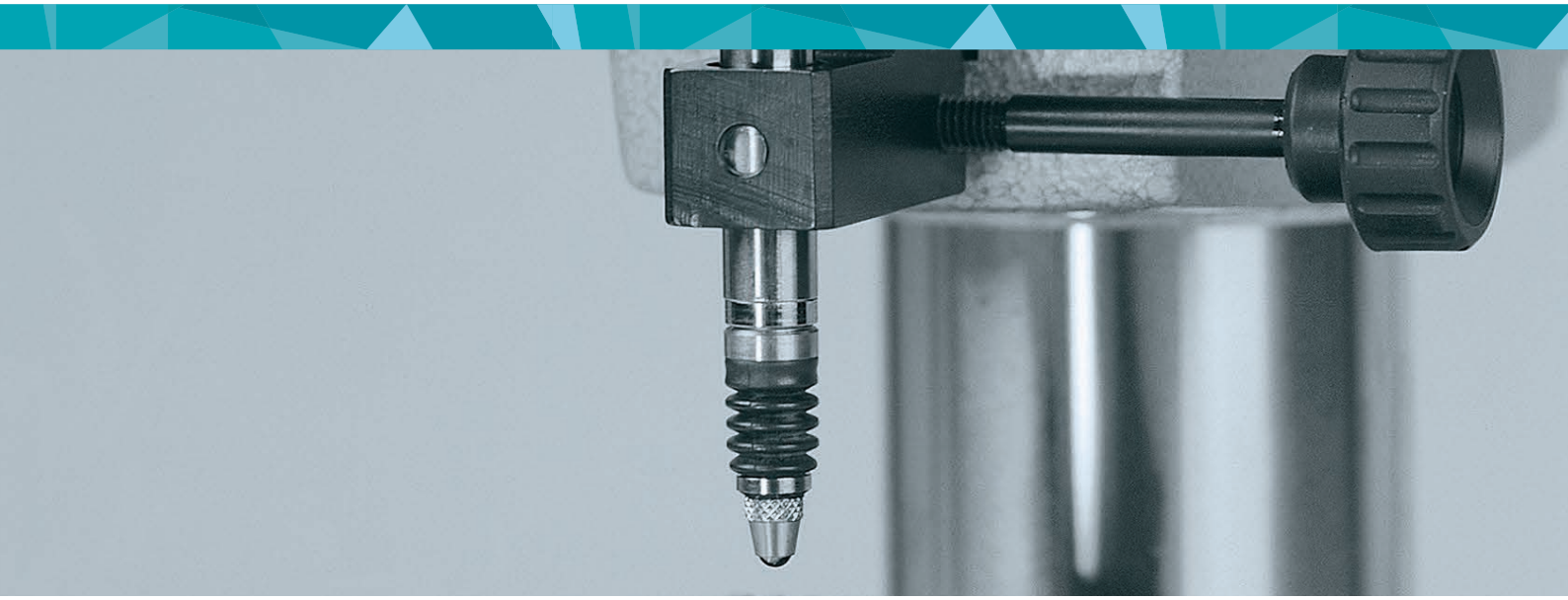
HEXAGON
MANUFACTURING INTELLIGENCE

TESA
TECHNOLOGY

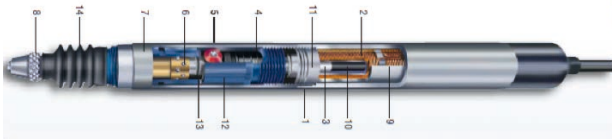
CASE STUDY

TESA ELECTRONIC PROBES AND PROBE INTERFACE BOXES

Felco – Les Geneveys-sur-Coffrane – Switzerland



TESA's GT21 half-bridge probes have proven their reliability in FELCO's inspection machine



TESA is a market leader in supplying electronic probes and interfaces to original equipment manufacturers (OEMs) as well as users of multi-gauging inspection fixtures and automatic inspection machines.

FELCO, a Swiss manufacturer of pruning shears, uses TESA electronic probes and TESA BPX 44 inductive probe interface boxes in their automatic machine for inspecting one of their crucial components.

Designed for continuous operation, these probes can work for years without any maintenance and can be repaired by replacing worn parts.

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The concept of a half-bridge probe is simple. A ferrite core (10) moving within an electrically charged coil (10) generates an analogue signal proportional to its displacement. Its mechanical design and execution ensures an excellent repeatability. The ball-bearing guided (6) measuring bolt is insensitive to radial shocks. Rubber bellows (14) prevent liquids from penetrating the inner mechanisms. TESA's GT21 probe is the ideal solution for rugged applications such as in FELCO's inspection machine which operates unmanned in night shifts.

TESA's BPX 44 inductive probe interface boxes amplify the analogue signals received from probes and convert them into digital values suitable for further processing. The BPX 44 can operate in stand-alone mode. In this case, it can be configured to provide an output classification signal (accept, rework or reject) to an external device via a type Sub-D 15-point female connector.

The standard mode is to connect the BPX 44 to a PC with TESA's TIS software. This enables a large number of functions such as static or dynamic measurement or measurement by feature or by part. Each BPX 44 has four probe inputs and several boxes can be stacked one over the other. As proven in the FELCO automatic inspection machine, TESA electronic probes and probe interface boxes can operate on a continuous basis under the most rugged conditions.

Pruning shears for professionals

FELCO's flagship product, pruning shears, are designed and manufactured for the demanding professional market. For example in Switzerland, grape growers use FELCO shears for pruning branches from their vines prior to harvesting.

Felix Flisch founded FELCO in 1945 in Genevrey-sur-Coffrans, near Neuchâtel, a region famous for its prestigious watch manufacturers. Apart from applying the watch industry's obsession with precision and quality, Flisch applied the following principles for making a superior pair of pruning shears:

- Design an ergonomic product
- Use the best available materials to guarantee cutting quality and durability
- Manufacture precision components to ensure inter-changea bility of parts

These three core values – ergonomics, durability and life-time maintenance – have driven FELCO's business strategy since 1945.

BPX 44 inductive probe interface box

FELCO pruning shears

Blade inspection – A process of continual improvement

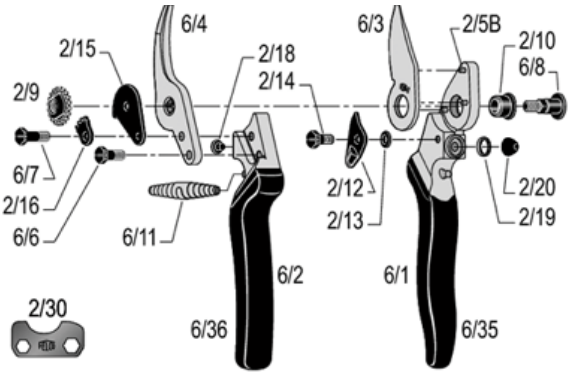
To ensure inter-changeability, FELCO's pruning shears are assembled from precise components and key components such as the blade (6/3) are 100% inspected.

Over the years, FELCO has continually improved its process for inspecting blades. Earlier craftsmen used straight edges to inspect blade profiles relying on their visual judgment to accept or reject blades. Later fixtures with dial gauges were used for comparative inspection. The dial gauges were set to zero to a master blade and prior to inspecting the deviations in the production blades.

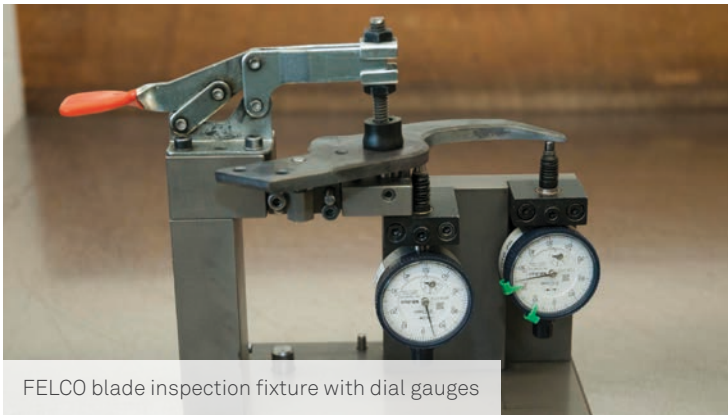
By the early 1990s, FELCO's production of pruning shears had crossed the 500'000 mark. In 1993 FELCO installed their first blade inspection machine using TESA electronic probes and the earlier generation TESAMODUL measuring modules for the display function.

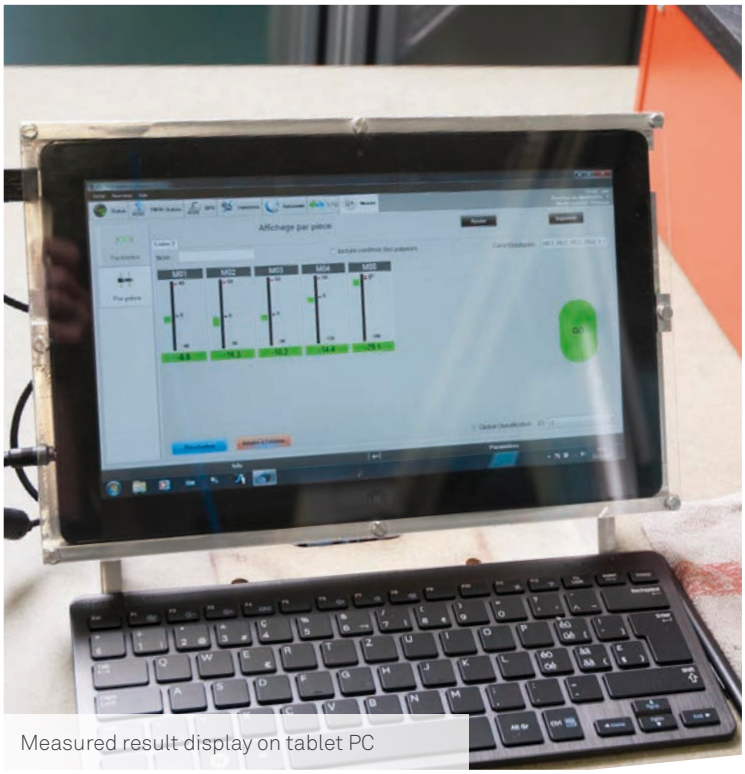
The TESAMODUL units were still in working condition when they were replaced by BPX44 probe interface boxes and a tablet PC with TESA TIS software to enable versatile measuring functions and a user-friendly interface enabling digital and graphical displays in real time.

FELCO is continually integrating the latest technological advances in its inspection processes.



FELCO spare parts diagramme


FELCO blade inspection fixture with dial gauges


Measured result display on tablet PC

2 BPX 44 boxes with 5 probe inputs

Measuring station section of automated inspection system

TESA blade inspection fixture and 2 BPX 44 boxes

Blade measuring station

Occupying the better part of the room, the fully automated inspection system includes a feeder unit for blades, a robot to pick the blades from a rotary table and place them in position on the TESA inspection station and a conveyor to transport the inspected blades to rework, reject or accept bins.

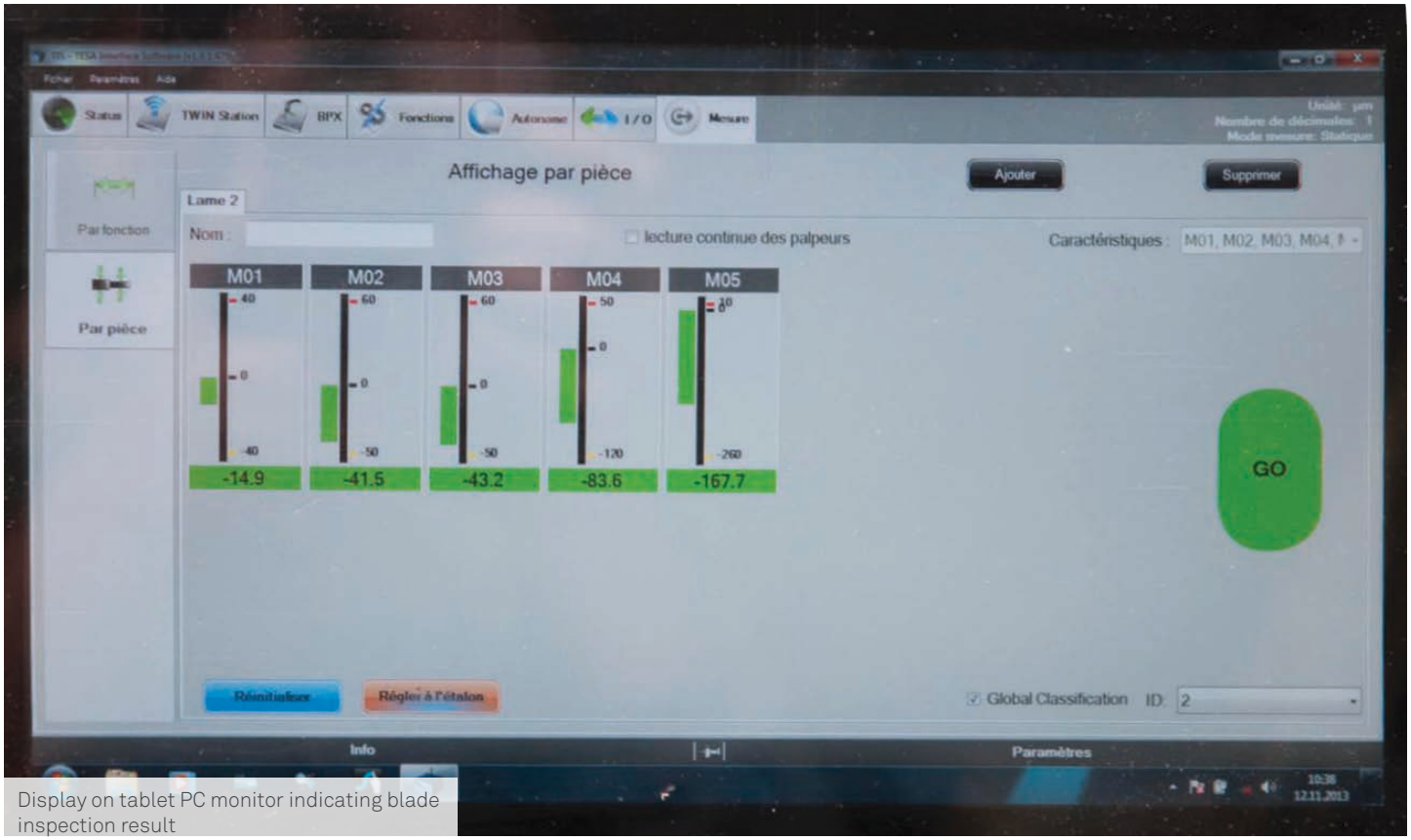
The blade measuring system consists of three elements: a inspection statin with five electronic probes mounted under a steel plate, two BPX 44 boxes and a tablet PC.

The inspection plate has openings for five vertically positioned electronic probes. Once the blade is placed and clamped in the inspection position, pneumatic controls enable the probes to make contact with the blade surface and check its profile.

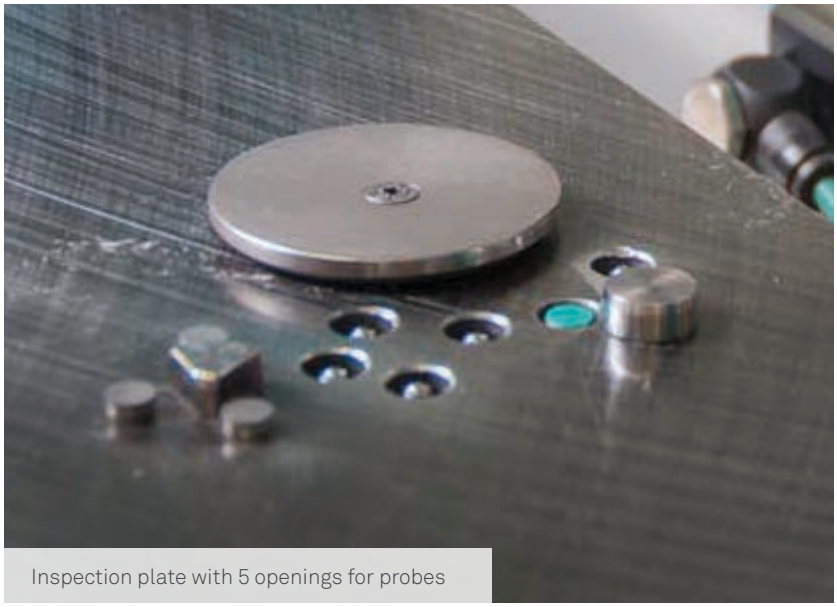
The BPX probe interface boxes manage signals from the five probes and transfer values to the tablet PC for processing. These values are processed and output for display on the tablet PC, which also indicates whether the blade is accepted or needs to reworked or rejected, as a function of specified tolerances for each dimension in the software. The machine can inspect several dimensions of a blade in a few seconds," said Mr Patrick Degoumois, Felco's Quality Control Manager.

It was fascinating to see how a blade gets inspected from start to finish. A robot picks up a blade from a stack and places it in the inspection station where it is clamped into position before the probes spring into action from the bottom. The results are shown immediately on the PC and a bulb lights up to indicate where the blade is accepted (green), needs rework (yellow) or is rejected (red). The robot picks up the blade and places it on a conveyor where it is transported to the appropriate bin. We noticed that almost all the blades passed the inspection test.

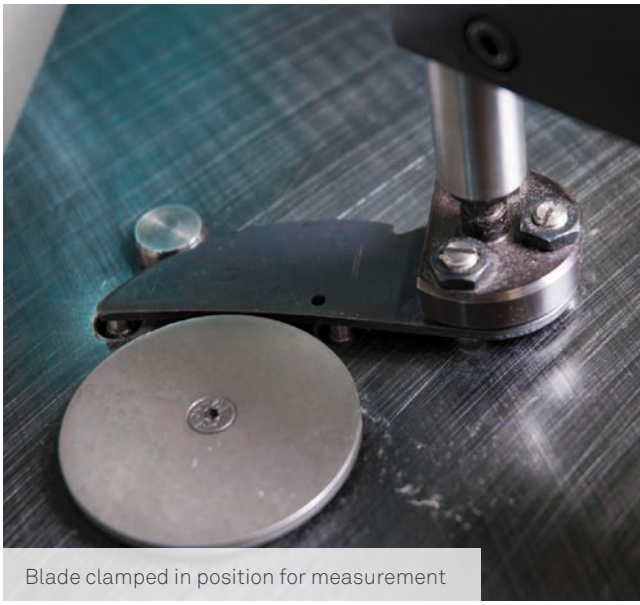
With a production of around a million pruning shears per year, this inspection machine has paid its way. The results are there to see. TESA is proud to be associated with FELCO in its initiatives for incorporating the latest technologies in its inspection processes.



Display on tablet PC monitor indicating blade inspection result



Inspection plate with 5 openings for probes



Blade clamped in position for measurement

We want to thank FELCO for their friendly support and for the authorization to publish this case study.

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Hexagon Manufacturing Intelligence helps industrial manufacturers develop the disruptive technologies of today and the life-changing products of tomorrow. As a leading metrology and manufacturing solution specialist, our expertise in sensing, thinking and acting – the collection, analysis and active use of measurement data – gives our customers the confidence to increase production speed and accelerate productivity while enhancing product quality.

Through a network of local service centres, production facilities and commercial operations across five continents, we are shaping smart change in manufacturing to build a world where quality drives productivity. For more information, visit **HexagonMI.com**.

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- AUTOMATED APPLICATIONS
- MICROMETERS, CALIPERS AND GAUGES
- DESIGN AND COSTING SOFTWARE

TESA
TECHNOLOGY

Established in 1941 and headquartered in Renens, Switzerland, TESA SA manufactures and markets precision measuring instruments that stand for quality, reliability and longevity.

For more than 75 years, TESA has distinguished itself in the market through its excellent products, its unique expertise in micromechanics and precision machining as well as its proven experience in dimensional metrology.

The TESA brand is the global market leader in the field of height gauges and a pioneer thanks to its wide range of instruments, including callipers, micrometers, dial gauges, lever-type dial test indicators and inductive probes.

TESA is a true benchmark for the inspection of incoming goods, as well as for production workshops and quality assurance laboratories.

Through its worldwide distribution network the company focuses on the mechanical engineering, micromechanical, automotive, aerospace, watchmaking and medical industries.

In 2001, TESA became part of Hexagon, a leading global provider of information technologies.
www.tesatechnology.com

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About FELCO

FELCO is the world-leading manufacturer of professional pruning shears and cable cutters since 1945. FELCO's product range now includes pruning knives, trimming snips and power tools.

From the outset, FELCO has sought to master all industrial processes and technologies required to design and manufacture its product range. This approach has allowed FELCO to systematically integrate technological advances into every stage of production. The full mastery of production processes guarantees the consistent quality of products; the added mastery of production capacity assures faultless and timely deliveries to customers.

FELCO's vast distribution network consists of professional representatives all over the world. The sales network is ideally placed to promote products and maintain close relationships with customers. The distribution network is an integral part of the large FELCO family, and shares the same desire of achieving total customer satisfaction.