Linatronic

Smart and reliable empty container inspection

KRONES

The latest generation of thoroughness

Whether it be material damage, contamination or the most minuscule particles of residual caustic: nothing can hide from the Linatronic. With its highly sensitive inspection modules it sees through each individual container – and only lets fault-free items pass through. Proof of its high precision sorting ability is not least apparent in its minimum false rejection rate of just 0.3 percent. How is this possible? Through the standard use of DART 4.0, the latest generation of Krones inspection software.

At a glance

- Inspection of empty containers
- Suitable for glass, aluminium and PET containers
- Modules with full equipment:
  - Foreign-bottle and scuffing detection
  - Side-wall and film inspection with thread and lateral neck finish inspection
  - Sealing surface inspection unit
  - Base inspection and base chip detection
  - Infrared residual liquid detection with inner side-wall inspection
  - Rust detection at lateral neck finish
  - High-frequency residual caustic detection
  - Applied ceramic label (ACL) detection and sorting

What's new?

- 4-in-1 inspection:
  - No separate modules required any more for lateral neck finish and thread inspection,
  - since the side-wall inspection unit can inspect them too if required.
- Test bottle program with 2D code
- Reduction of the conveyor supports at the infeed and discharge
  - Enhanced hygienic design
  - Improved accessibility to the hall floor, glass fragment container, etc.

The leap into a new era!

The Linatronic AI is the first of its kind in the world - and ushers in a new era of the empty-container inspection technology. How is that? Because it is equipped with a neural network trained with Deep Learning for maximum precision. After 40 years of experience in inspection technology, we are daring to take the plunge into a new technology, and thus open up a whole world of previously untapped possibilities!

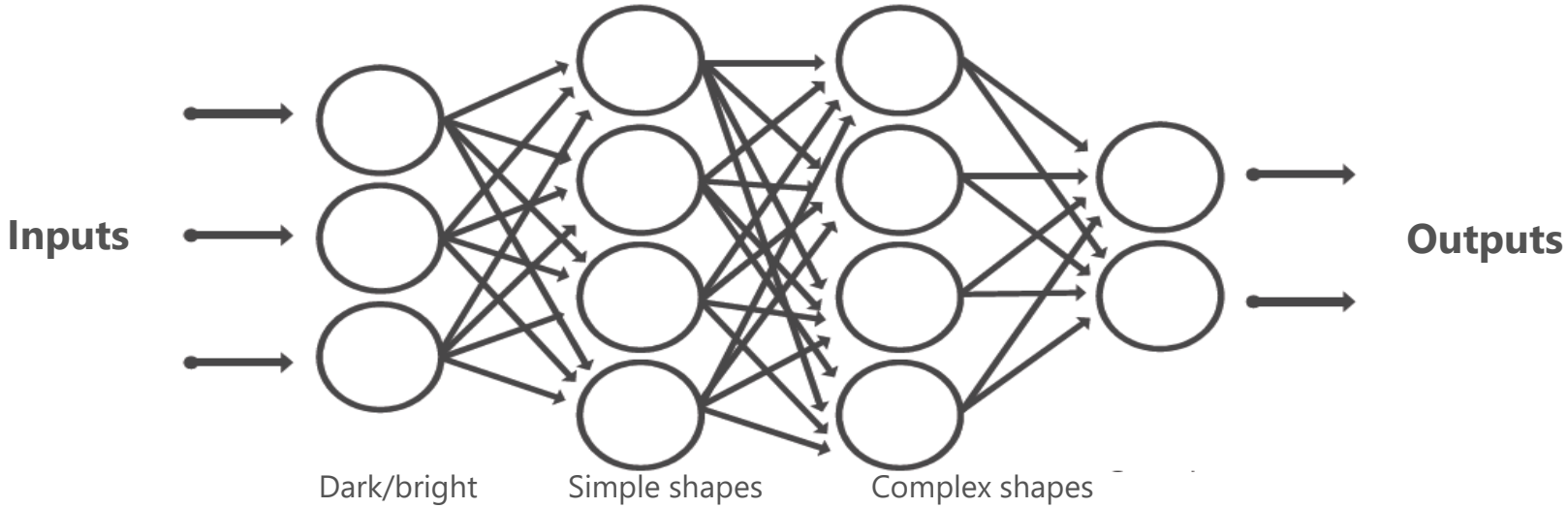
At a glance

- Empty-container inspector with Deep Learning technology
- Suitable for glass and PET containers
- Advantages over other inspection systems on the market:
  - Lowest possible false rejections
  - Highest possible inspection accuracy
  - Shortest commissioning time

Deep Learning in five sentences

- A neural network consists of several levels.
- Each level extracts a different feature from the incoming image information, similar to a filter.
- The output of one level flows as input into the next.
- This allows for the complexity of the image features to be constantly increased.
- The result: The machine detects a wide variety of anomalies with extreme precision, and can even distinguish drops of water from real faults.

Simplified representation



Advantages of Deep Learning
Glass line

Customer benefits

Increased inspection quality by means of selective detection
- Improved glass fragment detection, no base X-ray unit necessary
  → **Cost savings, high maintenance costs are dispensed with**
- Improved detection in the area of the base stippling

Base-chip detection in the base inspection unit:
- Additional unit no longer required → **Cost savings**
- Reduced bottle burst in the filler, avoidance of scattered glass fragments

Reduction of false rejections by approx. 50 percent, waste avoidance

Identical sensitivity adjustment for all machines = identical quality

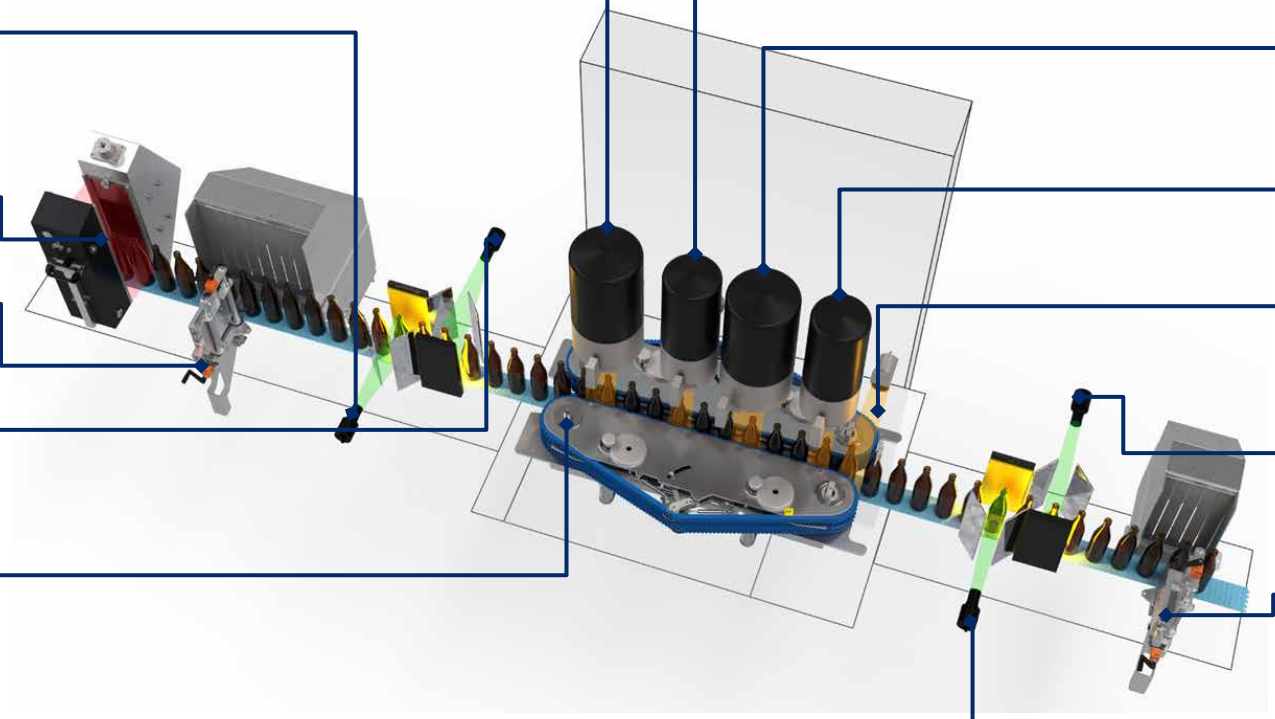
Parameterisation for each customer object is dispensed with, one neural network per container type (for pool containers)

No blowing of the neck finish necessary

Increased line performance (OEE) by avoidance of false rejections

Linatronic AI
Overview

- Sealing surface inspection unit
- 1. Side-wall inspection module: Side-wall inspection and film detection, lateral neck finish inspection and thread detection
- Camera for contour, height and colour detection (incl. scuffing detection)
- Ecopush rejection unit
- 2. Side-wall inspection module: Side-wall inspection and film detection, lateral neck finish inspection and thread detection
- Residual liquid detection unit HF
- Additional optional equipment:
  - ACL sorter
  - Mineral ring detection unit
  - Rubber seal inspection



- Thread inspection unit
- Residual liquid inspection IR, base and base chipping detection, film detection, inner side-wall inspection
- Rust detection
- Test bottle detection unit 2D code
- 4. Side-wall inspection module: Side-wall inspection and film detection, lateral neck finish inspection and thread detection
- Ecopush rejection unit
- 3. Side-wall inspection module: Side-wall inspection and film detection, lateral neck finish inspection and thread detection

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Foreign-bottle and scuffing detection

Technology used	P.E. sensor	Camera
Detects the following on the container	Height	– Height – Diameter – Contour – Colour – Scuffing
Benefits to you	– Reliably sorts out foreign containers – Prevents machine stops and increases the efficiency of the line	– Reliably sorts out foreign containers – Prevents machine stops and increases the efficiency of the line – Does not require any mechanical adjustment work – Is easy to clean – Automatically sorts out the bottle pool with its scuffing detection unit

Side-wall inspection

Technology used

- Two modules with one camera each
- 90° container rotation between the modules
- A total of six views per container
- **Result: 360° inspection of each container**

Detects the following on the side wall	– Non-transparent contamination – Semi-transparent contamination – Bottle cracks
Benefits to you	– Reliable inspection – Cost-efficient system

Note

The 4-in-1 inspection option is only possible with 4-camera variant (see next page).

Side-wall inspection with 4-camera view
Possible with Deep Learning!

Technology used

- Two modules with two cameras each
- 90° container rotation between the modules
- A total of eight views per container
- **Result: an up to 720° inspection of each container**

Detects the following on the side wall		– Non-transparent contamination – Semi-transparent contamination – Bottle cracks
Detects as an additional 4-in-1 inspection module	...on the lateral neck finish:	– Non-transparent contamination – Vertical cracks – Chips below the neck finish
	...on the thread	– Damage – Roughness
	... on the container side-wall:	– Glass embossings without UV coating
Benefits to you		– Maximum reliability thanks to the redundant inspection system – Optimum inspection of transparent containers with scuffing or engraving – Three functions in only one module and thus low total cost of ownership

Sealing surface inspection
Possible with Deep Learning!

Technology used

- Camera
- Dualflash – lights up the neck finish once from above and once from the side for two camera images

Detects the following in the neck finish area of glass bottles:	– Damage – Contamination – Overpressed neck finish
Detects the following in the neck finish area of PET containers:	– Damage on sealing surface and support ledge – Contamination

Base inspection
Possible with Deep Learning!

Technology used

Camera

Detects the following in the base of glass bottles	– Non-transparent contamination – Semi-transparent contamination – Polarising films – Damage (chipping on the container base) – Glass fragments in the residual liquid (water)
Detects the following on the base of PET containers	– Non-transparent contamination – Semi-transparent contamination – Stress cracks

Residual liquid detection unit

Technology used

	infrared	high-frequency
Detects the following on the container	Water and other residual liquids at a level of 3 mm above the centre of the base	– Water and other residual liquids at a level of 3 mm above the centre of the base – The most minimal quantities of caustic soda
Benefits to you		Maximum product safety

Inner side-wall and thread inspection

Technology used

Camera

Detects the following on the inner side-wall	Protruding semi-transparent and non-transparent contamination from a size of 1 mm (depending on the shape and quality of the container)
Detects the following on the thread	– Damage to the top edge of the thread – Interruptions – Roughness – Non-transparent contamination

Rust detection on the neck finish

Technology used

Camera

Detects the following on the neck finish	– Rust deposits – Mortar splashes

Test container program

Is the inspector working as precisely as it should? The test container program provides a clear answer to this question. For the method of operation of the individual inspection units is put to the test using test containers containing faults.

Technology used

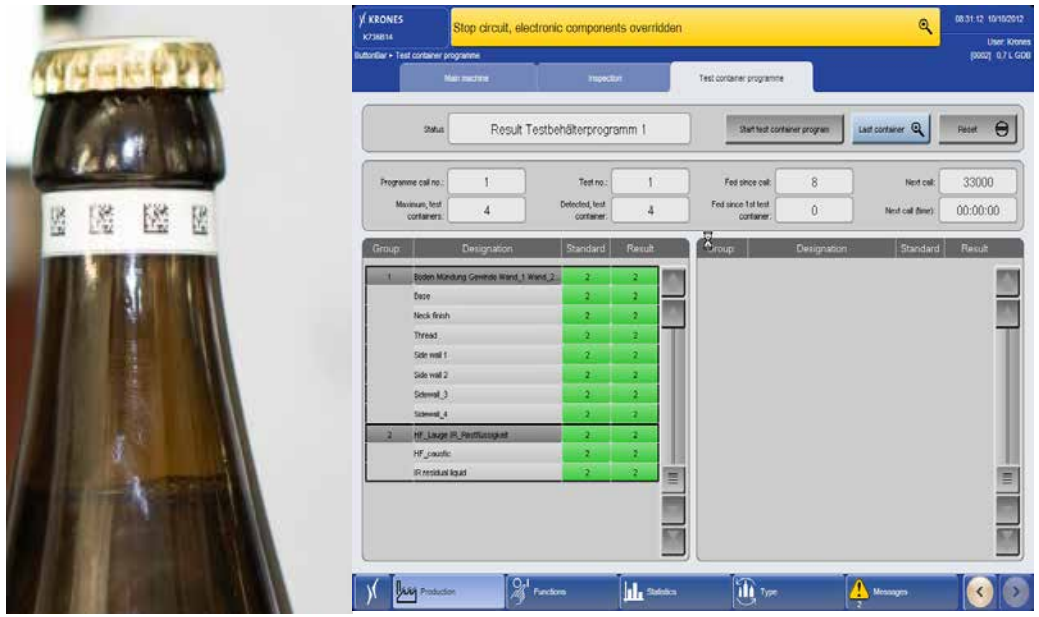
- Multifunctional test containers
- Reflective strip, optional self-adhesive 2D code strip

Method of operation

- The program is called up automatically after a specified number of containers or time
- All of the results are saved automatically with the date and time

Benefits to you

Regularly checking the inspection performance guarantees highly reliable production.



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Safety management

Data back-up

To ensure continuous traceability, the following production data is saved automatically:

- Production data
- Parameter changes
- Malfunctions
- Results of the test container program

Trend statistics

You can follow what is currently going on in and around the inspection at any time on the touch-screen. The displayed data includes the following:

- Changes in the container pool
- Deviations in ambient conditions, e.g. dirt on the protective glass covers
- Rejection rate – the user is also automatically warned or the machine is stopped if the deviation is too great

Password protection

- Production is started once an authorised person logs on
- Identification using transponder technology
- Password protection with automatic log-out function

Operation and maintenance

These settings are made automatically so that the type change-over can be performed quickly and correctly:

– Conveyor belt distance
– Distance between the top and bottom conveyor belt
– Camera position

Professional assistance around the clock

Remote maintenance is performed on the Linatronic via the GRS (Global Remote Service) remote service platform. If required, one person from the Krones team of inspection experts accesses the machine using a safe internet connection in order to, for example, ...

– optimise the inspection units.
– set up new container types.
– train the production/operator staff.

Conveyor belts and additional packages

Conveyor belts

- Do not absorb water or foam
- Are resilient to glass
- Have microbiological safety
- Can be changed over quickly and easily

Additional packages

Would you like to adapt your Linatronic to precisely suit your production requirements? No problem - thanks to a lot of extra equipment options:

- Thread detection
- 2D code test bottle program
- ACL sorter
- Mineral ring detection unit

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Rejection systems

The Krones rejection system conveys containers found to be faulty reliably and easily from the production flow. You can choose from a number of different systems depending on the application and line layout.

Ecoslider Pro

- Electrical rejection unit
- Suitable for empty glass bottles
- Rejection of the containers onto a rejection table
- Energy-saving operation without compressed-air consumption
- Up to 72,000 containers per hour

Ecopush

- Electrical rejection unit
- Suitable for empty glass bottles
- The bottles are rejected onto a rejection table, into a collecting bin or on parallel conveyors.
- Bottle sorting possible
- Energy-saving operation without compressed-air consumption
- Low noise level
- No maintenance work needed
- Up to 100,000 containers per hour
- Optionally with two pushing speeds

Benefits to you

Long-life conveyor belts

Particular care was taken when selecting the surface of the conveyor belts. It is more resilient to glass and prevents the absorption of lubricants and liquids.

Quick type change-over

The automatic adjustment of conveyors and the camera position ensure that the Linatronic is adjusted to new container types within just a few minutes.

Immediate round-the-clock assistance

With the GRS remote service platform your machine is directly linked with the Krones service department: If you require assistance, an inspection expert from Krones simply accesses the Linatronic online and immediately performs the task in hand – without having to travel to your company, at any time of the day or night.

Economic operation

Inspection modules capable of multitasking, energy-saving components and a false rejection rate of just 0.3 percent prove that it is also possible to create maximum production reliability with a low total cost of ownership.

Safety for you and your products

The Linatronic protects your consumers against unpleasant surprises. For its inspection modules scrutinise every container and detect event the smallest defects or irregularities.

Hygienic construction

Smooth surfaces and a reduced number of machine supports ensure that a low amount of dirt clings to them and the machine is easy to clean.

New machine enquiry
You can easily send an enquiry for a non-binding quotation in our Krones.shop.

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Certified ecological efficiency
Machines with enviro seal

At Krones, the enviro label stands for excellent ecological efficiency. Products that bear the enviro label have proven in an objective test procedure that they efficiently use energy and media, and that they produce in an environmentally-friendly way. The requirements are defined by the EME standard that has been developed by TÜV SÜD (technical inspection authority) for assessing production plants. The enviro test procedure, too, has been certified by TÜV SÜD as an independent expert. Therefore, you can be sure that: an enviro label stands for ecological efficiency.

This is why the Linatronic is enviro-classified:

Energy efficiency

- Complete drive systems with energy-efficient PM drives
- All rejection units are operated electrically without additional compressed-air consumption

Media efficiency

- Detection unit for compressed-air leaks
- No cooling air required thanks to the optimised control of lighting units and the use of the most up-to-date LEDs
- Minimised consumption of cleaning agents thanks to the hygienic design

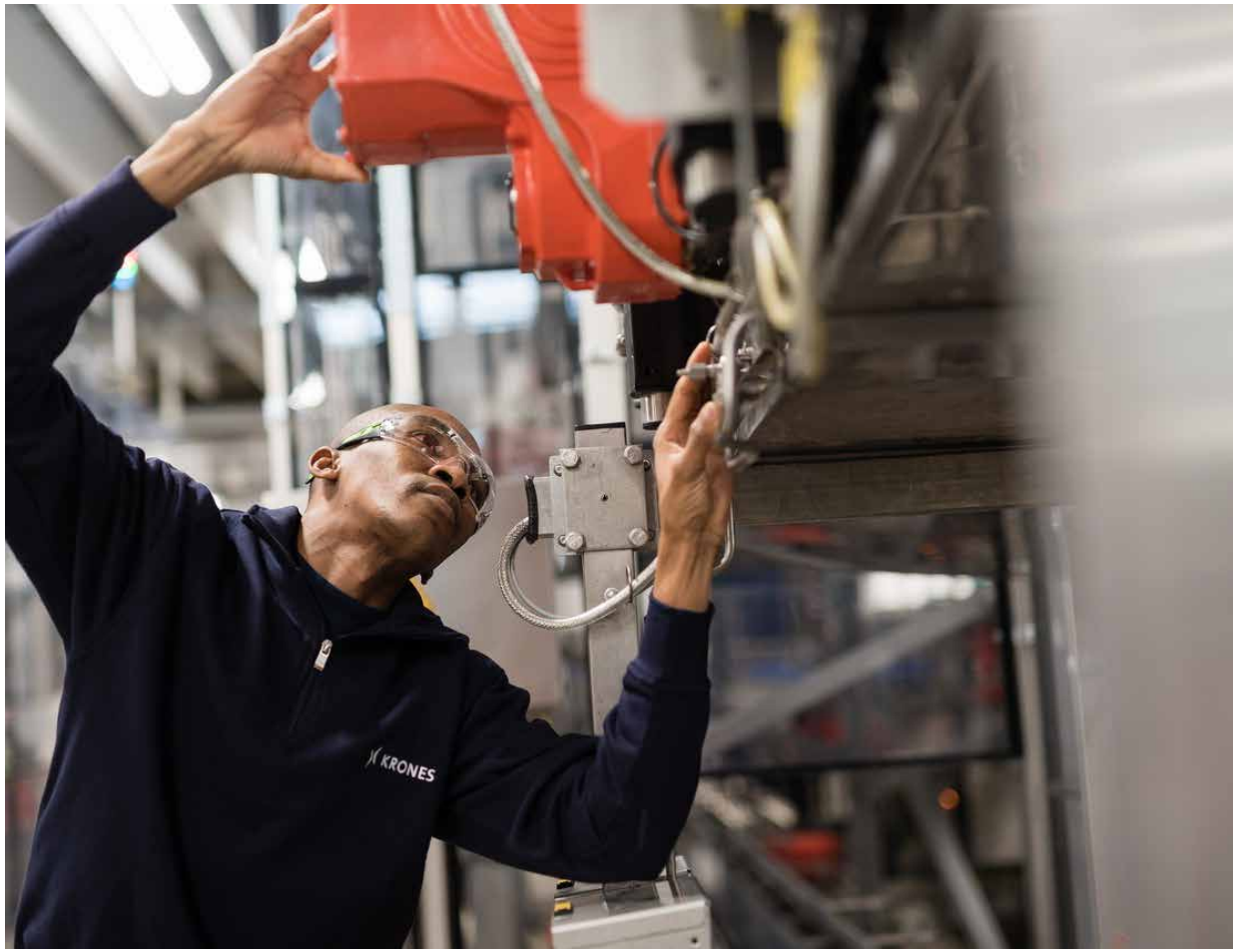
Everything from a single source

Training sessions at the Krones Academy – trained personnel for an increased efficiency of your line

The multifaceted offer by the Krones Academy ranges from operation, servicing and maintenance courses through to management training. We will gladly also create your individual training programme.

Krones Lifecycle Service – Partner for Performance

It goes without saying that also after the purchase of new machines, Krones takes care of your lines: The Krones LCS experts are always there to help you reaching your goals and turn your wishes into optimal LCS solutions.



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