

Press release

BrauBeviale 2024: Intelligent in-line inspection

From the compact entry-level device to the premium system for high-speed lines: Intelligent innovations for superior empty and full container inspection in the filling and packaging process can be found at the HEUFT stand 8-104 at BrauBeviale.

The HEUFT *InLine*^{II} *IX* X-ray and AI-supported all-surface empty bottle inspector has just gone into series production at the BrauBeviale 2023. The premium system, which achieves a new level of detection and rejection reliability even in high-speed lines, has been in high demand ever since – which is why it will of course also to be exhibited at BrauBeviale 2024!

Just like the further developed HEUFT *eXaminer*^{II} *XOS* with HEUFT *reflex*^{AI} cameras, pulsed X-ray and intelligent X-ray image analysis e.g. for precise glass-in-glass detection in filled bottles.

Especially for SMEs such as private and family breweries there will also be in-depth insights into the right technologies for getting started with inline quality control at HEUFT level at Stand 8-104. The spectrum ranges from the HEUFT *InLine*^{II} *IR*, which realizes a complete empty bottle inspection with minimum space requirements, to the compact HEUFT *ONE*, for fill level and cap checking among other things, to the HEUFT *PRIME*, which can also take over other important functions such as the reliable detection of burst bottles in addition to the full bottle check in the same work step.

Also on stand 8-104: the HEUFT *FinalView*^{II} *CAP* for seamless closure inspection and the HEUFT *FinalView*^{II} *LBL* for teach-in-capable label inspection. HEUFT *reflex*^{AI} also realizes a new dimension of precision here.

One of the trade fair highlights at BrauBeviale 2024 in Nuremberg, however, will be how smart the AI-supported image processing system

developed in-house detects glass splinters in empty and filled bottles
and minimizes the false rejection rate – and will be clearly demonstrated
at special enlightenment stations.

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X-ray empty bottle inspection: detection reliability as standard

Still completely new at drinktec 2022, ready for series production at BrauBeviale 2023 and already in operation for BrauBeviale 2024: the HEUFT *InLine*^{II} IX is going to the starting line!

Intelligent color sensor cameras developed in-house for optical all-surface empty bottle inspection with new precision. In-house developed AI technologies of the latest generation. Perfected pulsed X-ray for maximum operating and detection reliability for the challenging identification of glass in glass and critical defects such as inclusions or shell-shaped fractures at the bottom of the bottle. And a revised HEUFT *CleanDesign* for better accessibility and less cleaning and maintenance work: the HEUFT *InLine*^{II} IX has gone into series production just in time for the BrauBeviale in Nuremberg at the end of November 2023!

HEUFT's latest empty bottle inspector, which combines smart camera and pulsed X-ray technology, was still on show as a study at drinktec 2022 in Munich. In the meantime, the first devices are already in operation – at bottlers of glass bottles who are particularly concerned about glass-splinter-free primary packaging that can be filled without hesitation. With new, lifetime-optimized X-ray components and AI-supported X-ray image processing, it ensures even greater precision in glass-in-glass detection at the bottom of the bottle.

It is the only empty bottle inspector of its kind: HEUFT developed the concept of integrating X-ray technology to complete packaging and food safety in filling lines over ten years ago – and has been driving it forward ever since.

This also applies to the intelligent complete optical inspection of each individual bottle from the base to the neck finish. This is now carried out exclusively by HEUFT *reflexx*^{A.I.} cameras developed and manufactured

in-house. With adaptive LED lighting, smart image analysis and corresponding camera technology they not only open up completely new possibilities for the inline inspection of empty embossing or ACL bottles. The precision of the seamless inspection increases significantly. Transparent film and other foreign bodies and low-density contaminants are detected just as reliably as inclusions, scratches, cracks, breakouts and scuffing. Thanks to doubled resolution and distortion-free detection images, this applies in particular to the quadruple sidewall inspection, which covers well over 360° of the container volume.

HEUFT *fluid modules* for the reliable detection of residual liquids are now also directly integrated into the easily accessible, table-less new construction of the highly automated inspector in the hygiene-optimized HEUFT *CleanDesign*.

However, the HEUFT *InLine II IX* achieves a new level of precision with the lowest false rejection rate, particularly when it comes to the challenging glass-in-glass detection – thanks to new X-ray components developed in-house and the HEUFT *reflexx A.I.*! Ready for series production, the all-surface empty bottle inspector, which is already being used in several bottling lines to ensure the safety and quality of the empties, will certainly be one of the trade fair highlights at BrauBeviale 2024.

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Optical and radiometric full bottle inspection: no more blind spots!

The latest release of the HEUFT *eXaminer II* XOS is not only advancing the state of the art in full bottle inspection when it comes to glass-in-glass detection.

Word has gotten around in the industry that a full container inspection at the end of line is more than advisable, at least wherever beverages are filled into glass bottles. This is the only way to detect glass splinters, for example, which get into the primary packaging between the empty bottle inspector and the capper and pose a massive threat to the safety of the end product. The HEUFT *eXaminer II* XOS has its finger on the pulse and is constantly redefining the state of the art for effective consumer and brand protection.

The release of the highly automated full bottle inspector presented at the last drinktec already achieved exceptional operating and detection reliability in glass-in-glass detection – thanks to consistently further developed components for pulsed X-ray inspection and intelligent HEUFT *reflexx*^{A.I.} image processing which now also uses deep learning to compensate for glass thickness fluctuations and smartly remove image noise and artefacts from the X-ray images.

The latest model goes one better: the compact full-field X-ray image converter is now closer to the base of the bottle for sharper images during full-coverage radiometric dual inspection. The integrated HEUFT *sinker* technology has also been perfected in order to identify foreign objects with a lower density such as plastic or sealing pieces in addition to glass fragments. Just like the HEUFT *floaters* for more precise optical identification of paper, foil and other foreign objects floating in the beverage.

New HEUFT *reflexx*^{A.I.} color sensor cameras, which already have an

adaptive LED illumination integrated as well as intelligent image evaluation, now generate eight front surface views of the bottle base. There are even 16 for the side wall inspection, guaranteeing a complete inspection of these areas without any blind spots. Mould, film and other weakly absorbent foreign substances in the bottle, which are not always visible during pulsed X-ray inspection for physical reasons, are identified just as reliably as soiling, label and adhesive residues, chips and cracks.

As the only end-of-line system of its kind, the further developed HEUFT *eXaminer II* XOS combines the latest version of pulsed X-ray technology with smart high-performance optics. The double radiometric base inspection for reliable glass-in-glass detection achieves a new level of precision with minimal radiation. The false rejection rate is reduced to less than 0.2 percent.

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Teachable label inspection: Teach-in in under a minute!

The HEUFT *FinalView*^{II} LBL makes label inspection more adaptive than ever before. New types and designs can now be taught in very quickly and easily. This is not only good for production quality but also increases the availability and Overall Equipment Effectiveness (OEE) of entire filling lines.

Individualization is the trend. This is particularly true for drinks packaging and its features. And what is more individual than your own image on the bottle label? Visitors to BrauBeviale 2024 will soon be able to create this themselves at the HEUFT stand 8-104. And see how quickly and easily a new individual design can be taught in so that such a personalized bottle is not rejected as being of a different type during label inspection, but is recognized as good.

With intelligent HEUFT *reflexx*^{A.I.} image processing the HEUFT *FinalView*^{II} LBL achieves this in less than 60 seconds! The teach-in assistant of the audiovisual HEUFT *NaVi user guide* makes the learning process child's play. Practically everyone is able to enter the new equipment variant into the system themselves without outside help. It immediately memorizes the changed label with all its characteristic features and design elements. This applies to your own photo as well as to short-term promotional labels.

With an unchanged container shape, a suitably equipped bottle only has to pass through the HEUFT *FinalView*^{II} LBL once – and HEUFT *reflexx*^{A.I.} has already permanently memorized the changed type. The changed label is no longer assessed as faulty. Hours of downtime for commissioning new types and variants are no longer an issue. The availability and productivity of entire filling lines increases significantly. And thus also their OEE.

And the intelligent in-line inspection subsequently identifies labels

which are actually of a different type just as reliably as those which are crooked, wrinkled or torn, for example. Four HEUFT *reflex* ^{A.I.} high-performance cameras on two levels generate an undistorted 360° panoramic view of each individual bottle on which even the smallest defects are detected and marked in real time.

Easy to connect to full container inspectors and fill management systems such as the HEUFT *SPECTRUM* ^{II} VX, the high degree of automation and the intuitively understandable, audiovisual HEUFT *NaVi* user guidance of the HEUFT *SPECTRUM* ^{II} platform make the adaptive label inspection possible.

At BrauBeviale in Nuremberg, anyone can try out for themselves how quickly and easily the individual teach-in works at the HEUFT stand 8-104 from November 26 to 28, 2024 – using a personal bottle with their own image on the label!

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High-speed empty can inspection: clever image analysis

Ensuring sealability, preventing closer blockages and the associated loss of productivity, detecting faulty and contaminated packaging in good time before filling. The HEUFT *canLine II* carries out a quality inspection of up to 144,000 empty beverage cans per hour. The clever HEUFT *reflexx A.I.* image analysis perfects the simultaneous base and rim inspection with just one camera.

Identifying deformations, indentations and defects on the rim of the neck finish of empty cans just as reliably as dirty and dented inner walls or impurities and foreign objects on their base. The compact HEUFT *canLine II* does all this with just one HEUFT *reflexx A.I.* camera in a top-down arrangement in which an image evaluation system for targeted object detection and classification is directly integrated. The intelligent color sensor camera achieves such a depth of field that no critical defect is overlooked.

With the HEUFT *reflexx A.I.* image evaluation it is now also possible to compensate for the brightness of the adaptive LED lighting so that the base and crimped edge of the empty cans are always well enough illuminated on the images to reliably detect critical defects in both areas at the same time. And when detecting oval-shaped cans which may not be able to be securely sealed, the tolerance can now be individually adjusted with the HEUFT *reflexx A.I.*

The compact system can also be extended by an additional detection unit in order to ensure that the empty can inspection also completely covers the sloping inner shoulder area just below the can opening which is difficult to see: Based on the HEUFT *FinalView II CAP* technology for 360° closure inspection, it generates a total of eight high-resolution camera views directly on the conveyor belt from exactly the right perspective which show the sensitive area below the rim of each

individual can from all sides. Even the smallest damage, adhesions and contaminants such as material defects, paint defects, oil or grease residues and stains are reliably identified. Even at high speed with minimal distance between the individual containers on the belt.

The higher-level HEUFT *SPECTRUM* ^{II} platform achieves the highest level of automation and support for the user: the height and LED illumination of the intelligent camera is automatically adjusted to the new container format when the type is changed as well as the passage width of the guide rails in the inspection area. The HEUFT *NaVi* user guidance offers the operator audiovisual step-by-step assistance which makes every changeover self-explanatory.

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Closure inspection: Full coverage

The HEUFT *FinalView*^{II} CAP now also inspects difficult cap types such as tethered caps seamlessly and with high precision.

Full cap security all round! The HEUFT *FinalView*^{II} CAP is now fit for new challenges in the complete optical inspection of closures and their safety elements in order to guarantee this, among other things, for the most varied types of tethered caps:

A software upgrade makes it possible to roll out four individual camera recordings of asymmetrical tethered caps into a 360° view. This ensures complete coverage. New lighting hardware facilitates all-round inspection of the tamper-evidence bands of rPET bottles. And the advanced closure angle detection reliably checks whether all containers are actually correctly and tightly closed.

Transmitted light is used to detect defects on the tamper-evident band of all types of caps. Combined with a realistic frontal inspection in incident light, much more is possible, especially with asymmetrical tethered caps. Protruding hinges and unusual gaps in the tamper-evidence area then no longer lead to false rejections. The rotational asymmetry of some of these new types of caps can even be precisely calculated using the intelligent HEUFT *reflexx*^{A.I.} image processing system.

Where it used to be common practice to only generate a black and white view, four color cameras with incident and transmitted light can now be integrated into the HEUFT *FinalView*^{II} CAP. In contrast, the size of the errors that can be detected on the tamper-evidence band is reduced by a factor of three. Blind spots are no longer an issue and the software update mentioned at the beginning also increases the precision of the seamless 360-degree inspection by a good 50 percent.

Compared to its predecessors, the HEUFT *FinalView*^{II} CAP offers twice as

many color cameras and six times the resolution. The maximum diameter of closures which can be fully inspected has been increased by a factor of 1.5 and the possible height difference between the smallest and largest full bottle which can be safely inspected has been increased to 30 centimetres.

Brand and format changeovers can be carried out at the touch of a button. Easy to connect to full product inspectors and fill management systems such as the HEUFT *SPECTRUM* " VX, the high degree of automation and the intuitively understandable, audiovisual HEUFT *NaVi* user guidance of the HEUFT *SPECTRUM* " platform make the complete inspection of the closures simple – and achieve complete coverage even with asymmetrical tethered caps.

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AI-supported image processing: Reduce the false rejection rate!

HEUFT's image processing has been using artificial intelligence (AI) for a long time to clearly distinguish critical objects from harmless ones. Consistently further developed, HEUFT *reflexx*^{A.I.} now increases the detection accuracy even further – and reduces the false rejection rate.

Intelligent object recognition instead of a simple brightness comparison during image evaluation: HEUFT took this step over 20 years ago in order to increase the precision of the in-line inspection and reduce the proportion of incorrectly rejected good products. For more than ten years, the real-time image processing from our own development and production has been using AI to classify the detected objects, differentiate between genuine defects and harmless structures, implement a targeted teach-in and reduce the false rejection rate to less than one percent.

Continuously further developed, HEUFT *reflexx*^{A.I.} now also uses new hardware to implement *deep learning*-based denoising of X-ray images in order to further increase detection accuracy when detecting foreign objects. And in optical quality inspection, smart image processing now not only filters out water droplets on the bottle, but also makes it possible to see what is behind them.

The smart image processing can now be integrated into the specially developed HEUFT *reflexx*^{A.I.} camera with adaptive LED lighting, which processes and evaluates its own images directly in real time. These do not have to be transferred to the control or inspection device first. The camera can be easily connected to these, which means that much more can be achieved in the high-speed inspection of empty and full goods.

And with significantly higher resolution. The hardware and software

developed in-house combines classic image processing methods with modern AI methods such as object recognition, classification and learning functions. Nevertheless, you are not completely at the mercy of the AI, as if you were sitting in a self-driving car without a steering wheel and brake pedal. Unlike other providers, the object evaluation does not come from an unchangeable black box with countless unknowns. Instead, people can intervene at any time:

If, for example, an unknown object that has never been detected before is detected, the AI initially assesses it as a defect for safety reasons. However, the user always has the option of modifying the quality assessment based on their own experience and defining the identified structures as good and non-critical for product and packaging safety - or temporarily tolerating them if necessary. Production can then continue safely even in such cases without impairing the AI network or having to undergo time-consuming and energy-intensive retraining.

If necessary, the rating can therefore be changed easily: The expertise of experienced people in filling and packaging is not rendered obsolete. Instead, it is incorporated into the smart image analysis as required. This means that every single object can be taught into the multidimensional feature space fully automatically and classified individually in order to distinguish genuine defects from harmless structures such as drops of water.

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Fill management: identifying underfilling and overfilling even with fluctuating glass thicknesses

A very special X-ray module provides HEUFT's full container inspection and fill management devices with a clear plus in terms of functionality and detection reliability. The HEUFT *ONE*, HEUFT *PRIME* and HEUFT *SPECTRUM* ^{II} *VX* use one and the same measuring bridge to find underfilled and overfilled containers at the same time – and even compensate for thickness fluctuations in the container glass. An exact fill level check is thus realized even in difficult cases.

If there is less in it than it says, this is not only a legal problem, but also really annoying for the customer. After all, they have paid for the full nominal quantity stated on the label! So it's no wonder that they feel cheated and reach for a competitor's brand next time. On the other hand, bottlers don't want to deliver overfilled bottles. After all, they don't want to give away any of their valuable product and also want to prevent too much content from leading to burst containers during transportation, at the retailer or at the end consumer's home. A fill level check that identifies both underfilling and overfilling and reliably rejects affected primary packaging is therefore more than advisable. Especially if it also ensures that underfilled bottles, for example, are not mistakenly judged to be correctly filled due to deviating glass thickness.

All this now works in one and the same operation with just one single X-ray module which can be connected to the compact HEUFT *ONE*, the HEUFT *PRIME* and the HEUFT *SPECTRUM* ^{II} *VX* fill management system as standard. Where previously two measuring bridges were required to detect both underfilled and overfilled bottles, jars and cans, the newly developed single module is now sufficient in virtually all applications: even with a distance of 25 millimetres between the lower and upper filling limits the fill level inspection completely covers the area

in between.

Thanks to a recent extension of the self-programmed software and the new design of the X-ray receiver, the innovative measuring bridge not only carries out one, but up to twelve staggered measurements of the X-ray absorption of each individual packaging material – distributed over the entire height of the filling area to be checked. Fluctuations in the thickness and structures in the container glass, which absorb the X-rays so strongly in the conventional one-dimensional measurement that the actual fill level of the contents could be overlooked, are detected by the additional measurement results and can therefore be specifically compensated for.

This means that checking the filling quantity provides accurate results even in difficult cases. Underfilled containers with increased glass thickness are no longer mistakenly regarded as good and can no longer be placed on the market. The innovative X-ray measuring bridge also reliably detects underfilling and overfilling in opaque packaging, metal containers and full containers with special contents such as oils or high-proof alcohol. It can be integrated into the particularly compact HEUFT *ONE* entry-level device as well as into the HEUFT *PRIME*, which offers even more functionality for checking full containers. And of course also in the HEUFT *SPECTRUM II VX* which realizes comprehensive management of the filler and capper.

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Optimum entry to empty bottle inspection at HEUFT level

Especially for craft brewers and SMEs: the HEUFT *InLine*^{II} IR makes real cutting-edge technologies for the reliable full inspection of empty bottles accessible to beverage bottlers with lower line outputs, little space and high quality requirements. The particularly compact system combines a proven design and sophisticated detection technologies with the high performance and self-explanatory user guidance of the HEUFT *SPECTRUM*^{II} platform.

Fully inspect all surfaces of every single bottle before filling and benefit from an unprecedented level of automation, detection, tampering and operational reliability: It's not just the big players in the industry that want this. Smaller breweries and bottling plants no longer have to do without it either. The HEUFT *InLine*^{II} IR combines the proven design and sophisticated detection technologies of the longstanding benchmark in empty bottle inspection with the high performance of the HEUFT *SPECTRUM*^{II} platform and the intelligent HEUFT *reflexx*^{A.I.} real-time image processing. And all this in an extremely space-saving system with a footprint of just one square meter.

The tried and tested optics in the HEUFT *InLine*^{II} IR cover the entire base, neck finish and thread area in the smallest of spaces. And with a corresponding module in the outlet a genuine 360° inspection of their side walls is also possible at lower speeds of up to 36,000 empty bottles per hour – and thus an inspection of all their surfaces without blind areas. As always with modular HEUFT *SPECTRUM*^{II} systems even more is possible as an option: The integration of an additional detection unit for the side wall inspection realizes complete coverage without gaps even with higher line outputs.

The HEUFT *reflexx*^{A.I.} technology developed in-house combines and analyzes the detection images in real time and enables targeted teach-in.

Serious defects and foreign bodies are thus detected in good time and clearly differentiated from harmless aesthetic defects.

The integrated infrared detection with its own LED lighting prevents product contamination from oil or paint residue in the empty bottle. The HEUFT *fluid* module for the reliable detection of harmful residual caustic solution can be attached directly to the bottle conveyor in a simple and space-saving manner.

Even with little space in the line, a real full inspection of every single empty bottle is possible. And at HEUFT *SPECTRUM II* level: the HEUFT *InLine II IR* is based on the latest, further optimized release of the new generation device platform – and combines a further plus in computing power and precision for product tracking, inspection and fault rejection with the self-explanatory HEUFT *NaVi* user guidance. Craft brewers and SMEs with limited space also benefit from automation, detection, manipulation and operational reliability at the latest HEUFT level.

Leak detection: greater reliability in leak detection

Micro-leaks, cracks, closure faults: the HEUFT *squeezer*^{II} QS has the necessary performance to reliably identify and precisely reject leaking plastic bottles.

Detection reliability up, false rejection rate down: Thanks to the latest version of the highly automated HEUFT *SPECTRUM*^{II} device platform alone, the self-explanatory system simply achieves more when checking filled PET bottles for leaks.

The flexible belt drive, which guides, rotates and compresses the containers in a well-dosed manner, is extra-long – and so is the available inspection path. This increases the precision of the comparative fill level inspection in the unpressurised and pressurised state. Also perfected: The sensor technology for exact internal pressure measurement is now even more sensitive.

The HEUFT *FinalView*^{II} CAP for the 360° cap inspection can now be directly connected to the HEUFT *squeezer*^{II} QS so that a detailed all-round inspection of the PET bottle caps and all their safety elements can be carried out completely seamlessly from the contour and thread inspection to the cap logo detection and the all-round inspection of asymmetrical tethered caps.

The leakage check system carries out automatic brand and program changes: The position of all detection modules as well as the height and throughput width of the servo-controlled belt drive automatically adapt to the changed format. The ergonomic construction in the hygiene-optimized HEUFT *CleanDesign* facilitates the operation and cleaning of the HEUFT *squeezer*^{II} QS. The individually adjustable new goose neck panel, for example, creates more flexibility. The user always has the touchscreen with the audiovisual HEUFT *NaVi* user interface in view.

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Company profile: HEUFT is SYSTEMTECHNIK

Quality, safety, efficiency: these are the key factors in the filling and packaging of beverages, food and pharmaceuticals! Modular control, inspection and labelling systems from HEUFT SYSTEMTECHNIK GMBH implement these key factors effectively and simply. With maximum productivity, they ensure that only flawless products reach the market.

Unique camera, X-ray and intelligent image processing technologies for precise empty and full container inspection, trend-setting labelling technology and smart tools for container flow optimization, production data acquisition and performance analysis ensure sustainable product quality and line efficiency!

A consistent modular principle with a cross-system control unit for a wide range of technologies, processes and modules generates the right automation solution for every application with a high degree of component uniformity.

Anyone who opts for a user-friendly HEUFT system can rely on a high level of operational reliability. With long-term availability of spare parts and 24/7 service availability, competent support is always guaranteed.

This concept keeps the globally operating company on a dynamic growth path. The number of employees has long since exceeded the 1,000 mark. The company's own sites in 18 different countries and a close-knit network of service centres on all continents satisfy the high demand for HEUFT systems manufactured exclusively in Germany. The result: greater safety, quality and efficiency in the filling and packaging of beverages, food and pharmaceuticals. HEUFT ... knows how!

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Fact Sheet

Company:	HEUFT SYSTEMTECHNIK GMBH
Management:	Alexandra Heuft, Bernhard Heuft, Bastian Heuft, Dr. Thomas Jahnen, Thomas Holzberger
Company headquarters:	Burgbrohl, Rhineland-Palatinate, Germany
Other locations	Argentina, Australia, Brazil, China, Denmark, France, Great Britain, Hong Kong, India, Italy, Mexico, Netherlands, Austria, Russia, Spain, Thailand, USA
Foundation:	01.04.1979
Employees:	1,200 in the HEUFT Group, including over 750 at the Burgbrohl production site
Sector:	Special machine construction
Product range:	in-line inspection, quality control, labelling, rejection, transport and IT systems for the beverage, food and pharmaceutical industries
Applications:	empty bottle inspection, bottle sorting, fill management, full container check, full bottle inspection, foreign object detection, fault rejection, container transport, conveyor control, labelling, label inspection, code verification, production data acquisition, line analysis, brand and recipe management
Internet:	heuft.com