Bosch Manufacturing Solutions | BMG
Software Defined Manufacturing (SDM) – enabled by **Data-driven, Intelligent Production Equipment**

Bosch Manufacturing Solutions | BMG

CES 2026 – Highlights

AI-powered Digital Engineering	**Digital & Intelligent Solutions**
AI-powered Machine Operation Optimum	
Intelligent Electronics Manufacturing	
Cell-to-X turnkey Battery Production Equipment	

BMG insights

About BMG	**Full-liner Portfolio**
Manufacturing Processes & Technologies	
Battery	**eDrive**
Sensors & Electronics	**H2 & Power Generation**

(❁) **BOSCH**

BMG | **who we are**

Bosch Manufacturing Solutions | BMG –

Global industrialization partner & turnkey special machinery provider for production equipment & automation

> 30 years of experience as special machinery supplier

> 4.000 assembly & testing systems
> 10.000 small & services projects

Automation level adjustable, semi- to fully automated solutions

Digital planning & process to digital engineering & i4.0 applications

>17
Locations

Full-liner portfolio

Several industries & product areas
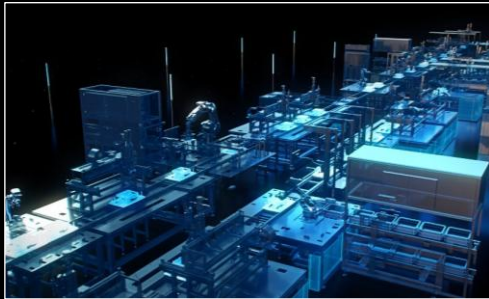
1.900
Employees

~680
TNS m€

BOSCH

BMG | **our portfolio**
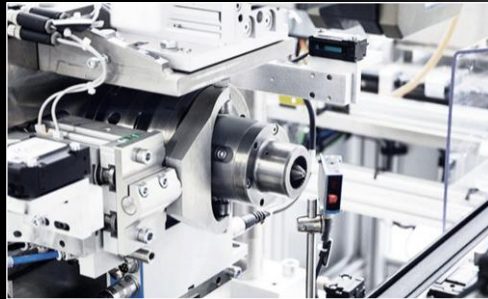## Customized assembly & testing systems

Global industrialization partner & turnkey special machinery
provider for production equipment & automation, offering

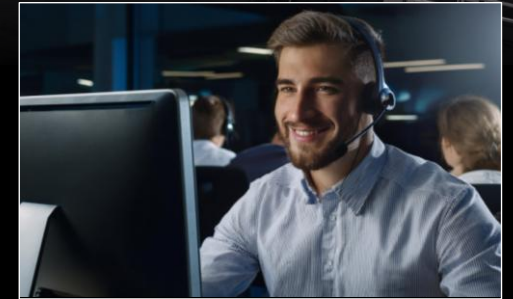# Customized assembly & testing systems

empowered by ...

**Engineering Consulting
& Digital Engineering**

**Advanced Manufacturing
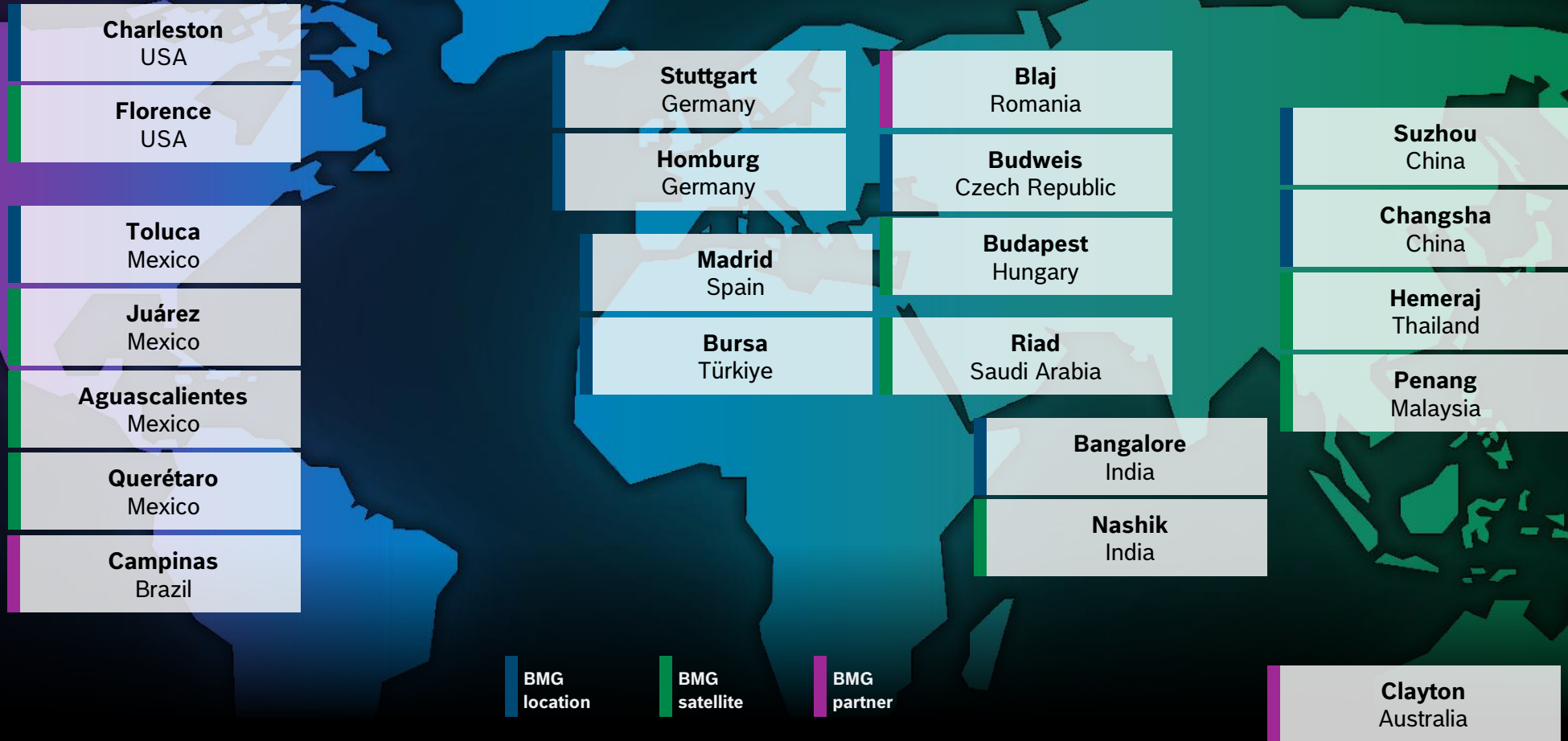Processes & Technologies**

**Digital & Intelligent
Solutions**

**Services along the entire
product lifecycle**

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BMG | global strength in network & partners

Charleston
USA

Florence
USA

Toluca
Mexico

Juárez
Mexico

Aguascalientes
Mexico

Querétaro
Mexico

Campinas
Brazil

Stuttgart
Germany

Homburg
Germany

Madrid
Spain

Bursa
Türkiye

Blaj
Romania

Budweis
Czech Republic

Budapest
Hungary

Riad
Saudi Arabia

Bangalore
India

Nashik
India

Suzhou
China

Changsha
China

Hemeraj
Thailand

Penang
Malaysia

Clayton
Australia

BMG
location

BMG
satellite

BMG
partner

BOSCH

BMG | **focus industries & product areas**

Focus industries

eMobility **Automotive (ICE)** **Energy** **Consumer Goods**

Focus product areas

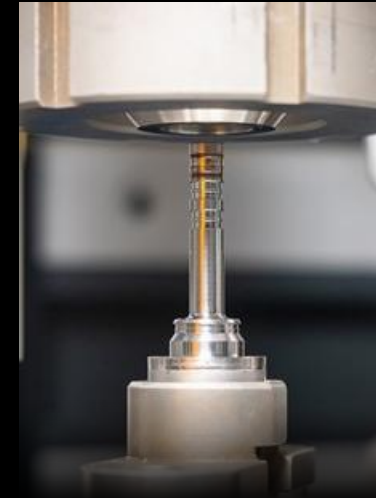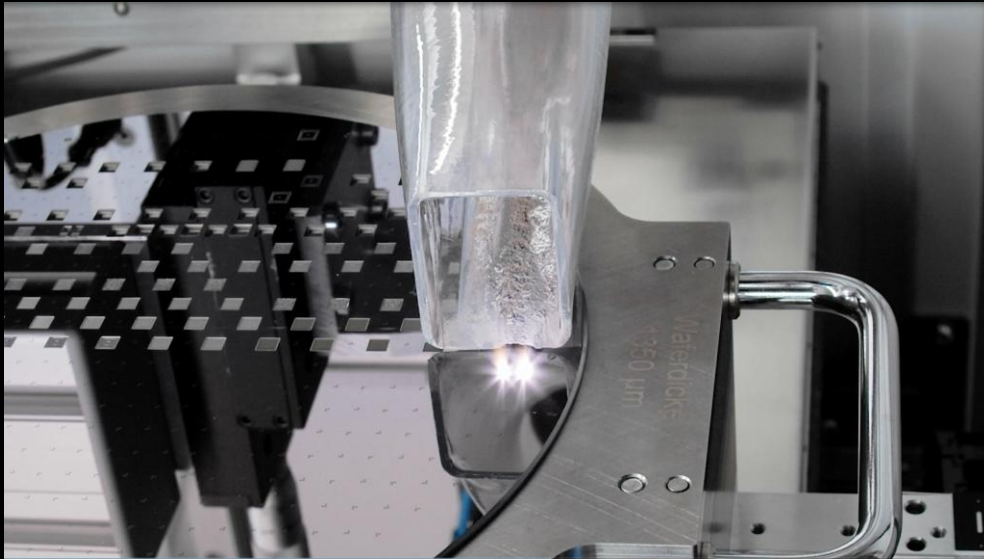**Battery** **H2 Solutions / Fuel Cell** **eDrive** **Sensors & Electronics** **Chassis & Steering** **Combustion Engine**

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Unleash the power

with sensors & electronics production equipment from Bosch Manufacturing Solutions | BMG. We provide flexible assembly technology for ECUs, power electronics, and sensors, mainly in eMobility. Our scalable solutions optimize investments and adapt to variable production volumes.

Sensors & Electronics – some insights

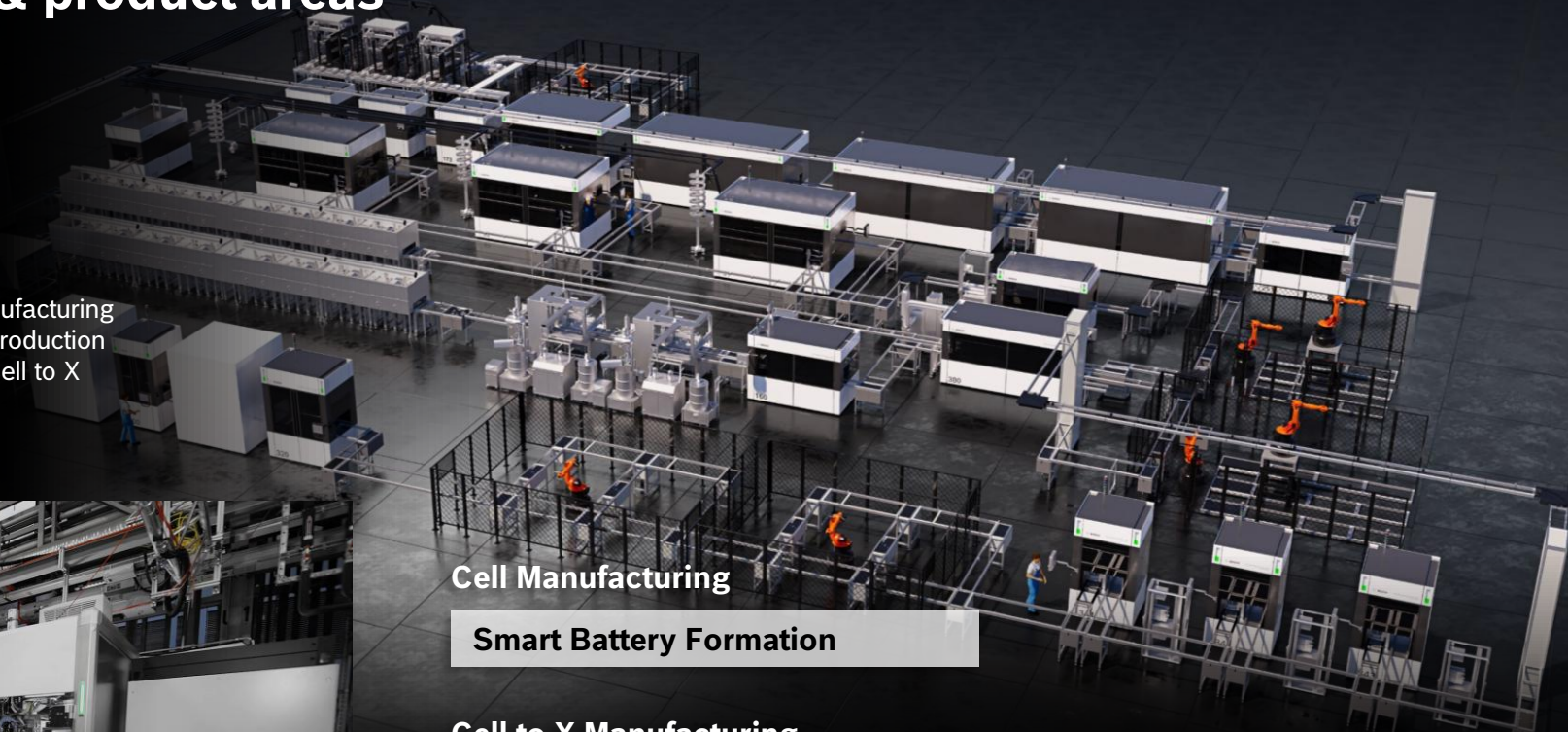|	
Dispensing	Tightening
Laser Welding of Electrical Connections	Pressfit & Single Pin Insertion
Laser Micro Structuring	Optical Inspection
Laser Cleaning	Flexfoil Handling
PCB Milling Machine	Magnetic Conveyor System

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Stay charged

with battery production equipment from Bosch Manufacturing Solutions | BMG. Our expertise reaches from cell production technologies up to fully automated and intelligent Cell to X assembly and testing systems.

Cell Manufacturing

Smart Battery Formation

Cell to X Manufacturing

Cell Supply	Resistance Welding
Cell Cleaning	Laser Welding
Electrical Testing (BOL/EOL)	Machine Vision
Dispensing	Leakage Testing

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BMG | **focus industries & product areas**
eDrive

Driving mobility

with innovative eDrive production equipment from Bosch Manufacturing Solutions | BMG. Our expertise ranges from various winding technologies such as Hair-Pin, I-Pin, X-Pin, for all vehicle classes, to individual line concepts from semi to fully automated, including AI based solutions for increased efficiency.

eDrive Lab

eDrive – some process highlights

Pin Manufacturing	**Trickling**
Handling & Robotics	**Clamping**
Twisting	**Optical Inspection: Post Vision**
Laser Welding	**Electrical Testing**
Separating & Cutting	**Further ...**

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» **Reference Project NorthH2 & Fraunhofer IWES**

From Water to Energy –

empower your sustainable future with H_2 solutions by Bosch Manufacturing Solutions | BMG, in the area of water purification & electrolysis, fuel cell assembly & testing as well as power generation.

» **H2 circle – BMG as system industrialization partner**

Water Purification
- » **BMG Pure Water System**

Electrolysis – from water to hydrogen
- » **PEM Ely Stack Testing**
- » **PEM Electrolyzer System**
- » **AEM Ely Stack Testing**
- » **SOEC & SOFC Stack Testing**

Fuel Cell – from hydrogen to energy
- » **PEMFC Testing**
- » **PEMFC – Assembly & Testing**
- » **PEMFC – Power Generator**
- » **PEMFC – Bipolar Plates Processes**
- » **PEMFC – Coatings**

- » **Hydrogen Gas Injection**
- » **GDA – Shot to shot measurements**

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As a technology and process expert for the automotive industry, we offer you the optimum manufacturing equipment for various components in the field of chassis and steering.

From hydraulic to electric steering and driving systems: New Braking Systems like the Integrated Power Brake (IPB) and the electronic stability program (ESP) are just some examples of components manufactured with equipment from Bosch Manufacturing Solutions | BMG.

BOSCH

BMG | **focus industries & product areas**
Combustion Engine

Our high-precision production and testing equipment for diesel and gasoline injection systems, e.g. including high-pressure injectors, diesel pumps, and exhaust gas systems, are backed by the expertise of Bosch Manufacturing Solutions | BMG.

As the ICE sector matures, our services are crucial in maximizing performance and extending the lifetime of your systems. From cycle time improvements and modernizations to relocation projects, we ensure peak efficiency throughout your equipment's lifecycle.

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BMG | AI powered digital enginnering

We support our customers already in **SE work** - for **sustainable product design** that leads to **simpler and more cost-effective manufacturing concepts**. Thanks to our **digital engineering**, we are able to simulate even before realization and thus check everything for feasibility and technical requirements.

- BMG connects **all engineering disciplines through an end-to-end AI enabled digital approach** – from concept to operation.
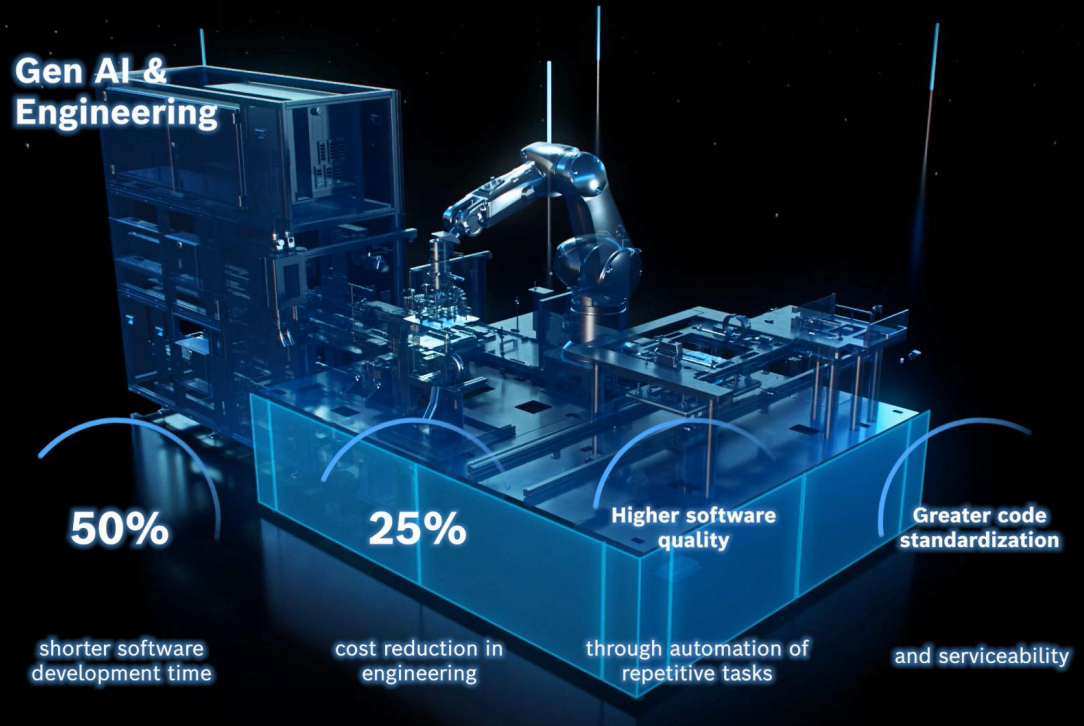
- **Model-based Systems Engineering (MBSE)** provides a unified data backbone linking mechanics, electrics, and software, forming the basis for Digital Twins.

- These virtual models enable simulations, early validation, virtual commissioning, and rapid adaptation to design or process changes.

- With AI-driven engineering tools and seamless field-data integration, equipment becomes intelligent, self-optimizing, and predictive in operation.
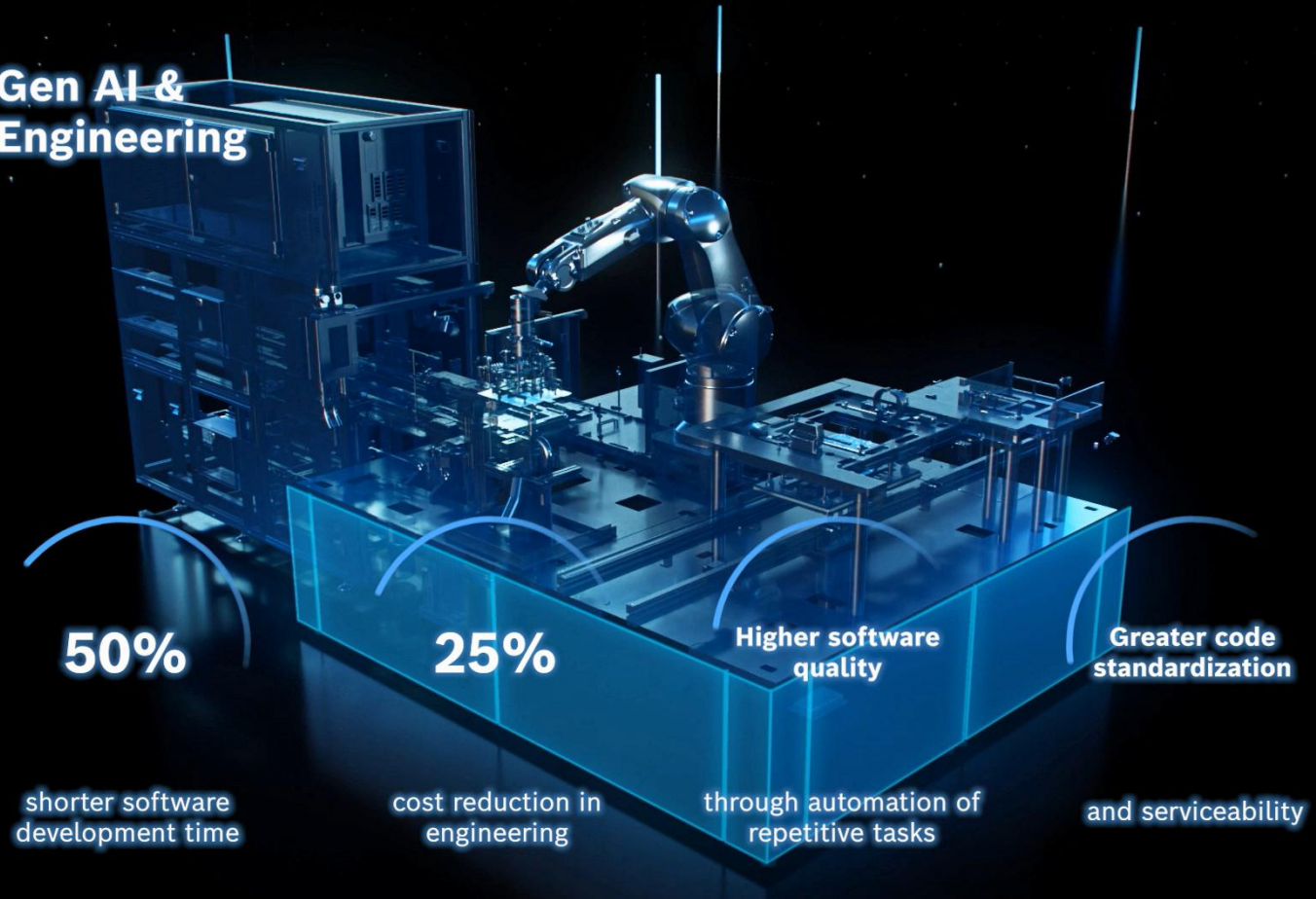
Gen AI & Engineering

50%
shorter software development time

25%
cost reduction in engineering

Higher software quality
through automation of repetitive tasks

Greater code standardization
and serviceability

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BMG | AI powered digital enginnering

Benefits

- **Cheaper:** 25% cost reduction in engineering

- **Flexibility** of equipment to various product types (variance of shape, size, and process sequence)

- **Operational Efficiency:** high technical availability from start, reduced downtime (up to 70% reduced) during services, predictive maintenance capabilities, up to 30% reduction in risk & failure costs

- **Faster:** up to 2 months shorter commissioning time, reduced project lead time by 4-8 weeks in average, 50% shorter software development time

- **Secure:** 100% protection of customer data

- **High Scalability** through high data integrity

- **Predictive maintenance and proactive service proposals**

Gen AI & Engineering

50% shorter software development time

25% cost reduction in engineering

Higher software quality through automation of repetitive tasks

Greater code standardization and serviceability

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Intelligent Production Suite *IP Suite*
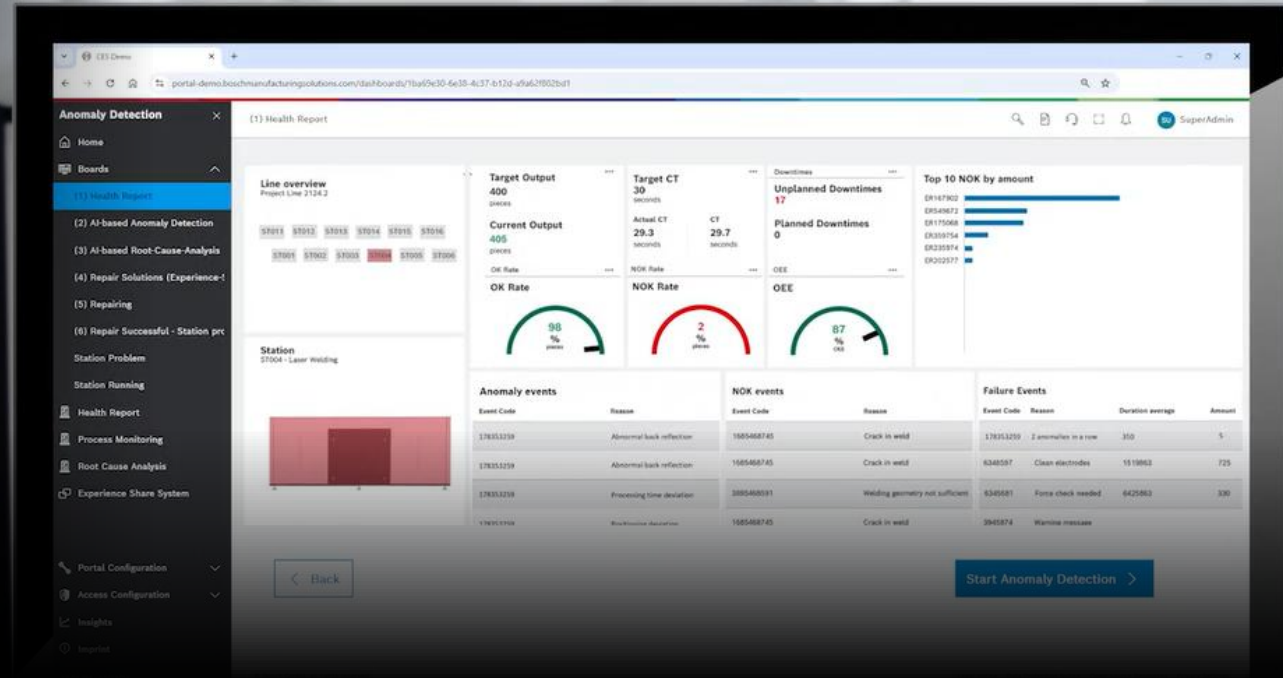

Intelligent Edge

Line & Shopfloor Solutions

System Connectivity

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BMG | Digital & Intelligent Solutions
Intelligent Production Suite (IP Suite) framework

Factory Network OS

Plant OS: e.g. Bosch Nexeed MES / IAS

BMG Intelligent Production Equipment & Automation

BMG intelligent production suite (IP Suite)

System Connectivity

- Enterprise & Cloud Connectivity
- Edge Connectivity
- Field Device Connectivity
- Remote Connectivity

Intelligent Edge

- Data Analysis
- Condition Monitoring
- Prediction
- Process Optimization

Line & Shopfloor Solutions

- Maintenance & Asset Management
- Operation Assistance
- Quality Management
- Planning & Scheduling

IP Suite Portal

IP Suite Access Control   IP Suite Notification Service   Edge Download Center   Data Marketplace

Hardware, Security, Documentation

BMG Consulting, Digital Engineering & Services

Line, Machine, Process | Nexeed | Beckhoff | Mitsubishi | Siemens | Fanuc | CtrlX | ...

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BMG | Digital & Intelligent Solutions
Intelligent Production Suite (IP Suite) – Modules

Factory Network OS

Plant OS: e.g. Bosch Nexeed MES / IAS

Software-defined manufacturing enabled by BMG IP Suite

BMG Intelligent Production Equipment & Automation

BMG intelligent production suite (IP Suite)

*AI integrated

System Connectivity

- Universal Machine Connector (UMC)
- Line Data Distribution (LDD)
- Transport Order Management

Intelligent Edge

- Health Report, Process Monitoring & Production Parameter Checker
- Energy Monitoring
- MathEngine - Algorithm Execution Engine*
- AI Process Parameter Optimization (PPO)*
- AI Anomaly Detection & Root Cause Analysis*
- Predictive Maintenance
- Process Development Assistant (PAMOS)
- Cycle Time Assist & Analysis (BCI Partner Solution

Line & Shopfloor Solutions

- Maintenance Ticket system
- Experience Share System*
- DashCAM – Event Based Videomonitoring
- Universal HMI (uHMI)
- Live Statistical Process Control (SPC)
- Component lifecycle

BMG Consulting, Digital Engineering & Services

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BMG @ CES | AI-powered Machine Operation Optimum (AiMOOp)

- Process parameters and machining strategies are determined fully automatically based on a trained process model, without the need for predefined machining parameters

- The system can automatically detect deviations from the target state and, if necessary, recalibrate itself autonomously

The system is consistently operating at optimal performance
→ reduced costs, outcome optimum, reduced scrap rate
→ Significantly improved process efficiency and quality

Complex processes need less operator know how
→ self operating and self learning machine

Assistance for operator to understand multidimensional parameter space

Less downtime of machine, less parts, less human capacity needed to find optimal settings

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BMG @ CES | AI-powered Process Parameter Optimization & Control (AiPOC)

Optimum parameter settings for production based on AI models and optimization methods

- Assistance in multidimensional space (many different parameters & quality criteria) by visualization of models and optimal areas for production

- Trained models or derived algorithms in control loops to keep machine during production in optimum parameter settings

Benefits

- Scrap reduction by keeping machine (e.g. against drifts) in optimum parameter settings (proven use case: 250k€ savings per line per year)

- Reduction of needed parts, time, machine and human capacity to find optimal parameters → e.g. > 80% time reduction finding initial parameter set based on trained process models

- Structured data storage enables reuse of data and further AI usage (LLM)

Technical specifications & AI Models

- Web applications with user guidance

- Machine interface via different communication protocol (e.g. OPC—UA)

- Flexible interface to integrate customer algorithms (e.g. Python) for control loops

- Bayesian Optimization (ML) & Gaussian Process Models (ML)

Proven use case:

250.000 €

savings per line & year by established control loops

> 80%

time savings in initial parameter finding

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BMG @ CES | AI-powered Machine Operation Optimum
Example (AiMOOP & AiPoCo)

AI-based multi-stage hybrid laser process

- Hybrid laser processing w/ fully automated measurement & AI model-based evaluation of parameter and processing strategy → self-optimization of laser process and machine

- Ablation: Multi-stage hybrid laser process with high-volume ablation (>10 mm3 / structure) and high-precision finishing (<1.5 µm contour accuracy / roughness)

- Welding: Sensor-based monitoring of laser process and real-time quality assessment followed immediately by model-based evaluation of the rework strategy if necessary

Benefits

- **Zero failure rate** through **closed-loop process control** & adaptive process guiding

- **Welding:** reduced scrap rate, higher quality, optimized cycle time, enhanced productivity even for safety-critical components

- **100% machine up time** due to fully automated monitoring and calibration without any kind of operator influence

Technical specifications & AI Models

- **Ablation ratio** >0.5 mm3/s combined with high surface quality (Sa < 0.5 µm) & **positioning accuracy** of laser structures relative to references 6s <5 µm

- Welding: Strength values of base material are achieved

- **Large language model (LLM)** for process software development

- **Deep learning (DL)** methods for analyzing sensor data, process monitoring & anomaly detection

- **Machine Learning (ML)** methods for dynamic adaption of process parameters in real time
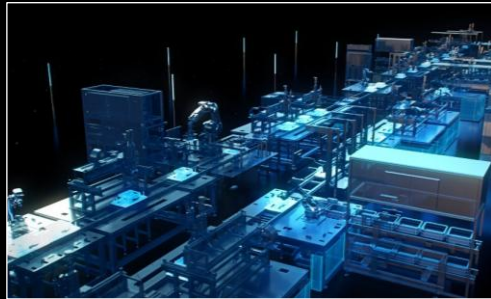
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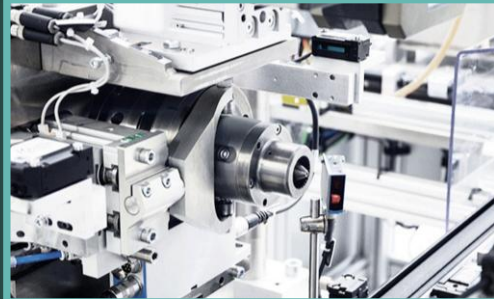Failure rate through closed-loop control

Machine up time of
100%
due to fully automated monitoring & calibration

Highest effective **ablation ratio** with **high precision**

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Manufacturing Processes & Technologies

Engineering Consulting & Digital Engineering

Advanced Manufacturing Processes & Technologies

Digital & Intelligent Solutions

Services along the entire product lifecycle

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Manufacturing Processes – innovative & intelligent.

Efficient solutions for demanding & customized applications

Handling, Robotic & Automation
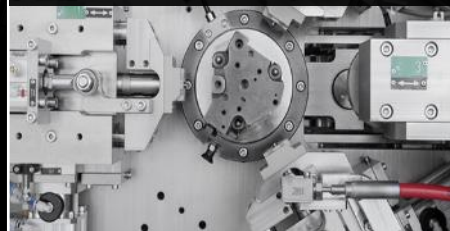
Machine Vision

Separating

Joining

Measurement & Testing

Laser Technology

Forming

Surface Technology

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Manufacturing Processes – innovative & intelligent.

Efficient solutions for demanding & customized applications

Handling, Robotic & Automation

- Handling & Positioning
- Transfer, Transport & AGVs
- Robotics & Gripping
- Feeding, Clamping, Palletizing

Machine Vision

- Assembly Guiding
- Process Control
- Quality Check End of Line / Inline

Separating

- Stripping / Skinning
- Cutting with undefined Edge (Internal Grinding & External Grinding)
- Balancing

Joining

- Resistance & keep welding
- Friction welding
- Ultrasonic welding
- Dispensing & gluing
- Tightening & screwing

Measurement & Testing

- Electrical Testing & Characterization
- Leakage, Gas & Pneumatic Testing

Laser Technology

- Laser Welding (on-the-fly)
- Laser Cutting
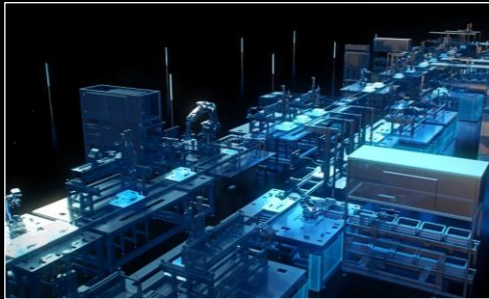- Laser Drilling
- Laser Micro Structuring

Forming

- Twisting
- Bending
- Winding
- 3D Forming

Surface Technology

- Electro plating
- PVD coating
- Functional printing

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Services along the entire product lifecycle

Engineering Consulting & Digital Engineering

Advanced Manufacturing Processes & Technologies

Digital & Intelligent Solutions

Services along the entire product lifecycle

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BMG | Services along the entire product lifecycle

Consulting Services & Services Contracts	Engineering Services	Modernization & Condition-based Services	Technical Support	Spare parts & Repair Services	Training
- Advice from Specialists - Manufacturing and production concepts, line design - End-of-life Consulting - Individual Service Contracts	- Development of new processes - Simultaneous Engineering - Feasibility Studies - Standardized platforms - Software applications - Optical systems and processes	- Increase production efficiency - Individual customer reports - Suitable implementation concepts: Classic modifications, specific engineering solutions to digital production concepts	- Ramp-up Support - Classical Maintenance - Machine Availability - Modifications - Relocations - Online Support - 24/7 Services Hotline	- Procurement of all types of technical parts - & machine components and equipment - Initial Equipment Package - Exchange Parts Pool - Global supply chain & logistic solutions in line - Webshop	- Standard Trainings & Education - Customer-specific Training

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more about BMG!**

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