Corporate Case Study

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Sensofar Medical
State-of-the-art medical device inspection

When Sensofar Medical was designing its new Q vix systems for stent and heart valve inspection, they needed an automated XY stage that would preserve both the aesthetic and functional elements of their established Q six system while meeting enhanced mechanical specifications.

Prior Scientific was able to provide the ideal solution in the form of a customized encoded stage.

The Requirements

Sensofar's Q vix systems work with a pixel size of approximately 1.7 µm and measure samples that move with the stage. Some analysis features needed to move the stage to specific coordinates based on image data.

The inspection routines also required excellent mechanical straightness, especially on the X-axis, to detect small defects on screen when the axis is in motion.

These requirements meant that high accuracy, linearity, and repeatability were essential to ensure measurement reliability.

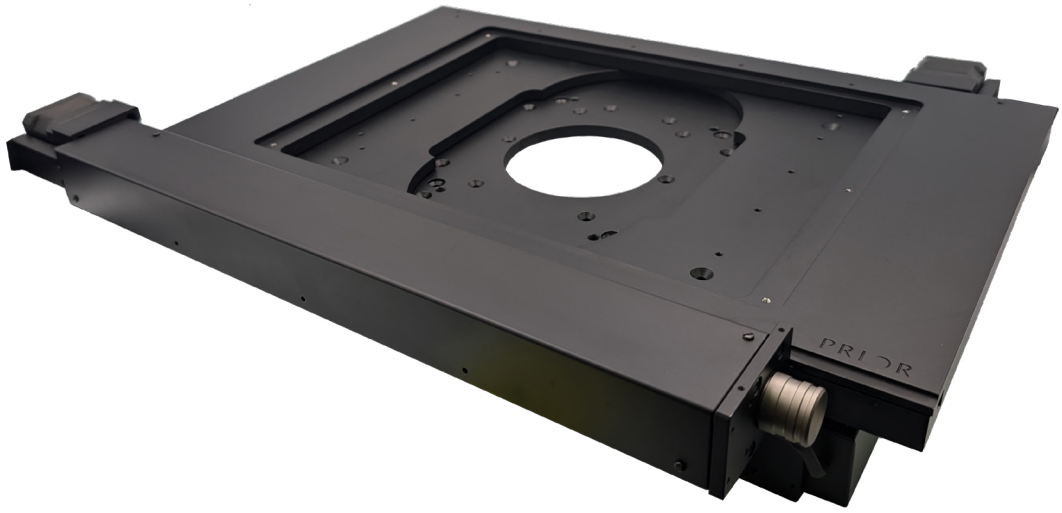
The systems are also designed to inspect stents and valves up to 220 mm in length, so a stage with a long travel range was required.

Rotary stage modules weighing up to 15 kg would need to be mounted on to the stage itself so load capacity was another key consideration.

Sensofar also needed to mount the stage with two pins to align the camera orientation of the sensor with the stage's orientation axis. This would make commissioning of each system much simpler than having to align the stage and camera manually.

"Prior is a trusted partner whose products give us confidence in the overall quality and reliability of our systems."

The Solution: ProScan HE16/2



Key Features:

- **Travel range:** 255 mm x 215 mm
- **Load capacity:** 25 kg
- **Bidirectional repeatability:** <0.9 µm
- **Resolution:** 0.1 µm (with linear encoders)
- **Maximum velocity:** 60 mm/s
- **Metric accuracy:** 0.10 µm/mm
- **Full travel metric accuracy:** <21.3 µm
- **Weight:** 8 kg

"Our previous experience with Prior Scientific stages gave us confidence in the performance and reliability of the HE16."

The ProScan HE16/2 is a large format encoded motorized XY stage designed for upright microscopy. Sensofar Medical chose a customized encoded HE16 stage to meet the high accuracy, linearity, and repeatability requirements of the system.

Key customizations include:

- **Model:** HE16/2S - motorized 255 × 215 mm (10 × 8.5") XY encoded stage with optional travel range adjustment.
- **Connector:** Relocated to the side of the stage rather than underneath to reduce vertical footprint.
- **Inverted Y-axis:** Change of orientation avoided mechanical clashes with other essential parts of the system.
- **Protected encoding:** Enclosed linear encoding ensures that key performance parameters cannot be disrupted during installation.
- **Stage Mount:** Two Ø4 H7 mm pins allow easy alignment of the stage to the optical system.

The stage's customizations preserved both the functional and visual continuity of Sensofar's previous Q six model (which used Prior's H105 stage) while adapting to the updated mechanical requirements of the Q vix series.

The modifications also ensured seamless integration into Sensofar's architecture and maintained a consistent user experience.

Compatibility

The HE16 is designed for industrial microscopy applications, which aligns with Sensofar's production inspection environments.

Prior's willingness to adjust the features of an established product ensured Sensofar did not need to significantly modify their core system to integrate it, while still reaping the benefits of the proven mechanical design of the HE16.

The stage offers several key capabilities to optimize the Q vix and Q vix Pivot systems.

Ease of Use for Operators

The HE16's linear encoder system provides closed-loop control that gives users confidence the stage will always return to the same position when scanning batches of samples. This eliminates guesswork and reduces training requirements, allowing the Q vix and Q vix Pivot systems to deliver consistent results regardless of operator experience level. Prior's open SDK allowed Sensofar to implement all the necessary movements for different experiments and sample loading with ease, ensuring excellent user experience.

Repeatable Measurement for Patient Safety

Manufacturing standards for medical devices require robust repeatability to mitigate risks to patients.

The HE16's 0.1 µm linear encoders deliver the precision necessary for the Q vix and Q vix Pivot systems to achieve consistent, reliable measurements across production batches. This closed-loop positioning ensures that critical dimensional inspections of heart valves and stents maintain the accuracy required by regulatory standards, with overall bidirectional repeatability better than 1 µm.

Prior's Intelligent Scanning Technology (IST) further enhances reliability by optimizing accuracy and linearity using a set of parameters calculated for each individual stage, ensuring consistent performance during extended production runs.

High Throughput with Variable Sample Handling

The Q vix and Q vix Pivot are versatile platforms that require high-resolution imaging to enable full inspection of large heart valves and smaller stents at reduced inspection times.

The stage's 250 x 215 mm travel range provides the imaging area needed for various sample sizes. For the Q vix Pivot, this large travel range supports efficient contoured inspection of non-cylindrical devices.

With a maximum load capacity of up to 25 kg, the HE16 is also equipped to handle the heavier loads of the rotary stage modules with ease, allowing inspection of more complex samples from all angles.

The stage's drive configuration provides an optimal balance of speed and resolution ideal for medical device inspection, enabling the Q vix systems to rapidly inspect diverse sample sizes without compromising measurement quality.

Minimal Downtime Through Robust Design

The HE16 was originally conceived for semiconductor inspection, which requires accurate and repeatable movement over long travel ranges and a design that will stand up to repeated use over long periods.

These characteristics are well suited to medical device inspection – driven using high precision ball screws and high quality stepper motors, the HE16 is insensitive to variable loads, unlike other drive technologies, whilst still minimizing friction to ensure that stage performance is maintained with intensive use. This drive technology is very simple to maintain over extended periods in the field.

The HE16's closed-loop control with linear encoders means the stage position requires calibration less frequently than open-loop systems, minimizing downtime. The stage's high load capacity also handles rotary stage modules without mechanical stress, reducing wear and extending service intervals.

About Sensofar Medical

Sensofar Medical provides state-of-the-art technology for the inspection of implantable medical devices and components as well as leading-edge solutions for research and development worldwide.

It is part of the Sensofar Group - a multi-national company represented in over thirty countries worldwide.

Q vix and Q vix Pivot

The Q vix (above, left) and Q vix Pivot (above, right) are comprehensive systems designed to simplify inspecting stents and heart valves in production environments.

The Q vix's flexibility enables it to inspect samples up to 32 mm OD and acquire and analyze images of outer, inner, and lateral surfaces of stents and valve frames.

The Q vix Pivot is an advanced version of the Q vix system specifically designed for inspecting non-cylindrical (contoured) devices. Its pivoting head sensor head has a tilt angle range from -45° to +45°, allowing it to obtain entirely focused images of samples with slopes in their profile up to 45 degrees and with a maximum OD of 40 mm.

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