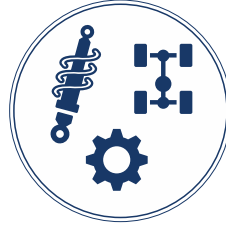




MATERIAL TESTING



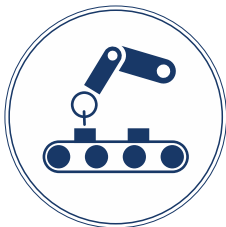
COMPONENT
& ASSEMBLY TESTING



ROAD TESTING, EMISSION TESTING &
ENGINE/POWERTRAIN TESTING

BOSMAL

Research & development



PROTOTYPING, MANUFACTURING,
ENGINEERING
& PRODUCTION AUTOMATION



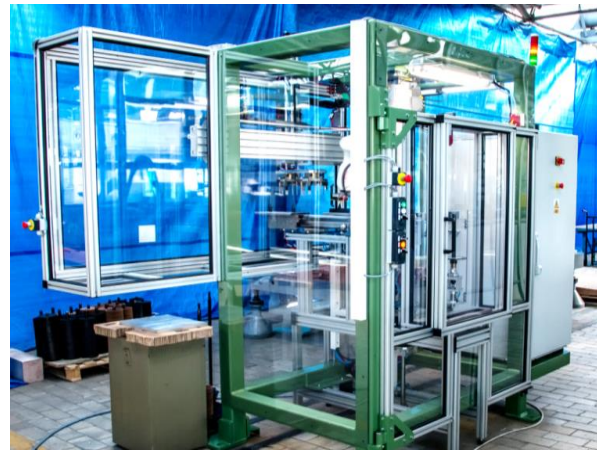
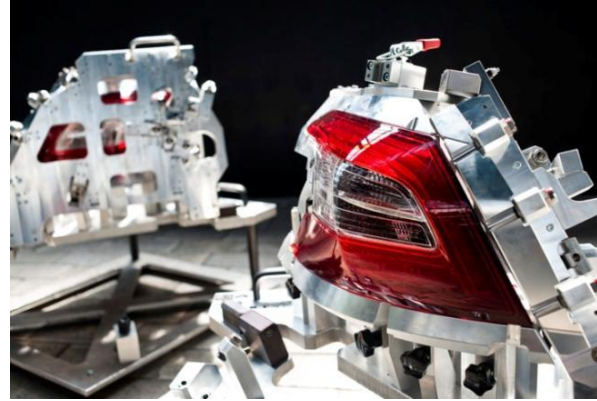
ENGINEERING
SERVICES



HOMOLOGATION
TYPE APPROVAL

BOSMAL RESEARCH & DEVELOPMENT

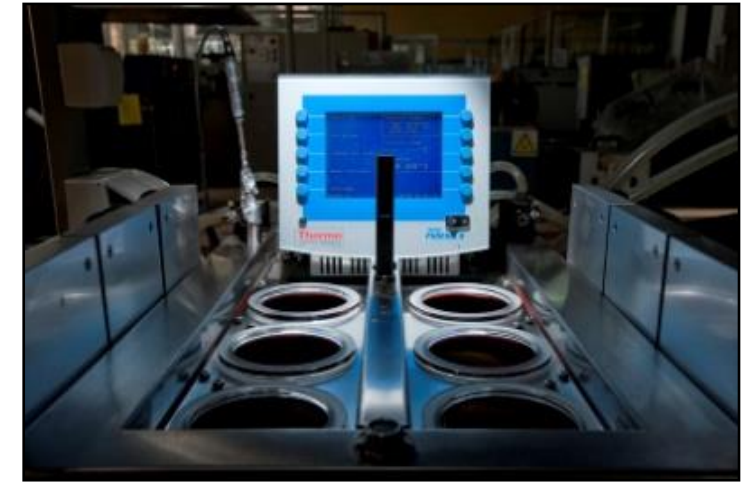
- Research and Development Center (with that legal status)
- Research laboratory meeting the requirements of PN-EN ISO / IEC 17025: 2018-02 - with a wide range of accreditation (over 600 methodologies)
- License for approval tests of vehicles (internal combustion and electric), as well as their equipment or parts (including internal combustion engines, electric engines and batteries)
- Certified, integrated management system (PN-EN ISO 9001:2015-10, PN-ISO 45001:2018-06 and PN-EN ISO 14001:2015-09)
- Certificate AQAP 2110:2016 - confirming compliance with NATO quality requirements in design, development and manufacture
- TISAX label. Results of Institute are available at <https://enx.com/tisax>
- Comprehensive range of research, design and production, engineering and production implementations
- Personnel: over 400 employees, including 230 engineers



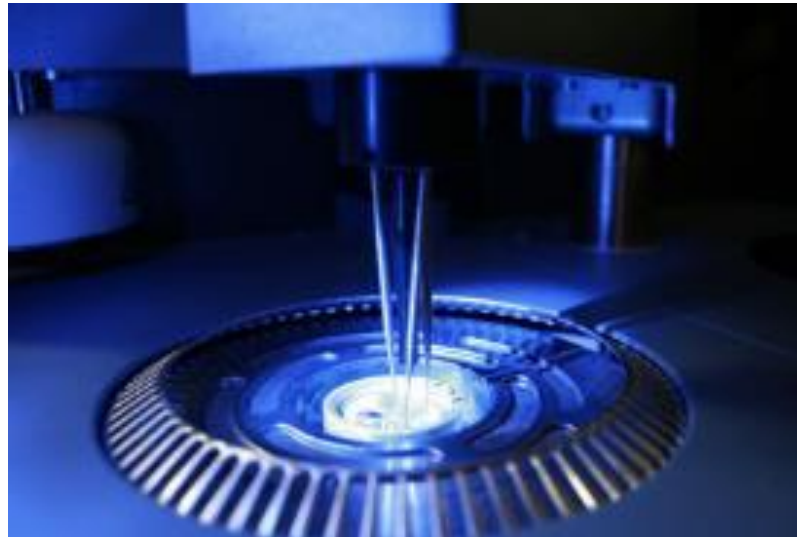


MATERIAL TESTING

1. material composition analysis (metals, metal alloys)
2. non-metallic materials constitution and composition analysis (rubber, plastics, solvents, paints, fuels and lubricants)
3. chemical and physicochemical tests
4. galvanized and organic (paints) coating examinations (corrosion tests), thickness, scratch (adhesion) testing
5. material resistance to light and climatic environment (ageing tests)
6. cleanliness of parts and components inclusions and contamination analysis regarding its composition and constitution



7. materials VOC (Volatile Organic Compounds) analyses
8. emission testing of hydrocarbons and halocarbons
9. tests of petroleum products: fuels, oils, lubricants, coolants for radiators, brake fluids, anaerobic adhesives, sealing compounds, other materials
10. thermal analysis
11. aging, heat cycles, environmental trials, low and high temperature resistance of materials and components tests

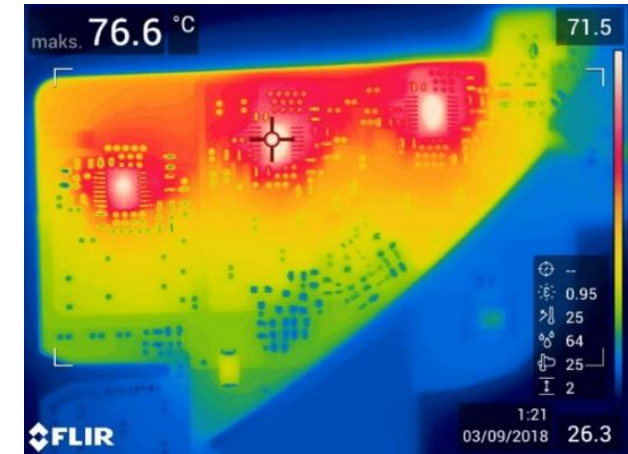




COMPONENT & ASSEMBLY TESTING

Tests of:

- batteries and their components
- engines and exhaust aftertreatment systems
- transmissions and gearboxes
- braking systems
- hydraulic hoses
- heat exchangers
- suspension systems
- windows
- automotive parts and assemblies
- chassis and body components



Types of tests:

- resistance, durability, material, functionality
- vibration, vibroacoustic (NVH) and tensometric
- static and dynamic twist tests
- aging, climatic, temperature, corrosion resistance
- resistance to water
- dust resistance
- pressure
- thermovision
- photometric
- electrotechnical and electronic
- photobiological safety assessment

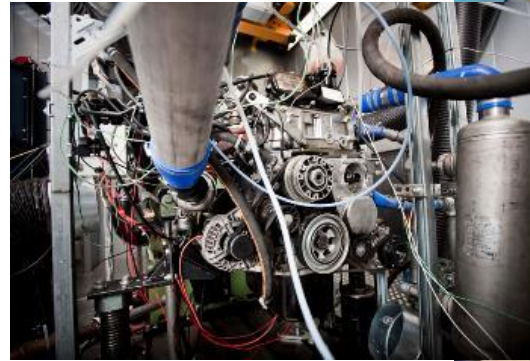


ROAD TESTING, EMISSION TESTING & ENGINE/POWERTRAIN TESTING

1. road tests
2. static tests of vehicles, machines, equipment and parts
3. engine and exhaust aftertreatment system tests
4. exhaust emission and fuel consumption tests: RDE – Real Driving Emissions (PEMS – Portable Emission Measurement System)
5. exhaust emission and fuel consumption tests: at engine test cells (at temperatures of -35°C to 60°C , on various road surfaces, different climate conditions and route profiles)
6. dynamic vehicle tests on 2WD and 4WD chassis dynos
7. vehicles, machinery and devices testing in large chambers at high and low temperature (from -45°C to 75°C or from -35°C to 60°C)



2 x Emissions Testing Laboratories (including 4x4 and climatic chamber)



8. hybrid and electric vehicles testing as well as conversion of vehicles from combustion engine to electric drive
9. vehicle functionality testing
10. engine durability testing
11. engine development testing
12. calibration work
13. testing engine oils and liquids
14. testing for type approval
15. Conformity of Production
16. ISC (In-Service Conformity)
17. MS (Market Surveillance)



Design & Production - turnkey systems

1. development of design assumptions
2. engineering calculations
3. designing
4. modeling
5. prototyping
6. verification and testing
7. certification
8. implementation into production

Design:

- 3D models
- 2D documentation
- Files format conversion

Simulation /Calculation analysis:

- Static linear
- Static nonlinear
- Dynamic
- Modal (natural frequency)
- Coupled field

Unit and small lot production:

- laboratory gauges & equipment
- Holders for vibration tests
- Control and measurement devices
- work center

Precise machining technologies:

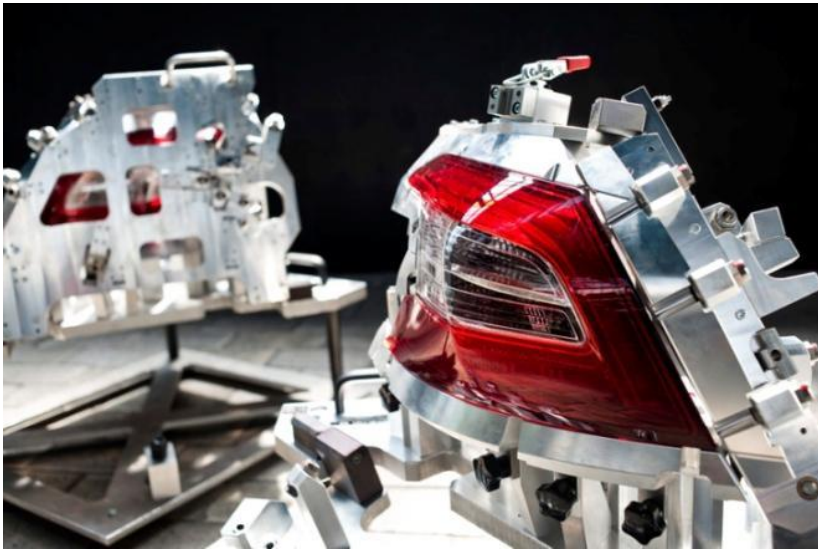
- milling
- turning
- grinding
- WEDM (wire electrical discharge machining)
- CMM validation

Metrological testing and certification



Automation and robotization in Industry

1. production automation, special machines, test stands
2. precise production equipment, measuring instruments – design and production
3. technological equipment of production lines
4. workshop aids, mock-ups, prototypes
5. support for maintenance and quality control





Staff augmentation (Body/ team leasing):

1. Rental of employees (including residents)

2. Auditors/ experts outsourcing

1. System audits
2. Product/ service audit
3. Process audit
4. Interim Management

Special production

1. 3D Printing
2. Precision parts
3. Surface coating
4. Parts Machining – technologies
5. Injection Moulding

Individual design

1. Body Systems
2. Exterior trim systems
3. Interior Trim Systems
4. New Product Development (NPD)
5. Modeling and engineering calculations
6. Draughting and Markup
7. Product analysis and optimization
8. 3D scanning and reverse engineering
9. Assembly design
10. Data Management
11. Materials

Opinions, analyzes, trainings and workshops

1. Technical analyses and opinions
2. Opinions on innovativeness
3. Root cause analysis (RCA) of non-conformances of components and subassemblies
4. Verifications of the conformity of vehicle production with the producer's requirements,
5. Trainings on type-approval regulations and requirements
6. Workshops on material testing

Development and optimization of processes in the company

1. Production processes simulation
2. Organization of purchases
3. Implementation and improvement of management systems
4. ERP/CAD/CAM/PLM systems
5. Production planning
6. Organization of the supply chain (logistics and warehouses)
7. Total Productive Maintenance (TPM)
8. Analysis and verification of manufacturing technology
9. Energy audits
10. Analysis and optimization of production and/or management processes



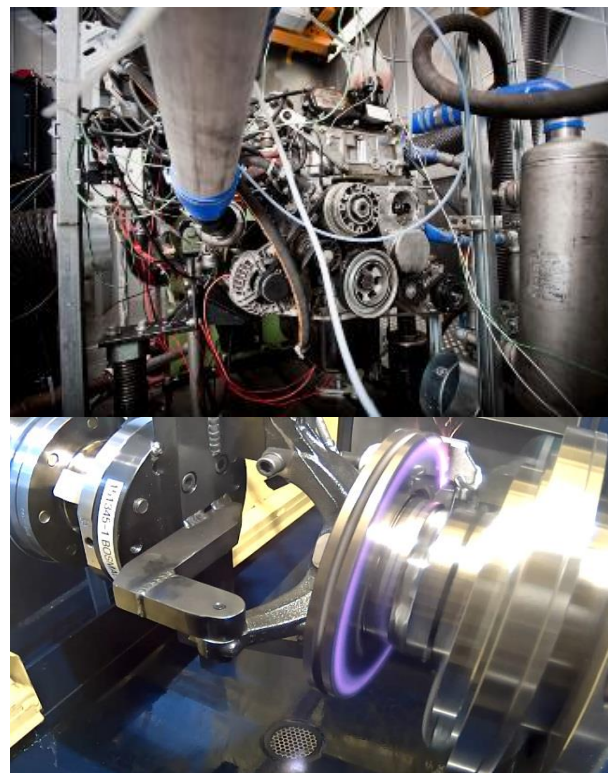


HOMOLOGATION - TYPE APPROVAL

1. Carrying out EU type approval and national individual approval tests of vehicles categories M, N, O, L, T, R, C, S (including LD, HD vehicles, buses, off-road vehicles – internal combustion and electric)
2. Conducting type approval tests of equipment or vehicle parts (including internal combustion engines, electric engines and batteries) and type approval tests of the assembly method of the installation adapting a given type of vehicle to run on gaseous fuel.
3. COP - Conformity of Production
Including preparation of type-approval documents by the type-approval department and submitting them to TDT (Transportation Technical Supervision) in order to obtain type-approval certificate.

As well as:

4. ISC tests (In-Service Conformity)
5. MS tests (Market Surveillance)





- SCOPE OF ACCREDITATION OF THE TESTING LABORATORY NO. AB 128
- CERTIFICATES, RECOMMENDATIONS, AWARDS AND DISTINCTIONS
- CONTACT - businessdevelopment@bosmal.com.pl, +48 33 8130 445, +48 33 8130 550

We welcome your business

- MATERIAL TESTING
- COMPONENT & ASSEMBLY TESTING
- ROAD TESTING, EMISSION TESTING & ENGINE/POWERTRAIN TESTING
- PROTOTYPING, MANUFACTURING, ENGINEERING & PRODUCTION AUTOMATION
- ENGINEERING SERVICES
- HOMOLOGATION - TYPE APPROVAL



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