



ROLLING STOCK

**PROVIDING COMPLETE LIFECYCLE ROLLING STOCK
ENGINEERING SOLUTIONS**

Rolling Stock is a key pillar of railway projects. Ingerop has a team of experts dedicated to engineering in all stages of the Rolling Stock life cycle, from the **design** phase, through **manufacturing, testing and commissioning**, to **maintenance**.

Ingerop also provides transversal services for the entire life cycle, such as **RAMS analysis** and **Auditing** of existing rolling stock fleets and the supply chain.



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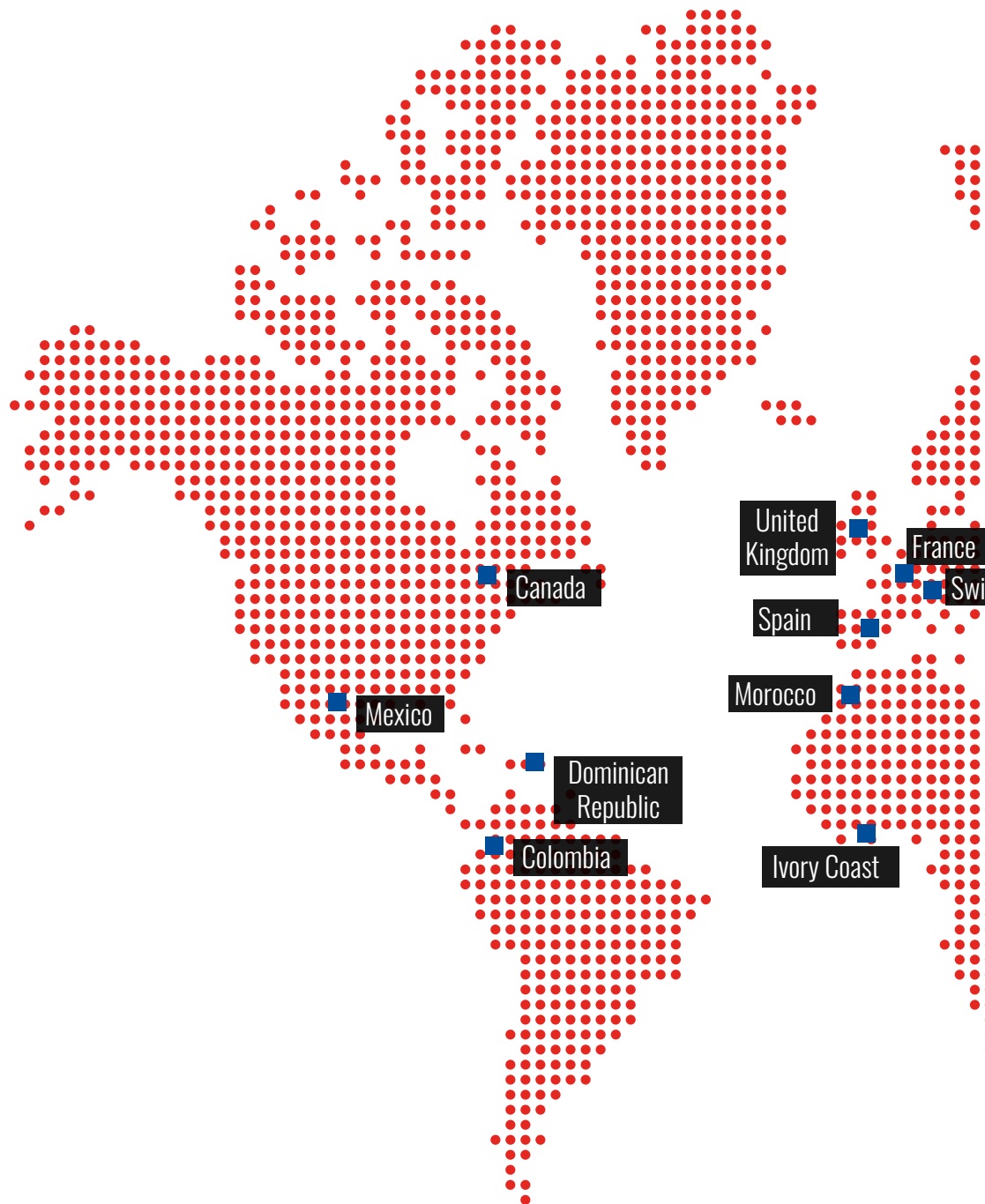
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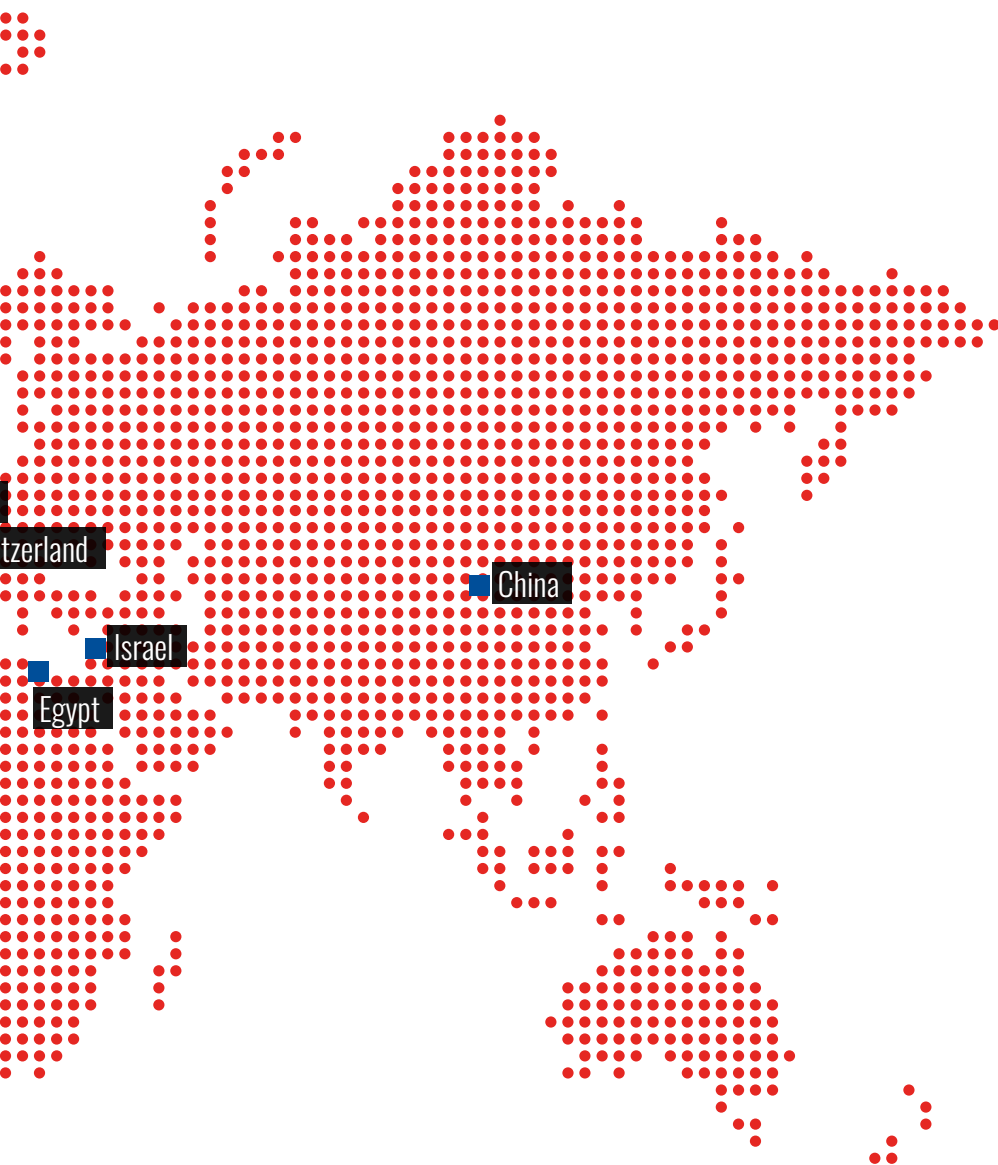


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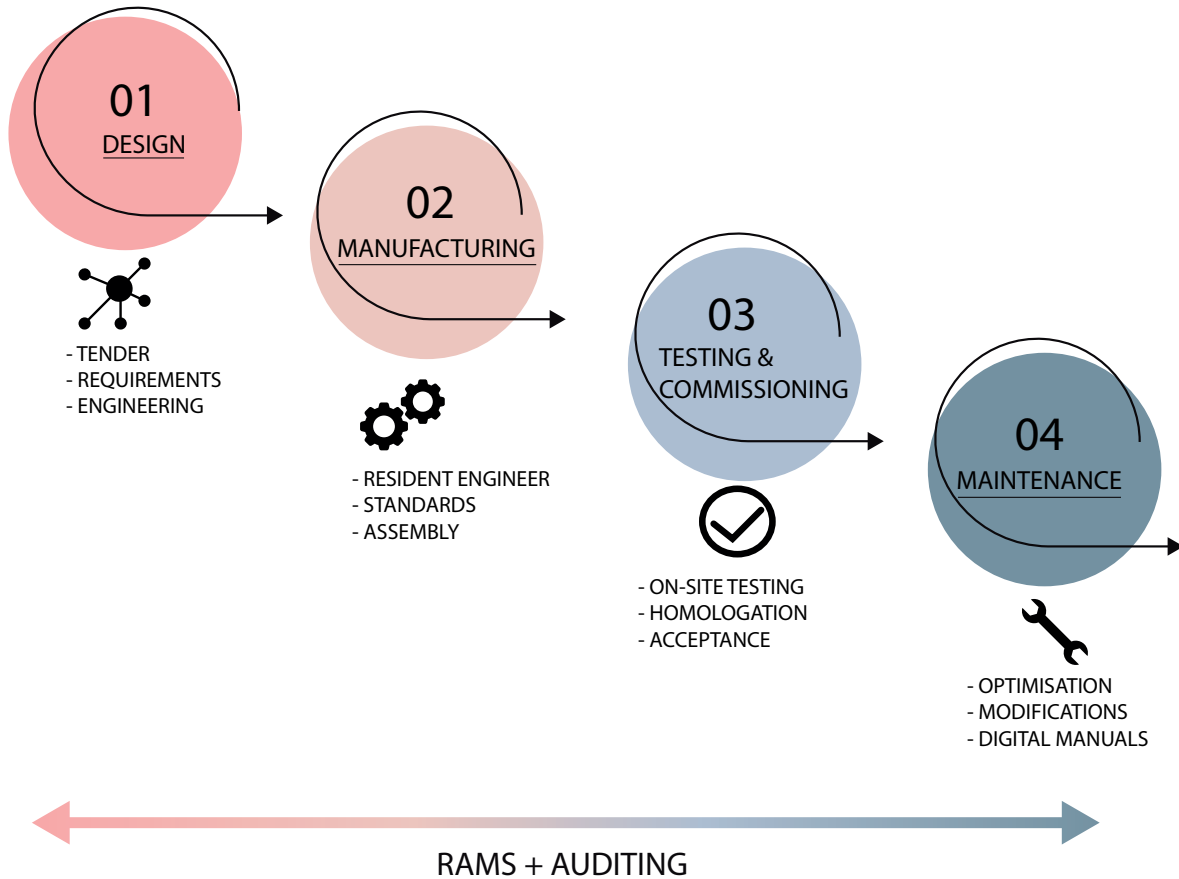
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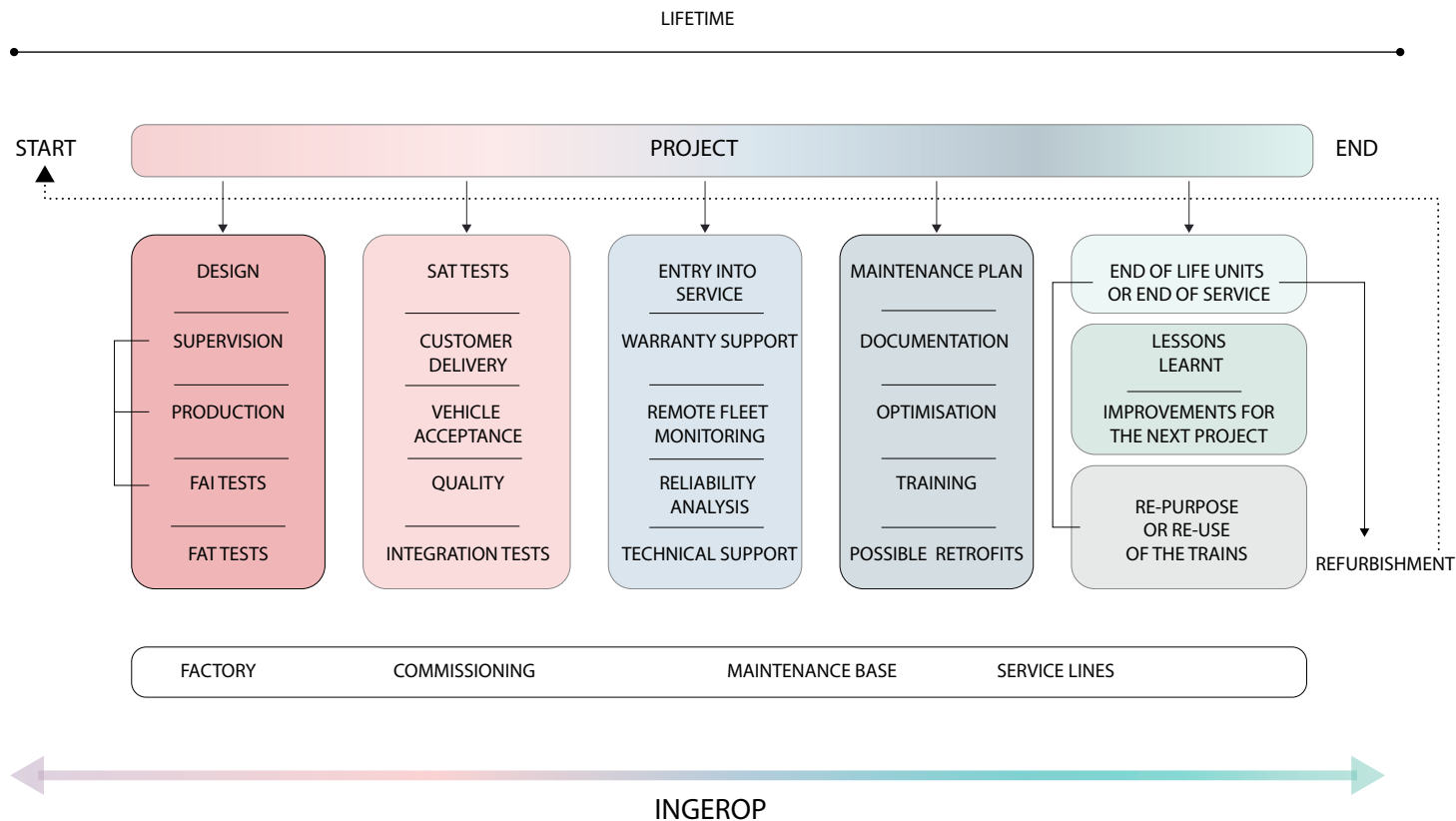




ROLLING STOCK



LIFE CYCLE SUPPORT CONCEPT



* FAI : First Article Inspection
FAT : Factory Acceptance Tests
SAT : Site Acceptance Tests

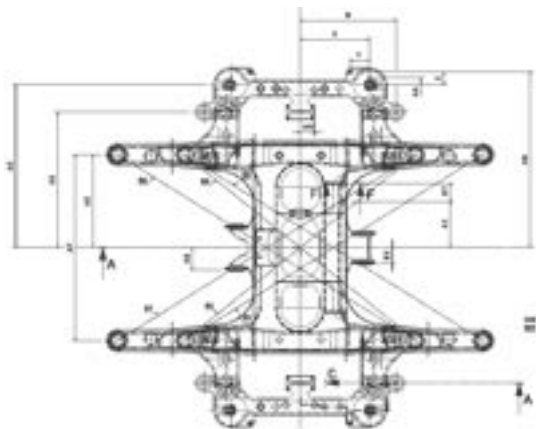
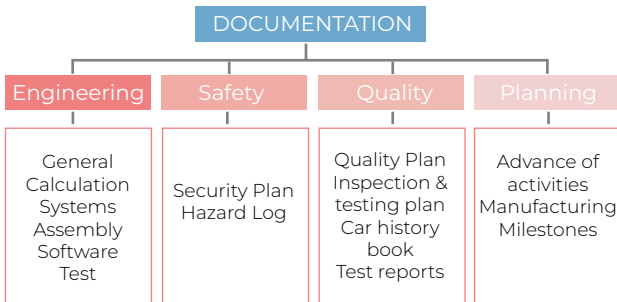
01 | DESIGN



“**We** review, manage and optimise the design phase with particular emphasis on the technical requirements and documentation associated with the project, ensuring that every detail meets the highest standards of quality and functionality.”

Documentary review of the project:

We oversee all the documentation associated with the project in all its phases (Conceptual design, General design and Detailed design), as well as its management with document software.



Requirements:

As a crucial component of the design phase, we oversee the review and management of rolling stock requirements, covering all systems and interfaces. This involves acting as a link between the manufacturer and the customer.

02 | MANUFACTURING

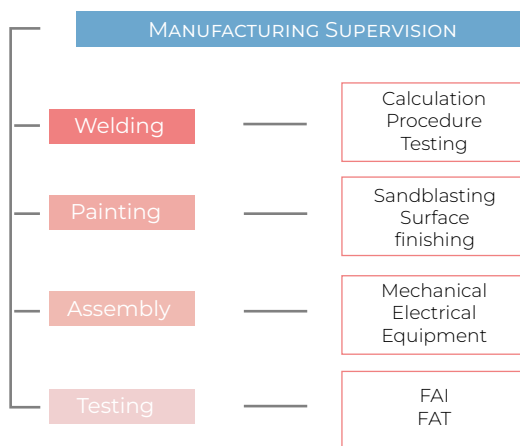


“By overseeing the rolling stock manufacturing process, we bring projects to life with unrivalled quality and precision at every stage.”



The rolling stock department is specialised in services related to manufacturing supervision, offering our clients the expertise gained during a long trajectory from projects with leading construction companies.

Our team checks and supervises the entire manufacturing process at the factory.



03 | TESTING & COMMISSIONING



“We ensure that each unit of rolling stock is ready to operate with maximum reliability.”



Dedicated on-site team:

- Acceptance of Rolling Stock.
- SAT (Site Acceptance Test).
- Integration tests.
- Ensure that equipment and systems operate according to their design.
- Provide opportunities for the operation team to become familiar with the system's functionality.
- Test and evaluate operational procedures and safety critical systems.
- Commissioning and first passenger operation.

04 | MAINTENANCE



“We ensure that the agreed objectives are delivered to budget and within the agreed timescales. We use specialised project management software tools to control and deliver complex projects.”



Short Term Overhaul Deferrals:

- Prevent rolling stock downtime by deferring overhauls on a short-term basis.
- Manage rolling stock availability.
- Thorough rolling stock inspections against overhaul scope including brake force testing.
- Detailed risk assessments against overhaul scope.
- Practical and pragmatic recommendations from experienced rolling stock engineers.

Optimisation:

- Life Cycle Cost (LCC) studies and analysis.
- RAM and Safety engineering & Consulting in the whole lifecycle.
- Reduce maintenance cost.
- Implement proactive and preventative maintenance regimes.
- Reliability Centred Maintenance (RCM) process approach.

Interactive Digital Maintenance Manuals:

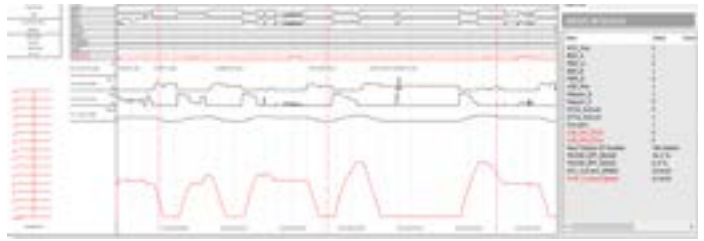
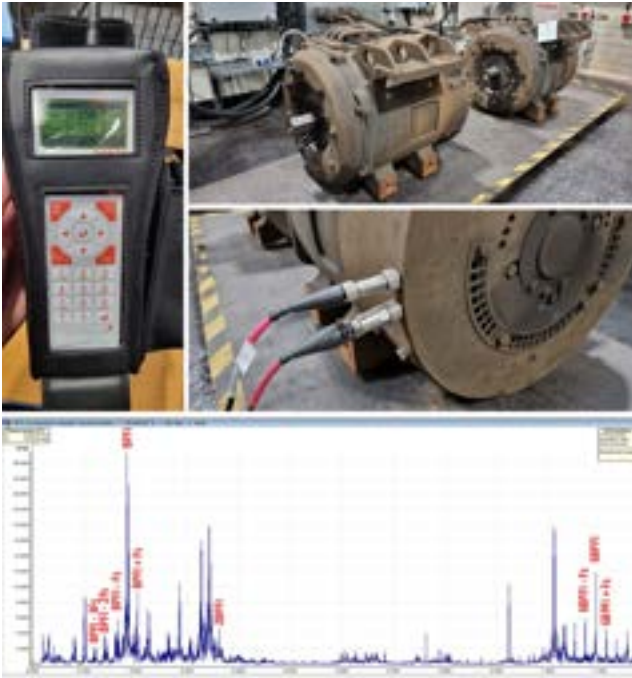
- Web based platform.
- Access via mobile, tablet or PC.
- Embedded interactive maintenance documentation e.g. hyperlinks, videos, 360 degree interactive images.
- Latest documentation available in real time.
- Structured and controlled change management built into the software.
- Simple user-friendly search functionality.



05 | ADDITIONAL SERVICES



“We provide transversal services for Rolling Stock projects such as RAMS analysis, System and Component Condition Assessments and Auditing of existing fleets.”



Auditing:

- Safety Audits (ISA & AsBO) based on ISO 17020
- Supplier Quality Assurance (SQA) Audits
- Depot and Asset Management Audits.
- Quality Assurance in all Rolling Stock Systems and lifecycle phase (ISO 9001 & ISO 14001 audits)

Electromagnetic Compatibility, EMC:

- EMC courses, consulting, simulation and testing.
- EMC directive applicability.

CE Marking specialists:

- Compliance and monitoring of the entire CE procedure and standards
- Assist with all kinds of testing work in laboratories

Integrated Logistic Support, ILS:

- Development of all kinds of ILS engineering documents (management systems, reliability monitoring and estimation)

System and Component Condition Assessments:

- Vibration Analysis on Traction Motors, gearboxes, axle boxes etc.
- Bearing condition assessments.
- Pneumatic component testing and condition assessments.

Engineering for Hydrogen transportation projects.

- Ingerop is positioned on the entire hydrogen value chain

RAMS Engineering:

- Fault Tree Analysis (FTA), Reliability Block Diagram (RBD) and Hazard Log (HL)
- Reliability standards (MIL-HDBK 217F, Telcordia, SN 29500, etc)
- Failure Reporting, Analysis, and Corrective Action System (FRACAS)
- Failure Modes, Effects and Criticality Analysis (FMECA)

OUR PROFESSIONAL NETWORK





