

NeuroCheck for Medical/Pharmaceutical Applications

From glass tube to ready-to-use injector:
NeuroCheck is your partner in the pharmaceutical manufacturing process

In the pharmaceutical industry, the focus in automated production is on the highest quality and absolute safety. Minor manufacturing errors can have fatal consequences for the patient. This is why manufacturers of glass injectors rely on the use of NeuroCheck camera inspection systems that are employed several times in a syringe's production cycle.

To safely prevent faulty injectors, all components have to be inspected already at the point where they are fed into the production machine. Various types of glass tubes and cannulas are often combined using the same assembly line. This enables the manufacturer to meet customer demand for different cannula sizes and volumes in a flexible way. However, this flexibility holds the risk to combine the wrong parts. Because of this, every part, without exception, is subjected to a 100% type verification. High camera resolution ensures that even minimal differences with regard to cannula size or glass tube dimensions are identified reliably and removed.

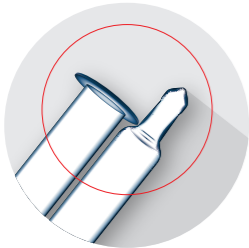
Besides type verification, the assembly inspection of individual components is one of the main tasks of an inspection system. Correct cannula protrusion and compliance with the maximum permitted mounting angle are queried, as well as the correct dosage of the adhesive that gives the medical device its stability.

The next production step is the inspection of the needle tip. Its cut is crucial to ensure that the patient can be injected as painlessly as possible. At the needle tip, the smallest deviation in the μm range is not acceptable.

NeuroCheck has developed a special test procedure to ensure that numerous consecutive processing steps do not damage the tips. Damaged needles are reliably detected regardless of the alignment of the cannulas. It is not necessary to turn the cannulas into a specific test position. This saves valuable production time and keeps the test application lean.

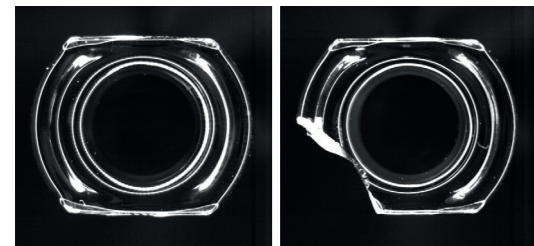
How is a glass syringe made and at what stages in the production process does NeuroCheck help to ensure quality?

1
Glass tube inspection for glass



Gauging

There are many shapes and sizes of injectors, depending on the application in the medical field. At the beginning of the manufacturing process of a glass syringe, a glass tube is brought into the desired shape by applying heat. Already at this stage, NeuroCheck checks the contour and size of the glass tube for possible damage such as broken glass or chipping.

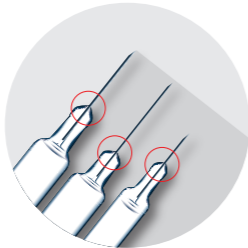


Result OK Result NOK
because of chipping

The inspection is carried out on the fly on moving parts in the production process on high-speed, multi-lane production systems.

For optimum image quality, the inspection system works telecentrically on the imaging and lighting side. Direct backlighting of the injectors on the assembly line is often difficult because of the workpiece carrier. That is why our engineers have developed lighting variants with prisms and mirrors. This tried and tested concept is specifically coordinated with the mechanical engineering partner and enables a telecentric lighting approach even in confined spaces. This is the key to high-contrast images that can be reliably evaluated.

2
Assembly and adhesive inspection to maintain



Presence verification

The glass tube and cannula are brought together in an automated gluing process. NeuroCheck then conducts the optical inspection of the adhesive to ensure that important dimensions such as total length, free needle length or inclined position of the cannula are adhered to. Additional dimensions can also be collected for the assembly of syringes in auto-injectors.

Innovative lighting concepts present adhesives with strong contrast. This allows the evaluation of the glue mound and the running-in characteristics of the glue itself even on the cannula tube.

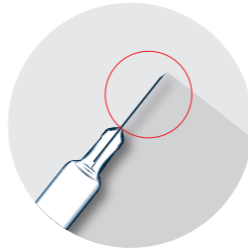
The most important inspection criteria are:

- Presence of the adhesive
- Form and completeness of the adhesive application
- Contamination in "prohibited areas" of the syringe
- Possible adhesive overflow
- Inflow depth



Result OK Result NOK because of
remnants of adhesive
on the needle shaft

3
Optical needle tip inspection for maximum

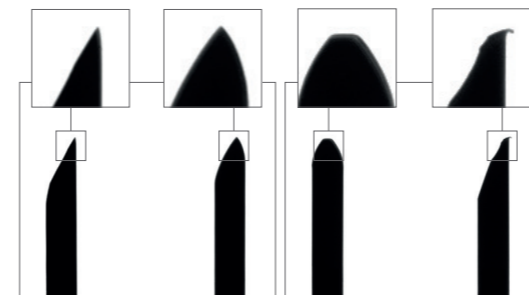


Gauging

Injection needles are available with a wide variety of tips, lengths and strengths. For production, this means a large number of different types and properties that are checked with NeuroCheck during the production process.



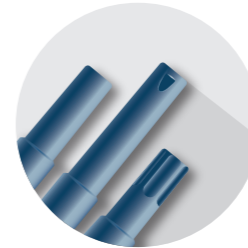
Deformations of the needle tip / needle shaft or contamination can occur during assembly. In order to recognize such defects and thus to give the patient the greatest possible safety, the needle tips are checked for length, diameter, angle and contamination from several camera perspectives without "pre-orientation". The evaluation is done using specially developed algorithms that enable the detection of defects in the range of a few micrometers.



Result OK Result NOK because of
damage to needle tip

The inspection of the patency of the needle is also done optically. A camera is positioned vertically above the injection needle and captures the passage. This ensures that the needle is not clogged and that the active substance in the syringe can escape cleanly during use.

4
Inspection of protective caps to exclude the risk of injury



Position/contour

A protective cap not only protects the needle tip, it also protects the user from injury. Depending on the type of syringe, there are many versions of protective caps which keep the injectors sterile until use.

The following inspection criteria are particularly important:

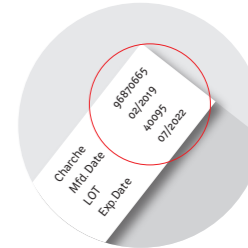
- Has the proper type of protective cap been placed on the syringe?
- Was the cap assembly done correctly?
- Was the needle bent when the protective cap was put on?
- When put on the needle, was the protective cap pierced?

NeuroCheck reliably detects deviations with the help of optical camera inspection. Thus, the risk of injury from a defective protective cap can be virtually eliminated.



Different types of protective caps for
injection needles

5
Packaging control of medical devices:
Character recognition



OCR/Character

At the end of the production process, medical products are labeled according to strict legal requirements. Illegible labeling can have serious consequences for patients and manufacturers. In addition, rejects due to faulty markings are particularly expensive at this production stage. In order to rule out incorrect labeling, the labeling is checked by visual camera inspection.

This prevents,

- the wrong content from being applied,
- the wrong part being marked, or
- markings being applied that do not survive the subsequent manufacturing process (e.g. cleaning, sterilization, passivation after marking).



LOT-Nummer, Verfallsdatum und weitere Pflicht-
angaben müssen gut lesbar sein

High-quality switch cabinet technology

NeuroCheck switch cabinet production

NeuroCheck inspection systems can be integrated into existing systems, but are also available as complete stand-alone systems in a switch cabinet. The special requirements of the production environment are always taken into account. NeuroCheck discusses the required surface quality (e.g. stainless steel for clean room applications), adequate air conditioning and integration into the assembly environment closely with the customer.

Our particular strength is the years of experience of our employees and the knowledge of the industry-specific requirements that every inspection application entails. NeuroCheck relies on quality standards that meet the highest demands.



Made for industrial production

We guide our customers step by step through all phases of the development of a powerful image processing solution

▪ Feasibility Study

At the beginning of a project there is a feasibility study with relevant product samples in order to work out the optimal inspection method. Various types of lighting and inspection approaches are examined here. At the customer's request, requirements and local conditions can also be evaluated during an on-site visit.

▪ Development of the inspection solution

The inspection solution is developed based on the results from the feasibility study. The structure is integrated in close cooperation with the planning level of our customers.

▪ Engineering

Highly qualified engineers develop complete inspection systems for production processes. The application potential covers the entire range of industrial visual inspection tasks. The basis for this are closely integrated concepts that guarantee smooth interaction of illumination, optics, camera, and evaluation software.

▪ Deployment

Before an inspection solution goes into operation at the production line, our employees set the cameras and lighting, carry out calibrations and establish the handshaking to the PLC. In a nutshell: The application is readied for serial operation of the system.

▪ Automatic inspection operation

The inspection solution created runs fully automatically during the production process. Status and results are visualized on the system monitor. The process is controlled by a PLC or master computer.

▪ Customer service

Before, during, and after project planning, we support our customers in technical and application-specific questions. We provide production support during start-up operation and, if necessary, carry out type extensions and adjustments.