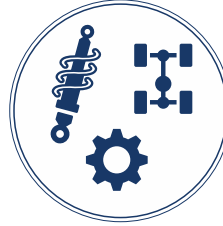




MATERIAL TESTING



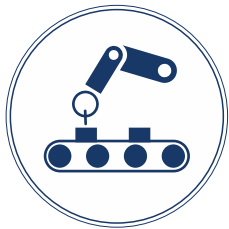
COMPONENT
& ASSEMBLY TESTING



ROAD TESTING, EMISSION TESTING &
ENGINE/POWERTRAIN TESTING

BOSMAL

Research & development



PROTOTYPING, MANUFACTURING,
ENGINEERING
& PRODUCTION AUTOMATION



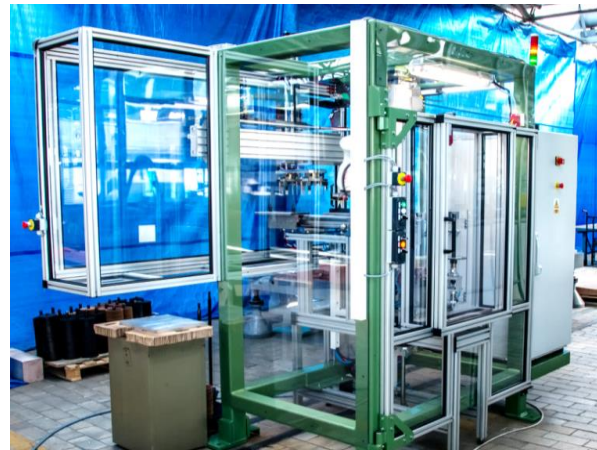
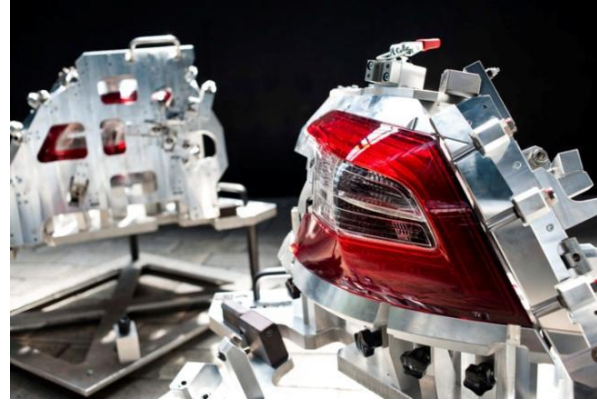
ENGINEERING
SERVICES



HOMOLOGATION
TYPE APPROVAL

BOSMAL RESEARCH & DEVELOPMENT

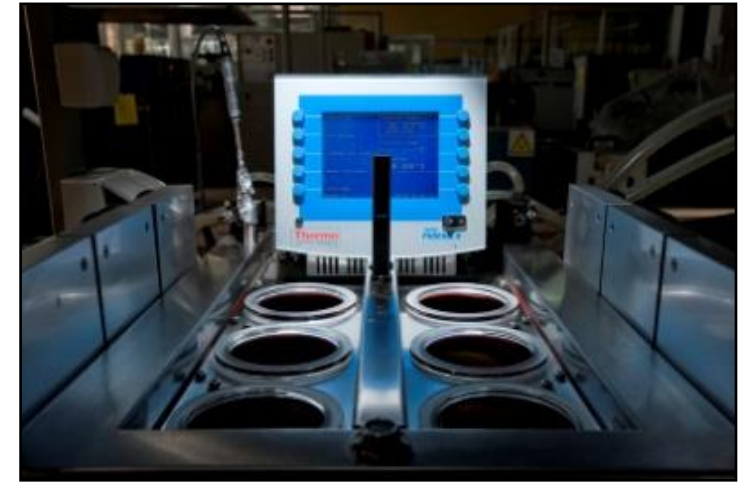
- Research and Development Center (with that legal status)
- Research laboratory meeting the requirements of PN-EN ISO / IEC 17025: 2018-02 - with a wide range of accreditation (over 600 methodologies)
- License for approval tests of vehicles (internal combustion and electric), as well as their equipment or parts (including internal combustion engines, electric engines and batteries)
- Certified, integrated management system (PN-EN ISO 9001:2015-10, PN-EN ISO 45001:2024-02 and PN-EN ISO 14001:2015-09)
- Certificate AQAP 2110:2016 - confirming compliance with NATO quality requirements in design, development and manufacture
- License of the Ministry of Interior and Administration No. B-138/2023 to conduct business activities related to the production and trade of explosives, weapons, ammunition, products and technology for military or police use
- Accreditation OiB (Defense and Security) confirming that the BOSMAL Laboratory meets the requirements of the PN-EN ISO/IEC 17025:2018-02 standard under accreditation no. 67/MON/2024.
- TISAX label. Results of Institute are available at <https://enx.com/tisax>
- Comprehensive range of research, design and production, engineering and production implementations
- Personnel: 340 employees, with 220 engineers



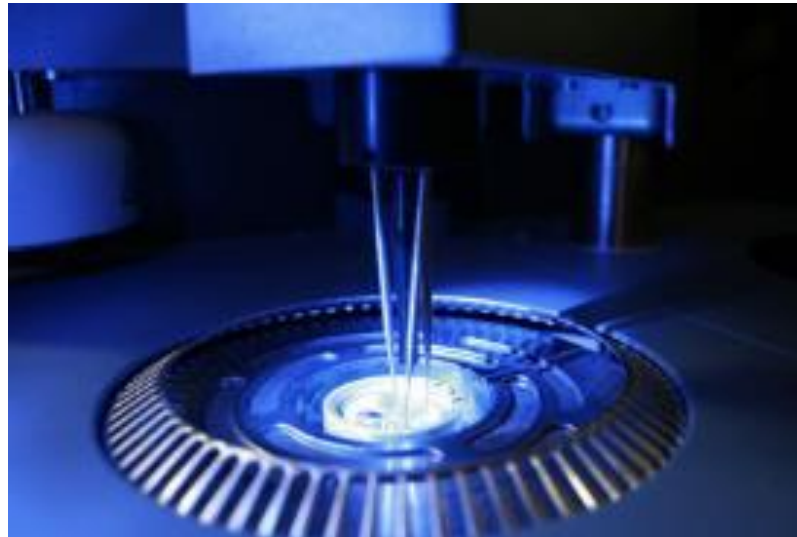


MATERIAL TESTING

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

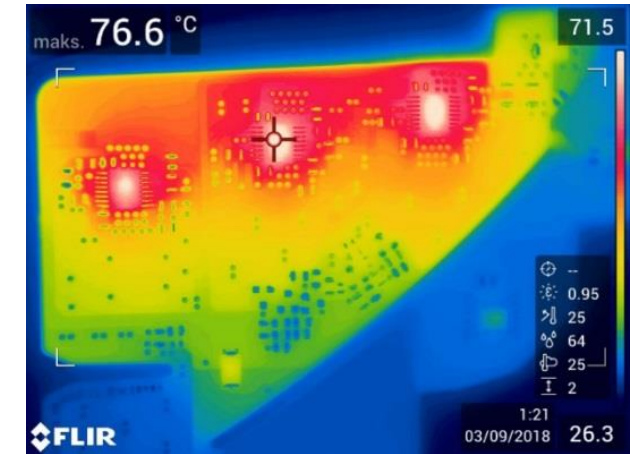




COMPONENT & ASSEMBLY TESTING

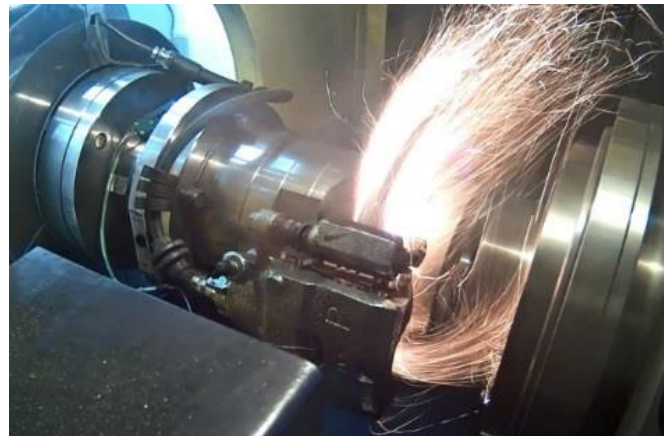
Tests of:

- 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



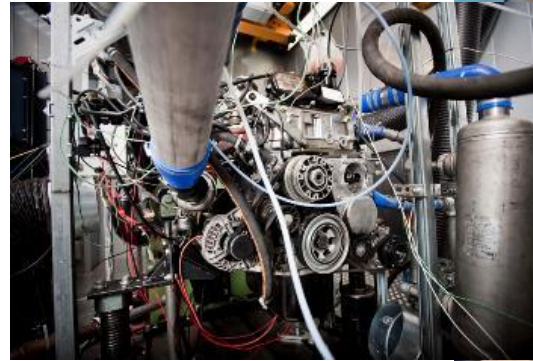


ROAD TESTING, EMISSION TESTING & ENGINE/POWERTRAIN TESTING

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:

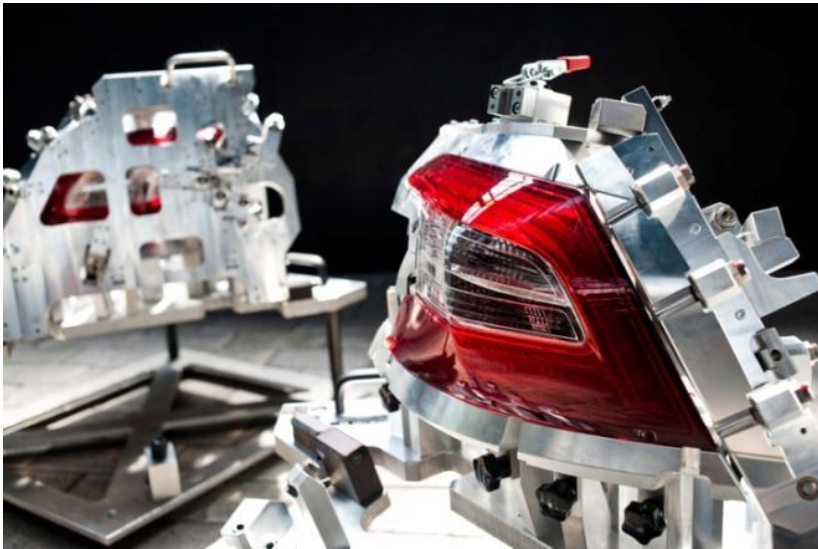
- milling
- turning
- grinding
- WEDM (wire electrical discharge machining)
- CMM validation

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



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HOMOLOGATION - TYPE APPROVAL

According to the decision No TD-5i-027-17(4)/13 of Polish Ministry of Transport, Construction and Maritime Economy of 14th October 2013, with amendments, BOSMAL Automotive Research and Development Institute Ltd is entitled to perform the following actions:

1. in the scope of approval:

- a) performing EC-type approval tests of vehicles or category **M, N, O, L, T, R, C or S** vehicle type approval tests,
- b) performing the approval tests of parts or equipment for category **M, N, O, L, T, R, C or S** vehicles,
- c) performing approval tests related to the installation process of gas retrofit systems adapting vehicles of category **M or N** to use gaseous fuels,
- d) performing:
 - Conformity of Production of vehicle, parts or equipment for category **M, N, O, L, T, R, C or S** vehicles,
 - Conformity of Production of installation of gas retrofit systems adapting vehicles of category **M or N** to use gaseous fuels;

2. within the scope of national individual vehicle approval, admission of a vehicle carrying out tests confirming the fulfilment of the applicable conditions or technical requirements of a given vehicle, in order to national individual vehicle approval for the categories of vehicles: **M, N** and **O**;

3) within the scope of individual vehicle approval, admission of a vehicle carrying out tests confirming the fulfilment of the applicable conditions or technical requirements of a given vehicle, in order to approve an individual vehicle for the categories of vehicles: **L, T, R** and **C**;

4) within the scope of EU individual vehicle approval, carrying out tests confirming the fulfilment of appropriate conditions or technical requirements of a given vehicle, for the purpose of EU approving of an individual vehicle for the categories of vehicles: **M1, N1** and **special vehicles M, N, and O**.



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- ENGINEERING SERVICES
- HOMOLOGATION - TYPE APPROVAL



Accredited Research Laboratory AB 128 *



AB 128



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Integrated Management System *



Scope-ID: SN7P72, Assessment-ID: ANY5K5-1. TISAX and TISAX results are not intended for general public.
Results are available through the ENX PORTAL
Portal (<https://portal.enx.com/en-US/TISAX/tisaxassessmentresults>)

* Certificates and the scope of systems (including the scope of accreditation covering services accredited by PCA) are indicated on the website: <https://www.bosmal.com.pl/zakresy/>

- 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

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