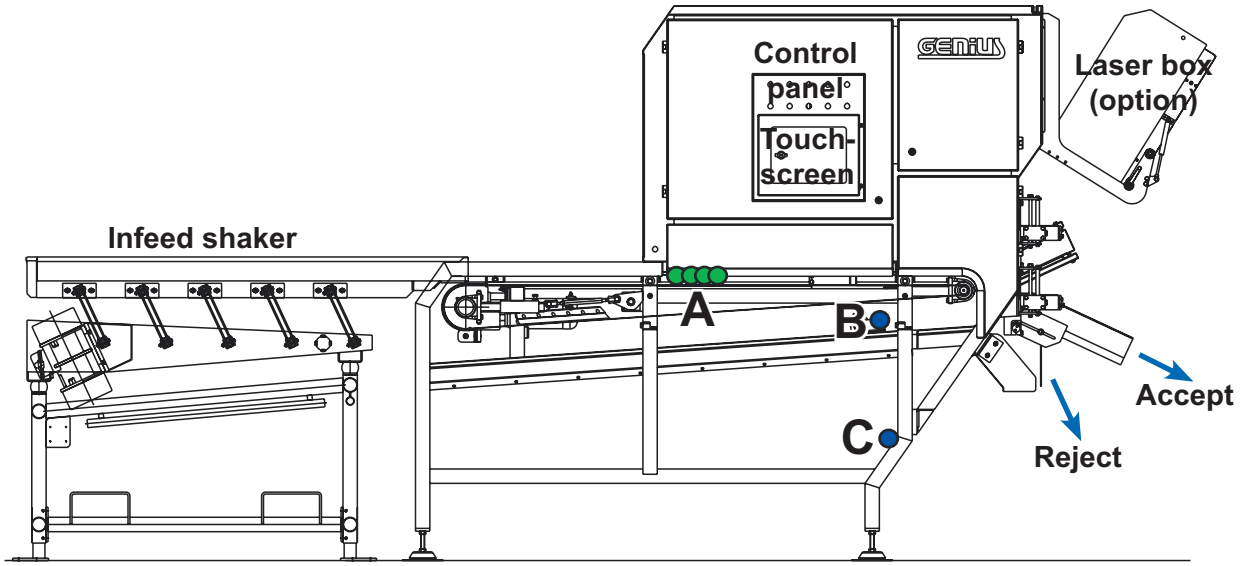
Picture: Top view of the **GENIUS Compact** optical sorter installation



A: **Water input; from cooling unit**
B: **Water exit; to cooling unit**
C: **Compressed air supply**
D: **Electricity supply sorter**
E: **Nitrogen connections (only with laser box option)**

Picture: Side view of the **GENIUS Compact** optical sorter installation



A: Connections to Belt motor & Shaker motors (usually on same side as belt motor).
B: Water connection belt cleaning system
C: Water connection cleaning system FSV unit (option) underneath sorter

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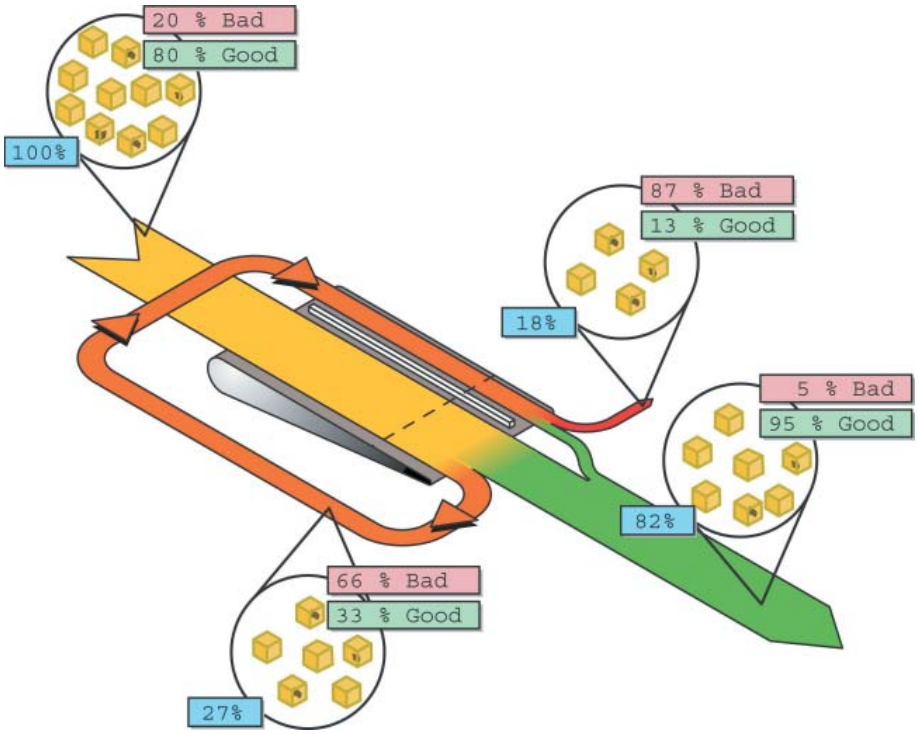
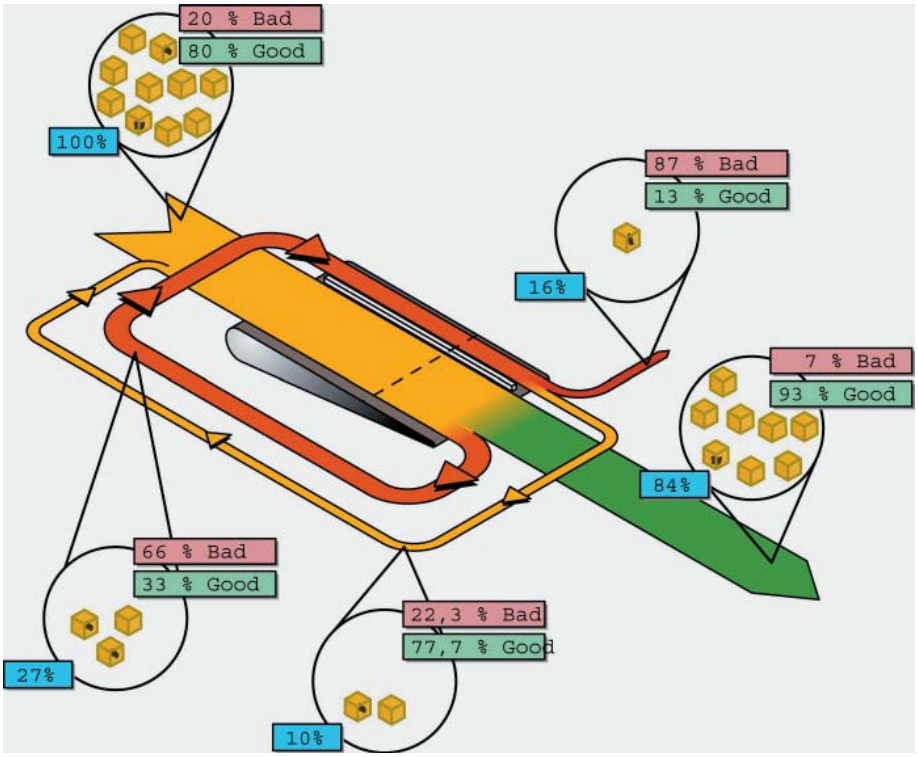
DRS or ARS systems

In case of DRS or ARS (Defect Return System or Accept Return System (see pictures underneath) specific installation schematics will be sent to you along with the confirmation of the order. These will also be included in this manual and will contain all data relevant to the mechanical installation of these systems. (The percentages in the following pictures are just examples and in no way representative for any particular product.)

DRS-system



ARS-system



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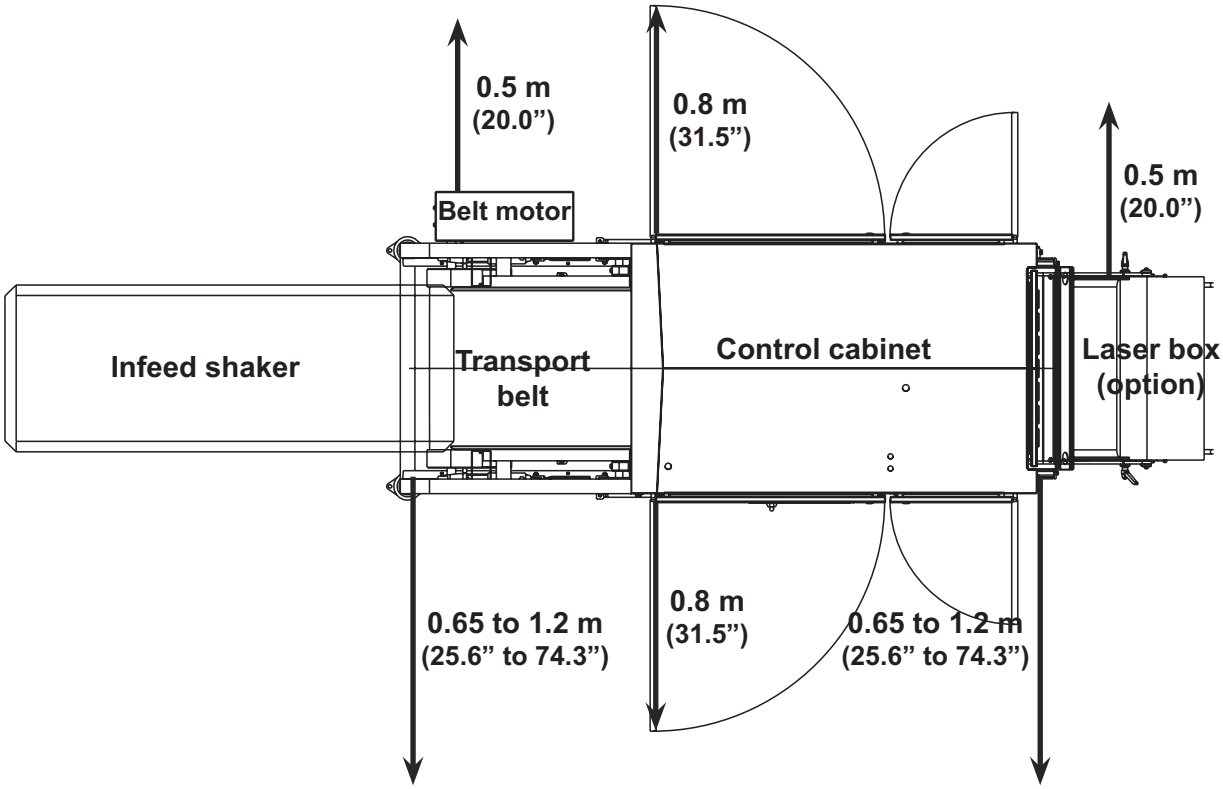
2.5. Full Pre-installation list

2.5.1. Preparation of the area

When preparing the area where the **GENIUS Compact** optical sorter is to be installed, all factors that might impede its proper functioning should be avoided (vibrating floors, contact with other machines, extreme temperature variations, etc...). The Purchaser therefore has to arrange this with **BESTnv** in advance. The Purchaser will be responsible for providing and preparing the area where the optical sorter unit, the infeed and accept/reject shaker(s)/belt(s) and all other accessories or optional equipment are to be installed. He will have to prepare this area before the date of delivery. Drawings of the **GENIUS Compact** sorter installation will be provided with the order confirmation by **BESTnv** after the signing of the contracts.

Attention: ***- Make sure to allow enough space (minimum 0.8 m / 31.5") for the opening of all cabinet doors on both sides of the* GENIUS Compact*.***
- There also has to be enough free space (minimum 0.5 m / 20") on both sides (left and right) of the* GENIUS Compact *to allow free access to all parts.
- At one side of the* GENIUS Compact *sorter unit, opposite to the drum drive motor, it is advisable to leave extra space (min. 0.65 m / 25.6" for the GENIUS* Compact *650 and 1.2 m / 74.3" for the GENIUS* Compact *1200) to enable the replacement of the detection (transport) belt and the reversing axle/bull nose.

Picture 2.5.1: Top view of **GENIUS** sorter installation with space for doors and servicing



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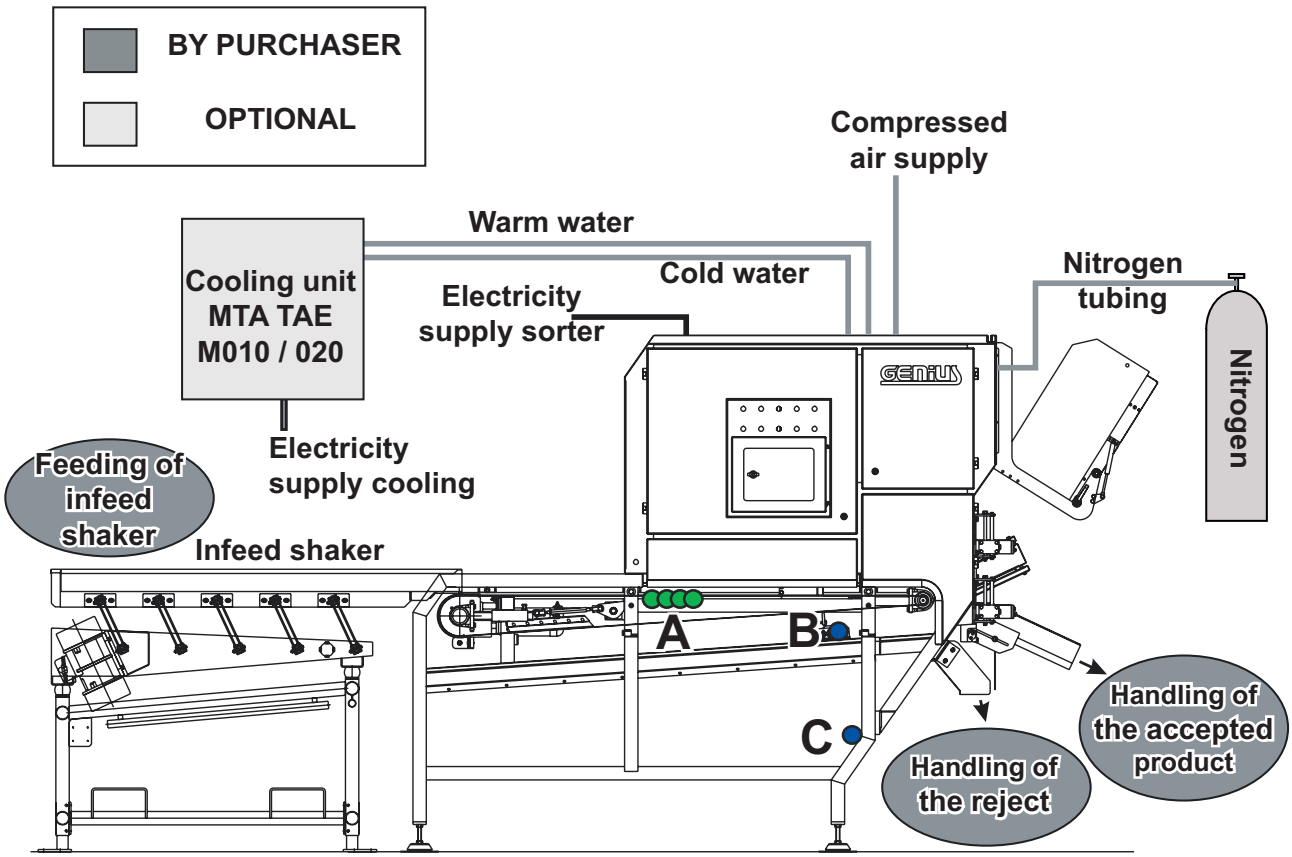
2.5.2. The GENIUS Compact optical sorter

Mechanical mounting of the GENIUS Compact optical sorter installation

The Purchaser will take care of the mechanical installation of the **GENIUS Compact** optical sorter in the area agreed upon. To this end he will provide all necessary and appropriate lifting, hoisting and transporting devices.

Picture 2.5.2: Total installation schedule



A: Connections to Belt motor & Shaker motors (usually on same side as belt motor).
B: Water connection belt cleaning system
C: Water connection cleaning system bottom unit (option) underneath sorter

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Installing the* GENIUS *Compact optical sorter

The Purchaser will provide and install all piping for water, compressed air and wiring for electricity.

The electrical wiring and the compressed air piping have to be laid up to the connection ends on top of the machine. The Purchaser should connect the necessary piping and tubing for water, pressurized air and nitrogen to the **GENIUS Compact** optical sorter. The wiring for the electricity should be laid with the cable ends reaching into the machine, but the final connections shall be made by the installation engineer from **BESTnv.** All piping, tubing and wiring should be installed without initiating electricity, water, nitrogen or compressed air supply. If new pipes are used, make sure to flush the pipes for a considerable number of minutes (+/- 15 min.) before connecting the tubes to the **GENIUS Compact**. The last end of the pressurized air piping should consist of flexible tubing, so as to allow some flexibility when positioning the machine.

Attention : ***- Do not fix the sorter unit to the floor before the final position has been determined by* BESTnv*'s service engineer during commissioning.***

The purchaser will also install all necessary operating panels (starters, circuit breakers, cables, etc...) between the **GENIUS Compact** sorter and the local power grid, as and when mandatory under local legislation. **BESTnv**'s service engineer will do a complete check-up on the **GENIUS Compact** sorter installation and make all necessary adjustments to put it in perfect working order before setting it into operation.

Attention: ***- Do not weld on or near the* GENIUS *Sorter.***

- Do not fix items on any of the* GENIUS Compact *units without first consulting* BESTnv*. This could seriously obstruct service & operation of the machine.

- Never fix any of the sorter parts to the floor before the position and location of all parts has been approved by* BESTnv*'s installation engineer.

- Make sure there is enough free space around the* GENIUS Compact *optical sorter, so as to leave all parts accessible for service and repair by* BESTnv *engineers.

- Do not initiate the electricity, water and/or compressed air supply before the installation engineer has approved the installation.

- Make sure the optical sorter does not come into contact with any other machinery, in order to avoid the transfer of vibrations to the sorter which might seriously hinder the sorting process and in certain cases cause damages to the sorter unit which are not covered under warranty.

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Standard GENIUS Compact Electrical Power Connections:

- 3 phase 400V (+ neutral & earthing), 8 kVA, 50 Hz (or 60 Hz USA)

If these voltages are not available on site, the purchaser will have to provide and connect a transformer.

On specific request, a transformer can be delivered along with the sorter.

THE ELECTRICAL CIRCUITS SHOULD BE FUSED AND NO OTHER ELECTRICAL APPLIANCE SHOULD BE CONNECTED TO THE CIRCUIT.

ALL ELECTRICAL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES

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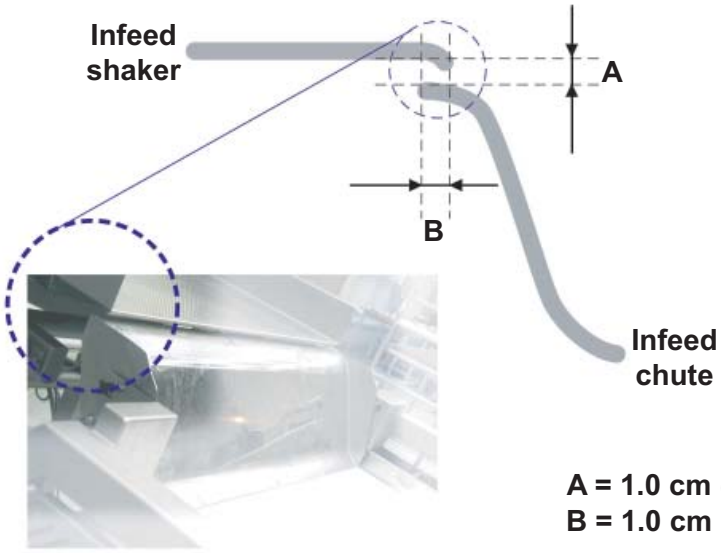
2.5.3. The infeed shaker

The infeed shaker arrives on a separate pallet or crate. The Purchaser will take care of the mechanical mounting of the infeed shaker and put it in position in front of the sorter unit. The distance between the infeed shaker and the machine should be as indicated in the drawing below. The distance between the nose of the infeed shaker and the infeed chute of the machine should be approximately 1.0 cm. The final position of the infeed shaker depends on the product and will be determined by **BESTnv**'s service engineer during the installation, therefore it is important not to fix the shaker or/and sorter unit to the floor.

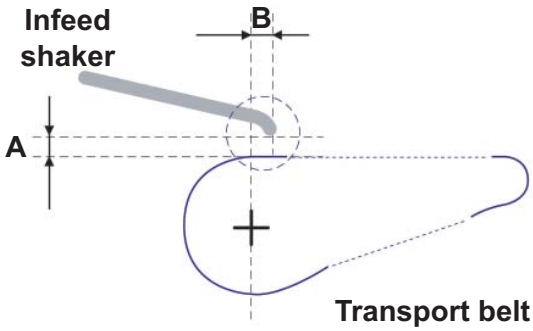
Attention : ***- Do not fix the shaker frame to the floor before the final position has been determined by* BESTnv*'s service engineer during commissioning.***

Picture 2.5.11: Relative position of infeed shaker

(sorter with infeed chute)

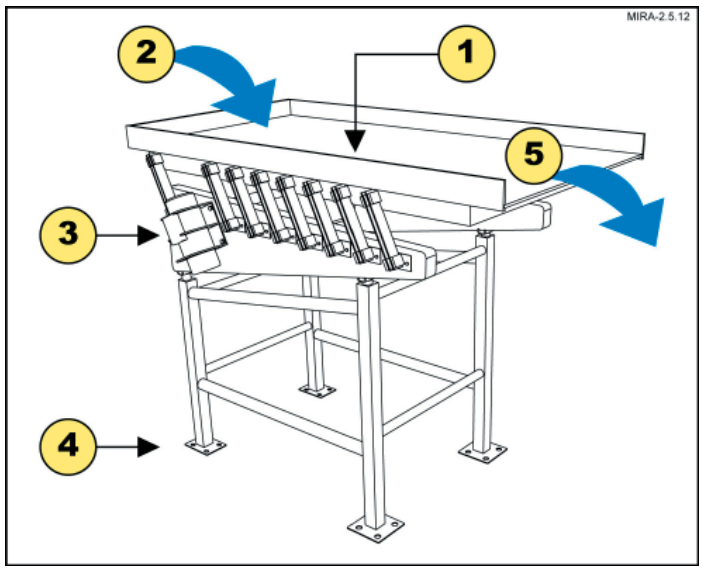


(sorter without infeed chute)



A = 1.0 cm (0.4")
B = 1.0 cm (0.4")

Picture 2.5.12: Infeed Shaker



1. Shaker table
2. Product infeed shaker
3. Shaker motors
4. Adjustable feet
5. Product outfeed (towards sorter)

The infeed shaker is electrically controlled by the **GENIUS Compact** sorter unit, and all wiring has been provided by **BESTnv**. The necessary connections will be made by the installation engineer inside the **GENIUS Compact** sorter unit.

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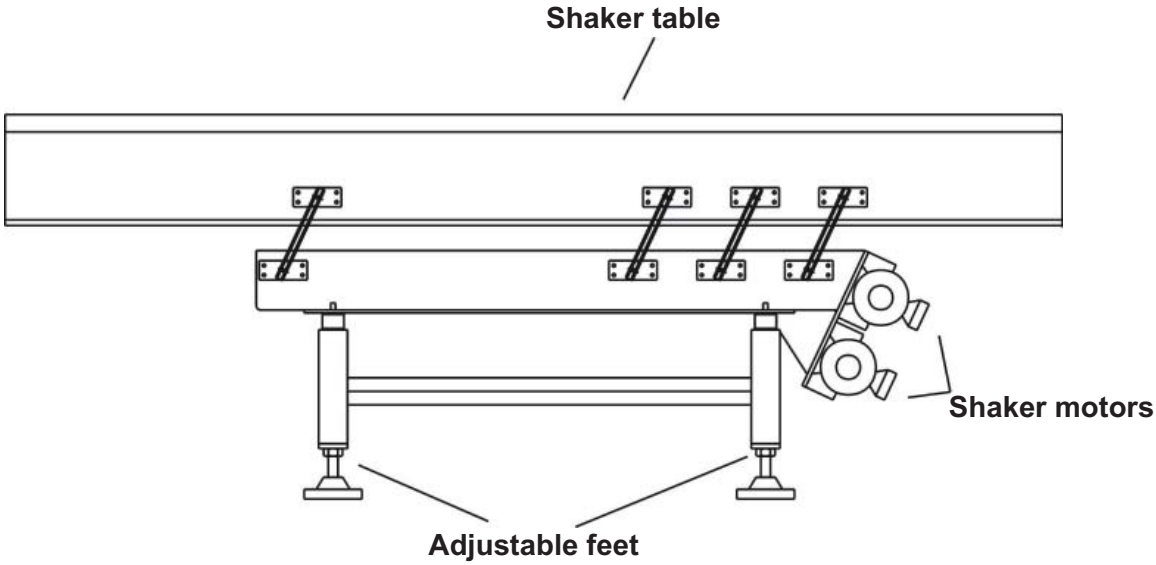
2.5.4. Accept/Reject shakers or belts (optional)

- In some cases the accept/reject shakers/belts have already been mounted and fixed underneath the sorter unit in the factory before the sorter installation is shipped.

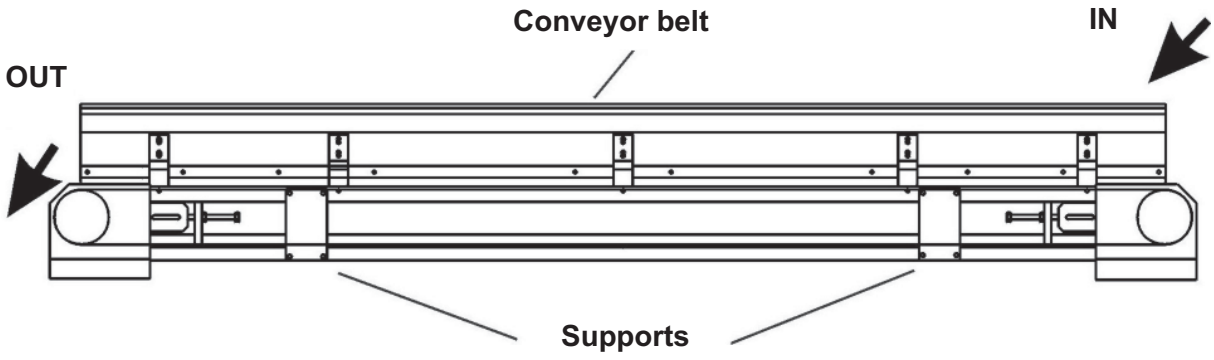
- When the shakers/belts still have to be installed, the customer will take care of the mechanical mounting without welding or drilling holes in the machine, using clamps or other fastening devices. Please note that it is always advisable to place the output sides of shakers/belts on the side of the touchscreen, so as to enable the operators to easily check the accept and the reject (e.g. the percentage of good product in the reject) while setting the sensitivities.

- The accept/reject shakers or belts are electrically controlled by the **GENIUS Compact** sorter unit, and if the shakers/belts were not provided and mounted by **BESTnv**, the purchaser has to provide the necessary cables and wiring (+/- 4 m / 13 ft) to enable the installation engineer to connect the shakers/belts with the sorter unit.

Picture 2.5.17 : Reject Shaker



Picture 2.5.18 : Reject Belt



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2.5.5. The nitrogen bottle

Due to safety regulations, **BESTnv** cannot ship a nitrogen bottle. The bottle of nitrogen therefore has to be provided by the Purchaser (For specifications: see table 2.2). **BESTnv** will supply a pressure control valve and plastic tubing. The plastic tubing will be laid and connected to the **GENIUS Compact** by the Purchaser prior to the installation visit (see picture 2.5.22 and 2.5.23). You will notice a fine tube is connected to the nitrogen out-connection, this is normal and the tube should not be removed or connected to anything.

Attention: ***- Nitrogen bottle and regulator have to be installed at a dry and secure place. In accordance with safety regulations the nitrogen bottle has to be fixed to the wall.***
- Be very careful when moving the nitrogen bottle! Should the tap be seriously damaged, due to a fall for example, the bottle could ignite and even explode, causing serious damage.

BESTnv's service engineer will check the installation during his installation visit and shall then pressurize the system. The Purchaser will not pressurize the system without prior permission of **BESTnv**. The nitrogen bottle should be installed within 25 m / 82 ft (standard length of tubing) of the **GENIUS Compact** sorter.

Nitrogen specifications : N2 - Grade 5.0

Purity (vol/vol%)	:	99.999
Analysis phase	:	Gas
Cylinder size-contents	:	B50 - 10 m³
Outlet nitro bottle must be	:	G 1/2" (inch) x 14, male

Attention! ***- It may be necessary for the Purchaser to buy a coupling piece if the connections of local nitrogen bottles do not match these requirements.***

Table 2.2

Maximum Impurities	
Components	**vppm**
O2	3
H2	1
CO + CO2	0.5
H2O	2
THC (as CH4)	0.5

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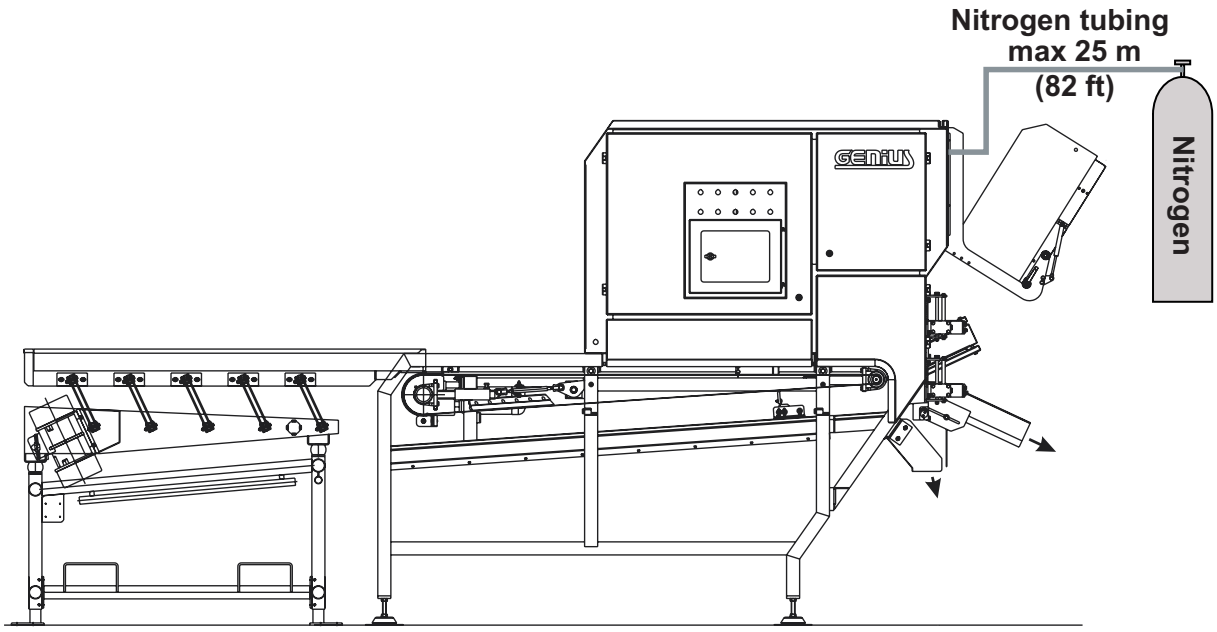
Picture: Installation of nitrogen bottle



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2.5.6. Cooling Unit (optional)

- The optional cooling unit is to be installed by the Purchaser at a dry and secure place and should be installed at the same ground level as the **GENIUS Compact** optical sorter. The water moves in a closed loop from the cooling unit to the sorter and back. Minor differences in height between sorter and cooling unit should be no problem, but if placed too low, the cooling unit might lose water due to the overflow mechanism. The tubing - for warm and cold water - between cooling unit and the sorter (minimum ½ inch tubing) and the electric wiring is to be provided and installed by the Purchaser (see pictures ...). The standard cooling unit for the **GENIUS Compact** needs a separate electrical supply.

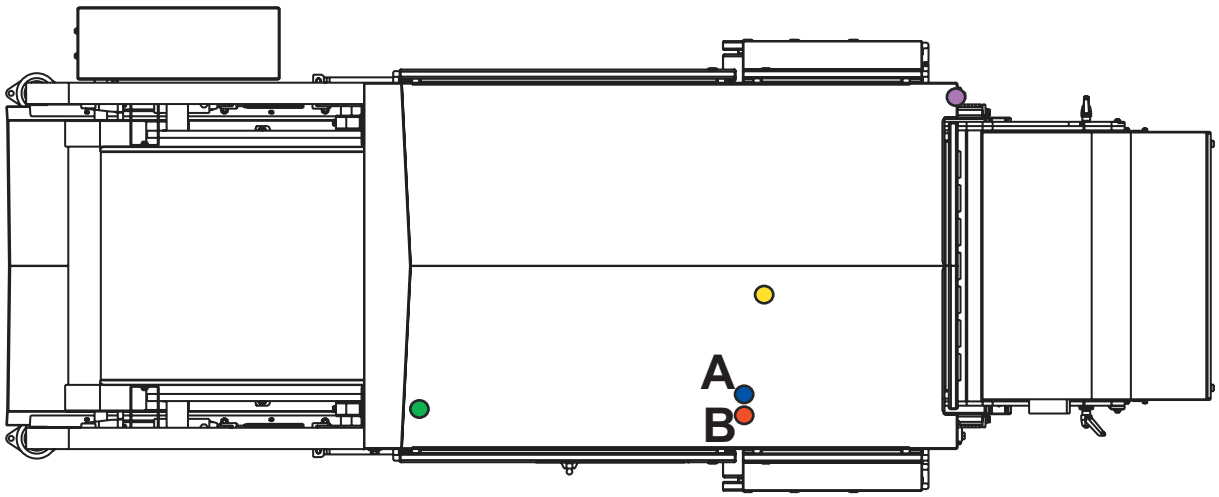
Attention: ***- The Purchaser is responsible for pressure safe piping.***
- The cooling unit must be installed at least 40 cm /16" from the nearest object, to ensure adequate air flow.
- Try to avoid major differences in height.
- The Cooling unit will require a separate power supply.
- It is always advisable to place the Cooling Unit in a clean setting.

WARNING : - This device will generate heat.

Water requirements

Water pressure	: between 1 and 3 bar (15 to 45 psi)
Temperature	: between 5°C and 12°C (41°F to 54°F)
Max. consumption	: +/- 500 l/h (132 gal/h)
Connection	: 14 mm (0.55") inside, inlet and outlet
Quality	: lime-free and reusable (add glycol if necessary, see cooling manual). When using distilled or demineralized water, please pay attention to the compatibility with the materials and to the minimum conductivity that lever sensor may relieve (80 µS). See Cooling Manual in Attachments.

Picture: Cooling water connections on top of sorter unit



A: Water input; from cooling unit
B: Water exit; to cooling unit

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In order to prevent damaging the Water pump in the TAE Cooling units, it is necessary to create an internal pressure difference. This can be achieved by partially closing the output valve until the pressure gauge on the control panel indicates the desired pressure. The ideal pressure is dependent on the type of cooling unit and the pump type (see data and pictures underneath).

Attention: ***- If the Pump is not running under ideal pressure conditions, it may break down after a very short working period.***

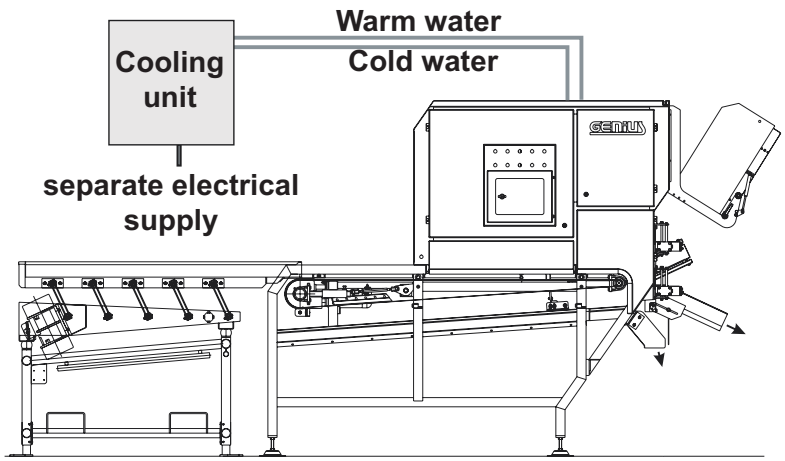
TAE M010 EVO with pump P0: between 2 and 3.5 bar
TAE 020 EVO with pump P3: between 3 and 4 bar

Picture: Back cooling unit TAE 020 EVO

Picture: Back cooling unit TAE M010 EVO

A: Pressure Gauge
B: Water Output valve

Picture: Installation of Cooling Unit



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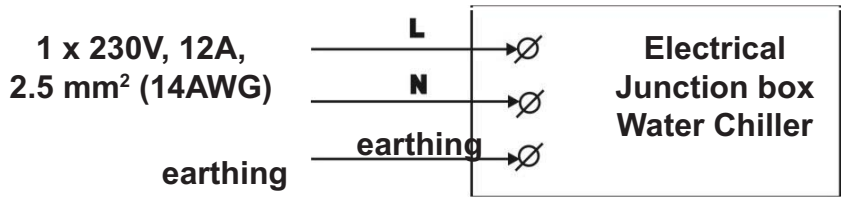
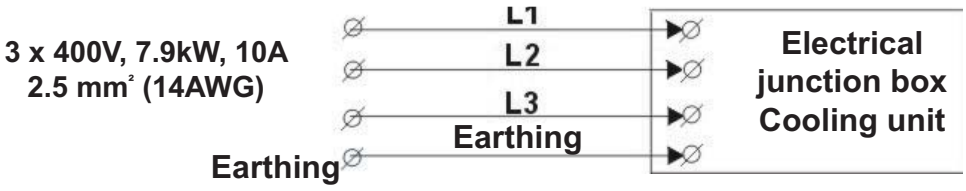
TAE M010 / PO (Cooling unit) Electrical Power Connections

Always separate power supply



TAE 020 EVO / P3 (Cooling unit) Electrical Power Connections

Always separate power supply



THE ELECTRICAL CIRCUITS SHOULD BE FUSED AND NO OTHER ELECTRICAL APPLIANCE SHOULD BE CONNECTED TO THE CIRCUIT.

ALL ELECTRICAL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES

non-US countries

Brand name: **MTA s.r.l.**
\+ address: Via Dell'Artigianato, 2
35026 Conselve (PD)
Italy

Tel.: +39 (0)49 / 9597211
Fax: +39 (0)49 / 9500620

E-mail: info@mta-it.com
Website: http://www.mta-it.com

Type:
- TAE M010 EVO / PO:
with built-in circulation pump and buffer tank (25 l);
standard cooling unit
- TAE 020 EVO / P3:
with built-in circulation pump and buffer tank;
in warmer environments, configurations with Argon lasers or to cool 2 machines

Cooling cap. : Water outlet temp. = 15°C; Water DELTA T = 5°C; ambient temp. = 25°C
- TAE M010 EVO: 4,4 kW
- TAE 020 EVO: 9.2 kW

Power supply:
- TAE M010 EVO / P0; 1-phase, 11.6 A, 2.6kW, 230V, 50Hz,
usually electrically controlled by laser sorter.
- TAE 020 EVO / P3; 3-phase, 7A, 3.9kW, 400-460V, 50Hz
always separate power supply.

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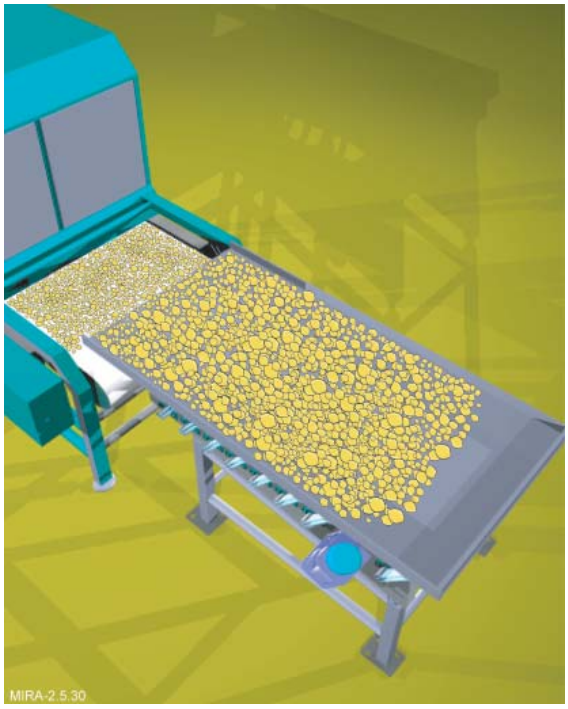
2.5.7. Product streams to and away from the GENIUS Compact sorter

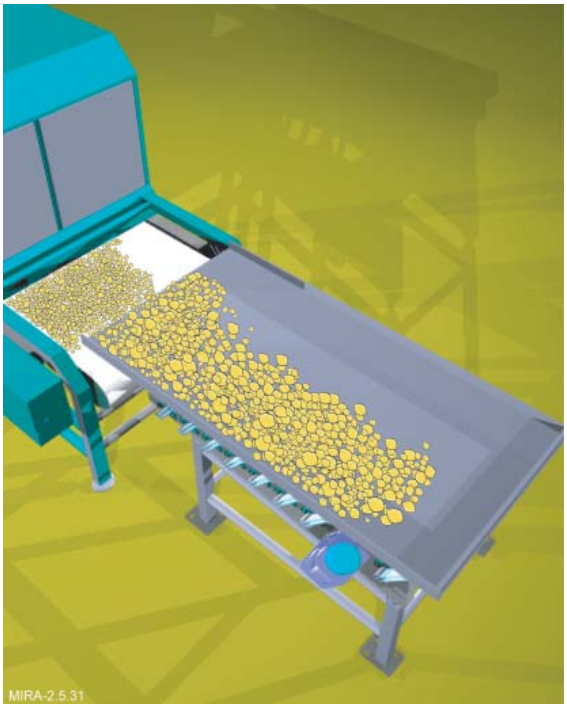
The input of the infeed shaker

The Purchaser is responsible for feeding the infeed shaker of the sorter using a belt, an elevator, or any other equipment. This equipment must be ready and installed before the arrival of **BESTnv**'s personnel for the start-up. Feeding must be done in the middle of the product infeed area, and must be immediately dispersed over minimum 80% of the width of the shaker, in order to accomplish maximum dispersal of the product on the belt and maximum efficiency of the sorter unit (see pictures 2.5.27 and 2.5.28).

Picture 2.5.30: **Good:**
product in middle of infeed area



Picture 2.5.31: **Bad:**
product to one side of infeed area



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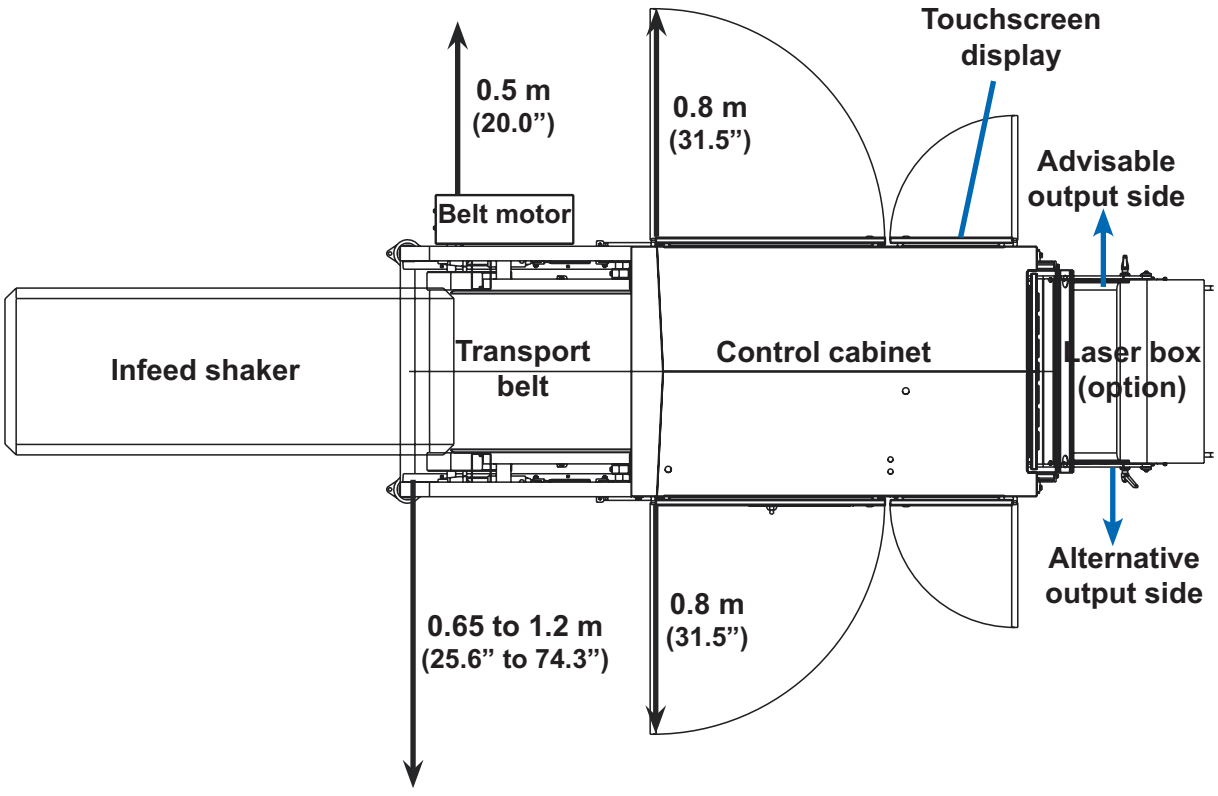
The product handling of the accepted and rejected product

Accept and reject leave the sorter by means of shakers or belts provided by **BESTnv** (generally). These can be positioned with the output at either side of the sorter (in accordance with the Purchaser's wishes). It is however advisable to keep the output of accept and reject within view of the touchscreen display on the control panel. This can be a substantial help while setting the sensitivities (see picture underneath).

Upon leaving the accept/reject shakers or belts, the product can be collected in trays, transported on a belt or moved via any other system to be provided by the Purchaser. The Purchaser is responsible for the handling of reject and accepted product using a belt, an elevator or any other equipment. This equipment must be ready and installed before the arrival of **BESTnv**'s personnel for the start-up.

Attention: ***- Make sure to leave enough room to the sides of the* GENIUS Compact *sorter to allow cleaning, service and maintenance personnel free access to all parts of the machine at all times (see picture 2.5.1.).***

Picture: top view output possibilities **GENIUS**



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2.6. Pre-installation checklist summary

1	**Preparation Installation area**	**- Ensure that the location where the sorter is to installed is free of interfering factors: (water vapour, dust clouds, vibrating floors, ...)**	
2		**- Adequate water supply**	
3		**- Adequate compressed air supply**	
4		**- Appropriate electrical connections**	
5		**- Enough space around the machine**	
6	**Unpacking of sorter**	**- Check for damage**	
7		**- Check all parts are present**	
8	**Installation of sorter**	**- Sorter unit**	
9		**- Infeed Shaker**	
10		**- Accept/Reject Shaker/Belt (optional)**	
11		**- Return system DRS/ARS (optional)**	
12		**- Nitrogen Bottle**	
13		**- Cooling Unit (optional)**	
14		**- All necessary tubing, piping and wiring is present.**	
15		**- Connections with and placement in production line are OK.**	

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III. Theory

3.0. Introduction

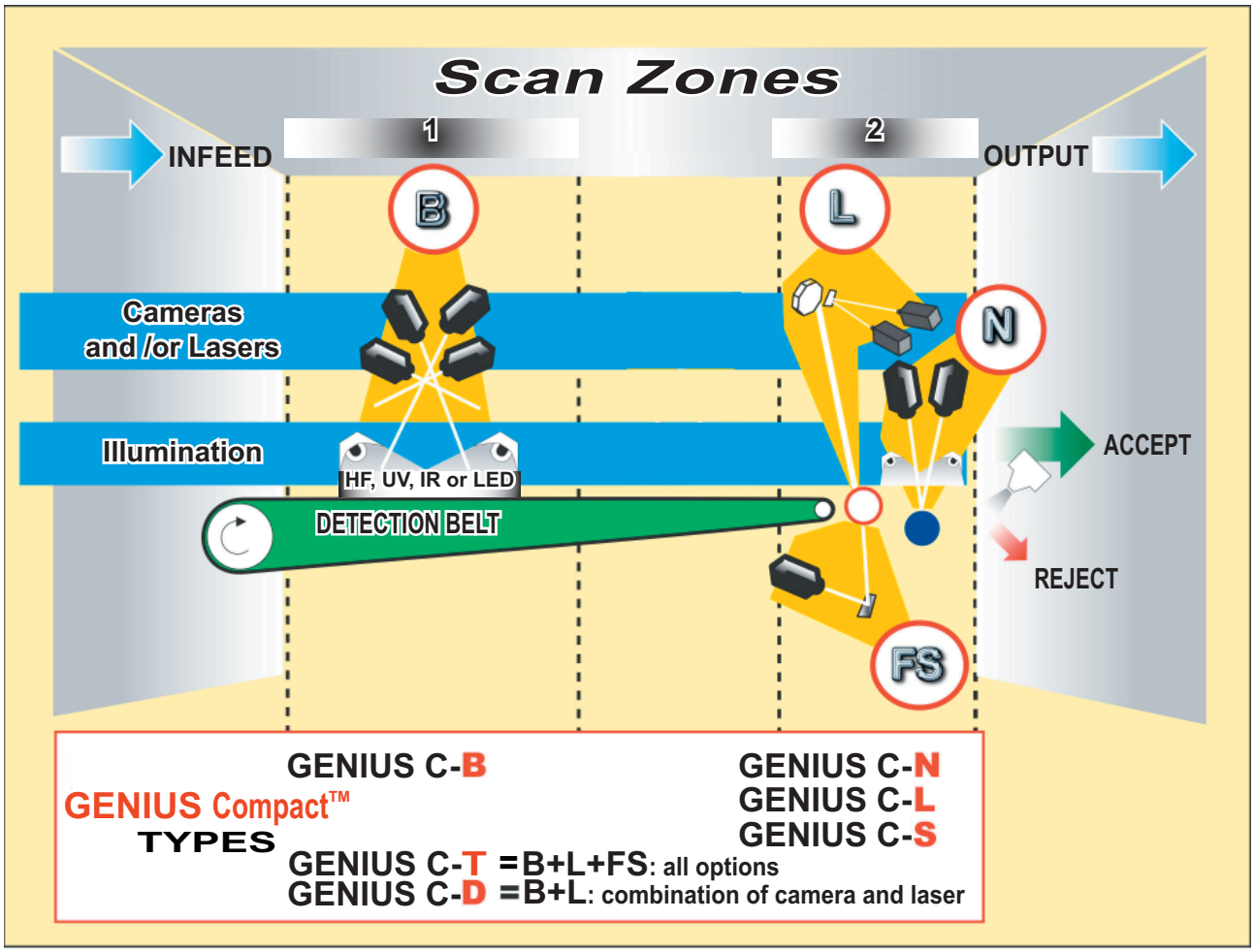
This chapter contains a complete overview of the different optical **GENIUS Compact** configurations and their advantages. A short explanation will be given of the different technologies and techniques that are being used. For an explanation of the laser technology used in the laser box option, please check chapter 7.

3.1. The Different Optical Configurations

To give the user a clear picture of the different possibilities, 2 different scan zones are defined on the sorter. The first scan zone (zone 1) is located on the belt, the second zone (zone 2) is located just after the belt, in the so-called free fall zone.

In every scan zone the number of cameras can vary (from 1 to 4 + laser box), and many of the different options can be combined. In general, one can say that all options can be combined in any number of different configurations, as long as only 8 camera signals are needed (a laser box will occupy one or two signals depending on the number of lasers). The only exception of the L and the N option in the upper part of the second scan zone, for these two cannot be present at the same time, due to lack of space.

Picture 3.1.a: Overview **GENIUS Compact** configurations



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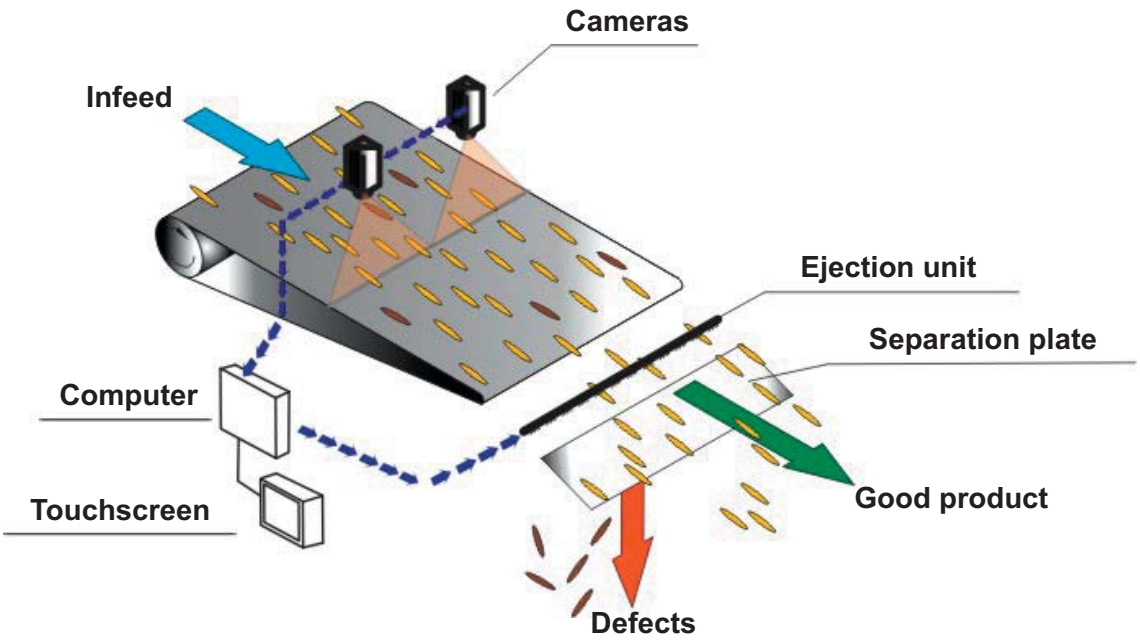
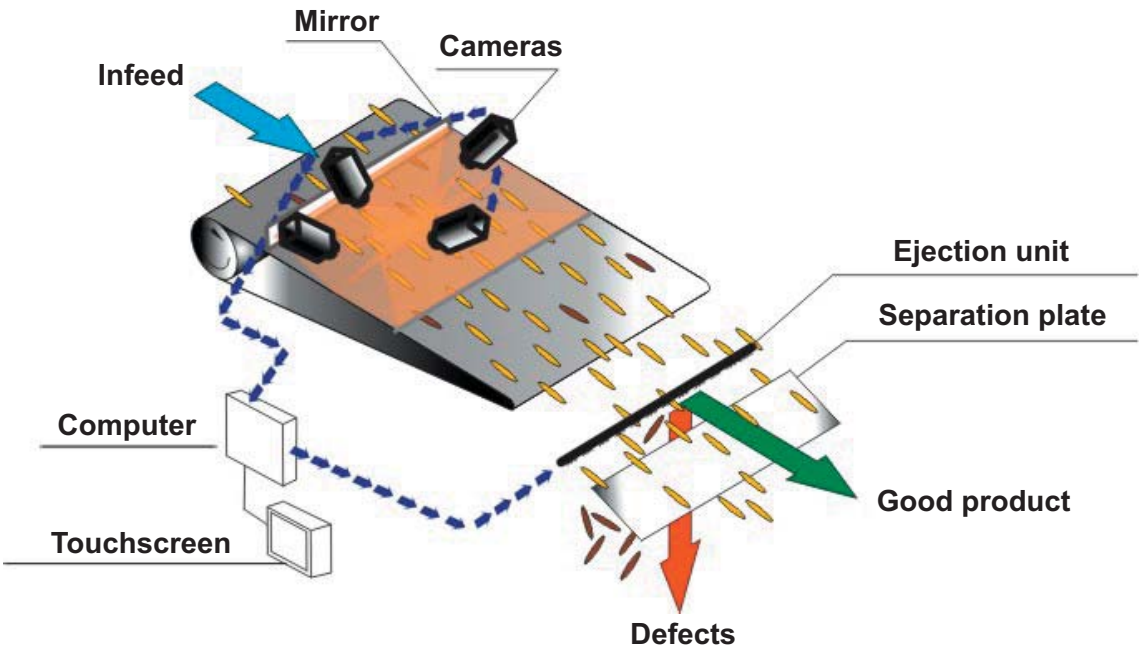
3.1.1. The GENIUS Compact-B (Basic) configuration

In this basic configuration of the **GENIUS Compact** several cameras (2, 4 or 6) will be used to inspect the product in the first scan zone on the belt (scan zone 1). The cameras can be placed perpendicular to the belt, or looking under an angle or a combination of the 2. Perpendicular cameras can be used to inspect flat products or to perform shape sorting (see picture 3.1.1a & b). When the product is rounder, such as a potatoes, the cameras will be placed under an angle (see picture 3.1.1c), to see as much of the surface of the product as possible. Cameras can be either monochrome (black and white) or colour cameras.

Picture 3.1.1a: GENIUS Compact-B configuration (2 cameras; perpendicular)



Picture 3.1.1c: GENIUS Compact-B configuration (4 cameras; angled)



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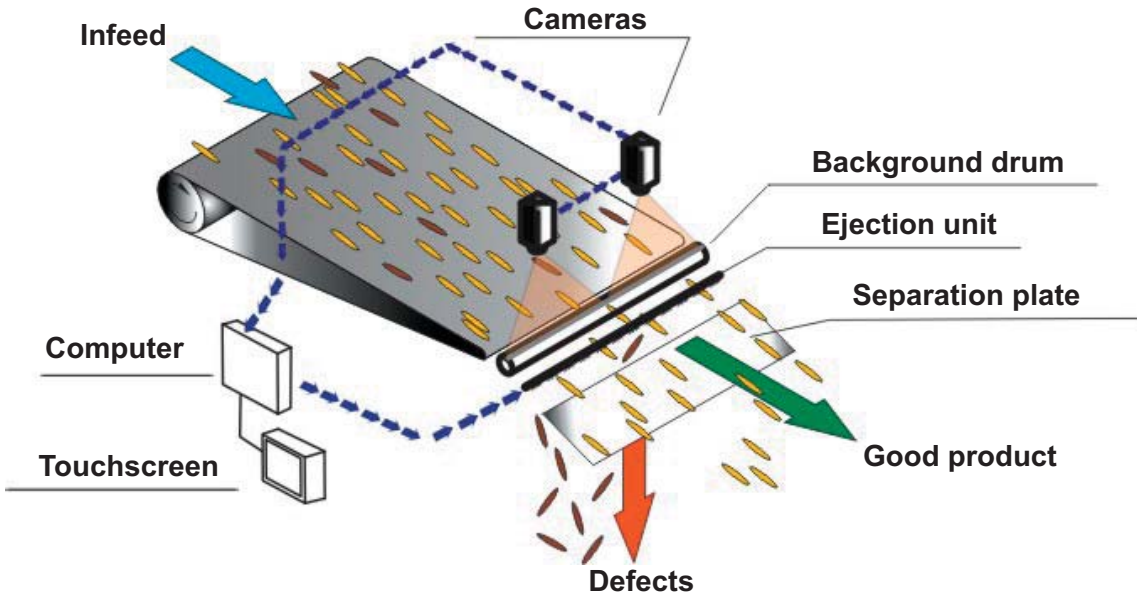
3.1.2. The GENIUS Compact-N option

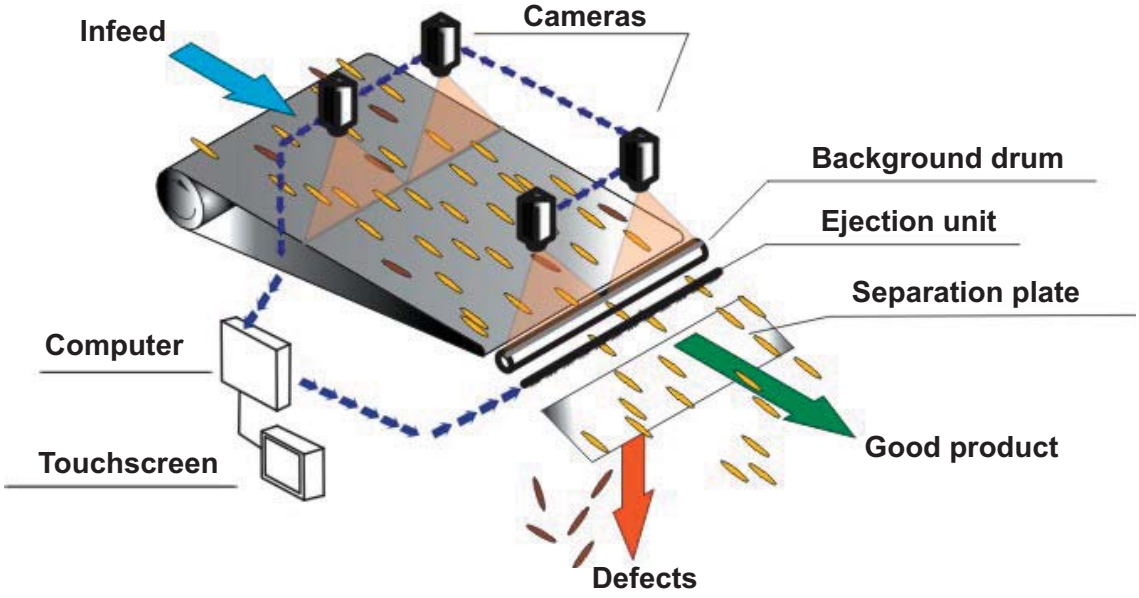
In this configuration 2 cameras will be used to inspect the product in the second scan zone, just after the belt (scan zone 2) over a background drum. This configuration is especially suited for sorting thin products that are not very stable. Because the product is scanned just before the ejection unit, any deviations from the normal trajectory are so small they can easily be ignored, thus greatly increasing the sorting efficiency.

This option cannot be combined with the L (Laser Box option).

Picture 3.1.3a: GENIUS-N configuration



Picture 3.1.3b: GENIUS-N configuration (combined with B)



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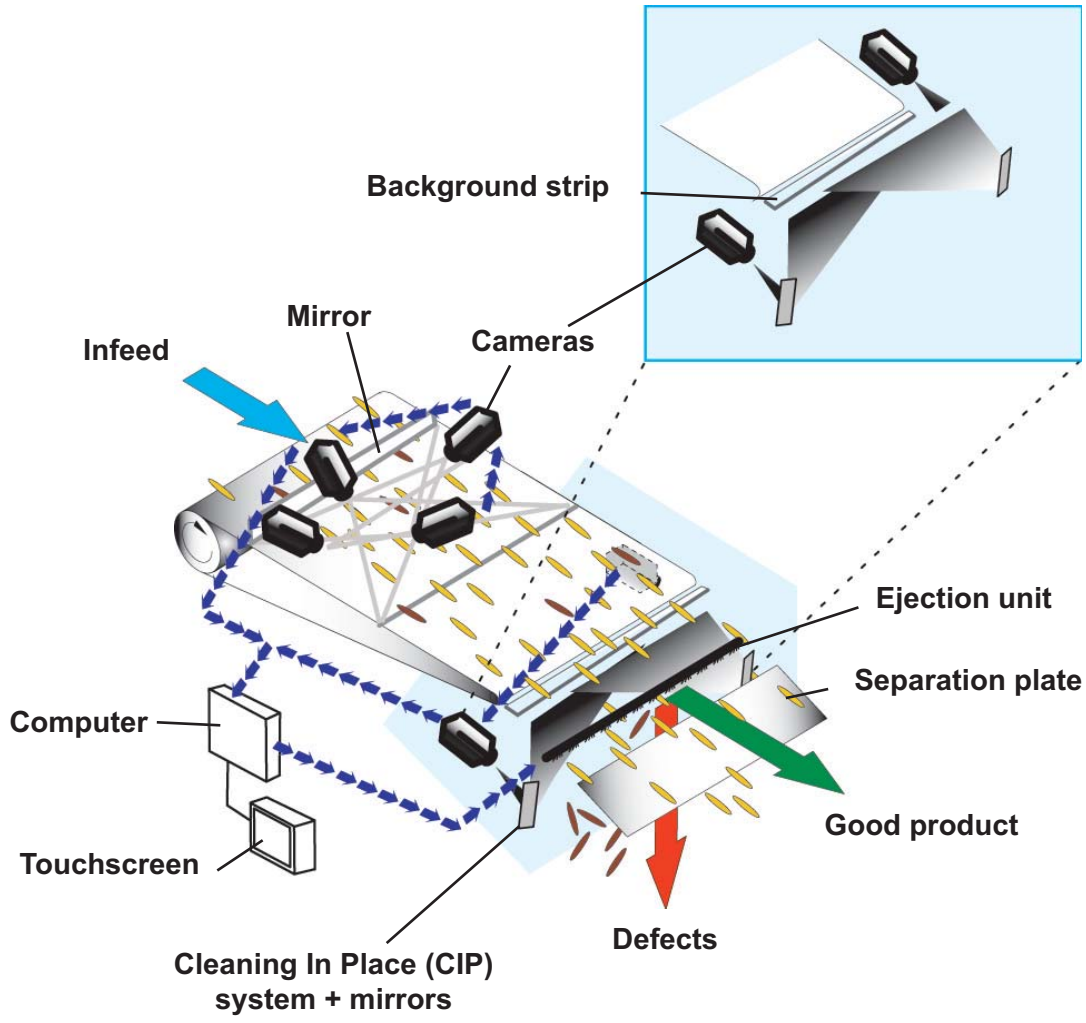
3.1.3. The GENIUS Compact-S (Surround/bottom) option

This option is usually integrated in the FSV ('full surround view') inspection system. This system combines bottom camera inspection (S-option) of the product with the standard top inspection (option B, 4 cameras under an angle). The product will therefore be viewed from all angles.

For practical reasons the bottom cameras are not placed directly underneath the inspection zone, but on the side of the machine, using mirrors to inspect the underside of the product with help of a background strip. Together with the CIP system, this will keep the bottom cameras clean at all times.

Picture 3.1.4a: GENIUS Compact-S configuration



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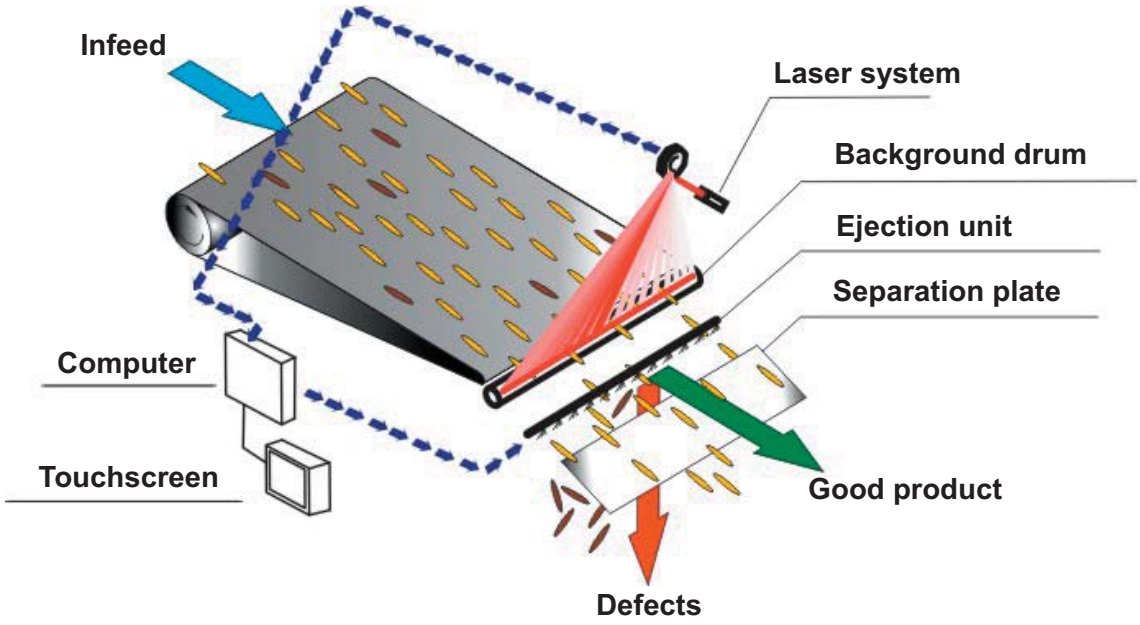
3.1.4. The GENIUS Compact-L (Laser) configuration

In this configuration a laser box containing max 2 lasers will be used to inspect the product in the third scan zone, just after the belt (scan zone 3). This laser technology is especially suited for structural sorting, though limited colour sorting is also available using different laser colours.

When an L option is combined with any of the B camera options, this is called a GENIUS Compact-D (Dual -sorter), see further.

Picture 3.1.5a: GENIUS Compact-L configuration



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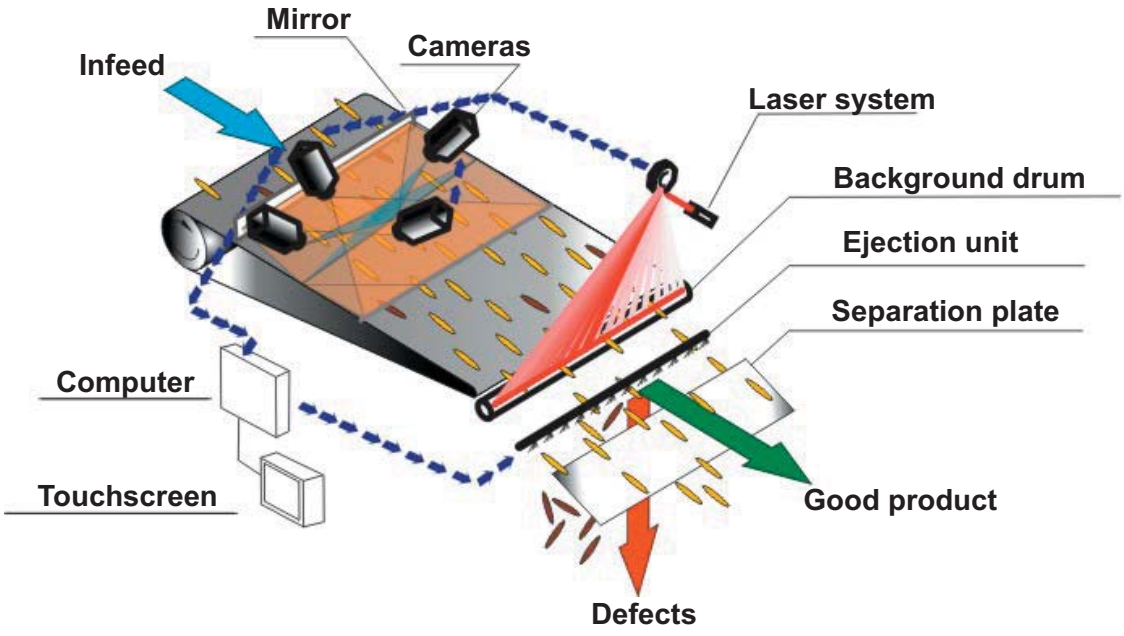
3.1.5. The GENIUS compact-D (Dual) option

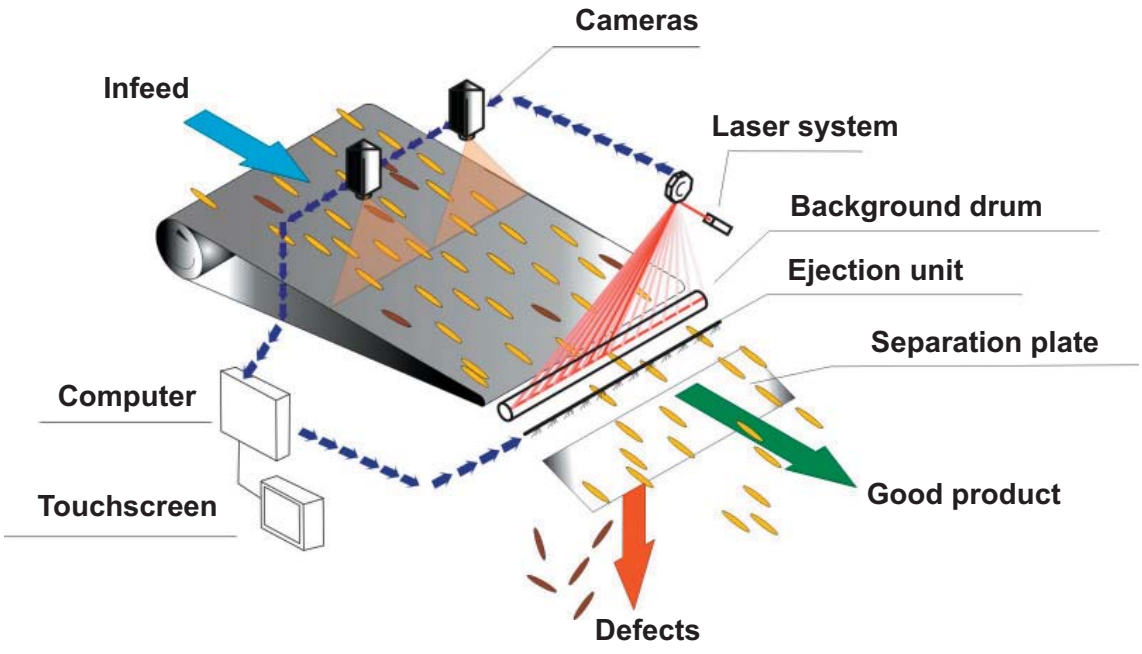
In this configuration cameras are combined with a laser inspection system (L-option). Laser and camera are two complementary technologies. The cameras allow colour sorting and/or shape recognition, while the lasers are primarily used for sorting on structure. Integration of 'FLUO'-technology is optional in this configuration.

A combination of the B, S and L options is usually called a Genius Compact-T, for Total, because it combines almost all the different options and technologies.

Picture 3.1.6a: GENIUS Compact-D configuration (with 4 cameras)



Picture 3.1.6b: GENIUS Compact-D configuration (with 2 camera's)



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3.2. Theoretical background

3.2.1. Cameras

All cameras used in the **GENIUS Compact** are line scan cameras, meaning that they only scan one line at a time, at a fixed frequency.

RGB(I) or -colour cameras "see" three colours: Red, Green, Blue and/or Infrared.
Monochromatic cameras can only distinguish different grey levels in one specific wavelength.

The length of the camera scan line must always be set equal to the width of the product stream on the belt that you wish to scan.
In other words, the length of the scan line is not always equal to the full width of the detection belt. Some cameras only scan half the belt (see pictures GENIUS Compact-B and GENIUS Compact-N) or even a specific small split part of the belt (with ARS or DRS return systems).

The width of the scan line on the belt however, is relative to the speed of the belt and the integration time of the sorting computers. It is therefore important to have a fixed and stable belt speed. Any fluctuations or changes in belt speed may adversely affect the optical sorting efficiency (the faster the belt in relation to the scan frequency, the less details can be detected).

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3.2.2. Illumination

Contrast

To achieve a good optical efficiency, a strong, stable and homogeneous illumination is required.

It ensures a high contrast, thereby making colour intensity differences in the product easily visible. After all, contrast originates from the difference in light reflection between dark and light spots in the product. With higher illumination levels, this difference is enlarged. When necessary, optical or software filters can be used to artificially create or increase the contrast.

Different Illumination options

To achieve a proper illumination on the scan zone on the belt of the **GENIUS Compact** (scan zone 1), the scan zone is generally illuminated from above by 2-6 illumination units, each containing fluorescent tubes inside a special housing with reflectors. The angle and the distance between the illumination units and the belt are very important to achieve optimum illumination.

Special R(red), G(green), B(blue) and/or I(infra red) LED light units (6 units total) can also be used. These are controlled by the software to create any given light colour and intensity, which can be very useful to enlarge the contrast between good and bad product, resulting in a more efficient sorting process.

With certain specific products UV (Ultra Violet) lights are used. This UV light increases the contrast for those products, for example peas, making the good product red and the defects black. Since the belt always has to have the same reference colour as the good product, an IR (Infrared) unit is mounted underneath the belt to give it the same colour value as the good product.

With a **GENIUS Compact**-S, which is equipped with Full Surround View (bottom unit), the product and background strip are illuminated by two rotating illumination drums underneath the belt and one rotating illumination drum as background lighting above the belt. For more info, see chapter 9: The FSV-system.

For more info on the illumination when using a Laser box, see chapter 7: Laser Box Option.

Warm-up time

Fluorescent tubes need approximately 30 minutes to reach the appropriate stable light level and colour temperature. Do not forget to take this warm-up time, which is also necessary for the cameras, into account when starting up the machine.

Attention: ***- Remember to wait 30 minutes (warm-up time) after starting up the machine, before taking a new reference line and starting up the sorting process.***

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3.2.3. Detection system

Theory

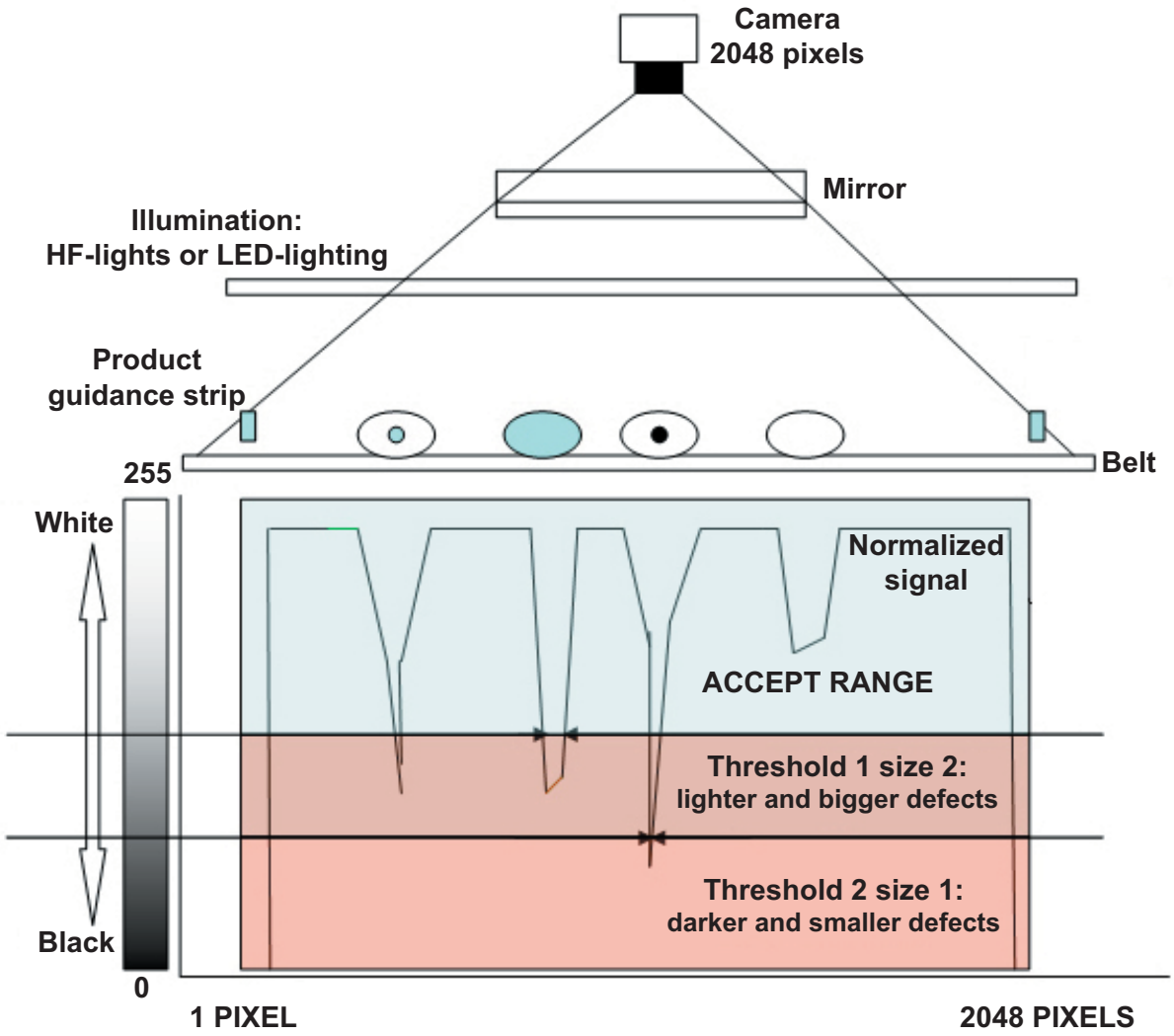
Each camera scans the product with a speed of 4000 FPS (Frames/Scans per Second). All cameras scan the belt vertically, directly or via mirrors. Each scan consists of only one line, but because the cameras are very fast, the successive scans provide a complete image of everything passing the detection zone.

Every camera signal consists of 2048 pixels in one line, where each pixel will give a value between 0 (black) and 255 (white/colour). Usually this signal will be somewhat curved due to the fact that the camera is positioned closer to the centre of the belt and further from the sides of the belt. Because of this, less light is reflected into the camera from the sides.

To counter this curve effect, the signal must be normalized (reference lines must be taken) regularly (at least once a day) to achieve a straight empty belt signal line (see **Normalization**).

Product, defects and transport belt absorb and reflect more or less of the light from the illumination (HF lamps/LEDs/lasers), and in different wavelengths (colours). Using different kinds of thresholds, good product is distinguished from bad product by means of this contrast: the differences in the light that is reflected/absorbed. Apart from the thresholds, 2 more parameters can be set to determine the final sorting result: the defect size (2D), and the defect density or fill rate percentage (see sorting parameters).

Picture: Theory of detection system: standard setup with 2 low thresholds



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Normalization

The Reference Line is in fact simply the signal you get when scanning the empty and clean detection belt.

An unprocessed camera signal of a belt with products does not generate a continuous straight line as could be expected, but a rather unevenly curved line (see picture underneath). This is due to different limitations of the optical setup: irregularities in the belt surface, local variations in the illumination, uneven distance to belt surface, etc...

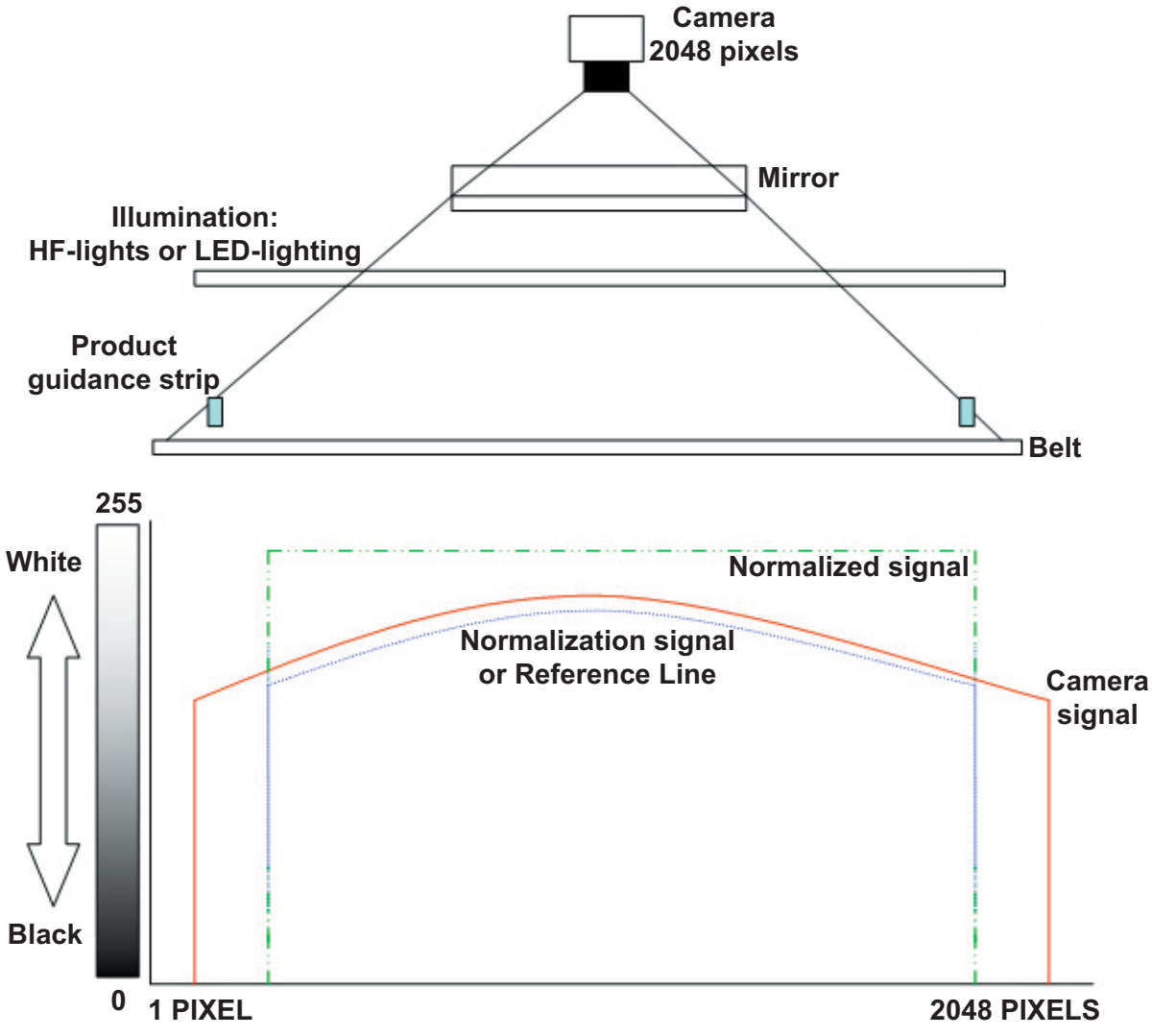
To create a straight line with only clear dips and peaks for the defects and products, the reference line (B) is used to correct all unprocessed camera signals (A). The resulting signals (C) can be used to sort the product by adding one or more different thresholds.

It is of course very important that the reference line corresponds to the actual condition of the belt. If the belt is dirty or damaged, or the lighting has changed since the reference line was last taken (new lamps or reference line has been made too long ago), then the image of he reference line will no longer be accurate, and this will cause false detections and certainly decrease the efficiency of the sorter.

Attention: ***- Whenever the sorter is started up a new Reference Line/Normalization should be taken before starting the sorting process.***

For more practical info on taking this reference line, see chapter 5: Operational procedures.

Picture: Normalization theory



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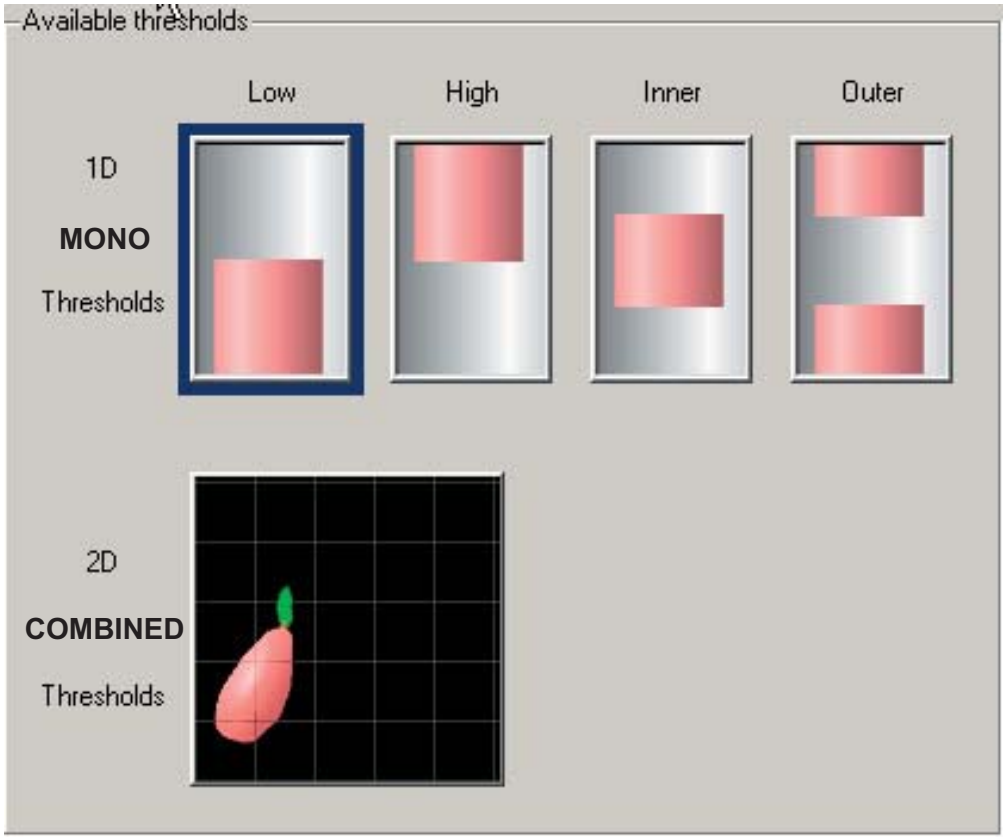
3.2.4. Sorting Parameters

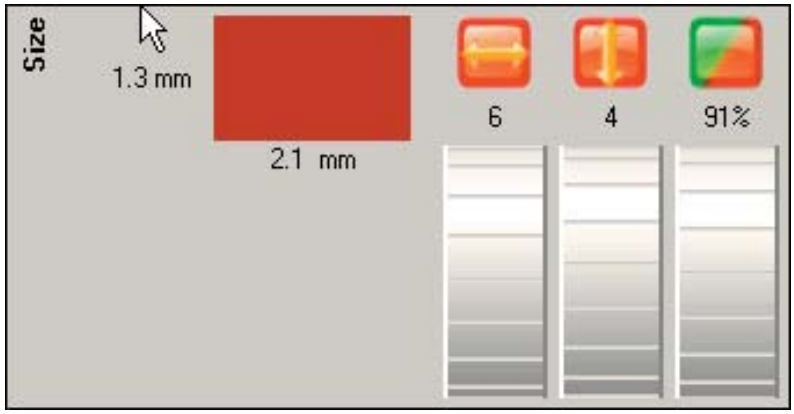
The Pollux system distinguishes 2 basic types of thresholds, 1D or Mono Thresholds, which use only one camera or laser colours or signals, and 2D or Combined Thresholds, which combine 2 different colours or signals to create a new threshold.

Picture: Pollux Thresholds



Next to the threshold values, you will find 3 more values that can be adjusted using a dial as described on the next page. These values are, in order from left to right, the Defect Width and the Defect Length of the **2D Defect Size setting**, and the Defect Density or Fill Rate percentage.

Picture: Dials for adjusting 1D and 2D defect size and Defect density



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Mono Thresholds

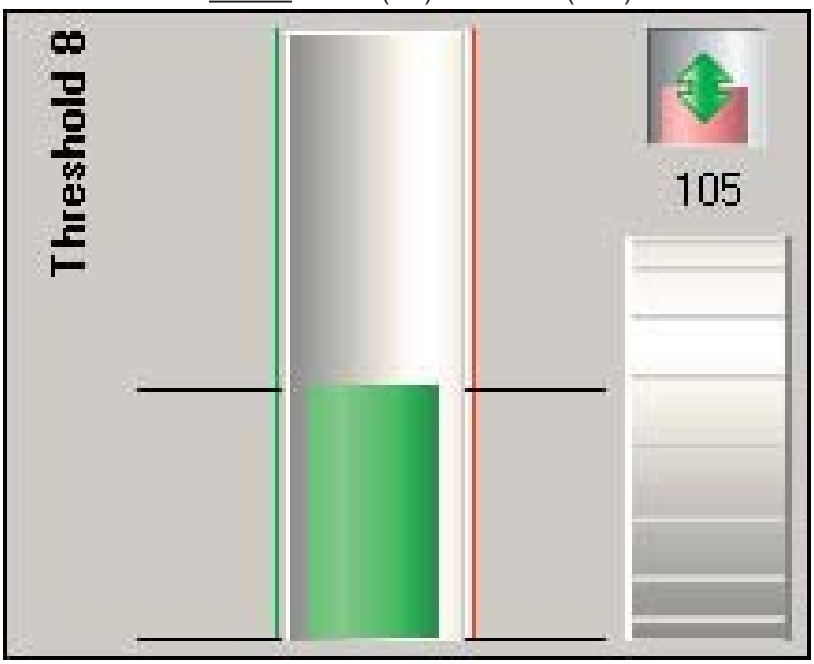
A 1D or mono threshold is in fact nothing more than a straight mathematical line, a value that defines the boundary between good and bad. Using a simple 1D threshold is generally the easiest way to distinguish good products from bad product or defects.

An ordinary mono threshold can be high or low:
With a High threshold, everything above the line or threshold value, is seen as bad product.
With a Low threshold, everything underneath the line or threshold value is considered bad product.

In the Pollux system, it is also possible to create a threshold zone using a combination of a high and a low threshold:
Inner threshold: zone between high and low threshold is designated bad product zone.
Outer threshold: zone between high and low threshold is considered good product zone.

With monochromatic cameras a grey value is used as a threshold: a value between 0 (black) and 255 (white).
With colour cameras an intensity value of one of the three colours Red, Green and Blue or Infrared can be used: this value will be between 0 (black) and 250 (full intensity Red, Green or Blue).

Picture: Mono (1D) Threshold (Low)



The striped bar in the right lower corner of the picture above represents a dial. Put your finger on the dial on the touchscreen and move it upwards to increase the threshold value, or downwards to decrease it. Pressing once in the upper/lower half of the dial will increase/decrease the threshold value (displayed above the dial) with 1 unit.

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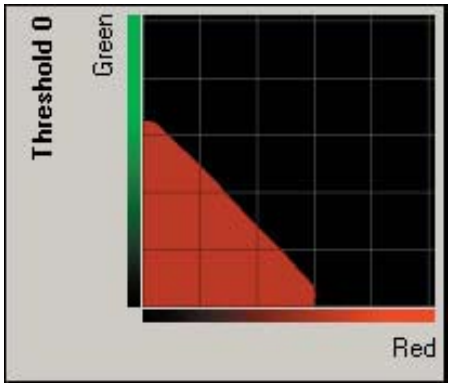
Combined Thresholds:

Combined thresholds are formed by combining two signals of a colour camera or two laser signals.

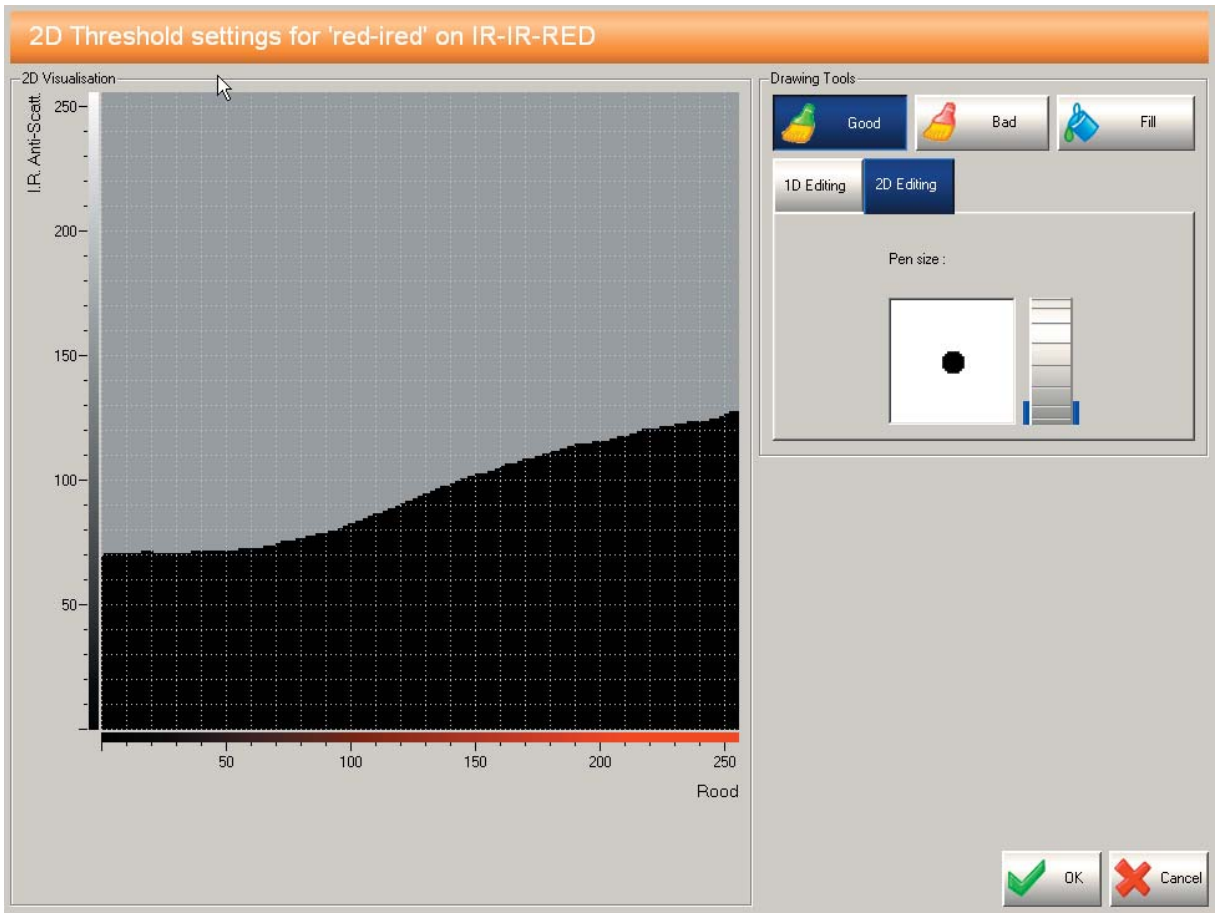
Combined sensitivities are used to detect defects that cannot be detected by ordinary sensitivities without causing a big rise in the percentage of good product in the reject. Combined sensitivities enable us to define the borders of the good product zone much narrower, which makes it possible to reach difficult areas and detect a number of extra, difficult, defects, without causing an undue rise in the percentage of good product in the reject.

Picture: Combined (2D) Threshold



To set the combined threshold, just press the graphic (see above) on the touchscreen, and use the tools in the settings menu to draw and/or fine-tune the good product and defect zones. For more info, see chapter 5: operational procedures.

Picture: Setting a Combined (2D) Threshold



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2D Defect Size

The 2D Defect Size consists of 2 simple thresholds:
- the Defect Width: the minimum number of pixels in a row in one scan line a defect must have to be detected. (Max. 256)
- the Defect Length the minimum number of pixels in a row in successive scan lines a defect must have to be detected. (Max. 8)

In other words: the higher the 2D Defect Size parameters, the bigger the defect must be before it is detected. The exact length and width of a pixel depend on the Width of the belt and the Belt Speed. The belt width will be set by the installation engineer and stays fixed, but the belt speed can be changed according to the customers wishes, and so the length of the pixels will change accordingly. The exact result of your settings, with respect to the set max. width and length of the defect will be calculated automatically (length only when belt is running) and shown graphically and with the values in mm next to the dials on the screen (see picture).

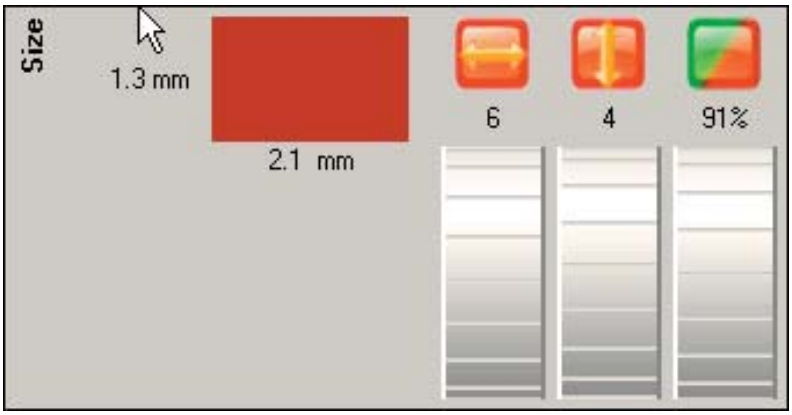
Attention: ***-2D Defect Size settings must be set with a running Belt!***

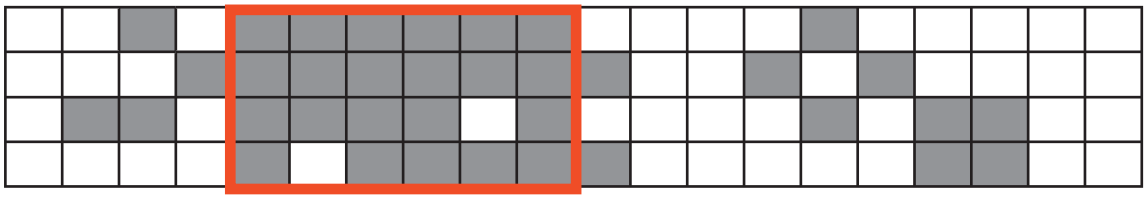
In general it is advisable to set these parameters in such a way that they roughly form a square.

Defect Density (Fill rate) percentage

With this setting one can determine the percentage of defect pixels an object must have before it is actually seen as defect and ejected. This value can be set from 0% to 100%. With 100% only objects that are completely composed of defect pixels will be ejected, with 0% everything will be ejected.

In the example underneath the Defect Width is set to 6 and the Defect Length to 4, which means all products or defects that count six defect pixels or more in one row on the line scan will be detected, everything smaller (A, C & D) will be ignored automatically. With a Defect Density set to 91%, only those areas of 6 by 4 pixels with 91% or more defect pixels will be ejected, all others are ignored.





This parameter is often used to ignore small fluctuations in colour, such as lighter spots on good product. It can also be used to improve detection of certain difficult defects: two thresholds are set, one with a very low defect size filter that detects all defect sizes, but cannot go too sensitive, and one with a higher defect size filter, but a more sensitive threshold, enabling the user to set the sorter more sensitive to certain bigger defects.

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Template Matching

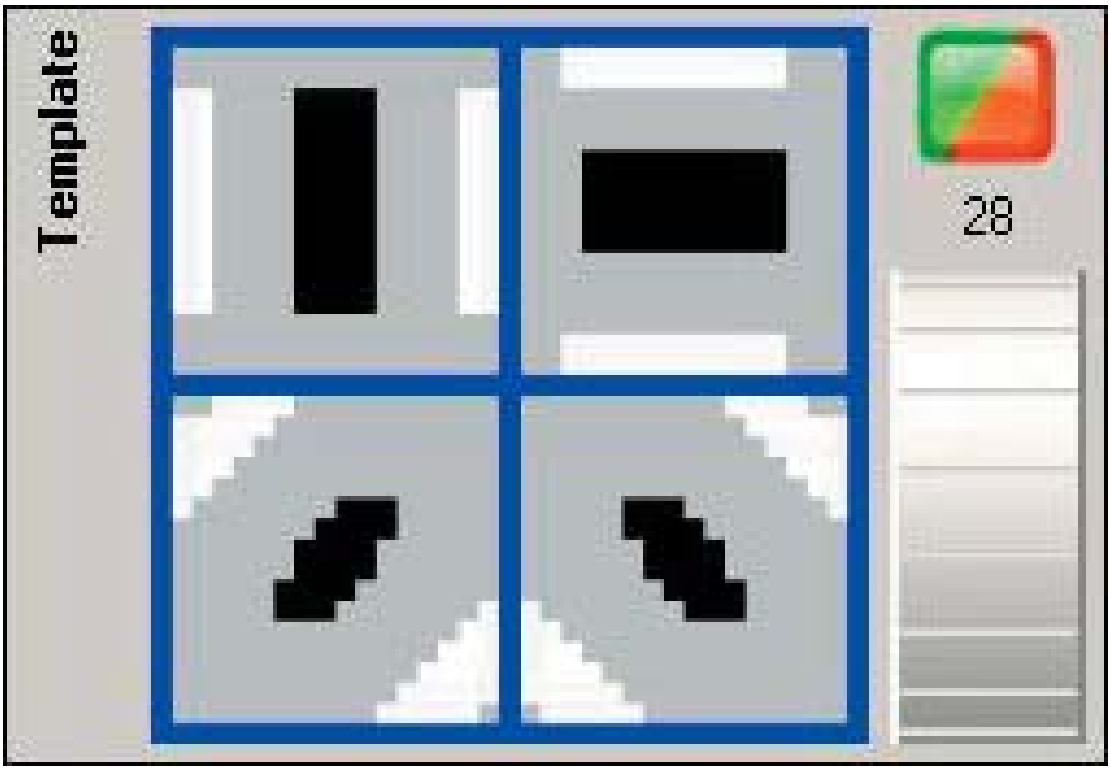
This is an extra option that can be added to the simple 1D (mono) or 2D (combined) filter thresholds.

With the standard thresholds an object is seen as a defect when it has a minimum length and width (defect size), and a minimum defect pixel percentage (see previous pages), With template matching the only thing that counts is its shape.

A template is created (see picture underneath) that represents the basic shape of the good product in 4 directions (horizontal, vertical and slanted right or left). The basic 1D or 2D threshold must be set in such a way that it detects everything (good and bad) except the transport belt.

- The 4 squares correspond to a zone of 16 by 16 pixels.
- The black zone must consist of detected pixels (only non-belt pixels).
- The grey zone may consist of detected pixels (belt and non-belt pixels).
- The white zone may not contain any detected pixels (only belt pixels).

=> The detected object must be at least as large as the black zone, but its shape must not fall outside the grey zone. => Everything smaller than the black zone or not fitting into the grey zone will be recognised as a defect and ejected.



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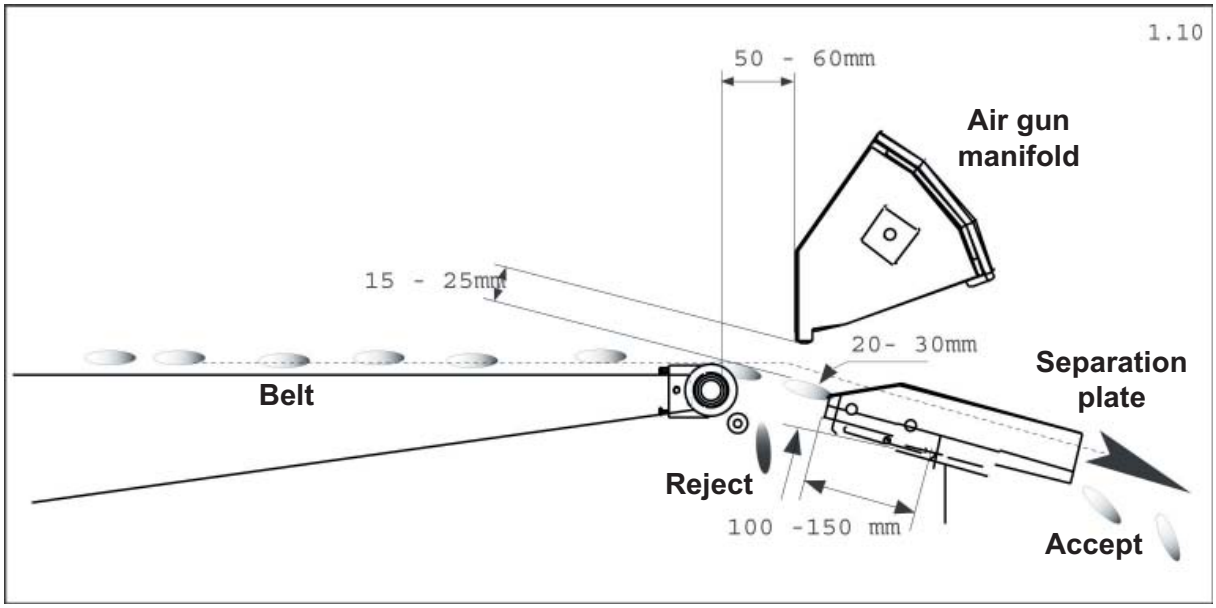
3.2.5. Removal of the defects

Once a detection is made, the electronics calculate the precise location of the object (every pixel has been appointed to one - or more in case of overlap - specific air gun valves) and a few milliseconds later the defect will be hit by a small blast of compressed air, which changes the trajectory of the object just after they leave the belt and are in free fall, so that it will fall into the reject chute, underneath the separation plate (see picture underneath).

Picture 3.3a: Reject system **GENIUS**



Position and/or angle of separation plate and air gun manifold can be changed in accordance with tests at the installation, with the different kinds of products that are to be sorted.

Furthermore it may be necessary to adjust the air pressure for the air gun valves, using the air pressure regulator, if the different products that are to be sorted are quite different in size and/or weight.

Remember:
- Moisture severely decreases the life expectancy of the air gun valves, so please make sure that the compressed air supply is as dry as possible and take care not to spray directly onto the air valves when cleaning with high-pressure cleaning materials.
- The ideal distance between reject system and product stream is +/- 20 mm. At this distance the overlap and false reject is reduced to a minimum.

In order to quickly test the air guns, the **GENIUS Compact** has been equipped with an air gun test system. This system is operated via the touchscreen, and activates either one air gun, or all air guns sequentially. For more info on the air gun test procedure, see chapter 8: Maintenance.

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The **GENIUS Compact** 640 mm has 64 air gun valves and the **GENIUS Compact** 1200 mm has 146 air gun valves. Each air gun valve covers an area between approximately 7.5 mm and 10 mm when the reject system is placed at +/- 20 mm from the product stream with a minimum of overlap.

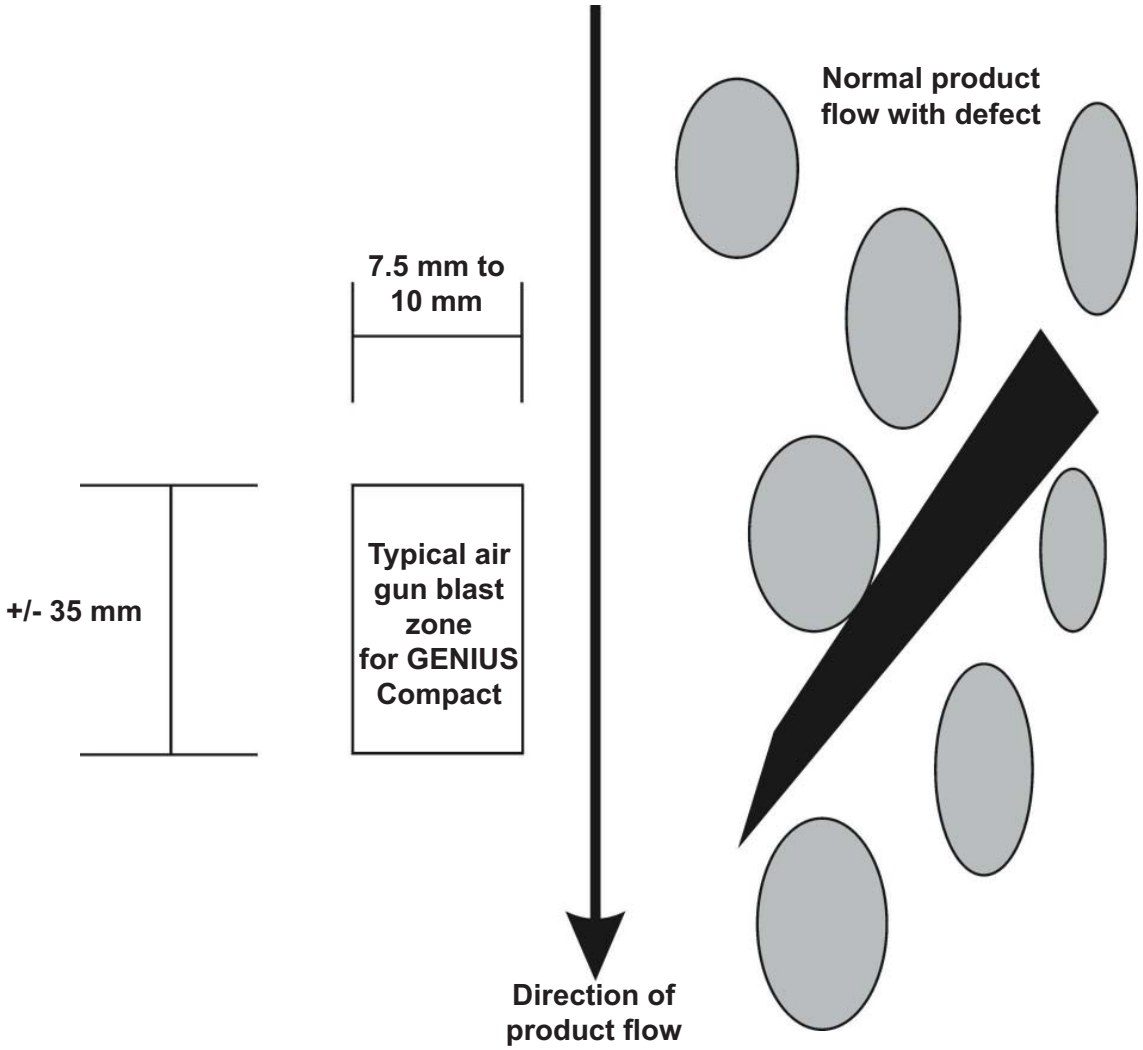
The exact width of the blast zone is dependent on the height of the reject system with respect to the product stream. The higher the reject system (the further away) from the product, the wider the blast zone will be. This means that the higher the reject system is placed from the product stream, the more overlap and the more false reject you will have.

Each detection is followed by an air gun blast of approximately 10 milliseconds (depending on product and common defects), and the product passes at the speed of +/-3 meter/second (depending on belt speed), which gives the blast zone a width of +/- 3 cm, plus the actual width of the blast zone.

It is clear that the dimensions of the blast zone are determined in major part by blast time, belt speed and the distance between product flow and ejection unit. Increasing the belt speed, increasing the blast time, or placing the ejection unit at a bigger than ideal distance from the product flow will unavoidably increase the amount of good product in the reject.

With the settings mentioned above, a zone of 0.75 to 1 cm (at ideal distance) by +/- 3.5 cm will be blown out for each detection. But even with these practically ideal circumstances and settings, this means that there will always be a few good pieces which end up in the reject stream (see picture underneath). This phenomenon is called “False reject”.

Picture 3.3.1: Bad product removal (dimensions blast zone at ideal distance: +/- 20 mm)



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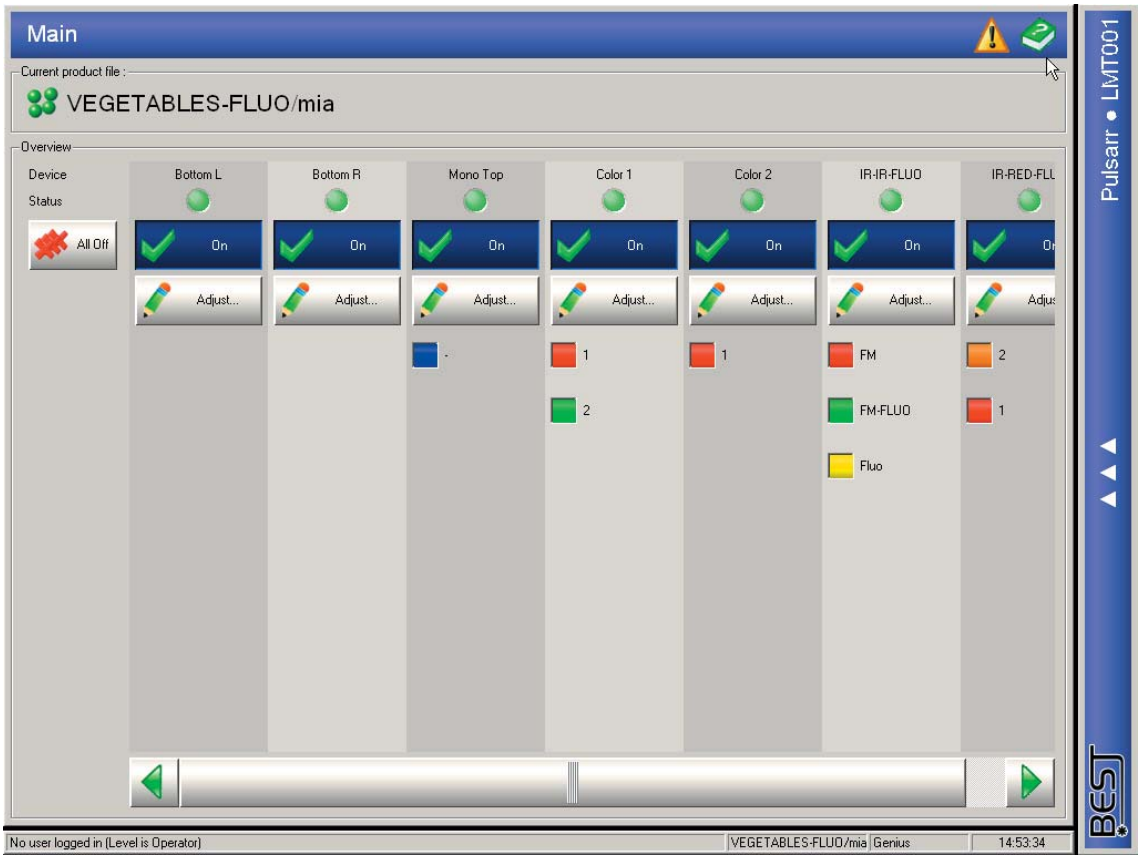
IV. Operating the GENIUS Compact

4.1. Introduction

Apart from switching the different parts of the machine On and Off, the **GENIUS Compact** can be operated entirely via touchscreen, featuring the POLLUX operation software, with a very user-friendly and conveniently arranged structure (see picture underneath).

Picture: Main Menu Touchscreen



Attention: ***- The entire sorting procedure is controlled via the touchscreen.***
- All adjustments and/or procedures for which a screwdriver or any other tool are needed are strictly reserved to qualified maintenance people.

Whenever the hourglass appears on the touchscreen the computer is busy, all data or commands entered during that time will be ignored!

Useful Terms:

LEFT	= when looking in the direction of the product flow this is the left-hand side
RIGHT	= when looking in the direction of the product flow this is the right-hand side

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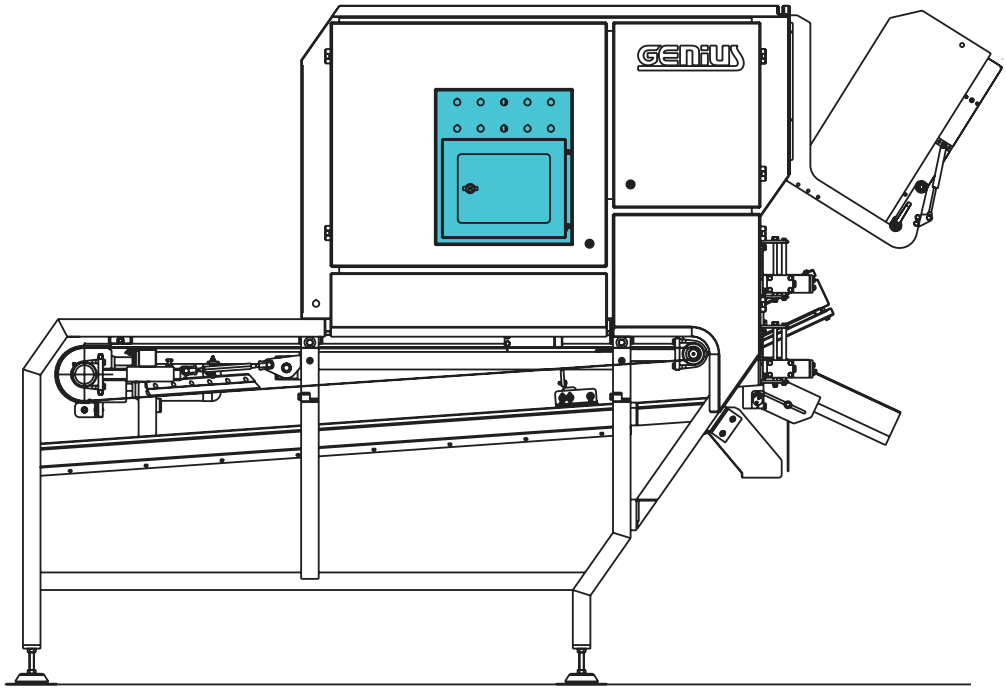
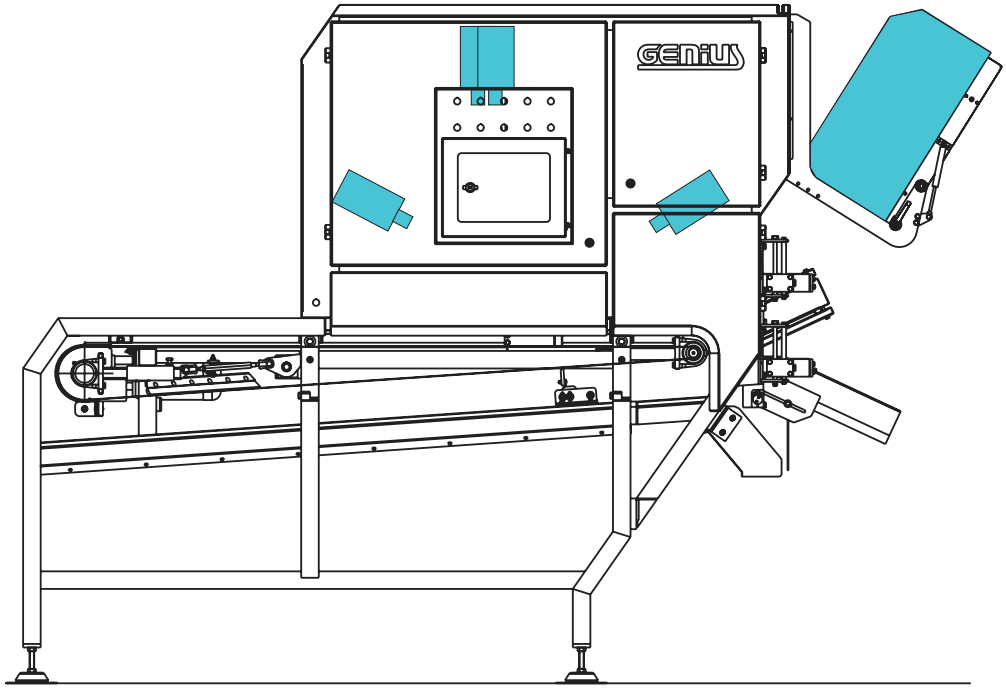
4.2. Location of the different parts

A. Control panel + Touchscreen



B. Optical systems (camera zones + laser box (optional))



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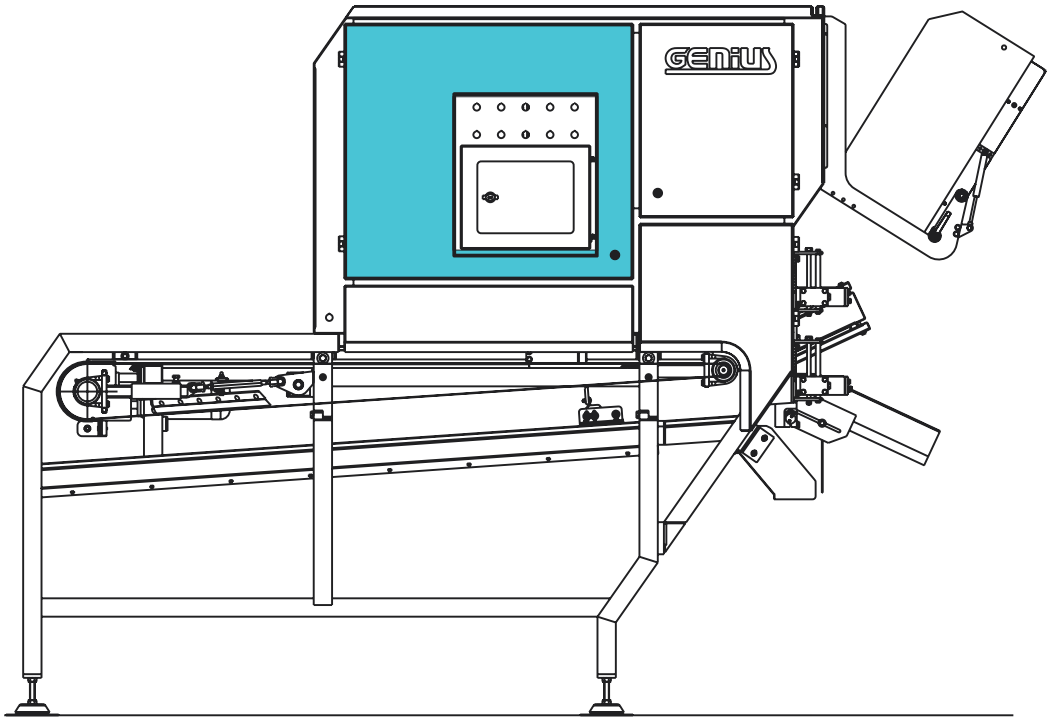
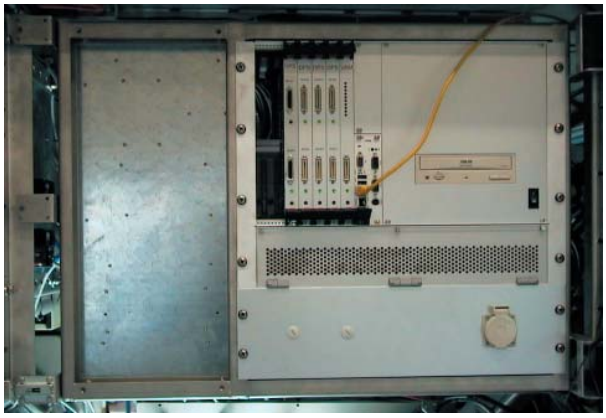
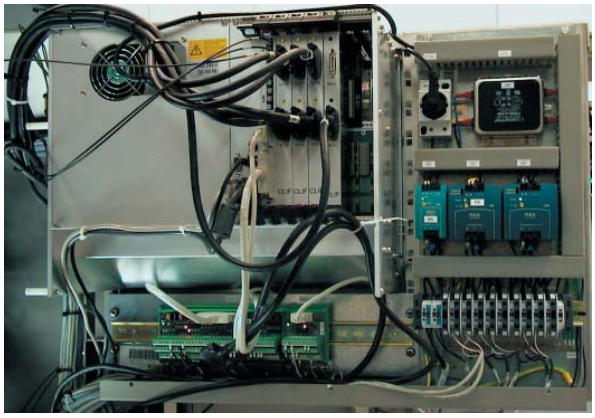
C. Electronics (on same side as touchscreen)







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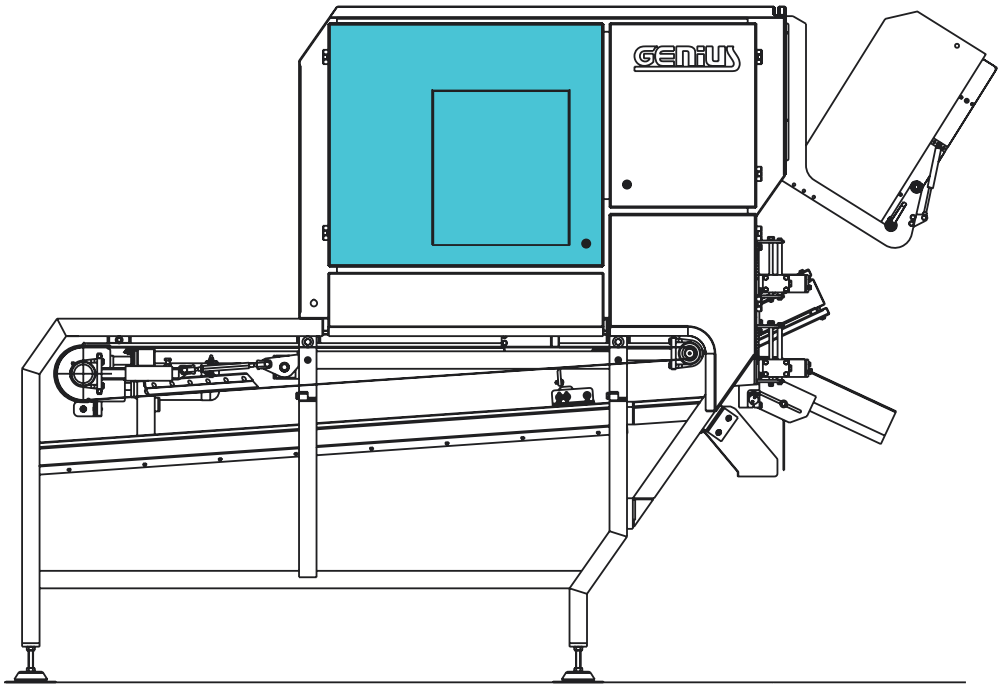
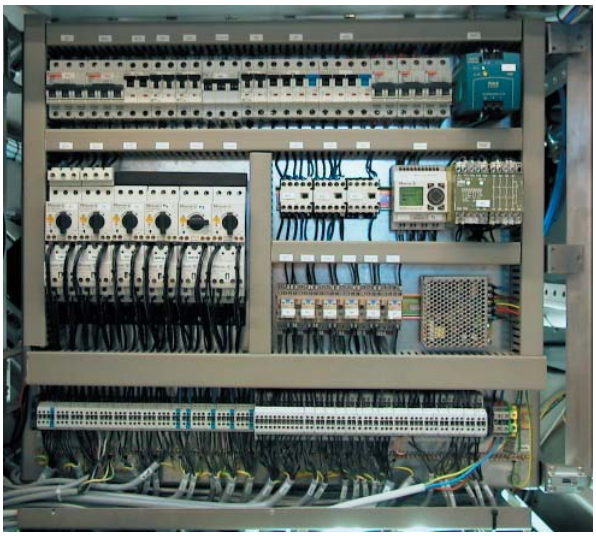
D. Main electrical installation (side opposite to touchscreen)
- relays, circuit breakers, ...





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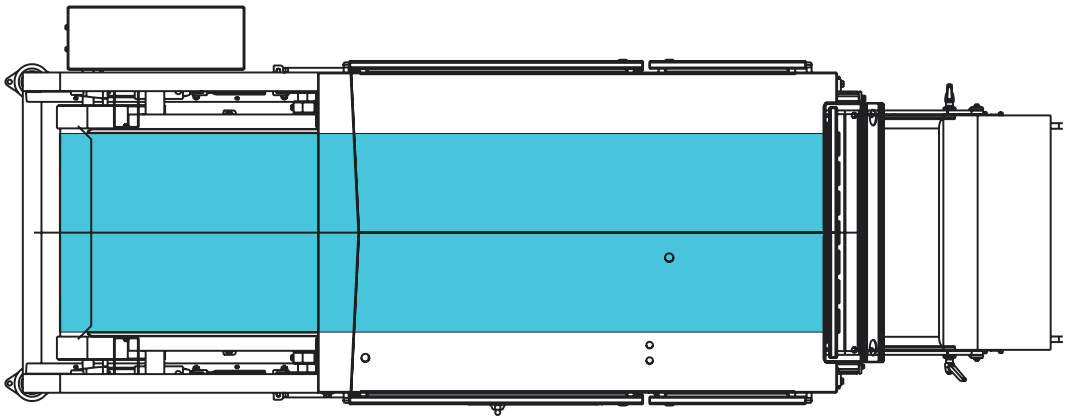
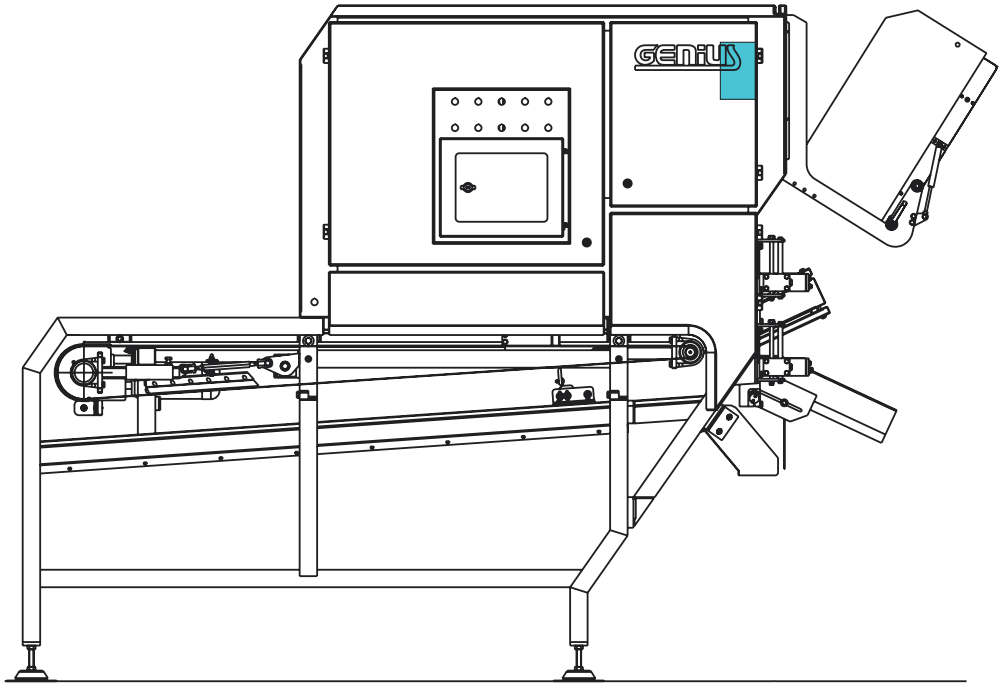
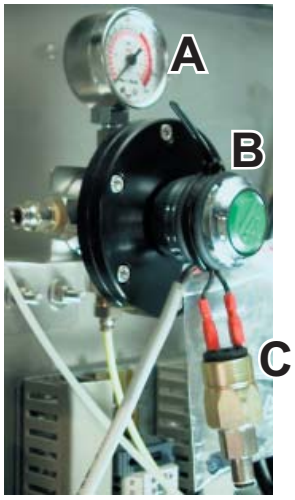
E. Belt



F. Nitrogen controls inside sorter unit (only with Laser box)





A. Internal Nitrogen pressure gauge
B. Nitrogen pressure regulator button
C. ???

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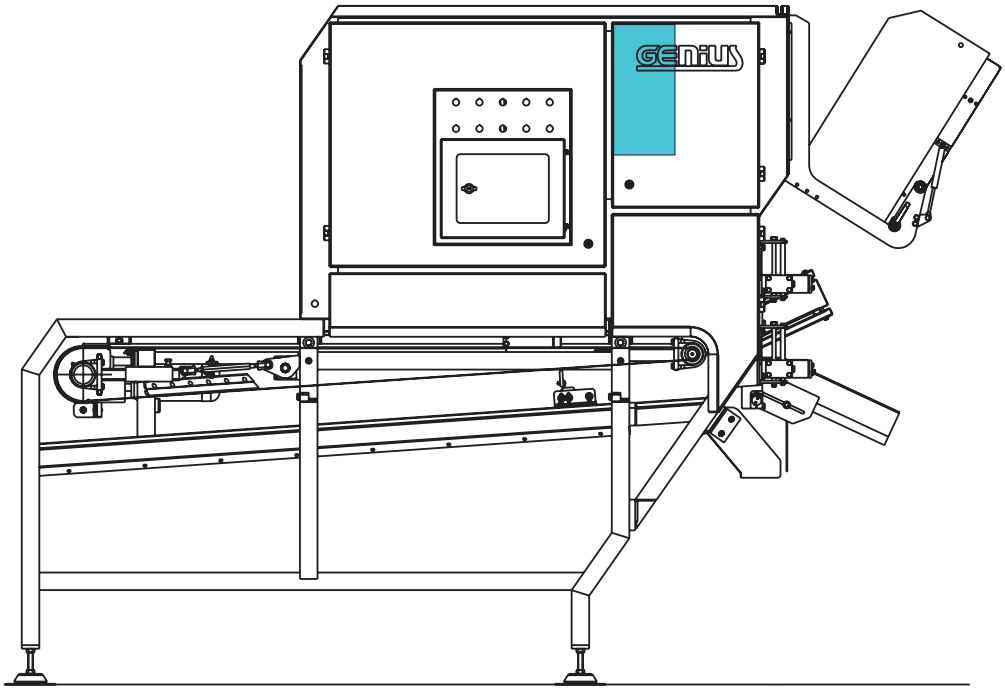
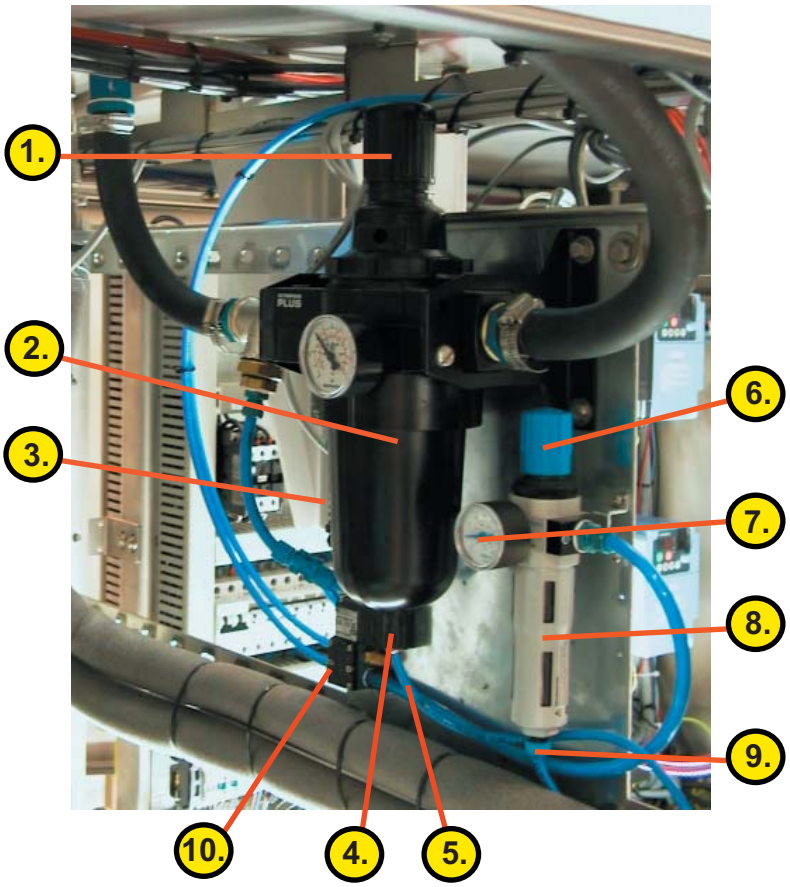
G. Compressed Air Controls inside sorter unit





Main Compressed Air Regulator/ Filter assembly

1. air regulator button
2. compressed air filter
3. water level indicator
4. water drain
5. water drain tube

Auxiliary Compressed Air Regulator/Filter (optional)

6. air regulator button
7. air pressure gauge
8. compressed air filter
9. water drain

10. Auxiliary Air Filter (optional)

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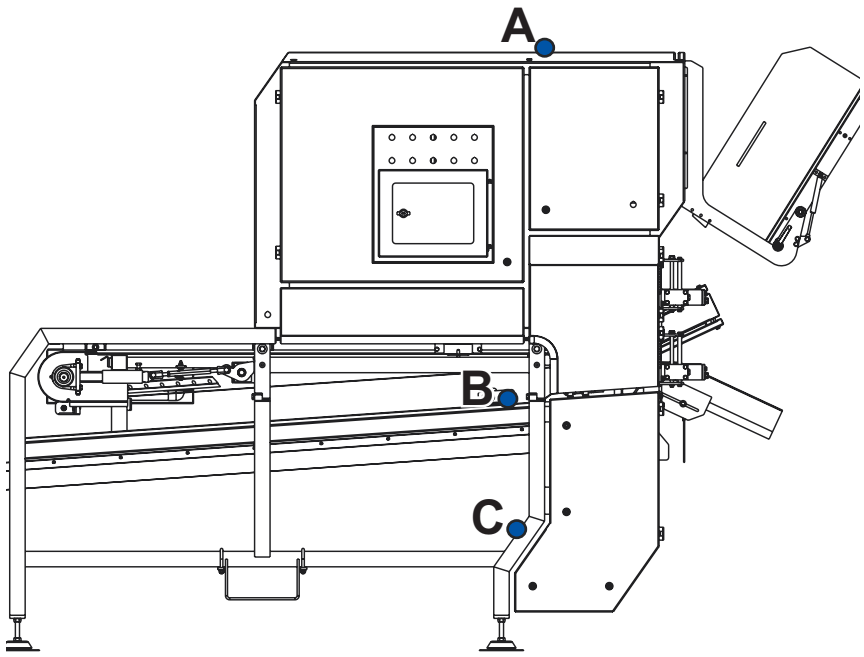
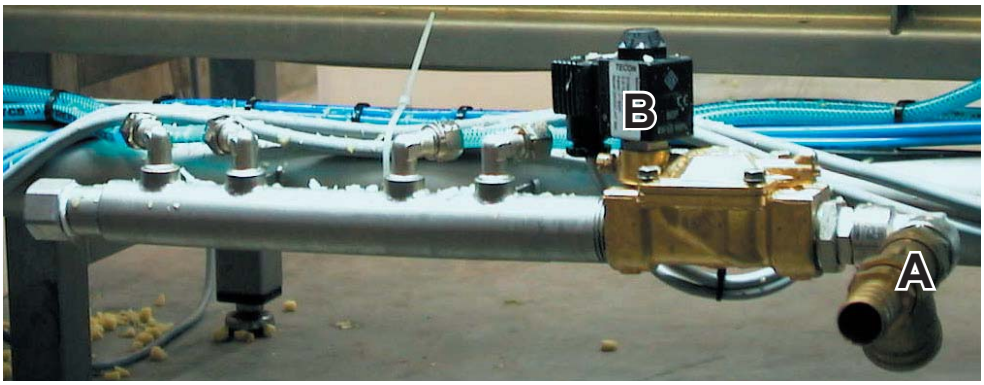
H. Water connections



A: Water Connections to/from Cooling unit or mains water supply.
B: Water connection belt cleaning system
C: Water connection cleaning syst. bottom unit (option) underneath sorter (3/4" Gaz)

Picture: Water supply cleaning system bottom unit (optional) underneath sorter unit



A: Water input cleaning system bottom unit (option)
B: Electronic water valve

Picture: Belt cleaning system underneath belt, with water connections on both sides

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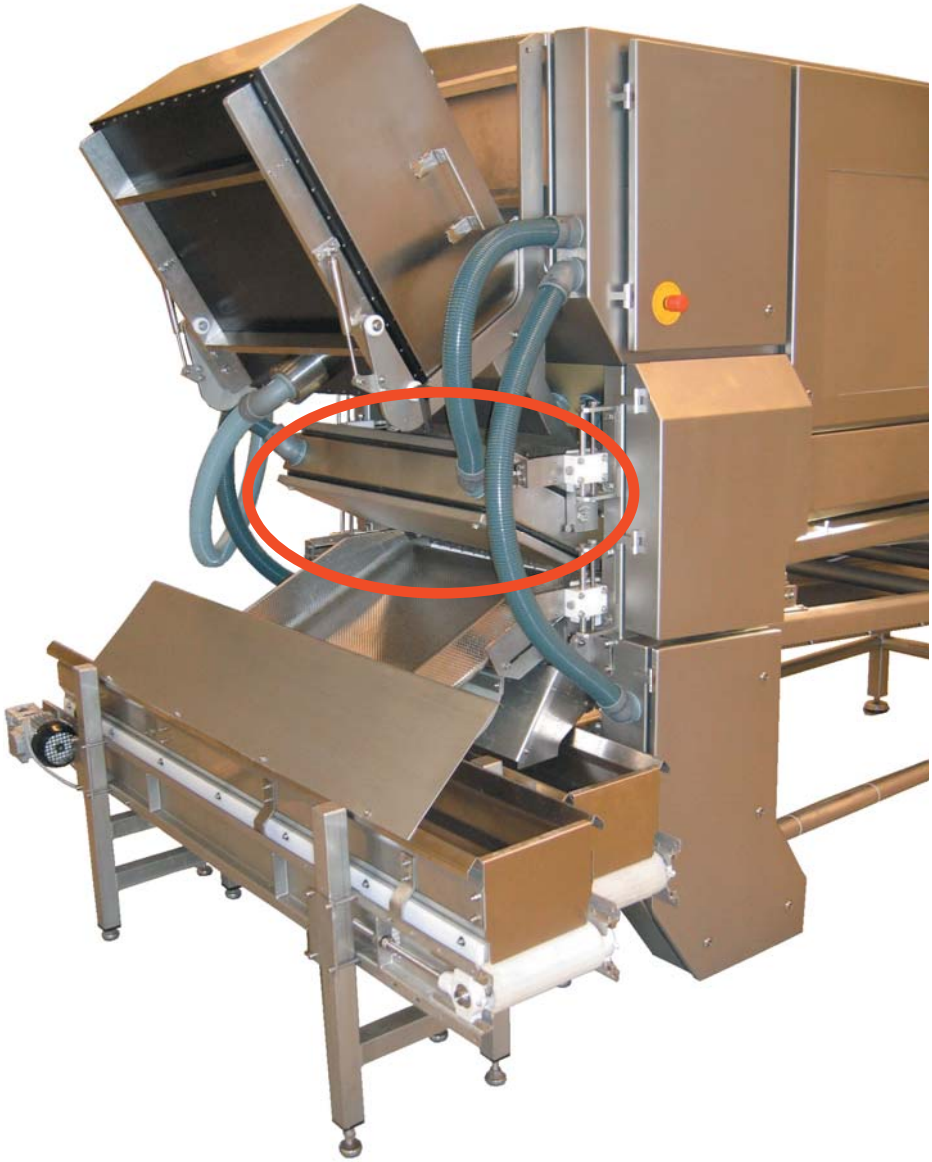
I. Ejection Unit



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4.3. Control panel

The control panel is on the left or right side near the front of the **GENIUS Compact** sorter unit, and consists of a touchscreen control display and directly above it 2 rows of control lights, buttons and switches:

Picture 4.3.1: Control panel + touchscreen

- 3 standard (+ 2 optional warning lights):
  220 VAC, Alarm, Service Mode + Nitrogen and Optics (only with laser box)

- 4 On/Off buttons:
  Control voltage, Belt, Vibrator and Return System.
  On the **GENIUS Compact** version these control buttons have been equipped with a central white light that will be activated when the buttons are switched to ON.

- 1 switch:
  Production Line switch

- 2 buttons (optional):
  Upper button to switch between normal Pollux operating system and Xyclops shape recognition system.
  Lower button to switch the bottom detection unit on/off (this button will light up when the bottom unit is ON).

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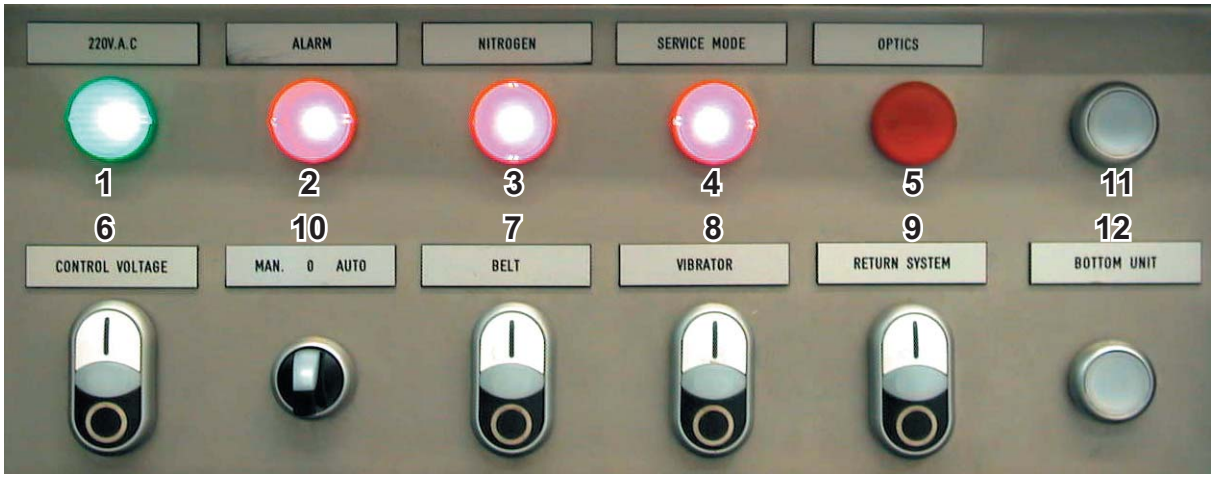
Touchscreen Control Display:

The Touchscreen Control display can be considered as a computer through which you can control the entire **GENIUS Compact** sorter system. Theoretically the entire sorting process can be controlled using this display.

The touchscreen can also give information concerning the hardware of the sorter and the sorting process, and major electrical and electronic failures will be indicated by messages in the appropriate touchscreen menu (further information on the messages and the use of the touchscreen display will be given in the **Troubleshooting** chapter and the chapter on the use of **The Touchscreen Display**).

Picture 4.3.2: control panel details



1. Green "220 VAC" Warning light

This light simply indicates that the Main Power Switch is switched on and the machine is powered. When the Main Power Switch is switched off, the green warning light will switch off as well.

2. Red "Alarm" Warning Light

This light will be on whenever there is an alarm, indicating there is a problem impeding the proper functioning of the sorter.
When this warning light is activated, the control current will be switched off automatically.

3. Red "Nitrogen" Warning light (Only with laser box)

This light will be activated whenever there is insufficient nitrogen pressure.

4. Red "Service Mode" Warning Light (Only with laser box)

This light will be activated whenever the laser safety interlocks have been defeated. All lasers will automatically switch off.

5. Red "Optics" Warning Light (Only with laser box)

This light will be activated whenever the temperature of the laser box is too high, the lasers will be switched off and sorting with the laser box will be halted.

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6. Control Voltage button

Use this button to switch on the control current. This enables power supply to all secondary parts of the **GENIUS Compact** and immediately switches on the lighting for the optical systems.

This button must be activated in order to be able to start the Belt, the Infeed Shaker and/or the Return System.

Whenever the Emergency stop has been used, or an “Alarm Out” warning is given, the control current is automatically switched off.

7. Belt button

Use this button to start/stop the belt, without starting or stopping any other part or the sorter itself.
To be able to start the Belt, the Control Voltage button must be activated.

8. Vibrator Button

Push this button to start/stop the infeed shaker, without starting or stopping any other part or the sorter itself.
To be able to start the shaker, the Control Voltage button must be activated.

9. Return System

Push this button to start/stop the return system, without starting or stopping any other part or the sorter itself.
To be able to start the return system, the Control Voltage button must be activated.

10. Production Line switch: Man / 0 / Auto

With this switch the command mode of the sorter installation can be changed.

In Man (manual) mode, all buttons on the control panel above the touchscreen can be used to switch any component on and/or off.
In Auto (automatic) mode, none of the buttons can be used to switch any component on and/or off. All these command functions are transferred to the control panel of the production line.
In 0 (deactivated) mode, the control panel cannot be used, not manually and not through the production line control panel.

11. Program-switch button

This button is used to switch the touchscreen function from Pollux program to Xyclops program.

12. FSV button
(Only present with Full Surround View/Bottom unit System)

Push this button to switch the Full Surround View module ON or OFF.
To be able to start the FSV system, the Control Voltage button must be activated.

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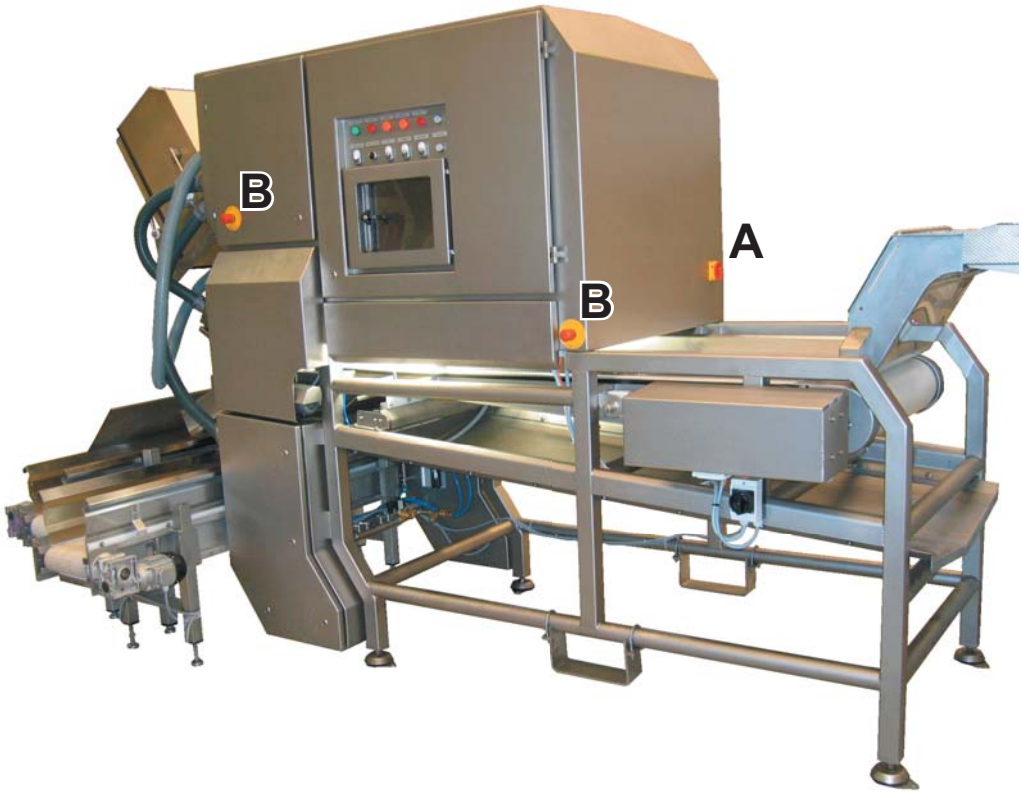
4.4. Main Power Switch & Emergency stop

Picture: Main Power, Emergency Stop



A. MAIN POWER Switch:

The Main Power Switch is located on the rear of the **GENIUS Compact** sorter unit near the right corner.

This switch controls all power to the sorter and the machinery it controls.

B. EMERGENCY STOP Button:
(Red button surrounded by a big yellow circle)

A number of these buttons can be found all over the sorter unit, they should only be pushed in case of an emergency. All electrical power to the lighting and the belt of the **GENIUS Compact** sorter unit, the infeed shaker and all other machinery that is controlled by the **GENIUS Compact** will be cut immediately, the entire sorting process will be stopped if this button is pushed.

To switch the lighting and the moving parts of the machine back on again, pull the emergency stop button out to release it, and press all the appropriate buttons on the control panel, starting with the Control Voltage button.

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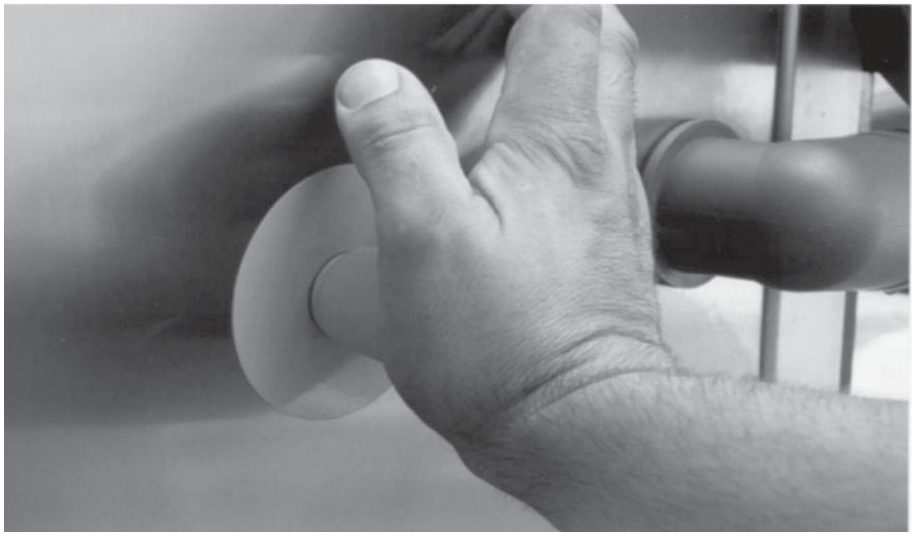
EMERGENCY STOP : When and what?

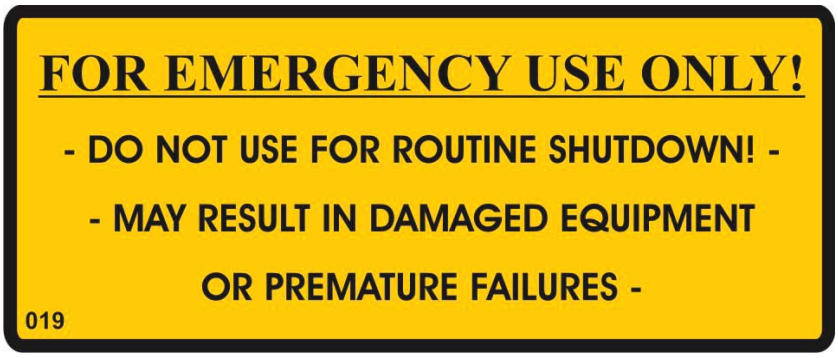
In case of emergency do not hesitate to press the Red/Yellow button (see picture underneath). All electrical power to the lighting and all moving parts of the machine will be cut immediately.

Picture 4.3.1: Push Emergency Stop



Attention: ***- Do not use the Emergency Stop for routine shutdown!***

- Frequent use of the Emergency Stop may result in damaged equipment or premature failures of certain electrical or electronic components (see Emergency Stop Label underneath).



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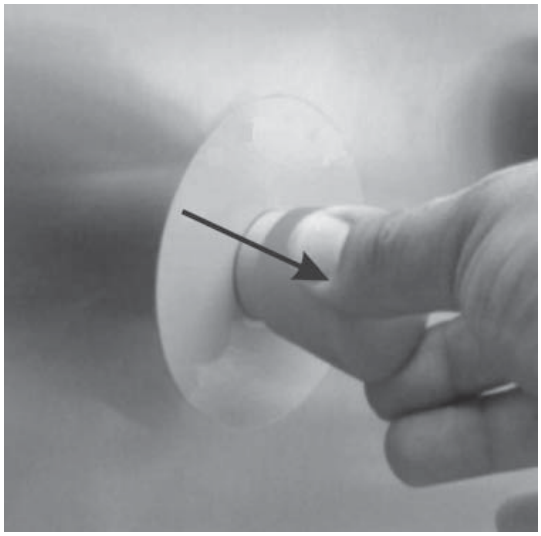
To restart the machine after an emergency stop:

1. Pull the RED Emergency button back to release it



2. Press the control Voltage button (always first button to the left)

3. Press all other buttons on control panel, from left to right to reactivate all sorter components. Belt, Shaker and Return system can only be reactivated when the production line switch is set to MAN (manual).

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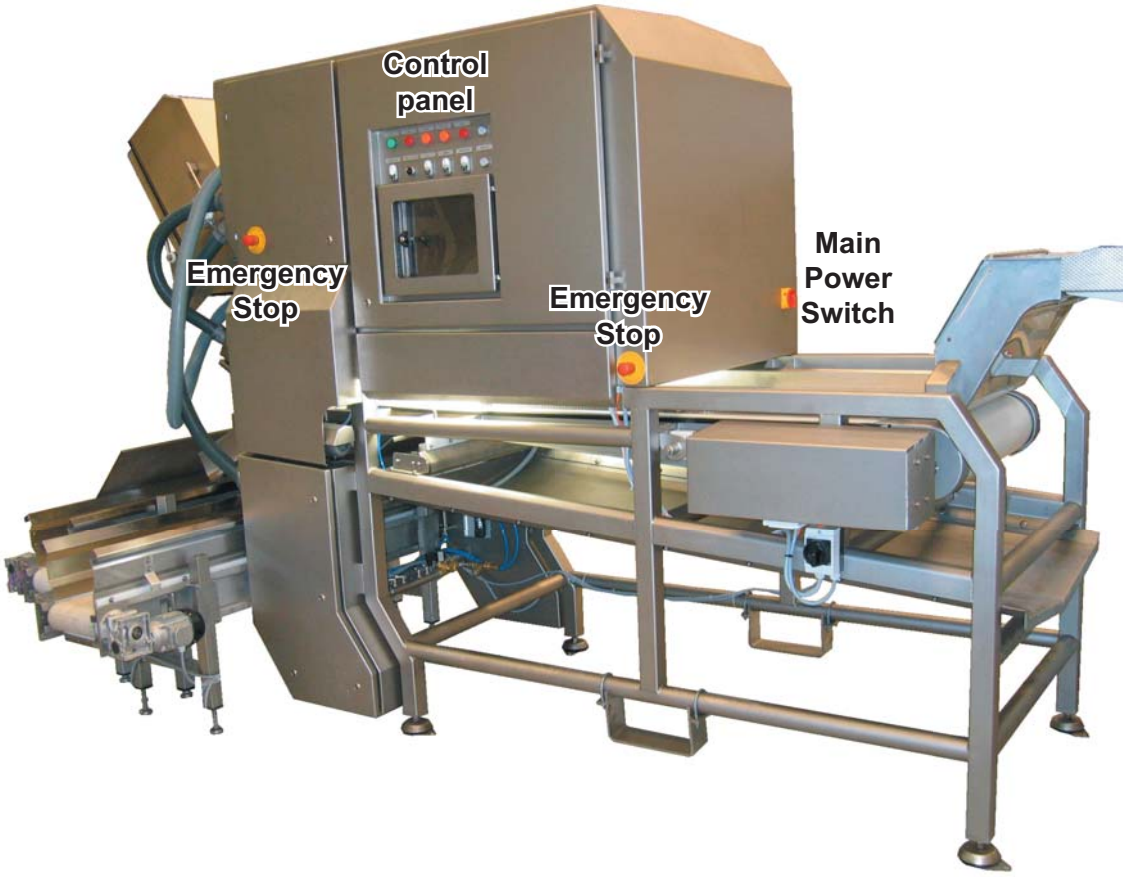
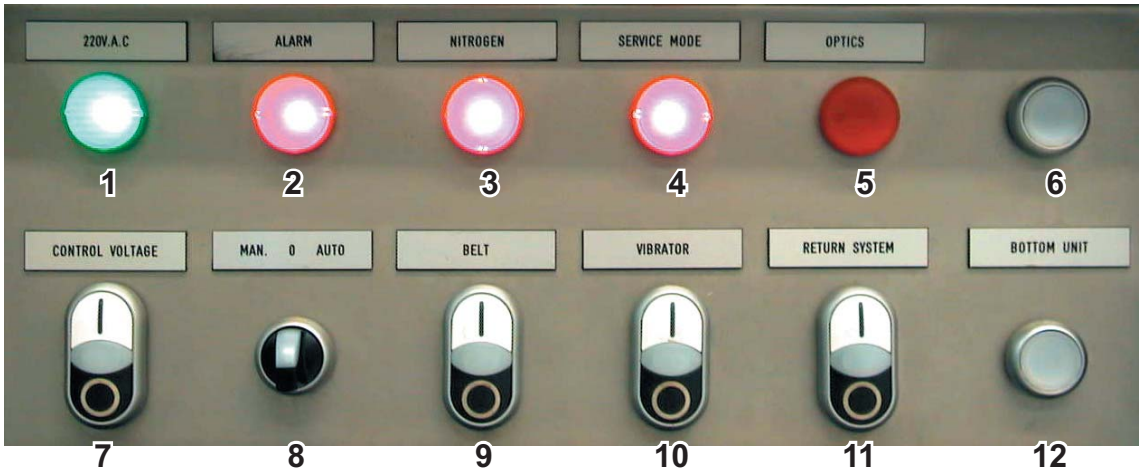
V. Routine Operational Procedures

5.1. The different Startup/Shutdown Procedures

Picture 5.1.1:



Picture 4.3.2: Control panel details



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1. Complete Shutdown/Startup

Complete Shutdown Procedure

- For longer periods of inactivity (one day or more), or for safety when working on the electrical installation. All power to the sorter installation will be cut.

1. **Switch Control Voltage button to OFF (0)** (see control panel: 7) to switch OFF Shakers, Belt and Lighting (Only when Product Line switch (8) is on manual).

2. **Turn Main Power Switch OFF** (see picture) to **switch off** the **GENIUS Compact sorter**. All machinery controlled by the sorter unit (Infeed shakers and return systems) will be switched off as well).

3. Next **switch off the cooling unit** (if present) **and/or any other related machinery** not controlled by the sorter unit.

Main switch ON

Main switch OFF

Complete Startup Procedure

- After complete shutdown.

Attention: ***- Please remember to start the machine at least half an hour earlier (+/-30'), to give the light tubes and the cameras sufficient warm-up time to reach the appropriate light intensity and colour temperature before taking reference lines and starting the sorting process.***

1. **Switch on the Cooling unit** (if present) several minutes (10' to 15') before switching on the sorter unit. This will give the Cooling unit some time to lower the temperature of the cooling water.

2. **Turn Main Power Switch On**.

3. **Activate Control Voltage button** (see control panel: 7).
(Only when Product Line switch (8) is on manual.)

4. **Activate other buttons on control panel** (see control panel: 9-11).
- all accompanying machinery (Infeed shakers and/or return systems e.g.) controlled by the **GENIUS Compact** will be switched on automatically.

5. **Switch on all other related machinery** (if present) not controlled by the sorter unit.

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2. Emergency Stop

- Press the yellow /red Emergency button only in case of emergency!!
The control current of the **GENIUS Compact** sorter unit will be cut. This means all power to the lighting for the optics, all moving parts and all equipment directly controlled by the sorter will be cut immediately!

Emergency Shutdown Procedure

1. **Push any Emergency Button**.

Attention: ***- Do not use the Emergency Stop for routine shutdown!***
- Frequent use of the Emergency Stop may result in damaged equipment or premature failures of certain electrical or electronic components (see Emergency Stop Label underneath).

2. **Switch off all other related machinery** if the sorter will remain switched off for a longer time.

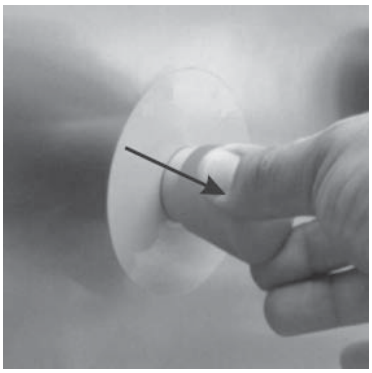
Emergency Stop label

Startup after emergency shutdown

1. **Pull the RED emergency button** back to release it (see picture underneath).

2. Follow **steps 3 to 5 of the Complete Startup** procedure.

Pull Emergency Stop back



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3. Standard Shutdown/Startup

Standard Shutdown Procedure

- For short periods of inactivity. Only the lighting, the moving parts and related machinery controlled by the **GENIUS Compact** will be switched off. The rest of the sorter will still have current: Touchscreen display and electronics will still be powered.

1. **Switch Control Voltage button to Off (0)** (see control panel: 7).
(Only when Product Line switch (8) is on manual.)

Standard Startup Procedure

- All accompanying machinery (Infeed shakers and/or return systems e.g.) controlled by the **GENIUS Compact** will be switched on automatically as well.

Attention: ***- Even after a short shutdown period the lights and the optics may need a few minutes to stabilize.***

1. **Activate Control Voltage button** (see control panel: 7).
(Only when Product Line switch (8) is on manual.)

2. **Activate other buttons on control panel** (see control panel: 9-11).
- All accompanying machinery (Infeed shakers and/or return systems e.g.) controlled by the **GENIUS Compact** will be switched on automatically.

3. **Switch on all other related machinery** (if present) not controlled by the sorter unit.

Remark: ***- When switching On the Control Voltage button, always make sure the compressed air supply is activated. Without compressed air, continuously activated air gun valves may remain unnoticed for a long period, overheat, and short-circuit.***

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5.2. Using the Pollux Touchscreen navigation bar

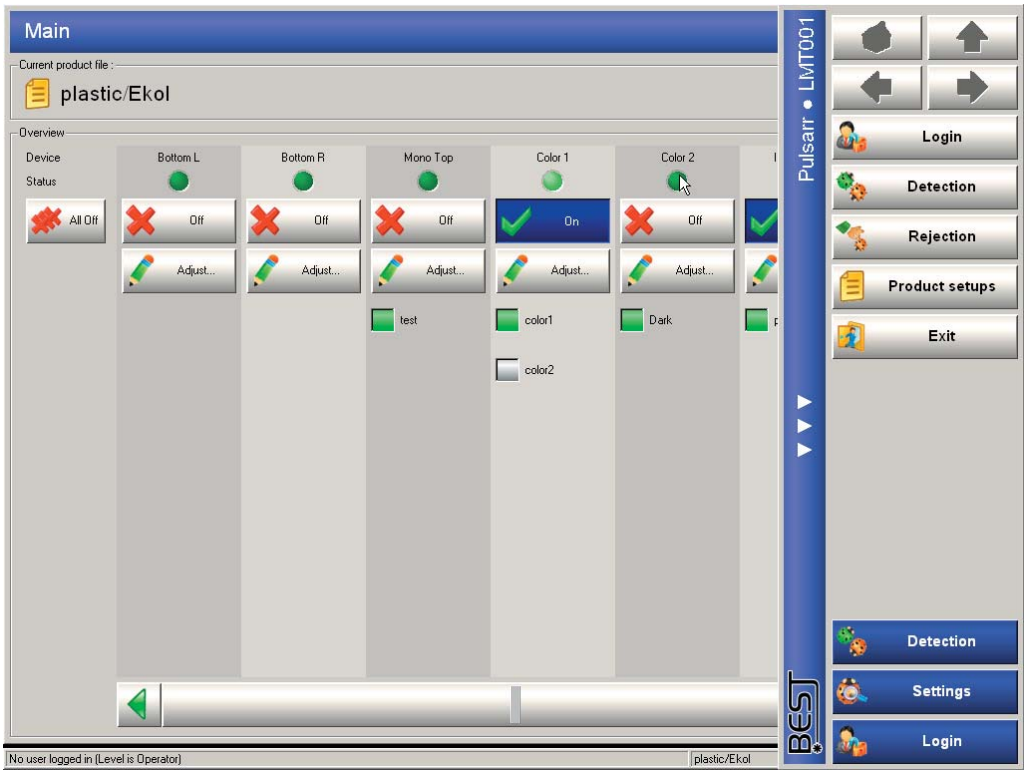
To the right side of each touchscreen menu there is a bar containing 3 arrows pointing to the left. If this bar is pressed, the navigation bar will pop out, slightly overlapping the central screen of the menu. To make the navigation bar disappear again, just press the bar to the left of the navigation bar with the arrows pointing to the right.

The navigation bar contains a number of buttons that can be divided in 3 groups from top to bottom on the bar:

1. Navigation buttons: from left to right, and from top to bottom:
   - "Home" Pressing this button will take you right back to the main menu.
   - "Level up" Pressing this button will take you to the menu that is exactly one level above the menu you are in.
   - "Back" Pressing this button will take you back to the previous menu you visited
   - "Next"" Pressing this button will take you to the next menu (will only be activated when the 'Back' button has been pressed one or more times).

2. Menu Buttons:
   The buttons shown here provide links to the menu's that can be visited directly from this menu. Usually these are the menu's directly below this menu

3. Most visited buttons:
   These 3 buttons provide direct links to the 3 most visited menu's.



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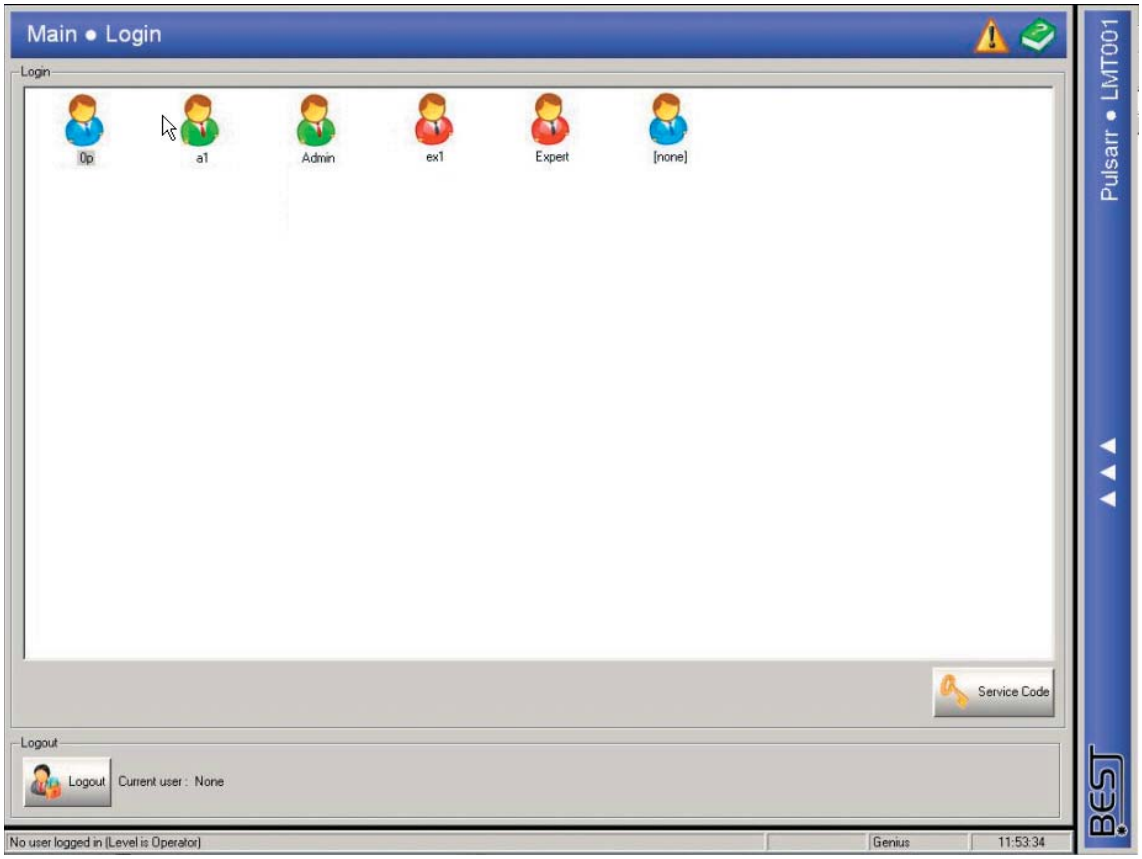
5.3. Log-in

The Log-in menu

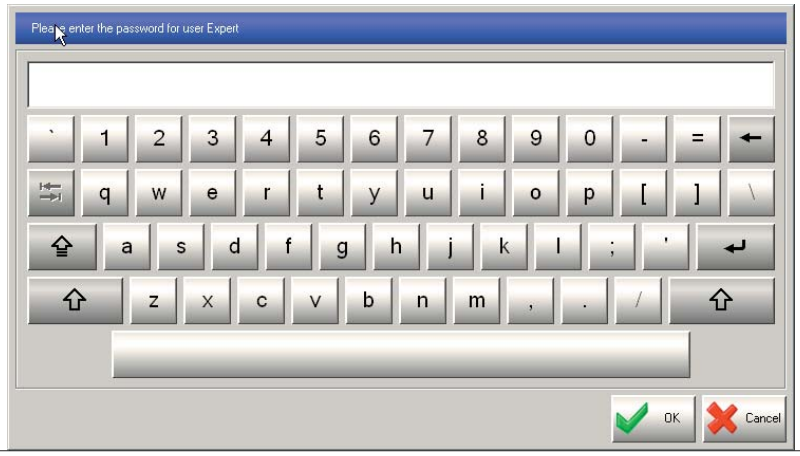
After the **GENIUS Compact** sorter unit has been switched on (main power switch ON), the touchscreen program will start up automatically and the Login Menu should appear on the touchscreen display.

The Pollux program will automatically start up in the lowest user level possible, the so-called “no-user” level. In this user level only the Login menu is available.

The Login menu will appear (see below), featuring a number of user icons, representing different users and/or user groups with specific rights.



Select the appropriate user by pressing the appropriate icon. Use the pop-up keyboard (see next picture) to enter your user code and press OK once the correct code is entered.



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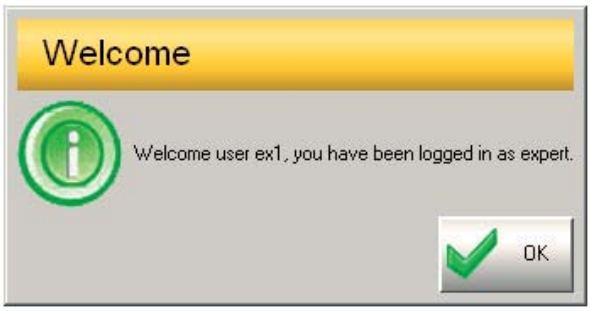
After entering the correct user code, a welcome screen will welcome the user and indicate name and user level.



The user will then have access to a number of menu's and settings in accordance with his user level. All user levels are also colour coded, meaning that the colour of the upper bar and the side navigation bar also indicates the present user level.: Operator (blue), Administrator (green) or Expert (yellow). A separate Service level (black) can be accessed by pressing the "Service" button to the lower edge of the screen. This level is only intended for **BESTnv** service engineers.

More info on the different user levels will be given in the touchscreen chapter later in this manual.

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5.4. Normalization

Attention: ***- Make sure the belt is running when taking a normalization!***

- Belt surface must be clean and undamaged and no product may pass over the belt while taking a new normalization.

- Be sure to take a new normalization for all camera's after start-up, before determining product settings or starting the sorting process.

- Always take into account the warm-up time for the lights and optics, (+/-30 min. after a longer stop), before taking a normalization.

- On top of this, it is advisable to take a new normalization every time the system is halted and/or restarted.

Attention: ***- If something goes wrong with the New Normalization, the system will still overwrite the Old Normalization. This means that any problems that occur must be solved, and a new normalization must be taken successfully before the sorting process can be started!***

- If something keeps going wrong when taking the normalization, please note the content of the error message and contact the BESTnv service department

To take a new normalization, use the Touchscreen on the control panel; the touchscreen program starts automatically when the **GENIUS Compact** is started. The normalization procedure in operator level differs from the procedure in expert level.

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5.4.1. Operator level procedure:

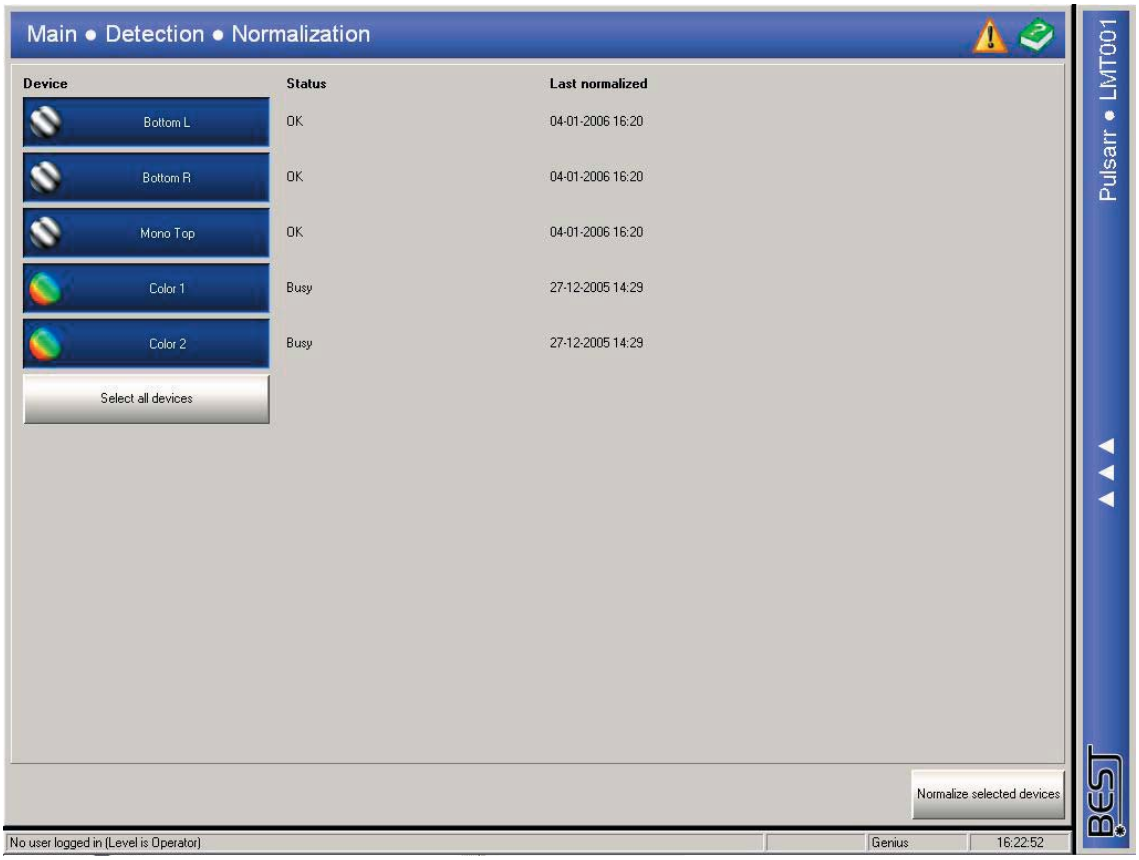
1. Press the Detection button on the navigation bar to get to the Detection Menu.

2. Press the Normalization button on the navigation bar to get to the Normalization Menu.

3. Press the device you want to normalize. The button pressed will turn blue. Usually it is advisable to simply select the Select all devices button in the Normalization Menu (all device buttons will turn blue).

4. Press the Normalize selected devices button.

The devices will be normalized one by one, busy will appear after the device that is currently being normalized, and the OK means a successful normalization has been taken.



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5.4.2. Expert level procedure:

1. Press the Detection button on the navigation bar to get to the Detection Menu.

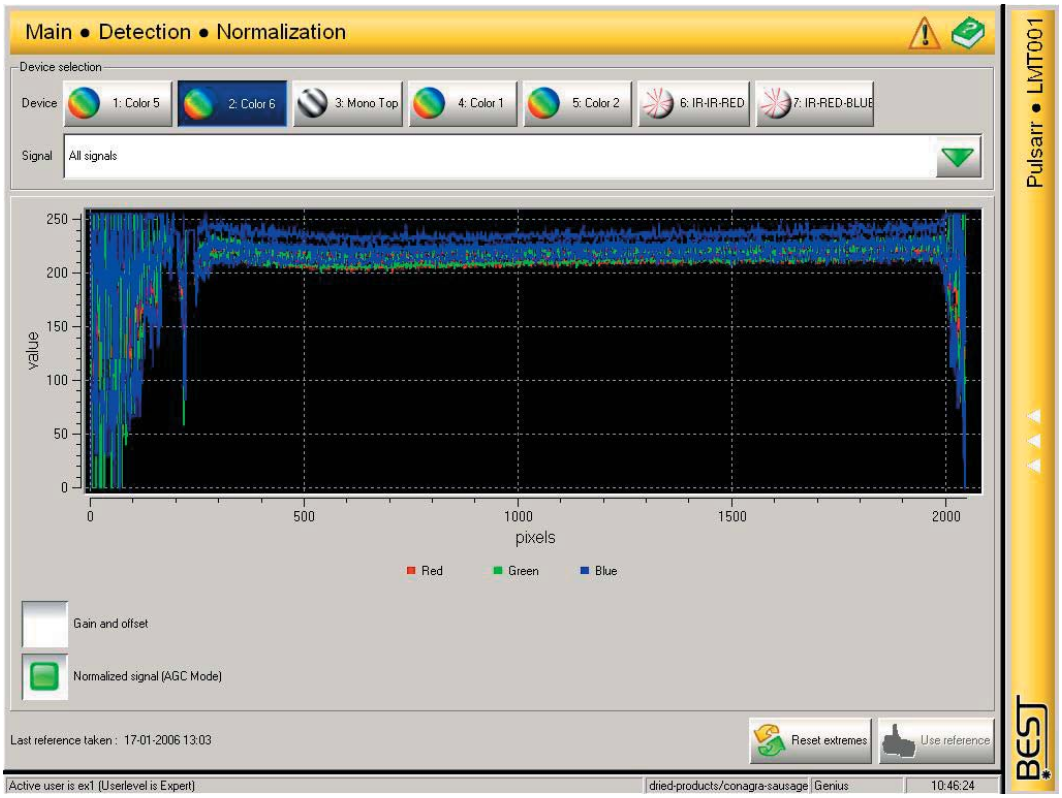
2. Press the Normalization button on the navigation bar to get to the Normalization Menu.

3. Select the appropriate device by pressing the button to the top of the screen (Lasers do not need normalization). The button of the selected device will turn blue.

4. Select all signals (with colour camera).

5. Press Reset extremes button to bottom right of screen.

6. Activate “Normalized signal AGC model” view.
   - Press white square before “Normalized signal AGC model”
   All signals on the main screen should now form a more or less horizontal line (see picture) and should be approximately on top of each other (see picture below).



7. Adjust offset and gain if necessary.
   - Press white square before Gain and offset.
   A pop-up screen will appear (see picture).
   Increase or decrease Gain and Offset as needed.

8. Repeat points 3 to 7 for all active devices (cameras).

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5.5. Sorting

Attention:

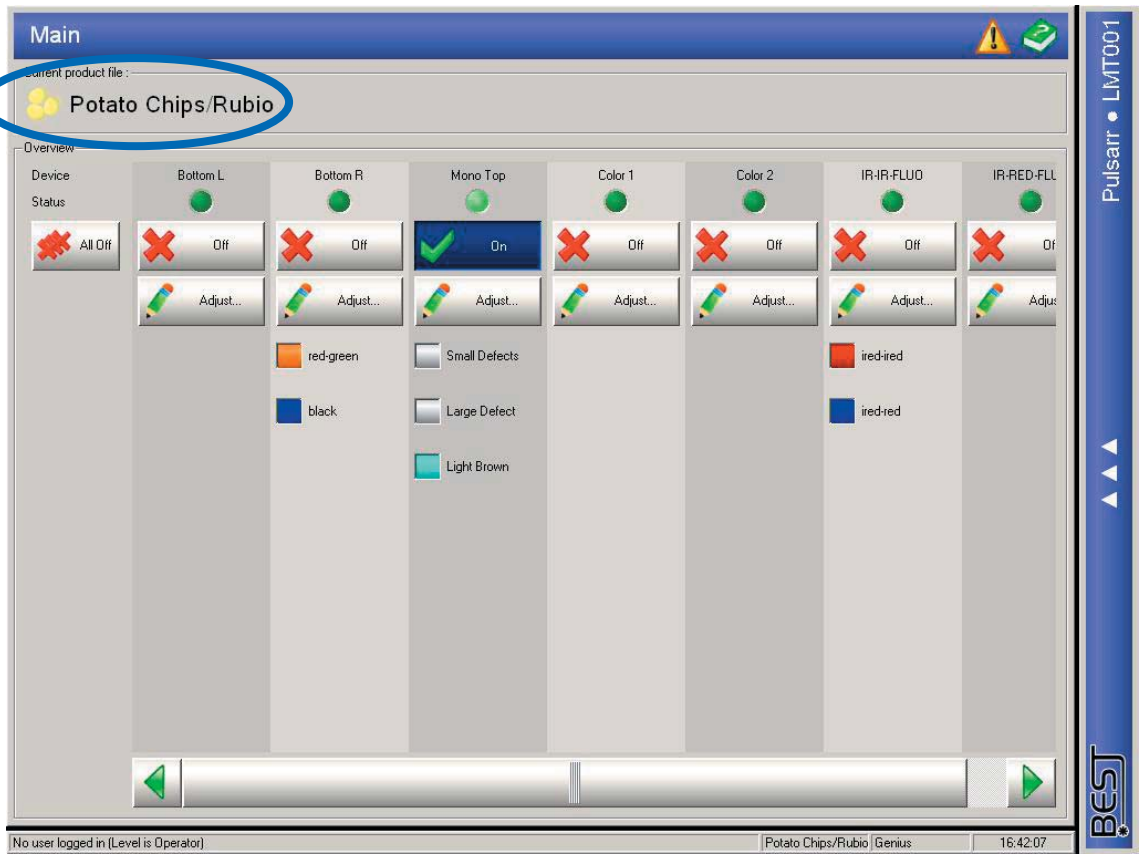
- Before sorting, always make sure no emergency stops have been pushed and no alarms have been activated.

- Always make sure that no factors remain that could impede the sorting process: no objects on the belt, infeed shaker and/or return system, the belt must be clean and well aligned, windows must be clean, etc. ...
(see maintenance and cleaning chapters).

- Make sure all doors and compartments have been closed.

- It is often necessary to make small changes to the threshold and filter settings with every new product batch, due to variations between batches in product and defects.

The **GENIUS Compact** will always start-up with the same product file that has last been used before the machine was switched off. The symbol of the currently used product file is displayed in the upper part of the main menu under Current product file (see picture).



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To start sorting:

1.- **Switch on the sorter** as described in the start procedures.

2.- Before starting the product flow to the sorter installation, first **take new Normalizations** for all cameras and/or lasers (see subchapter 5.3.)

Attention: ***- Always take into account the warm-up time for the lights and optics, (+/-30 min. after a longer stop), before taking a reference line.***

3.- Check that the **Compressed air supply** and the **Water supply** (if necessary) are initialised.

4.- When sorting a **different product** as before, first **load an existing product file** (see subchapter 5.5.) **or create a new product file** with new product settings (see subchapter 5.6.).

5.- The sorter is now ready to start sorting, simply **initialise the product flow** to the sorter installation.

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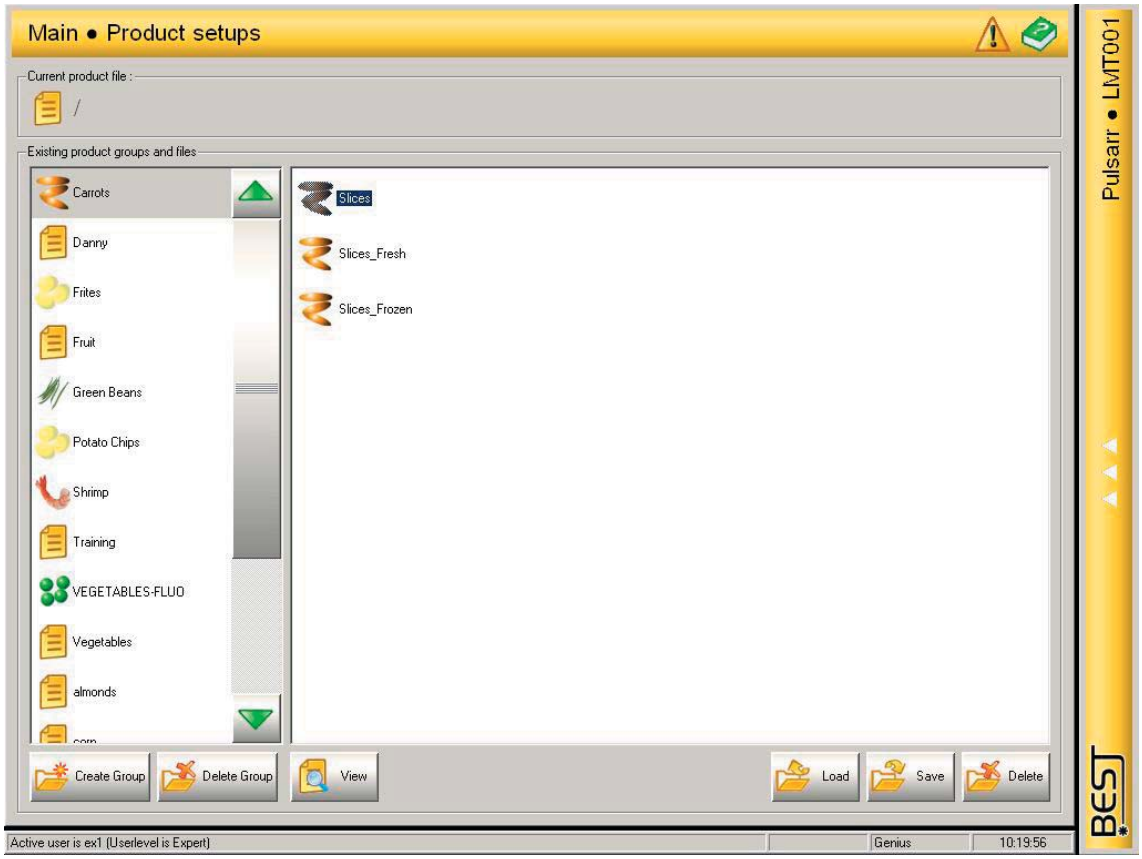
5.6. Saving and loading Product Files



In the Product Setups Menu all management of Product Files takes place.
The actual adjustment of filters, thresholds and other settings must be done in the Detection or the Rejection Menu.

The following functions are available in this menu:

1. Create Group (Expert level)

2. Delete Group (Expert level)

3. View the Product File (Operator and Expert level)
   Shows a list of all settings saved under the selected product file.

4. Loading Product Files (Operator and Expert level)

5. Saving Product Files (Expert level)

6. Deleting Product Files (Expert level)

Remember: ***- The product file that is currently in use cannot be deleted.***
- Saving product settings under the same name as an existing product file will overwrite the old file.

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5.6.1. Loading Product Files:

To load an existing product file:

- Go to the Product Setups Menu.
- Select the appropriate product group and next the appropriate product file.
- Press the LOAD button

5.5.2. Saving Product Files
(Only for Expert users)

To save any changes or new settings you have made:

- Go to the Product Setups Menu.
- Press the Save button.
- Enter a new file name,
  or Confirm the file name displayed if you want to overwrite your original product file.

Attention: ***- Make sure to give all your Product Files unique and simple names, so all operators can easily see which program to use for each type of product.***

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5.7. Setting a New Product File

Preparation:

1.- **Switch on the sorter** as described in the start procedures, but do not switch on the infeed shaker, belt or return system. Make sure all is clean and ready for sorting.

2.- Before adjusting any optical settings or starting the product flow to the sorter installation, first **take new Normalizations for all devices** (all cameras and/or lasers), see subchapter 5.4.

Attention:

- Always take into account the warm-up time for the lights and optics, (+/-30 min. after a longer stop), before taking normalizations.

- Make sure the Product is available before starting Product Setup.

- If a Product File exists for a product that is similar to the product you want to sort, it is always advisable to load that Product File before performing this procedure (See Subchapter 5.6. Saving and Loading Product Files.)

- When starting from a preexisting Product File, it is usually possible to skip Part 1 of this Product Setup Procedure. When in doubt, please check Part 1, to see whether the settings correspond with you product.

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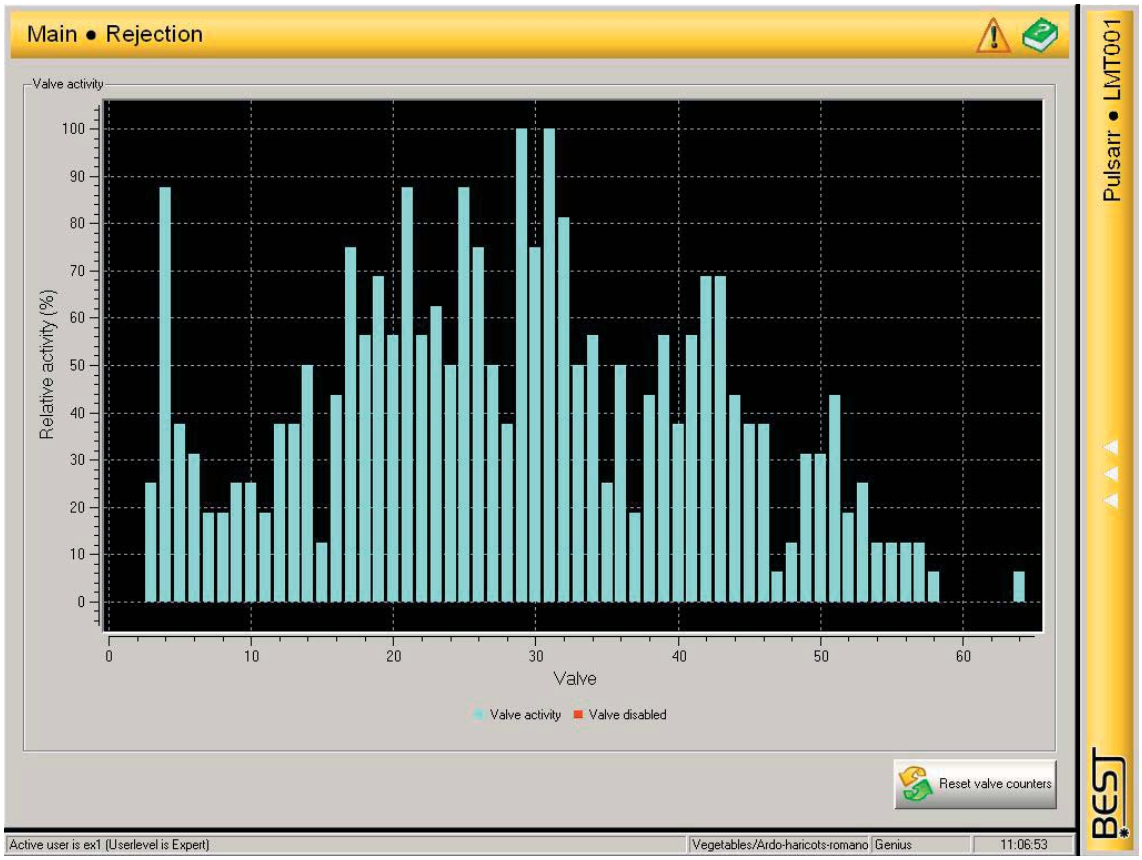
Part 1: Adjusting the Ejection Settings (only when setting completely new product)
(This part is usually not necessary when making a product setup file that can be based on the setup file of a similar product.)

3.- **Go to Rejection Menu** (see picture) by pressing the Rejection button in the navigation bar.



The Rejection menu displays a graph that shows the relative activity of all the valves. In optimum sorting circumstances this graph should show that all valves are +/- equally active (all columns should be +/- equally high). If one valve or a particular group of valves are clearly more or less active, or one side of the screen shows clearly more activity than the other, something is wrong (see troubleshooting).

Via the navigation bar of this menu all parameters that have to do with the actual rejection of detected defects can be adjusted.

- **1. Rejection Settings**: Delay; Blast (Blast time): Neighbour valves (Overlap)
- **2. Valve Test**: Testing and Deactivating Valves.
- **3. Belt Speed**: Can only be changed in Expert level.
- **4. Reject unit**: Mechanical settings for ejection unit and accept chute.

Delay: the distance between detection zone (camer/laser) and ejection zone (air gun valves) in mm. Can only be changed by Expert user.
Blast (blast time): the duration of the air gun blast (in mm).
Neighbour valves (overlap): the number of neighbouring valves that are activated together with the triggered air gun to be certain to eject the defect (depending on product size and shape.

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4.- **Press Belt Speed button** (navigation bar) to **set Belt Speed**

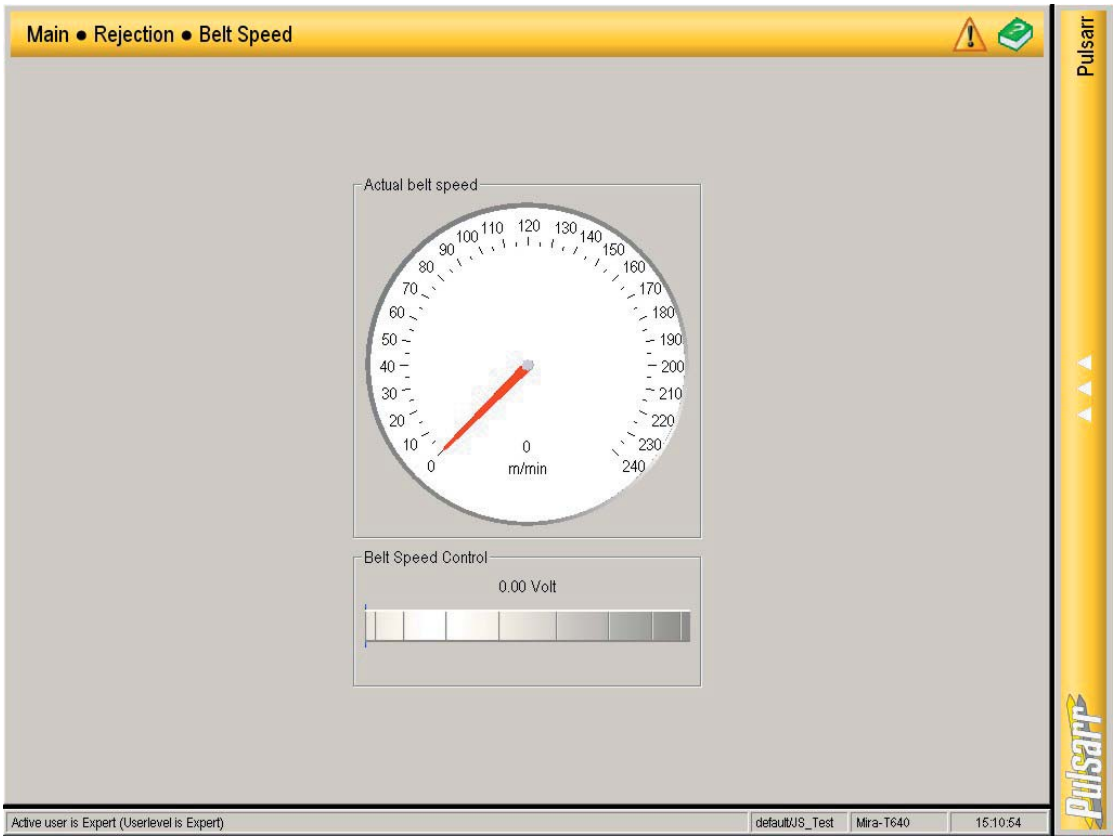
- Switch on the belt (press belt button on control panel).

- Turn the speed knob to the bottom of the screen to the left (press finger on the right and move it to the left) to lower the speed, and to the right to increase the belt speed.

To set the optimal belt speed, keep in mind the following general rules:

- The lower the belt speed, the less false reject, but the lower the product capacity
- The higher the belt speed, the higher the product capacity, but usually this will cause a higher false reject percentage.
- The belt speed should be set in such a way that the product is stable on the belt when it crosses the detection zones.

=> If the product rolls in the detection zone, this will significantly decrease the sorting efficiency, please lower the belt speed!



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5.- Adjust the position of the Accept Chute

- Loosen the necessary screws and handles and move the Chute closer to or further from the belt.
The angle hardly ever needs to be changed, and this should only be done by an experienced service engineer from **BESTnv**.

- Put a number of typical good product objects on the running belt (with sorting or valves switched off). If any objects fall into the reject chute, please move the accept chute closer to the belt until all objects reach the accept chute.

Keep in mind the following rules:

- The accept chute should be moved as far away from the belt as possible (without having accept going into the reject chute), to minimize the chance of getting reject in the accept.

6.- Adjust position of Ejection Unit

- Loosen the necessary screws and handles and move the ejection unit upwards or downwards.
The angle hardly ever needs to be changed, and this should only be done by an experienced service engineer from **BESTnv**.

Keep in mind the following rules:

- The ejection unit should be as close to the belt as possible, while still allowing the product to pass between the ejection unit and the belt.
- A distance of 20 mm is ideal to minimize the false reject due to the width of the blast zone.

- Go to the Reject unit menu and enter the settings of both Accept chute and Ejection unit.
These data are just to have reference values when necessary. Changing them will not change the position of reject unit or accept chute, that must be done manually.

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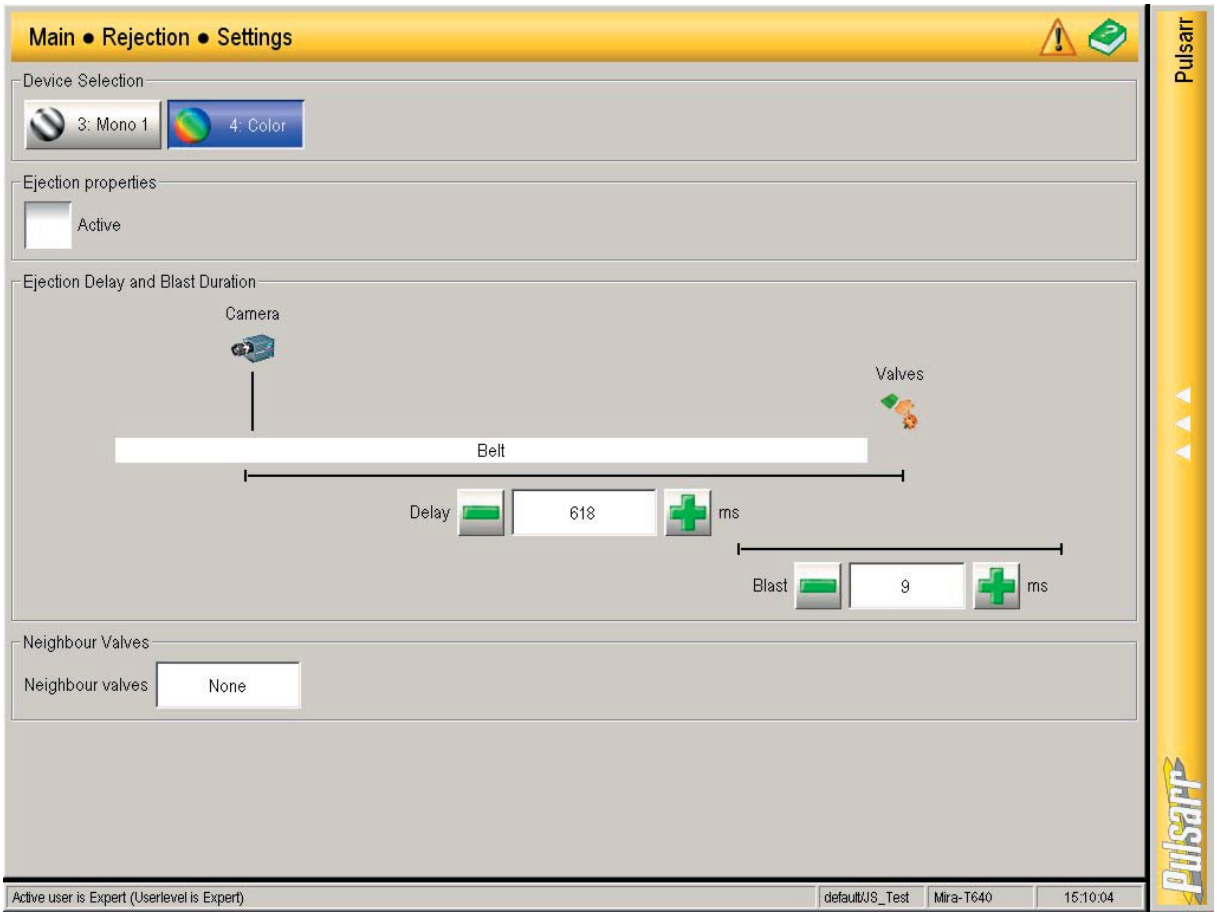
Setting Blast Time, Delay and Overlap (Neighbour valves)

- Go to Rejection Settings menu by pressing the Rejection settings button in the navigation bar.

These 3 settings must be set for each device (camera/laser) present in you machine.
To select a device, just press the appropriate button near the top of the menu.

Picture: Rejection Settings menu



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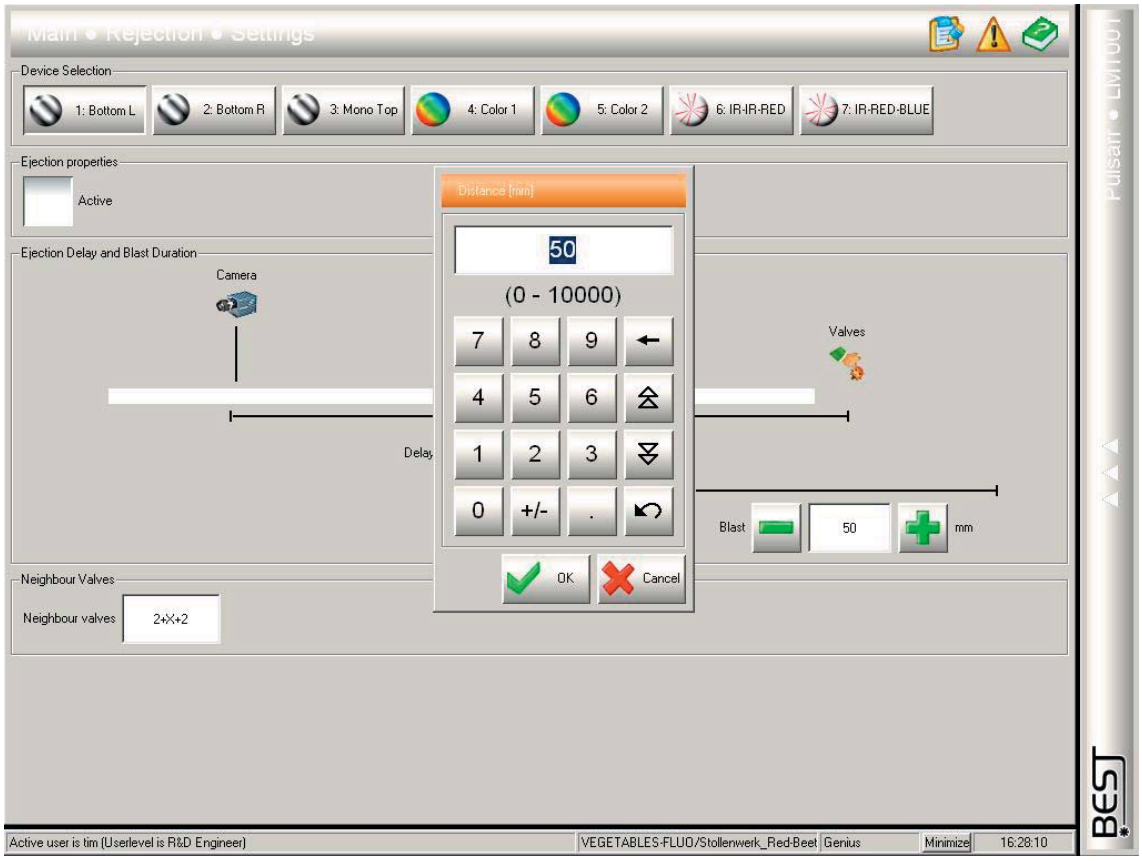
7.- **Set the Blast Time**

Adapt the Blast time value by using the + and - buttons after Blast in the right lower part in the menu, or by pressing the value after Blast. An input menu will appear (see picture).



Keep the following rules in mind when setting the air jet duration:

- Keep the blast time as short as possible: the longer the air jet, the more good product will be targeted along with the defect.
- For certain large or long products (potatoes, whole carrots, etc. ...) a longer blast time will be necessary in order to be sure the defect will be blown out, even when it is situated at an extremity of the product.

The blast time is mostly dependent on the shape and size of the product, and is usually the same for all devices.

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8.- **Set the Delay** (only in expert level)

You will have to set the delay for each new camera.

Adapt the Delay value by using the + and - buttons after Delay in the centre of the menu, or by pressing the value after Delay. An input menu will appear (see picture).

Procedure to set Delay:

- 1. **Set one of the thresholds** (of the appropriate device: laser/camera) in such a way that everything except the belt itself is detected:
  - Activate the appropriate camera/laser and raise the threshold until the **GENIUS Compact** starts detecting the belt (air guns will be activated on an empty belt).
  - Next lower the threshold a little until it stops detecting the belt.

- 2. **Put a number of defects** that will certainly be detected (e.g. black pieces) **on the belt and switch it on**.
  - All defects should end up in the reject chute.

- 3. **Increase the delay** gradually, with units of 5 or 10 mm, until some defects are missed and end up in the accept.
  - Write this distance down.
  - Lower the distance again: all defects end up in reject chute.

- 4. **Decrease the delay** gradually, with units of 5 or 10 mm, until some defects are missed and end up in the accept.
  - Write this distance down.
  - Calculate the average value and enter it.

- 5. **Repeat steps 1 to 4 for all the other devices: cameras/lasers** present in your machine configuration.

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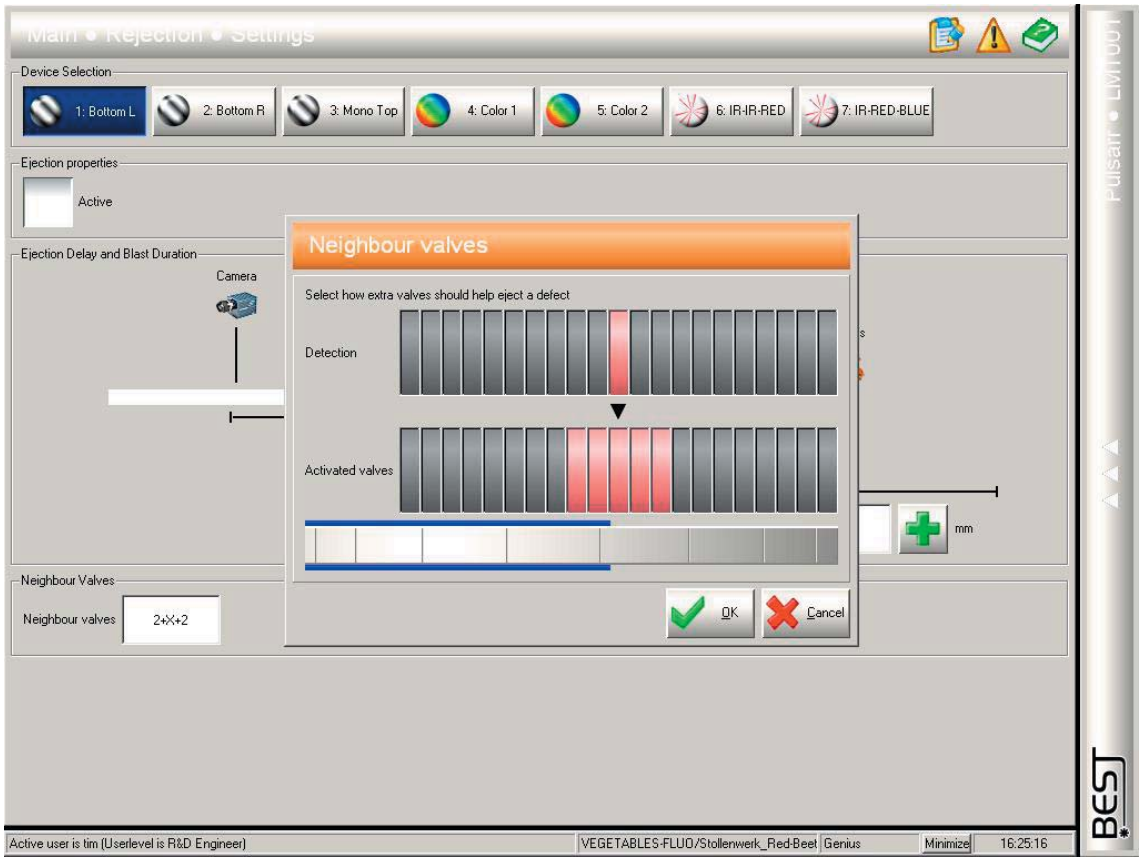
9. - **Set the Overlap (Neighbour valves)**

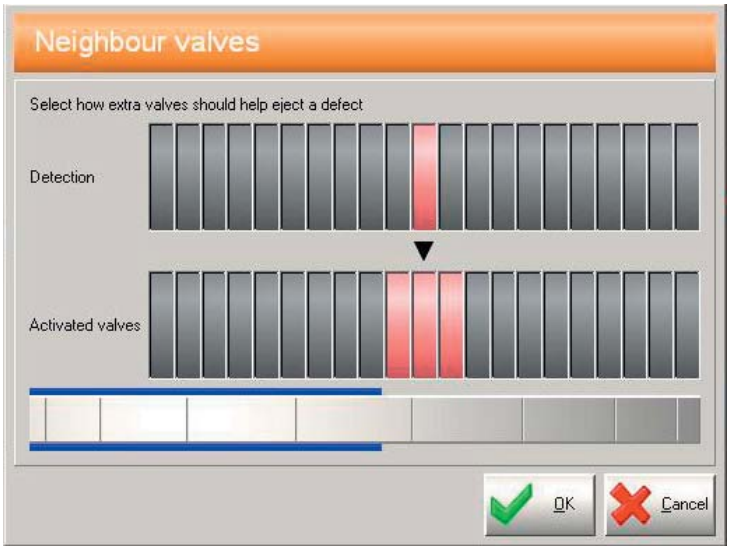
To set the overlap, press the value after the title Neighbour valves. A pop-up screen will appear (see picture below).



Positive Overlap (+1 to +10):

The value +1 means that one extra air gun valve at both sides of the detected defect will fire.
For example: if a small defect spot is detected in the zone of only 1 air gun valve, the two neighbouring valves will also fire.

This feature makes it possible to eject bigger/heavier products with small defect spots.



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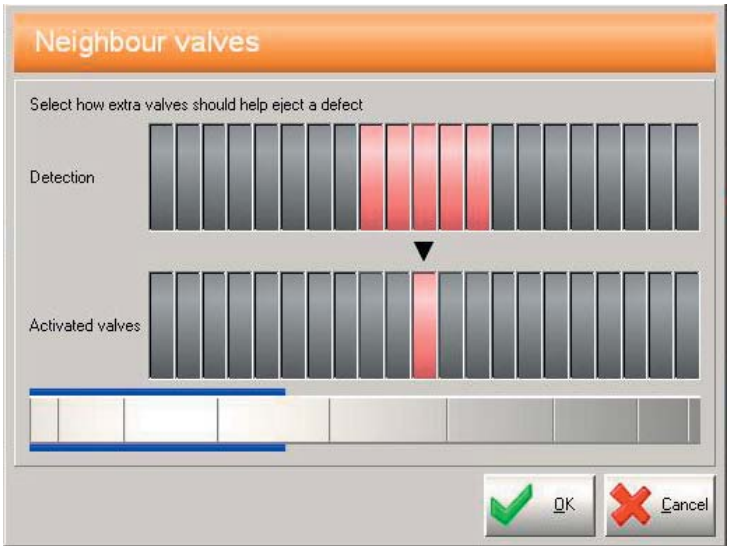
Negative Overlap (-1 to -10):

The value - 2 means that two less air gun valves at both sides of the detected defect will fire, with a minimum of 1 air gun that will always fire.
For example: if a large defect is detected that falls within the zone of 5 air gun valves, only the middle valve will fire. If a defect only falls in the zone of 1 air gun valve, it will still fire.

This can be useful when sorting very light products, to avoid too much false reject.



Always keep the following basic rules in mind when setting the overlap (Eject Mode):

- Always keep the overlap as small as possible: the bigger the overlap, the more good product will be targeted along with the defect.
- For certain large or long products (potatoes, whole carrots, etc. ...) a bigger overlap may be necessary, in order to be sure the defect will be blown out, even when it is situated at an extremity of the product.

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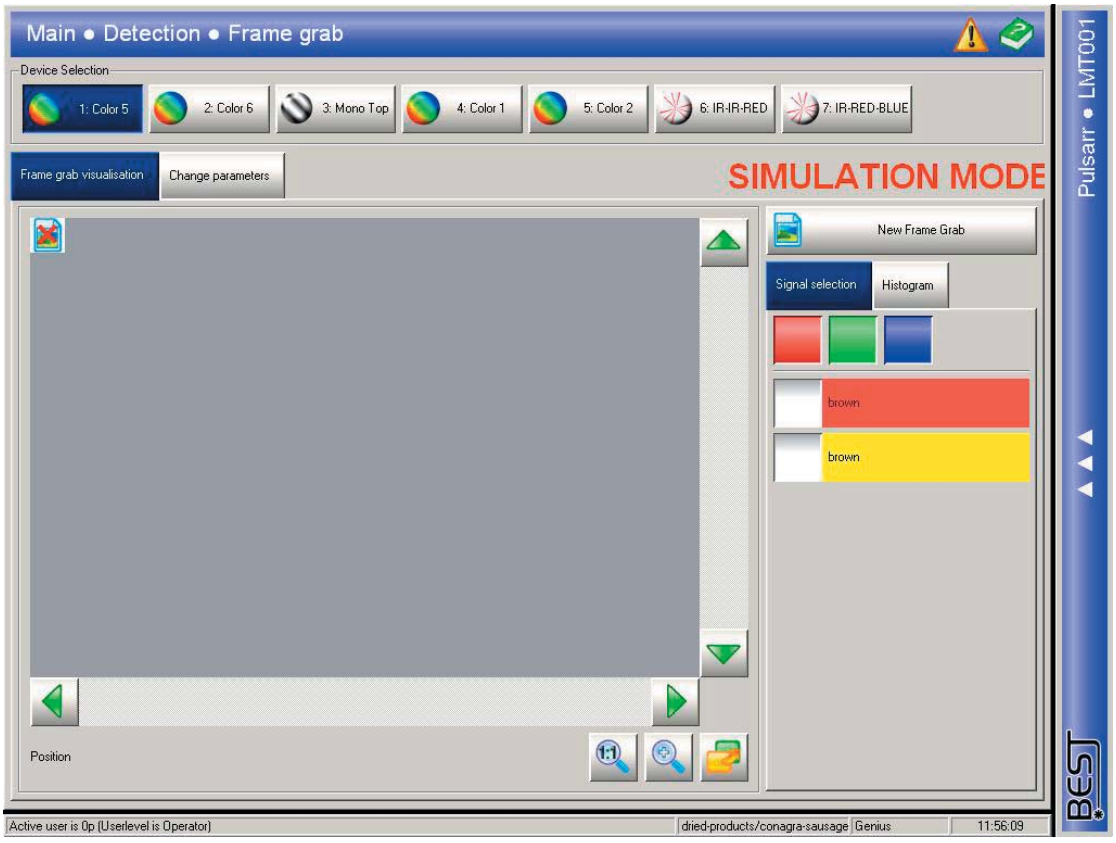
Part 2: Adjusting the Product settings

If a Product File exists for a Product that is similar to the product you want to sort, it is advisable to load that Product File before starting with Part 2 (see subchapter 5.6. Saving and Loading Product Files). Even for a totally new product it is usually simpler to start with an existing program than to start from scratch. In the rest of this procedure it is taken for granted that the user starts with an existing program, for this is by far the most common situation.

10. - **Go to Frame Grab Menu**

- First go back to Main menu (press home button on navigation bar).
- Next press Detection button to go to Detection menu.
- Finally press Frame grab button to go to Frame grab menu.



Operator user level
In this user level a Frame grab is always taken immediately.
So all frame grabs should be taken during production to make sure a useful image is captured.
(In general this procedure is only used to make small changes to an existing program.)

- 1. Select first device (device button will turn blue)

- 2. Press “New frame grab” button.
  A Frame grab is taken immediately, a small pop-up screen will indicate how long the process will take.

Go directly to point 5 of the expert procedure.

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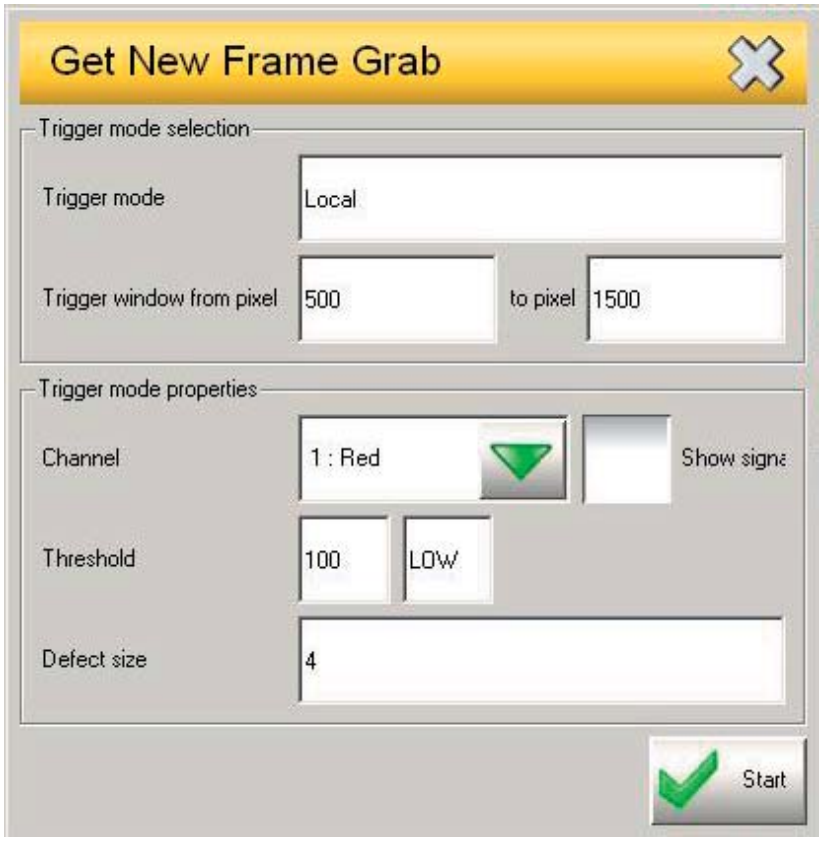
Expert user level:
In this user level the user can adjust a number of settings before taking an actual frame grab.
This can also be done during production, but is usually done when there is no production to prevent too much loss of good product.
(This procedure is a lot more extensive and is especially useful when creating a new product program or adapting an existing program for a new product.)

- 1. Put a number of typical product objects (good + bad product) on the belt.
  - If possible put the product and defect objects in a logical order or grouping:
  (E.g. from left to right, starting with light coloured good product and end with black bad product, or put all the good product in one group, and all the typical defects in another group.)

  - Make sure the threshold is set high enough so the frame grabber will be triggered by the objects on the belt (sometimes a small black object is added to trigger the frame grab).

- 2. Select the first device (button will turn blue).

- 3. Press the “New frame grab” button.
  A pop-up screen will appear (see picture below).
  In general the settings on this pop-up screen do not have to be changed and can be kept as they have been set by **BESTnv**’s installation engineer.



Frame Grab settings

Trigger mode: - Local: means that the frame grab will be taken when the frame grab is triggered (in other words, when something passes the detection zone that exceeds the threshold for this device).
- Immediate: (default setting for operator level) Frame grab is taken immediately, whether something is passing the detection zone or not!

Trigger window: - Allows the user to set the zone in which the grab will be taken. In this case from pixel 500 up to pixel 1500 (since a camera has 2048 pixels this is +/- in the middle of the belt).

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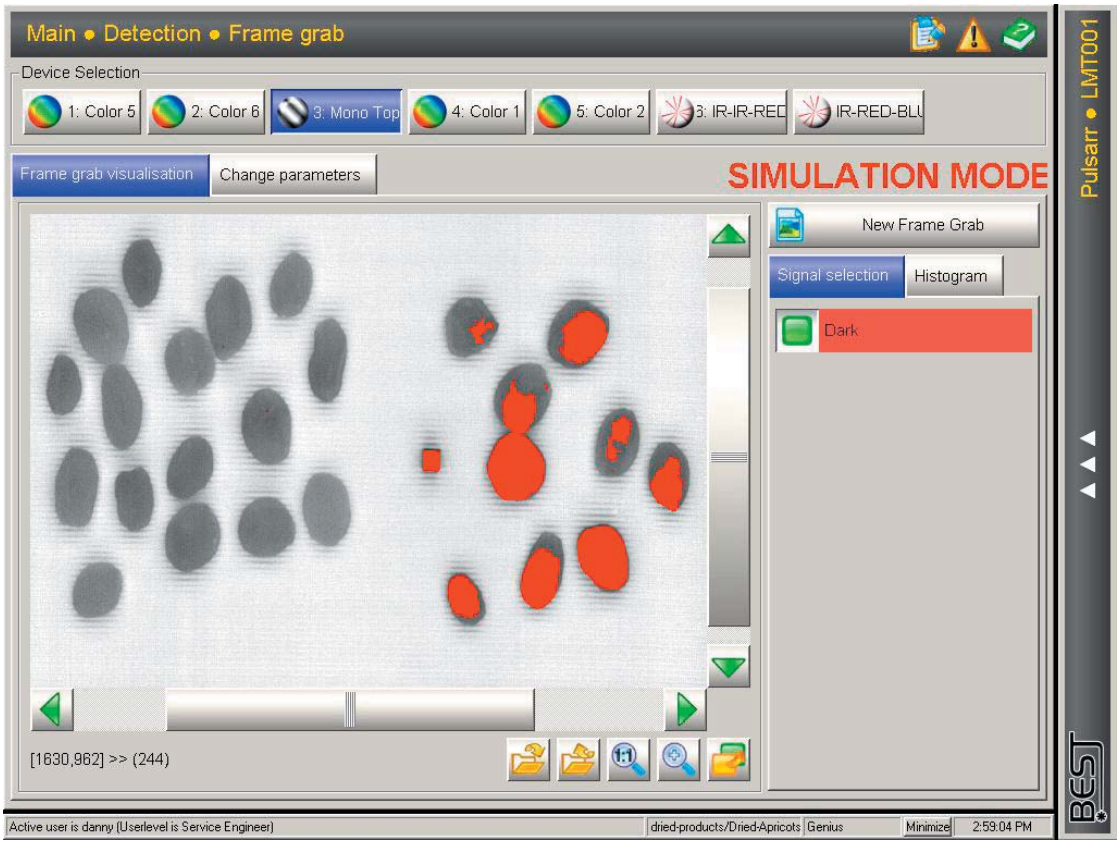
Channel: - Pick the channel that gives the most contrast
Threshold: - The threshold value should not be too high, so as not to detect the transport belt, but not too low in order to detect an object to trigger the frame grab.
- Usually the Threshold is set to Low
Defect Size: - This value is usually quite low. The defect size filter prevents the detection of very small spots that do not represent a real defect.

- 4. Press the “Start” button to initiate the Frame grab and start the belt. The moment the product passes the detection zone a frame grab image will be taken. A small pop-up screen will indicate how long the process will take.

- The Frame grab image of the product flow/product examples will be shown in the centre screen (see picture).



Depending on the product and the previous settings it is possible some (or all) defects, good product and/or even belt are detected (tagged with a threshold colour).

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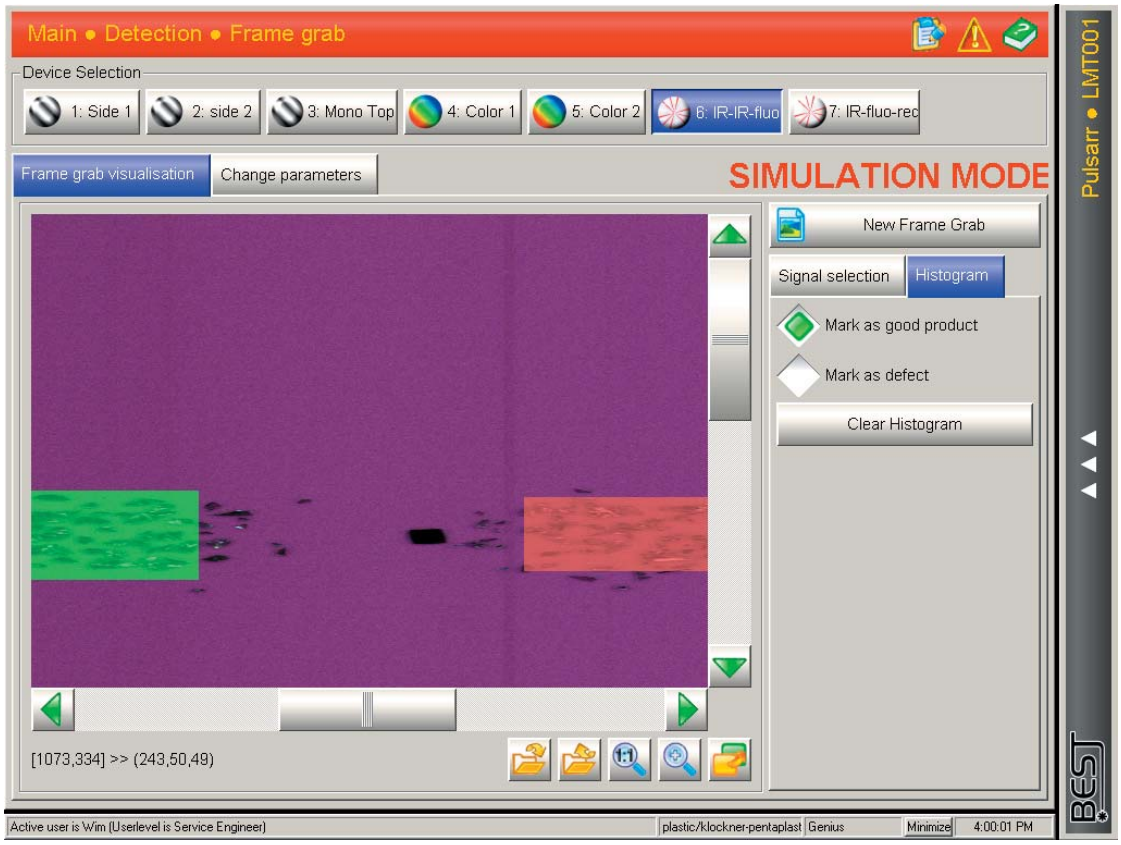
- 5. Press the Histogram button to the right of the screen (see picture below).
  - Activate the “mark as good product” function and indicate (by drawing a green rectangle) a number of examples of good product on the screen.
  - Activate the “mark as bad product” function and indicate (by drawing a red rectangle) a number of examples of bad product/defects on the screen.
  - If you made a mistake, just press the “Clear Histogram” button and start over.

Attention: ***- Try to avoid overlap between good and bad product. When marking the good product it is especially important not to accidentally include any defect objects or spots.***



- 6. Next the Threshold filters can be set or changed.

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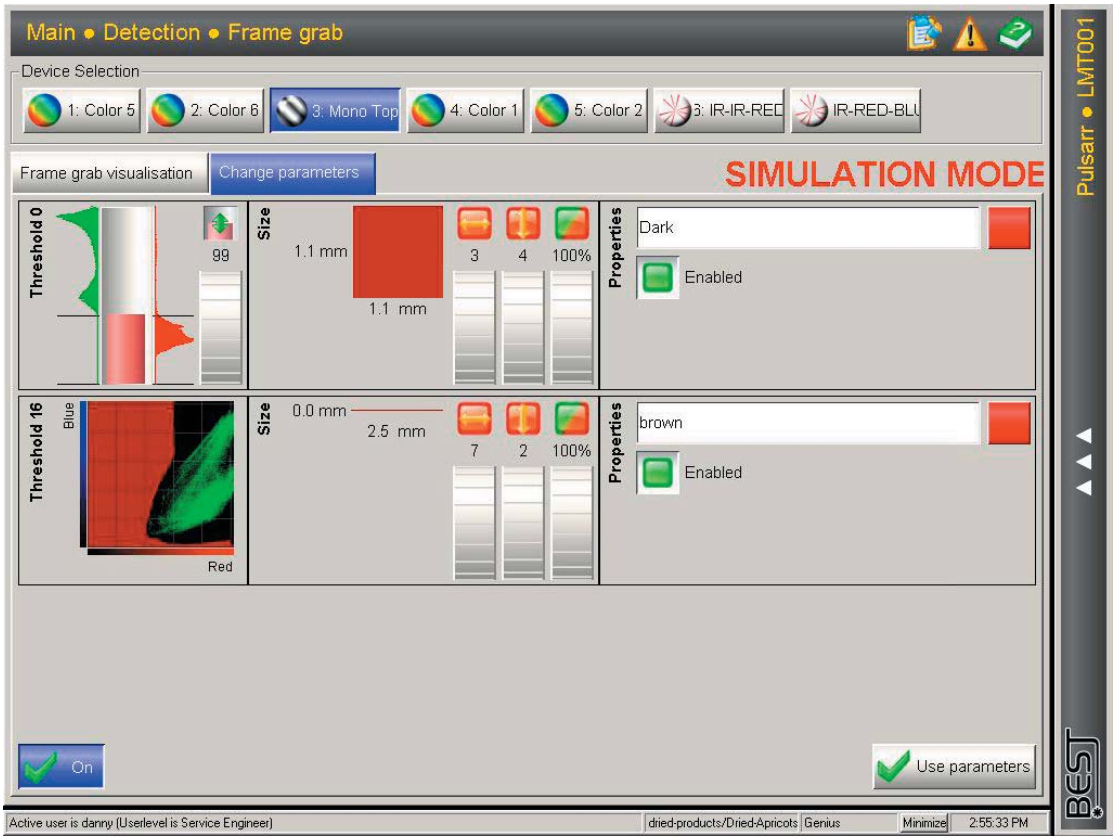
11. - Changing/Setting Threshold filters

- 1. Press the “Change parameters” tab above the centre screen.
The centre screen will now show the Threshold filter(s) for the selected device (see picture).



Attention: ***- None of the changes made in this menu will have any effect on the sorting process as long as the “Use parameters” button is not pressed!***

- 2. Setting the 2D Defect Size and Defect Density (Fill rate) percentage.

- 2D Defect Size
In general it is advisable to set the Defect width and Defect length in such a way that the 2D defect dimensions form a square. Usually +/- 1 x 1 mm for smaller products and larger dimensions for bigger products or for specific defects (see picture above).
(Remember! To see the actual dimensions the belt must be running)

- Defect Density
This is usually simply left at 100%, but in certain specific cases it may be lowered to allow for small spots (see chapter 3: Theory).

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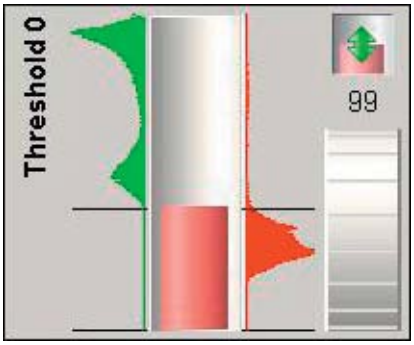
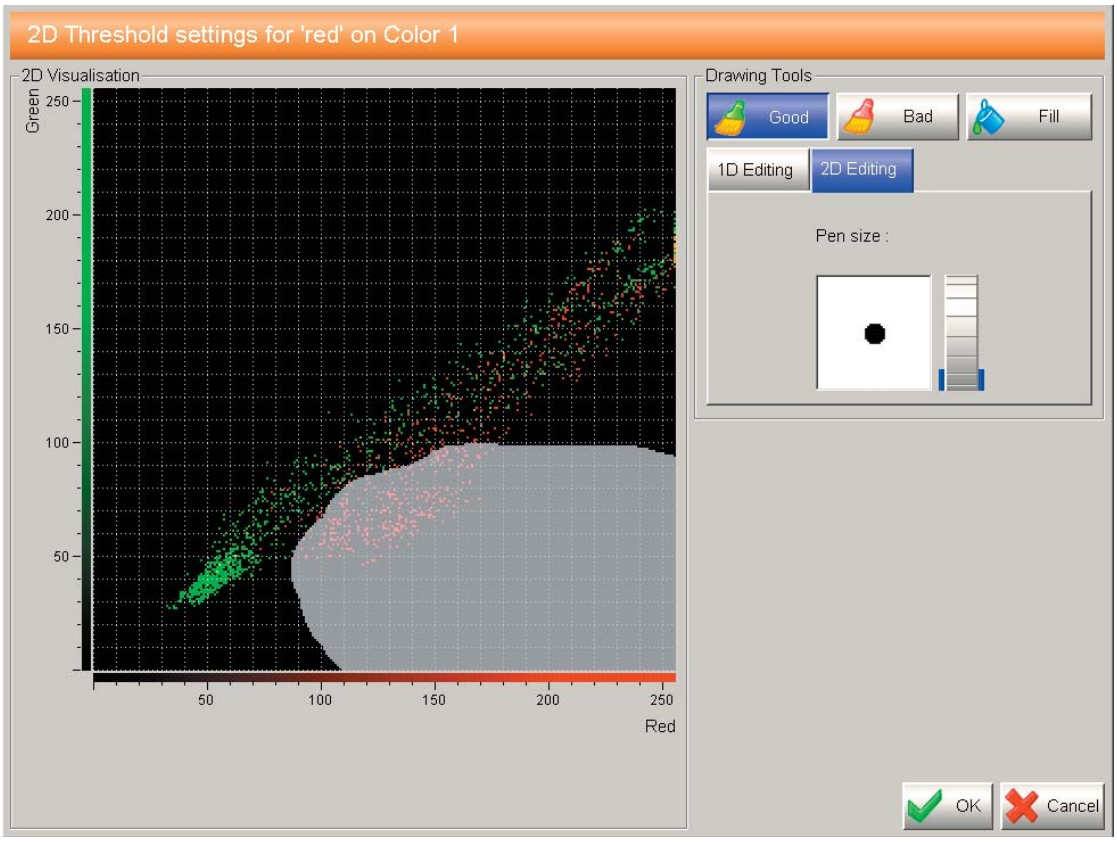
- 3. Setting the actual Threshold filters.
  - 1D (mono) threshold

    Just increase or decrease the threshold value: first dial on the left, next to the filter image. Ideally the filter should be set in such a way that no good product (green on graph) is detected, but most (preferably all) of the defects (red on graph) are detected (e.g. see picture below).



  - 2D (combined) Thresholds

    To change this filter, one should press the image of the 2D threshold filter. A 2D (combined) Filter Menu will appear (see picture below).



Use the “Good”, “Bad” and “Fill” buttons, with 1D or 2D editing to draw a Good product zone (black) around the green pixels representing the good product, or draw a Bad product zone (colour of threshold) around the red pixels representing the defects (see picture).

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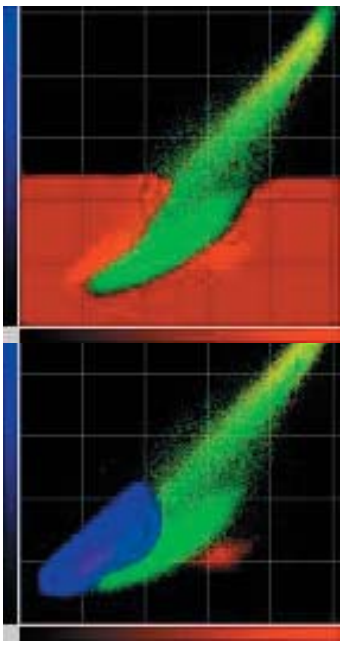
Sometimes the good and bad product zones can be nicely extrapolated from the red and green pixels generated by what was indicated in the frame grab (see picture).



In some cases it may be advisable to target a specific type of defect. A defect zone (colour of threshold) is drawn around the defects that are specifically targeted, and other defect types are ignored. In this case the good product zone (black) includes everything except the targeted defects.

Remember: ***- In the Frame Grab menu no threshold filters can be added or deleted, this must be done in the Detection Settings Menu.***

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12. - Checking the Results in the Frame Grab Image

- 1. Press Frame Grab Visualisation Tab to go back to Frame Grab image.

- 2. Press Signal selection button in right part of screen and activate all the different thresholds.

- All (parts of) objects that are detected by one or more thresholds of the device that is presently selected will be indicated in the colour of the detecting threshold(s).

- All defect objects of a similar type or types (e.g. dark spots, stems or discolourations, etc..) Should be detected by at least one threshold of your device. If this is not he case, adjust your 1D and 2D thresholds (see previous point) until all targeted defects are detected (see picture below).

Remember: ***- Some defects can only be detected by a specific filter of one device, so for certain configurations with multiple devices it will be necessary to repeat the entire procedure for every one of the different devices available until all defects are detected.***

- 3. All defects (of the type that can be detected by this device) are detected (every defect is tagged with the colour of at least one threshold), and no good product is detected. If this is the case, go directly to the next device (if present) and repeat steps 10 to 12 for this device,

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13.- When **all devices have been set** to satisfaction, **press the Change parameters tab** and **press the "Use parameters button"** to the bottom of the screen to activate the changes.

14.- Finally the **resulting settings should be tested on real product**. Make adjustments to the threshold filters when necessary (steps 10-12). This can be done by starting up production or by sorting small test batches of the product.

15.- It is advisable to **regularly check the results of the sorting process during production**. It may be necessary to make small adjustments to the threshold filters to compensate for small changes in the incoming product (steps 10 to 12).

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5.8. Sorting

Depending on the optical and mechanical configuration, the **GENIUS Compact** optical sorter can sort the following products (this is not an exhaustive list):

- Potatoes:
o Whole peeled potatoes
o Potato products: fries, chips, slices, cubes, wedges and parts (fresh and blanched)

- Vegetables:
o A large variety of fresh and blanched vegetables and fruits
o Carrots:
* Whole washed and unpeeled carrots
* Whole peeled carrots
* Baby carrots
* Cut carrot products: parts, slices, cubes
o Green beans

- Seafood:
o Shrimps and cold water prawns (fresh and peeled)
o Scallops

- Miscellaneous food:
o Sunflower seeds, etc. ...

- Non food products:
o Plastic pellets and flakes
o Recycling: a.o. glass and plastics

Consult a **BESTnv** service engineer to see if your configuration is suitable to sort any of these products.

Examples of possible settings for your product can be given on demand. However, these values will only be of limited use, since the exact values of the sensitivities are highly dependent on certain specific and often local circumstances, such as: the specific defects that are to be detected, the quality of the final product, certain differences between different batches of the same product, etc. ... As a result your specific values might be substantially different from the examples we can provide. It is advisable to set the sensitivities on the spot and to use as much as possible the values that have been set during the installation by our service engineer.

Because of said variations between different batches of one and the same product it is often advisable to make small changes during the sorting process.

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VI. Cleaning the GENIUS Compact

All points of this Cleaning procedure (if applicable to your machine) should be done at least once per shift (begin or end) unless explicitly indicated otherwise.

First read this cleaning procedure completely and thoroughly before starting cleaning.
All cleaning and maintenance personnel should be acquainted with this procedure.

Attention:

***- When using detergents, always make sure they are nontoxic, non corrosive and non abrasive. If in doubt, please contact* BESTnv.**

- Always make sure that all doors are closed before cleaning. Dirt, water and/or water vapour inside the machine could seriously affect the sorting efficiency and even damage the machine itself.

6.1. Cleaning Procedure

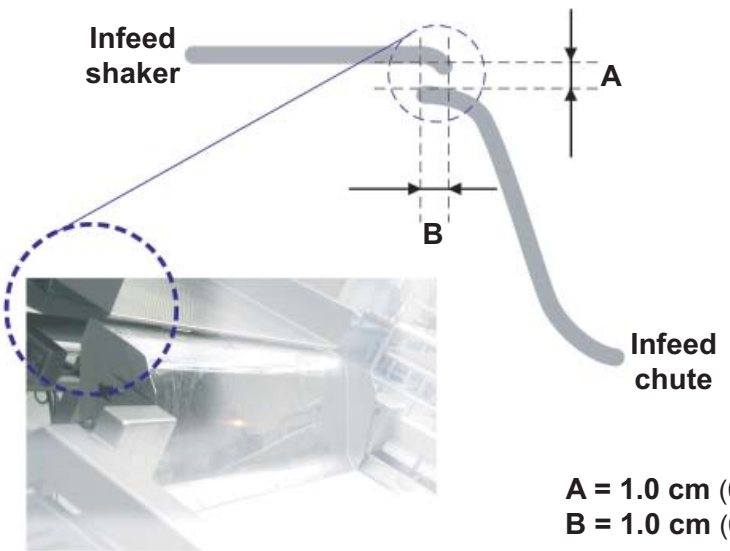
1. Clean the **Infeed Shaker**: (after every shift)
   - 1. Hose down with water or compressed air. Remove all dust and dirt, but make sure not to damage the shaker surface. Dirt buildup or scratches in the shaker surface may impede the proper product flow.

   - 2. If your shaker is equipped with a wire mesh or a wedge wire grid, remove all material stuck in the meshes, but make sure not to damage the grid.

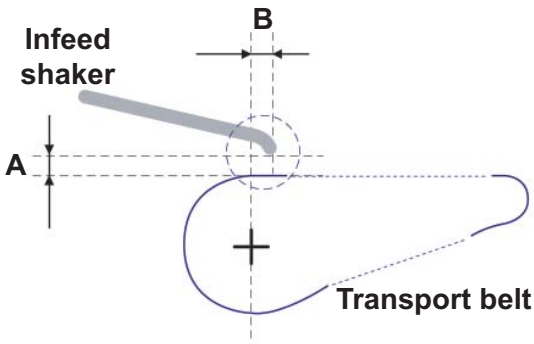
   - 3. Check the alignment of the infeed shaker versus the infeed chute to the sorter unit.
     a) Make sure the sides and the bottom of the Infeed shaker do not touch the infeed chute of the sorter. Check again when the sorter and the shaker are functioning!

Picture 2.5.11: Relative position of infeed shaker

(sorter with infeed chute)



(sorter without infeed chute)



A = 1.0 cm (0.4")
B = 1.0 cm (0.4")

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2. Clean the **Sorter unit**: (after every shift)
   - 1. Clean all areas that come into contact with the product from top to bottom (brush lightly and rinse with cold water).

Attention: ***- Always clean from top to bottom, to prevent dirt from piling up on the lower sorter parts.***

- Make sure all doors and cabinets are closed.

- When hydroblasting, spray from at least 30 cm distance, and avoid spraying directly on the control panel, the belt edges and the joints of cabinets and doors.

- ***Never spray directly into bearings, air gun valves and the edges of the rotating light tubes.***

3. Clean the **Sorter Belt:** (after every shift)
   - 1. Clean the Belt daily with an Alkaline detergent.

     - Remove coarse and loose dirt by brushing and rinsing with cold water
     - Apply alkaline cleaning solution by spraying, brushing or foaming
     - Rinse thoroughly after the prescribed saturation time
     - Disinfect and rinse again if necessary

   - 3. Once a week an Acid detergent should be used instead of an Alkaline, to prevent lime deposits.
     - Always rinse thoroughly afterwards.
     - Never use an Acid detergent when the equipment will not be used for more than 24 hours.

Attention: ***- Never exceed the proscribed concentration of detergent or the saturation time, for this could damage the belt.***

- The environmental temperature or the temperature of water or detergents should never exceed 50°C, for this may cause protein adhesion, and thus reduce the sorting efficiency.

- When hydroblasting, spray from at least 30 cm distance, and avoid spraying the Belt edges.

- Be very careful with sharp objects, such as steel sponges or putty knives, these can easily damage the Belt.

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4. Clean the **Background Drums** (if present): (every shift)
   - 1. Use a clean soft cloth and alcohol or another non-corrosive and non-abrasive detergent.

Attention: ***- Do not scratch or otherwise damage the drum surface.***

- To clean the background drums* BESTnv *advises the 3M Marine Fibreglass Cleaner and Wax. To remove small scratches* BESTnv *advises the 3M Marine Fibreglass Restorer and Wax.

- A damaged or dirty background drum could cause false detections and significantly decrease the efficiency of the sorter.

5. Clean the **Return system** (if present): (every shift)
   (this includes all accept/reject shakers/belts that are part of the **GENIUS Compact** installation)
   - 1. Scrape loose and remove dust and dirt if necessary.

   - 2. Spray from top to bottom with clean water (with non-corrosive detergent if necessary)

   - 3. Check positioning of return system parts to ensure optimum product flow.

6. Clean **Windows of Illumination unit detection zone 1**: (every shift)
   - 1. Lift up side cover plate (see picture below).

   - 2. Spray the windows of the illumination units with clean cold water without detergents.
   Dry them with a clean cloth to avoid scale (only on the outside of the machine, over the belt).

Attention: ***- Do not scratch or otherwise damage any of the illumination windows.***

- Avoid scale, water drops and/or any spots that could influence the sorting efficiency.

Picture 6.1.1.: Detection zone 1

Illumination Windows detection zone 1

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7. Clean **Camera mirror(s), insides of Illumination unit windows (detection zone 1 & 2)**:
(Check once every month, and only clean when necessary)
- 1. Make sure all other cleaning nearby is finished before opening the doors to the inside of the sorter unit.

- 2. Check the state of the mirrors and of the Illumination windows inside the sorter unit and only clean with a soft dry and clean cloth if necessary.

Attention! ***- When cleaning mirror(s), please pay attention not to move or turn the mirror in any way. Do not press too hard on the mirror surface!***
If any mirror is moved, this may completely ruin camera focus and severely affect sorting efficiency.

- In optimal conditions (doors are kept closed as much as possible, machine is cleaned regularly, ...) the mirrors should stay clean and almost never need cleaning.

8. Cleaning of the **Laser Window** (if present): (every shift)
- For more info on cleaning and replacing the laser window, see chapter 8: the Laser Box.

9. Cleaning of **FSV-module** (if present): (check daily)
- For more info on cleaning the FSV-module see chapter 9: the FSV-module.

10. Clean the **Cooling unit** (chiller) (if present):
- 1. Clean the condenser fins of the cooling unit with low pressure air (at least once every 6 months, more when processing very dusty product).

- 2. When the air inlet of the cooling unit is equipped with filters, these must be checked every shift, and cleaned or replaced when necessary.

- 3. Depending on your cooling unit type, certain additional maintenance tasks may be advisable, please check the Cooling manual included in the attachments chapter of your sorter user manual.

11. After the entire installation has been cleaned with water, it is advisable to activate all air gun valves for +/- 5 seconds (see **7.4.1. Air Gun Draining and Test procedure**) to ensure no water remains in the air gun valves.

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6.2. Detergents

Attention:

- All detergents should be nontoxic, non corrosive and non abrasive.
- Never use detergents that contain chlorine or iodine compounds.
- Never use Acid detergents if equipment will remain unused for more than 24 hours.
- Always rinse thoroughly after using Alkaline or Acid detergents.

For more info on which detergents may be used on the **GENIUS Compact** installation, please contact **BESTnv**.

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VII. Maintenance:

7.1. Warranty Limitations and General Conditions

7.1.1. Warranty Limitations

In order to claim warranty the purchaser should take note of the following limitations:

- To claim warranty the maintenance program, as described hereafter in paragraph **7.2 Essential maintenance tasks**, under Daily, Weekly, Monthly, Yearly and Preventive Maintenance, must be applied to the **GENIUS Compact** optical sorter.
- The warranty is limited to the warranty period mentioned in the contract.
- Failures caused by lightning, floods, storm or other environmental events are excluded from warranty.
- Failures during warranty have to be reported to the vendor within 24 hours.
- During warranty period the defective parts must be returned to the vendor within 30 days after reporting the problem in order to claim warranty.
- Warranty does not cover loss of production due to machine failures.
- The warranty does not cover failures resulting from an error made by the purchasers operator(s).
- Mechanical damages caused by the purchaser while moving the machine are not covered by the warranty.

7.1.2. General conditions

- The purchaser is not allowed to make any changes to the electrical wiring without prior written permission of **BESTnv**.
- The purchaser is not allowed to make any mechanical adaptations without prior written permission of **BESTnv**.
- The purchaser is not allowed to make any adaptations to the electronics without prior written permission of **BESTnv**.
- All cleaning detergents to be used on the **GENIUS Compact,** that are not specifically approved in this manual, have to be approved in writing by **BESTnv**.
- The machine cannot be installed in corrosive environments.
- The user is at all times responsible for the quality of water, pressurized air and electricity.
- Components that are damaged by surges in the voltage level of the electricity supply are not covered by the warranty.
- Environmental temperatures have to be within the limits specified in the technical annex attached to the contract. Different environmental temperatures have to be specified at the order.
- No welding may be done on or near the machine!
- Only clamps can be used to mount something on the machine and not without written permission from **BESTnv**. All systems involving the use of holes drilled in the machine or welding are strictly forbidden.
- The **GENIUS Compact** optical sorter can only be used for the purposes it has been sold for, as described in the contract.
- **BESTnv** cannot be held responsible for failures caused by the use of other spare parts than those specifically approved by **BESTnv**.
- **BESTnv** cannot be held responsible for safety hazards resulting from the adaptation or removal of the safety circuits and/or components by the purchaser.
- The Laser box (if present) should never be opened without explicit written permission of **BESTnv**.

BESTnv cannot be held responsible for unsafe situations, accidents, failures or damages which are caused by disregard for warnings and prescriptions as indicated in this manual.

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7.2. Essential maintenance tasks:

The items of the maintenance program as described hereafter under Daily, Weekly, Monthly, Yearly and Preventive Maintenance, must be applied to the **GENIUS Compact** optical sorter (if applicable) and are essential to ensure that the sorter can keep working in optimum sorting conditions (more information about the position of the different parts can be found in chapter 2):

7.2.1. Daily maintenance

- Thorough cleaning of the sorter installation:
  - Cleaning of all different sorter parts, as indicated in chapter 6: Cleaning, including optional parts, such as laser window (chapter 8) and FSV-system (chapter 9).

- Visual inspection of sorter installation:
Before starting sorting system:
  - Check for and remove all obstacles and objects on the conveyor belts.
  - Check for damaged and/or excessively worn conveyor belts, replace if necessary (see procedure later in this chapter).

During operation:
  - Check tracking of operation belt (see procedure later in this chapter)
  - Check overall state of detection belt, rollers, drums and/or pulleys and Illumination windows.

- Pay attention to all excessive vibrations and noise from any moving parts.

7.2.2. Weekly maintenance

- Check water level of the air pressure regulator filter. If water level is too high, manually drain and check for blockages in drain tube, see 7.3.

- Check the position of the infeed shaker versus the sorter unit (this position is important to ensure proper feeding of the product on the infeed accelerator chute (see Pre-installation).

- Check the stroke of the infeed shaker.

- Check the operation of the air gun ejectors (using the “test valves procedure” later in this chapter), grease or replace air guns if necessary (see chapter 8).

- Check alignment of belt(s), return systems and/or positioning of shaker(s) of return system (if installed).

- Check the water level of the cooling unit (if no water is present, the water pump of the cooling unit may be damaged).

- Check current of detection belt motor (on frequency regulator) current should stay under the nominal value (9A). Lower tension of belt to 0.3% or 0.3 mm/m if necessary.

- Replace or clean air conditioning filters (see chapter 6: Cleaning & chapter 8: Laser Box (option))

- Check greasing of bearings: each week +/- 25 grammes of grease should be added (see manufacturer info in Attachments chapter).

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7.2.3. Monthly maintenance

- Check Cooling unit (if present)
  - Check the degree of protection of antifreeze liquid in water cooler (if present) (dependent on season and minimum room temperature).
  - Check the condenser of the radiator cooling unit.

- Check the torque of all mounting bolts, especially on the vibrator motors of the infeed shaker.

- Check the operation of all Emergency Stops & Laser Interlocks (if present)

7.2.4. Yearly maintenance

- Clean or replace the filter of the air pressure regulator (see 7.3).

- Replace Detection Belt +/- once a year (depending on product and machine configuration) (Procedure later in this chapter)

- Replace fluorescent tubes in illumination units with new ones of the same type.

- Clean the condenser of the radiator cooling unit

- Check the general state of the bearing blocks of the detection belt (2 on belt drive drum, and - if present - 2 on return shaft) and of the reference roller/background drum (2, if present).
  (After 3000 hours of operation or every year.)
  - Verify wear and tear and state of seals.
  - Check greasing and replace grease if necessary.
    (For more info, see greasing procedure later in this chapter.)

- Renew oil for drive drum motors of rollers and return system belts.
  (After 10.000 hours or every 2 years)
  (For more info, see manufacturer information in Attachments chapter)

- Renew oil and bearing grease of drive drum motor of detection belt.
  (After 20.000 hours or every 4 years)
  (For more info, see manufacturer information in Attachments chapter)

- Yearly preventive revision of small return axle (only for 1200 mm version of GENIUS Compact).
  (Replace bearings or completely replace return axle assembly)

- If greased regularly (preferably after every cleaning of the machine) the bearings of the standard return axle system (Ø 75 mm) may last 5 to 10 years without needing replacement.

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7.2.5. Preventive maintenance (recommended)

- Regularly check the quality of the water, air and nitrogen supply to make sure they are conform with the requirements stated in chapter 2.3 and repeated underneath.

Compressed air requirements

Pressure	: 6-7 bar (90-100 PSI) (on the sorter connection)
Typical consumption	: 400/1500 L/min (14/53 cfm) depending on configuration
Max. consumption	: 10000 L/min (177 cfm)
Quality	: filtered 40 µm oil, water and dust free
Connection	: 3/4" (3/4 inch) (Gaz)
Tubing	: 2" (2 inch) tubes

Water requirements

Water pressure	: between 1 and 3 bar (15 to 45 psi)
Temperature	: between 5°C and 12°C (41°F to 54°F)
Max. consumption	: +/- 500 l/h (132 gal/h)
Connection cooling water	: 14 mm (0.55") inside, inlet and outlet
Connection bottom clean	: 3/4" (3/4 inch) (Gaz) inlet
Quality	: lime-free and reusable (add glycol if necessary, see cooling manual). When using distilled or demineralized water, please pay attention to the compatibility with the materials and to the minimum conductivity that lever sensor may relieve (80 µS). See Cooling Manual in Attachments.

Nitrogen specifications : N_2 - Grade 5.0

Purity (vol/vol%)	: 99.999
Cylinder size-contents	: B50 - 10 m³
Outlet nitro bottle must be	: G 1/2" (inch) x 14, male

Attention! ***- It may be necessary for the Purchaser to buy a coupling piece if the connections of local nitrogen bottles do not match these requirements.***

- Take the necessary measures to prevent power surges and fluctuations in the power supply of the sorter unit, for this could seriously hinder its performance. The power supply has to be conform with following requirements:

Electrical requirements

Voltages	: 3 phase 400V (+ neutral & earthing)
Electrical power	: 8 kVA
Frequency	: 50 (or 60 Hz USA)

- Regularly inspect the tubing, the wiring, the valves and all connections on and around the **GENIUS Compact** for leaks and breakages. (For more information on the connections see chapter 2)

- A Yearly check up by a certified maintenance engineer from **BESTnv** or trained by **BESTnv.** (It is advisable to plan this a few weeks/months before peak season).

- Replace all ejectors every three years.

Please contact the BESTnv service department if you have any questions concerning this maintenance program.

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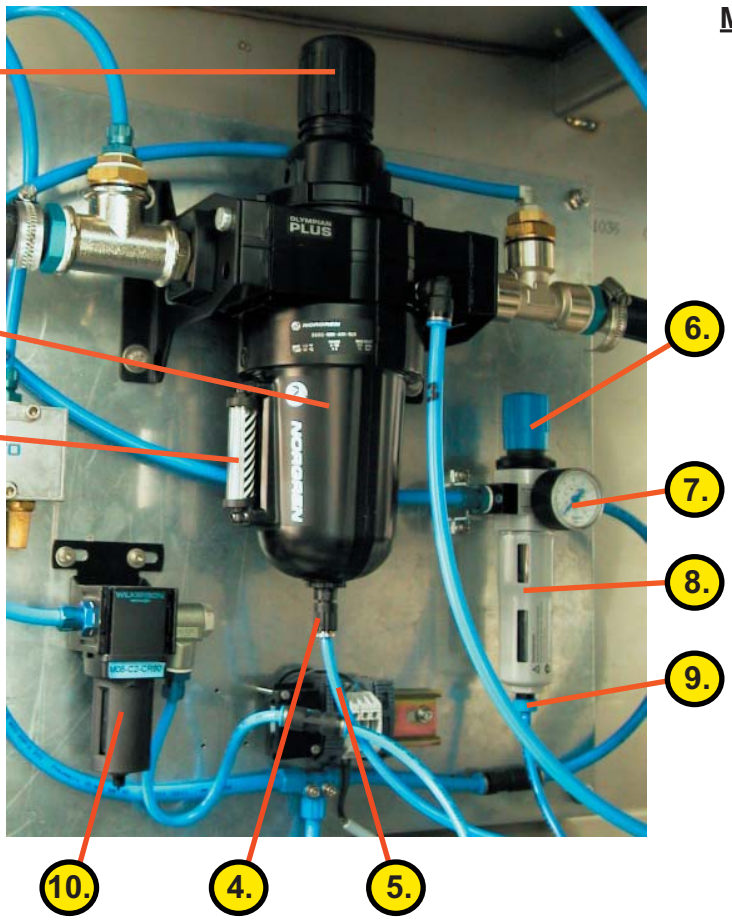
7.3. Air Pressure Regulator

The air pressure regulator needs very little maintenance; apart from a periodic check-up of the filter and the water level in the draining system, it is virtually maintenance free.

Compressed Air Controls inside sorter unit



Main Compressed Air Regulator/ Filter assembly

1. air regulator button
2. compressed air filter
3. water level indicator
4. water drain
5. water drain tube

Auxiliary Compressed Air Regulator/Filter (optional)

6. air regulator button
7. air pressure gauge
8. compressed air filter
9. water drain

10. Auxiliary Air Filter (optional)

Air pressure gauge (7)
(Main air pressure gauge on control panel above touchscreen)
Here you can check the actual pressure in the compressed air tubing.
Regular checks are advisable.
(Optimal pressure depends on your product, ask your **BESTnv** installation engineer).

Air filter (2), (8) & (10) (8 & 10 are optional)
Filters dust, dirt and water particles out of the compressed air. The filter should be checked approximately once a year and replaced when necessary (depending on the quality of the compressed air).

Water drain: Automatic (4)
Removes the water from the compressed air that accumulates in the filter unit.
The removal of the water happens automatically, via a tube that goes to the bottom of the sorter cabinet.

However, if the compressed air supply is of lesser quality, the draining system may become clogged, due to the accretion of dirt and dust particles. In this case it is necessary to drain the water by hand. With the manual drain, just unscrew the drainage screw underneath the filter.

To avoid getting water in the pressurized air tubes the water level should be checked regularly, +/- once a week.

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Below you can see that the water level in the drainage system is indicated on the side of the Air filter. If a sizeable amount of water has accumulated, water level indicator at +/- half full, screw open the water drain at the bottom end of the air filter and drain all the water.

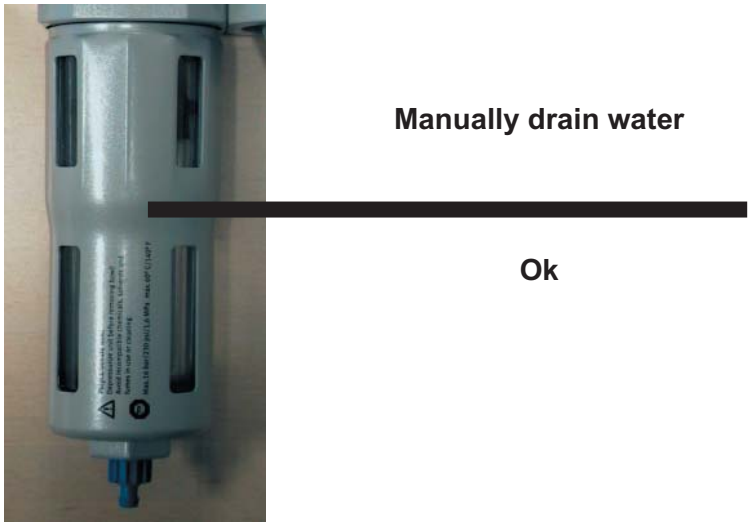
Periodically check the system for clogs and blockages.

Picture: Water Level Indicator for Main Compressed Air Regulator/Filter

Manual water drain (9) (optional)
Below you can see that the water level in the auxiliary water drainage system can be checked by looking through the see-trough parts of the filter bowl. If a sizeable amount of water has accumulated, water level +/- 10 mm underneath filter (filter is white part inside filter bowl), screw open the bleeding screw at the bottom end of the air filter and drain all the water.

Periodically check the system for clogs and blockages.

Picture: Water Level Indicator for Auxiliary Compressed Air Regulator/Filter



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7.4. Hibernation of the machine

Hibernation is the term used for any period of more than a few weeks in which the machine is not used and all power to the machine is switched off.

- The ambient temperature in the room where the machine is hibernating should never be lower than -20°C (68°F) or higher than 50°C (122°F).

- All power to the installation should be cut. (Pull the plug or switch of all fuses of all electrical circuits to and from the machine)

- Before leaving the machine in hibernation all water should be removed from the tubing (see procedure).

- In case a Cooling unit is used, it is advisable to remove all water from the cooling unit.

- In case of water problems with the air gun valves (usually due to high pressure cleaning too close to the valves, or too much moisture in the compressed air supply), it is advisable to remove all the water out of the air gun valves by activating each air gun.

7.4.1. Air Gun Draining and Test procedure

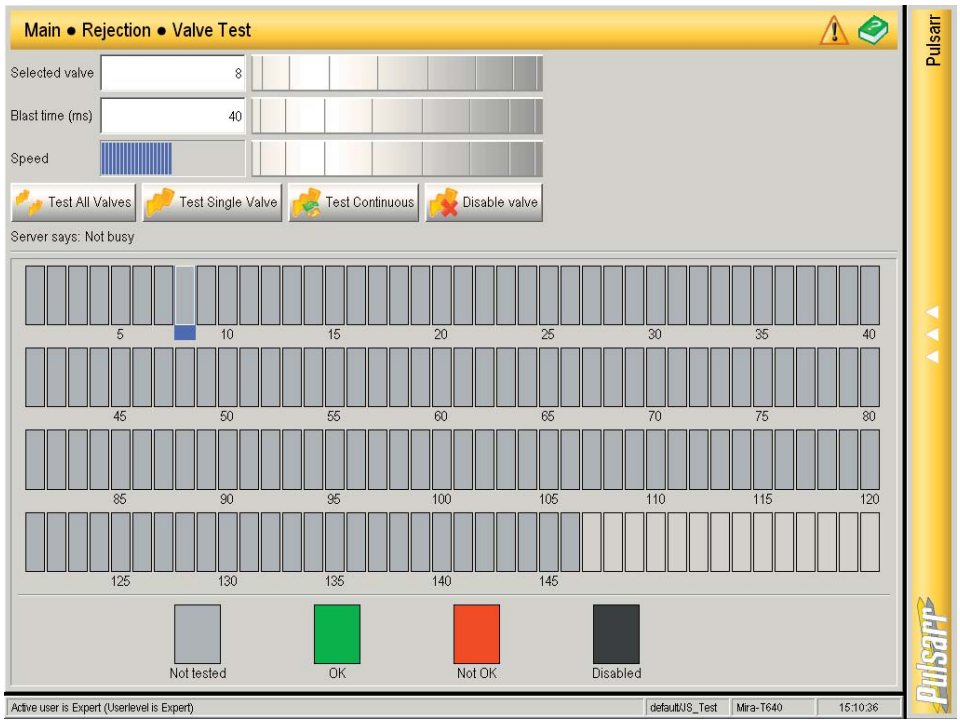
- To remove all water that might be in the air valves, first go to the Rejection Menu, and next select Valve Test menu (see picture below).

- Set the Blast Time to +/- 5 sec. and Set the Speed to slow (very few blue bars visible).

- Next press the “Test all Valves” button (all valves will be activated one after the other).
Good valves will light up green, bad valves will be indicated in red and disabled valves will be black.

In case one or more air guns no longer function, it is advisable to replace them as soon as possible (broken air guns may mean that defects are missed). When in need of extra air guns, please contact **BESTnv**.

Picture: Valve Test menu



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Procedure to remove water from the sorter tubing:
(If water is used for optional systems: Bull nose, Belt water sprinkler, Water Cooling system, FSV-module, ...)

- Switch off the water supply to the installation (switch off chiller (option) and/or turn off the mains water supply).

- Disconnect the tubes from the main water valves on the outside of the sorter unit. Do not forget to empty all tubes to prevent leaks due to freezing or big temperature changes. For more info on connections to sorter unit, see chapter 2: pre-installation guide.

- Disconnect the water tubes from the optional water-using systems on the sorter unit: belt cleaning and/or FSV-module (option) cleaning system and use compressed air to blow all the water out of the tubing.

- If water is used to cool internal systems (such as optional laser box), disconnect the tubes inside the sorter unit from those systems. Make sure to place the end of the tube outside the sorter unit (if possible) or place a container to collect all the water, and use compressed air to blow all the water out of the tubing.

Attention! ***- Make sure never to spill any water on any electrical, electronic or optical components! This can seriously affect the sorting efficiency and even cause damages to certain components.***

When switching the sorter unit back on after a hibernation period:

- Before restoring power to the sorter installation, one should first reconnect all tubes to all water-using systems/options on and inside the sorter unit, and connect the water supply tubing to the main water valves of the unit.

- Next switch on the main water supply (and/or fill the cooling unit with water and switch it on), and make sure all tubes are properly connected (without water leaks).

- Restore power to the sorter installation and switch on the sorter unit (see Complete Start-up procedure chapter 5).

Attention: ***- Always take into account the warm-up time for the lights and optics (+/-30 min. after a longer stop), before taking reference lines/normalizations.***

Always switch on the Cooling unit (option) several minutes (10' to 15') before switching on the sorter. This will give the Cooling unit some time to lower the temperature of the cooling water.

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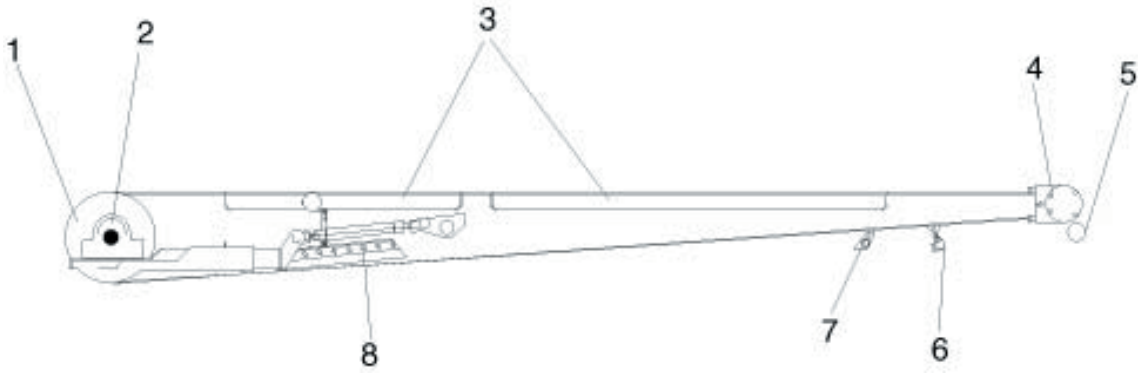
7.5. The Detection Belt

7.5.1. General



Schematic

The detection belt consists of a wide flat belt (640 or 1200 mm) of a specific colour chosen in function of the products to be sorted. It is driven by a reductor motor that rotates the drive drum (1). The upper part of the belt runs from the drive drum over gliding plates (3) to the return station (4), and the lower part goes straight back to the drive drum.

To keep the belt clean during the sorting process the system has been equipped with an optional water spray system (6). To remove any sticky product or objects, an outside scraper (7) and a v-shaped inside scraper (8) have been added. During operation one should regularly check that the scrapers - inside and outside - really do touch the belt, but are not pressed too tightly against the belt (for this could damage the belt and thus affect the sorting efficiency).

The return station (4) may consist of a large or a small return axle. The choice of return station is determined by the shape and the properties of the products that are to be sorted. Large or small return axle makes absolutely no difference when tensing or tracking the detection belt. Keep in mind that the return station is always fixed to the frame, so any adjustments for tensing and/or tracking will have to be done by adjusting the position of the drive drum.

If the **GENIUS Compact** sorter unit is equipped with a laser box, a background drum (5) will be added to the configuration.

General

Remember that correct tensing and tracking is very important for any kind of belt (including return system, accept and/or reject belts). If the belt is under enough tension it will start slipping and will not function properly. However, if it is under too much tension, this will damage and decrease the lifetime of not only the belt itself, but also of the bearings of the belt system.

It is also important to regularly grease the bearings of all rotating elements, including drive drum, return axles, background drums/reference rollers (laser box option), light tubes (FSV-option), etc... For more info, check greasing procedure later in this chapter. The return axle of the detection belt is greased for life and should not need any maintenance.

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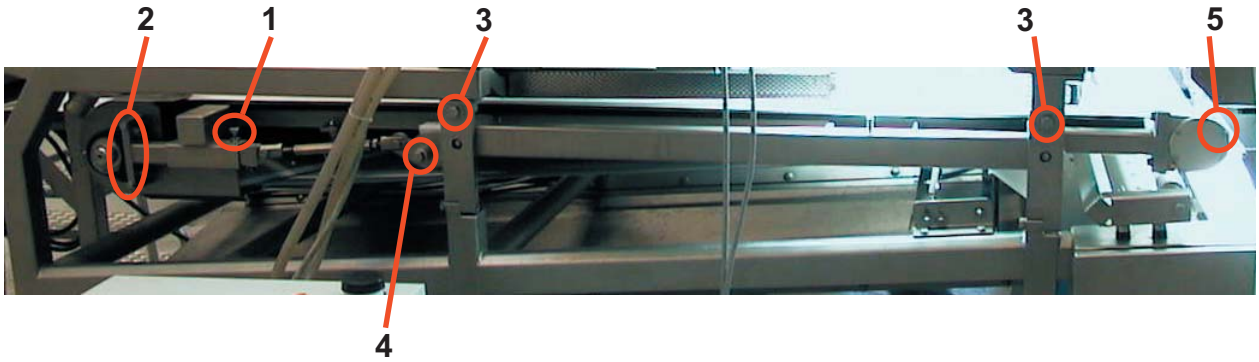
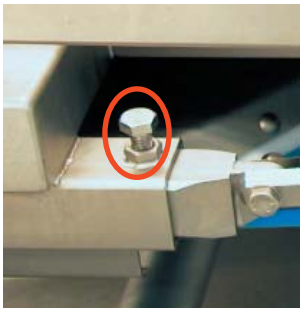
7.5.2. Replacing the Detection Belt

The Detection Belt has to be replaced regularly (exact frequency depends on product and machine configuration). Make sure to have the necessary tools available (spanners/wrenches).

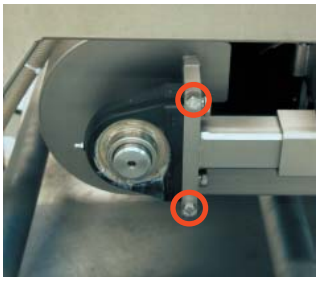
Belt Replacement Procedure:



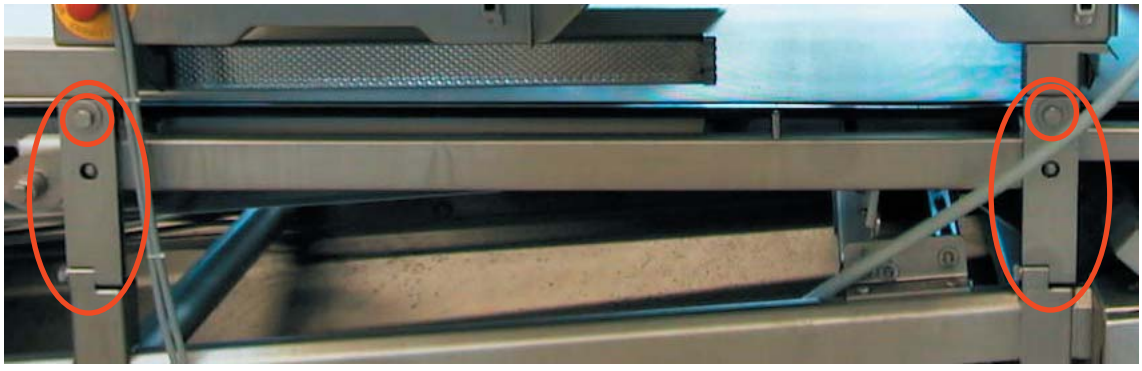
1. Loosen bolt to release bearing block supports.



2. Remove safety plate of belt drive drum (remove 2 bolts).



3. Unscrew bolts and open wedges.



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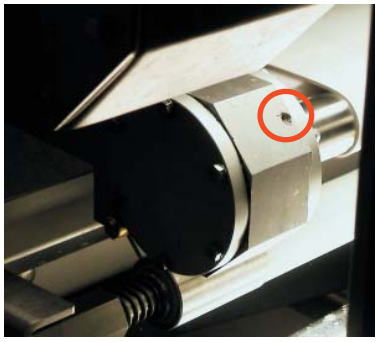
4. Release belt tension mechanism by turning the big hexagon screw to the left.

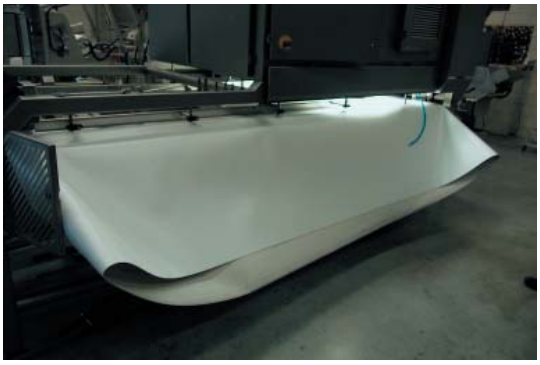
5. Remove grease nipple on right bearings block of return axle. This grease nipple would make replacing the belt much more difficult, and could damage the new belt.

Attention: ***- Make sure to always place the greasing nipple back after replacing the belt, without it greasing of the bearings is impossible.***



6. Remove old belt and replace it with a new belt. Place the new belt approximately in the middle.

Attention! ***- While the rest of the procedure can easily be done by 2, placing the new belt is best done by 3 persons to avoid damaging the new belt.***



7. Close wedges and tightly screw down the bolts.

8. Insert greasing nipple.

9. Perform procedure: Tensing and Tracking of Detection Belt (see next pages)

10. Place back the belt drive drum safety plate (see point 2) and screw the bolt back in to fix the bearing block supports (see point 1).

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7.5.3. Tensing and Tracking of Detection Belt

Tensing of Detection Belt

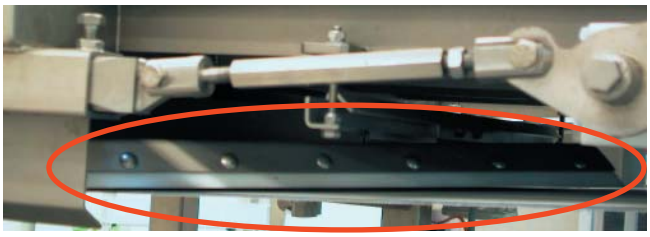
If the Belt Tension is too high, the Belt will damage the bearings of drive drum and/or return axle(s).

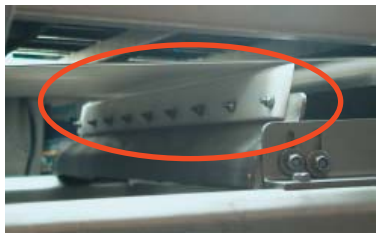
If the Belt Tension is too low, the Belt will start to slip, which will have a negative influence on the sorting process.

Belt Tensing Procedure:

1. Set inner and outer scrapers and support shoes in such a way that they do not touch the detection belt.

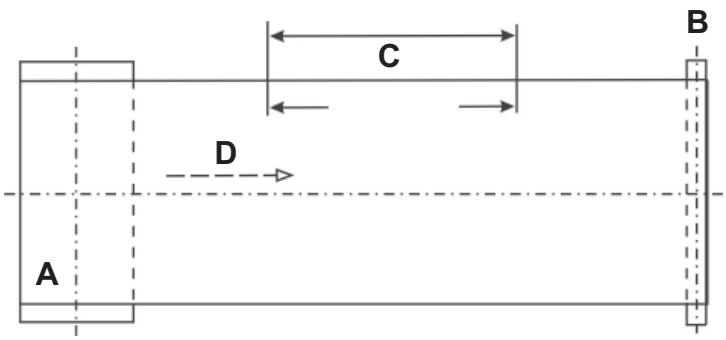
2. Adjust the position of the drive drum in such a way that the belt is not under tension (move drum slightly inwards using tightening screw on both sides).





3. Make sure that both drive drum and return axle (or bull nose) are at right angles to the direction of the belt motion (see picture underneath). Do not put tension on the Belt before it has been placed correctly.

4. Place two easily removable dashes to mark a distance of 1000 mm (39,37") on both sides of the belt (see picture above).



A: Drive Drum

B: Return Axle

C: Marks indicating 1000 mm distance on belt

D: Transport direction belt

5. Increase the belt tension by adjusting the position of the drive drum, away from the return shaft, until the 1000 mm distance between the two dashes has become 1003 to 1004 mm on both sides of the belt. This corresponds to the advised belt tension of 0.3% to 0.4%.

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6. Make sure the drive drum is still at right angles to the direction of the belt motion. If necessary, adjust the angle and check the tension on both sides of the belt.

7. When the correct tension is reached on both sides of the belt, check the tracking of the belt, and if necessary adjust (see next procedure).

8. Remove the marks and position the inner and outer scrapers in such a way that they lightly touch the belt.

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Tracking of Detection Belt

To prevent the belt from deviating from the transport direction, the drive drum is slightly spherical. On top of that, the tracking of the belt must be finely tuned when placing a new belt.

Tracking should always be checked and adjusted after the belt has been set to the correct tension. The tracking can be adjusted by tensing the drive drum (moving it further away from the centre of the machine) or loosening it (moving it closer to the centre of the machine).

Please keep in mind that both too high and too low a tension on either side must be avoided. Always make sure to do all tensing on the same side of the machine (e.g. always do tracking on side opposite to belt motor). This will make it impossible to put too much tension on the belt, because the tension on one side of the belt will always remain constant.

Belt Tracking Procedure:

1. If the belt deviates to one side, tense the drive drum on the opposite side, or loosen the drive drum on the same side, until the belt tracks nicely in the middle. (e.g.: belt deviates to right (always as seen in transport direction), tighten drum to the left or loosen to the right)

***Simple rule*: - Always tense the belt to make it run away from you, and loosen it to make it come towards you (see picture).**

Attention! ***- Always check what happens when turning the spanner up or down.***

- Always do tensing and loosening of belt on the same side (e.g. always on the side opposite to the belt drive motor (to prevent too much tension on the belt).

- Always use small steps, and make sure that the maximum belt tension (0.5% or 1005 mm for large return axle; 0.3% for small return axle) is never reached on either side of the belt, for this could damage belt and/or bearings.

- Make sure the Drive Drum is fastened securely after adjusting it.

2. Verify that the belt keeps tracking in the middle for a little while (+/- 5 min) and then switch off belt. (E.g. draw a line right next to the belt and check whether the distance between line and belt stays constant.)

3. Remove the marks and position the inner and outer scrapers in such a way that they lightly touch the belt.

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7.6. Greasing the bearings

The bearings for all rotating elements, including drive drum, return axles, background drums (laser box option), etc... must be greased regularly. See following schematic:

- The re-greasable seals must be greased monthly in case of approximately 8 h of continuous use per day. If the belt is used more extensively it should be greased more often.

- If the belt is installed in aggressive environment and in continuous contact with water, salt, dust, etc., or when working under full load it will be necessary to re-grease more frequently.

- If the belt is cleaned by means of special chemical detergents, high pressure water or steam, re-greasing should take place daily when such cleaning removes the grease from the seals.

Procedure for greasing the re-greasable seals:

1. - Inject grease into the greasing nipples.

2. - Turn on the belt to spread the grease over the ball bearings.

Drive drum system

Greasing nipples can be found at both sides of the drive drum. Regularly add grease into greasing nipples.

right greasing nipple drive drum

left greasing nipple drive drum

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Standard (Ø 75 mm) return axle system

A greasing nipple can be found on both sides of the return axle system (see picture underneath). Regularly add grease (preferably after cleaning the machine) and keep adding grease until the old grease is pressed out through the relief valve.

greasing nipple standard return axle

Attention! ***- Do not use oils containing additives which may damage the motor insulation or the seals.***
- Furthermore, graphite, molybdenum disulphide or other oils based on electrically conductive additives must not be used, as they will cause damage to the motor.

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7.7. Replacing the small return axle of the detection belt

(Only for GENIUS Compact 1200 mm version)

In optimal circumstances the return axle has a life span of +/- 2 years. But due to the fact that in practice the detection belt is often strained too much, it is advisable too check it more often, and usually it has to be replaced after +/- 1 year.

Before removing the old return axle, first release the belt tension mechanism by screwing big hexagon screw to the left.

Attention!

- Be very careful not to damage the detection belt when removing and replacing the return axle.

- After replacing the detection belt, always check tension and tracking (see previous procedures).

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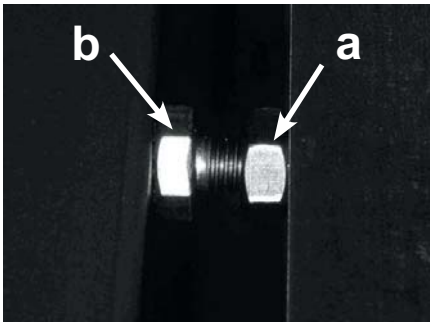
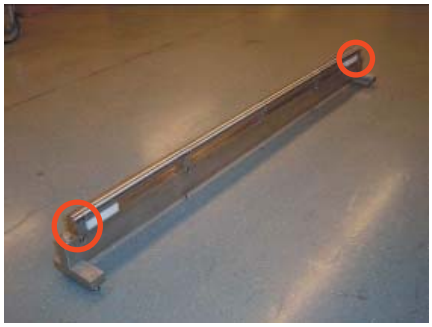
Procedure:

1. Unscrew 2 fixing bolts of return axle assembly on both sides of the sorter unit (see pictures underneath) and carefully remove the return axle assembly.

2. Screw in the supporting bolts (see pictures) between small return axle assembly and frame. These bolts give extra support against the pressure of the belt on the return axle assembly.
   - First loosen the hexagon nuts (a).
   - Next screw in the supporting bolts (b) until they no longer touch the return axle assembly.



3. Remove a bearing block at one of the ends of the mounting block (see picture).



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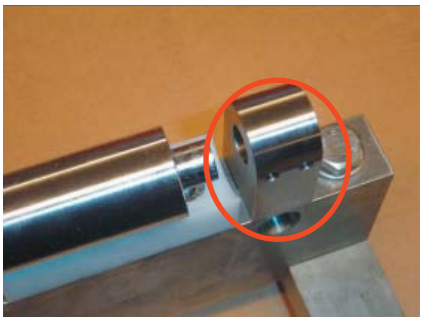
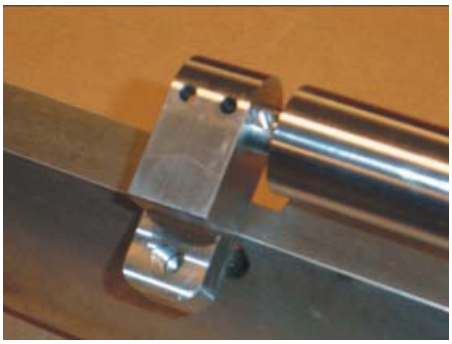
- a) Use an Allen key to carefully remove the M10 screw that fixes the bearing block to the mounting block.

- b) Unscrew the inner M5 setscrew (see picture) to remove the bearings block from the roller, the outer setscrew should not be unscrewed.



4. Remove first roller: Unscrew first setscrew in next bearings block and slide out roller (see pictures).



5. Remove next bearings block: Use an Allen key to carefully remove the M10 screw that fixes the bearing block to the mounting block.

6. Repeat steps 4 and 5 until all rollers (4 for 1200 mm version) are removed and only the outer bearing block is left.

disassembled parts 1200mm version

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7. Take new rollers out of spare parts package and mount new rollers and bearing blocks:

Remark: ***- Make sure to clean all screws and holes before applying Loctite 222 (M5 screws) or Loctite 243 (M10 screws).***

- a) Put Loctite 222 on each M5 setscrew before screwing in, and never screw too tight.

- b) Put Loctite 243 on each M10 tap screw, and inside the screw hole before screwing in.

8. Take return axle assembly with new rollers and place it back carefully, so as not to damage the detection belt. Screw the fixing bolts back in.

9. Screw out the supporting bolts until they touch the return axle assembly and then screw out one extra 1/2 turn.

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7.8. Cooling

Water Cooling: (standard)

The water cooling is essentially maintenance free, except for regular inspections of the water quality and the state of the tubing of the water supply. To work properly, the cooling system needs an adequate water supply, but the water can be recycled and an optional external cooling system is always available (usually TAE M020).

(For more info about the optional external cooling unit, see chapter 2: pre-installation chapter, and the manual of the cooling unit in the Manufacturer's Information in the Attachments Chapter.)

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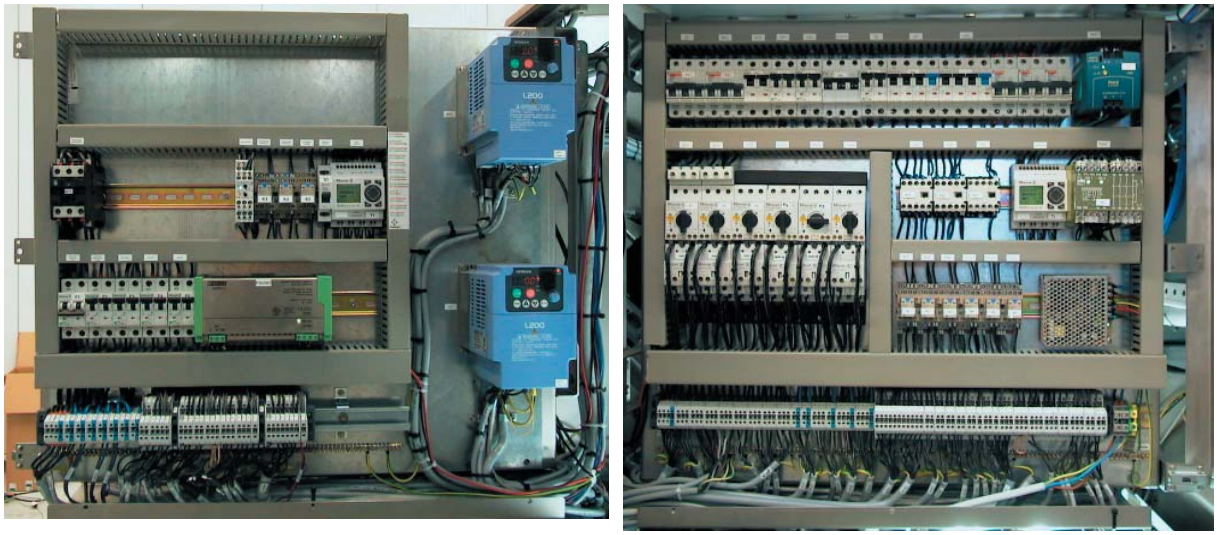
7.9. Electrical installations

Except for regular inspections of the wiring and the connections the electrical installation is essentially maintenance free. Almost all electrical components are standard and should be easy to replace in case of failure and all electrical components can be ordered through **BESTnv** if necessary.

Picture: Electrical installation inside sorter unit



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VIII. Troubleshooting

8.1. Introduction

The **GENIUS Compact** sorter is equipped with a number of alarm lights that indicate possible problems or errors that may hinder or stop the sorting process.

In the first part of this Troubleshooting chapter a number of basic rules will be given to prevent problems, and the different alarm lights and their significance will be explained.
The second part will feature a number of basic troubleshooting procedures that can be very useful to prevent or solve certain specific problems.

8.2. General Troubleshooting and Alarm lights

General

Whenever any alarm lights are activated, and before checking troubleshooting procedures or calling **BESTnv**, first check the following items:

- All fuses must be switched on.
- The sorter unit must have been started properly (if this is not the case, please follow the appropriate procedure: chapter 5).
- Make sure no Emergency stop buttons are pressed.
- Make sure none of the safety switches have been bypassed or disabled.

Alarm Lights

2. Alarm Warning Light
This light will be on whenever there is an alarm, indicating there is a problem impeding the proper functioning of the sorter. When this warning light is activated, the control current will be switched off automatically.

3. Nitrogen Warning light (Only with laser box)
This light will be activated whenever there is insufficient nitrogen pressure.

4. Service Mode Warning Light
This light will be activated whenever the laser safety interlocks have been defeated. All lasers will automatically switch off.

5. Optics Warning Light (Only with laser box)
This light will be activated whenever the temperature of the laser box is too high, the lasers will be switched off and sorting with the laser box will be halted.

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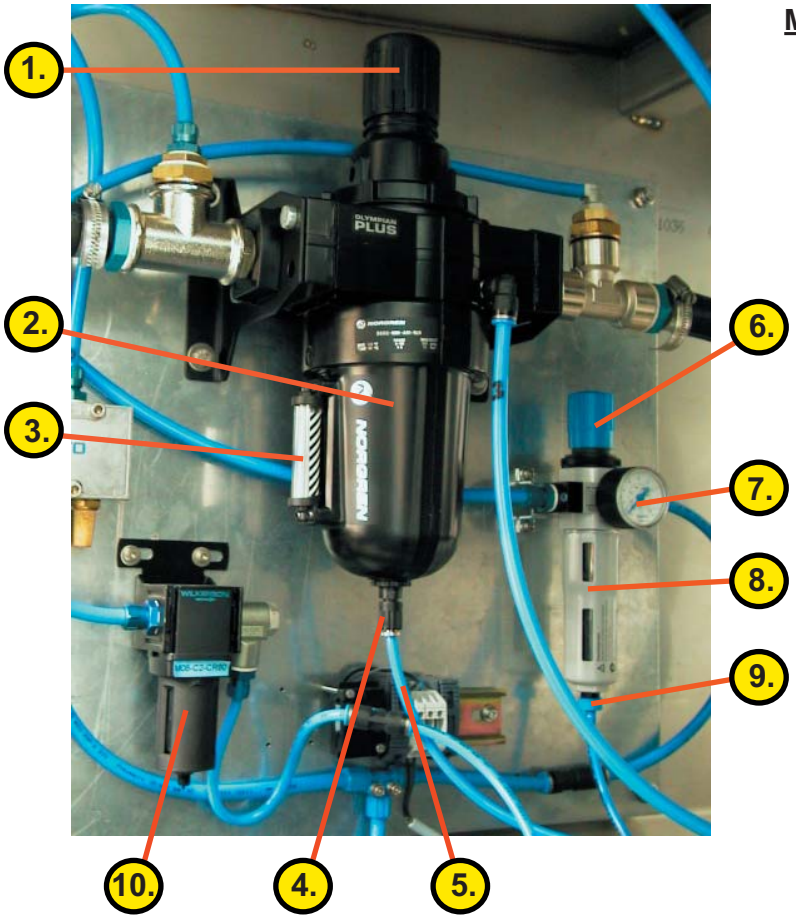
8.3. Troubleshooting Procedures

8.3.1. Procedure 1: Testing Main Air Pressure Regulator

1.- Check the air pressure on the pressure gauge (see control panel).
2.- Turn the air pressure regulator button clockwise.
3.- The air pressure gauge should indicate an increased air pressure.
4.- Next turn the air pressure button counterclockwise.
5.- Activate the air guns (go to the Valve Test Menu via the Rejection Menu, next press the “Test All valves” button to activate all valves.
6.- The air pressure gauge should indicate a decreased air pressure.

Compressed Air Controls inside sorter unit



Main Compressed Air Regulator/ Filter assembly

1. air regulator button
2. compressed air filter
3. water level indicator
4. water drain
5. water drain tube

Auxiliary Compressed Air Regulator/Filter (optional)

6. air regulator button
7. air pressure gauge
8. compressed air filter
9. water drain

10. Auxiliary Air Filter (optional)

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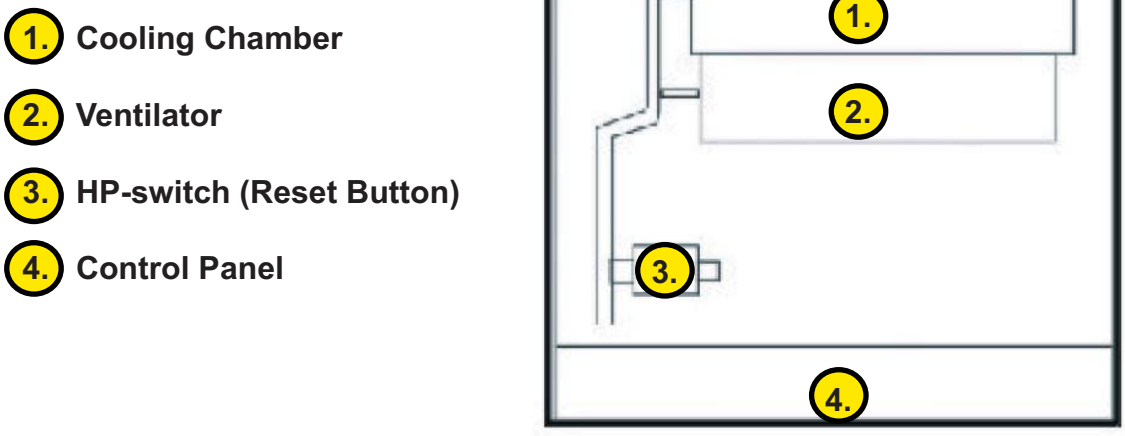
8.3.2. Procedure 2: Testing Settings optional cooling unit (MTA TAE 020 or M010)

1.- Switch off cooling unit with On/Off button (next to main power switch).
(Only for TAE M010)
2.- Press the P-button (min. 5 sec. for TAE 020).
3.- The display should indicate a temperature between 10°C and 13°C.
4.- If the temperature indication is not correct, use the arrow button to reach the correct value.
5.- Press the P-button again.
6.- The display should now indicate d3.
7.- When the indication is incorrect, use the arrow button to reach the correct value.
8.- Switch the Cooling Unit back on.

- If the indicator displays a default code, check the operators manual of the cooling unit (to be found in the provider info chapter).

- If the compressor of the cooling unit does not work (LED in compressor icon is orange during operation), remove the cover of the cooling unit, and press the High Pressure switch inside (see picture).

Top view inside cooling unit



- For further and more detailed information on the cooling unit, see the operation manual in the attachments section at the end of this manual.

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8.3.3. Procedure 3: Replacing compressed air valves (FESTO)

Before starting the Procedure, first check thoroughly which valves need to be replaced (See chapter 7: 7.4.1. Air Gun Draining and Test procedure) and write down the numbers of the defective air guns.

FESTO

1. - Cut of compressed air supply and check if air pressure is released.
   (Activate a few functioning air guns to check that no more compressed air is available.)

2. - Switch off Sorter unit.

3. - Unscrew 2 screws to open panel Rejection unit (upper panel for even numbers, lower panel for uneven valve numbers).

4. - Each air gun is numbered and fixed to the manifold with 1 screw and electrically connected with wires to the air gun drive boards.
   a. Disconnect electrical connections of defective air valve.

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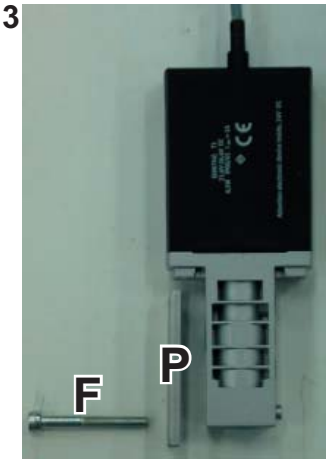
b. Unscrew the fastening screw (F) (use allen key). Make sure to catch the little protection plate (P) which is fixed to the air gun with the fastening screw (F) (see pictures 1, 2 & 3 below).

1

2

3



5. Replace the defect air gun with a new one (make sure to mark the new valve with the same number as the old valve), put in the screw (with protection plate, see picture 3 above) and reconnect the electrical connections.

6. When the necessary air guns have been replaced, the cover must be mounted again

7. Next the air pressure valve should be opened again. It is advisable to check whether the air pressure gauge indicates the correct air pressure. If not, use the air pressure button to regulate the pressure (see picture procedure 8.3.1).

8. Switch the main power to the machine back on (see procedure in chapter 5).

9. Start the laser sorter and test all air guns (Valve Test menu touchscreen).

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IX. Touchscreen Program

POLLUX version 3.0

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9.0. Contents of Touchscreen Program

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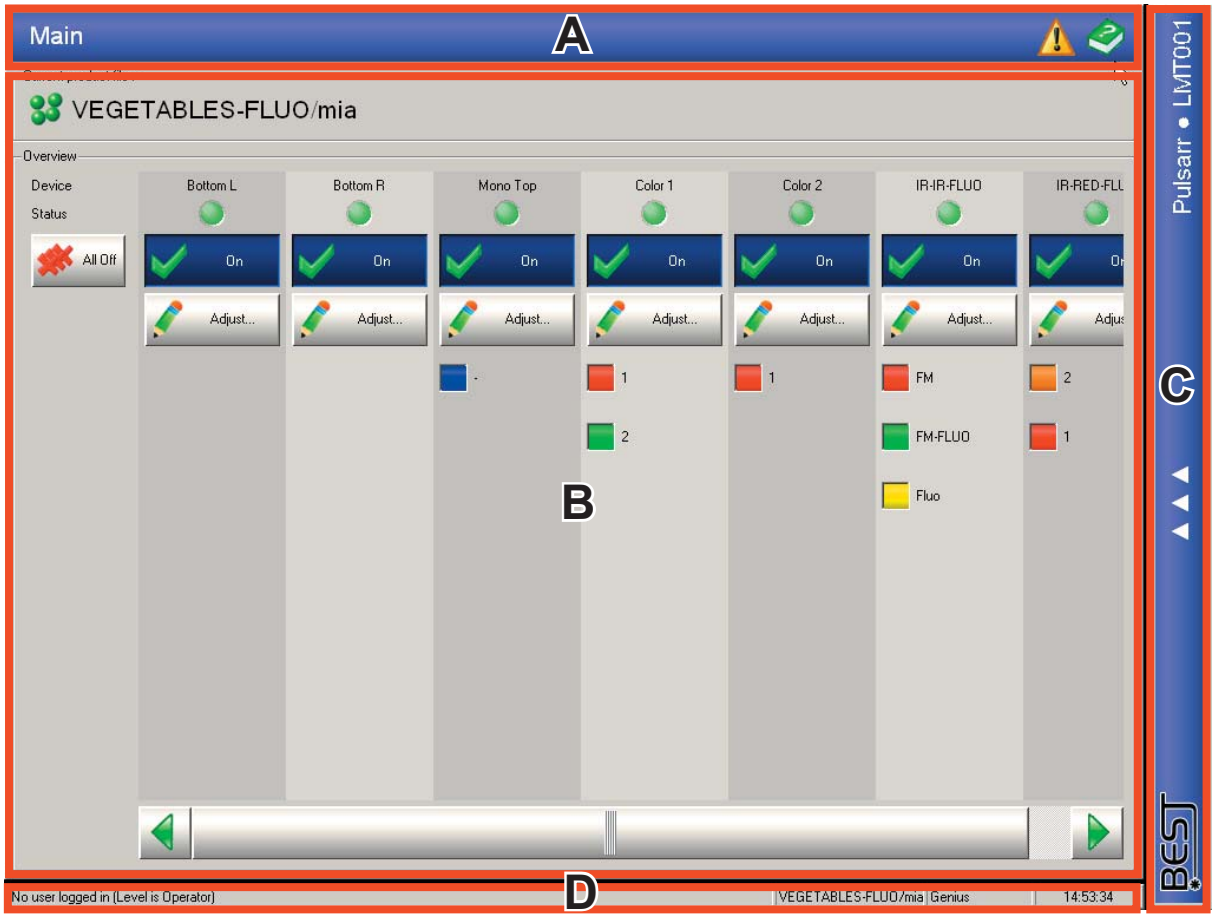
9.1. General info

For all practical purposes the touchscreen display can be used as if it were an ordinary computer, but operated via a touchscreen instead of a keyboard (if necessary a keyboard contact is available). Commands are given by simply touching the appropriate parts of the screen, which, together with the very user-friendly and conveniently arranged structure of the program, makes it very easy to operate, even for those possessing no computer skills whatsoever.

By means of the **POLLUX** touchscreen program all necessary commands to the sorter unit, concerning the sorting electronics, optics and the detection belt can be given.

9.1.1. Screen Layout

Every menu consists of Title bar (A), Main Screen (B), Navigation bar (C) and Status line C).



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A. Title Bar

- To the left this bar features a list of menu names ending with the name the currently active menu. These are the names of all the menu's and submenus you have passed through to get to this menu. (E.g. the title bar below indicates we are presently in the Normalization menu, which is a submenu of the Detection menu, which is itself a submenu of the Main menu.)
- To the right you will find 2 icon-buttons:
  The alarm button: a yellow warning sign (left). Press this button to access a pop-up screen with a list of warning and error messages
  The Help button: a green book (right). Press this button to access the Help files.

B. Main Screen

Can be subdivided into several zones, containing buttons, screens, graphs and/or information. This is the zone where the user will be adjusting settings or entering values.

C. Navigation Bar

To the right side of each touchscreen menu there is a bar containing 3 arrows pointing to the left. If this bar is pressed, the navigation bar will pop out, slightly overlapping the central screen of the menu. To make the navigation bar disappear again, just press the bar to the left of the navigation bar with the arrows pointing to the right.

The navigation bar contains a number of buttons that can be divided in 3 groups from top to bottom on the bar:

1. 'Navigation' buttons: from left to right, and from top to bottom:
   - "Home" Pressing this button will take you right back to the main menu.
   - "Level up" Pressing this button will take you to the menu that is exactly one level above the menu you are in.
   - "Back" Pressing this button will take you back to the previous menu you visited
   - "Next"" Pressing this button will take you to the next menu (will only be activated when the 'Back' button has been pressed one or more times).

2. 'Menu' Buttons:
   The buttons shown here provide links to the menu's that can be visited directly from this menu. Usually these are the menu's directly below this menu

3. 'Most visited' buttons:
   These 3 buttons provide direct links to the 3 most visited menu's.

D. Status Line

The status line underneath the main screen displays the following info from left to right (see below):
- User name + level, current Product file name and Time.

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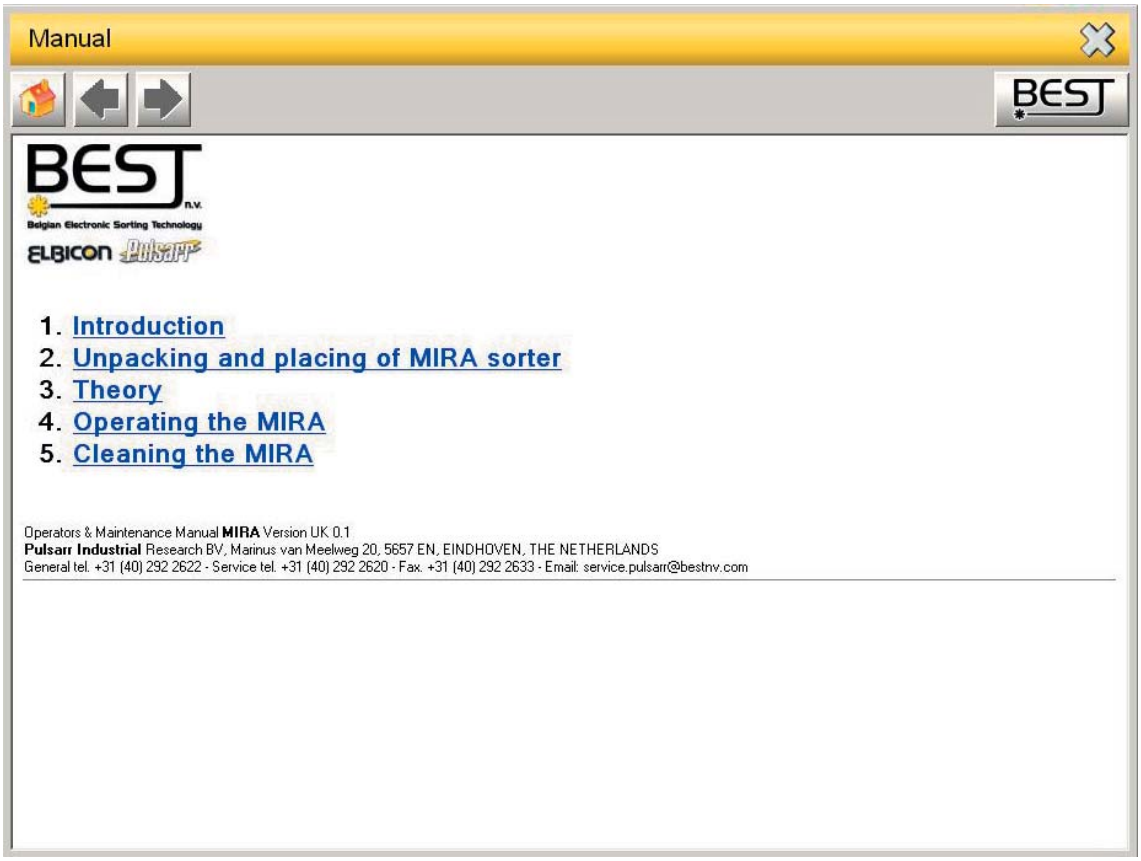
9.1.2. Help Menu

Press the Help button (to access the Help files.

In this Menu you will find information on the Software version of your sorter and all data necessary to contact the **BESTnv** sales and service departments. A limited version of the operation and maintenance manual will be available through this menu in most machines.



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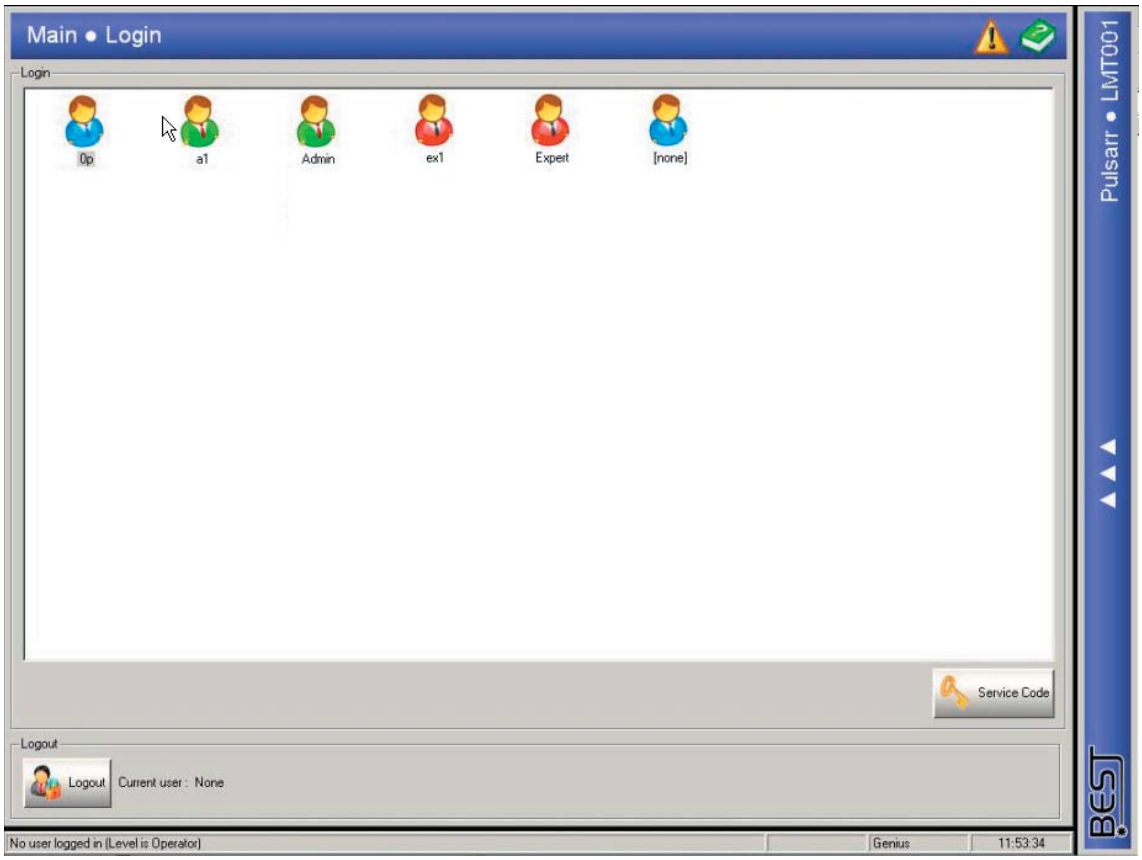
9.2. Log-in Menu

After the **GENIUS Compact** sorter unit has been switched on (main power switch ON), the touchscreen program will start up automatically and the Main Menu will appear on the touchscreen display.

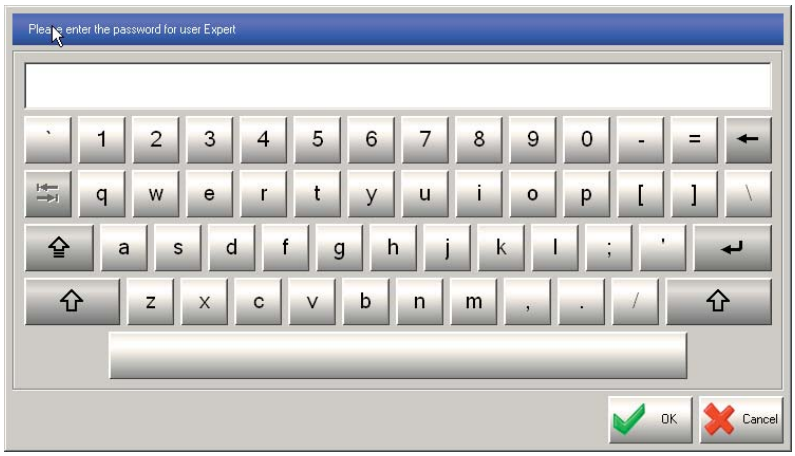
The Pollux program will automatically start up in the lowest user level possible, the so-called “no-user” level. In this user level only the Login menu is available.

9.2.1. Logging in

The Login menu will appear (see below), featuring a number of user icons, representing different users and/or user groups with specific rights.



Select the appropriate user by pressing the appropriate icon. Use the pop-up keyboard (see next picture) to enter your user code and press OK once the correct code is entered.



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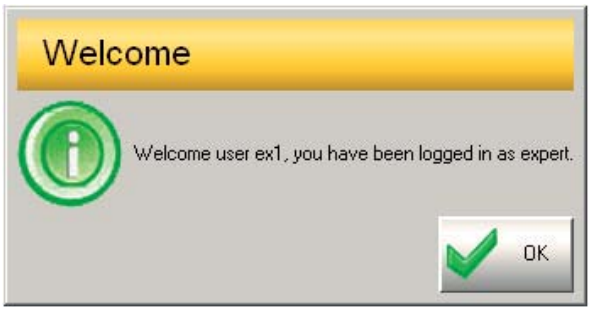
After entering the correct user code, a welcome screen will welcome the user and indicate name and user level.



The user will then have access to a number of menu's and settings in accordance with his/her user level.

9.2.2. User Levels

All user levels are colour coded, meaning that the colour of the upper bar and the side navigation bar also indicate the present user level. The name of the user and the user level are also indicated on the status line underneath the screen.

There are 4 basic user levels:

1. No user (blue):
   In this level only the login menu is available.
2. Operator (blue):
   In the Operator level most submenu's are available, but only the more basic settings can be changed.
   A number of buttons and submenu's will not be available (e.g. User Management is not available).
3. Administrator (green):
   In this user level, only the Main menu and the User Management menu are available.
   This user level is mainly used to create and edit Operator, Expert and Administrator users.
4. Expert (yellow):
   All but the most advanced machine settings are available in this user level. Expert users can change practically any setting and almost all buttons and menus are available.
   Expert users can also create and edit operator and expert level users.

A separate Service level (black) can be accessed by pressing the "Service" button to the lower edge of the screen. This level is only intended for **BESTnv** service engineers.

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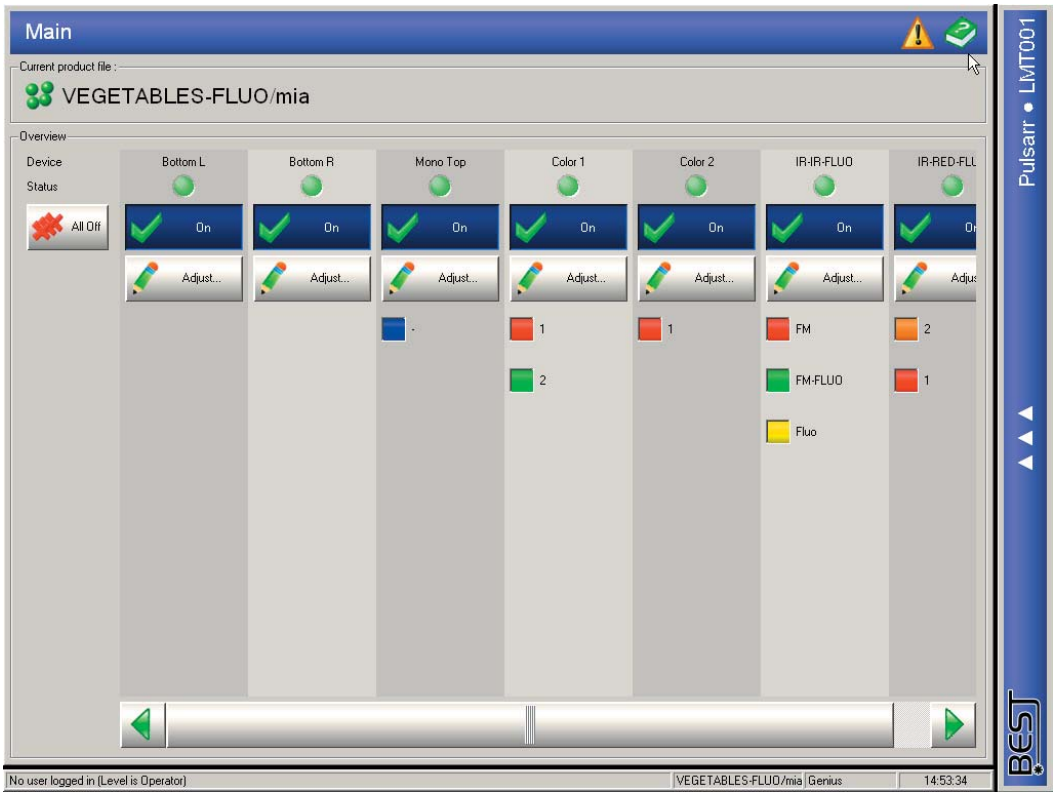
9.3. Main Menu

This menu will appear immediately after login (see picture below).



On this menu the following **features** can be found:

1- The icon and name of the product file that is currently in use is displayed near the top of the main screen.

2- All devices (cameras and lasers) are displayed on the main screen in separate columns containing the following items:
- A green status light underneath the device name will be active if the device is on.
- The On/off button can be pressed to switch the device on/off. The current state of the device (On/Off) is also shown on the button.
- The "Adjust" button can be pressed to go directly to the settings submenu of the detection menu. Here the signal thresholds can be adjusted (see 9.?.? Settings submenu) and added or deleted (only in expert level).
- The coloured squares represent the different signal thresholds that have been created. By pressing them these can be turned off (grey) or on (coloured).

3.- "All off" button to switch all devices off.

Via the **navigation bar** the user can go to the following submenu's:
- Detection menu: This menu and its submenu's contain all info, settings and functions regarding the actual detection of product and defects.
- Rejection menu: This menu and its submenu's contain all info, settings and functions regarding the actual rejection of the defects.
- Product Setups menu: This menu contains all info and functions regarding the management of product setup files.
- Expert Settings menu: (only in expert user level) This menu contains all info and functions regarding the management of the users and user levels.

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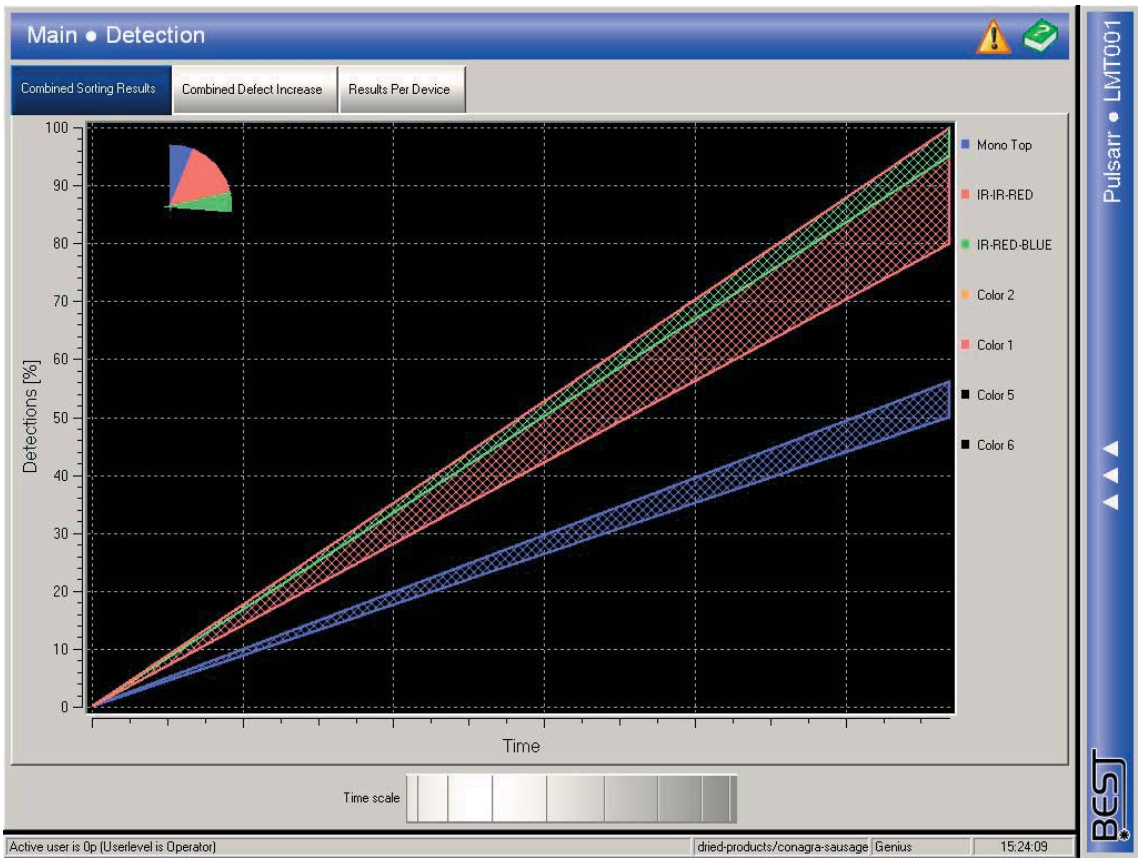
9.4. Detection Menu

Press the Detection button in the navigation bar to get to the Detection menu
The Detection menu and its submenu's contain all info, settings and functions regarding the actual detection of product and defects.
For more info about the setting and/or adjusting of thresholds & filters and the taking of reference lines, see **chapter 5: operational procedures**.

This menu has 3 tabs in the main screen:

1.- Combined sorting results



In this screen the total sorting results are split up per device:
- The pie chart in the left corner shows how much product is rejected and by which device (camera/laser).
- The graph on the main screen shows how much is rejected by each device over a certain period of time.
The time period that is displayed can be adjusted with the dial near the bottom of the screen.

This menu may be useful to check which camera rejects the most product.

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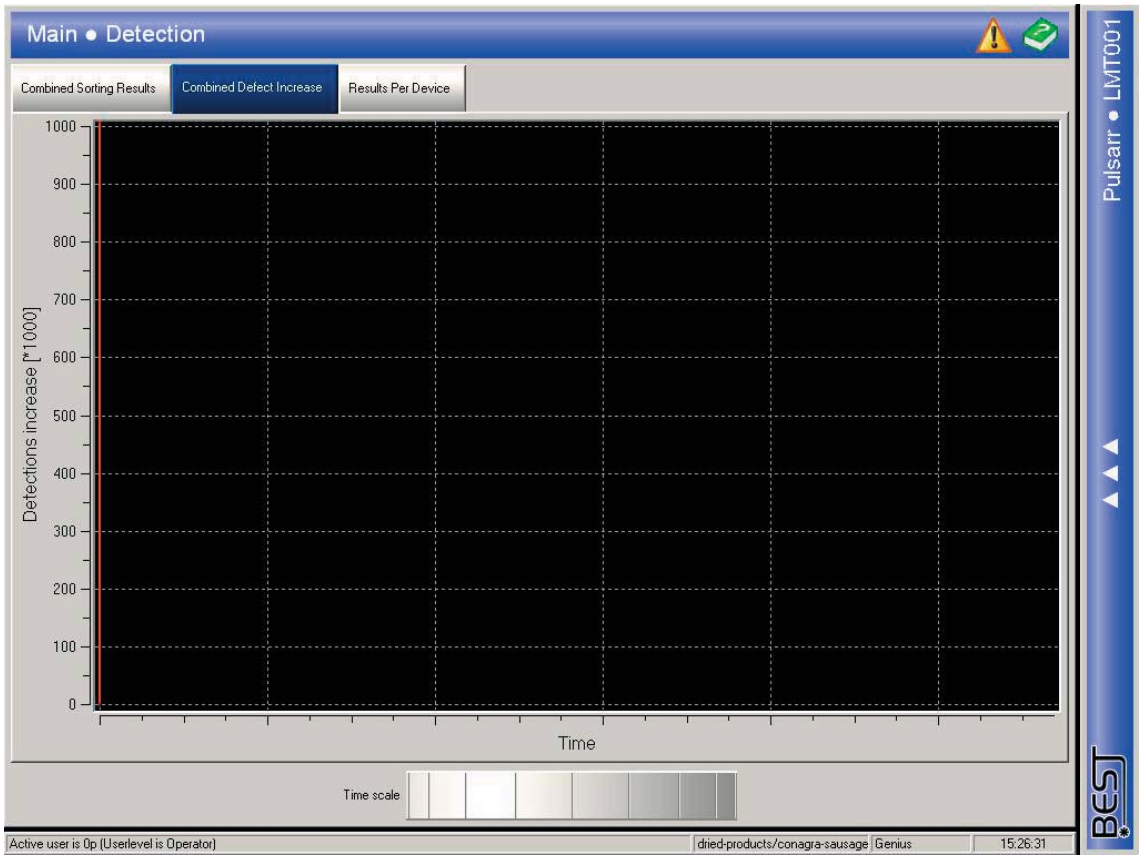
2.- Combined defect increase



This screen will show the overall evolution of the defect percentage (the percentage of product that is ejected) over a set period of time.

The time scale can be adjusted using the dial near the bottom of the screen.

This graph should make it possible to see whether the defect level (number of defects) in your incoming product has gone up or down.

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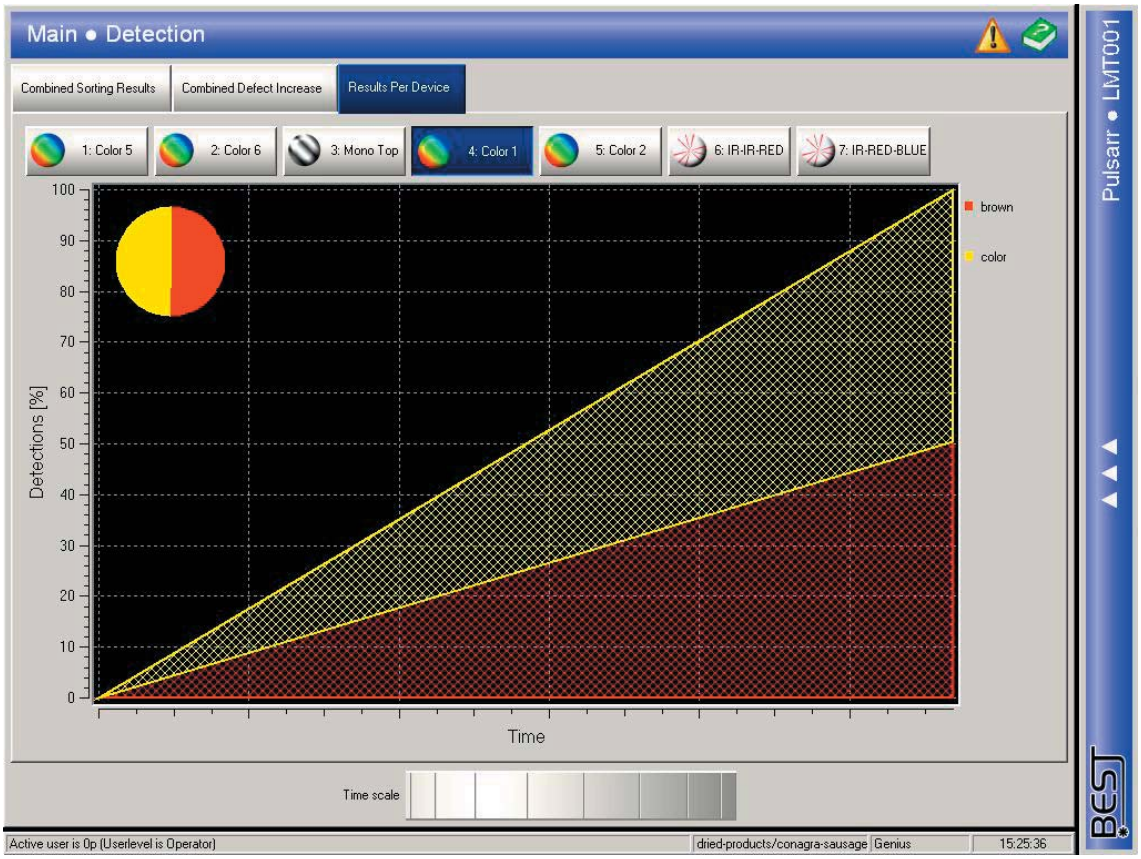
3. Results per device



In this screen the results per device are split up per signal threshold belonging to this device:
- The pie chart in the left corner shows how much product is rejected and by which threshold.
- The graph on the main screen shows how much is rejected by each threshold over a certain period of time. The time period that is displayed can be adjusted with the dial near the bottom of the screen.

This menu may be useful when checking which threshold rejects the most product and may have to be lowered to lower he reject percentage

Via the **navigation bar** the user can go to the following submenu's:
- Settings menu: This submenu contains all settings and functions concerning the thresholds and filters of the different devices.
- Frame grab menu: This submenu contains all settings and functions concerning the Frame grabs.
- Scope menu: This submenu is used to check the oscilloscope images of the different camera/laser signals.
- Normalization menu: In this submenu a normalization/reference line can be taken for all devices.
- LED Lighting menu: (only in expert menu) In this submenu the colour of the LED-lighting (if present) can be adjusted.

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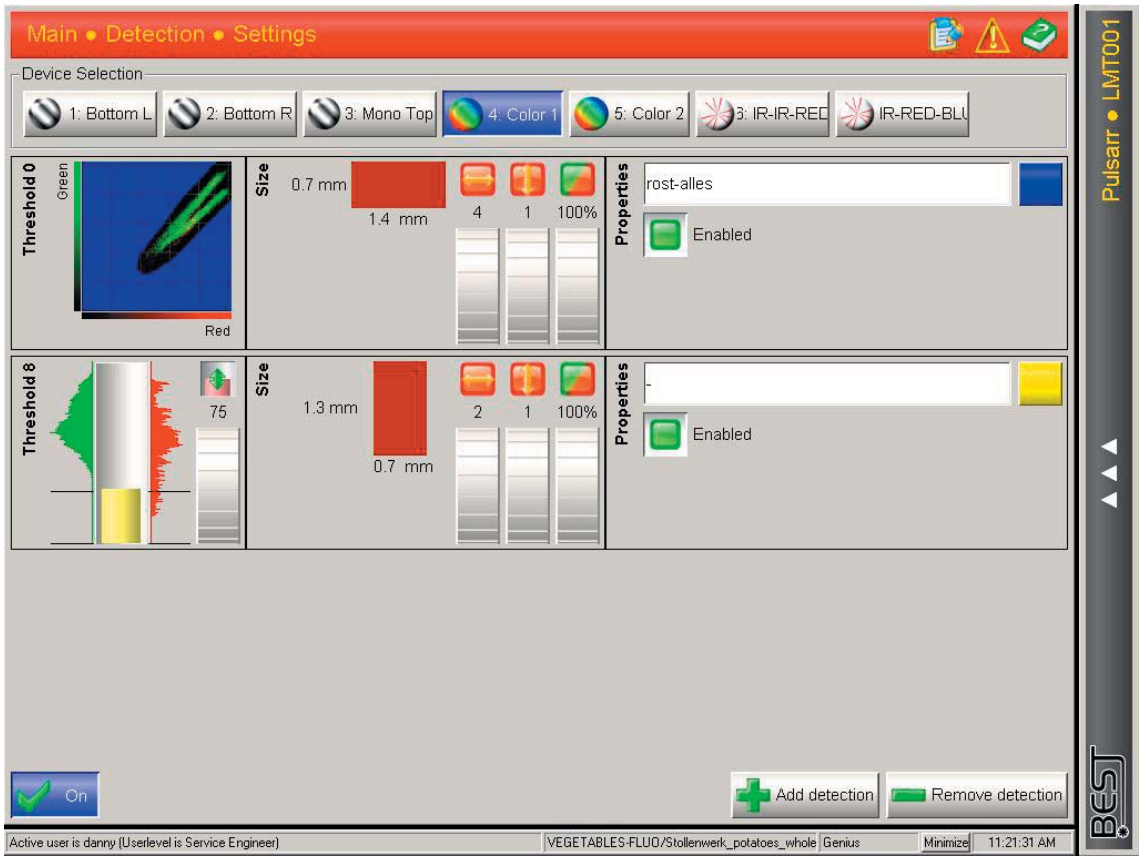
9.4.1. Settings Menu

This submenu contains all settings and functions concerning the thresholds and filters of the different devices (camera/laser).

Attention! ***- All changes made in this menu will have immediate effects on the sorting process if the device and the threshold are activated.***



Features:

- Device buttons near the top of the screen: To select a particular device, press the appropriate button. There are 3 different types of devices, Monochrome camera's, Colour cameras and Lasers.
The different thresholds that have been created for this particular device will immediately appear on the main screen.

- Different Detection Filters on the main screen (see picture):
There are 2 basic filter types: 1D (mono) and 2D (combined), and an additional Template Matching option for both filter types.
For more theoretical information on the different Detection Thresholds, see chapter 3: Theory.
For a procedure on how to set the different thresholds, see chapter 5: Operational Procedures.

- Add Detection button near the bottom right corner of the screen: With this button new detection filters can be added for the selected device. A number of menu's will appear giving a choice in the type of detection filter (1D or 2D), the signal to be used and the option (size filter or template matching).

- Delete Detection button near the bottom right corner of the screen: With this button detection filters of the selected device can be deleted. Just press the button and make your choice.

- Off button near the bottom left corner of the screen: With this button the selected device will be switched ON or OFF (the button will display the current state).

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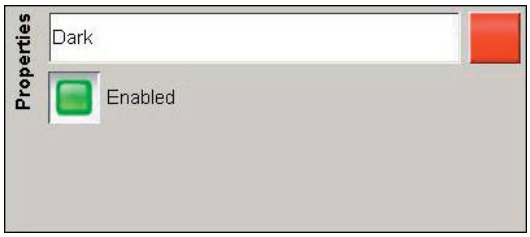
The Different Detection Filters

All filters have 2 basic parts that are quite alike: The *Filter properties* and the *Additional filters*

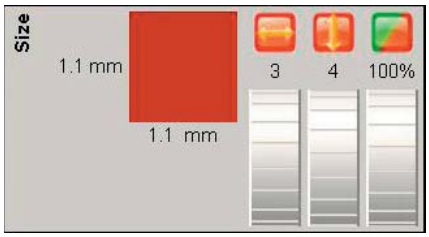
- The *Filter properties*: Name of the threshold filter
  Colour of the threshold filter
  Enabled/not Enabled

To change any of these properties, just press the appropriate field or button. With the name and colour a specific pop-up screen will appear to enable you to change them. The new name will appear in the appropriate field after you have entered and confirmed it. The colour of the button and the colour on the filter display will change immediately. If it is marked with a green square before it, the threshold is enabled, otherwise it is disabled.



- The *Additional filters*: Defect dimension visualization (only functions when belt is activated)
  Defect Width (in pixel)
  Defect Length (in pixel)
  Defect Density (in %)

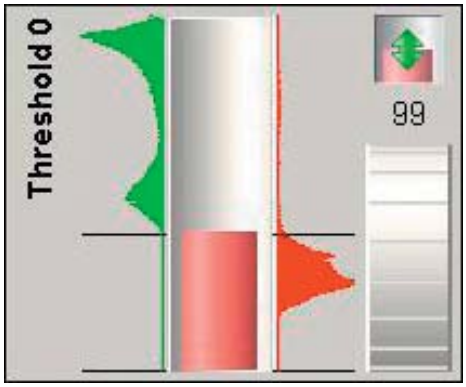
All these filters can be changed using the appropriate dial (turn the dial upwards to increase and downwards to decrease). The values above the dials will change immediately. The Defect dimension visualization and accompanying values in mm will only change when the belt is activated.

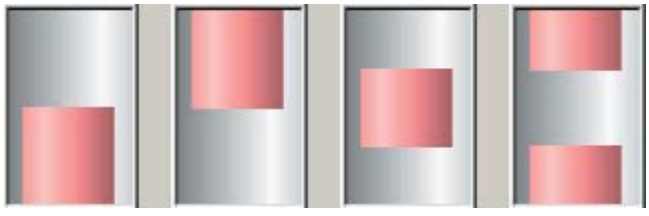


The only part that may differ substantially in appearance is the *Filter display*, for this changes considerably depending on whether we are dealing with a 1D (mono) or a 2D (combined) threshold filter.

1D (mono) Filter display

A Mono (1D) threshold detection filter will usually look somewhat like the first picture underneath, but other shapes are also possible (see second picture). To change the actual filter value, just turn the dial upwards or downwards. The value above the dial and the image will immediately change accordingly.





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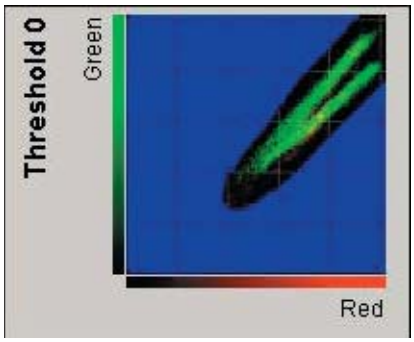
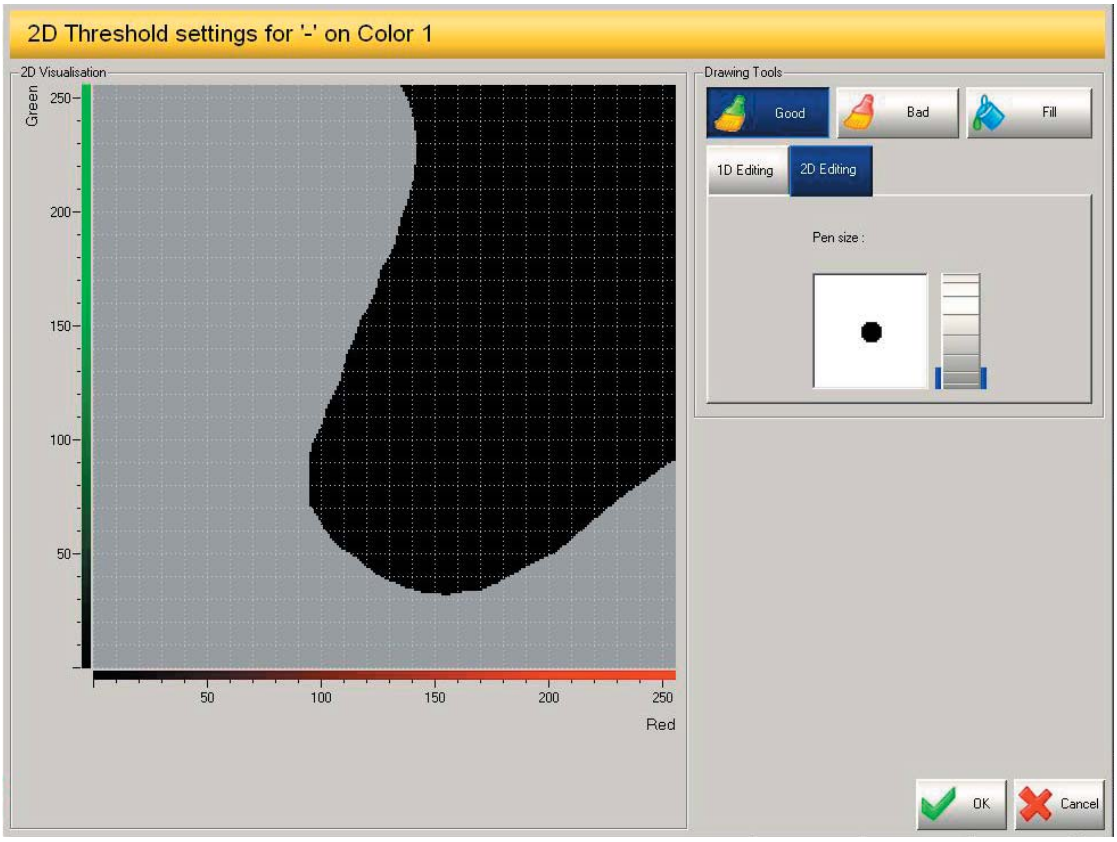
2D (combined) filter display



The 2D filter display will usually look somewhat like the picture to the left. In ideal circumstances it will be showing a black zone encompassing the green good product, and a coloured zone encompassing the red bad product.
To change this filter you just have to press the image. A pop-up screen: the 2D (combined) Filter menu (see picture below) will appear, enabling you to adjust this threshold to your satisfaction.

2D (combined) Filter Menu:



Features:

“Good” button: - Press this button to indicate the good product zone on the screen (black).
“Bad” button: - Press this button to indicate the bad product zone on the screen (coloured).
One of these 2 buttons (indicated in blue) is always activated.
“Fill” button: - Press this button to indicate the entire screen as Good or Bad (active button).

1D Editing: - In this editing mode only 1 threshold will be edited, so all adjustments will consist of vertical or horizontal lines over the full length or width of the screen (depending on the threshold that is selected).
- The accompanying little menu features 2 different thresholds that can be activated (active threshold is preceded by green button).

2 D Editing: - In this editing mode, the combined threshold is edited in 2 dimensions. This way a detailed figure can be produced to delineate good form bad product.
- The accompanying little menu features a dial that indicates the thickness of the drawing point (i.e. the thickness of the point your finger will create on the screen).

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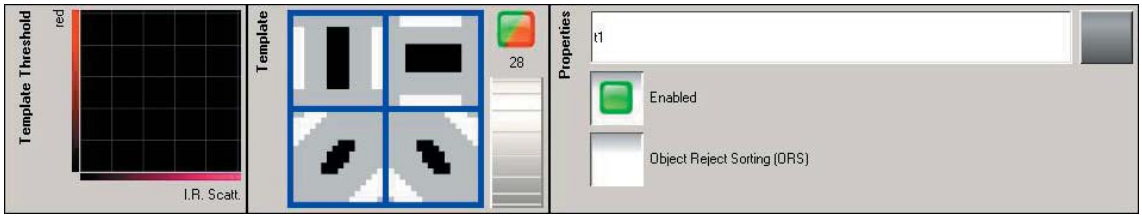
Press the “OK” button to accept the changes to the 2D threshold graphic, you will immediately go back to the Detection Settings menu. If the Threshold and device are activated, the new settings will be applied immediately.
Press the “Cancel” button to cancel all changes and go back to the Detection Settings menu.

Template Matching Option
(Only for very experienced operators trained by BESTnv).

This option is available with a 1D (mono) filter or with a 2D (combined) filter, and is based on a normal 1D or 2D filter, but with a specific form filter overlaying it (for more theoretical info, see chapter 3: Theory).

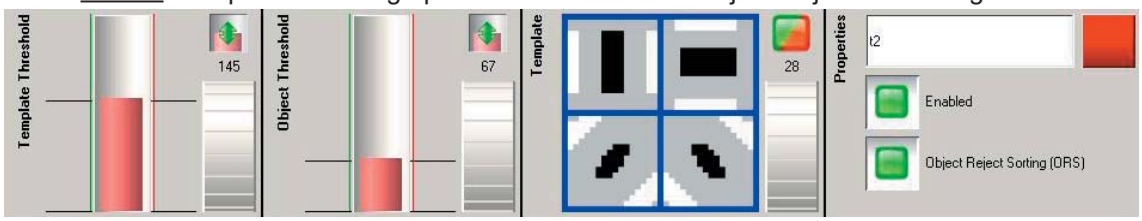
Picture: Template matching option with 2D filter.



Attention: ***- If the template matching option is chosen, only one filter can be used per device.***
- This also means that the template matching option is not available if one or more filters are already set for this device. To use template matching, first remove all other filters.

An additional filter is available: the Object Reject Percentage Filter (see picture below).
With this extra filter it is theoretically possible to reduce the amount of good product in the final reject.
This filter is rarely used and should only be set by a **BESTnv** engineer.

Picture: Template matching option with 1D filter and Object Reject Percentage filter.



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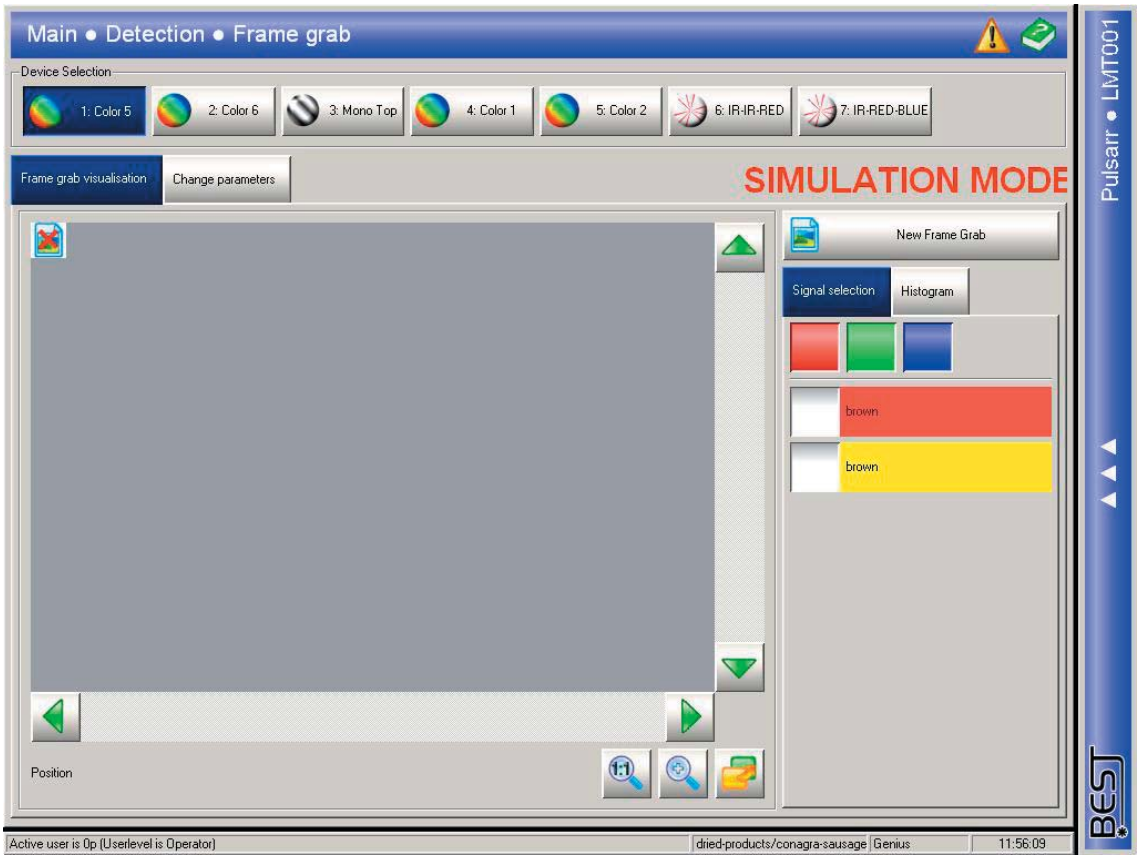
9.4.2. Frame Grab Menu

This submenu contains all settings and functions concerning the taking of Frame Grabs and the adjustment of existing thresholds and filters for the different devices (camera/laser) in function of the Frame Grab results.

For more info on the exact procedure to follow when using this menu to take a Frame Grab and adjust the thresholds, please check chapter 5 : Routine operation procedures.

Attention! ***- Simulation Mode = Any changes made in this menu will have no immediate effects on the sorting process, even if the device and the threshold are activated.***
- To use any changes made in this menu, press the "Use Parameters" button under the Change Parameters submenu.



Features:

- Device buttons near the top of the screen: To select a particular device, press the appropriate button. There are 3 different types of devices, Monochrome camera's, Colour cameras and Lasers.

- 2 Basic Submenus that can be accessed via Tabs underneath the device buttons:
  Frame Grab Visualisation: This submenu contains all functions and options having to do with the actual taking and using of Frame Grab images.
  Change Parameters: This submenu contains all functions and options to adjust existing Thresholds and Filters in function of the Frame Grabs taken.

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Frame Grab Visualisation Submenu

Features:

Main screen: This screen will feature the Frame Grab image.

New Frame Grab button: Press this button to take a new Frame Grab.
(For more info, please check chapter 5: Routine Operation Procedures)

Signal Selection tab: If this Tab is activated, the user can check the effect of the different thresholds on the Frame Grab image.

Histogram tab: If this Tab is activated, the user can indicate the good product and the defects on the Frame Grab image.

A number of function buttons underneath the Frame Grab image:


- Save Frame Grab image: Press this button to save the Frame Grab image presently on the screen, a pop-up screen will appear allowing you to choose a slot where you want to save the image.


- Load Frame Grab image: Press this button to load a Frame Grab image, a pop-up screen will appear allowing you to choose the image(slot) you want to load.

- Show entire Frame Grab Image: When this button is pressed, the complete Frame Grab image will be shown on the screen.


- Zoom in Frame Grab image: Press this button to zoom in on a specific detail of the Frame Grab image. Use the sliding bars next to and underneath the image to navigate in the image.


- Mask Frame Grab image: When this button is pressed, a grey mask will be put over the Frame Grab image. This makes it easier to see which objects are detected by the different threshold filters, because this makes the different filter colours more obvious.

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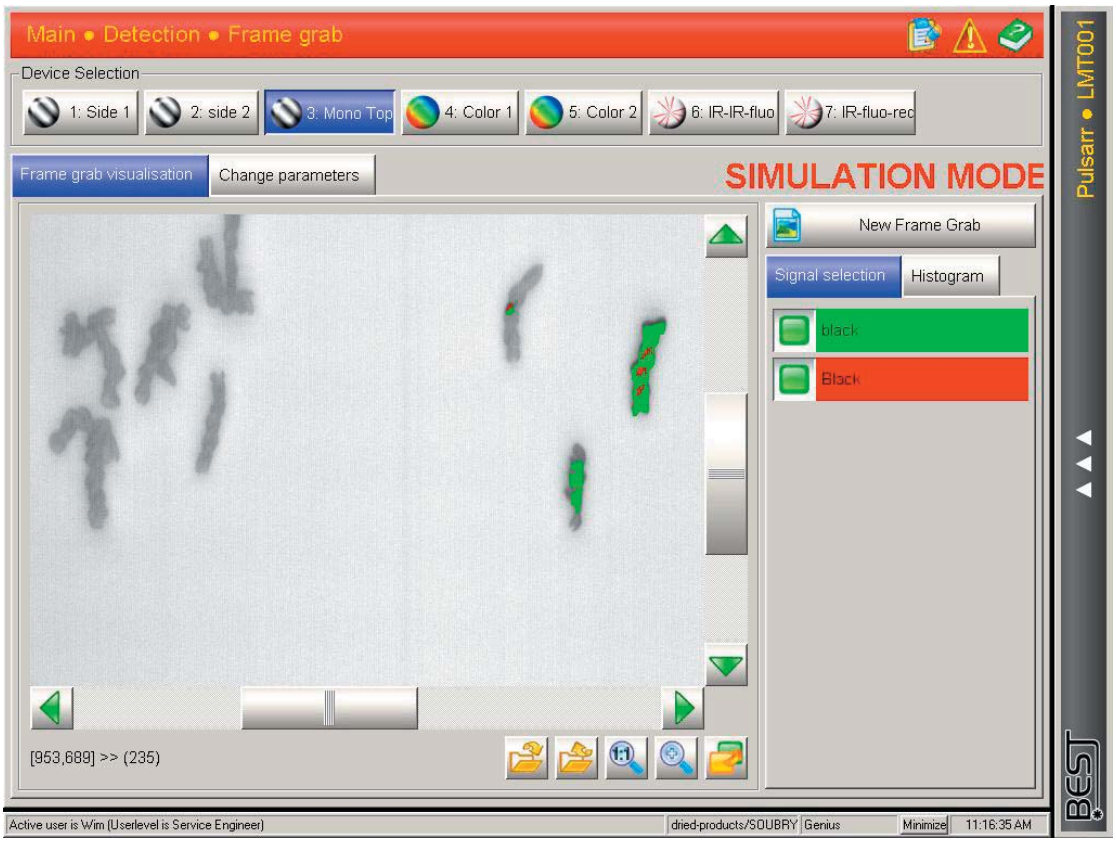
Signal Selection mode

In this mode the effect of the different filters on the sorting process can be checked.

The main screen will feature the Frame Grab image, with different colour spots that indicate which objects are detected by which threshold filter (every colour indicates a different filter).

The panel to the right of the main screen will feature the different signals that can be selected (not with mono camera, see picture) and the different filters with their specific colour. All filters can be activated or deactivated to clearly see the specific objects detected by one particular filter.



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Histogram mode

In this mode the user can indicate which objects are to be considered defects and which objects are good product.

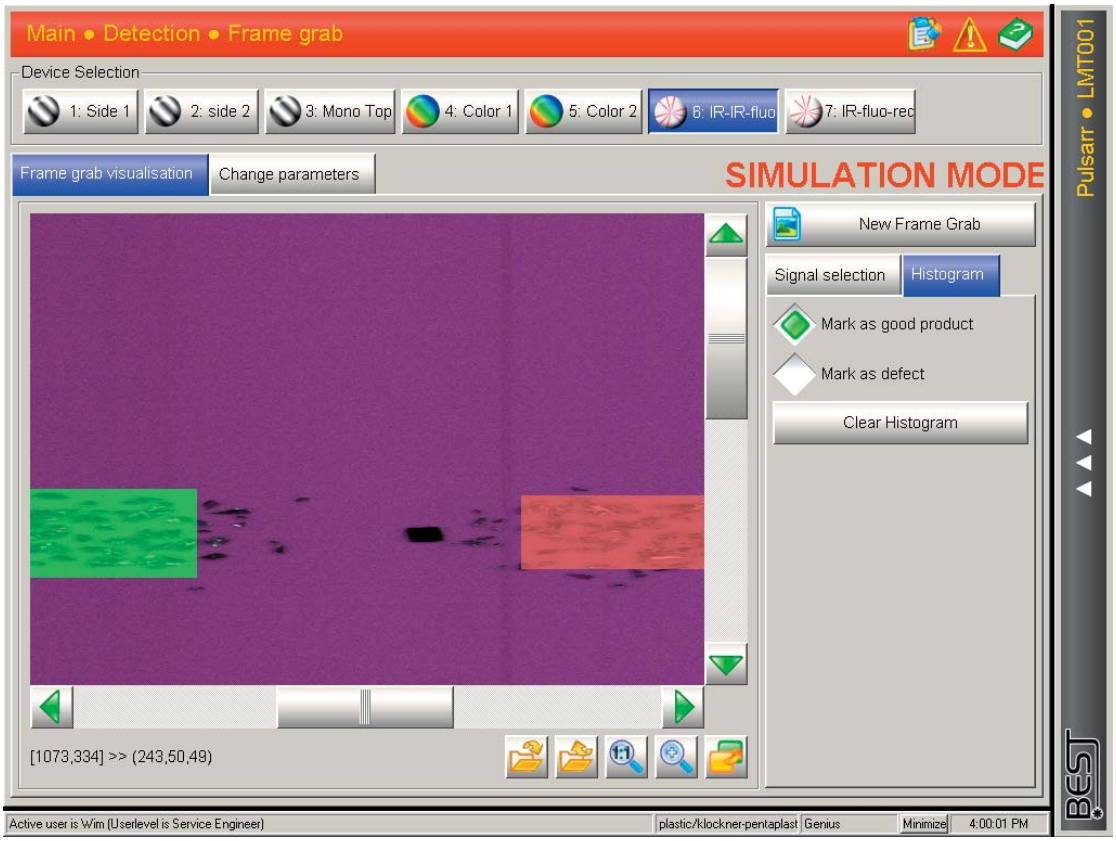
The main screen features the frame grab image, possibly with green and red rectangles that indicate good and bad objects indicated by the user.

The panel to the right of the main screen will feature 3 functions that can be activated:

- Mark as Good product: Activate this function to indicate a number of different objects that fall within the good product range. Draw a green rectangle over or in the good objects.
- Mark as defect: Activate this function to indicate the different types of defect objects that can be found in the frame grab image. Try to draw a rectangle in or over the different defect objects.

Attention! ***- Please make sure no good products are included in the red defect rectangles, and no defects are included in the green good product rectangles.***

- Clear Histogram: If something has gone wrong while indicating good and bad product rectangles on the frame grab image, just press this button and start over.



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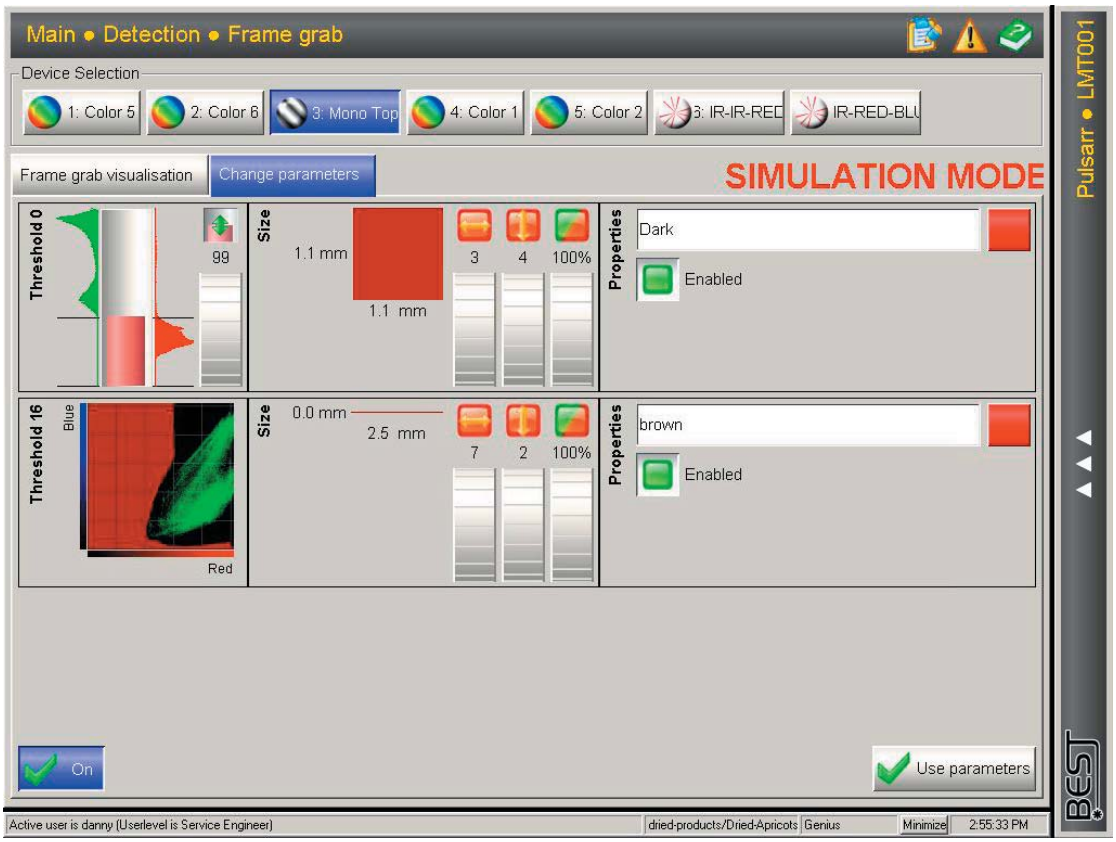
Change Parameters Submenu

This submenu corresponds almost exactly to the Settings Menu (see 9.4.1).
The only differences are:

- 2 Tabs underneath the device buttons: Frame Grab Visualisation and Change Parameters, used to go from one submenu to the other.
- The red text “Simulation Mode”, to indicate that nothing that is done in this menu will affect the sorting process unless the Use Parameters button is pressed.
- No Threshold filters can be added or deleted in this menu.

All other functions and options are exactly as those described in 9.4.1. Settings Menu.



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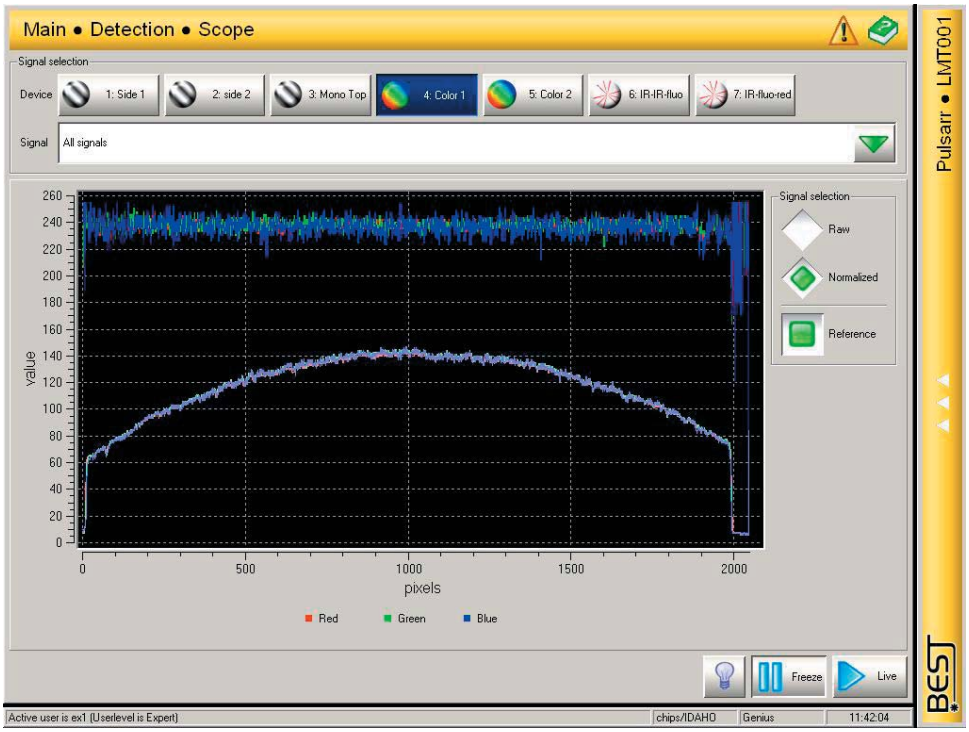
9.4.3. Scope Menu

In this menu the device (camera/laser) signals can be analysed using the different scope options.

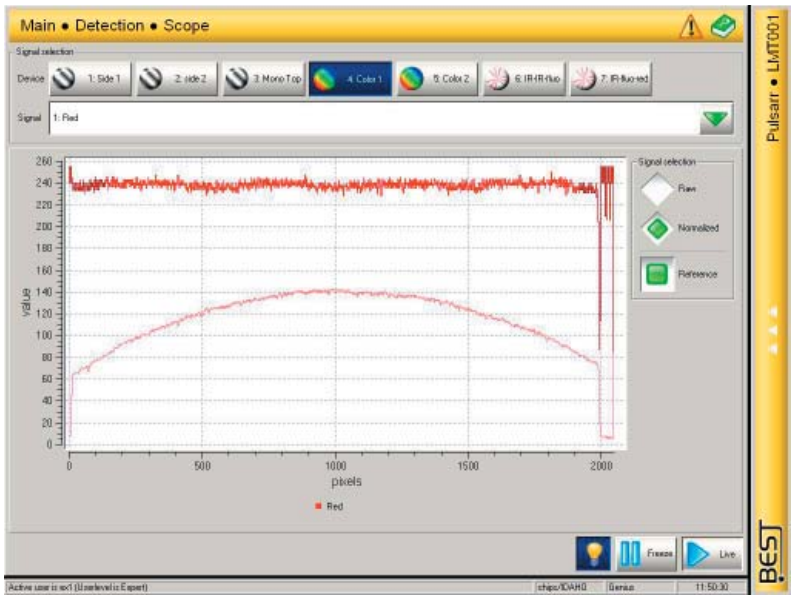
For every device the different signals can be shown (separately or all together, see pictures), raw or normalized and with or without the corresponding Reference signal.

Remark: ***- In ideal circumstances, with a clean empty belt, the raw signals should almost perfectly overlap the corresponding Reference signals.***

The signal can be studied Live, as it changes second by second, or in one frozen instant by pressing the Freeze button.



By pressing the light bulb underneath the screen the user can change the backlighting of the signal to get a better contrast if necessary.



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9.4.4. Normalization Menu

Operator level

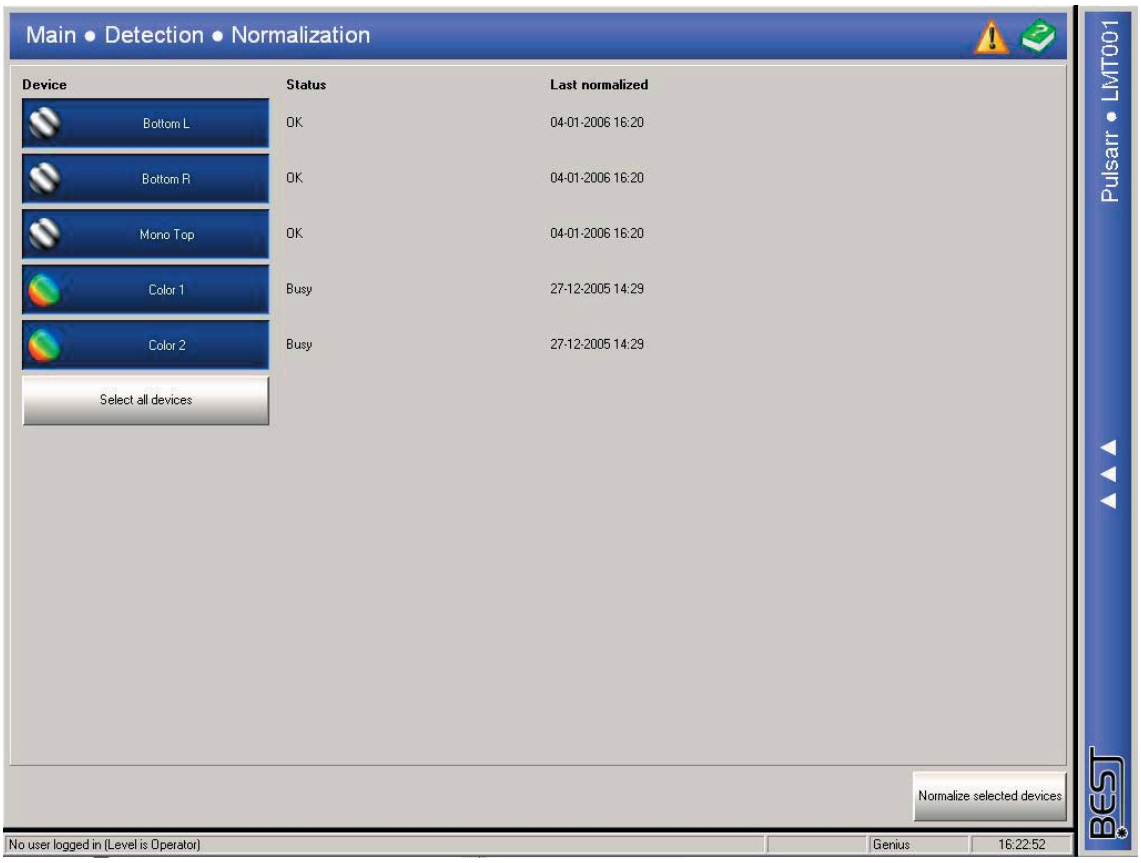
This is a simplified Normalisation Menu for operators.

It contains only a few features:
- 1 button for every device: With these buttons the devices to be normalised can be selected.
- 1 Select All devices button: press this button to select all devices.
- 1 Normalize Selected Devices button: press to start the normalisation of the selected devices.

During normalisation the status of each device will go from busy to OK while the Pollux platform takes a number of camera signals and calculates the average to use as reference line.

Remember: ***- If for any reason a normalisation does not succeed, it is imperative that the normalisation is repeated until it is successful and OK appears after the device.***

The date of the last successful normalisation performed for each device can be found under Last normalized.



Attention! ***- It is advisable to take an new normalisation at least once a day, and preferably once a shift.***

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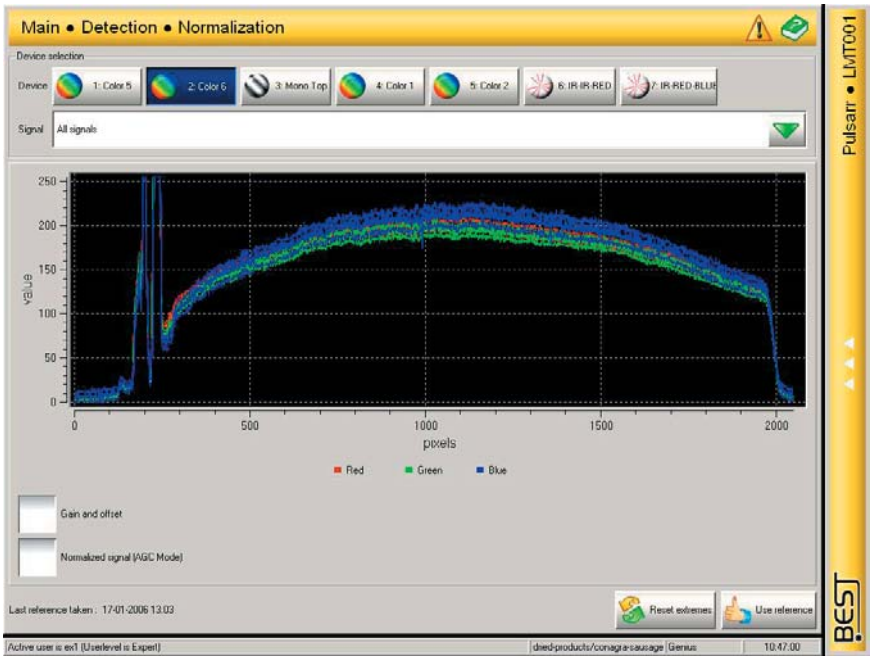
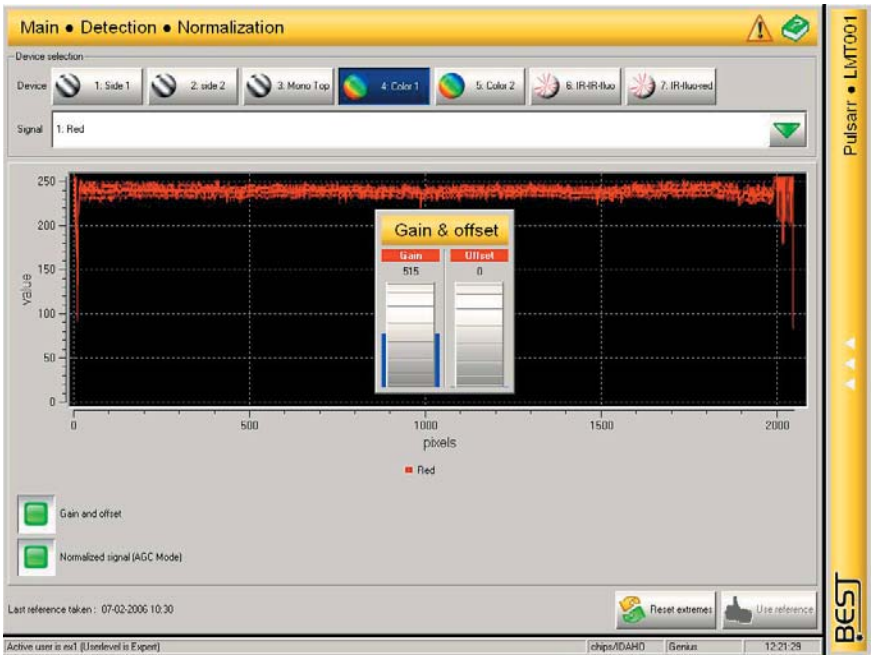
Expert Level

In this level the expert user can analyse and compare basic and normalised signals and adjust Gain and Offset if necessary.

The Menu features:

- Device buttons: to indicate which device the user wants to check.
- Signal selection (not for mono cameras): here the user can select one or all signals to be displayed.
- A central screen displaying the selected signals. Underneath the screen the colour and names of the displayed signals are shown.
- Gain and Offset option: when activated a small pop-up screen will appear, allowing the user to set/ change the gain offset values for the displayed signal(s).
- Normalised signal (AGC mode) option: when activated the normalised signal(s) will appear on the screen, instead of the normal raw signal image(s).
- Reset Extremes button: when this button is pressed the signal peaks are flattened a bit.
- Use Reference button: press this button to use the final signal(s) as reference line(s) for this device.





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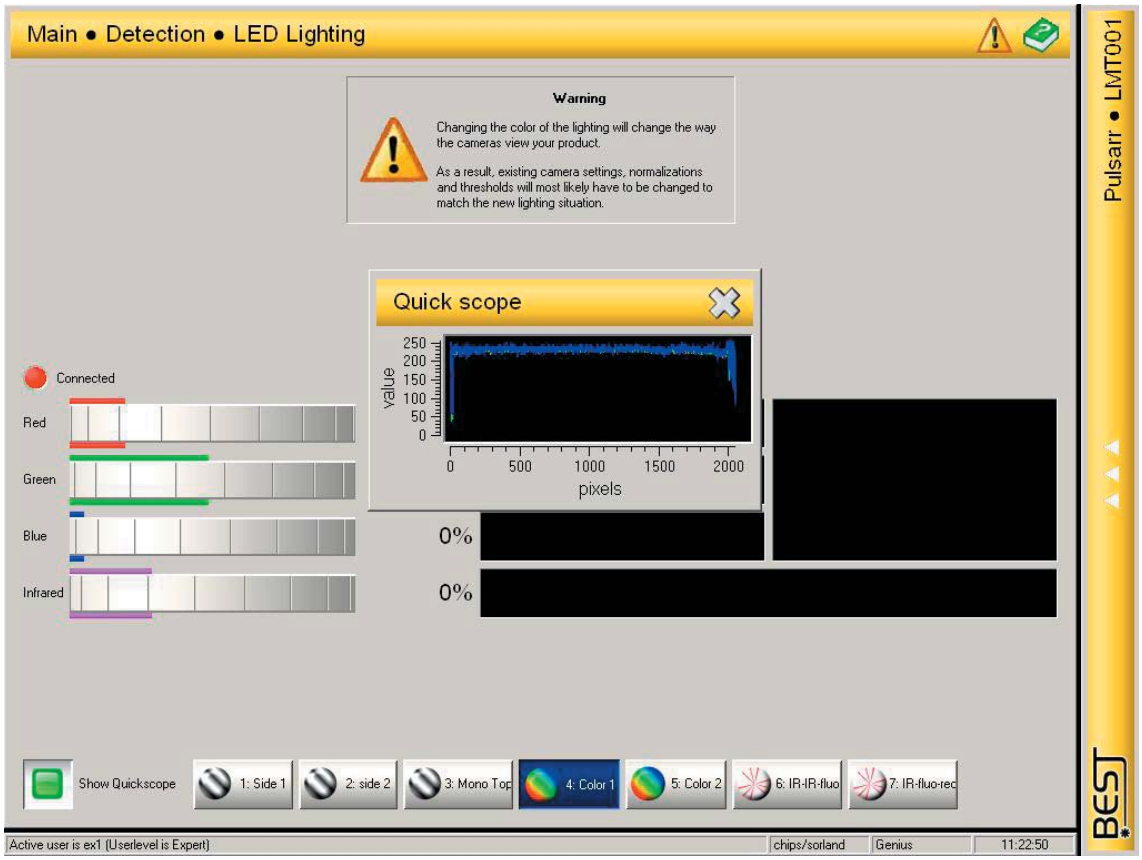
9.4.5. LED Lighting Menu

This menu contains all options and functions to set the LED lighting (only active if LED lighting option is present and connected).

In general it is rarely necessary to change the LED settings once they have been set during installation by the **BESTnv** engineer.

Attention: ***- Changing the colour of the lighting will change the way the cameras view your product. As a result, existing camera settings, normalizations and thresholds will most likely have to be changed, to match the new lighting situation.***

Features:
- *Connected* indicator (Red/Green): This light indicates whether the LED lighting module is installed/ connected. Red = Not Connected; Green = Connected.
- *Colour dials*: With these dials the user can change the colour of the LED light by changing the percentages of the composing colours.
- *Colour displays*: In these small screens the percentage of every specific colour will be displayed, and the total effect on the final colour (larger screen).
- *Show Quickscope* function (on/off): After activating this function a small pop-up screen will appear showing the oscilloscope signal of the selected device. This enables the user to see the effect of the LED colour changes on the oscilloscope signals of the different devices, and as a consequence the effect on the sorting process.
- *Device buttons*: Press this button to select the device for which you want to see the scope signal.



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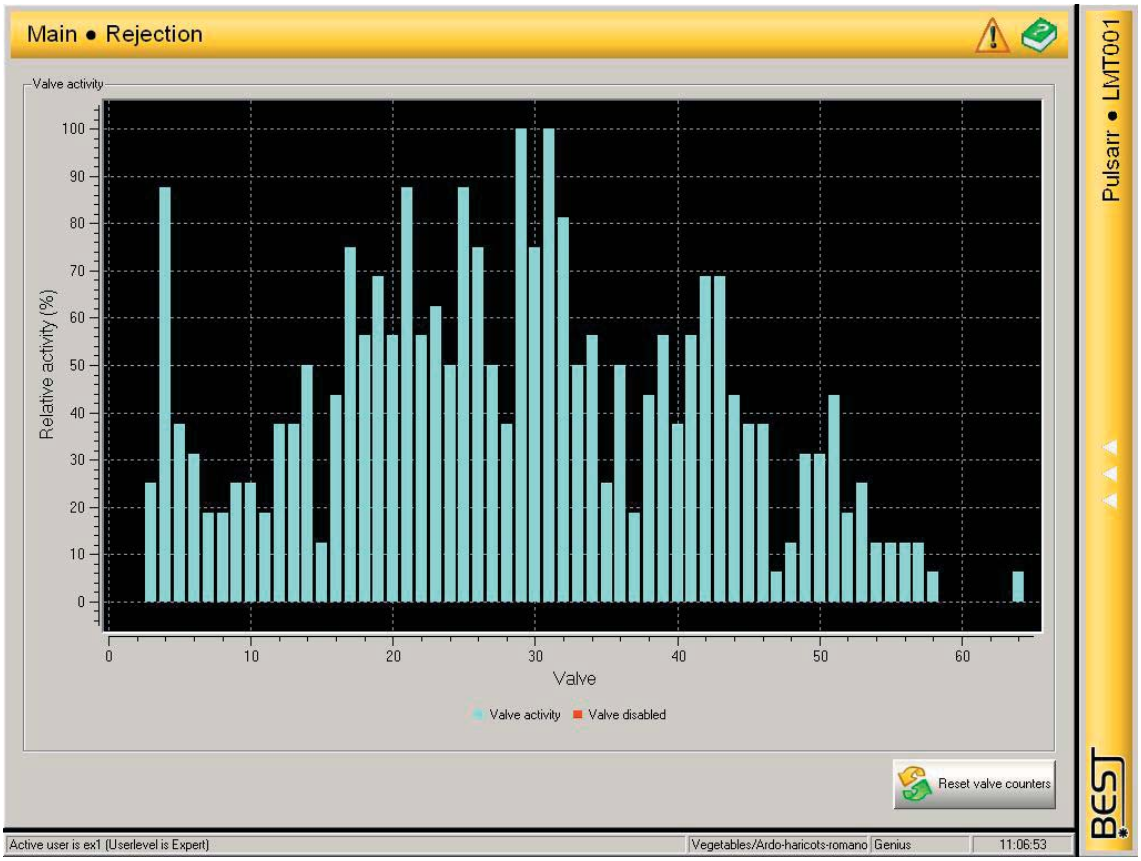
9.5. Rejection Menu

This menu and its submenus contain all options and functions having to do with the actual rejection of detected defects.

The Rejection menu itself displays a graph that shows the relative activity of all the valves.
In optimum sorting circumstances this graph should show that all valves are +/- equally active (all columns should be +/- equally high). If one valve or a particular group of valves are clearly more or less active, or one side of the screen shows clearly more activity than the other, something is wrong.



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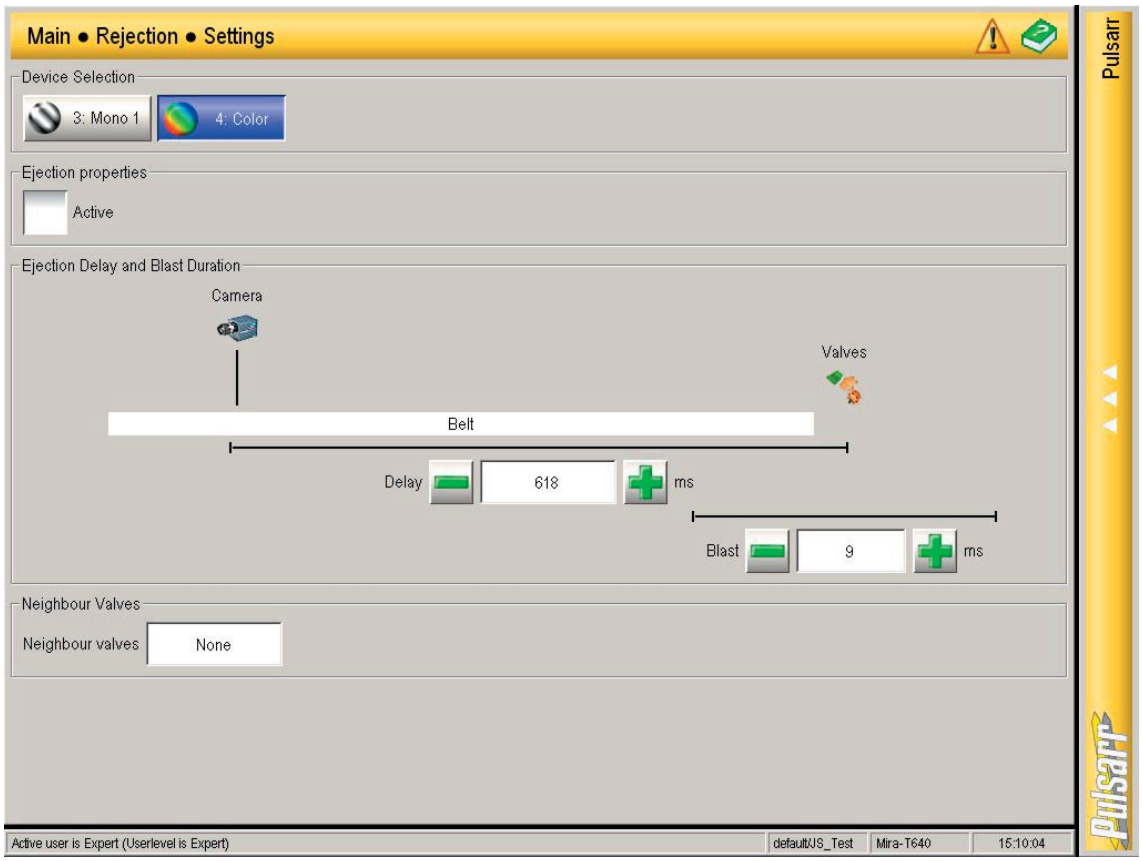
9.5.1. Settings Menu

This submenu contains those settings that have to do with the rejection of defects, but are specific for every single device: in other words, in this menu the Delay, the Blast Time and the Overlap can be set.

For more info on the exact procedure to set these settings, please check chapter 5: Routine operational procedures.

Features:
- Device buttons: With these buttons the user can indicate which device's settings he wants to change.
- Ejection properties option (on/of): ???
- Ejection Delay and Blast Duration:
  The *(Ejection) Delay* is the time the product needs to go from the scan zone of the Device (camera/laser) on the belt, to the actual ejection zone (see drawing).
  The *Blast (Duration/Time)* is the time the air gun valves of the ejection unit have to blow to make sure the defects are actually removed.
- Neighbour Valves setting: When pressing the value cell, a pop-up screen will appear allowing the user to set the *Overlap*. This is the amount of neighbouring valves that are to help when ejecting a defect.



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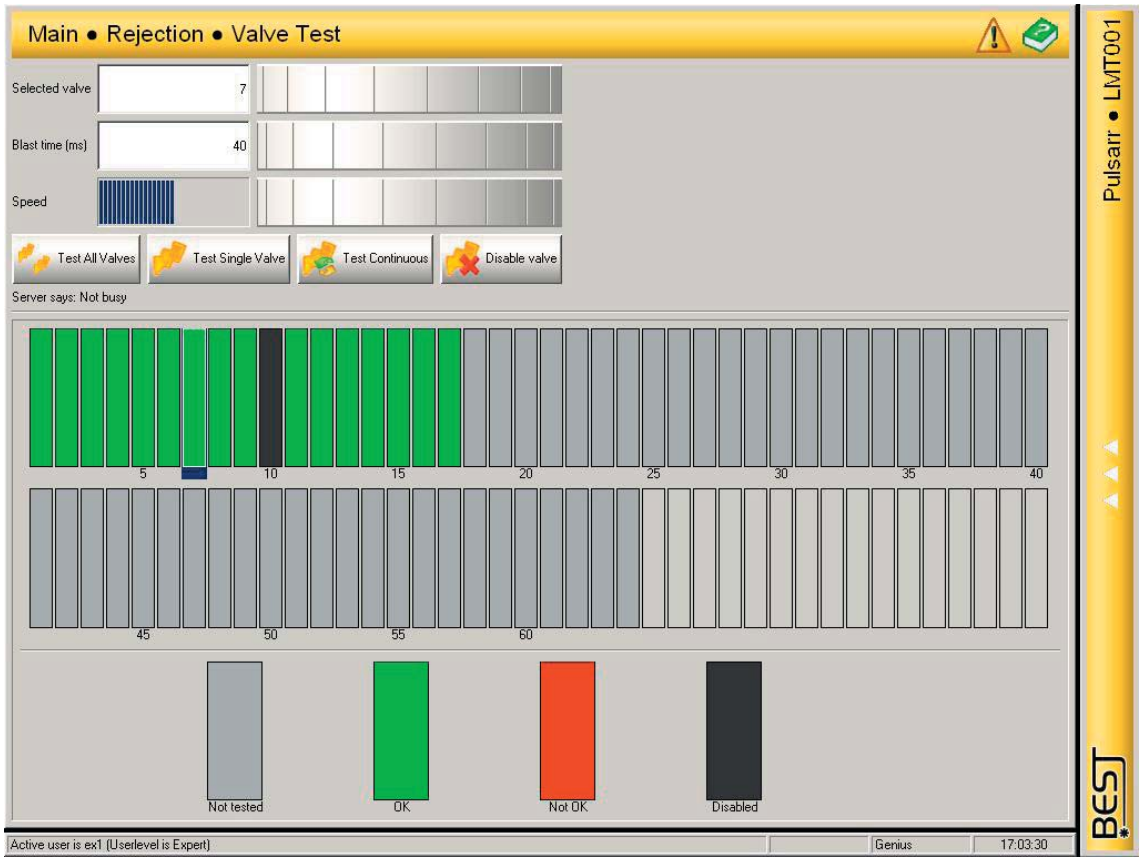
9.5.2. Valve Test Menu

This Menu contains all settings for testing the air gun valves.

Features:
- Selected Valve cell + dial: by turning the dial or pressing the value cell and entering a number, a specific valve can be selected. The selected valve in the valve table will appear to come slightly forward will have a small blue rectangle underneath it.
- Blast Time (ms) cell + dial: by turning the dial or pressing the value cell and entering a number, a specific Blast time can be selected. This is only the blast time/duration for the testing, and has nothing to do with the blast time used during sorting (see 9.5.1.).
- Speed dial: with this dial, the speed at which the different valves will be activated in succession can be changed. Slower => less blue lines, faster => more blue lines.
- Test buttons:
  - Test All valves: press this button to activate all air valves in succession for a short burst (see Blast time).
  - Test Single Valve: press this button to activate one valve for a short burst (see Blast time).
  - Test Continuous: press this button to activate one valve continuously.
  - Disable Valve: with this button the selected valve can be disabled.

Colour coding:
- Grey: not tested
- Green: OK
- Red: not OK
- Black: disabled



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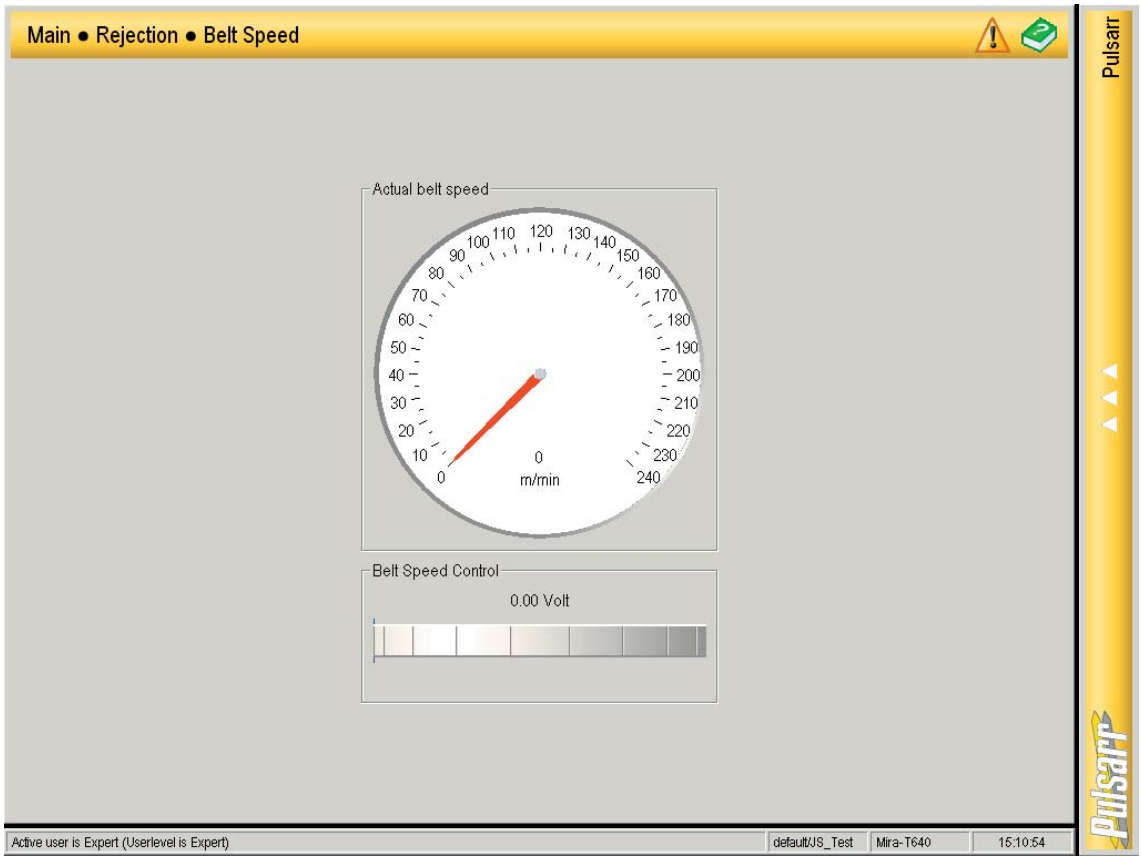
9.5.3. Belt Speed

This submenu contains a meter showing the actual Belt speed and a dial to increase or decrease that speed.

Remember: ***- Switch on the belt (press belt button on control panel) to see the actual belt speed.***

- Turn the speed knob to the bottom of the screen to the left (press finger on the right and move it to the left) to lower the speed, and to the right to increase the belt speed.



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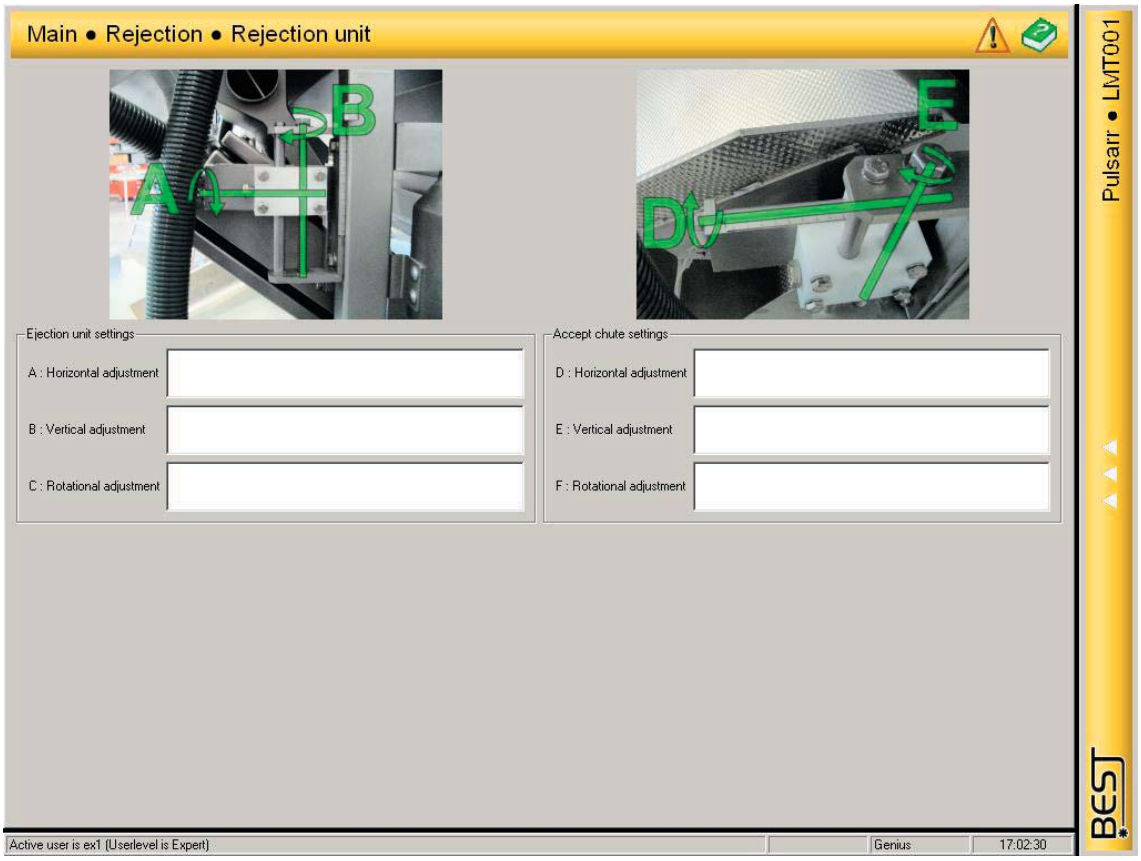
9.5.4. Reject unit

Any changes in this menu have no effects whatsoever on the sorter or the sorting process, this menu only serves to record the position of the accept chute and the Ejection unit.
These data can come in handy when someone has accidentally or without proper forethought changed either position (e.g. by standing on any of the two parts).

In general the positions of these two parts should only be changed by **BESTnv** engineers.



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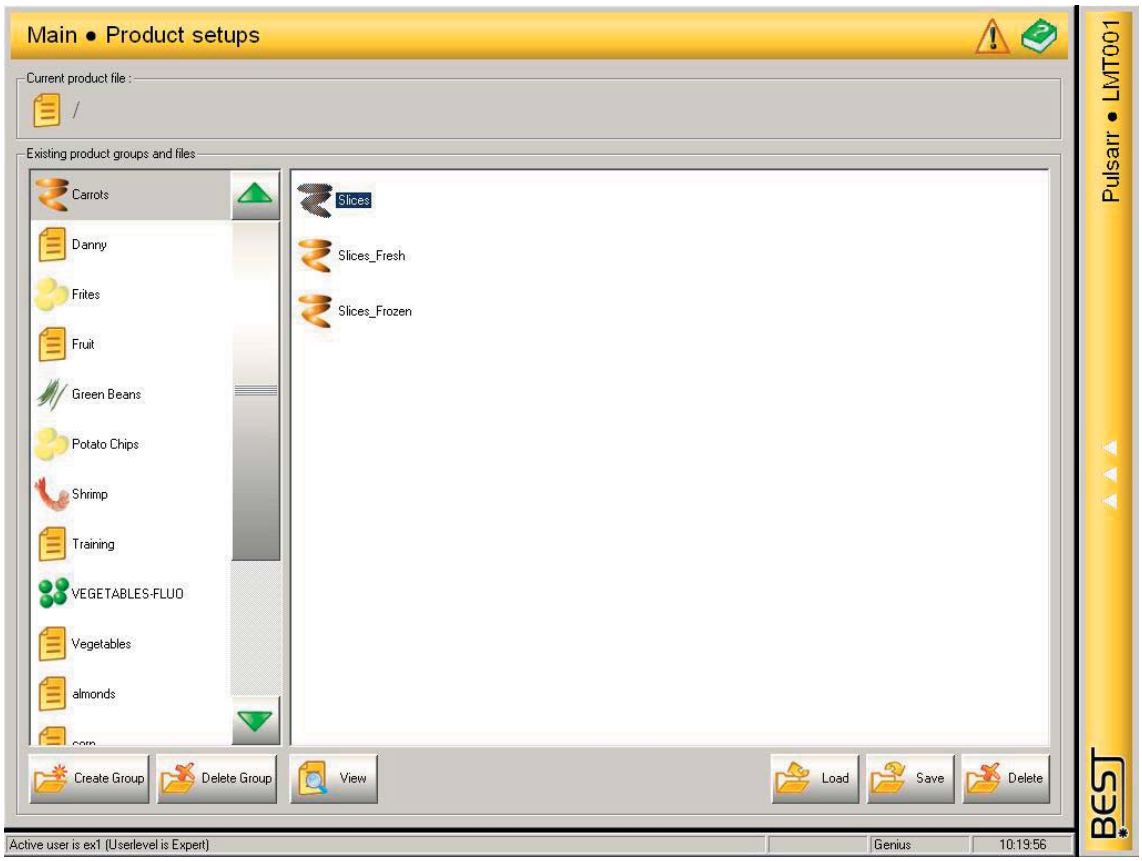
9.6. Product Setups Menu

In the Product Setups Menu all management of Product Files takes place.
The actual adjustment of filters, thresholds and other settings must be done in the Detection or the Rejection Menu.

Features:
(a number of buttons is only available in the expert level)
- Create Group button (Expert level): press this button to create a new product group.
- Delete Group button (Expert level): press this button to delete an entire product group.
- View button: press this button to check all data that has been saved under the selected product file.
- Load button: press this button to load the selected product file.
- Save button (Expert level): press this button to save the presently used product file (a pop-up screen will appear to allow the user to choose a product file name.
- Delete button (Expert level): press this button to delete the selected product file.

Remember: ***- The product file/group that is in use cannot be deleted.***
- Saving product settings under the same name as an existing product file will overwrite the old file.

Use the slide bar in the middle to navigate through the product files, and select the desired product file by pressing it. The name of the selected file will be highlighted in blue.



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9.7. Expert Settings

(Only available in Expert user level)

At present this only contains the user management menu.

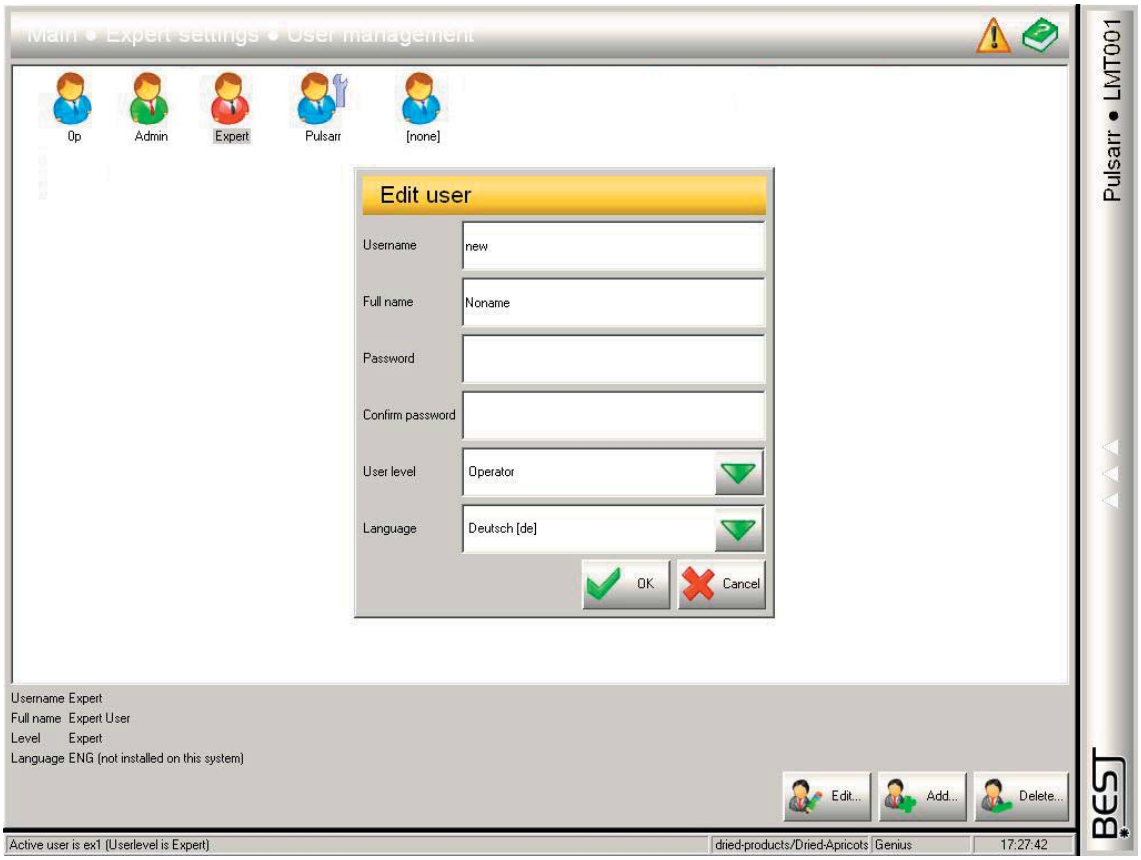
9.7.1. User Management Menu

This menu contains all features having to do with the management of the different users. Users can be added, deleted, or edited.

Features:

- Edit button: Select a user icon and press this button to edit an existing user. A pop-up screen will appear (see picture below) showing the present data of the user and enabling you to change that data.
- Add button: Press this button to add a new user. An empty pop-up screen will appear (see picture below) enabling you to fill in the appropriate data.
- Delete button: Select a user icon and press this button to remove an existing user. A pop-up screen will appear asking you to confirm your choice.

- In the left lower corner of the menu the data of the current user are displayed.



There are 3 basic user levels (see 9.2.2):

- Operator (blue)
- Administrator (green)
- Expert (yellow).

There is an additional Service level (black) which can be accessed by pressing the “Service” button to the lower edge of the screen. This level is only intended for **BESTnv** service engineers.

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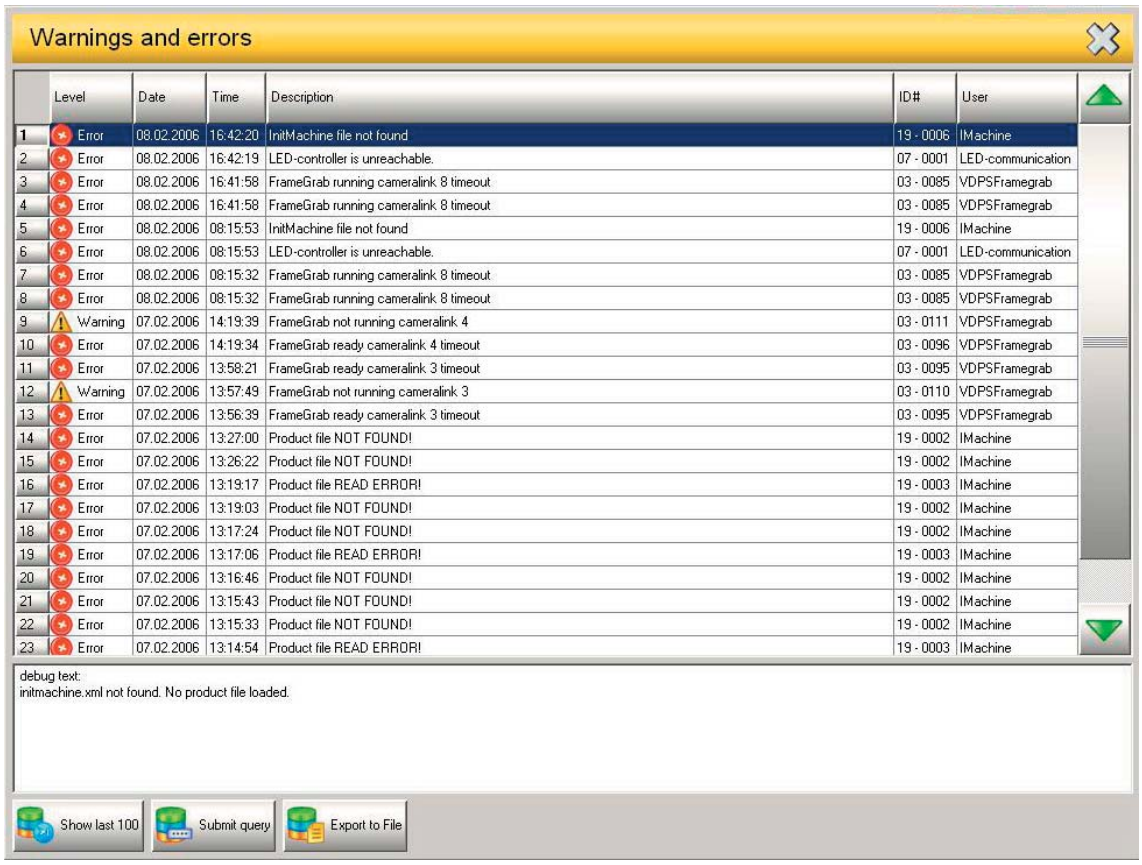
9.8. Warnings and Errors Menu

This menu contains all functions concerning the consultation and management of all error, warning and information messages encountered by the POLLUX software:

If a menu starts flashing red, there is a new error message displayed which may have direct influence on the functioning of the software and/or the sorting process. It is advisable to check this out immediately and take the appropriate measures to solve the problem or contact **BESTnv**.

To consult this menu, please press the Warning button in the top bar of every menu.
The following menu will appear showing the 25 last Warning and Error messages:



Features:

- *Messages table*:
For every message the following data will be displayed: type, date, time, a short description, an ID number and the User that was logged in at the time the message was created.
There are three basic message types:
- Error messages are preceded by a *red circle* with a white cross: these generally indicate problems that hinder the proper functioning of the software and/or the sorting process.
- Warning messages are preceded by an *yellow triangle* with an exclamation mark: indicate problems that may influence the sorting process.
- Information messages are preceded by a *green* circle: general info messages on the functioning of the sorter and the software.

- ***Text screen***: underneath the message table. Here some explanation may be given about the nature of the message selected in the table.
- ***Show Last 100*** button: Pressing this button will display the last 100 messages in the message table.

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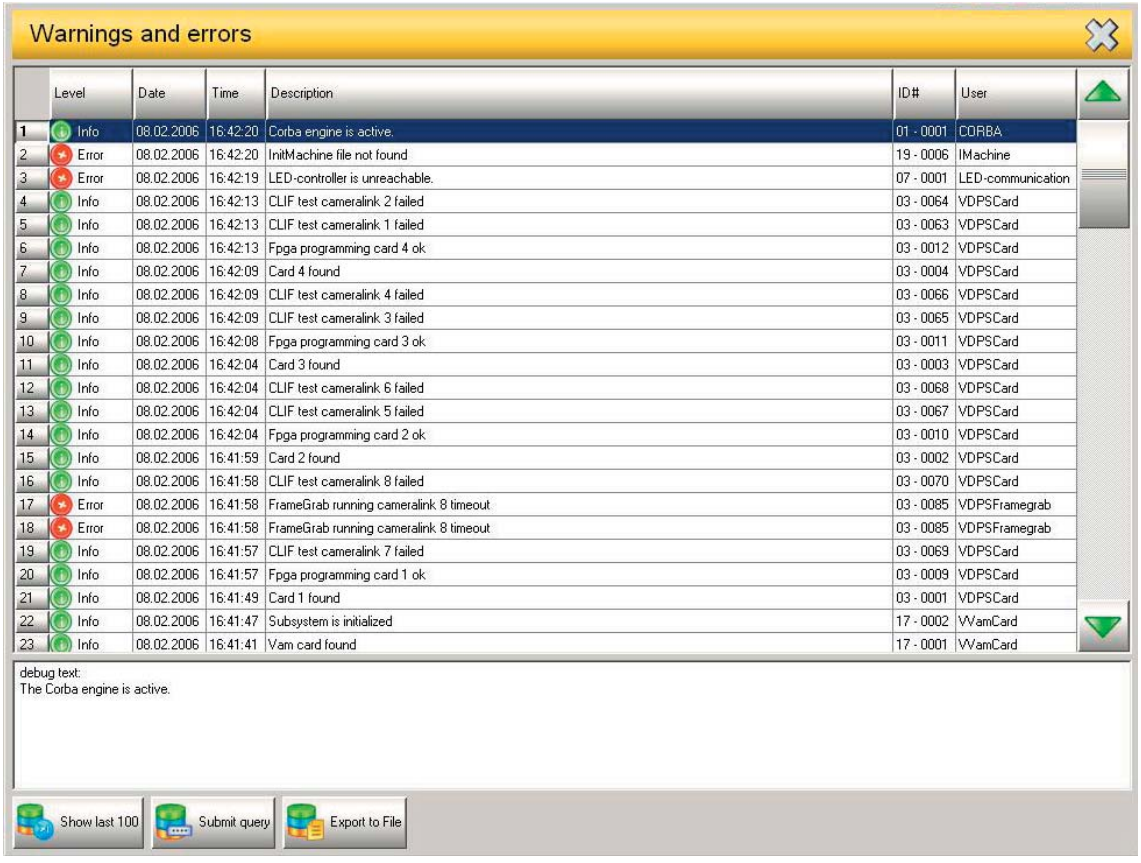
- ***Submit query*** button: When pressing this button a pop-up screen will appear enabling you to create a detailed query in order to check all messages of a certain type, for a specific user, date, time, etc... (see next picture).
- ***Export to file*** button: With this button the message table that is presently displayed can be saved in a log file.

Set and submit query menu

Features:
- ***User***: With this selection list you can select all messages that appeared when one specific user was logged in.
- ***Level***: Indicate which type of message(s) you want to see ("Changes" option is not yet available).
- ***Quick set***: A selection list with a number of quick set options for the period, e.g.: last 15 min., last hour, last day, last week, ...
- ***Start/End***: These settings allow you to define a specific period specifying the start and end of the period. To enter the year, month, day, hour and even minute of Start and End, just press the appropriate cell. A pop-up screen will appear allowing you to enter the appropriate value.

Press ***OK*** to confirm. A new Message table will appear, listing all the messages conforming to your query (see picture below).
Press ***Cancel*** to annul your query request.



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X. The Laser Box

10.1. Introduction

Only the **GENIUS Compact**-L and the **GENIUS Compact**-D configurations are equipped with a **Laser Box** system. In these configurations Lasers are used as light sources instead of high frequency light tubes, and special sensitive light receivers are used instead of - or in addition to - cameras to capture the light and generate a signal for the electronics to use in separating good and bad product.

The laser box system is always located in the third detection zone of the **GENIUS Compact** sorting system (see chapter 3: theory).

The major advantage of laser over camera technology is that it can see differences in structure as well as differences in colour. This is especially interesting when trying to remove defects that have almost/exactly the same colour as the good product.

10.2. Theory

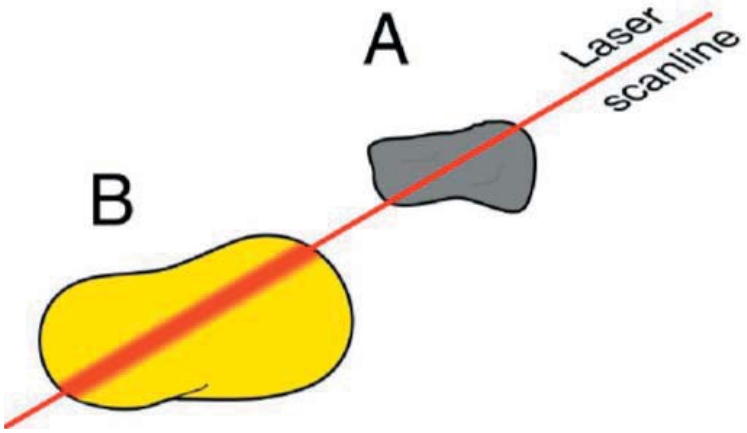
10.2.1. Laser Light Illumination

Laser light is quite different from normal white light that is used for camera sorting:

- Laser light is emitted in a very tight and focused beam, which means that it stays constant even at a longer distance from the light source, making it possible to place the light source further away from the detection zone.
- Laser light is also emitted in a very small spectrum (specific frequency/colour), unlike white light, which consists of a very wide spectrum containing all visible colours. This means that different lasers (specific colours) will be used depending on the product that is to be sorted.

Thanks to these special properties of laser light, two different techniques can be used to “see” the difference between defects and good product:

- Direct reflection: all products reflect and absorb a certain amount of light, and depending on the colour of the product, and the colour of the light, more or less light will be reflected.
- Scattered reflection: not only the amount of light, but also the way the light s reflected can differ from object to object: a hard object will reflect light directly, while a softer object will scatter the light, which means that the light is able to enter the product before it gets reflected, which changes the intensity and shape of the reflected light (see image below).



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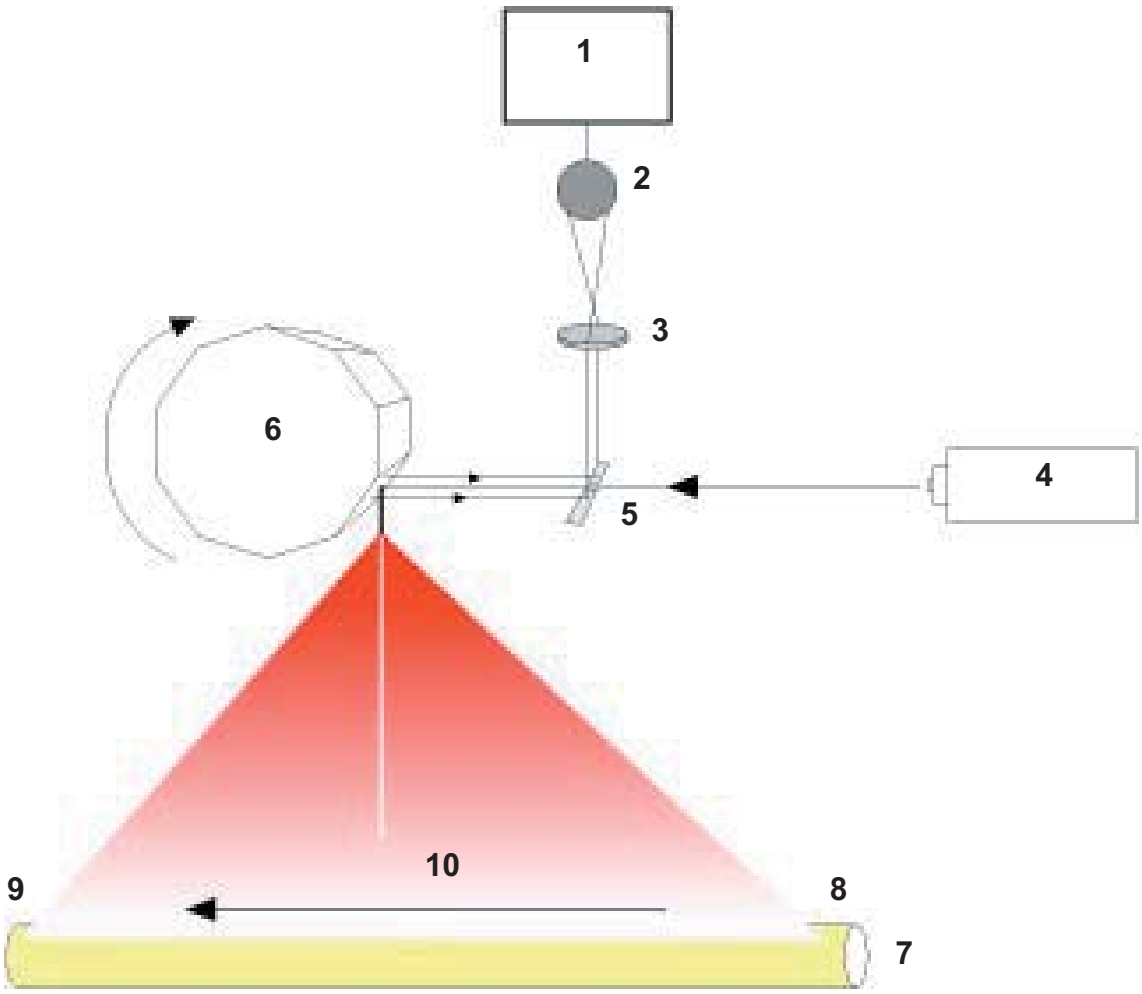
10.2.2. Basic principle laser sorting

The tightly focused laser beam is aimed at a rotating polygon mirror, which reflects the light towards a specifically chosen background drum (surface colour and structure of background drum should be similar to that of the good product). Every mirror surface produces a scan from left to right and the polygon mirror is rotating at a speed of 12.000 rpm. Multiply this number by 10, the number of surfaces on the polygon mirror, and you will see that every minute 120.000 scans are being realized, this equals 2000 scans per second. In other words, every laser scans the full width of the product stream at least 2000 times per second (depending on the product settings).

A part of this emitted laser light is reflected back into the laser box via the same polygon mirror, and captured by a very sensitive light receiver. This receiver transforms the captured light into an electronic signal, which is then sent to the PVS sorting computer for further processing.

Picture: Basic principle



1. Electronics
2. Light receiver
3. Lens
4. Laser source
5. Mirrors
6. Rotating polygon mirror
7. Background drum
8. Start of scan line
9. End of scan line
10. Scan direction

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10.3. GENIUS Compact Laser Safety

Laser Class II Product
(Only for GENIUS Compact L(aser) or GENIUS Compact D(ual) configurations)

10.3.1. Optical Laser Safety

Laser light, because of its special properties, poses safety hazards not associated with light from conventional sources. The safe use of lasers requires that all laser users, and everyone near the laser system, are aware of the dangers involved. The safe use of the laser depends on the user being familiar with the instrument and the properties of coherent, intense beams of light.

Direct eye contact with the output beam from the lasers may cause serious damage to the eyes and possibly even blindness

Laser beams can ignite volatile substances such as alcohol, gasoline, ether and other solvents, and can damage light sensitive elements in video cameras, photo multipliers and photo diodes. Reflected beams may also cause damage. For these reasons, and others, the user is advised to follow the precautions below.

1. Observe all safety precautions in the user manual

2. Extreme caution is called for when using solvents in the area of the laser.

3. Limit access to the laser radiation inside the laser box to qualified users who are familiar with laser safety practices and who are aware of the dangers involved. Only qualified personnel authorised by the manufacturer may open the optical box.

4. Never look directly into the laser light source or at scattered laser light from any reflective surface. Never reflect the beam back into the source.

Laser safety glasses can present a hazard as well as a benefit. While they protect the eye from potentially damaging exposure, they also block light at the laser wavelengths, thus preventing the operator from seeing the beam.

Therefore, use extreme caution, even when using safety glasses.

5. Advise all those using the laser product of these precautions. It is a good practice to operate the laser product in a controlled and restricted area.

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Shutter System

The Laser box has one opening through which the laser beams pass. To protect cleaning and maintenance personnel from possibly hazardous laser radiation, this opening will be closed by means of a shutter system whenever one of the doors in the laser area are opened, or when something is wrong with the electrical power system or with the compressed air supply.

Hazardous Radiation Exposure

Use of controls or adjustments or performance of procedures other than those specified in this manual can result in hazardous radiation exposure.

Attention! ***- Always keep the laser box closed! All cleaning and maintenance to be done inside the laser box is strictly reserved to trained and qualified personnel of BESTnv.***

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10.3.2. Laser Safety Labels (only with laser box)

Below you will find a list with the pictures of all Laser safety labels located on the **GENIUS Compact** installation. For more info on the exact position of the labels, consult the pictures on the pages following the list.

No	Label name	Picture	Position
004 UK	Warning label		1- On both sides on the little door protecting the laser background drum.
005 UK	Defeatable interlock label		1- Inside the laser box. 2- On both sides of the cover of the laser box.
006 UK	Aperture label		1- On both sides of the scan shielding box.
007 UK	Laser Class II Label		1- Next to Identification Label.

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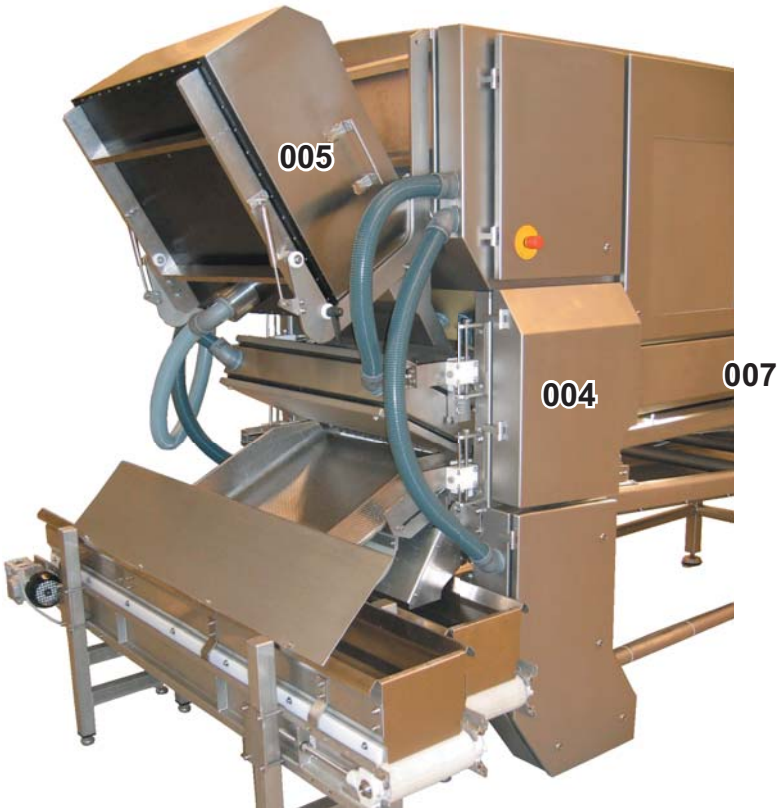
THE POSITION OF THE DIFFERENT LASER SAFETY LABELS

Picture: Left front view **GENIUS** Compact installation (with laser box)



Picture: Tight front view **GENIUS** Compact installation (with laser box)

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10.4. Operation

For all practical operational purposes the lasers can be considered as cameras. In the touchscreen program lasers and camera's are all indicated as devices, and apart from the names, there is not much visual difference in the menu's between lasers and camera's. The procedure to set thresholds on laser signals is exactly the same as for thresholds on camera signals (see chapter 5: Operation procedures).

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10.5. Cleaning & Maintenance

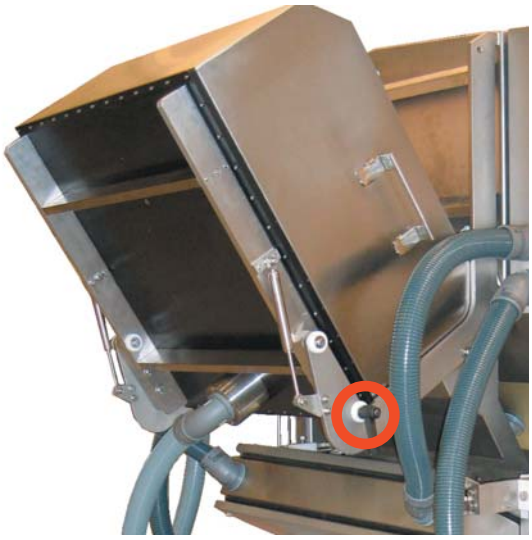
Inside the Laser Box

The customer is not allowed to perform any Maintenance and/or Cleaning actions inside the laser box. If any maintenance or cleaning should be necessary inside the laser box, this must be done by qualified maintenance engineers of **BESTnv** or by trained technicians with the explicit written permission of **BESTnv**.

10.5.1. Scan Shielding and Laser window

Attention! ***- Always lower box and clean the laser window after the cleaning of the rest of the sorter unit has been finished. This to prevent getting dirt or water on the laser window after it has been cleaned.***

1. Lower the Laser box (see pictures underneath).
   - Loosen handles on both sides of the laser box.
   - Lower the laser box gently until it is +/- horizontal.



2. Check the Scan Shielding and clean it out if necessary:
   - Remove all dirt from the inside with compressed air (if necessary)

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3. Check the Laser Window and clean if necessary:
   - Thoroughly clean the laser window with a soft clean cloth or a cleanex type paper tissue (see picture).

Attention: ***- Make sure no water or dirt remains on the window, this could seriously impede the performance of the laser sorter.***
- Do not scratch or otherwise damage the window.
- Avoid scale (use methanol and decalcify if necessary).

- Put the optical box back in its original position, and fasten the handles.

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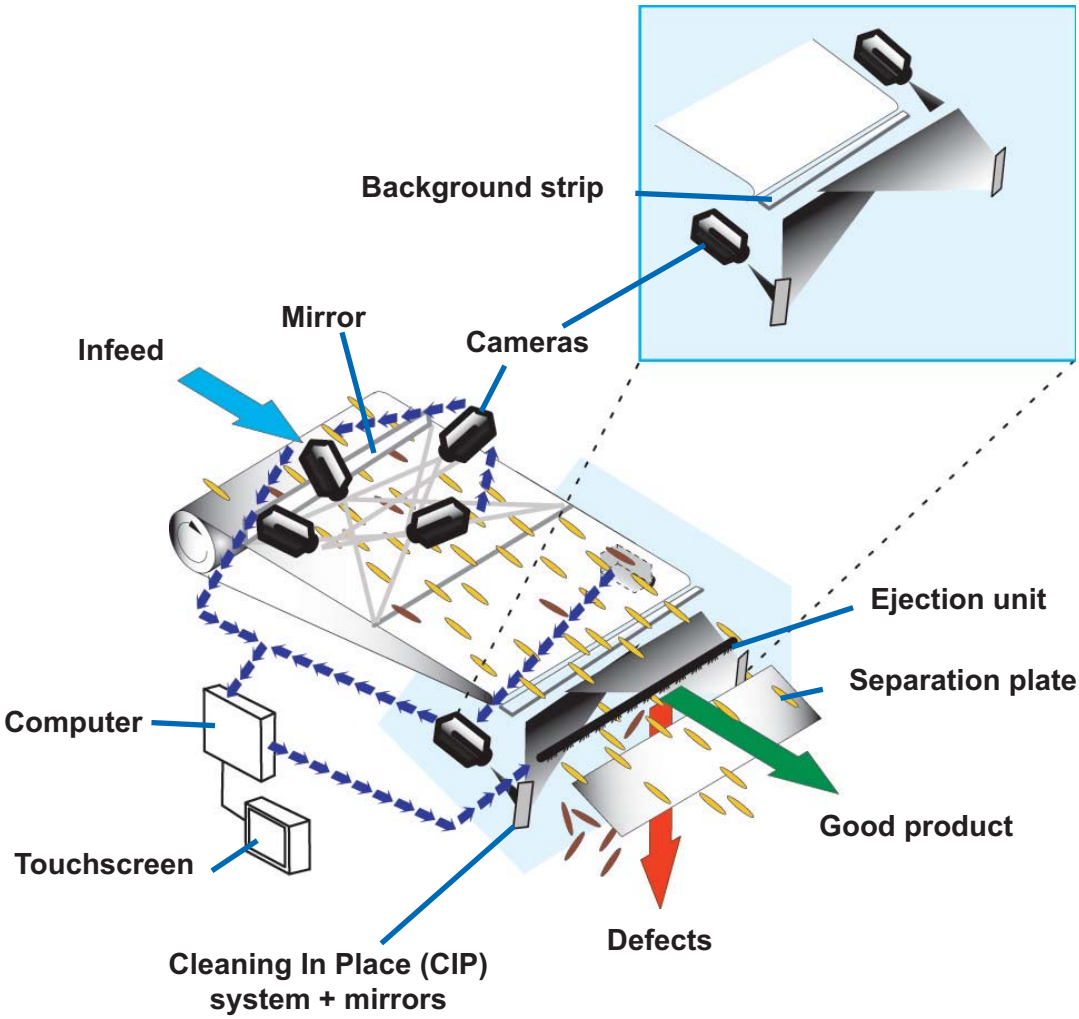
XI. FSV-System

11.1. Introduction

The FSV ('Full Surround View') inspection system (also called "Bottom unit") has been specifically developed to view product from underneath in the **GENIUS** Compact-S configuration. This system combines bottom camera inspection (S-option) of the product with the standard top inspection (option B, 4 cameras under an angle). The product will therefore be viewed from all angles.

For practical reasons the bottom cameras are not placed directly underneath the inspection zone, but on the side of the machine, using mirrors to inspect the underside of the product with help of background lighting. Together with the CIP-system, this will keep the bottom cameras clean and guarantee a clear line of sight at all times. Fluorescent light tubes built into two continuously rotating tubes have been added to provide the necessary lighting.

Picture 3.1.4a: **GENIUS Compact**-S configuration



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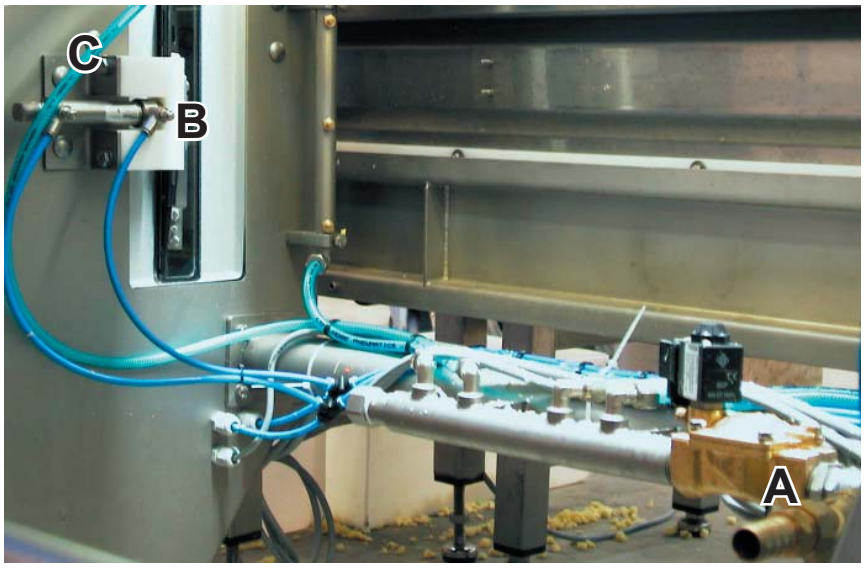
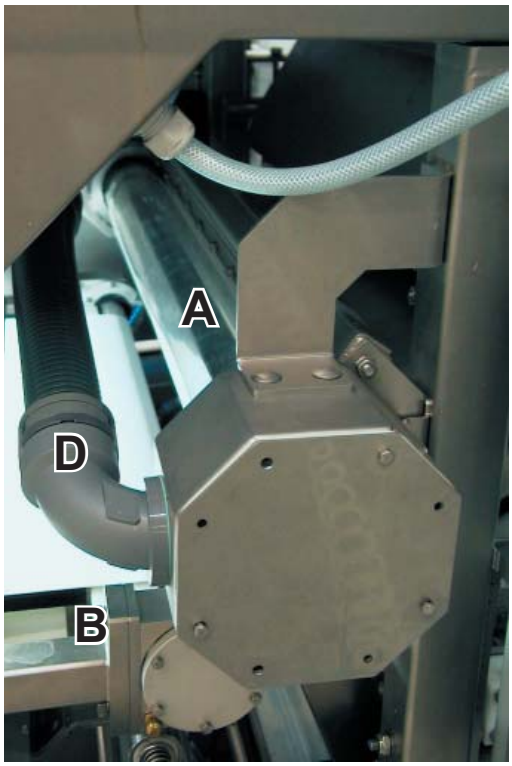
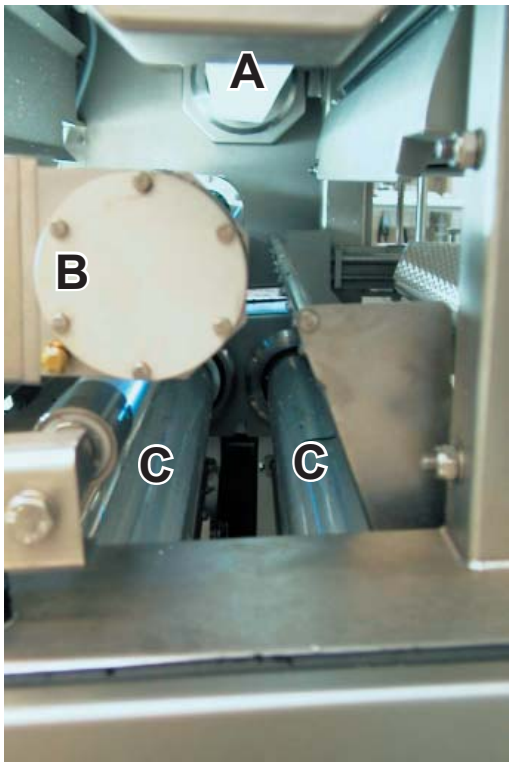
Picture: View underneath **GENIUS Compact** with FSV-system



A: Input water for CIP-system
B: Wiper for window of left FSV-unit
C: Water for sprinklers of rotating light tubes

Picture: Inside view **GENIUS Compact** with FSV-system





A: Upper light tube (background lighting)
B: Detection belt
C: Lower light tubes (normal lighting)
D: Air supply for cooling rotating light tubes and FSV-units

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11.2. Safety

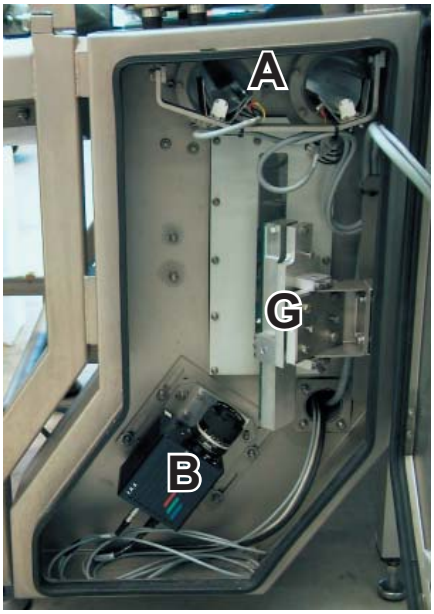
Apart from the safety features that are valid for the entire installation (such as emergency buttons and main power switch) the FSV-unit is also equipped with a separate Interlock system.

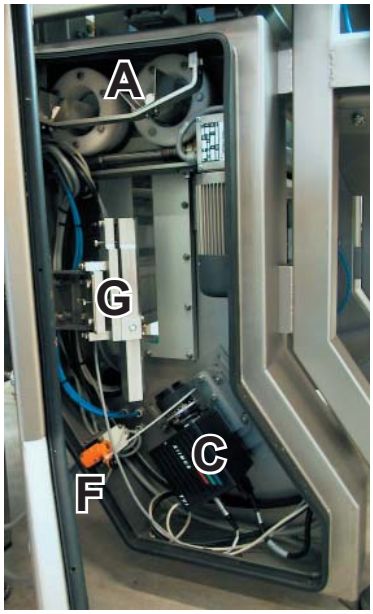
11.2.1. Interlock system FSV-system

Whenever someone opens the left door of the FSV-unit, an interlock switch will immediately switch off the drive motor of the rotating light tubes to prevent people from getting hurt by rotating elements. The lights in the light tubes will be switched off as well, for if they stop rotating the tubes may bend because of the heat.

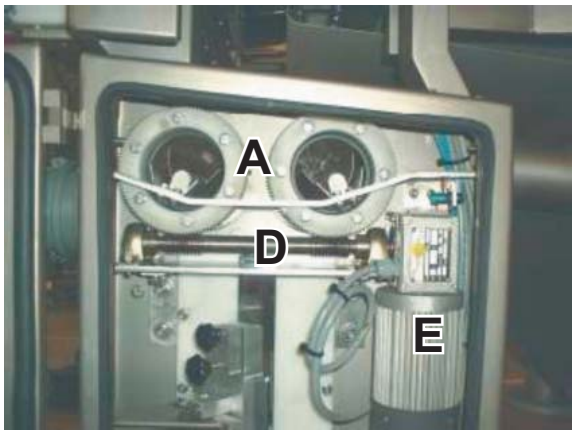
Attention! ***- When working on the electrical installation, make sure to switch of the sorter using the main power switch.***

Pictures: inside view right and left unit FSV-system





Pictures: detail upper part FSV-system



A: Lower light tube openings
B: Right bottom camera
C: Left bottom camera
D: Rotating axle for lower light tubes
E: Drive motor for axle
F: Interlock switch in left unit
G: Mirrors

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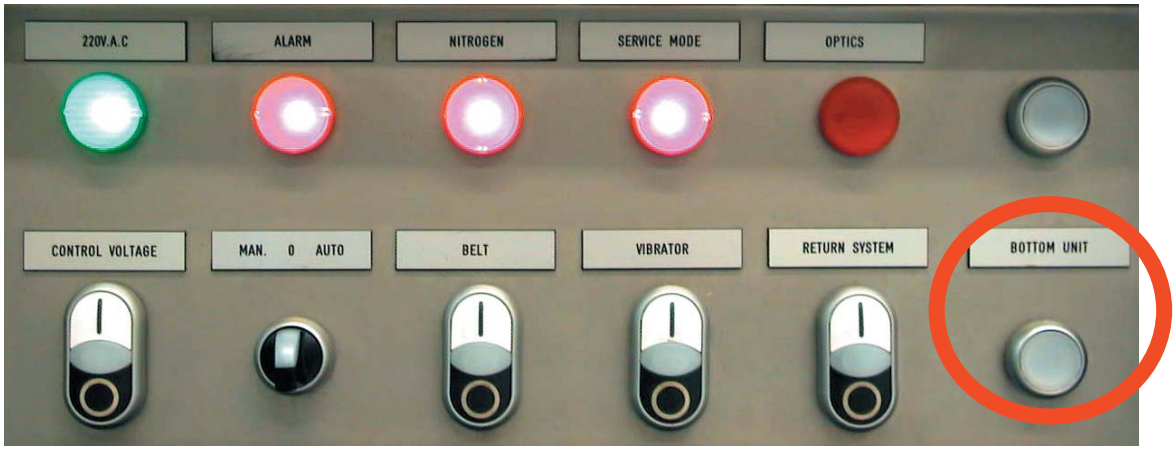
11.3. Operation

11.3.1. Switching the FSV-module ON/OFF

The FSV-module can be turned On and Off independently with one button that is added to the control panel. The LED inside this button indicates the status of the FSV-module.

LED off	= FSV-module turned off.
LED on	= FSV-module turned on.
LED flashing	= The left cabinet door of the FSV-module is open (FSV-lights and rotating tubes turned off).

Picture: Control panel with extra FSV-button



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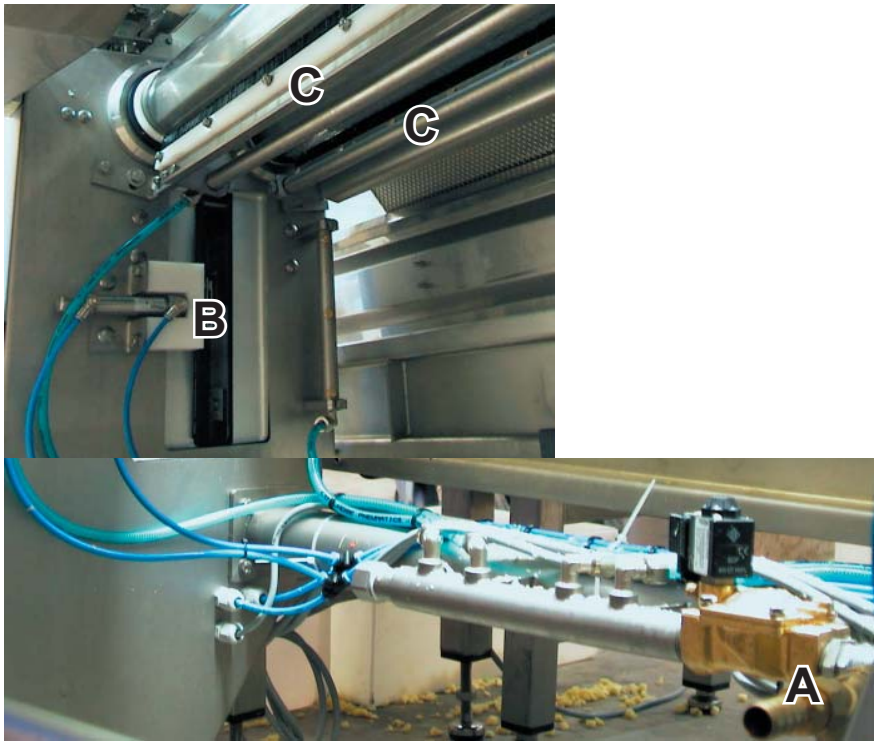
11.4. Cleaning

11.4.1. CIP (Clean In Place)-system

Due to the fact that the camera windows of the FSV-system cameras are below the level product stream, they are more prone to pollution with dust, dirt and/or spilling water etc. .. than other cameras. To ensure that the camera windows of the bottom unit stay clean a CIP (Clean In Place) system was developed.

The CIP-system consists of water sprinklers and scrapers to clean the 2 lower light tubes that are continuously rotating, and wipers in front of each camera window to remove all dust and dirt.
The upper light tube also rotates but is only supplied with a scraper. It is situated above the product stream and should get less dirty than the lower tubes..

Picture: View underneath **GENIUS Compact** with FSV-system



A: Input water for CIP-system
B: Wiper for window of left FSV-unit
C: Brushes and Sprinklers for lower rotating light tubes

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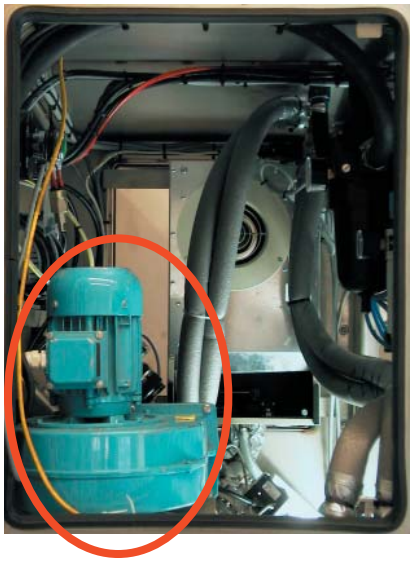
11.5. Maintenance

11.5.1. Cooling

To cool the cameras and the tubes with the fluorescent lights, a big fan is placed inside the machine (see first picture). Via various tubes, this fan blows air from inside the machine into the upper light tube, and via a tube on the left front of the machine into the left FSV unit, through the lower light tubes into the right FSV unit. Via another tube the air gets back into the central space of the sorter.

To keep the light tubes from bending, they must keep on rotating as long as the lights are on.

Picture: Fan + air cooling tubing for FSV-system



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Attachments

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Attachments

Attachment A: Electrical Schematics

Attachment B: Supplier Information

- B 1: Infeed Shaker
- B 2: Power Supplies
- B 3: Electrical Components
- B 4: Cooling Unit (optional)

Attachment C: Spare Parts List

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Attachment A: Electrical Schematics

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Attachment B: Supplier Information

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Attachment B: Supplier Information

- B 1: Infeed Shaker
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- B 4: Cooling

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B 1: Infeed Shaker
(Supplier Information)

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B1: Infeed Shaker

- User Manual VLD systems

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Users manual
Resonance transport shaker

WRITTEN: 2-3-2005.

VDL Systems bv
Erfstraat 3
5405 BE Uden
Nederland

Tel. +31 (0)413 - 250505
Fax. +31 (0)413 - 251025
E-mail: info@vdlsystems.nl

CE Qualification.

The resonance transport shaker has been provided with an "IIB declaration". Meaning that the resonance transport shaker qualifies according to the European guidelines. The provided manufacturers declaration lists the specific guidelines.

Operation of the installation only according to the instructions shown in this manual. Consult VDL systems when in doubt.

Disclaimer:

VDL Systems bv will not be counted responsible for unsafe work environments, accidents and damages as a result:

- Neglecting of warnings or guidelines as shown on the installation or in this users manual.
- Operation in different applications or different circumstances then listed in this users manual.
- Alternations on the installation. This includes the use of non-original spare parts
- Lack of maintenance.
- Removal of safety traps.
- Unprofessional operation of the installation.
- Maintenance on parts that are still connected with electrical power.

VDL Systems bv is not responsible for damages following a malfunction of the installation. (i.e. damaged products or interrupted processing).

MANUFACTURERS DECLARATION
(according to appendix IIB of the Machine guideline)

Concerning appendix II B of the machine guideline, for non-independent operating installations or parts of an installation.
We, VDL Systems bv
Erfstraat 3
5405 BE Uden
Nederland

Declare, independently responsible:
We are the manufacturer of product:

Resonance transport shaker	According to drawing	105198

This declaration relates to.
1. An installation designed and manufactured in appliance with machine guideline 98/37/CE.

Banned for operation!
We would like to express ourselves that the belt conveyor is to be designated in combination with other installations. Following that, on ground of machine regulations, it can only be used when the complete installation complies with the European guidelines.

City: Uden
Date: 2-3-2005

Name: VDL Systems bv

Managing Director: T. Behr

TABLE OF CONTENTS

1. INTRODUCTION

The Resonance transport shaker has been designed for equal spreading and transportation of product. The shaker exists of a lower frame on adjustable legs, a middle frame with two unbalance motors and a shaker pan.

The product movement is as follows:

- Product is transported towards the shaker where it ends up in the shaker pan.
- A diagonal upward directional force, created by the two unbalance motors, will transport the product over the width and length of the shaker pan.
- Cause of this the product is equally spread over the complete shaker pan area.
- Product will leave the shaker pan over the complete width of the shaker pan.

This manual has been made to help you install, operate, clean and maintain your Resonance transport shaker.
The manual has been made to prevent accidents and/or damages during installation, operation, cleaning and maintenance of your Resonance transport shaker.

When you still have questions about your Resonance transport shaker after reading this manual, please contact our service department or your local dealer.

For installation of- or maintenance at your Resonance transport shaker, you way want to turn to our specialized service engineers.

For specific information regarding our scale of Resonance transport shaker or other transportation equipment you can always contact our sales department

Suggestions regarding this Resonance transport shaker or this manual are always welcome.

Please send your remarks / input to :

VDL Systems bv
Postbus 120
5400 AC Uden (Holland)

2. SAFETY.

2.1 General safety regulations.

- Attend that only qualified personnel has access to the Resonance transport shaker
- Make sure all personnel who works with-, near- or at the Resonance transport shaker have read and understood the safety instructions in this manual, and act accordingly while working with-, near- or at the Resonance transport shaker
- Do not reach into moving parts of the Resonance transport shaker – including removal of a product pile up – while in operation or in stand by. When not in operation the Resonance transport shaker can still be "ON".
- Safety precautions may not be removed or disabled.
- Keep the work area clean.
- Make sure there is good illumination.
- Do not stand, climb or walk on the Resonance transport shaker
- Position the Resonance transport shaker water level and tension free. When necessary fixate the supports to the floor to prevent vibrations and "walking" of the Resonance transport shaker.
- When moving the Resonance transport shaker used the present hoist points.
- Do not reset an emergency switch when unknown why and who activated it.

- Danger! Never start operation of the Resonance transport shaker when above listed General safety regulations cannot be complied.

2.2 Warning signs.

When warning signs are utilized at the Resonance transport shaker, apply the following rules:

- These pictograms may not be removed or damaged. Operator must check this regularly.
- Operator is responsible that pictograms are visually clear.

3 SPECIFICATIONS.

3.1 Physical operational circumstances.

The following physical circumstances apply:

During transport / storage	:	-10° to 55° Celsius
Operating surrounding temperature	:	-5° to 40° Celsius (unless noted different)
Relative humidity (RH):		30% to 80% not condensate
Illumination	:	Regular surrounding illumination
Altitude	:	Air pressure till 1000m above sea level

This machine is not suited for outdoor operation.
This machine is not suited for operation in an explosive dangerous environment.

3.2 Utilized guidelines and standards.

See the IIB declaration.

3.3 Malfunction list.

- The shaker pan “dances”.
  - ➢ One of the vibration absorbers broken, replace absorber.
  - ➢ One unbalance motor malfunction, check unbalance motor.
- Product moves to one side of the shaker pan.
  - ➢ Shaker pan not water level, level shaker pan.
  - ➢ Vibration absorber broken, replace absorber
- Unbalance motor “boinks” and turns hot.
  - ➢ Bearing in unbalance motor worn, check and replace when necessary.

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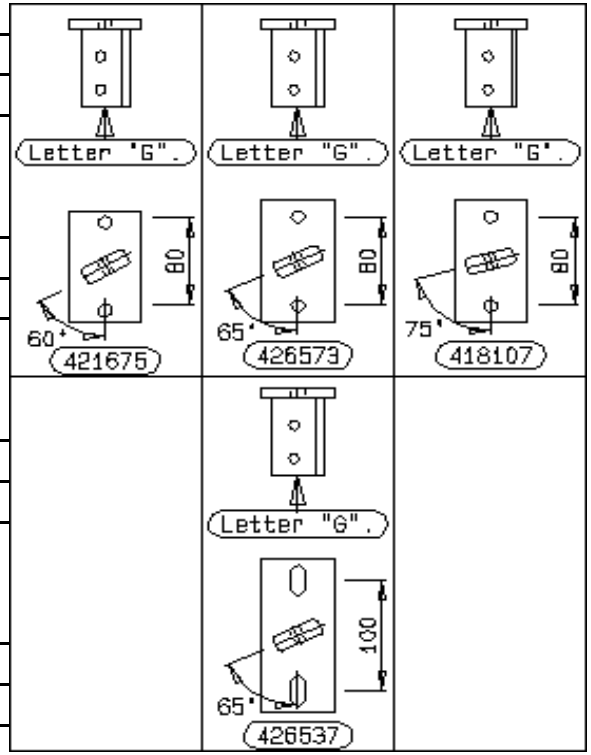
Spare-parts "Flat pan - shaker"

Spare part	Present	Draw.nr	PBS-nr.:	Technical description	Remark
A-0070	**X**	415760	01760	Spacer	
A-0080	**X**	415694	01808	Spring leaf 6 mm	
		426858	09710	Spring leaf 8 mm	
A-0090	**X**	415693	00359	Clamping plate	
A-0100	**X**	415706	01720	Stroke indicator	

er

Spare-parts "Flat pan - shaker"

Spare part	Present	Draw nr	PBS-nr.:	Technical description
A-0040		421675		Support upper right - stress relieved
A-0060				Support lower right - stress relieved
A-0040		426573		Support upper right - stress relieved
A-0060				Support lower right - stress relieved
A-0040		418107		Support upper right - stress relieved
A-0060				Support lower right - stress relieved
A-0040	**X**	426537		Support upper right - stress relieved
A-0060				Support lower right - stress relieved



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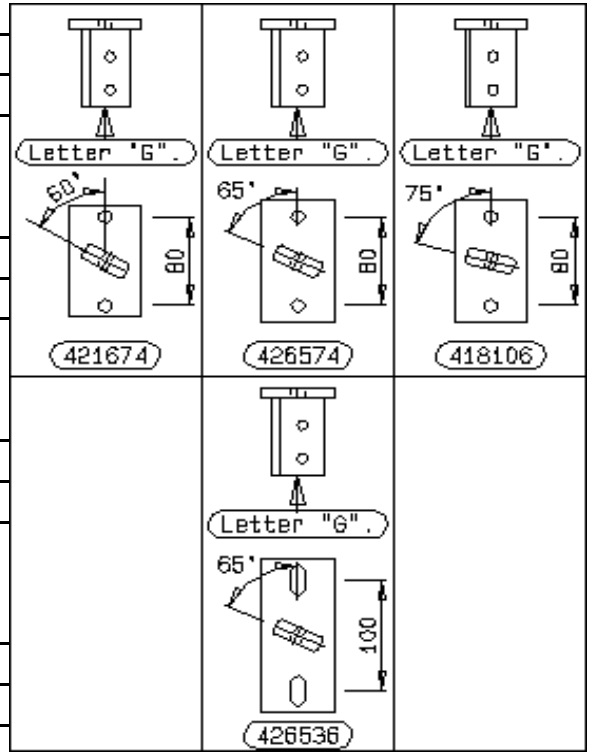
Spare-parts "Flat pan - shaker"

Spare part	Present	Drawnr	PBS-nr.:	Technical description
A-0030		421674		Support upper left - stress relieved
A-0050				Support lower left - stress relieved
A-0030		426574		Support upper left - stress relieved
A-0050				Support lower left - stress relieved
A-0030		418106		Support upper left - stress relieved
A-0050				Support lower left - stress relieved
A-0030	**X**	426536		Support upper left - stress relieved
A-0050				Support lower left - stress relieved



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Spare-parts "Flat pan - shaker" >> drawing 105198

Spare part	Present	Drawnr	PBS-nr.:	Technical description	Remark
A-0010			01506	Unbalancemotor BX 40-6 k	
			05877	Unbalancemotor BXZ 40-8 k	
			05877	Unbalancemotor BXZ 40-8 k 60 Hz	
			09578	Unbalancemotor BX 40-4 k 50 Hz	
	2*		01498	Unbalancemotor BX 60-6 k 50 HZ	
			09565	Unbalancemotor BXZ 60-8 k 60 Hz	
			08257	Unbalancemotor BX 90-6 k 50 Hz	When ordering, list motornumber and -type.
			01508	Unbalancemotor BXZ 90-8 k 60 Hz	
			09376	Unbalancemotor BX 90-4 k 50 Hz	
			09676	Unbalancemotor BXZ 90-6 k 60 Hz	
			08228	Unbalancemotor BX 150-6 k 50 Hz	
			01509	Unbalancemotor BXZ 150-8 k 60 Hz	
			01511	Unbalancemotor BX 201-6 k 50 Hz	
			01502	Unbalancemotor CX 200-6 k	
A-0020	**2***		03411	Vibration absorber ø 50 H= 45 40° Shore	
			03410	Vibration absorber ø 50 H= 45 55° Shore	
	2*		03412	Vibration absorber ø 75 H= 55 40° Shore	
			03417	Vibration absorber ø 100 H= 55 40° Shore	
			03422	Vibration absorber ø 100 H= 75 55° Shore	

A FLAT PAN SHAKER

1.1. Maintenance.

1.2. Cleaning the Flat pan shaker.

To clean your shaker, follow the listed procedure:

- Wear protective clothing
- Complete installation must be turned **"OFF"** and locked in this position. See manual for electrical controls.
- When washing the shaker attend that bearings, electrical and electronic components remain as dry as possible.
- Clean the installation daily with a disinfectant.
- Rinse the installation thorough to prevent disinfectant remaining behind. Not rinsing the disinfectant may cause damage. Concentration by evaporation of chloric acid leads to very high concentrations of chlorine. In combination with long periods of contact it will attack on the cleaned materials (also on stainless steel) of your installation.
- Hard and / or iron keeping water will leave a chalk residue and a rust film on your installation. We advise you to clean your installation weekly with an acid containing foam.

1.3. Maintenance.

When performing preventive or corrective maintenance at your shaker, the following acts need to be considered:

- Wear protective clothing.
- Complete installation must be turned **"OFF"** and locked in this position. See manual for electrical controls.
- Inspection of fixing materials for becoming loose.

Photo 1 en 2: Details- mounting of Unbalance motor.

- Inspect assembly bolts of unbalance motor. Also see Photo 1 and Photo 1.
- When removing unbalance motors from shaker, all bolts and rings must be replaced!
- These bolts are tightened with a torque of 200Nm.

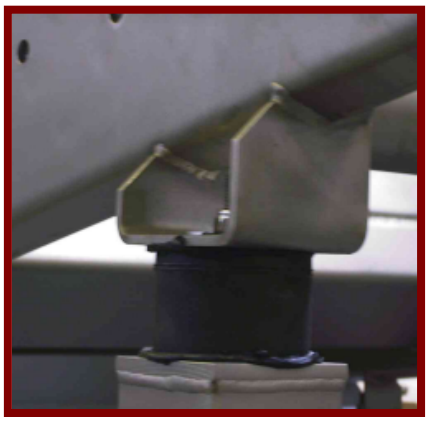

Photo 3 en 4: Details – Vibration absorber.

- Inspect vibration absorbers on wear, tear and fatigue (becoming spongy). Also see Photo 3 en 4.
- Inspect assembly bolts of vibration absorber. Also see Photo 3 en 4.

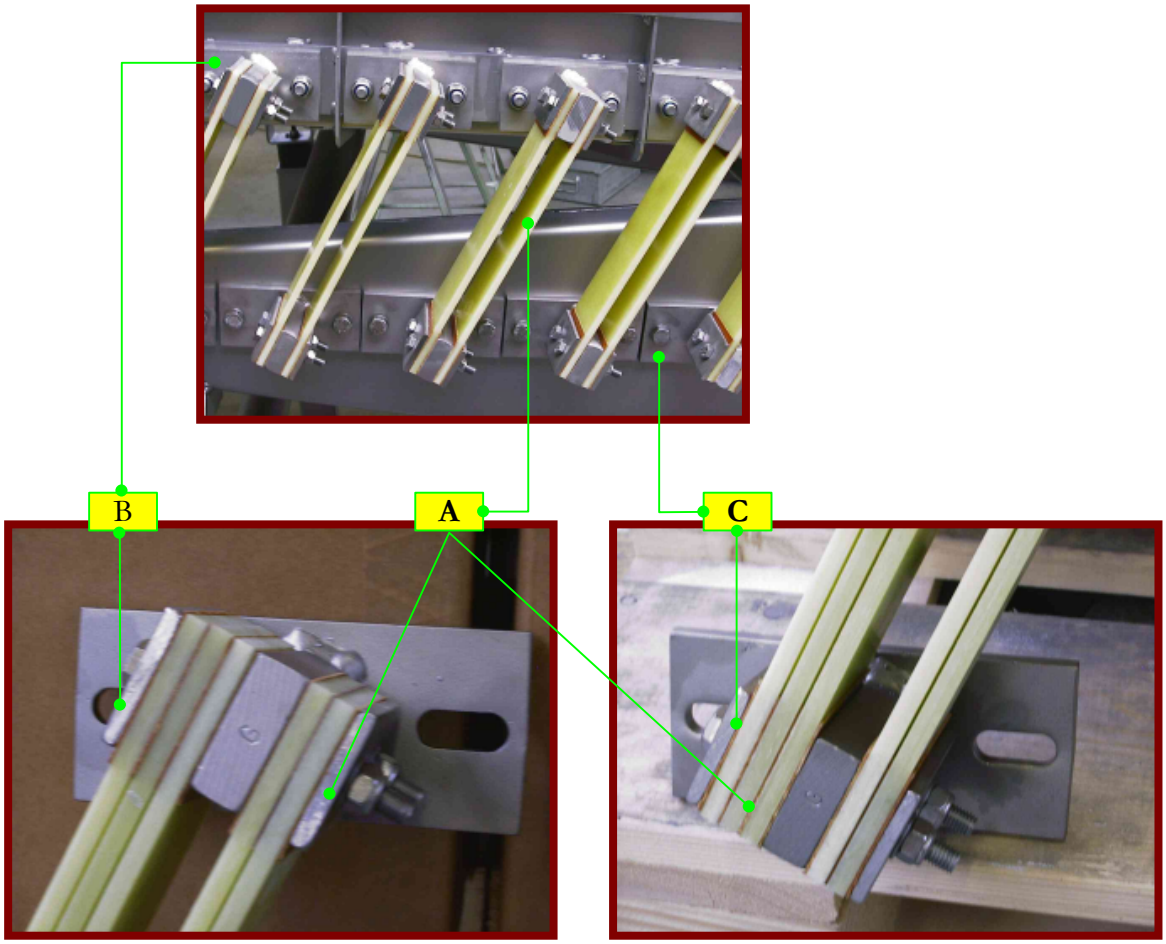

Photo 5, 6 en 7: Details – assembly spring leafs.

- Inspection of spring leafs A on wear and tear. Also see Photo 5, 6 en 7.
- Inspection of supports B and C on wear and tear. Also see Photo 5, 6 en 7.
- Inspection of bolts on spring leafs and supports. Also see Photo 5, 6 en 7.

All parts that are worn or parts that are damaged so that safe operation can no longer be guaranteed must be replaced.

1.5. Spare parts list - Flat pan - shaker.

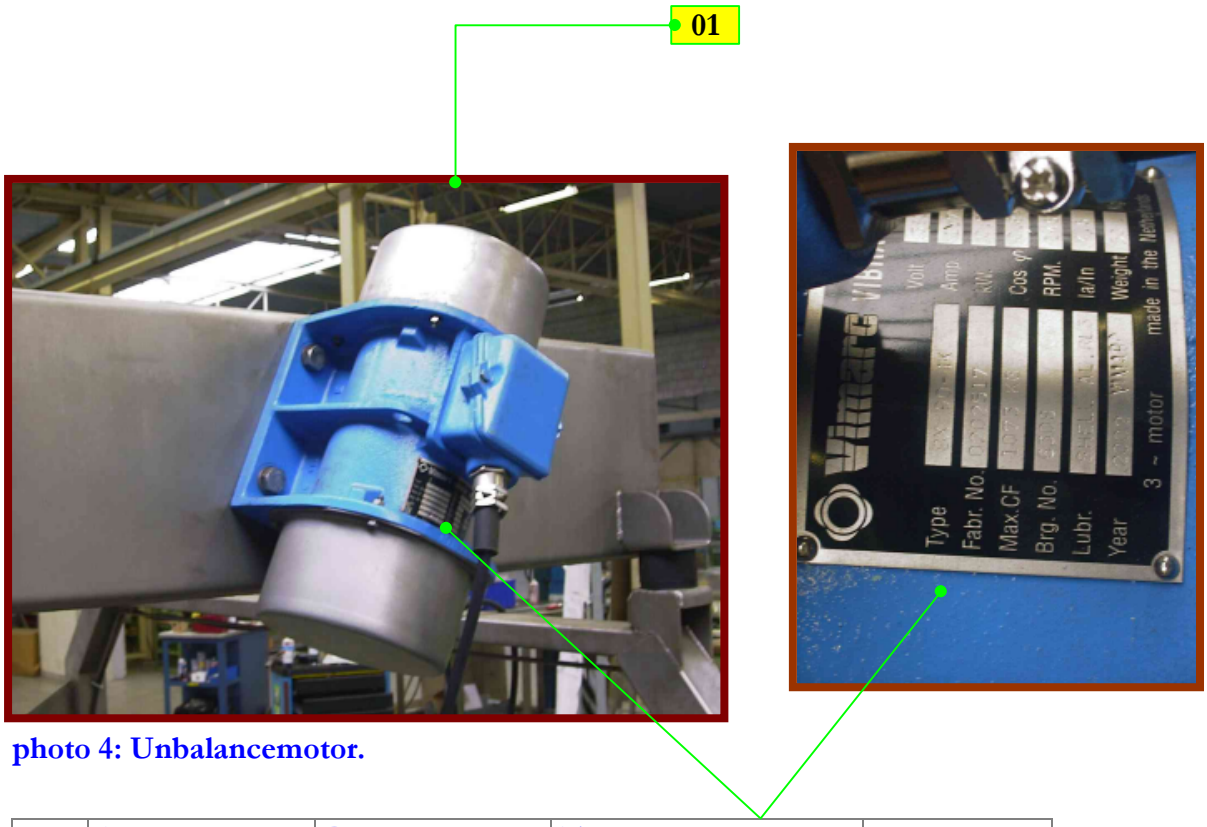

photo 4: Unbalancemotor.

Pos.	Spare part	Description	Type +manufacturer nr.:	Remark
			BX 40-6 k	
			BXZ 40-8 k	230 Volt
			BXZ 40-8 k	400 Volt
			BX 40-4 k	
01	A-0010	Unbalancemotor	BX 60-6 k	
			BXZ 60-8 k	
			BX 90-6 k	
			BXZ 90-8 k	
			BX 90-4 k	
			BXZ 90-6 k	
			BX 150-6 k	
			BXZ 150-8 k	
			BX 201-6 k	
			CX 200-6 k	

Photo 5 Vibration absorber.

ATTEND: front and rear absorber can be different!

Pos.	Spare part	Description	Type		
01	A-0020	Vibration absorber	ø 50	H= 45	40° Shore
			ø 50	H= 45	55° Shore
01	A-0020	Vibration absorber	ø 75	H= 55	40° Shore
			ø 100	H= 55	40° Shore
			ø 100	H= 75	55° Shore

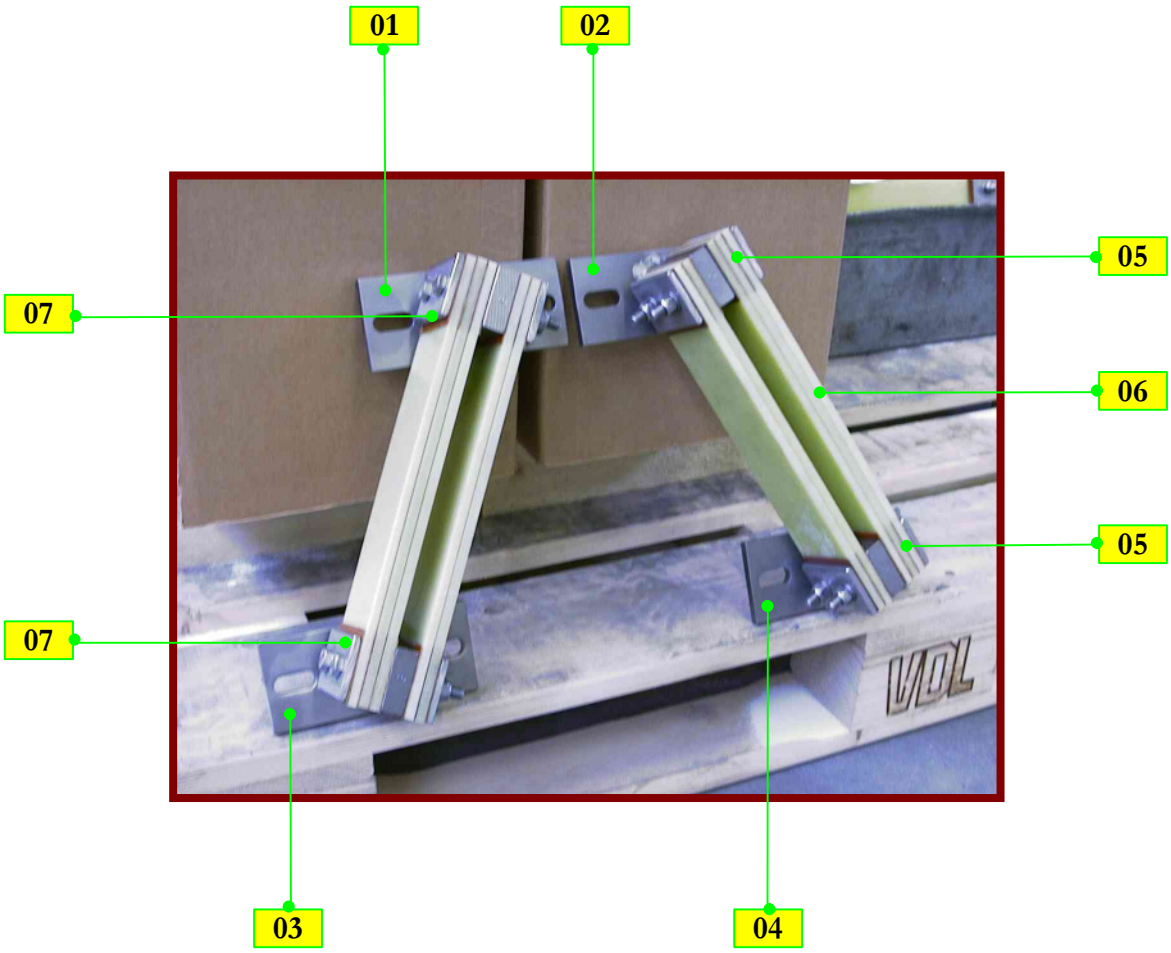

Photo 6: Set Spring leafs.

Pos.	Spare part	Description	
01	A-0030	Support upper left	Viewed with transport direction
02	A-0040	Support upper right	Viewed with transport direction
03	A-0050	Support lower left	Viewed with transport direction
04	A-0060	Support lower right	Viewed with transport direction
05	A-0070	Spacer	
06	A-0080	Spring leaf 6 mm.	
		Spring leaf 8 mm.	
07	A-0090	Clamping plate	

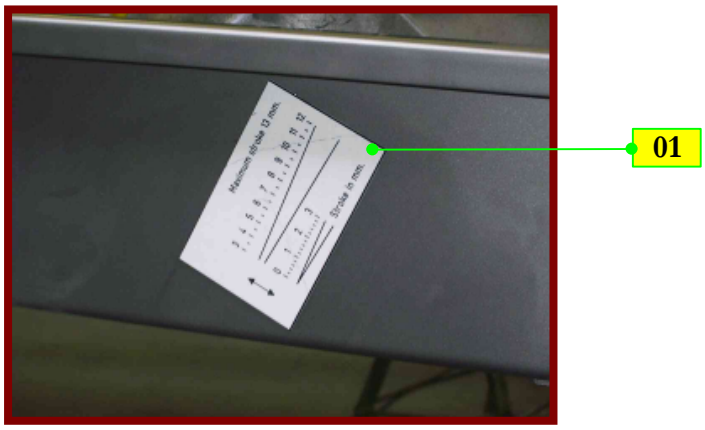

Photo 7: Stroke indicator.

Pos.	Spare part	Description
01	A-0100	Stroke indicator

z ORDERLIST SPARE PARTS

O Order O Quote

Customer details

Customer: _____

Requested by: _____

Address: _____

_____

_____

Phone nr. : _____

Fax nr. : _____

E-mail: _____

Part specifications

Spare part:	Description:	Amount:
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

B 2: Power Supplies
(Supplier Information)

BESTnv Industrial Research BV, Marinus van Meelweg 20, 5657 EN, EINDHOVEN, THE NETHERLANDS
General tel. +31 (40) 292 2622 - Service tel. +31 (40) 292 2620 - Fax. +31 (40) 292 2633 - Email: service.BESTnv@bestnv.com

B 2: Power Supplies

BESTnv Industrial Research BV, Marinus van Meelweg 20, 5657 EN, EINDHOVEN, THE NETHERLANDS
General tel. +31 (40) 292 2622 - Service tel. +31 (40) 292 2620 - Fax. +31 (40) 292 2633 - Email: service.BESTnv@bestnv.com

B 3: Electrical Components
(Supplier Information)

BESTnv Industrial Research BV, Marinus van Meelweg 20, 5657 EN, EINDHOVEN, THE NETHERLANDS
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B 3: Electrical Components

- Frequency Converter Danfoss VLT5000 manual
- Ströter Lubrification Table
- Lenze drive motors manual

BESTnv Industrial Research BV, Marinus van Meelweg 20, 5657 EN, EINDHOVEN, THE NETHERLANDS
General tel. +31 (40) 292 2622 - Service tel. +31 (40) 292 2620 - Fax. +31 (40) 292 2633 - Email: service.BESTnv@bestnv.com

B 4: Cooling
(Supplier Information)

BESTnv Industrial Research BV, Marinus van Meelweg 20, 5657 EN, EINDHOVEN, THE NETHERLANDS
General tel. +31 (40) 292 2622 - Service tel. +31 (40) 292 2620 - Fax. +31 (40) 292 2633 - Email: service.BESTnv@bestnv.com

B 4: Cooling:

- Manual for MTA TAE M010 EVO Water Cooling Unit (optional)

BESTnv Industrial Research BV, Marinus van Meelweg 20, 5657 EN, EINDHOVEN, THE NETHERLANDS
General tel. +31 (40) 292 2622 - Service tel. +31 (40) 292 2620 - Fax. +31 (40) 292 2633 - Email: service.BESTnv@bestnv.com

Attachment C: Spare Parts List

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