ROTOTEST TO ELOTEST M6: MR6 ROTOR, ADVANCED BOLTHOLE INSPECTION WITH LAYER DETECTION

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Rohmann GmbH
Eddy Current Test Instruments and Systems

Overview

What to expect

- Why Bolthole inspection?
- Back in Time: Bolthole inspection with the ROTOTEST
- The new MR6 Minirotor
  - drive concept
  - LED: illumination and signalling
  - optional depth scale
- Layer Detection
  - Use cases
  - New Sensors?
  - Limitations

WHY BOLTHOLE INSPECTION?

It is not an easy task!

Why Bolthole inspection?

It’s not an easy task

- Aircraft structures are subject to many heavy load cycles
- The holes used for the fasteners are very often starting points for cracks
- Fasteners are used to connect several layers of materials such as
  - At the lap joint: Skin panels, doubler, stringer/frame
  - Stringer and frames
  - Using bolts, rivets, Hi-Loks
  - Layes with same or different materials
- Small cracks originating from inner layers can not be detected from the surface
- Cracks hidden under the fastener‘s head can not be detected from the surface

How is it done?

It’s not an easy task

- Time consuming and expensive
- Normally done during C and D checks
- Fasteners need to be removed
- Rotating eddy current probe is inserted in hole to scan the ID
- Cracks need to be reported and assessed

When a crack is found

What needs to be done?

- Specified in the manufacturer Structural Repair Manual (SRM) or a specific Airworthyness Directive (AD)
- Depending on position and crack length:
  - Reaming and oversize fastener/bushing
  - Stop drilling
  - Reinforcement
  - Part replacement

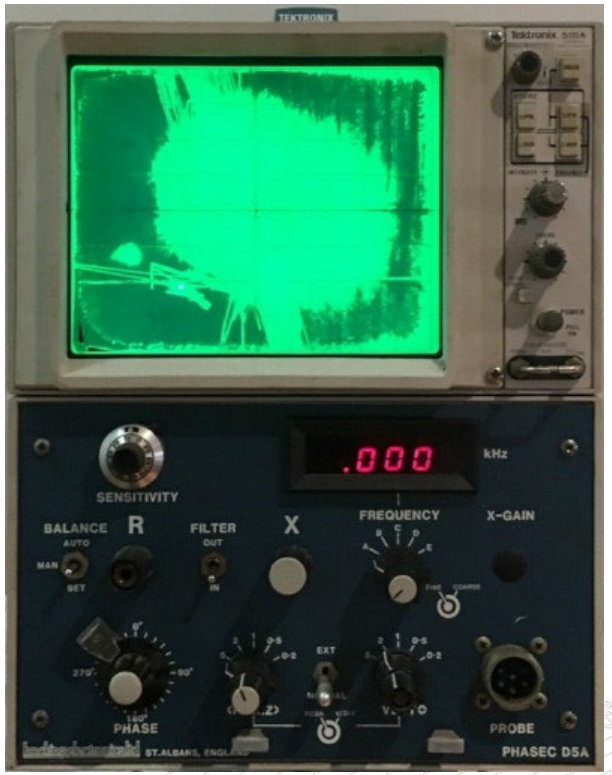
BACK IN TIME

Where it all began: The ROTOTEST

How it began

Rotating the Probe

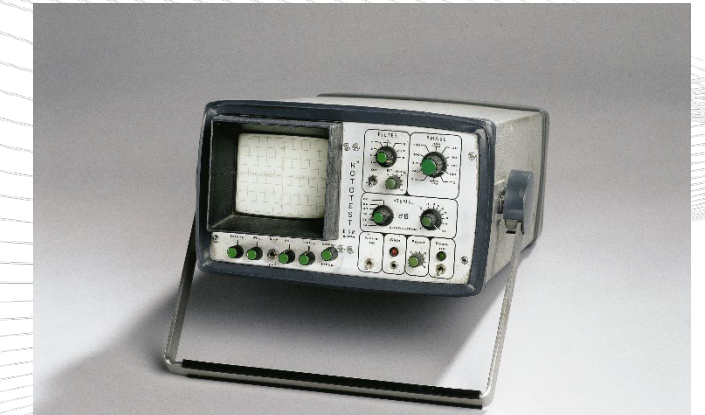
- From the 1960s, general purpose eddy current instruments where used for rotary inspections
- Rotary Scanners were used with Instruments like the Hocking D4/D5
- First procedures and technical orders where written



Back to 1977 (yes, that long ago)

Birth of the ROTOTEST B500

- Rohmann GmbH in Germany was founded in 1977 in the basement of Jürgen and Ines Rohmann‘s home
- In the same year, the first product was released: The ROTOTEST B500
- The first dedicted instrument for rotary inspection
- The first portable and battery operated eddy current device
- The name ROTOTEST was soon widely used for this type of inspection



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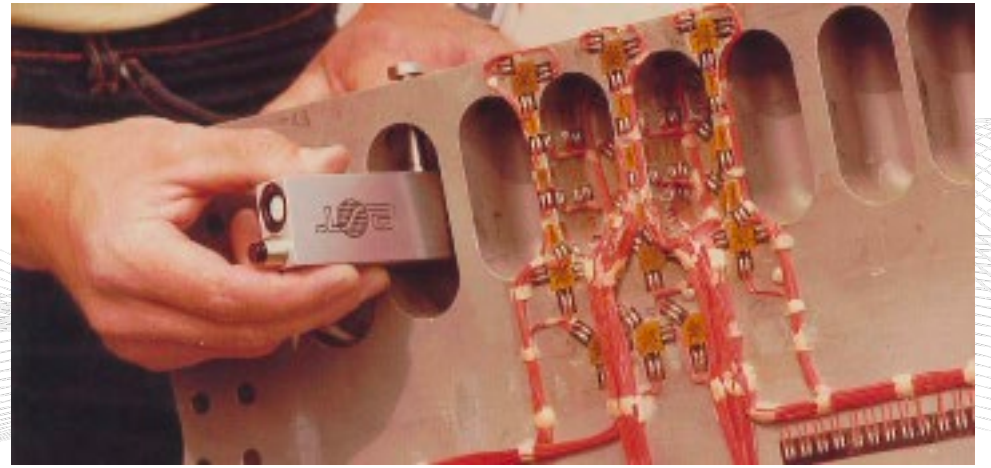
Rotors (or Scanners if you like)

Rotating the sensor and getting the signals

- First rotating sensor assembly probably by MAC or Förster as early as 1959 for long products
- First handheld rotor by Förster, mains operated in the housing of a power drill
- First commercially available dedicated handheld rotor by Rohmann in 1977: The SR1 (Standard Rotor 1)
- Much smaller version MiniRotor MR3 in 1981
- MR3 design has be copied numerous times with compatible sensor interfaces
- Even smaller Submini Rotor SMR4 by Rohmann in 1985, also copied by many manufacturers for working in tight spaces



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THE MR6 MINIROTOR

Perfect compagnion for the ELTOTEST M6

The MR6 Minirotor

The perfect companion for the ELTOTEST M6 handheld instrument

- Same form factor as the Minirotor MR3
- Additional receiver channel (one driver, two receiver channels) dedicated to Layer Boundary Detection
- Brushless DC Motor with integrated controller for less power consumption, better low speed performance (torque) an increased durability
- Available as MF (Medium Frequency) and HF (High Frequency) versions
- New 16 Pin Fisher connector to connect to the ELOTEST M6 for single cable operation with depth gauge

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- Compatible with all standard RSM probes (Rohmann and third party)

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Depth gauge

Can be attached to both rotors

- Magnetic reading head integrated in rotor

Depth gauge

Tolless attachment

- Magnetic reading head integrated in rotor
- Magnetic sliding scale can be attached
- Different gauge heads can be used
- Resolution 0.05mm
- Available in different length versions matched to sensor length
- Ajdustable and changeable head
- Scaled CSCANS with the ELTOTEST M6

Programmable SoftButton

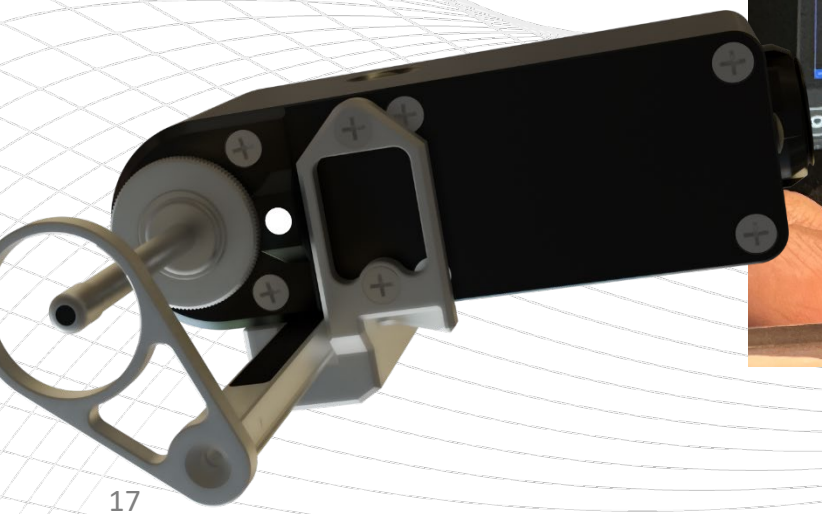
Start/Stop recording or other function

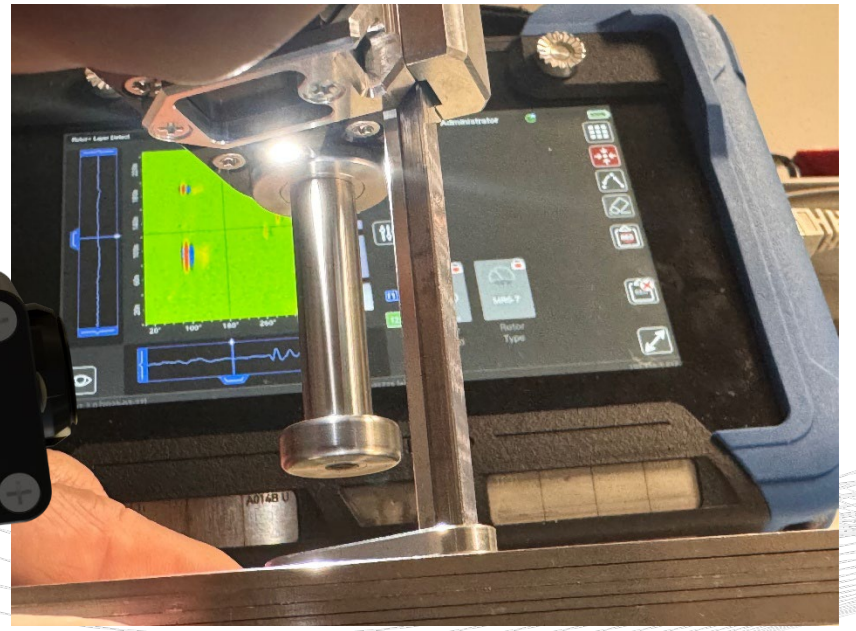
- Software configurable function in the ELOTEST M6
- Default: Start/Stop Recording
- Default: Auto clear when Starting

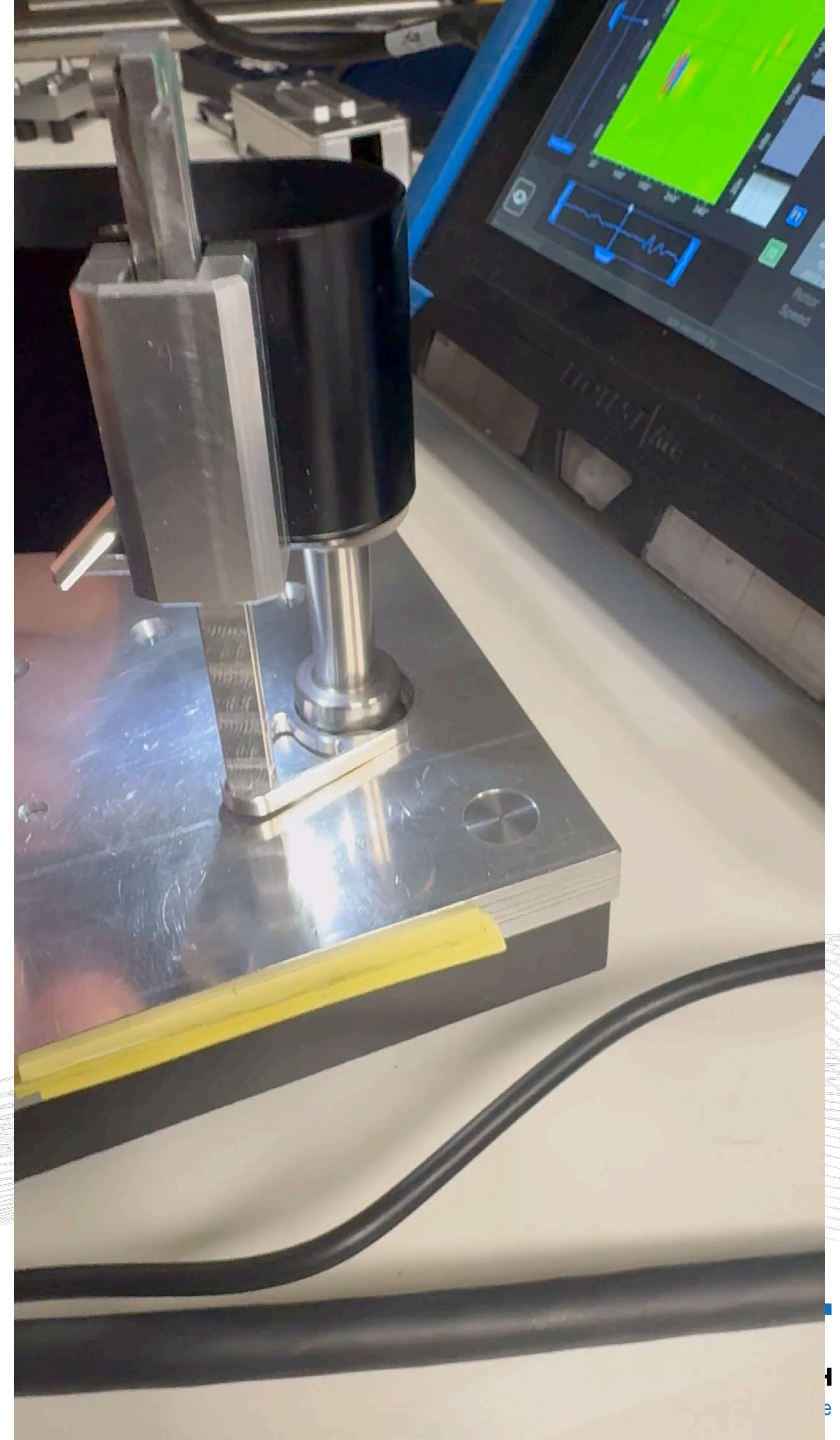
RGB/W LED

Illumination and Status

- Auto On with Rotation
- Illuminates Workpiece
- Changes Color with M6 Status LED
  - Blue for Threshold
  - Red for Sensor Fault
  - Orange for Overload







LAYER DETCTION

Knowing where the defect is

Layer Boundary Detection: Why?

Important information

- Important information for structural repair
- Small defects might for example be acceptable in the doubler but not in the stringer
- Even with depth gauge, it might be difficult to see wether a defect is on the bottom of layer 2 or on the top of layer 3
- Feature requested directly from aircraft manufacturer
- Problem: the normally used differential sensors can not be used to reliably detect the layer boundaries (wrong orientation)
- First solution: additional absolute sensor element
  - Would require to replace all existing sensors with new ones
  - Would not be compatible with existing sensors
  - Limited space in smaller diameter sensors could make it imposssible to mount additional coil

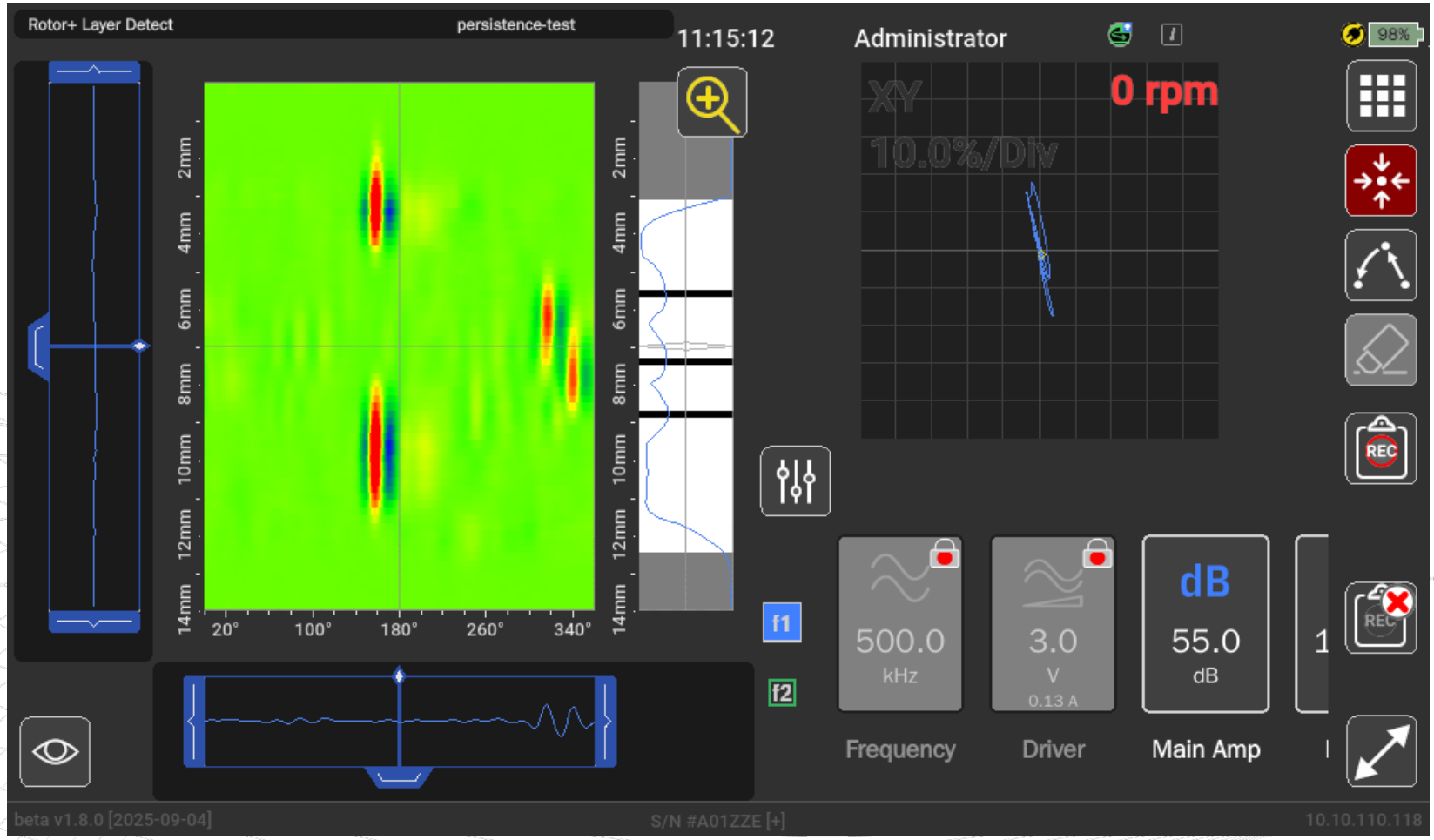
Advanced Rotary Layer Detection Mode

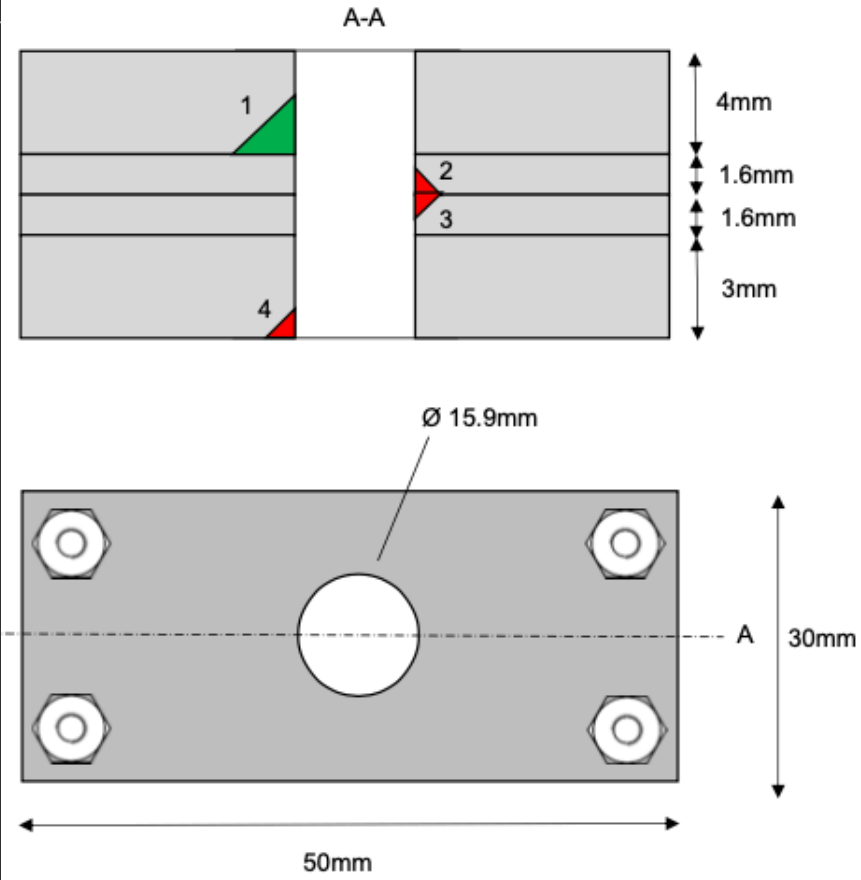
For the ELOTEST M6

- CScan (Timebase or Encoder/Depth gauge) for defect channel
- Absolute Channel for layer detection uses driver coil as parametric absolute sensor
  - Works with all legacy RSM probes, Rohmann or third party
- Detects Specimen Boundary (part surfaces)
- Detects Layer Stack Boundaries
- Works for same and mixed material stacks
- Balance in Air needed!

Advanced Rotary Layer Detection Mode

Will be available in Software Version 1.8





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Thank you for your attention!

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