

CHORUS

Robotic Non-Destructive Testing System

Equipment Highlights

CHORUS is a multi-technique robotic NDT system that can be integrated with tracks, turntables, rotating scanners, part actuators, and immersion tanks in single and multiple robot configurations, working separately or together.



Flexible Configuration

Single and multi-robot cells that integrate with tracks, turntables, and other external axes of motion. Available with industrial robots from KUKA and ABB.



Complex Geometry Inspection Capabilities

Designed to automatically locate, scan, and inspect complex aerospace components with irregular edges, cut-outs, variable radii, T and Ω stringers, and intricate double curvatures.



Multi-technique with Automatic Tool Changers

Compatible with a wide range of NDT methods, including UT (PE, TTU, PAUT), EMAT, LUT, EC, RT, IR, VT, and ST.



NDT-WEB ROUTINE

Web-based programming and inspection software that integrates all offline and online processes. Modular, intuitive interface that eliminates the need for direct robot programming.



Remote Training and Support

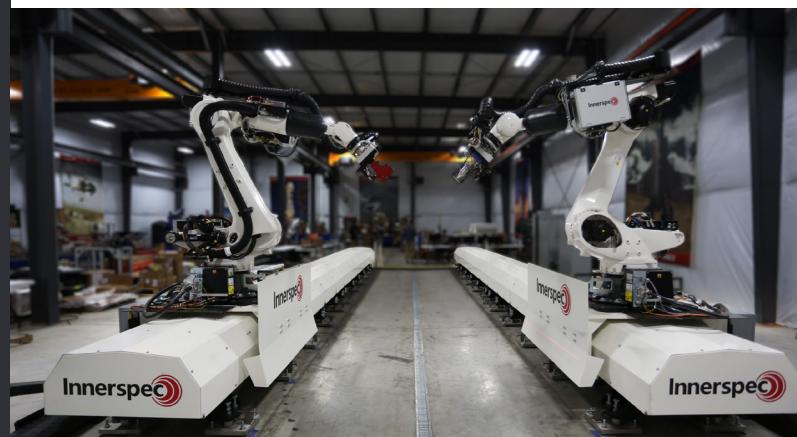
NDT-LINK cloud-based portal providing 24/7 services including user management, asset tracking, technical support, documentation, training, spare parts, and remote data analysis.

The Comprehensive High-Output Robotic Universal-NDT System (CHORUS) is an advanced inspection platform developed specifically for nondestructive testing with articulated robots. It is optimized for both large and small composite parts, forgings, and metallic components, with a particular focus on complex aerospace composite structures. CHORUS supports conventional ultrasonic techniques—such as Pulse-Echo (PE), Through-Transmission Ultrasonics (TTU), and Phased Array UT (PAUT)—as well as advanced NDT methods including EMAT, Laser Ultrasonics, Eddy Current, Radiography, Thermography, and Shearography. Innerspec's proprietary robot-control module, TEMPO, provides precise spatial correlation between robot motion and NDT data acquisition, allowing the highest inspection speed in the industry.

The system can include one or multiple industrial robots mounted on stationary pedestals, linear tracks, or gantries to maximize inspection coverage, flexibility, and throughput. Robots may be equipped with standard or custom-designed end effectors and yokes tailored to complex geometries. Automatic tool changers enable integration of additional devices, including defect marking systems and vision-based tools for part identification and scanning.

All system operations are managed through NDT-WEB ROUTINE, an integrated software environment that handles every stage of the inspection workflow. CHORUS integrates seamlessly with Innerspec instrumentation and analysis software, as well as a wide range of third-party systems. Inspection data is stored in an open HDF5 format, enabling straightforward access and compatibility with widely used industry analysis tools.

Designed in the United States, CHORUS systems can be manufactured and assembled at Innerspec facilities in the U.S. or Europe, based on customer preferences.



NDT - WEB ROUTINE

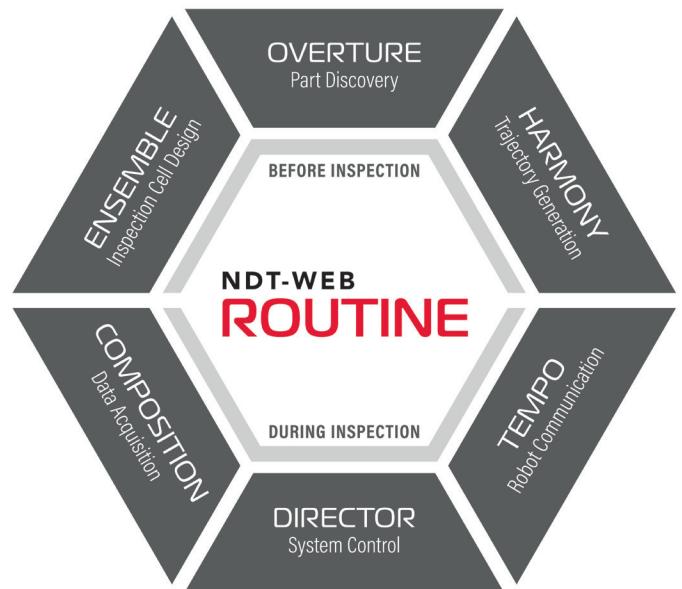
CHORUS robotic systems include Innerspec's NDT-WEB ROUTINE (Robotic UT Integration Environment), a suite of web-based and seamlessly integrated sub-programs covering all the Offline and Online processes required to manage the inspection.

Before Inspection:

- **ENSEMBLE:** Inspection Cell Design. Provides tools to design and share designs among different facilities.
- **OVERTURE:** Part Discovery using 2D lasers and cameras to find and create a 3D model of the object to be inspected.
- **HARMONY:** Automatic Trajectory Generation synchronized with the motion of the robot.

During Inspection:

- **TEMPO:** Ultra-low latency Robot Communication protocol that ensures swift and seamless data exchange between the robot and the NDT instrument. Available for both KUKA and ABB robots.
- **DIRECTOR:** System Control software that coordinates all online processes during inspection.
- **COMPOSITION:** Data Acquisition NDT software. The system can be integrated with instrumentation and software from Innerspec and other manufacturers (e.g. UTEX InspectionWare).



CHORUS - Specifications

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| Inspection Technique | <ul style="list-style-type: none"> • Any conventional UT (TTU, PE, PAUT) as well as other NDT methods such as EMAT, LUT, ECA, RT, IR, VT, ST. |
| Instrumentation and Software | <ul style="list-style-type: none"> • Innerspec: <ul style="list-style-type: none"> ◦ Instrumentation: PRIMO HP (UT), PRIMO SC (EMAT), PRIMO EC (ECA). ◦ Software: NDT-WEB ROUTINE. • Third Parties: <ul style="list-style-type: none"> ◦ Instrumentation: Evident, PeakNDT. Other manufacturers available upon request. ◦ Analysis Software: UTEX InspectionWare, NDTkit. |
| Other Hardware | <ul style="list-style-type: none"> • Robots: KUKA, ABB. • PLC: Beckhoff. Other manufacturers available upon request. • Tracks and other controlled axes. Güdel, KUKA, ABB. |
| Unique Capabilities | <ul style="list-style-type: none"> • Ultra-low latency robot communication with 10 kHz control and data refresh rate, enabling inspections at up to 10m/s with 1mm resolution. • Browser-based software platform accessible from any modern device, with no OS or client software dependencies. • Automated tool changing allows fast transitions between NDT sensors, vision systems, and defect-marking hardware. |

