RODScan - Inspection of the solid and hollow shafts, axles, and the like

SONOTRON NDT

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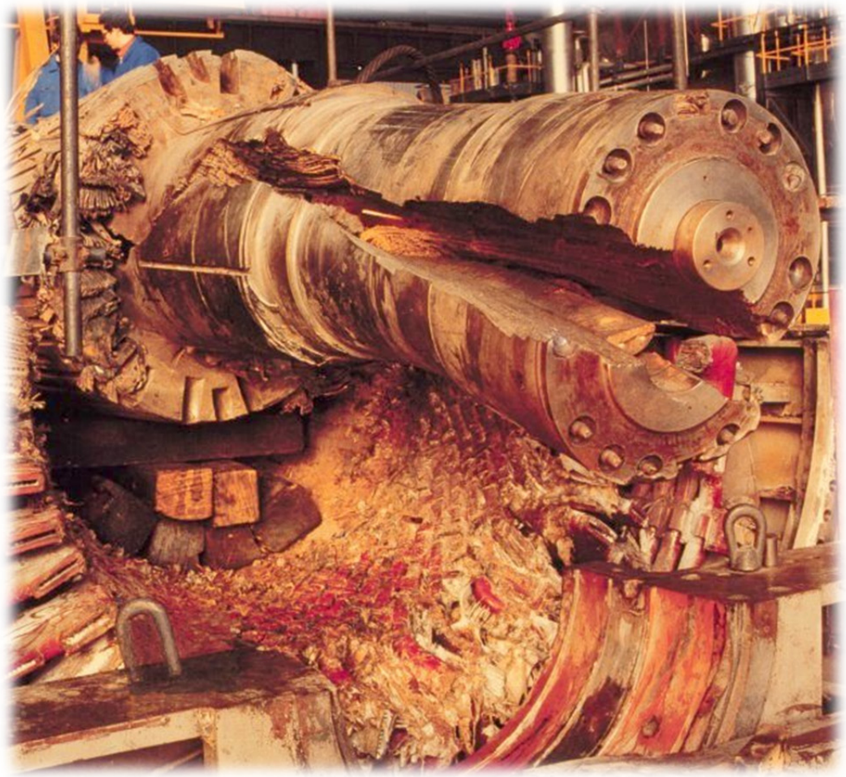
The turbine shafts are the extremely loaded parts of the rotors. The high mechanical stresses accompanied with elevated ambient temperature may cause appearance and growing of fatigue cracks followed by catastrophic failure. Thus the axis vicinity areas of rotor shafts have been inspected ultrasonically on regular basis during the scheduled shutdowns



Usually the 100% inspection of the hollow shafts is performed with the use of probe system scanning over the entire rotor length from the bored surface (ID side). For the solid shafts the inspection is performed from the OD surface; the same inspection is suitable for the screening of the hollow shafts in the cross sections in between the rings carrying the turbine blades

Depending on the rotor type the inspection with use of conventional probes lasts 6...7 work shifts. To reduce the inspection time to 1 work shift there was an inspection procedure based on use of the PA modality developed by Sonotron NDT in cooperation with IEC. The inspection is implemented with the use of **ISONIC** series PA instruments (**ISONIC 3510**, **ISONIC 2010**, **ISONIC 2009 UPA-Scope**) through running of the **RODScan** Inspection SW application utilizing the ***True-to-Geometry (True-to-Shape) S-Scan coverage and imaging strategy***. The complete cross sectional view is formed in one revolution of the shaft through superimposing of all ***S-Scan*** images obtained along the entire revolution. The raw data ***A-Scans*** (primary and superimposed according to the settled focal laws) composing every recorded ***S-Scan*** image are stored completely and may be played back off-line providing all-standards-compliant ***A-Scan*** based evaluation

Whilst running the instruments in the **RODScan** inspection mode the ***S-Scan*** coverage and capturing of the ***S-Scans*** over entire shaft rotation may be performed with the use of **EquPAS** and **FMC/TFM** protocols simultaneously: this increases the speed and precision of the defects evaluation significantly being especially important for the monitoring of the discontinuities in the shaft material until developed to the critical shape / dimensions. The increased inspection speed and precision of the evaluation allow prolonging of the service life and save the expenses for the turbines health monitoring

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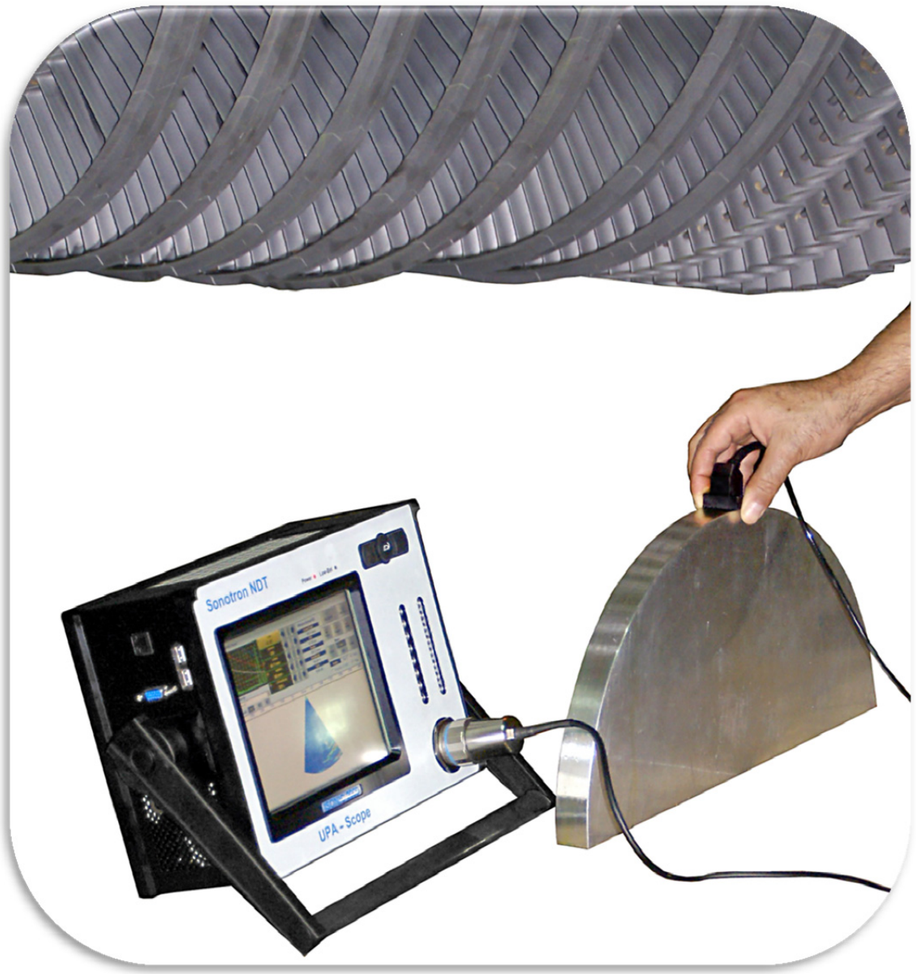
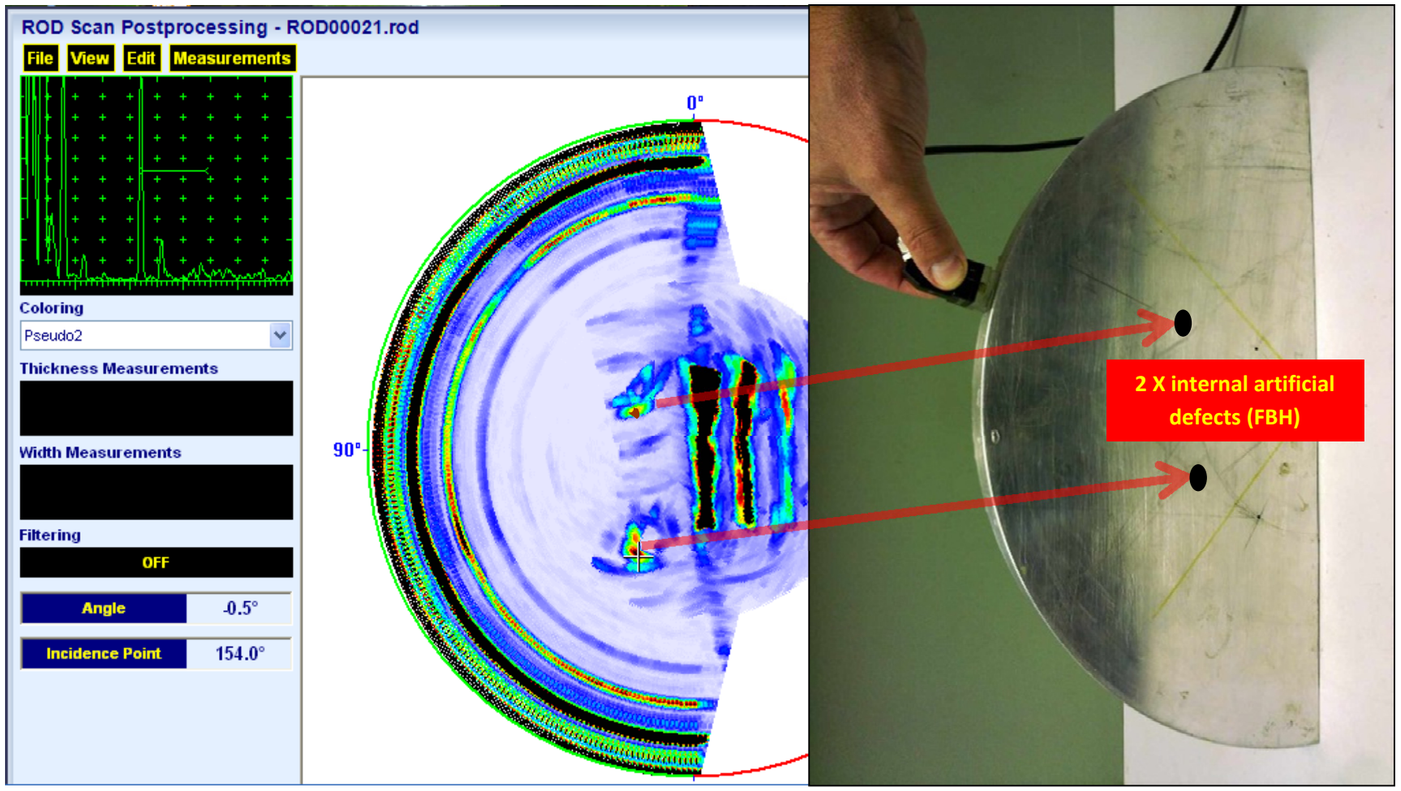
Calibration block for the inspection of the solid shaft





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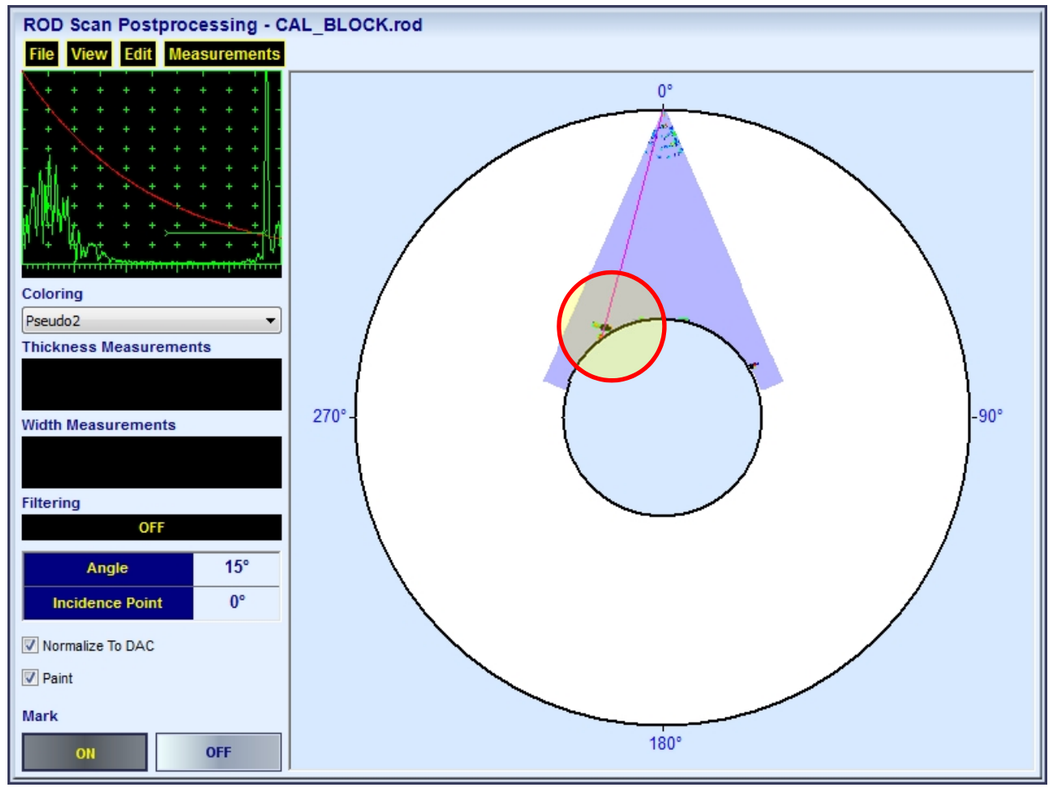
Calibration block for the inspection of the hollow shaft



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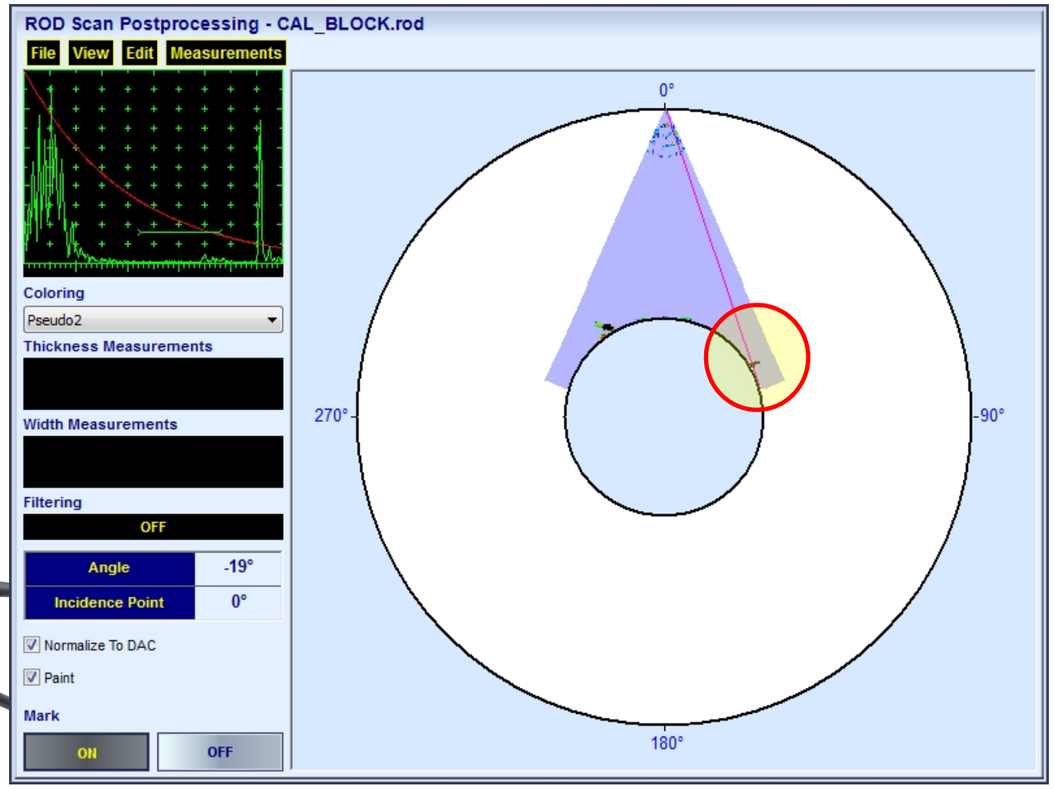

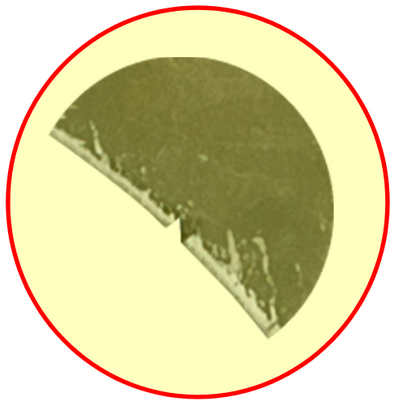

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Monitoring the defect development in the hollow shaft

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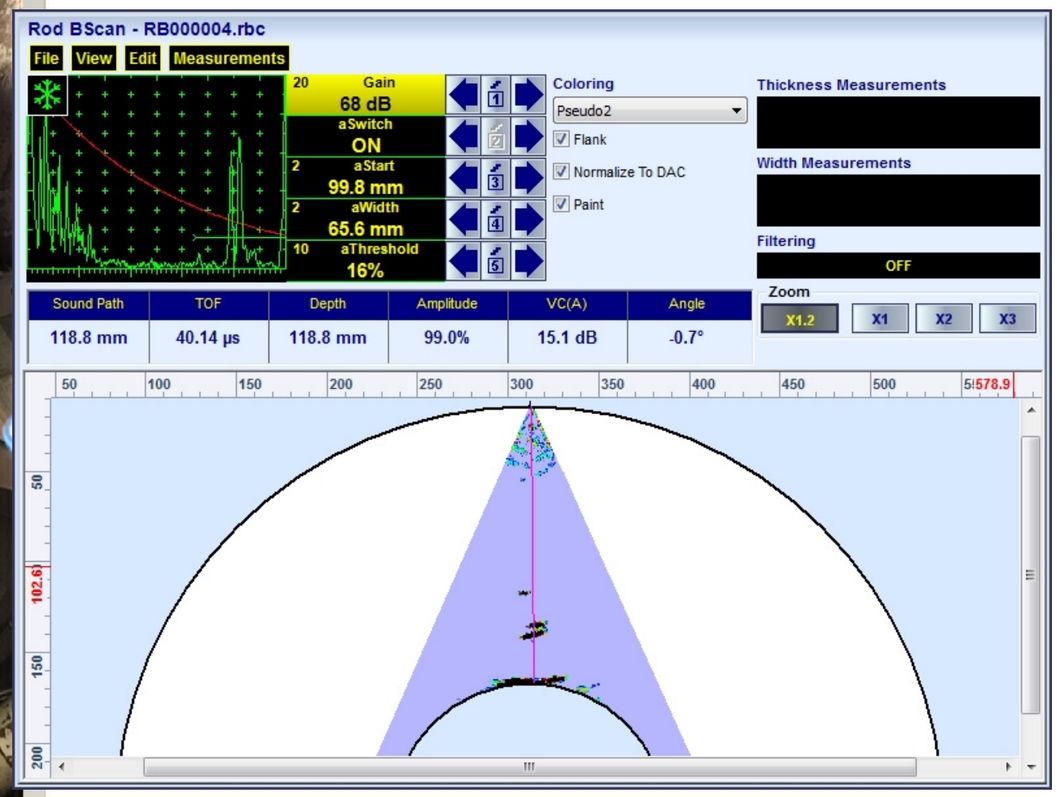

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Initially designed for the inspection of the turbine shafts the **RODScan** inspection SW application was found very useful for the various axles, thick wall tubes, other round and tubular cross-section parts and materials, fittings lugs in the aircraft, and the like

Detection of the fatigue crack on the ID surface of the fitting lug in the aircraft

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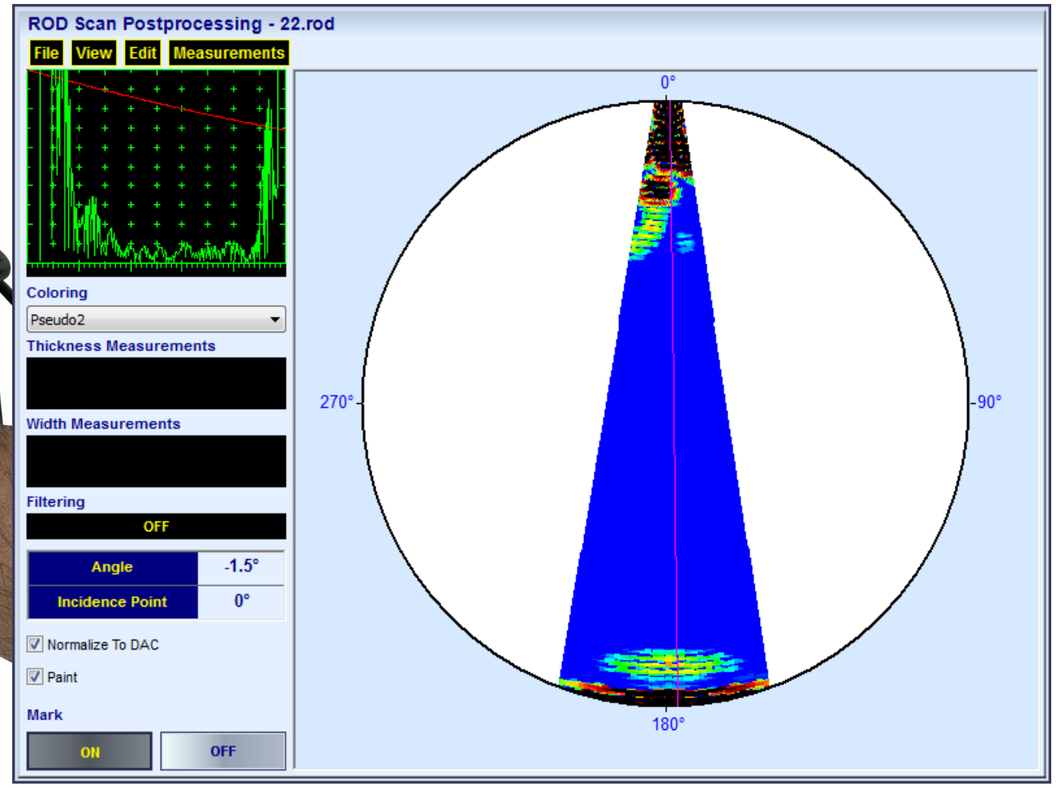
Inspection of the Round Section of the Drill Rod

Item	*Order Code (Part ##)*
Inspection SW Application for ISONIC 2009 UPA-Scope - Phased Array Modality: **RODScan - Inspection of solid and hollow shafts, rods, axles, thick wall tubes, fitting lugs, and the like - LW sector scan insonification combined with circumferential scanning and complete cross section image reconstruction** ➪ True-To-Geometry Rod Cross Section Overlay Volume Corrected Imaging ➪ Sector-Scan Cross Sectional Coverage ➪ Intuitive Image Guided PA Pulser Receiver with Beam Forming View ➪ DAC / TCG Normalization ➪ Built-In Solid / Hollow Rod Geometry Editor and Ray Tracer - Scanning Pattern Design ➪ Independent on TCG Angle Gain Compensation / Gain Per Focal Law Correction ➪ Encoded and Time based Overall Rod Cross Section Coverage Through Superimposing of Sector Scans Obtained Through Rotation of the Rod ➪ 100% Raw Data Capturing ➪ FMC/TFM Protocol for the data acquisition and imaging ➪ Comprehensive Postrpocessing Including: → Recovery and Evaluation of Captured A-Scans from the Recorded Rod Cross Sectional Views → Off-Line Gain Manipulation → Off-Line DAC Normalization of the Recorded Images / DAC Evaluation → Numerous Filtering / Reject Options (by Geometry / Position / By Amplitude / dB-to-DAC / etc) → Defects Sizing → Automatic creating of inspection reports - hard copy / PDF File	SWA 909811



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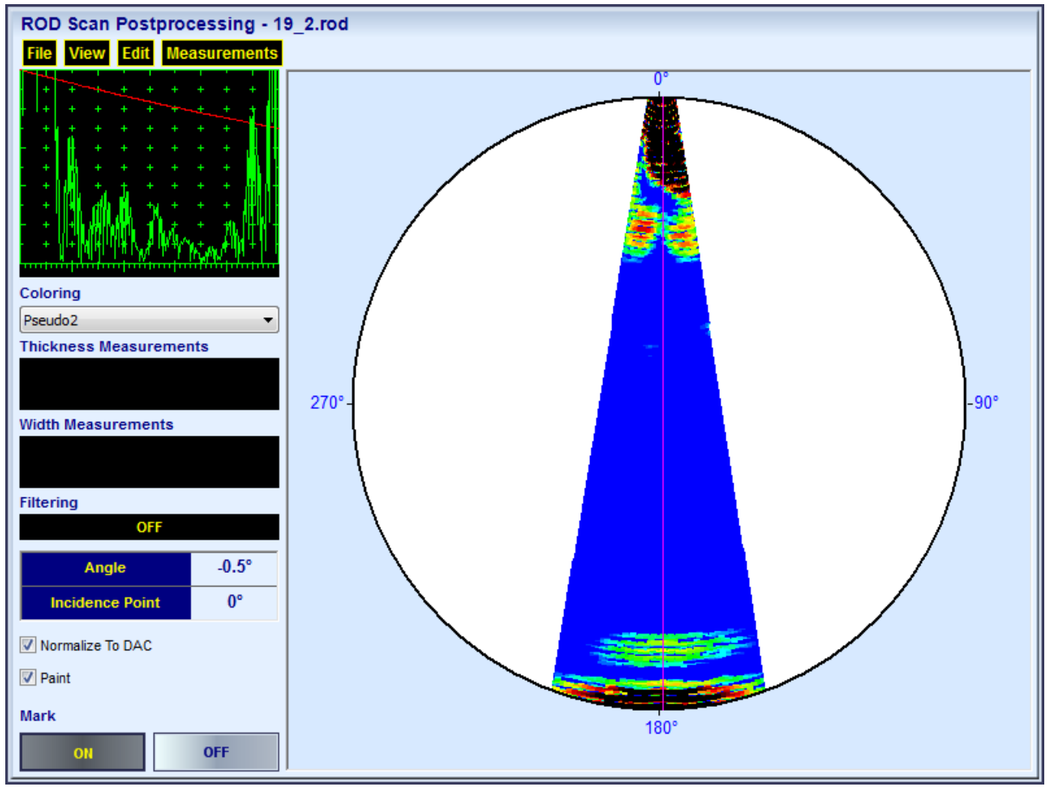

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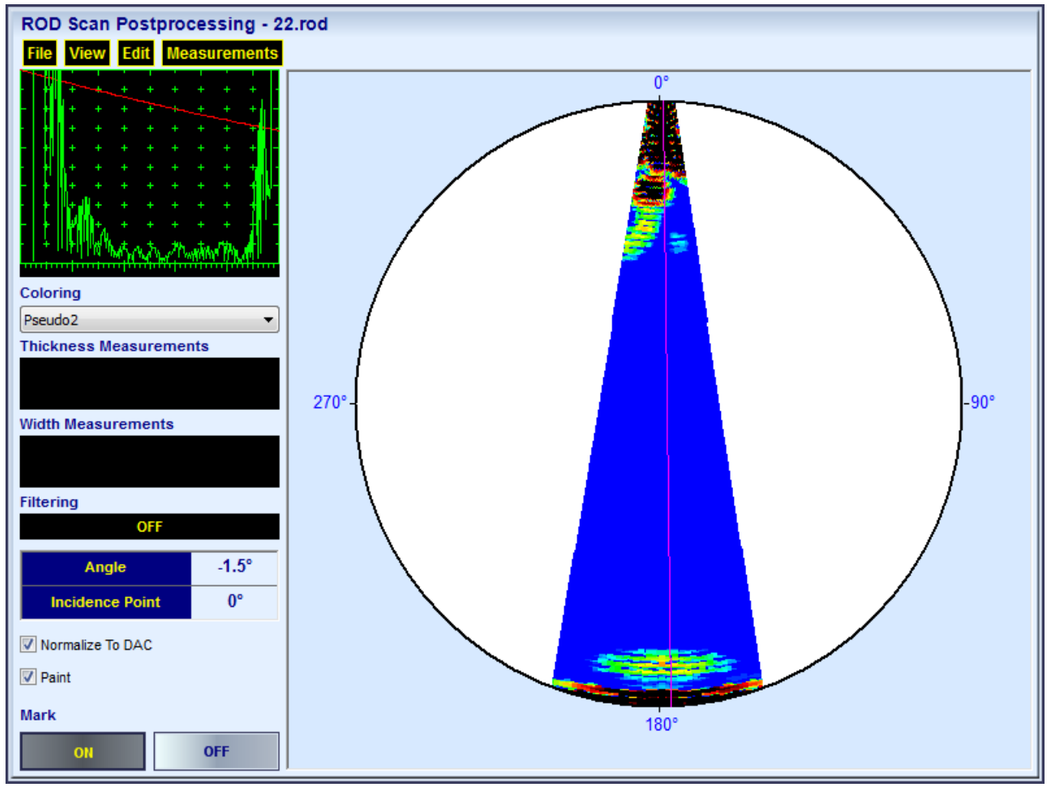
Item	*Order Code (Part ##)*
Inspection SW Application for ISONIC 2010 / ISONIC 2010 EL - Phased Array Modality**: RODScan - Inspection of solid and hollow shafts, rods, axles, thick wall tubes, fitting lugs, and the like - LW sector scan insonification combined with circumferential scanning and complete cross section image reconstruction** ⇨ True-To-Geometry Rod Cross Section Overlay Volume Corrected Imaging ⇨ Sector-Scan Cross Sectional Coverage ⇨ Intuitive Image Guided PA Pulser Receiver with Beam Forming View ⇨ DAC / TCG Normalization ⇨ Built-In Solid / Hollow Rod Geometry Editor and Ray Tracer - Scanning Pattern Design ⇨ Independent on TCG Angle Gain Compensation / Gain Per Focal Law Correction ⇨ Encoded and Time based Overall Rod Cross Section Coverage Through Superimposing of Sector Scans Obtained Through Rotation of the Rod ⇨ 100% Raw Data Capturing ⇨ FMC/TFM Protocol for the data acquisition and imaging ⇨ Comprehensive Postrpocessing Including: → Recovery and Evaluation of Captured A-Scans from the Recorded Rod Cross Sectional Views → Off-Line Gain Manipulation → Off-Line DAC Normalization of the Recorded Images / DAC Evaluation → Numerous Filtering / Reject Options (by Geometry / Position / By Amplitude / dB-to-DAC / etc) → Defects Sizing → Automatic creating of inspection reports - hard copy / PDF File	SWA 910811



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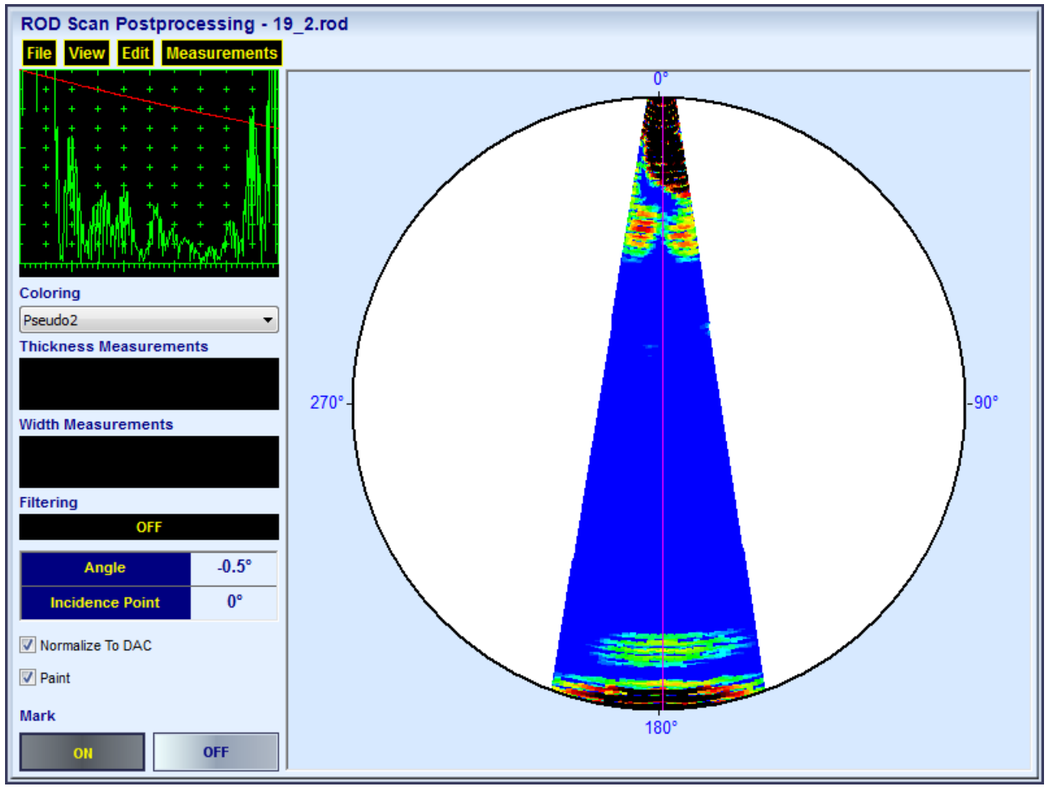

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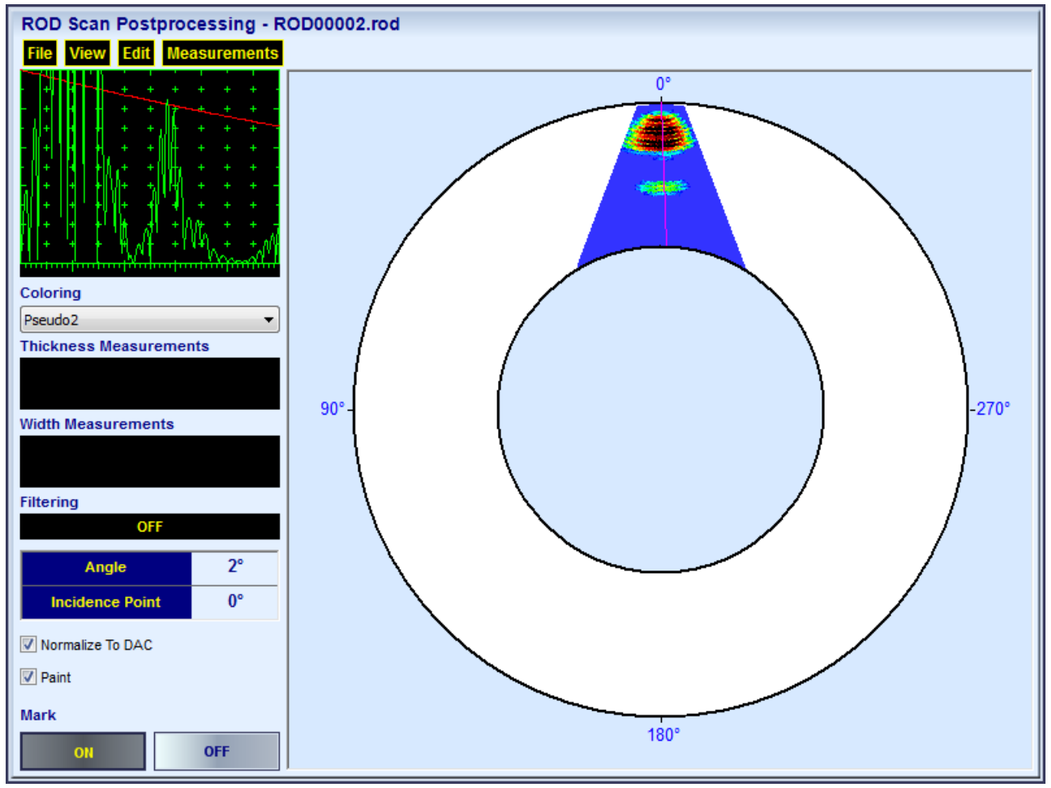
Item	*Order Code (Part ##)*
Inspection SW Application for ISONIC 3510 - Phased Array Modality: **RODScan - Inspection of solid and hollow shafts, rods, axles, thick wall tubes, fitting lugs, and the like - LW sector scan insonification combined with circumferential scanning and complete cross section image reconstruction** ⇨ True-To-Geometry Rod Cross Section Overlay Volume Corrected Imaging ⇨ Sector-Scan Cross Sectional Coverage ⇨ Intuitive Image Guided PA Pulser Receiver with Beam Forming View ⇨ DAC / TCG Normalization ⇨ Built-In Solid / Hollow Rod Geometry Editor and Ray Tracer - Scanning Pattern Design ⇨ Independent on TCG Angle Gain Compensation / Gain Per Focal Law Correction ⇨ Encoded and Time based Overall Rod Cross Section Coverage Through Superimposing of Sector Scans Obtained Through Rotation of the Rod ⇨ 100% Raw Data Capturing ⇨ FMC/TFM Protocol for the data acquisition and imaging ⇨ Comprehensive Postrpocessing Including: → Recovery and Evaluation of Captured A-Scans from the Recorded Rod Cross Sectional Views → Off-Line Gain Manipulation → Off-Line DAC Normalization of the Recorded Images / DAC Evaluation → Numerous Filtering / Reject Options (by Geometry / Position / By Amplitude / dB-to-DAC / etc) → Defects Sizing → Automatic creating of inspection reports - hard copy / PDF File	SWA 3510011



Compression wave inspection of the tubular parts for the in-wall inclusions, cracks, etc – calibration / performance demonstration block

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