Engineering Division

- NDT-technology and automation for Railway and Metal-industry
- Research & Development
- Software solutions
- Engineering services
Far-sighted support for top-class safety and efficiency with arxes-tolina

Reliability and Flexibility

Railway operators, energy providers, chemical- and nuclear industries, metal-industries and their suppliers are committed to inspect safety-relevant components continuously and recurringily. Non-destructive technologies provide the most efficient and reliable methods for such inspections for maximum quality and safety of crucial components now and in future.

As a strong partner arxes-tolina GmbH provides the most reliable and cost-efficient solutions for such high demands with its automated inspection devices and management systems.

We support our customers by optimising their existing NDT-inspections or by developing new solutions for upcoming challenges.

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NDT systems for
- Bar steel
- Pipes
- Welds
- Sheet metal and plate steel
- Profiles
- Discs

Automated handling of
- single parts
- continuous material flow

Inspection with
- Eddy current
- Ultrasound
- Conventional
- Phased Array
Solutions for global competition

Individual design & intelligent integration

The emerging of global competitors is increasing dynamic and pressure on the entire industry. Streamlining of processes and their management are crucial for sustainable competitiveness. We believe in the combination of cost-efficient availability of highest quality with an outstanding process-management. The products of arxes-tolina GmbH represent the most effective options to combine efficiency and reliability.

Market leading means, understanding the significance of efficiency and reliability for success.

Our product portfolio

Product-Line Railway

- (RWI) Single wheel Inspection
- (HAT) Hollow axle inspection
- (Protec) Optical profile measurement
- (AURA) Autom. wheel inspection
- (UFPE) Underfloor inspection
- (TBI) Track-based Inspection
- Combined systems (AURA + SAT)
- (UER) Residual Stress analysis

Product-Line Industry

- Inspection of bar Steel conventional probes
- Inspection of Bar Steel Phased Array
- Inspection of welding seams
- Inspection of Bar Steel polygonal profiles
- Inspection of disks

Product-Line Equipment

- Inspection of sheet metal and plates
- Transducers, Probes and Equipment

Product-Line Software

- Software
**arxes data management (adm)**

*adm* is a tool for depicting and effectively managing technical and economical processes of high complexity. The objective is a global and unlimited access to any project status respective KPIs, as *time, cost and quality.*

This modular and extraordinary flexible software is based on a standard framework. This framework is originated in the IRMS software, which is in service successfully since 1992, undergoing several evolutionary milestones.

Our experienced software-team creates a customer-specific solution out of a comprehensive set of modules and functions which provides streamlined work-processes and optimized communication-structures. The interface management integrates *adm* seamless into any existing software-landscape and optimizes data-interchange by automized protocols.

*adm* provides following modules:

### Material Master
Management of any objects as data-set in the material-master. This module can display a complex product structure. The material-master provides management of various parameters e.g. variations, versions, components, etc..

### Project-schedule
Project-management over all phases. Display of milestones, due-dates corresponding to the product-structure.
- Project-planning in a clear structure
- Status via traffic-light logic
- Escalation of indications from components to main-structure
- Global access 24/7
- Integrated cost-management function

### My Tasks
- Automated assignation of tasks to respective stake-holders including follow-up
- Generating of access-rights for each stake-holder according a progress-orientated task-profile

### Documents
Automatic management of:
- Orders
- Tenders
- Invoices
- Specifications
- Instructions
- Certificates
- Delivery-notes
arxes data management (adm)

Further available modules of adm:

**Procurement**
Planning, processing and monitoring of various procurement-methods e.g. purchasing or manufacturing.

Automatic feedback
- Controlling: Check Costs
- Schedule: Check due-dates
- Supplier-module: Check quality

**Warehouse**
- Automatic processing and Documentation of incoming goods control
- Management of stock, in- and outflow of goods and documents
- Barcode System

Automatic feedback
- Controlling: SET-IS comparison
- Procurement: Re-order on time

**Human Resources**
Automatic management of:
- Qualifications & Certificates
- Tools & Efficiency
- Rolls & Responsibilities

**Supplier**
Managing, ordering, controlling and evaluation of suppliers via global online-access. Interface via supplier-accounts in adm.

Available interfaces with adm:

- [SAP](#)
- [Microsoft Dynamics](#)
- [DATEV](#)
- Generischer Import / Export

Solutions for your adm infrastructure:

- [Client](#)
- [Cloud](#)
- [Server](#)

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*arxes-teiling*
Engineering IT Software Consulting
Railway Management System RMS

RMS is an application software for management purpose in the railway industry. RMS is also based on the standard framework of IRMS, and performs excellently since 2006. RMS provides various functions for managing operation and maintenance of wheel-sets including components.

One elementary function is the collecting, storing and protocolling of several NDT-inspection data including history. RMS links all available inspection-systems across locations, independent of manufacturer and collects their diagnosis-data via interface. The result is a single protocol of all inspections for each wheelset, available any time.

**Linking Inspection Systems:**
- Axle-inspection SAT
- Wheel-inspection AURA
- Residual stress analysis UER
- Optical Profiling
- Others (MT, etc.)
- Underfloor inspection UFPE
- Lathes, heat treatment
- Mobile devices

RMS furthermore provides the management of life-cycle data of wheel-sets:
- Automatic identification of a wheel-set via RFID or optical marker
- Link-management between trains, vehicles, wheel-sets and their components
- Management of operating data, e.g. mileage
- Analysis and Evaluation under respect of inspection result.
- Definition of thresholds for defined parameters, e.g. minimum diameters.

**Combined with the Rail Telematic Monitoring System RMS provides even further options:**
- Train configuration management
- Tracking & tracing via GPS
- Loading condition
- Predictive maintenance
- DeRailment function
- Event-triggered alarms

Solutions for your RMS infrastructure:
RWI – Railway Single Wheel Inspection

The wheels are safety-relevant components of each railway vehicle. Because of exposure to intense stress during service, wheels undergo a strict quality inspection during the manufacturing process and are released with certificates before going into service. After testing the base material during steel-production, an NDT inspection of the wheel after shape-cutting and heat treatment is essential for a competitive manufacturing.

The ultrasonic RWI-system, offered by arxes-tolina can complete any production line with a minimum investment and maximum reliability.

**Automatisation**

Any manufacturing process requires short cycle times within highest accuracy for the integrated ultrasonic inspection. One full-automated RWI system is the equivalent to 4 state-of-art high-speed lathes. In full-automated configuration, the RWI system performs wheel-inspections autonomously, with high realiability.

- Automated inspection ensures continuous accuracy on highest level
- Full-automated material handling reduced cycle time to less than 5 minutes
- The full automated version of the RWI system is also capable of performing without operator with highest reliability
- Optionally semi-automized versions will meet any customer requirement

**Immersion Technique**

Immersion technique with contact free probe in elevated or fixed water tank avoids any wear.

- The selection of beam probes according testing duty for best performance
- Automated or manual archiving and evaluation of results
- Clear and easy evidence in any case insured
- Minimisation in device service thru self-diagnostic and remote maintenance

**Following norms and standards are respected:**

- RD 32.144-2000
- UIC 812-3V
- ISO 5948
- AFNOR 09-340
- EN 13 262
- AAR M 107-84
- DB-TL 918 272
- AFNOR ND-FOIL-142

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Semi-automized version of the RWI-system for wheel rim inspection.

Full automated version of the RWI-system for inspection of entire wheel.

Modular inspection technique for wheel-rim, -disc and -hub.
AURA – Automated Ultrasound Wheel Inspection

Wheels of railway vehicles are exposed to undamped vibrations during operation. Such vibration can lead to rapid crack growth until total material failure. Ultrasonic inspection is the most reliable and cost efficient method of identification of such cracks. A time-consuming and expensive magnetic inspection can be avoided.

The inspection systems of arxes-tolina have a stationary layout and can be integrated into any inspection line or used as stand alone unit. Optionally the AURA can be customized according to any specific requirement including any wheel geometry.

Modular Concept

The AURA concept is accepted and relied upon worldwide by operators of the largest global railway systems. A.o. Deutsche Bahn is using the AURA for generation 2 and 3 of German ICE-trains.

- Availability in full- or semi-automated configuration
- Integration in any existing inspection line
- Customisation to any requirement from inspection of running surface up to entire volume with curved wheel-disc
- Availability of modules for conventional and Phased Array technology

The easy user interface of the integrated software ensures a high quality of inspections, which are independent from operator’s qualification.

- The integrated IRMS management software provides a fast and clear status
- Digital archive of results as A-, B-, C-scan and pdf report
- Clear and easy evidence in any case insured
- Minimum maintenance effort by self-diagnosis and remote maintenance
UFPE – Underfloor Inspection Unit

The inspection of wheel-sets can be performed as part of a “light maintenance” without disassembly from the vehicle for cost-saving reasons or for acceleration of the process. The most important advantage of the “light” maintenance is a significant reduction of time required.

The automated underfloor wheel inspection system UFPE utilizes a autonomous semi-mobile unit, which is moved along the train in a trench. This unit that stops at every wheel-set for performance of the required inspection. The UFPE system performs the inspection of one standard high-speed train within one shift. UFPE systems can be equipped with a set of inspection modules for several purposes:

Wheel inspection

Characteristics

- Flexible feeder mechanism ensures coupling to running surface and front edge of any wheel diameters
- Cardinic suspension and spring mechanism for optimised coupling
- Robust layout for operation under workshop conditions
- Coupling with water ensures high quality with low costs
- Splash water protection
- Simple variation of testing probes systems in relation to different train types and wheels

Advantages

- Maximised S/N ratio with superior electronics PCUS Pro
- High accuracy in combination with short cycle time
- Low maintenance cost by minimized wear
- Simple operating and management of software ensured a best in quality also at different operator skills.
- Easy evidence with stored diagnosis data in case ensured

The diagnosis data is displayed and stored as a digital A,-B- and C-picture either on-board or in the workshop’s network. Reports and data are available any time as part lifecycle history. In a case insured, e.g. an accident, the diagnosis data provides clear evidence, that the inspection was performed correctly. Self-testing and remote-maintenance functions reduce maintenance efforts to a minimum.

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UFPE – Underfloor Inspection Unit

The automated underfloor inspection is an efficient method for light maintenance of railway wheelsets. The modular inspection unit is installed in the trench and feeding motion is applied to from underfloor. Additionally to the wheel inspection, the solid axle inspection from underfloor completes the range of applications for this technology. Limited available space is no obstacle. The track based Roll-over inspection requires a minimum of ground space. Probes, which are running along the train are superior to any track mounted solution.

**Solid shaft inspection**

**Characteristics**
- Compact and robust device
- Based on proven technology from SAT-system
- Accuracy on highest level due to latest Phased Array technology
- Minimized maintenance efforts and wear
- Cycle time down to 3.5 min per axle

**Advantages**
- Inspection of solid axles without demounting from vehicle
- High accuracy combined with short cycle time.
- Rotating mounted probe inspects axle without applying rotation

**Roll-over wheel inspection**

**Characteristics**
- Roll-over speed up to 15 km/h
- Splash water proof
- Accuracy on highest level
- Repeatable inspection results stored in database
- Probe-head coupling onto wheel and moves along during 360° rotation

**Advantages**
- Inspection of solid axles without demounting from vehicle
- Minimised maintenance effort due to roll-over method for entire train
- Superior precision and larger area, covered in comparison with track-mounted Rayleigh-probe

Display of diagnosis data as C- and B-Image
HAT – Hollow Axle Inspection system

The type HAT-M04 inspection systems are used for the inspection of railway axles with longitudinal borehole. These hollow axles are commonly in service for high speed trains. Usually the ultrasonic inspection is performed during light maintenance. The procedure ensures a return to service of the vehicles in a minimum time. The compact and mobile systems of type HAT-M04 are globally in service with its 4th generations already and have proven its reliability and flexibility successfully. For inspection a probe is inserted into the axle’s longitudinal bore. Rotation and axial feeding motion of the probe generate a spiral inspection pattern.

**Characteristics**
- Flexible operation due to compact, mobile concept
- Modular design of probe-system addresses individual inspection requirements
- Integrated IT-equipment with UPS
- Inspection of hollow axles with mounted components
- Highly accurate determination of defect location
- Cycle time down to 8 minutes
- Integrated software for analysis and storage
- Display of diagnosis data as A-, B- and C-images

**Parameters**
- Max. axle length: 2300 mm
- Max. axle height: 320 mm-1200 mm
- Inner bore diameter: 30 mm-90 mm
- Space beside train: 1400 x 1400 mm
- Hatches of bearing housing disassembled
- Axle temperature: 5°-35° C
- Room temperature: 5°-40° C
- Reference reflector: Tangential saw cuts 2mm x 0,1mm

**Advantages**
- High efficiency with light maintenance
- Online display of diagnosis data during inspection
- Short cycle time and easy handling
- Maximum S/N ratio via compact electronics **PCUS Pro**
- Continuously high level of quality, independent from qualification and motivation of operator
- Easy evidence with stored diagnosis data in case ensured
- Highest level of reliability by use of proven components of renown Supplier
- Minimized Maintenance efforts by self- and remote diagnosis
- Simplified display of results for easy evaluation
SAT – Solid Axle Inspection

The SAT type inspection systems from arxes-tolina GmbH represent the global state-of-the-art in accuracy, resolution, reliability and cycle time. The fast and clear detection of defects solid axles is a key safety requirement of the growing rail transport.

The SAT type inspection systems from arxes-tolina GmbH are equipped with latest Phased Array technology, developed in cooperation with Fraunhofer Institute (IKTS / Dresden). The automated handling technology has been proven for years.

Characteristics

- Full- or semi-automated operation
- Online visualisation during scanning process
- Cycle time: approx. 3.5 min. in full-automated operation
- Easy adoption to any international standard
- Reproducible diagnosis data
- Simplified visualisation with B- and C-Scans
- Inspection quality independent from surface condition
- Coupling liquid: Water
- Reference reflector: tangential saw cut 2mm x 0,1mm

Diameter-steps, e.g. at wheel-seats of brake-seats are critical areas for an ultrasonic inspection of railway axles. Customers can select various options out the modular concept to cover these critical areas or 100% of surface or volume. Arxes-tolina also offers consultancy service of our experts for a tailored solution according standards and specifications.

Advantages

- Inspection without disassembly of wheels
- Inspection with thick-layer coating of axle and rough surface condition
- Low operating costs through wear reduced design
- Cost- and performance optimisation via customized solutions
- Result quality independent of qualification and motivation of operator
- Clear and easy evidence in case ensured
- Simple visualisation for fast decision making

Full-automated SAT-application in maintenance facility at DB AG

Scan result in B- und C-picture
Customisation

The standardised inspection systems of type HAT, SAT, AURA, UFPE and UER are forming an comprehensive portfolio of effective NDT-inspection solutions for wheel-sets. The most relevant aspect for the operation of the inspection systems beside safety and reliability is the efficiency under in the customers framework.

To address the requirements of such frameworks, arxes-tolina GmbH provides a portfolio of modules for customisation of NDT-method, throughput, operational condition and integration in existing infrastructure.

Automation

The automation of NDT-inspections provides reproducible diagnosis data of continuous high quality and significantly reduced cycle times as major advantages.

- Semi-automated systems can be operated with high economical efficiency and still provide all other advantages
- Reduction of investment costs by re-using of existing handling devices or modernisation of old systems

Modular concept

With the extension of an task and range of an inspection system, a number of additional components (e.g. probes) is required. Investment costs can be reduced significantly by sequential use of already existing components.

Devices with high degree of complexity, as type SAT or RWI can be optimised according price or cycle time, while maintaining all advantages like reliability or accuracy.

Combination

Maintenance workshops are often gradually equipped with inspection systems, which perform inspections successively. This approach is related to high costs, because specific components are purchased several times.

The inspection modules of arxes-tolina GmbH can be combined to entire, customized systems with following advantages:

- Low investment and operations costs by shared use of components
- One-stop maintenance of a combined system with high quality level
- Combination with cleaning, measurement and machining systems of reliable partners in railway industry
- Centralised control of entire maintenance / inspection line, inclusive data storage
RailTM Telematic Monitor
Optimizing Railway Logistic Processes

Several European projects were recently initiated for improvement of the economic status of the railway sector.

- „Shift 2 Rail“ project (increase market share in logistic sector for rolling stock business)
- „Innovative rolling stock wagon 2030“ project

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<td>Optimizing Railway Logistic Processes</td>
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Immediate identification of derailments
Emergency stop for prevention of damage on tracks and rolling stock
Low investment costs for wagon-mounted sensor equipment
High accuracy and secure identification via combined sensors
Robust design for operation under-floor
Minimised operation costs by 6 year maintenance free service.

Tracing System Including Derailment Warning

Immediate identification of derailments
Emergency stop for prevention of damage on tracks and rolling stock
Low investment costs for wagon-mounted sensor equipment
High accuracy and secure identification via combined sensors
Robust design for operation under-floor
Minimised operation costs by 6 year maintenance free service.
RailTM Telematic Monitor

Product Sheet
- Central processing unit
- Wireless radio signal transmitting (2G, 3G, 4G technology)
- Data’s to store on-board
- Network-compatible as a hub preferred
- Geolocation (GPS, Galileo, Glonass, Beidou)
- Multi-sensor array
- IP67 electricity prevention class
- Operating temperature -25°C to 75°C
- Energy supply self-sufficient for 3-5 years
- Hub network: ZigBee / XBee

Secured Transfer of Data, Notifications and Alarms

Universal Software Interface
- Worldwide access
- Clear and simple controlling
- Complete disposability of documents
- One system for all tasks in fleet management
- Workflows, roles & responsibilities allocation
- Live-monitoring, status & individual reports
- Integrated data base
- Various interfaces
- Client, Server, Cloud installation
Quality of products is one key to success in global competition. Strict quality standards are present already for the production process of semi-finished metal products.

Manufacturing defects like cavities or inclusions negatively influence the stability of critical components and act as seed for micro-cracks and fatigue fractures. Removing affected parts early from the process is a key to cost reduction.

Arxes-tolina GmbH offers a portfolio of products and solutions, which allow the combination of high-level quality with commercial efficiency. Our highly motivated team develops custom-fit inspection solution with state-of-the-art inspection methods and reliable feeding technology, which can be easily integrated into any production line.

**SIS-Bare Steel Inspection System**

**Modular inspection methods**
- Ultrasound as contact or immersion technique
- conventional or Phased Array Probes
- Magnaflux for high resolution surface inspection

**Inspection range**
- Volumetric defects
- Radial, axial and tangential cracks

**Resolution**
- Volumetric defects: DSR 1,5mm
- Surface cracks: DSR 0,8mm

**Compliance with standards**
- DIN EN 12680-3 2012-02
- SEP 1920 1984 12
- EN 10293, EN 10308, EN 10228

**Material handling**
- Continuous material or single specimen
- diameter 20 mm to 1300 mm
- Feeding rate, pending on diameter
  - F<500 mm: bis 2 m/s
  - F>500 mm: bis 1 m/s

**Advantages**
- Online display of results
- Modular concept for individual solutions
- Constant inspection quality on highest level at economic efficiency
- Automated archiving and analysis of diagnosis data

**Management of Diagnosis Data**

Each inspection is equipped with an analysis software for diagnosis data, which is connected with the IRMS data base and a management module. The diagnosis data is analysed during inspection and displayed online. A comprehensive report is automatically generated for each inspection.
WIS-Welding seam inspection system

Modular inspection methods and technology
- Ultrasound with gap technology
- Conventional or Phased Array Probes
- Oil-/ water coupling

Covered areas
- Root pass
- Side- and interpass fusion defects
- Cracks in heat affected zone

Resolution
- Volumetric flaws < DSR 1

Compliance with standards
- DIN EN 10293:2015-04
- 10246-06 2000-03, 10246-07 2005-12
- 10246-13 2000-07, 10246-14 2000-03
- EN 1017

Feeder technology
- Sheets metal or pipes with defined length
- Individual to Y-, V-, X-, or T-seams
- Feeding rate: 0.5 m/s

Advantages
- Online analysis of diagnosis data and display of inspection results
- Modular concept for customised solutions
- Inspection quality independent from qualification of personnel
- Significant reduction of discard
- Simplified display of results for fast and easy evaluation

Management of Diagnosis Data
Each inspection is equipped with an analysis software for diagnosis data, which is connected with the IRMS database and a management module. The diagnosis data is analysed during inspection and displayed online. A comprehensive report is automatically generated for each inspection.
PTS-Plate Steel Test System

Modular inspection-method/ -technique
- Ultrasound with immersion- or gap technique
- Squirter technique for inspection of composite material
- Magna-flux method

Defect type
- Volumetric defects / surface cracks
- Doubling / delamination
- Thickness measurement

Resolution
- Volumetric defects: DSR > 0,2 mm

Compliance with standards
- DIN EN 10160 1999-09

Feeder technique
- Thickness between 6 mm and 200 mm
- Feeding rate depending on width
  D<500 mm: bis 1,0 m/s
  D>500 mm: bis 0,5 m/s

Advantages
- High degree of autonomy
- Online analysis of diagnosis data and display of inspection results
- Modular concept for customised solutions
- Inspection quality independent from qualification of personnel
- Significant reduction of discard
- Simplified display of results for fast and easy evaluation

Management of Diagnosis Data
Each inspection is equipped with an analysis software for diagnosis data, which is connected with the IRMS data base and a management module. The diagnosis data is analysed during inspection and displayed online. A comprehensive report is automatically generated for each inspection.
Accredited test laboratory in ultrasound

Accreditation by DAkkS according DIN EN ISO/IEC 17025 (D-PL-11234-01-00)
Arxes-tolina offers manual and mechanised ultrasonic inspection of metal parts and components of mechanical and chemical engineering in the accredited laboratory.

Accredited Ultrasound Standards

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DGZfP Certified Employees

DIN EN 9712 in NDT-process
- UT Level 2+3 (Is)
- PT Level 2+3 (Is)
- MT Level 2+3 (Is)
- ET Level 2 (Is)
- VT Level 2 (Is)
- RT Level 2 (Is)

Personnel

Our team-members are:
- NDT Master (DGZfP)
- Engineers
- Auditors
- Inspector

Service Offer:
- Consultancy and configuration of systems for any NDT-application
- Consultancy for simulation, analysis and optimisation of ultrasonic inspection
- Sectoral inspections, surface characterisation, machine-training
- Material analysis with spectrometer
  - Volumetric and surface inspections according latest norms
  - Inspections of Prototypes or small batches
  - Welding seam inspections
  - Manual and mechanised inspection with conventional and Phase Array probes
Accredited laboratory

Mechanised Ultrasonic Inspection with Immersion Technique
- USPS 3010VHF 3d scanning device company Dr. Hillger
- High-End ultrasound-high frequency system 65 MHz bandwidth
- PC-card with avalanche-pulser for extreme high resolution
- Ultrasonic electronic close to probe-head for maximum S/N ratio
- Simplified display of volumetric flaws in A, B, C and D scans
- Immersion pool for specimen size 400mm x 400mm x 150mm
- Phased Array immersion probes 5-50MHz with variable focus

Manual Ultrasonic Inspection
- Portable ultrasonic inspection device GE USM 35x S
- S-type with AVG, ERG, DAC and TGC
- 0,2 to 1 MHz /0,5 to 4 MHz /0,8 to 8 MHz /2 to 20 MHz
- Amplification 0 to 110dB
- RS232 data logger /interface to PC-Software
- Storing, printing and export function for results
- Suitable for probes-heads between 1MHz and 10MHz frequency

Equipment and Tools
- Thermometer P770 (DKD calibrated)
- Caliper IP57 (DKB calibrated)
- Luxmeter testo 545
- Level meter Karl Deutsch (50 mm)
- Multiple gauging forms (K1, K2, SKK)
- PCUS pro – single & multi (FhG IZFP)
- PCUS testing software ProLab (FhG IZFP)
The engineering division of arxes-tolina has collected an unique of competence and experience within 21 years of engineering work. Since 1992 the team’s qualification and motivation satisfies customer demands with accurate solutions. Beside the product-portfolio arxes-tolina proposes this competence to customers:

- Development of automated inspection systems and special purpose machines
- Update and modernisation of existing systems
- Upgrade existing inspection devices on latest standards
- Research and development

**Concept**
- Analysis of potential for automation
  - Economic und technical analysis
  - Specification and feasibility studies
- Ultrasonic inspection concepts
  - Conventional and Phased Array system
  - Other NDT methods
  - Simulation & pre-design
- Concepts for automation
  - Conformance with norms and standards
  - Custom-fit automation for maximum efficiency

**Development**
- Mechanical Layout
  - 3D modelling and space allocation
  - Manufacturing drawings
- Control and PLC
  - Layout
  - Programming
- Electrics
  - Planning and circuit design
  - Cable loom installation
- Software
  - NDT inspection software
  - Data management
  - System integration (Industry 4.0)
Engineering services

**Installation**
- Control PLC
  - Sensors and actuators
  - Control / regulation
- Electrics
  - Cable loom installation
  - Motors
  - Testing and certifications
- Software
  - All modules
- Mechanics
  - Hydraulics and pneumatics
  - Feeder systems
  - Mobile solutions

**Customer service**
- Maintenance all systems
  - Hydraulics / pneumatics
  - Mechanics
  - Electrics using approved methods
- Training of customer’s maintenance personnel
- Obsolescence Management
- Upgrades
  - Software
  - Hardware according new requirements or standards
Your notes