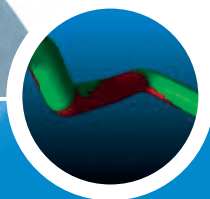


TubeInspect

Efficient quality assurance for tube and wire bending

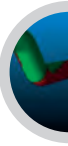
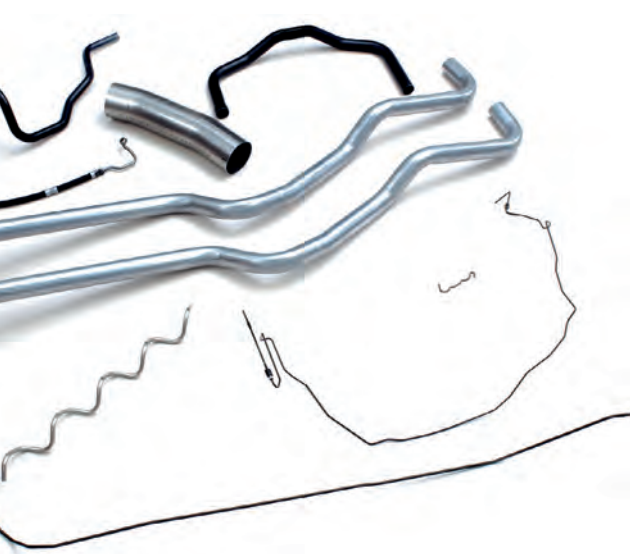


MEASURE THE ADVANTAGE

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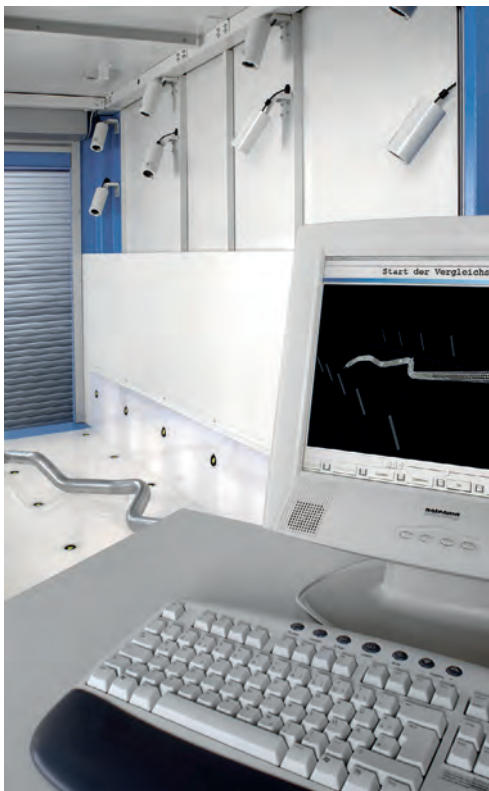
TubeInspect

Efficient quality assurance for tube and wire bending

Optical tube measuring system

The demand for ever more cost-effective tube production as well as the increasingly stringent requirement for product quality are constant challenges in today's tube bending industry.

TubeInspect, an optical tube measuring system, incorporates advanced technology for the high-precision measurement of tubes, the determination of set-up and correction data and quality assurance of the final product. TubeInspect can entirely replace mechanical gauges.



M E A S U R E T H E

How TubeInspect works

TubeInspect, a non-contact measuring system, merely requires that the tube to be measured is placed in an optical measuring cell. Sixteen high-resolution digital cameras accurately measure the tube's geometry in a few seconds. The tube does not need to be moved. The geometry is reported in an easily understandable way, that is as sheath tolerance. The measuring range of TubeInspect is 2,500 mm x 1,100 mm x 700 mm (approx. 8.2 feet x 3.6 feet x 27.6 inches) and this can be extended by repositioning the tube.

TubeInspect measures tubes with diameters ranging from 3.2 mm to 200 mm. Bends between 1° and 180° can also be measured easily. Moreover TubeInspect has the capability of measuring tubes with connected bends or with flexible parts. For example tubes with hose-sections, shaped hoses, and tubes with fixtures or mounting attachments. Beyond that TubeInspect is able to measure free-form geometries.

Thus AICON extends the spectrum of optical measurement applications significantly. Tube measurements can be compared with a previously recorded sample part or with an imported CAD model.



A D V A N T A G E

Accuracy

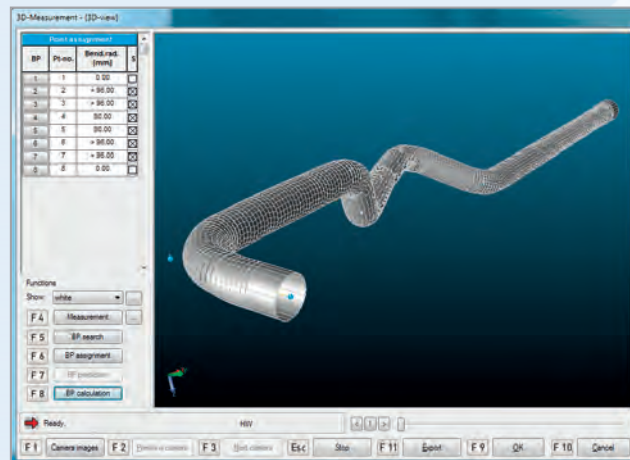
The system acquires information about the tube with sixteen permanently mounted high-resolution digital cameras. Therefore no movement of the part or the acquisition device is necessary.

A part can be measured without the need for special fixtures or clamping devices. Sheath tolerance can be determined to an accuracy of $\pm 0.1\text{mm}$.

Tubelnspect is suitable for high volume production

High volume production requires that product quality be maintained. A further requirement is the ability to switch production to new models or model variants with minimal production delays.

Tubelnspect enables you to achieve this flexibility in tube manufacturing quality assurance. When production changes to new models or model variants, lengthy set-up procedures are no longer necessary: Tubelnspect is ready for use immediately after digital nominal data has been entered into the system. All component related measurements can be stored and analyzed with statistical process control programs.



The 3D cylinder model is compared against design data.

Tubelnspect measures quickly and easily

Tubelnspect's unique measuring principle allows the measurement of any tube geometry without elaborate preparation, and is not affected by form, color or surface texture.

Tubes with varying diameters or changing radii (free-form tubes) can be measured along with attachments such as hangers and brackets. Components with cylindrical profiles, such as bent wires, moulded tubes or even subassemblies of tubes and flexible parts can also be measured.

Tubelnspect eliminates test equipment and reduces change-over time

Tubelnspect eliminates the need for numerous bending gauges and reduces change-over time. Because Tubelnspect uses optical measuring technology, it has proved to be very reliable and requires little maintenance, even when being used in a continuous production environment.

Tubelnspect allows efficient prototype production

Would you like to manufacture prototypes under production conditions? Tubelnspect, as an optical gauge for bending machine set-up and quality assurance, is particularly suitable for the manufacturing of prototypes. It is also suitable for the quick and precise measurement of sample tubes.



Long and thin tubes can also be measured without fixtures.

Tubelnspect is suitable for all types of tubes

Tubelnspect is suitable for all types of industrial tube manufacturing, from highly flexible thin brake lines to large exhaust pipes for heavy trucks. It can also be used to measure tubes designed to carry hydraulic and cooling liquids or fuel.

Optimized data handling with BendingStudio

There are several steps between a drawing and an actual part, each one requiring different types of data: CAD data from design, bend programs and bend corrections for manufacturing, inspection plans and measurement reports for quality and data analysis for process control. BendingStudio bridges all these data types, enabling manufacturers to monitor, quantify, visualize and document all changes in the different process steps. All data stays together and nothing gets lost. And the required data are ready for quick access at any time.

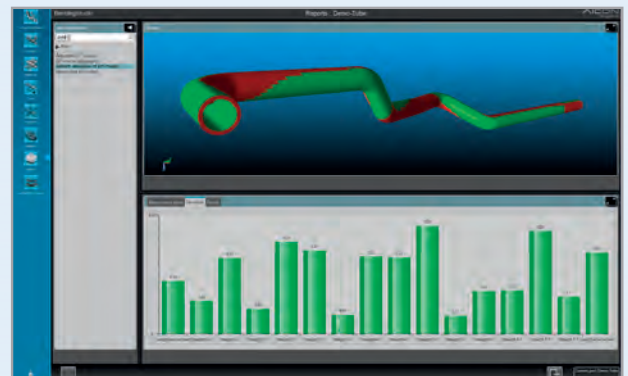
Tubelnspect is totally integrated in BendingStudio and benefits from its various evaluation possibilities. BendingStudio supports the individual configuration of virtual optical gauges to measure the quality related measuring points of a component. This is also possible for further functional dimensions, such as distances and angles.



Tubelnspect provides online corrections to bending machines

With BendingStudio Tubelnspect may be directly linked to Computer Numerically Controlled (CNC) bending machines. If tube measurements indicate that adjustments need to be made to the tube manufacturing process, corrections are directly transmitted to the bending machine via the CNC program.

Corrections will be made more quickly so that dimensionally correct tubes are produced with minimal waste. Machine set-up becomes predictable, and down time is drastically reduced.



Graphical output allows the user to quickly judge whether a tube is within tolerance or not.

System Specifications

TubeInspect



TubeInspect S



TubeInspect HS



Technical specifications			
Measurement area	2,500 mm x 1,100 mm x 700 mm	1,100 mm x 1,100 mm x 700 mm	1,080 mm x 980 mm x 500 mm
Cameras	16 metric cameras	10 metric cameras	10 high performance metric cameras
Tube diameter	3.2 mm - 200 mm	3.2 mm - 200 mm	2 mm - 100 mm
Bending angle	1° - 180°	1° - 180°	1° - 180°
Minimum push between two bends	bend in bend and free-form possible	bend in bend and free-form possible	bend in bend and free-form possible
Software	BendingStudio	BendingStudio	BendingStudio
Reference field	Stability optimized steel structure with LED reference targets	Stability optimized steel structure with LED reference targets	Stable glass reference including elevated targets for highest 3D position
Dimensions	3,200 mm x 1,680 mm x 2,300 mm	1,750 mm x 1,680 mm x 2,300 mm	1,750 mm x 1,680 mm x 2,300 mm
Weight	2,000 kg	1,200 kg	1,300 kg
Accuracy			
Sheath tolerance	± 0.1 mm	± 0.1 mm	± 0.050 mm (50 µm)

For all tubes up to 6 m in length

The TubeInspect optical gauge is the universal tube measurement system for all tube lengths. Tubes of up to 2,500 mm can be inspected in one step. Longer tubes are measured in several steps while the results are automatically connected.

TubeInspect has successfully run in various production facilities for several years and saves our clients the cost of buying expensive gauges.

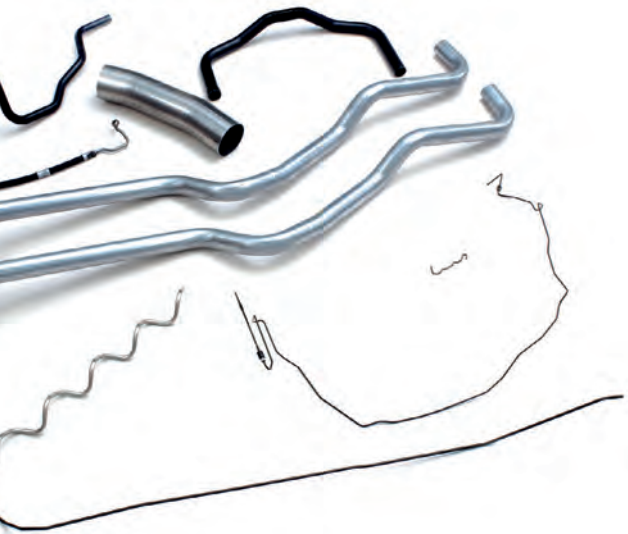
Cost effective solution for the bulk of applications

With TubeInspect S, producers of short tubes have a customized solution that provides TubeInspect's complete functionality with no constraints.

TubeInspect S measures tubes of up to 1,100 mm in one step. The ideal use is inspection of cooling-, gas- or hydraulic tubes or tubes with flexible parts.

Improved accuracy for tight quality requirements

TubeInspect HS is applied when especially high accuracies are requested (e. g. in case of injection pipes).



TubeInspect

Efficient quality assurance for tube and wire bending

- Optical tube and wire inspection system
- Programmable optical gauge
- Set-up and correction of bending programs
- Reverse Engineering and inspection of sample tubes
- Automatic 100 % inspection in a robot cell

MEASURE THE ADVANTAGE



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