

COMMUNICATION FROM SPECIALIST TO SPECIALIST

One Way glass bottles for beverages

ADDITIONAL INSPECTION DIRECTLY BEFORE FILLING IS BECOMING STANDARD!



About the Author

Dr.-Ing. Markus Grumann
Managing Director miho Inspektionssysteme GmbH
based in Ahnatal near Kassel.
mgrumann@miho.de

After a decline period, glass as a container material for beverages has experienced a strong upswing in recent years. More and more frequently, the control of glass bottles „only in the glassworks“ is no longer enough. The solution is to extend inline inspections in the bottling line to include empty glass inspection directly before filling, supplemented by filler monitoring (both as CCP as part of an HACCP concept).

Compared to reusable glass for beverages, one-way glass offers a significantly greater variety of shape and decoration. In addition, the types of defects differ considerably from those in returnable glass. The ideal empty bottle inspector should therefore, in addition to being highly accurate and reliable in terms of defect detection, be able to inspect even the smallest containers and also non-cylindrical glass bottles, in order to be prepared for the future.

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Away from PET, towards glass - it is not presumptuous to speak of a trend reversal of containers for beverages! While glass lost market shares compared to other container materials, mainly PET, for a long time, glassworks have been recording sales growth for years now, in 2020 even despite Corona.

The trend towards glass, with the attributes of sustainability and purity, gives the glass manufacturers full order books and exacerbates the conflict between achieving production figures on the one hand and quality specifications at the cold end on the other.

The risks of bottle damage or contamination during transport have also to be considered. Finally, the retailers' demands on product safety, as the buyer of the products, are rising year after year. Conversely, the reliable inspection of the empty

Reasons for the one-way glass inspection at the filler:

- declining quality efforts of the glassworks
- resorting to glassworks from abroad (Eastern Europe) with significantly lower quality standards due to the high demand in the market
- Documentation of the quality deficiencies of the glassworks for the purpose of quality improvement or recuperation
- Increasing demands of the bottler's customers, especially at the LEH or in the export market
- Possibility to reduce costs: less loss of product and packaging, less downtime
- Avoidance of image loss due to defective products in the trade or even through public recalls (www.lebensmittelwarnung.de)

bottles enables the beverage producer to document quality defects as his basis for negotiations with the glass supplier towards compensation and glass quality improvement. The following article limits itself on the inspection of empty bottles for

one-way glass in beverage bottling. The combination of modern filler and capper monitoring, with state of the art empty container inspection, guarantees the bottler that the filled products are free of glass-related faults.

The renaissance of the glass container

BV Glas, 29.09.2020: "Conversely, production figures in the container glass industry rose by 8.5 percent. This segment has profited from the in-home food and beverage consumption trend during the pandemic. Pharmaceutical glass manufacturers' business expectations are also positive. This segment is preparing to manufacture millions of glass vials for the coronavirus vaccine." *1

The types of defects in one-way glass

For manufacturers of inspection machines for glass containers, the faults in one-way glass are at first classified according to the severity of the risk posed by the defect. Secondly –in purely technical terms– according to the position of the defect and the possible detection strategy.

There are countless classifications of defect types, all of which have in common the requirement that container defects that pose a health risk to the

consumer are rated as critical.

The location of the defect best classifies the critical defect. The CETIE Institute³ gives a precise specification of critical defects that can occur along the glass container (from the top to the bottom), see Figure 1. There is an accumulation of faults in the container's upper area, which, for example, is manufactured with a thread structure for the closure.

Classification of one-way glass defects

Classification of new glass defects according to the risks involved, according to American Glass Research²

- Critical defects, which primarily lead to a risk to the consumer.
- Functional defects that can lead to failures in the subsequent process, e.g. bottle breakage
- Impairment of stability
- Increase in internal stress
- Cosmetic defects that do not affect the function of the product

Critical glass defects and their occurrence, according to the CETIE Institute.

Location	Critical defects
Finish	Overpressed finish Stuck plug Sugary top / Sugary bore Ring finish damage High top
Neck & Shoulder	Choked bore Glass membrane
Body	Stuck glass Flanged joint Internal contamination Tramp glass Fused glass insid
Bottom	False bottom Spike
General	Birdswing

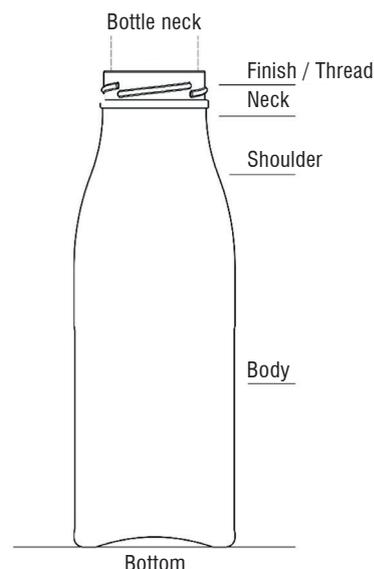


Figure 1: Critical glass defects and their occurrence, according to the CETIE Institute.



Figure 2: Examples of critical defects in the top area of glass bottles: Finish, thread area and transition to the neck area. Defects of this type can be reliably detected and rejected with the miho David 2 Empty Bottle Inspector.

The following picture gallery shows examples of one-way glass defects classified as „critical” in the bottle’s upper area (Figure 2). The miho David 2 empty bottle inspector from miho Inspektionssysteme GmbH can reliably detect all defects of this type.

For the inspector’s technology, it is essential whether the glass container has a circular shape or has a profile that deviates from circular. There are plenty of oval, square and one-sided flattened glass containers around. The bottle’s base (illustration 3) or body inspections (illustration 4) via the miho David 2 are nevertheless ensured.

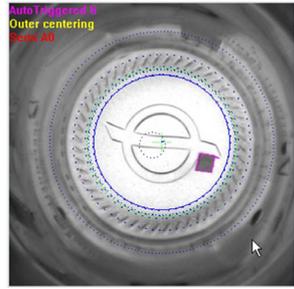
The lower area of the glass container

To detect glass fragments on the bottom of the container, in particular, some manufacturers now use X-ray technology. The use of this technology, however, is fraught with hurdles such as compliance with special approval procedures and fire protection regulations or the appointment of a radiation protection officer. The follow-up costs with regard to X-ray generators and image converters are not to be neglected.

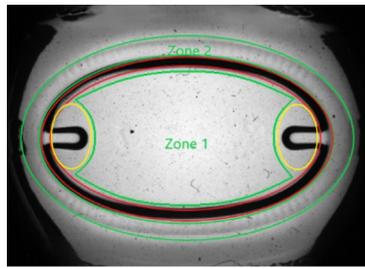
In addition, there is the worldwide organic trend (for example, www.bio-mineralwasser.de) with the consequence for the bottling plants to stay away from using ionising X-ray radiation.



Non-cylindrical bottle with embossing on the base. Unrestricted inspection in the green area



Despite the embossing, the opaque contamination is detected



Oval bottles with grooves for container orientation. Unrestricted base inspection in the green area



External chipping due to damage during transport

Figure 3: Empty bottle inspection in the lower area of the glass container: Here, the shape of the glass container poses a particular challenge if it deviates from a circular shape or has embossing. If the inspection of the empty bottle is positioned in front of the rinser/filler, the bottles are dry which is advantageous for the base inspection: a sharper defect detection with acceptable false rejection is then possible.

The ideal inspector of the empty one-way glass bottle in the filling line

For filling lines handling 20,000 containers per hour and up, one cannot ignore the advantages of a linear inspector with lateral belt guidance as the central part of the inspection machine. It is also crucial to choose an experienced equipment manufacturer aware of the specific demands of beverage filling lines.

With a modern empty bottle inspector like the miho David 2 in the design for glass containers, the detection possibilities for one-way glass faults are tremendous and offer additional security after the final inspection in the glassworks.



Figure 4: Disposable glass containers with defects, some critical, in the area of the body of the bottle or container.

The miho Inspektionssysteme GmbH with its headquarters at Ahnatal near Kassel, has been a manufacturer of control and inspection equipment for the beverage industry for over 40 years.

miho has been building empty bottle inspectors for almost 30 years. Since then, more than 500 devices have been installed worldwide, in recent years more and more frequently for one-way glass inspection, and not only for bottles.

The current empty bottle inspection machine miho David 2 in the design variant for one-way glass was designed from the beginning to be as flexible as possible. Circular, oval or rectangular shapes can be inspected as well as extremely small containers down to a filling volume of only 50 ml.

However, even a linear machine such as the miho David 2 using the lateral belts for the base and neck finish inspection reaches its limits when the container deviates significantly from the circular shape. The 90° rotation of the container in the lateral belts area is then no longer possible - a prerequisite for the 360° sidewall inspection. In the case of complex bottle shapes, miho therefore implements special turning mechanisms defined according to the project requirements



Figure 5: The miho David 2 empty bottle inspector from miho Inspektionssysteme GmbH in three different device configurations, suitable for inspecting glass containers.

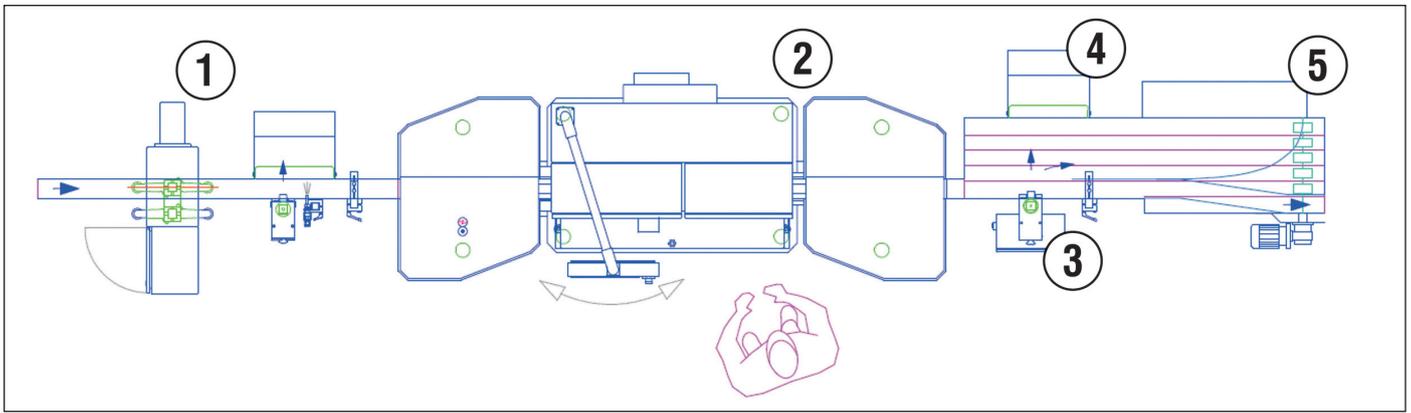


Figure 6: Schematic top view of the miho David 2 Empty Bottle Inspection Machine in the dual sidewall configuration (significantly larger 360° sidewall coverage). The containers come from the left and are inspected for geometric errors in a camera-based infeed inspector (1). The central inspector (2) checks for all defects. The reject table can be used, for example, for test bottles. The servo pusher (3) at the reject table directs the container individually into the broken glass container (4) or upright onto the reject table (5).

Inspection of empty glass bottles with decoration

Decorations such as ACL (applied ceramic label) or „direct digital print“, pose an additional challenge to empty bottle inspection, see figure 7. There seems to be no limit to the variety of decorations. The sidewall inspection's art is to distinguish between the structures of the decor and soiling or damage.

Especially for such glass bottles, where the identification of a defect has to be carried out highly dynamically, miho Inspektionssysteme offers also the sidewall inspection in the areas with décor via its OpAL (optimised allocation logic) software. Miho OpAL works with decor such as printed motifs (ACL) special features such as embossing or a relief structure.



Figure 9: The one-way glass bottle with a volume of 60 mL at the infeed of the miho David 2 in the XS version.

Inspection of the smallest containers

Actually paradoxical: the smaller the container, the greater the inspection difficulties! With the innovative XS variant of the David 2, miho can now inspect empty glass containers down to 65 mm container height and 30 mm container diameter and nominal volumes down to 50 ml!

To ensure the optimal inspection of small size bottles, a special drive and transport concept for the empty bottle inspector was designed, which, on the one hand, enables the bottles to be safely transported inside the machine, and on the other hand, ensures the accurate inspection of the bottle sealing surface and base.



Figure 8: A one-way glass bottle with a nominal volume of 60 mL and a blister in the base. This defect is reliably detected with the XS version of the miho David 2.

An investment that pays off



Many one-way glass beverage bottlers do not yet have an inspection system to check the bottle's integrity before filling. From quality assurance and customer safety point of view, the glass manufacturer's inspection alone will not be enough in the long run. The good thing is that the bottler who invests in an empty bottle inspector gains financial and competitive advantages.

Yes, it pays off!

In a current project with a sparkling wine bottler the calculated ROI (return of investment) is less than two years, even though the bottling capacity is less than 20,000 bottles/hour and the annual filling hours is less than 1,000 hours.

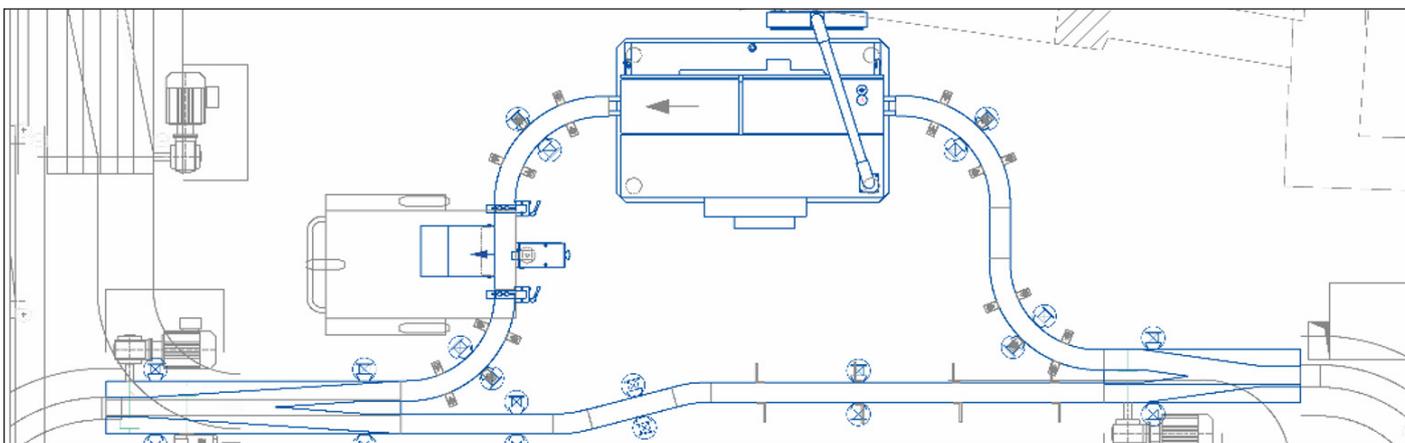


Figure 10: The miho David 2 inspecting empty one-way bottles with a volume of 60 ml. via a mechanical switch (see layout) the shots bottles come from the right side of the depalletiser, pass through the empty bottle inspector via the bypass and continue towards the left in the direction of the rinser.

In summary

The miho David 2 empty bottle inspector is designed for the inspection of one-way glass bottles before filling. It is based on robust and well-established technology and has been further developed following the market requirements for more than two decades.

For bottlers of shots, smoothies or spirits, the machine is just as perfectly suited as for the food sector (baby food, jam,...).

Commercial advantages of an empty bottle inspector in a one-way glass filling line

Avoid loss of product

Avoid loss of container and closure

Refund from claims to glass suppliers

Away from visual inspection reduced staff assignment

Reduced down time due to line-stops

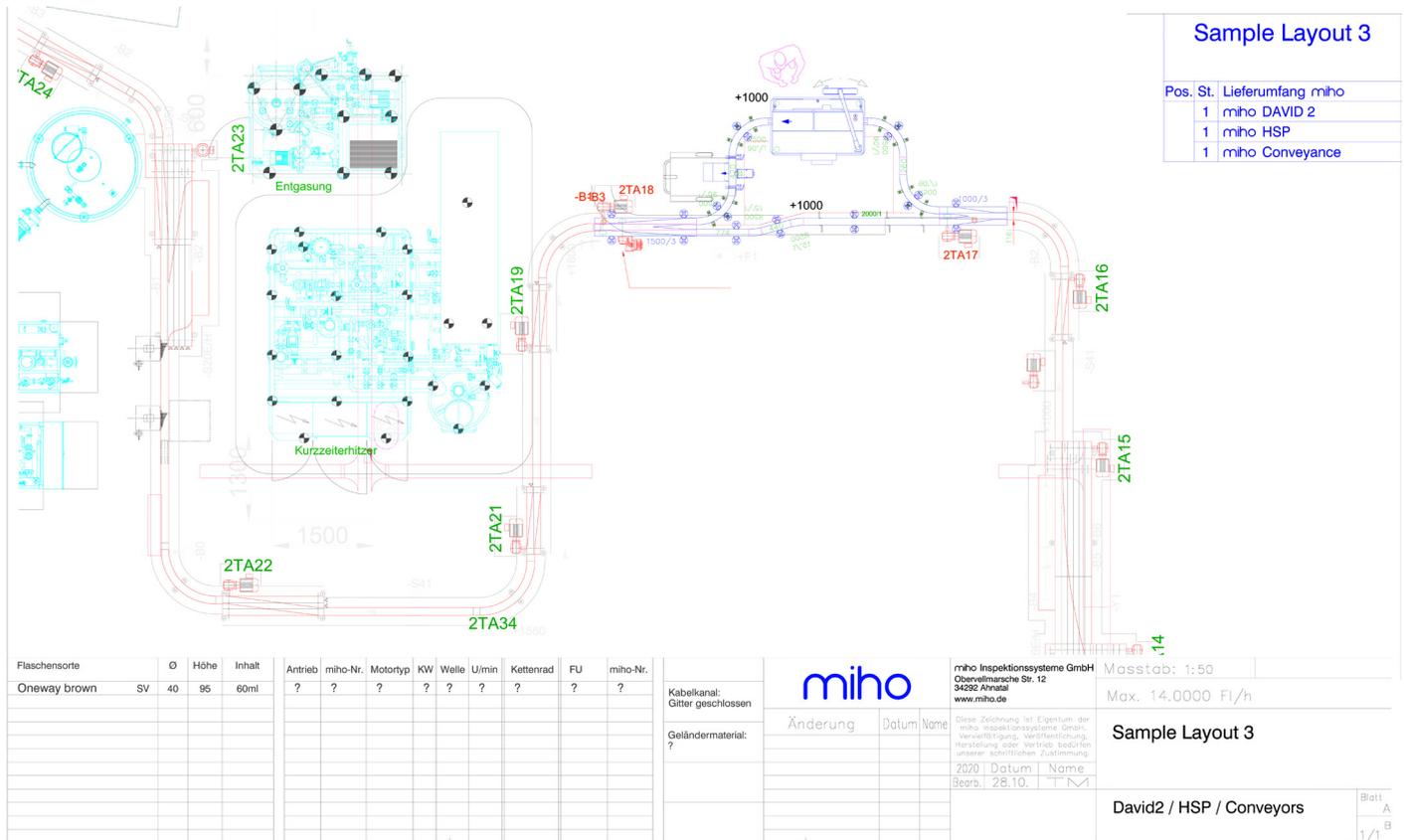
Send us your bottle samples, come to miho and see the inspection system.
Let us customize it for optimum results.

For more information we invite you to visit our website www.miho.de or to contact us directly by mail at info@miho.de

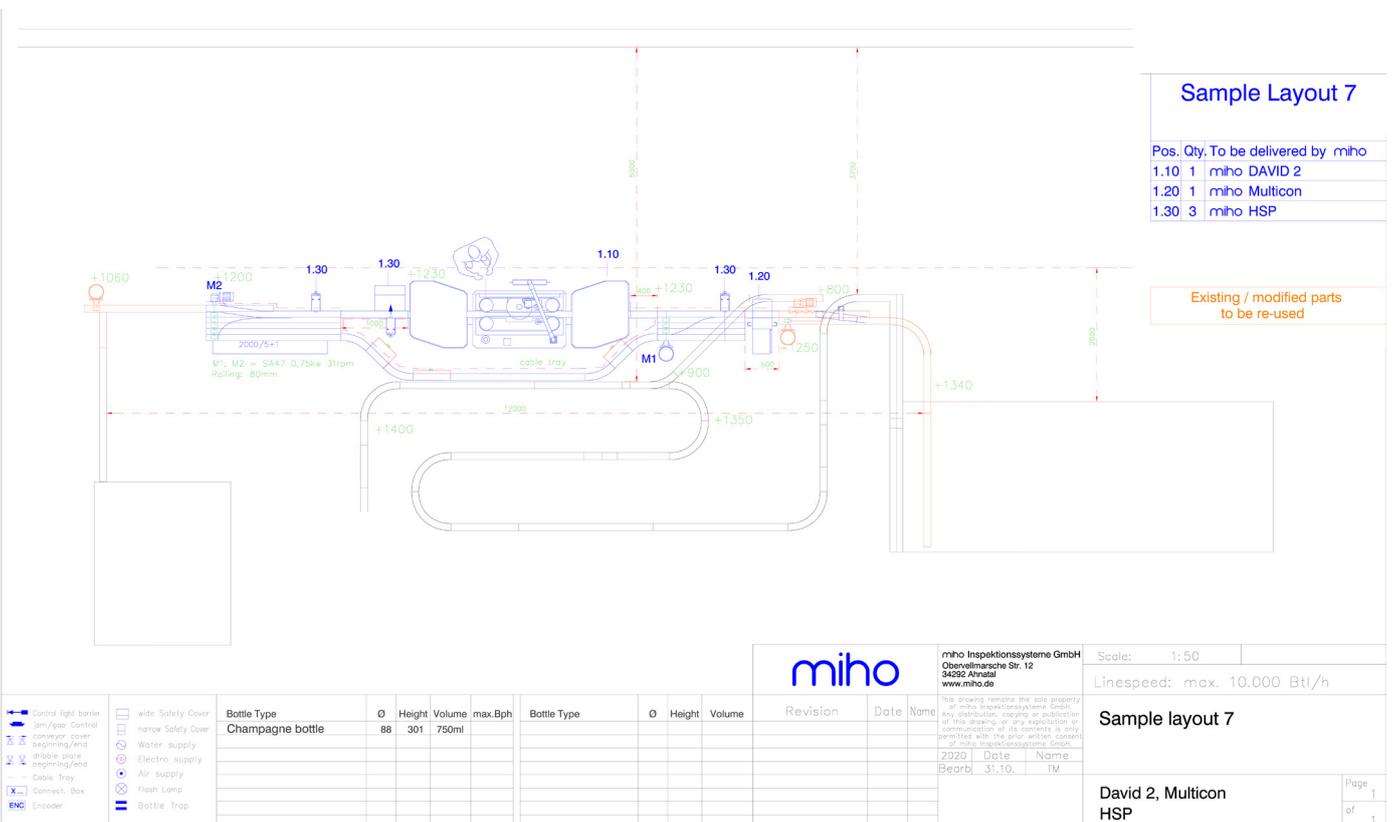
Literatur:

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2. American Glass Research: Color Atlas of Stones in Glass, ISBN 978-1-36-721388-3
3. CETIE France, General datasheet DT26.00, May 2020, Revision 2: GLOSSARY OF GLASS CONTAINER VISUAL CRITICAL DEFECTS, www.cetie.org

Appendix: Interesting Reference-Layouts



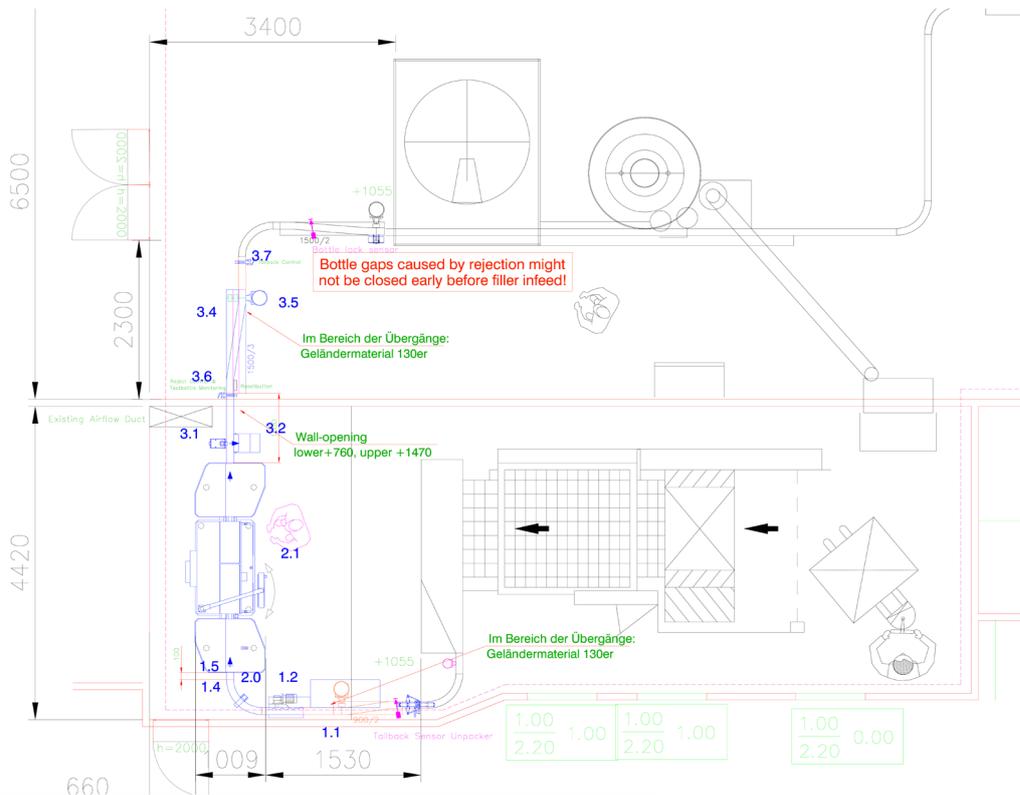
The miho David 2, fully equipped (Base, Finish, 2 Residual Liquid Inspections, Dual Side Wall, Finish Sidewall Inspection) for the inspection of washed sparkling wine bottles with a volume of 750ml. An infeed worm ensures uniform separation of the bottles. The upstream sorting miho Multicon rejects bottles with colour and shape deviations. To ensure ergonomic operation and easy removal of the rejected bottles, the two reject tables are connected to each other. The operator can thus remove all the rejected bottles in one place.



The miho David 2 in asymmetrical design to achieve maximum inspection performance with exactly specified installation space: For the inspection of square spirits bottles with MCA thread Infeed Sorting unit, Base, Finish, 2 Residual Liquid Inspections Dual Side Wall in combination with Single Sidewall Inspection, Finish Sidewall Inspection). For rejection, a miho HSPM with two-way rejection is used, which directs the bottles either onto the collection conveyor or into a broken glass container.

Sample Layout 6

Pos.	Qty.	To be delivered by miho
1.1	1	miho Threat Blowing Unit
1.2	1	miho Infeed Worm
1.4	1	miho Conveyance
1.5	1	miho Conveyance
2.0	1	miho Infeed control
2.1	1	miho DAVID 2
3.1	1	miho HSP rejector
3.2	1	miho Safety Cover
3.4	1	miho Conveyance
3.5	1	miho Drive Control
3.6	1	miho Backpressure Sensor
3.7	1	miho Testbottle Monitoring



Existing / modified parts to be re-used

Bottle Type	Ø	Height	Volume	Motor NB	miho-Nr.	Motor Typ	KW	Shaft	U/min	Gearwheel	Inverter	miho-NB	Cable Tray	miho Inspektionssysteme GmbH Oberwilmarsche Str. 12 34292 Ahnatal www.miho.de	Scale:	1:50	Linespeed: max. 6.500 Btl/h
				?	?	?	?	?	?	?	?	?					

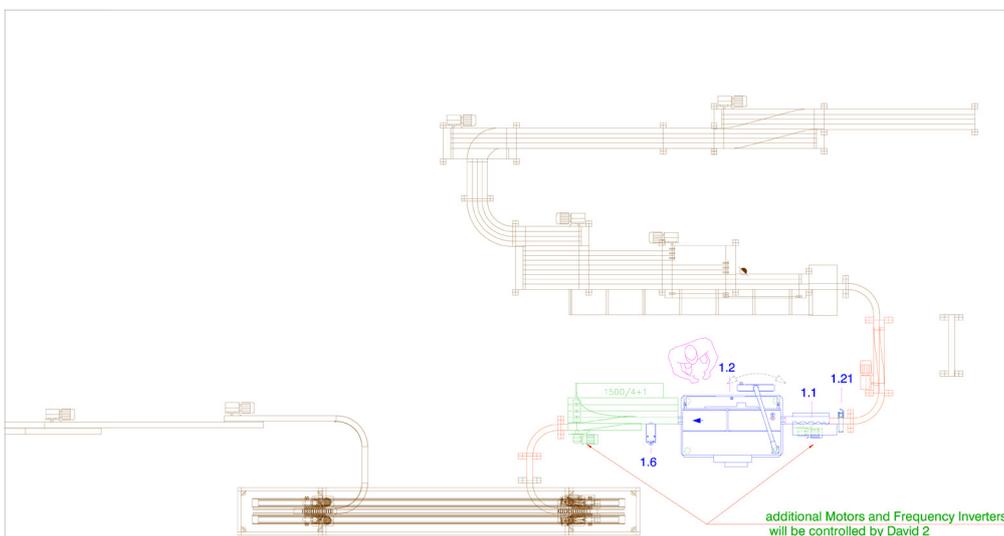
The miho David 2, fully equipped (Base, Finish, 2 Residual Liquid Inspections, Dual Side Wall, Finish Sidewall Inspection) for the inspection of one-way mineral water bottles with threaded finish. In addition to the infeed worm, the confined space conditions were also taken into account by dispensing with a reject table and a special test bottle monitoring system.

Sample Layout 8

Pos.	Qty.	To be delivered by miho
1.2	1	miho DAVID 2
1.6	1	miho HSP
1.21	1	miho ELK
1.1	1	miho Conveyance

To be delivered by local manufacturer

Existing conveyors to be re-used



Preliminary layout suggestion, all dimension and positions must be checked on site

Bottle Type	Ø	Height	Volume	Motor NB	miho-Nr.	Motor Typ	KW	Shaft	U/min	Gearwheel	Inverter	miho-NB	Cable Tray	miho Inspektionssysteme GmbH Oberwilmarsche Str. 12 34292 Ahnatal www.miho.de	Scale:	1:50	Linespeed: max. 15.000 Btl/h

The miho David 2 without Sidewall Inspection: For the inspection of square one-way bottles with MCA thread (Infeed worm, Base, Finish, 2 Residual Liquid Inspections, optional Inner Sidewall Inspection and Thread Inspection reflected light principle). For rejection, a miho is used. Worm and table drive are controlled directly by the miho David 2