

**ScanMaster**

# Industrial Ultrasonic Scanning Systems

LFS - 300 SERIES



*Precision inspection machines  
for C-scan imaging, evaluation  
and documentation of large  
rotary-symmetric forgings and castings.*

# PRODUCT DESCRIPTION

## ***Introducing the LFS-300 Series***

LFS-300 Series ultrasonic inspection machines are intended for efficient and reliable ultrasonic inspection of large, rotary-symmetrical forgings and castings. Using a unique servo-driven part rotating platform (W-axis), forgings are vertically chucked in the machine, permitting full inspection accessibility to all surfaces in one part set-up.

## ***Test part sizes***

All types of forgings with rotary-symmetric part geometry. Accepts chucked part diameter from 900 to 3200mm (35" to 125"), height to 3000mm (120') and weight to 40 tons.

## ***Inspection technique***

Contact inspection with water coupling, using transducer bubblers and wear shoes.

## ***Inspection (feed) rates***

Surface inspection speeds to 500mm/sec (20in/sec), depending on operator-selected PRF and inspection resolution.

## ***Surface coverage***

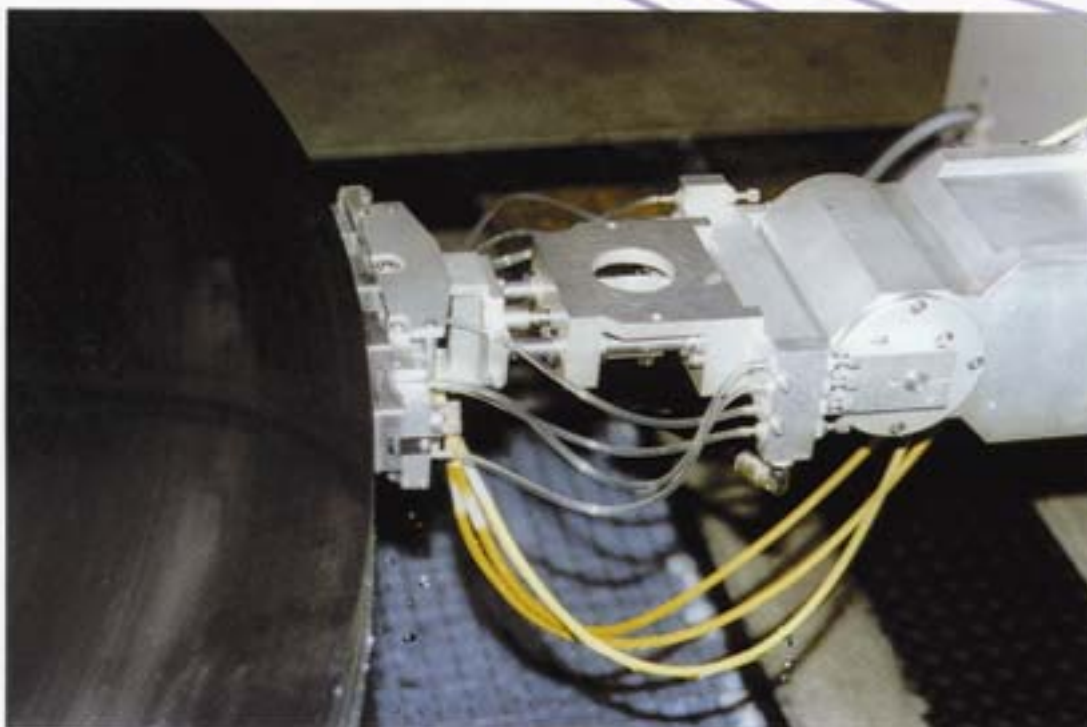
- Cylindrical, top and bottom flat surfaces - using standard single or multi-probe manipulator.
- Slopes and internal bores- using standard or optional single-probe adapters.
- Radii and curved surfaces - using probe bubblers with fitted wear shoes.

## ***Scanning robot***

Rugged inspection robot with three main motion axes (Z-axis vertical column, Y-axis horizontal boom, and V-axis transducer manipulator) for scanning test parts according to preprogrammed scan plans. All motion axes include precise positioning servo motors with digital motion control. A second, optional robotic arm is available for through-transmission applications.

## ***Multi-channel transducer manipulators***

A selection of manipulators incorporating quick-release fixtures for one to four ultrasonic transducers. Each transducer is fitted with a spring-loaded bubbler and wear shoe. A pneumatic loading device ensures constant contact pressure on the part surface, irrespective of surface speed, to ensure repeatable and stable ultrasonic inspection.



## ***Transducers***

Contact transducers specifically designed for machine-controlled contact inspection of forged parts. These include T-R probes with excellent near-surface resolution, high-sensitivity (deep penetration) straight and angled longitudinal wave probes, and shear wave probes with superior penetration and resolution properties.

**Upi-50 ultrasonic hardware**

Multi-channel **upi-50** rack-mount ultrasonic instrument with built-in Pentium CPU. Includes one RPP2 programmable square-wave pulser preamplifier for each channel. Remote installation of pulser preamplifiers on the scanning robot ensures enhanced ultrasonic signal-to-noise in the most difficult inspection environments.

**Enhanced dynamic range**

RPP2 square-wave pulser with optional LAM4 programmable logarithmic amplifier provides an operating dynamic range greater than 80dB for high-sensitive, far-field flaw detection. Total equivalent input noise less than  $4nV/\sqrt{Hz}$ .

**Flaw detection**

From 0.8mm (No.2) diameter flat-bottomed hole (FBH) at 1.5mm (0.060") depth. Other detection sensitivities per customer request.

**Motion control**

**MAC** servo drive hardware, with encoder feedback, RF noise suppression circuitry, and **ScanMaster** motion control software, for precise, repeatable positioning of all axes. Motion control hardware and system electrical panel installed in air-conditioned environment-proof control cabinet.

**Operator control console**

Single-screen interface for ultrasonics and motion control, using keyboard, mouse or remote pendant. Precise positioning of robot axes using the interactive **ScanMaster** 'virtual' control panel.

**UT set-up and storage**

Virtually unlimited hard-disk storage of ultrasonic set-up files. TEACH-IN interface with **ScanMaster** scan plan tools for operator-selected single or multi-segment scans. Local 'anchor points' compensate for part-to-part machining tolerances.

**Data acquisition**

**ScanMaster** C-scan imaging software with simultaneously screen display for up to four B or C-scan images in real-time and a toggle-selected A-scan signal. Rescan of selected surface areas of any size, 'SMART' full A-scan signal capture. Stop-on-Defect alarming, automatic detection of invalid pixels, and precise LOCATE cursor for validating indications.

**Inspection resolution**

Inspection resolution operator-selected from 0.5mm (0.02") along the part circumference.

**Data evaluation and processing**

**ScanMaster** field-tested defect classifiers, including area-amplitude cluster size (**ScanMaster** Search & Identify) and statistical signal-to-noise algorithms.

**Report Generator**

Customized reporting format designed to customer specifications. Display of data and parameter fields, such as ultrasonic set-up files, captured and stored A-scan records, spectral content of probes (FFT), and lists of flaws detected according to **ScanMaster** classifiers. Equivalent KSR (FBH) sizes. Inspection reports produced automatically or on demand.

**Remote communication**

LAN communication with a host computer or remote data processing station, providing maximum flexibility for the automation of inspection and data analysis procedures.

**System access control**

Five levels of programmable authorized access.

**Options**

- Second servo-controlled, programmable inspection arm for thru-transmission inspection.
- Special fixtures for scanning along internal surfaces.
- 'Local scan' axis for precise positioning along the part circumference to within 0.02mm (0.001").
- Drip-free coupling water recirculation.
- Remote operator station.

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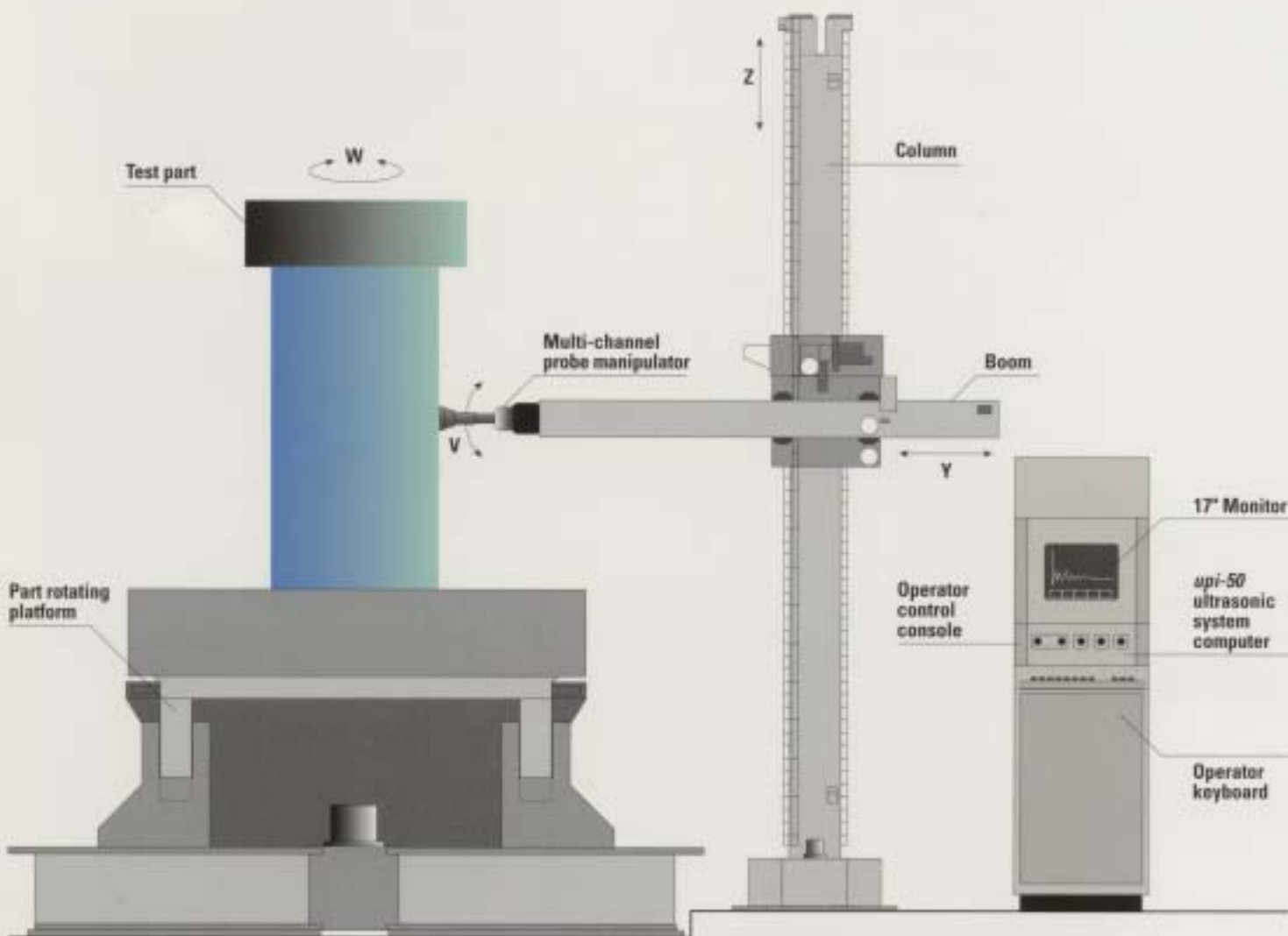
## P E R F O R M A N C E E N V E L O P E

Axis	Envelope	Speed range	Resolution	Repeatability	Accuracy	Backlash	Min. motion
	deg		deg	±deg	±deg	±deg	deg
<b>V</b>	±90	0.1-20deg/sec	0.01	0.02	0.02	<0.02	0.03
	Mm (in)	mm/sec (in/sec)	mm (in)	±mm (±in)	±mm (±in)	±mm (±in)	mm (in)
<b>W</b>	Continuous	1-500 (0.04-20) <sup>1</sup>	0.05 (0.02) <sup>2</sup>	0.05 (0.002) <sup>2,3</sup>	0.1 (0.004) <sup>4</sup>	<1.5 (0.06) <sup>5</sup>	<1 (0.04) <sup>2,3</sup>
<b>X<sup>6</sup></b>	±100 (±4)	1-50 (0.04-2)	0.01 (0.001)	0.02 (0.002)	0.05 (0.002)	0.01 (0.004)	0.02 (0.002)
<b>Y</b>	To 1880 (75) <sup>7</sup>	1-150 (0.04-6)	0.01 (0.001)	0.02 (0.002)	0.1 (0.004) <sup>7</sup>	<0.02 (0.01)	0.02 (0.002)
<b>Z</b>	To 3000 (120) <sup>8</sup>	1-150 (0.04-6)	0.01 (0.001)	0.2 (0.002)	0.1 (0.004) <sup>7</sup>	<0.04 (0.002)	0.03 (0.002)

- <sup>1</sup>Surface speed at outer diameter of part. • <sup>2</sup>At outer diameter of part. • <sup>3</sup>With five ton load. • <sup>4</sup>Per 1000mm (40in) of distance along circumference. • <sup>5</sup>Optional 'local' scan axis for precise flaw 'prove up'. • <sup>6</sup>Selected by customer for largest diameter test part. • <sup>7</sup>Per 1000mm (40 in) length. • <sup>8</sup>Selected by customer. Includes inspection from top of part.

### S A F E T Y S T A N D A R D S A N D A P P R O V A L S

LFS-300 systems are fully compliant with the most stringent safety standards. rated for safety and RFI/EMI interference. Approved by major manufacturers for C-scan inspection of forged shafts and disks.





Dual-beam search tubes for simultaneous P-E and T-T inspection



Extension arms for bore inspection



'Local' scan axis for precise 'prove up' of flaws

