

15.07.2023

Automotive Component Industry Competitor Analysis



SONA COMSTAR



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SONA COMSTAR

Mission

Be leaders in the technology we invest in and give our customers and edge over the rest, while designing and building products that enable the future of mobility.

Vision

To become the world's most respected and valuable auto technology company for our customers, employees, and shareholders.

Values

Integrity

Always do the right thing.

Vitality

Build better products

Frugality

Build better products – more economically.

Agility

Build better and more economical products – faster

Business Overview

Revenue: 25,756 Mn Rupees (FY23)

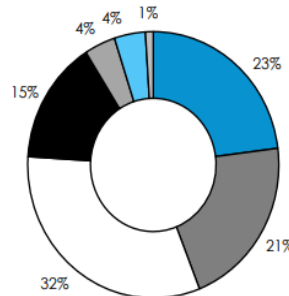
No. of Employees: 4065

Headquarters: Gurugram, India

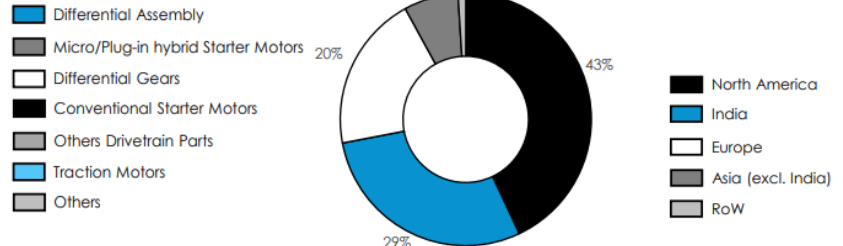
No. of Location: 9 Manufacturing units – 4 Countries

Revenue Breakdown

By Product



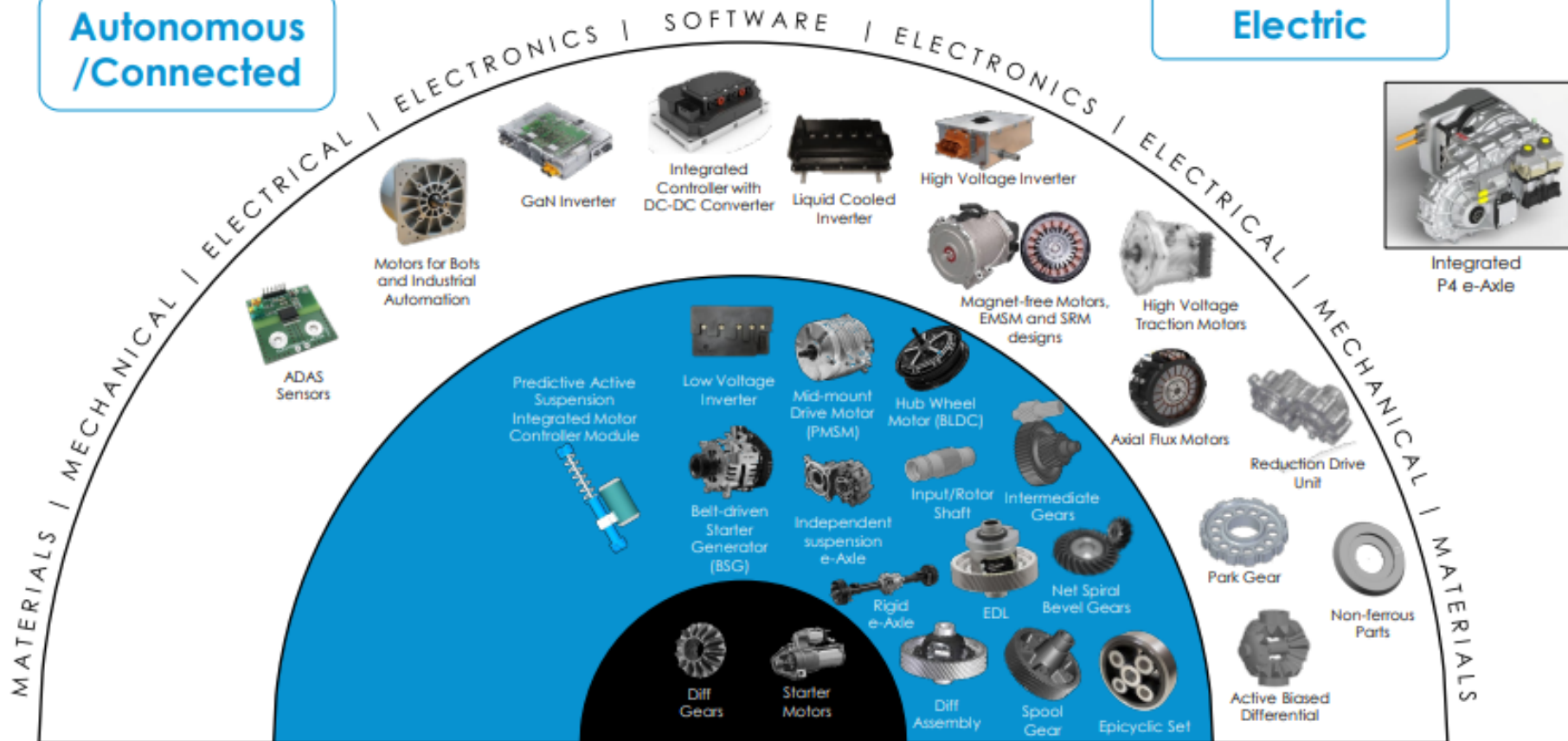
By Geography



Product Overview

Autonomous
/Connected

Electric



Future Products

Current Products

Legacy Products

Methodology for the Competitor Analysis

Upon conducting an in-depth analysis of Sona Comstar, encompassing its products, technology, and prospective future undertakings, I proceeded to delve into the highly competitive realm of automotive components. My research included the study of the manufacturing technologies used and e-mobility trends, with the aim of comprehending the trajectory of this industry. Utilizing Sona Comstar as a foundation, I thoroughly examined 17 comparable companies in this field. These companies were analyzed with the objective of gaining valuable insights into their positioning, operations and strategies. The companies were as follows:

1. AAM
2. Bharat Forge
3. BorgWarner
4. Bosch
5. Continental
6. DANA
7. Denso
8. GKN
9. Linamar
10. Mahle
11. Magna
12. Meritor
13. Mitsubishi Electric
14. Mobis
15. Musashi
16. SEG Automotive
17. Valeo





BRINGING THE FUTURE
FASTER

Vision

To POWER a more sustainable future while providing value to our stakeholders

Mission

Advancing globally mobility through innovative technologies and sustainable solutions

Company Overview

Revenue FY22: \$5.8 Bn

No. of Employees: 19,000

Headquarters Location: Detroit, USA

Locations: 18 countries, 80+ locations including 14 Global Engineering & Tech centers

Gross New Business Backlog

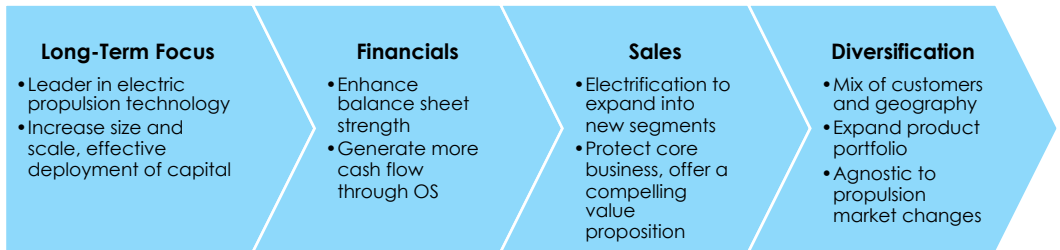
Backlog by Segment

Electric	40%
Trucks/SUV	30%
Crossover	20%
Pass Car	5%
Other	5%

Backlog by Geography

Americas	45%
Asia	30%
Europe	25%

AAM Long-Term Value Creation



Sustainability

Sustainability Mission: to deliver POWER and build a safer, greener sustainable future for our Associates, customer, communities & environment



AAM Products

Driveline

Advanced product, process and systems capabilities

Rear-wheel Drive (RWD), All-wheel drive (AWD), Four-wheel drive (4WD) for internal combustion, hybrid and electric vehicles



Driveline products and solutions include:

- Electric and hybrid driveline products and systems
- Disconnecting driveline technology
- Lightweight axle technology
- Traction-enhancing axle differentials
- Rear beam axles
- Front axles
- All wheel drive (AWD) modules
- Torque transfer devices
- Rear drive modules
- Driveshafts and multi-piece driveshafts
- Constant velocity joints
- Power transfer units
- Powdered metal connecting rods
- Automatic transmission clutch modules
- Transmission differential assemblies
- Engine isolation pulleys
- Engine crank dampers
- Balance shaft assemblies
- Damped gears
- Vibration control systems

Metal Forming

Mass optimization, improved part performance, quality and efficiency

Provide engine, transmission, driveline and safety-critical components for traditional ICE and electric vehicle architectures including light vehicles, commercial vehicles and off-highway vehicles, as well as products for industrial markets..

Largest automotive forging enterprise

Processes and Capabilities:

- Hot forging
- Warm forging
- Cold forging
- Assembly
- Sinterbraz
- Precision machining
- Precision grinding
- Gear finishing
- Welded assemblies
- Induction heat treat
- Batch heat treat
- Automation
- Autogaging
- Precision measuring



“How we do it”

1. Delivering Power

With an acute focus on quality, operational excellence and technology leadership

2. Operating System

Customer Satisfaction focus, Lean principles and Process, Team level problem solving, Associate Engagement and Empowerment

3. Research and Development

AAM has invested more than \$1 Billion in R&D initiatives, created 14 global engineering development centers, 2 main global technology centers (Advanced technology center (ADTC) – hub of AAM expertise, research, collaboration and innovation) (Rochester Hills technical center (RHTC) – works in tandem with ADTC, acts as a testing and validation facility)

AAM's Advanced Technology

Quantum Beam Axle

- Lightweight & Efficient
- Optional TracRite Locking differential
- Up to 35% lighter than a typical axle
- Up to 30% improvement in efficiency
- Improved Vehicle Traction
- Scalable across multiple applications

Quantum AWD & RWD Modules

- Lightweight and efficient rear drive modules & AWD units
- Available in open, mechanical limited slip, electronic limited slip and torque vectoring configuration
- Up to 25% lighter than typical axle
- Up to 30% improvement in efficiency
- Less packaging space
- Scalable for RWD & AWD

EcoTrac – Disconnecting All-Wheel drive system

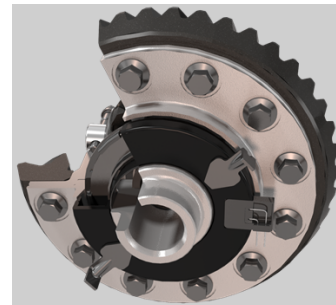
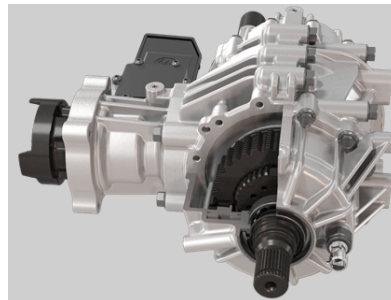
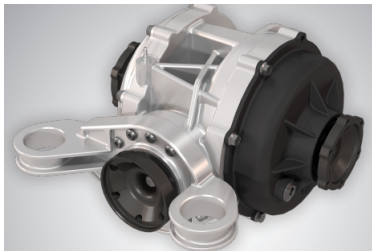
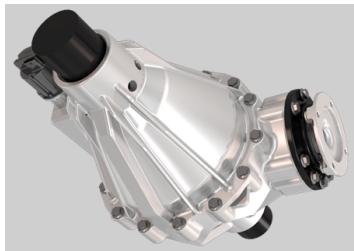
- Industry-first disconnecting AWD system
- AAM-developed vehicle controls
- AAM smart actuator
- Optional 2-speed disconnecting PTU
- Optional 2-speed RDM with electronic locking capability
- Improved vehicle fuel economy
- Off-road capability

VecTrac – Torque Vectoring rear-drive module

- AAM-designed rear drive module with integrated dual clutches
- AAM - developed device and vehicle controls
- AAM-designed brushless motor, valves, and control modules
- Torque Vectoring
- Improved fuel economy when coupled with EcoTrac disconnecting PTU

TracRite – Traction enhancing differential

- TracRite Open
- TracRite PC Plate Clutch
- TracRite GT Gear Train
- TracRite EL Open + Electric Locker
- TracRite AI Automatic Locker
- TracRite GTL Gear Train Locker
- TracRite eLS Electronic Limited Slip
- Improved vehicle traction, handling and stability



The Electric Vehicle Market

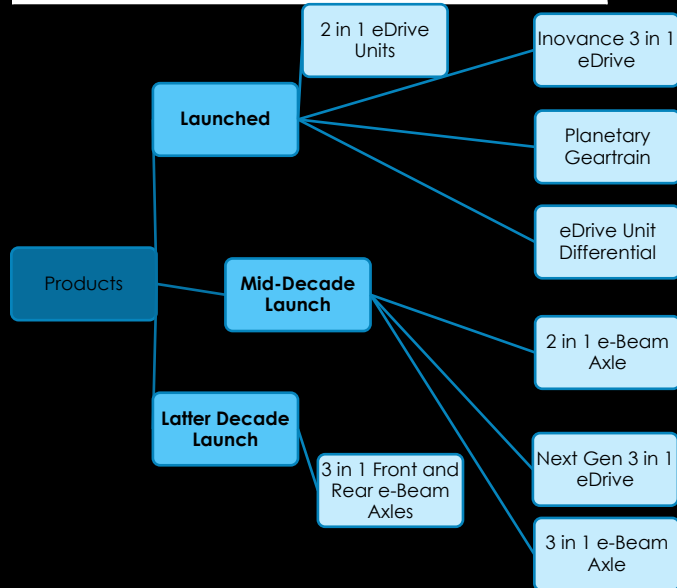
**Electrification
Market Share
Goal 2030**

>10% Share of
estimated market by
2030

Innovative product
platform with multiple
vehicle segments

Higher outsourcing
probability & share for
e-beam axle

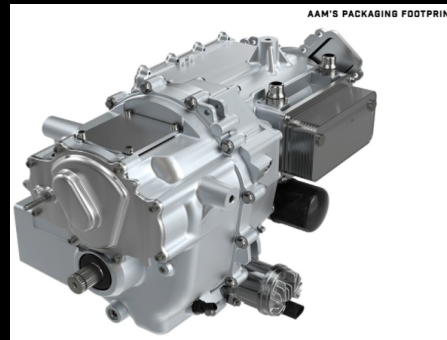
Electric Drive Technology



Thinking Big, Building Small

Combines the motor, inverter and gearbox into a small system, giving them more design flexibility. With a 40% reduction in packaging space

- High speed motors result in small diameter rotors
- Compact gearboxes
- Inverter integration on end-cap of e-machine



Modular + Flexible Architecture

The scalable driveline system is compatible with all electrified systems and can be modified with multiple motor diameters and flexible stack lengths to provide optimized packaging, power and torque.

- Multiple motor diameters
- Flexible Stack lengths
- Permanent magnet and induction motor types

BHARAT FORGE



KALYANI



SONA COMSTAR

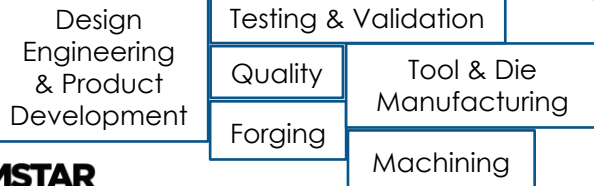
Core Objectives

- To be committed to listening and responding to the needs of our customers, associates and business partners honoring their individual value.
- To be committed to an entrepreneurial spirit that fuels the growth of our companies and increases shareholder value

What we are

- Your partner in innovation
- World-class Technology
- Vertically Integrated with end-to-end capabilities
- India's Largest automotive forging company
- More than 50 years of experience in manufacturing
- Building India's economic backbone

Facilities

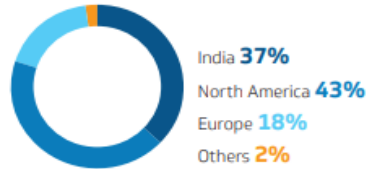


SONA COMSTAR

Company Overview

- Revenue:** \$3 Bn (Part of Kalyani Group)
- No. of Employees:** 10,000
- No. of Locations:** 15 Manufacturing Facilities – 5 Countries
- Headquarter location:** Gurugram, India
- Revenue Break down:**

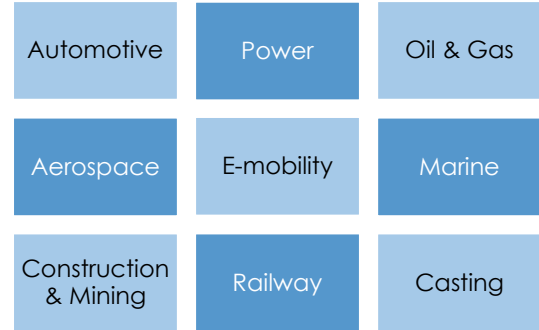
Revenue by Geography *



Revenue by Business*



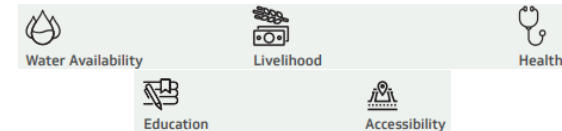
Businesses



Sustainability

Bharat Forge is committed to minimizing impacts, maximizing and ensuring planet positive.


Areas of Development



Automotive Business

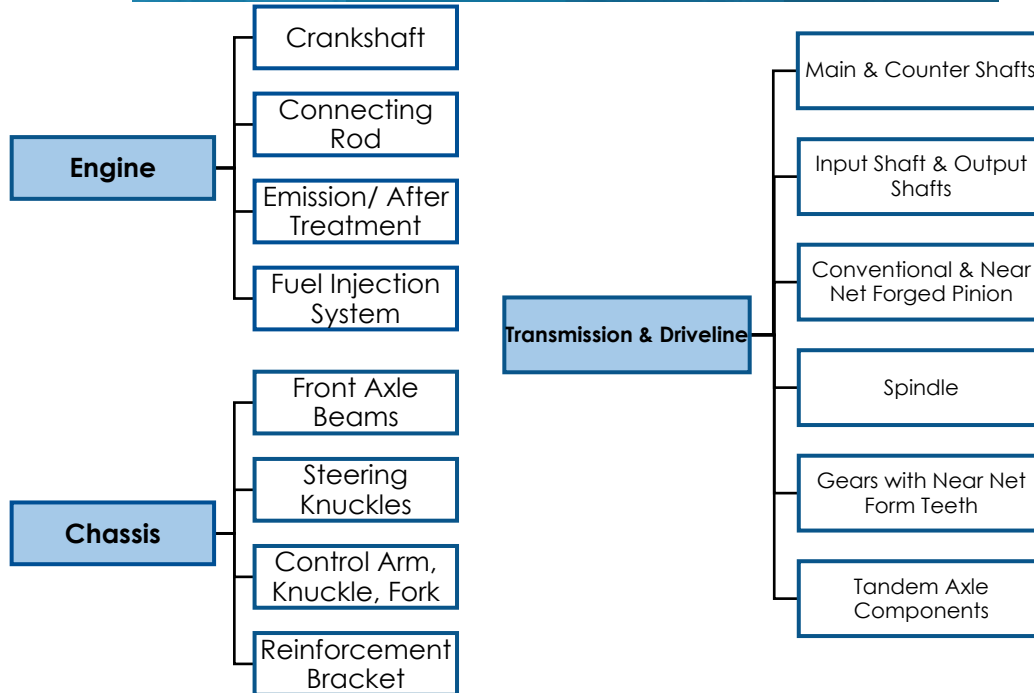
Largest exporter of Auto Components from India


Fully automated
forging lines


Fully automated
machining lines


Strong IT platform based
technology infrastructure


Seamless engineering and
design support



E-mobility

Electric Power-train capabilities

- Modular design concept
- Motor Design & Development
- Motor Testing
- Battery Management System design & Development
- Inverter Design and Development

Products & Services

- Full Powertrain Solutions
- Systems & Sub Systems
- Parts for Powertrain



- Bharat Forge invested, for a stake of 45%, in an EV Startup – Tork. Tork Motorcycles is India's first premium electric motorcycle company.



- Bharat Forge also invested 10 Mn Euros in a UK based Electric commercial vehicle company – Tevva Motors. With this partnership they build scalable & modular commercial electric vehicles.

Technology & Innovation

Kalyani Centre for Technology & Innovation (KCTI)

Products made:

- Scanning Electron Microscope
- Optical Microscope
- Heat Treatment
- Laser Processing
- Mechanical Testing – Creep & Fatigue Testing
- Material Testing
- Additive Manufacturing

Kalyani Centre for Manufacturing Innovation (KCMi)

Laboratory Facilities

Technical Training & Educational Programs

Material Science

Several R&D projects in the area of high strength steels and alloys of exotic metals have helped Bharat Forge build a portfolio of components with application over different sectors

Forging

Green Forging – Majority of power produced by Renewable Resource

Advanced Manufacturing

- Point Cloud Data
- Design for Additive Manufacturing
- Rapid Prototype tool
- Additive Manufacturing
- 3D Printed Impeller
- 3D Scanning

Design & CAE

- 3D Modelling & FEA
- Weight Optimization & Fatigue Testing
- Mathematical Modelling
- Advanced Technology Implementation

Advanced Machining

NPD	Technology Enhancement	Analysis
Development of super alloys parts for Aerospace Ind.	Micro-Machining	Tool Wear Analysis
Gear Manufacturing	Ultrasonic Machining	Chip Mechanism & Crack Analysis
Composite Machining	Nano-Fluids & High Pressure Coolant	Grain Deformation
Magnesium Alloy Machining	Machining	Force & Temp Analysis
	High Speed Grinding	Process FE
	5-Axis Machining	
	LMJ & AWJM	

 **BorgWarner**



A clean, energy-efficient world

Mission

To deliver innovative and sustainable mobility solutions for the vehicle market

BorgWarner Beliefs

Inclusion
Respecting
Individuals

Integrity
Honoring the
Truth

Excellence
Focusing on
results

Responsibility
Our
Commitment

Collaboration
Building on
Trust

Company Overview

Revenue FY22: \$15.8

No. of employees: 52,700

No. of locations: 92 **Headquarter:** Michigan, US

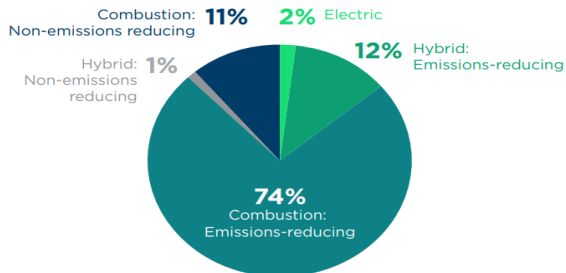
**BorgWarner
Pillars**

Real
Commitment

Tech-Driven
Innovation

Partnering
for progress

Revenue Breakdown



88% of the revenue is from clean, emission reducing products

Sustainability

“Sustainability means driving environmental, social and governance (ESG) initiative to deliver value to all stakeholder, both for today and tomorrow.”

Sustainability Strategy

Environmental stewardship

Create a Cleaner, More energy- efficient world

Social Responsibility

Live the BorgWarner Beliefs

Governance

Partner and report to stakeholder

Light Vehicles

Products: AWD and Cross Axle Systems, Boosting technologies, Chargers, Controllers, Sensors, Electric Drive Modules, Electric Drive Motors, Engine Timing Systems, EV Transmissions, Fuel Handling, Fuel Injection Systems, Ignition Technologies, Intake and Exhaust Gas Management, Power Electronics, P0/P1/P2/P3/P4/PS Hybrid Architecture, Starters and Alternators, Thermal Management, Transmission Technologies, Valvetrain systems

Light Vehicle Solutions – Electric Boosting Technology

eBooster Electrically Driven Compressor



Benefits:

- Enhances performance for light vehicles
- Reduces emissions and improves fuel economy
- Allows further engine downsizing

eTurbo



Benefits:

- 11 kW continuous power and 17 kW peak power
- Lowers emissions
- enhances fuel economy
- Improves transient response

Commercial Vehicles

Products: Battery Systems, Boosting technologies, Chargers, Controllers, Electric Drive Modules, Electric Drive Motors, Engine Timing Systems, Fuel Injection Systems, Ignition Technologies, Intake and Exhaust Gas Management, Power Electronics, Starters and Alternators, Thermal Management.

Commercial Vehicle Solutions – Electric Boosting Technology

eBooster Electrically Driven Compressor



Benefits:

- Enhanced performance for commercial vehicles
- Combines optimized fuel economy and driver enjoyment with lower emissions
- Improved torque and response for smaller and lower-speed engines

eTurbo



Benefits:

- Up to 13 kW continuous power and 23 kW peak power
- Reduces turbo lag and offers faster time-to-torque
- Improves fuel economy and lowers emissions

eTurbo compound



Benefits:

- Facilitates cost-effective recovery of heat energy from the exhaust gas flow
- Minimal effects on engine operation or vehicle packaging

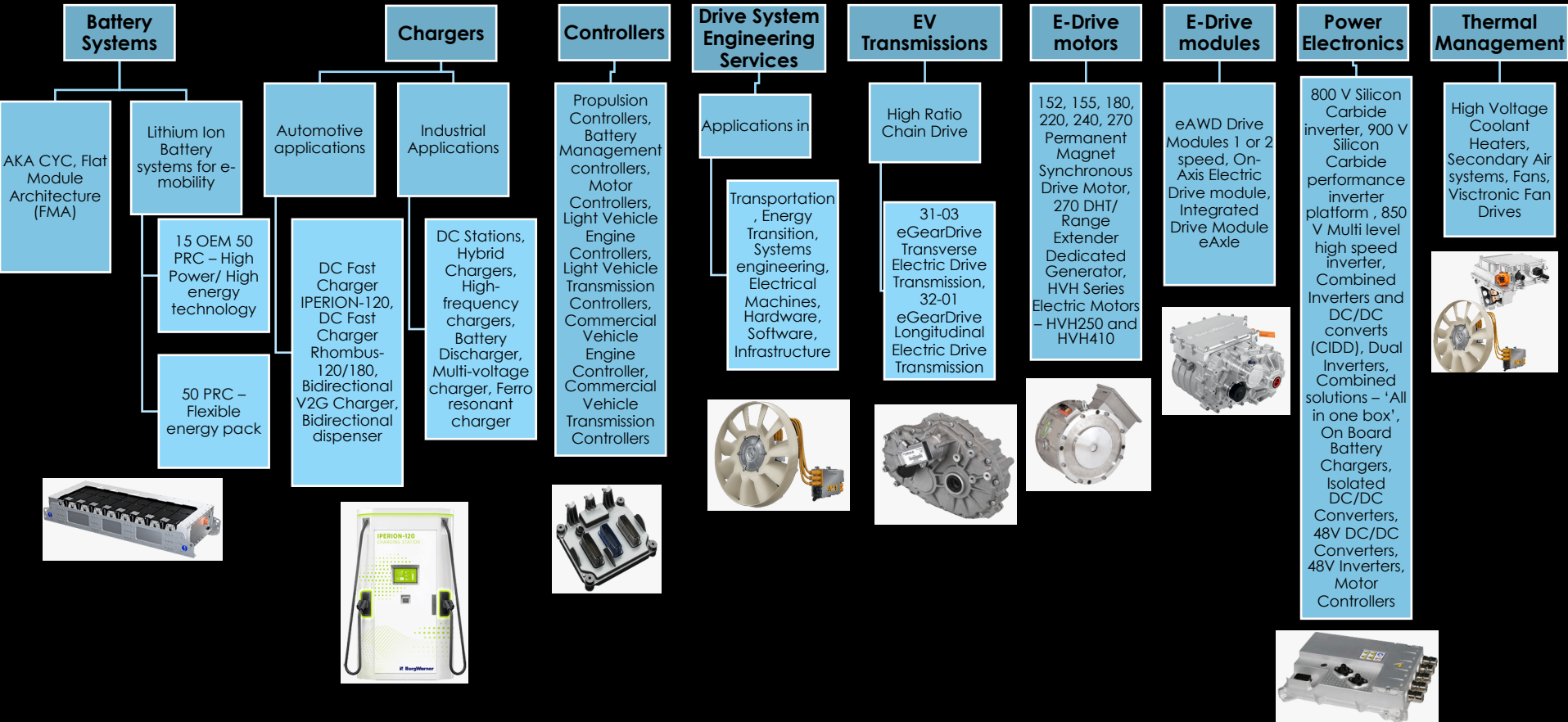
Organic Rankine Cycle Turbines/ Pump Expanders



Benefits:

- Up to 91 percent overall efficiency
- 65 percent peak turbine efficiency
- 7 kW nominal and 13 kW maximum output

“Accelerating the world’s transition to eMobility”





BOSCH





BOSCH

“We are Bosch”

Objective – “What we want to achieve”

Secure the company's future by ensuring its strong and meaningful development and preserving its financial independence

Motivation – “What drives us”

“Invented for life”

Products that spark enthusiasm, improve quality of life

Strategic Focal Points – “What will help us succeed”

- Focus on customers
- Shaping change
- Striving for excellence

Strengths – “What we do well”

- Bosch Culture
- Innovation
- Outstanding quality
- Global Presence

Values – “What we build on”

- Future and result focus
- Responsibility and sustainability
- Initiative and determination
- Openness and trust
- Fairness
- Reliability, credibility, legality
- Diversity, Equity and Inclusion

Business Overview

Revenue: 88.2 Bn Euros

No. of Employees:
421,300

No. of Locations: 468
locations in 60
countries

Headquarter:
Gerlingen, Germany

Sustainability

07 | Seven action areas for embedding sustainability culture

						
Make management “walk the talk”	Engage in active internal communication about sustainability	Support internal change pioneers and facilitators	Recognize and value commitment	Link sustainability to associates' private lives	Create inspiring events within the company	Keep an open dialogue with associates

Industry Breakdown

Industrial Technology

- Drive and Control Technology – Bosch Rexroth AG (100% Bosch)

Energy and Building Technology

- Building Technology
- Thermotechnology
- Bosch Global Service Solutions

Consumer Goods

- Power Tools
- Home Appliances
- Garden Tools
- Measuring Tools
- Cleaning Tools
- Heating, Cooling and Well Being
- Smart Home

Mobility Solutions

- Powertrain Solutions
- Chassis Systems Control
- Electrical Drives
- Cross-Domain Computing Solutions
- Automotive Electronics
- Automotive Aftermarket
- Automotive Steering
- Bosch eBike Systems

Solutions

Infotainment - Displays	Electronic components	Driving Safety	Actuators	Injector
Parking	Charging	Interior	Assistance Systems	Transmission Technology
Ignition & Wipers	Electric Motors	Batteries	Thermal Management	Vehicle Computer
Glow	Fuel Distribution	Power Electronic	Air management	Steering
Pumps	Camera	Control Units	Sensors	Valves
Powertrain	Software & Services	Exhaust Gas Treatment	Development Services	Automated Driving

Relevant Solutions

Transmission Technology

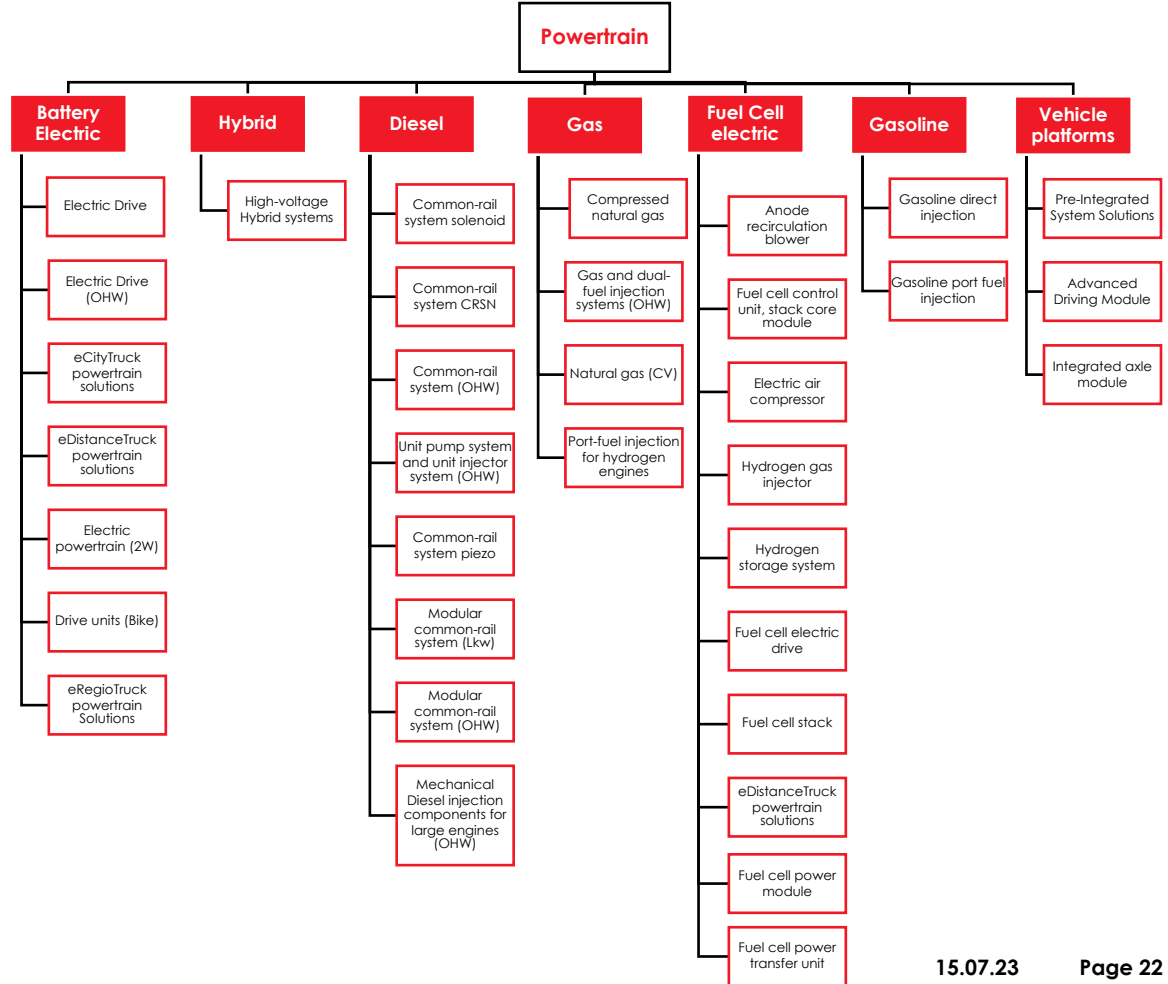
- Automatic Transmission
- Electronic modules
- Electric drivetrain transmission
- Transmission sensors
- Linear-forced solenoid
- Variable-force transmission solenoid
- Pressure or flow activated direct electric shift control
- Transmission CVT4EV
- Transmission control unit
- DH-CVT transmission
- Pushbelt

Automated Driving

- Bosch driving assist
- Localization for automated driving
- Road signature
- Predictive road condition service

Power Electronics

- Charge-converter
- DC/DC converter start/stop
- Electric Drive Module
- Inverter (CV)
- High Voltage DC/DC converter gen 3evo
- E-axle
- Power modules on cooler for inverters
- Inverter gen. 4



Relevant Solutions

Electric Motors

- E-axle
- Electric Drive Module
- Electric motors for commercial vehicle
- Global Blower Motor GBM
- EC motors for electric cooling fans
- Electric motors and active parts
- Global brushless blower GBB

Thermal Management

- Brushless engine cooling fan
- Electric refrigerant compressor
- Electric Coolant pump PCE
- Global brushless blower GBB
- Thermal management engineering services
- Thermal management for combustion engines
- Electric refrigerant valves
- Electric coolant pump PDE
- Flexible thermal unit
- Global Blower Motor GBM
- Thermal Management for hybrid systems and electric drives
- Predictive control of thermal system

Camera

- Interior monitoring systems
- Near-range camera
- Multi-purpose camera
- Multi-purpose camera gen 3 (CV)

Parking

- Automated valet parking
- Remote park assists
- Home zone park assist
- Parking aid
- Secure truck parking
- Trailer tow assist
- Garage park assist
- Park assists
- Rear cross traffic warning

Sensors

- Vehicle motion and position Sensor
- Brake pad wear sensor
- Speed sensor for exhaust gas turbochargers
- Pressure-based air-flow meter
- Electronic Battery Sensor
- Front radar sensor (CV)
- High-pressure sensor
- Inertial measurement unit
- Knock sensor
- Steering angle sensor
- Medium pressure sensor
- Wideband lambda sensor
- Differential pressure sensor
- Pressure tube sensor
- Corner radar sensor
- Front radar sensor
- Transmission sensors
- Hot-film air-mass mete
- Interior monitoring systems
- Crankshaft speed sensor
- Boost pressure and temperature sensor
- Medium-pressure and temperature sensor
- Low pressure sensor
- NOx Sensor
- Peripheral acceleration sensor
- Wheel speed sensor
- Intake manifold boost pressure and temperature sensor
- Switching-type lambda sensor
- Temperature sensor
- Ultrasonic sensor
- Camshaft position sensor
- Particle sensor
- Peripheral pressure sensor
- Rotor position sensor
- Corner radar sensor (CV)
- Sensor data fusion
- Overview powertrain sensors
- Angular position sensor

Areas of Research

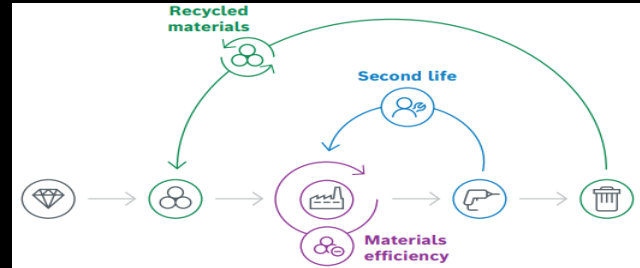
- Artificial Intelligence research
- Chemical energy conversion
- Electrified mobility and systems
- Innovative healthcare solutions for a better quality of life
- Information and communication technologies
- IoT@ life
- AI-enabled fully autonomous systems
- Modeling, simulation, optimization and new materials for engineering
- Sustainability innovations for resources and energy efficiency
- New Business
- Production systems
- Smart sensors and hardware systems

“Invented for Life”

Hydrogen Economy

- Developing fuel cells for mobile and stationary applications
- Equipping hydrogen filling stations with compressors
- Producing hydrogen at their own plant
- Also plans to enter the electrolyzer components business

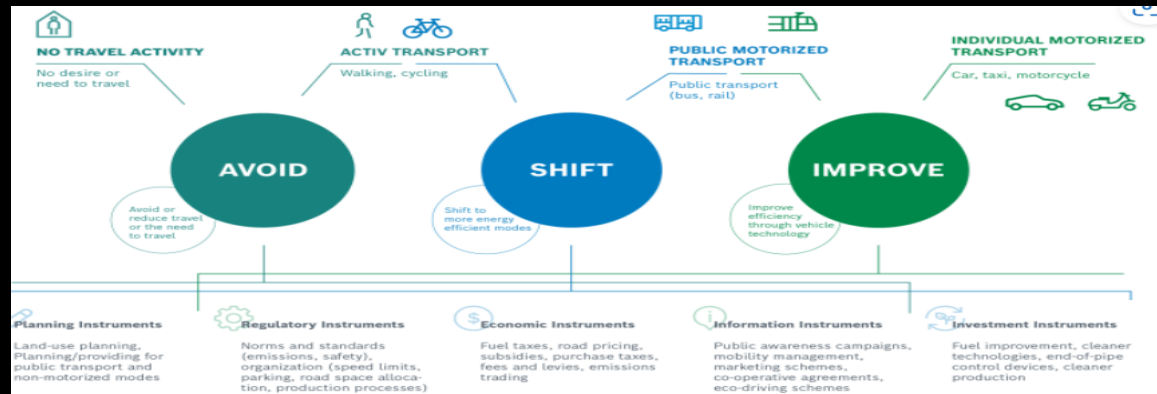
Potential of the circular economy



Circular Economy Strategy

- Level 1: Materials efficiency
- Level 2: Second life
- Level 3: Recycled materials

Carbon Footprint reduction



Continental 



Vision

Creating value for a better tomorrow

Strategy

Strengthen operational performance

Differentiate our portfolio

Turn change into opportunity

Fundamental Corporate Values

Trust

Passion to win

Freedom to act

For one another

Continental

Mission

Our Technologies. Your Solutions.
Powered by the passion for people.

Company Overview

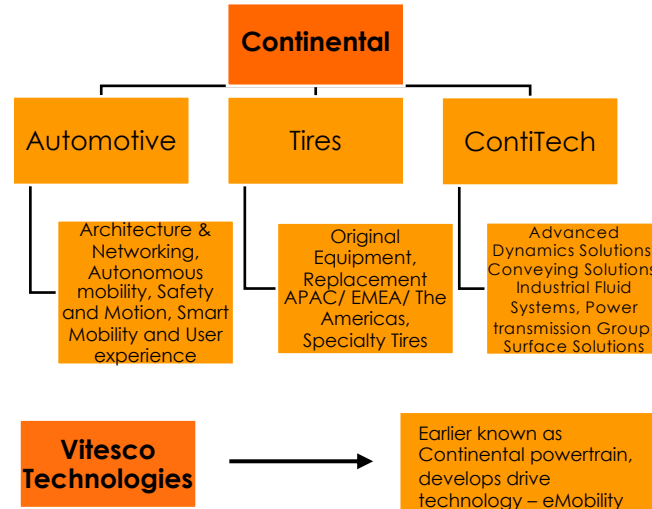
Sales: \$39.4 Bn

No. of employees: 200,000

No. of locations: 57

Headquarters: Hanover, Lower Saxony

Company Breakdown



Sustainability

Ambition: We drive the ongoing transformation of the economy towards a healthy ecosystem for sustainable mobility and industries

Carbon Neutrality

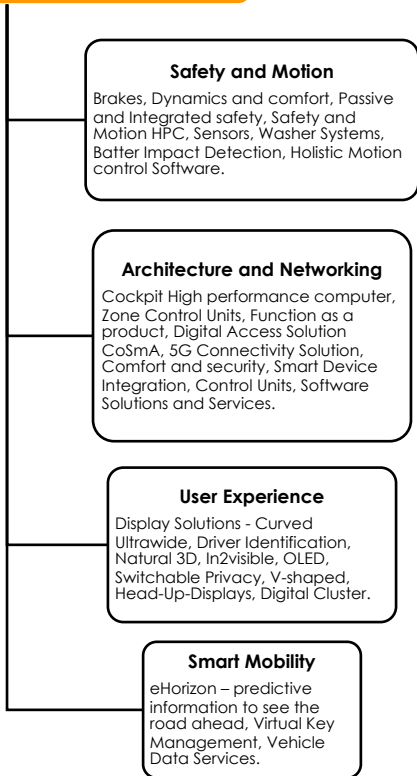
Circular Economy

Responsible Value Chain

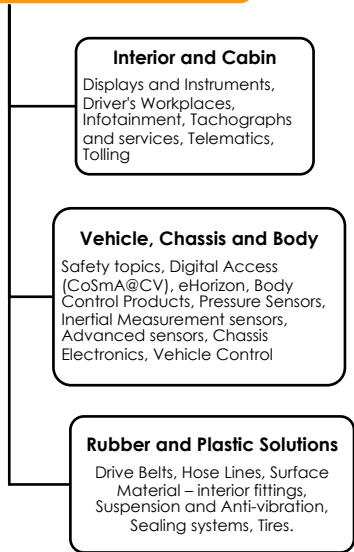
Emission-free Mobility and Industry

Continental Automotive

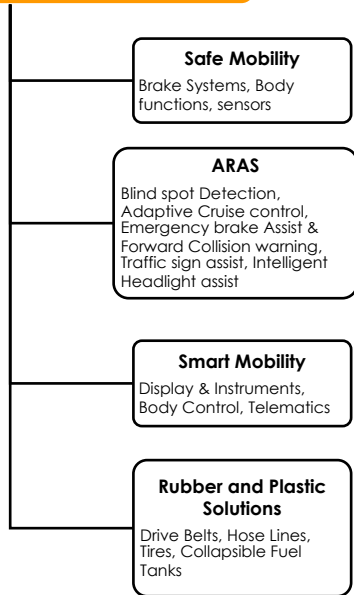
Passenger Cars



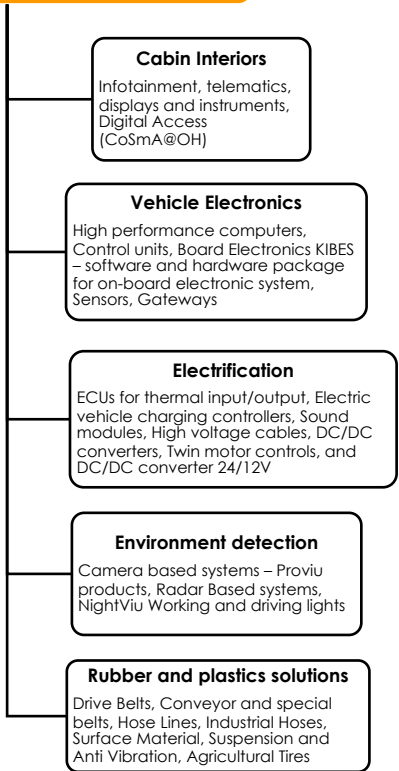
Trucks and Busses



2-Wheelers



Agriculture/ Construction & Mining Vehicles/ Material Handling



Technology Trends

Passenger Cars

Green Breaking

- Hydraulic Brake Systems
- Calipers
 - High performance with less weight in same time -> 2g/Km of CO2 emission is saved.
 - Innovation – Downsizing of Calipers
- Drum Brakes
 - No corrosion, No residual drag – Ideal for Evs
 - Innovation – Dry Drum Brakes : Duo-servo brake, sensors measure the effective brake moment, so the exact amount of force is applied

Holistic Motion Control System

- To enable the market trend of Software-defined vehicle (SDV). Using smart sensors, Central ECUs, smart actuators (by wire), and Application SW products (SWaAP) as a One stop shop

EV Market

- Battery Impact Detection
- eRPS- High-speed Inductive e-moto Rotor position sensor
- eRSS – e-motor Rotor Speed Sensor
- Stunt based current sensor - Keeping the battery healthy
- Intelligent Battery sensor – for battery status
- One box brake system MK C2- second generation brake-by-wire system
- Cost optimized braking system
- Ac2ated Sound/Automated Conductive Charging system
- Sensors for EVs

Trucks and Busses

Digital Access and Authorization

- CoSmA@CV – smartphone based easy, safe and flexible truck access

High performance computers

- For the future proof of E/E architecture of commercial vehicles

Trailer Capacity Assessment

- Smartphone base calculation of cargo space

Continental Verified Inspection

- Ensures correct inspection and accurate results

Electrification

- Components for energy management for e-CVs
 - Pantograph
 - Charging control unit
 - Intelligent battery sensor
 - Battery management system
 - Current sensing module
 - Thermal input/ output ecu
 - Dc/dc convertor
 - 800V inverter

ContiTech

Industries Covered

Agriculture and forestry	Aerospace	Construction
Energy management	Food chain processing	Home, garden and leisure
Material Handling	Mechanical and plant engineering	Mining
Industrial Safety	Printing	Rail Transport
Ships, ports and sea	Two wheelers	Commercial vehicles

Products and Solutions

Non Automotive

Compounds and Sheeting

- Rubber Compounds
- Elastomer sheeting
- Insulation material

Conveyer Belt Systems

- Processing and special belts
- Conveyor services

Printing technology and Rollers

- Printing Blankets
- Flexo Printing plates
- Coating/ varnishing
- Rollers

Sealing Systems (Industrial applications)

- Insulation material
- Elastomer Sheeting
- Expansion Joints
- Diaphragms/ Diaphragm Materials
- Gas Holder Diaphragms

Surface Material

- Living Spaces
- Protection and Health
- Mechanical Engineering
- Industrial Rollers
- Sustainable surfaces

Surface technologies

- Staynu Technology
- Laif Technology
- Cool colors technology
- Design, Service & Tools



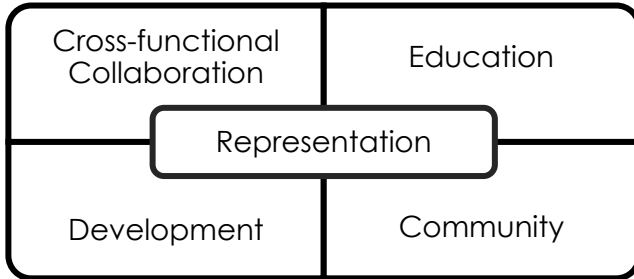
SONA COMSTAR



Vision Powering Innovation to move our world

Mission People Finding a better way

Pillars of Strength



Revenue Breakdown

By Segment

Light Vehicle **40%**
 Off-Highway **29%**
 Commercial Vehicle **20%**
 Power Technologies **11%**

By Region

North America **48%**
 South America **8%**
 Europe **30%**
 Asia Pacific **14%**

Dana's Values

Value Others

Inspire Innovation

Grow Responsibly

Win Together

Company Overview

Revenue: \$10.2 Bn

No. of Employees: 42,000

No. of Locations: Facilities in 31 countries and 13000 customers in 141 countries

Three years sales Backlog: \$900 Mn, 65% electrified

Headquarters: Maumee, US

Sustainability

Changing our world through e-propulsion

Actioning renewable energy

Greening our operations

Driving a responsible supply chain

Protecting our water resources

Financing and manufacturing sustainably

Light Vehicle

Passenger car, Light truck, SUV/ CUV,
High performance, Van, Specialty
Electric

Drive

- Axles
- Propshafts/ Driveshafts
- Transmissions
- Gearboxes

Systems

- E-Drive Systems
- E-Axles

Electrodynamics

- Motors
- Inverters

Sealing

- Transmission separator & Fuel cell plates
- Cylinder Head & secondary gaskets
- Valve Stem seals
- Sealing Modules

Thermal

- Engine & Transmission Oil Cooling
- Active Warm-up
- Battery, motor, and electronics cooling
- Thermal-Acoustical Protective shield

Commercial Vehicle

Linehaul, Heavy-haul, Medium-
duty, vocational

Digital

- Active and passive system controls

Drive

- Axles
- Propshafts/ Driveshafts
- Transmissions

Systems

- E-Axles

Electrodynamic

- Motors
- Inverters

Sealing

- Cylinder/Secondary Head gaskets
- Valve Stem seals & Sealing Modules
- Fuel cell plates

Thermal

- Thermal-Acoustical Protective shield
- Charge Air, battery, motor, and electronics cooling

Off-Highway

Construction, Agriculture,
Mining, Material Handling,
Forestry, Specialty electric

Drive

- Axles/ Propshafts/ Driveshafts
- Transmissions
- Gearboxes/High-Precision Gears
- Shifting Solutions
- Torque-Hubs

Systems

- e-Hub Drive
- e-Axles
- e-Transmissions

Electrodynamic

- e-Motors and generators
- Inverters

Motion

- Hydraulic motors, pumps and valves
- Slewing and pump drives
- Electronic/ Mechatronic sensors
- PTO Gearboxes
- e-pumps and e-slew drives

Transforming the future of mobility

eMobility Vehicle Integration

EV Architecture Design

Electronics Power cradle

Powerhouse of the vehicle, can be put in the same location as an engine. It can house the electrified power steering unit, Air compressor, HVAC, and countless other auxiliary items

Dana TM4 Traction Motor

Multiple motor models with varying sizes paired with a choice of medium or high voltage inverters, provide a wide range of solutions to your electric or hybrid propulsion needs

Products Developed till Date

- e-propulsion systems – e-Axles, e-Drive units, e-Hub Drives, e-Gearboxes
- e-Motion Systems
- Completely fully integrated e-Powertrain

Future

With 26 Technology centers globally, they are currently working to develop unique new technologies. And have secured hundreds of development agreements with potential electrification customers across the globe.

SONA COMSTAR Dana - Company Profile

Engineering service and testing

Electrification Engineering

Construction

Prototype development, build and assembly with 3D Design - CAD

Electrical Engineering

Conception of electrical safety features, preparation of electrical products and manufacturing information

Embedded Systems

Design and functional simulation models in MTALAB/ Simulink
Model based design and conventional programming in C

Control Systems

Design, programming and calibration of closed loop operational strategies for complex vehicles and propulsion systems.

Validation and Verification

Validation, Verification, Calibration of all systems regarding function and safety

Technical Support

Commissioning assistance and field support and troubleshooting

Vehicle Testing

Powertrain-in-the-loop (PIL)

Allows them to realistically simulate all load conditions, and thereby define all parameters needed for the characterization of system components.

Fields of application

Testing and evaluation of individual components

System testing of components in flexible combinations

Continuous load testing of complete electric drive systems

Performance data verification of electric drive systems

Validation and characterization of high-energy storage-devices (traction batteries)

DENSO
Crafting the Core



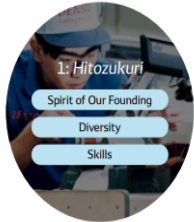
DENSO

Crafting the Core

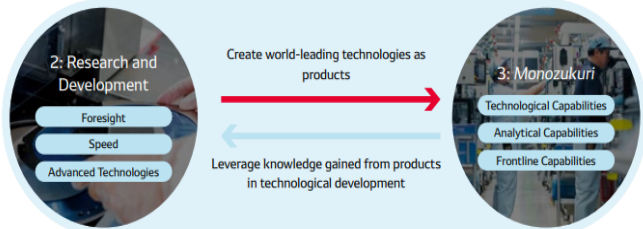
“Contributing to a better world by creating value together with a vision for the future”

Vision	Exploring the deeper meaning of happiness in order to build a future with greater well being for all			
Four Ideals of Denso	Be trustworthy and responsible	Cherish modesty, sincerity, and cooperation	Be pioneering, innovative and creative	Provide quality products and services

Denso's Three Strengths



Support and realize sustainable growth as a source of value creation ↓ ↑ Refine and strengthen frontline technologies and capabilities



Company Overview

Revenue FY23 - ¥6,401.3 billion (US\$47.9 billion)
Total No. of Employees - 164,572
Headquarters Location - Japan

Revenue Breakdown by Region

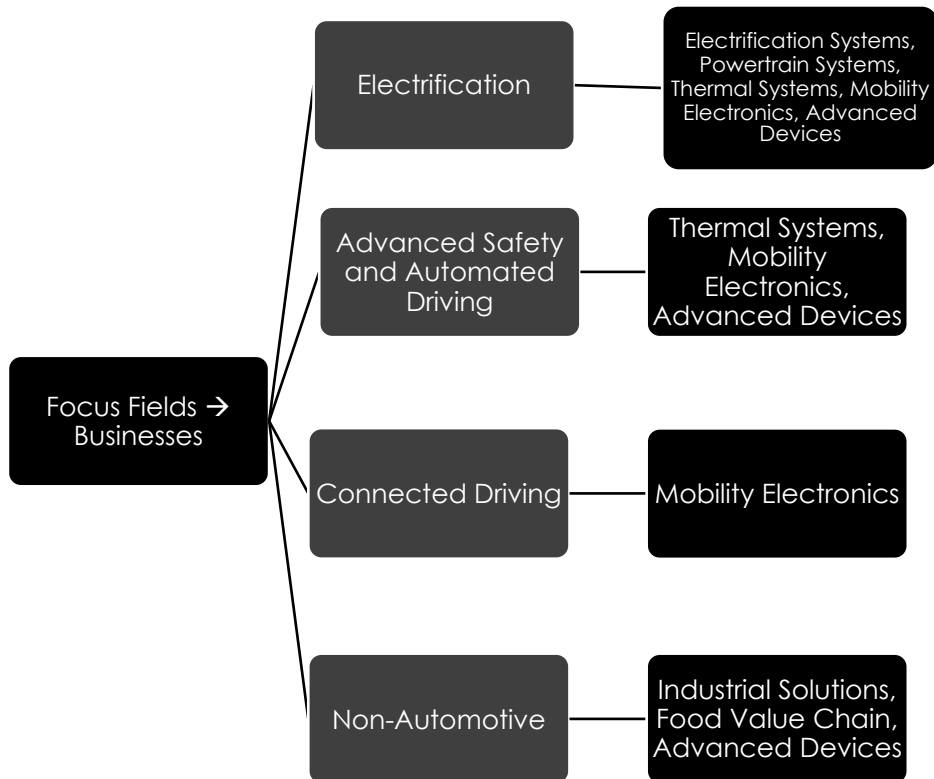
Japan	North America
Companies: 60	Companies: 20
Employees: 79,304	Employees: 22,722
Revenue: ¥3,705.8 Bn	Revenue: ¥1504.1 Bn
Europe	Asia
Companies: 27	Companies: 77
Employees: 14,142	Employees: 45,568
Revenue: ¥685.6 Bn	Revenue: ¥1931.7 Bn

Business Breakdown Revenue Ratio FY22

- Electrification Systems **20.6%**
- Powertrain Systems **22.6%**
- Thermal Systems **23.3%**
- Mobility Electronics **24.6%**
- Advanced Devices **3.2%**
- Industrial Solutions **3.4%**

Other: Companies 7, Employees 2,836, Revenue ¥ 101.2 Bn

Four Focus fields and Seven Core Businesses



Non – Automotive Businesses → Products

Industrial Solutions

- Provides industrial solutions to factories, supported by their manufacturing technology and skills developed in automotive parts production.
- **Products:** Automated Modules, Vertical Articulated Robots, Collaborate robots, IoT data servers, Barcode and 2D code handy terminals, QR solution services

Food Value Chain

- Agricultural Industrialization, sale of systems for digitization of food distribution and data-linked services
- **Products:** Horticultural facility/ Greenhouse related products, Compact mobile refrigeration units, In-vehicle refrigeration units, QR traceability systems, Production source verification support system

Advanced Devices

- **Products:** Multi-flow control valve (MCV-e), Shift by wire system actuators, Accelerator pedal modules, Power cards, Semiconductor sensors, ASIC

Automotive Business

Electrification Systems

Development and manufacture of HEV & BEV drive systems, power supply systems, electric power steering motors, control brake motors, and electric control units (ECUs)

Development and manufacture of various kinds of small motor system products, such as windshield wiper systems, power window motors, engine control motors, and blower fans

Products: Power control units, Motor generators, Battery ECUs, Lithium-ion battery packs, Windshield wiper systems, Power window regulator motors, Electric power steering motors, Control brakes

Powertrain Systems

Development and manufacture of gasoline and diesel engine management systems, which cover everything from combustion to intake and exhaust.

Development and manufacture of valve-related products, such as variable cam timing (VCT) systems and exhaust gas sensors; and products for drive systems, such as oil pressure control valves

Products: Common rail systems, Gasoline direct injectors, Ignition coils, Spark Plugs, Exhaust gas sensors, VCT systems, Motorcycle products (AGC-S, ECUs)

Thermal Systems

Development and manufacture of AC systems for passengers and commercial vehicles. And air quality products for comfortable spaces.

Development and manufacture for Cooling products such as radiators and inverter coolers. And thermal management systems and heat pump systems

Products: HVAC units, Condensers, Radiators, Bus air conditioners, Heat pump systems, Inverter cooling systems, Battery cooling systems.

Mobility Electronics

Development and manufacture of HCUs (Human-machine interface), meters, HUDs (Head-up display), CIDs (Center information displays), ETC (Electronic toll collection) systems for vehicles, road-to-vehicle and vehicle-to-vehicle communication devices, vision sensors, millimeter-wave radar sensors, sonar sensors, self-driving car ECUs, airbag sensors & ECUs, DSMS (Driver status monitors), and other safety-related products

Products: Engine ECUs, HEV ECUs, BEV ECUs, Vision sensors, mm wave radar sensors, Cockpit systems, Full graphic meters, Road – Vehicle and Vehicle – Vehicle communication Devices

Service Parts and Accessories

Maintenance Parts : Spark Plug, Oil Filter, Cabin Air Filter, Wiper Blade, Air filter Element

Repair Parts : Starter Motor, Alternator, Compressor, Oxygen Sensor, Fuel Pump, AC Service parts

Collision Parts : Radiator, Condenser

Accessories : Plasmacluster Ion Generator

Service Tools : Refrigerant Recovery, Recycling and Charging Machine

NaviBridge – An application to remotely navigate operating maps in a car navigation system from a smart device using Bluetooth

“Bringing hope for the future for our planet, society and all people”

**Long-term Policy
for 2030**

Green
Lasting vitality for the environment

Peace of Mind
Providing a sense of well being

Inspiring
Making a difference

The Goal:

Promoting
Electrification



Contributing to a
Carbon- Free Society



With the help of Silicon Carbide
Power Semi-Conductors

Denso Semiconductors

**Mission 1: Be
Smart and Strong**

**Mission 2:
Achieve flexible
movement**

Sense

Monitor the
Situation –
GSP3 (Sensing
system)

Monitor the
Condition –
DSM (Driver),
BMU (System),
D-FAMS
(Service)

Act

High output &
Energy
Efficient (Power
Semiconductor,
or, PCU)

Robust

Rugged
Body to
protect
semiconductors
(mounted
ECU)

Condition
management
(Double sided
cooling
technology)

Think

Image
Recognition
Algorithm

AI Algorithm –
Estimation of
the condition

System

Moving limbs
at will
(Connected
System,
Powertrain
system,
Sensing
system)

Software

Thoroughly
efficient
(NSITEXE)

**SoC, CPU,
ASIC**

Minimalist
and
Seamless

Material

SiC power
Semiconductors
and
R&D from
Toyota and
DENSO

Denso MaaS

- It is a technology that matches vehicles in the real world with network-based services
- Two main technologies
 - Mobility IoT core: Enables real time data collection and device control
 - Digital Twin: Reproduces the real world in a virtual digital space, using the data collected through Mobility IoT Core
- The two technologies allow various mobility service providers to analyze data and control vehicles safely from the cloud leading to significant reduction in development periods and costs.

Quantum Computing

- With the help of Dr. Tadashi Kadowaki – one of the first scientists to propose quantum annealing – and other collaborations, DENSO is exploring the possibilities of utilizing big data.
- Expanding into
 - Mobility IoT
 - Factory IoT
 - Society IoT
 - Basic Technology



AUTOMOTIVE





Purpose To drive a cleaner more sustainable world

Company Overview

Revenue: Euro 4.3 Bn
No. of employees: 25,000
No. of locations: 50
Revenue Break down:

- **Driveline** **72%**
 - Sideshafts 59%
 - Propshafts 13%
- **ePowertrain** **27%**
 - AWD systems & components 25%
 - eDrive systems & components 2%
- **Other** **1%**

Targets

Charity partnerships established in all locations by **2025**

50% of R&D expenditure to decarbonize the automotive sector by **2025**

50% of new products to contribute to decarbonization of sector by **2025**

Sustainability

Our People

Climate Action

Responsible Sourcing

Our Impact

Strategy

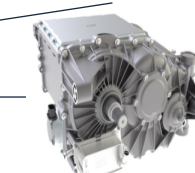
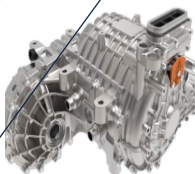
Sustainability Roadmap



eDrive Systems

Modular eDrive Systems

eDrives can be supplied as 3-in-1 with inverter, motor and transmission and software and controls fully integrated, sourced as 2-in-1 systems, or as single modules or components



For EVs

For Compact cars

For Mid-sized cars

For large pure EVs

Dedicated hybrid transmission (Multi-Mode)

Multi-Mode transmission offers a simpler, smaller, lighter transmission that helps offset the added battery and power electronics costs of hybrid systems.



Torque-vectoring Twinster eDrive system

Unlocks the full potential of electric power, while minimizing the effects of battery mass on dynamics. Improves on- and off-road performance, by enhancing traction, cornering and efficiency in real-world driving conditions.



SideShafts

VL3 sideshaft for premium rear-wheel drive



VLX rear sideshaft for off-road all-wheel drive



UF-MTS-AAR sideshaft system for small front-wheel drive cars



Side-shaft system for sports utility vehicles



Sideshaft system for low-cost rear-wheel drive applications



PropShafts

The system comprises two pre-assembled constant velocity joints, one with a high-strength, lightweight tubular shaft and one with the company's "Direct Torque Flow" interface.

Modular Lightweight propshaft systems



All-wheel & 4-wheel drive systems

1. Efficient ActiveConnect all-wheel drive systems

The intelligent driveline system provides a high-efficiency front-wheel drive mode for steady state driving at speeds above 35kph.

ActiveConnect Power Transfer Unit



Booster Rear Drive Unit



Twin AWD RDU

ideal for SUVs and crossovers



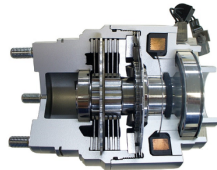
Twinstar torque-vectoring RDU



2. Intelligent on-demand all-wheel drive systems

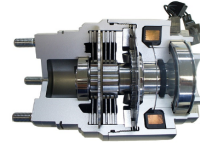
Includes all products from Efficient ActiveConnect all-wheel drive systems + Electro-magnetic Control Device

Electro-magnetic Control Device

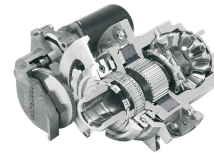


3. Building blocks for AWD systems

All-wheel drive coupling modules



Electronic Torque Manager (ETM)



Final Drive Unit (FDU)



Electronic Differential Lock (EDL)



Limited Slip Differentials



Working with EVs

Pure-play EV OEMs



LUCID



RIVIAN



STREETSCOOTER

BOLLINGER MOTORS

e.GO



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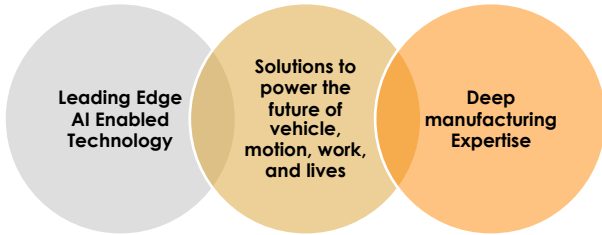
ARRIVAL



LINAMAR

Power to Perform





Goal	Net zero emissions by 2050
-------------	----------------------------

Commitment
Net zero facilities
Net zero supply chain
Net zero customer products

Four Key Principles	Equal Opportunity	Proportionate Representation
	Advance on Merit	No Quotas

Transportation

- Carbon Efficient
- Electrified
- Lightweight
- Autonomous
- New Mobility

Infrastructure

- Safe
- Efficient
- Work to height

Agriculture

- Optimized Harvest Yield
- Availability of Food

Company Overview

Revenue Breakdown

- Industrial Sales **26%**
 - Access 13.4%
 - Agricultural 12.1%
- Mobility Sales **74%**
 - Automotive 68.4%
 - Off Highway 1.9%
 - Commercial 4.2%

No. of Employees: 28,812
Locations: 66 Manufacturing Facilities, 28 Sales offices, 14 R&D Centers

Headquarters: Guelph, Canada

Key Drivers of Market Opportunity



Manufacturing Capabilities

Metal Forming

- Robotic Welding
- Laser cutting
- Metal forming
- Stamping
- Painting
- Assembly

Machining and Assembly

- Advanced Automation and Robotics
- CNC Expertise
- Complex Assemblies
- Hydroforming
- Heat treatment

Light Metal Casting

- Gravity & Low-pressure Aluminum Die Casting
- High Pressure Aluminum & Magnesium Die Casting

Forging

- Hatebur High Speed Hot Horizontal Forging
- Conventional Vertical Forging
- Cold Forming
- Ring Rolling
- Radial Forging

Mobility Products

Transmission

Gear and Shafts

Gearbox Housings

Shaft and Shell Assemblies

Clutch Modules

Driveline

Differential Assemblies

Power Transfer Unit (PTU)

Rear Drive Unit/ Module (rdu/ rdm)

Engineered Gears

Engine

Cylinder Blocks and Heads

Connecting Rods

Camshafts

Balance Shaft Modules

Chassis

Shock towers

Centre consoles

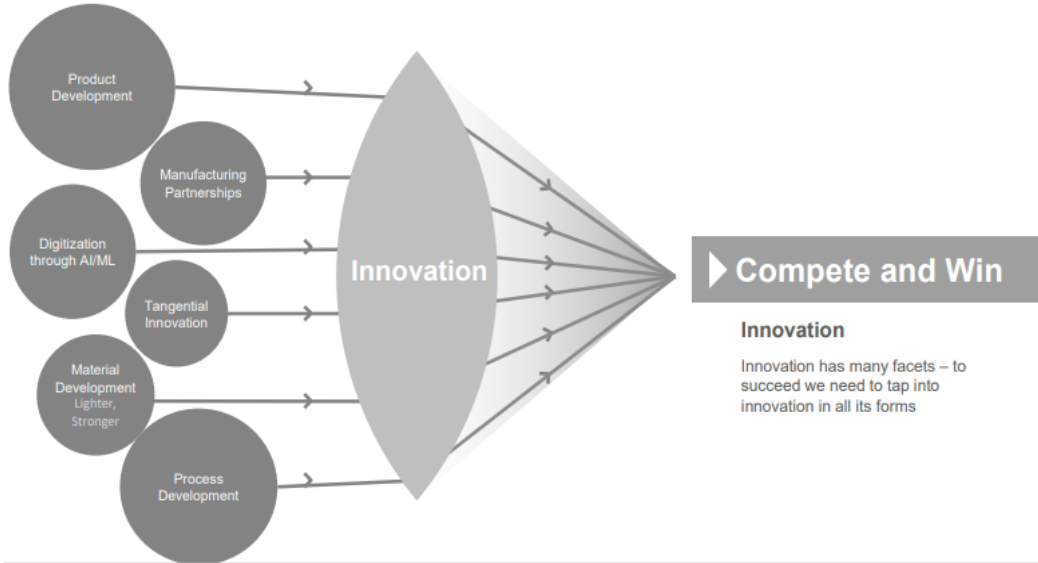
Cross Car Beams

Wheel Spindles

eLIN

- Focuses on developing **electrified product solutions** for all business lines.
- **Four key areas:** Power generation, power storage, Propulsion Systems, Structural & Chassis offerings for EVs
- **Product Solutions**
 - Power Generation
 - Energy Storage
 - Propulsion Systems
 - Structural Chassis

Innovation Roadmap



BEV Technology Demonstrator Truck



- Fully Functioning retro fitted 2500 Pickup Series BEV
- 2022/23 R&D Project by the eLIN Product Solutions
- Showcases capabilities of eLIN eUD10 Beam eAxle design (front & rear)
- Equipped with eMatrix Battery Pack
- Starting Ride & Drive road shows for potential OEM customers

eLIN eAxle Product Family

Light Duty Independent eAxle



eLD 05

Vehicle Class

Light Duty Beam eAxle



eLD 05

Vehicle Class

Utility Duty Beam eAxle



eUD 10

Vehicle Class

Medium Duty Beam eAxle



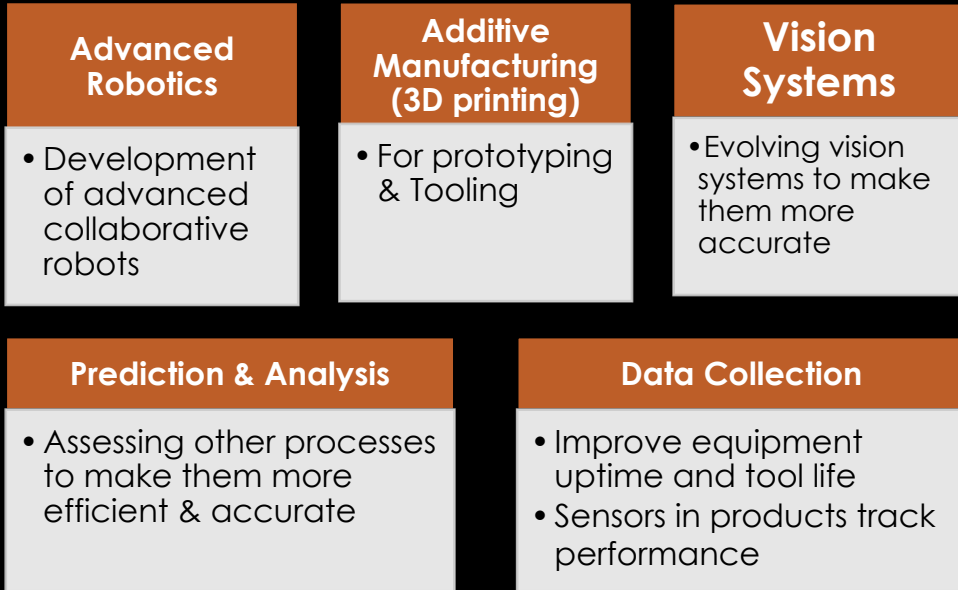
eMD 15

Vehicle Class

Linamar's AI Roadmap



Efficiency & Innovation with AI/ML



Digitization already done with AI/ML

- **66 Plants**
- **524 Data Collection Connections**
- **2328 RFID Stations**
- **2797 Traceability Read Stations**
- **1201 Vision Systems**
- **3603 Robots**
- **1078 Traceability Marking Stations**
- **6 AGVs**
- **3106 Connected Machines**

MAHLE



MAHLE

“Driven by Performance”

Vision

We shape future Mobility

Business Overview

Revenue: 12.4 Bn Euros

No. of Employees: 71,947

Headquarters: Stuttgart, Germany

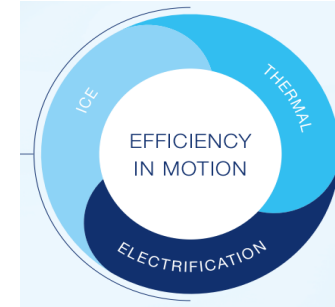
Locations: 152 product locations, 12 R&D centers

Business Units: Engine systems and components, Filtration and Engine Peripherals, Thermal Management, Electronics and Mechatronics, Aftermarket

Sustainability



Strategy: Focus Fields



Electrification

- Focus on electric drives and intelligent charging to help e-mobility become affordable, simple and reliable

Thermal Management

- Continue to expand our position for highly efficient thermal management systems for batteries, efficient drives, and first-class cabin comfort.

ICE – Components for efficient & clean combustion engines

- Remain a reliable partner to our customers around the world as long as demand exists. Because electrification will not be the only solution for an emission-free society. MAHLE will drive efficiency progress in this segment with cutting-edge products and optimize its cost structures.

E-Mobility

ChargeBIG

Charge as fast as necessary, not as fast as possible

Advantages: Scalable, Cost-effective, Grid-friendly, User-friendly

Electronic Control Units for efficiency

Solutions for Passenger cars



Low Voltage
Traction Inverter



Energy
Management



EMC Battery
Filter 1



EMC Battery
Filter 2



Fuel Cell Monitor



Power
Electronics for
Auxiliaries



PTC Heater
Controller 1



Electronics for
Diesel Systems

On-Board Charger, DC-DC Converter, Motor Controller, Glow Control Units & Exhaust aftertreatment for diesel engines

Solutions for Commercial cars

EMC Battery Filter, On-Board Charger, Fuel Cell Monitor, DC-DC Converter, PTC Heater Controller, Motor Controller, Exhaust aftertreatment & Glow Control units for diesel engines

Images for the products are same as featured above

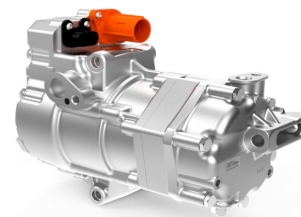
Light. Sport. Smart.

- As a full system provider for smart e-bikes whether Urban, Road, Gravel, or Mountain Bike - MAHLE offers a platform for compact drive units with an optimized battery-concept, components for connectivity and customized motor control.

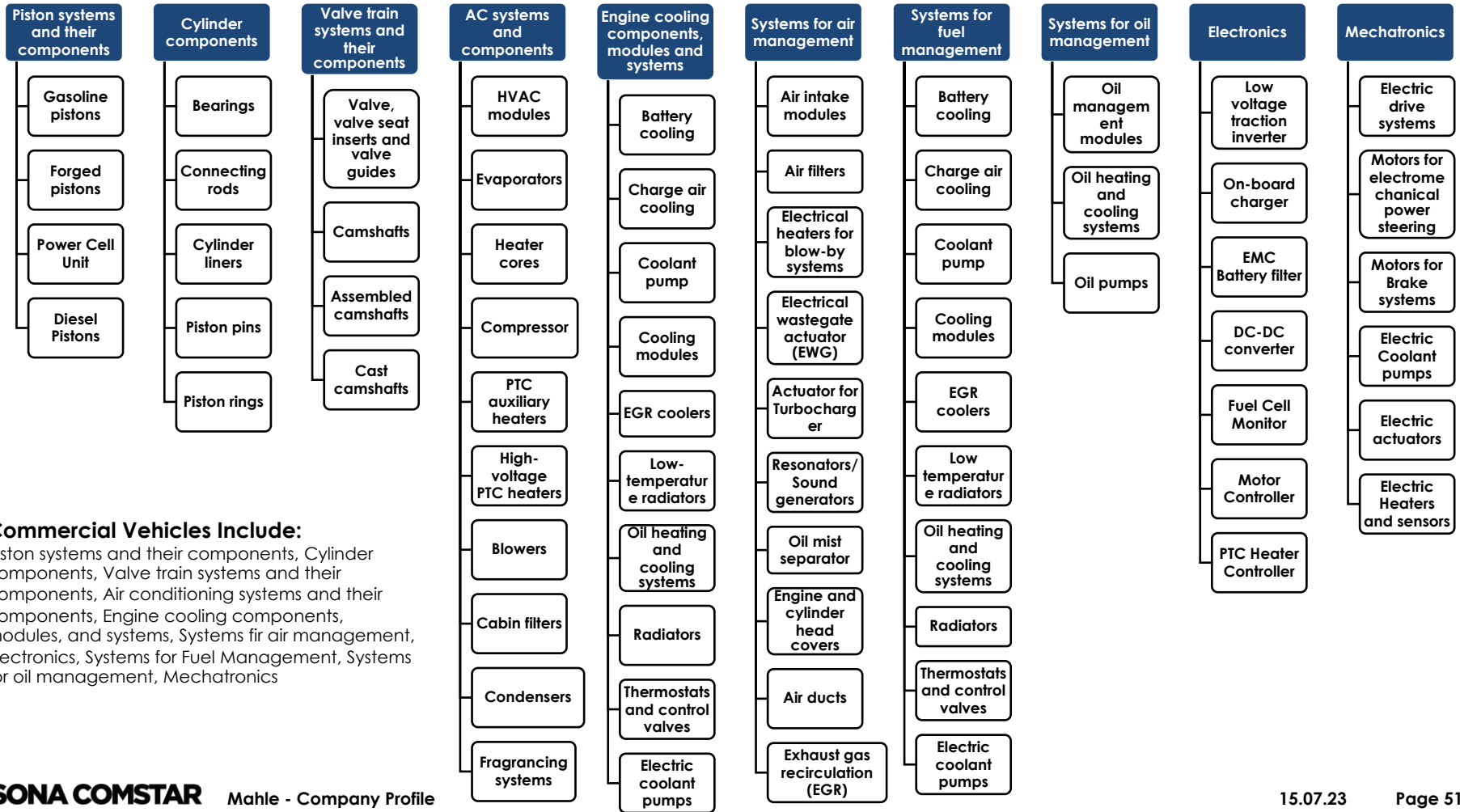


Thermal Management – Enabler for eMobility

- E-mobility will be a key component of CO2-neutral individual transportation over the long term.
- E-compressor



Passenger Cars/ Commercial Vehicle Products



Commercial Vehicles Include:

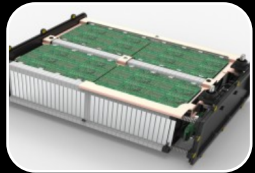
Piston systems and their components, Cylinder components, Valve train systems and their components, Air conditioning systems and their components, Engine cooling components, modules, and systems, Systems for air management, Electronics, Systems for Fuel Management, Systems for oil management, Mechatronics

Innovation

Three tracks, one goal:

- Electrification: The E-evolution continues
- More climate expertise: thermal management
- Open to technology in the future: modern combustion engines

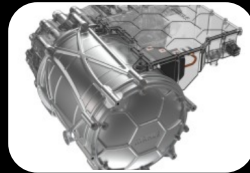
R&D innovations



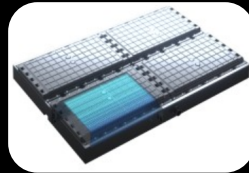
Battery concept for 90s charging



Electric Air Conditioning Compressor



Magnet-free traction motor



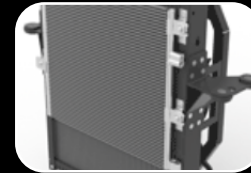
Immersion-cooled battery module



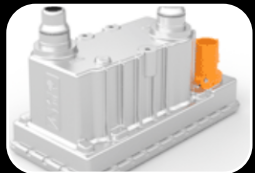
Intelligent air conditioning



Modular air filters for fuel cells



Cooling Module



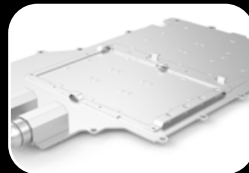
High-Voltage heater



Air conditioning system



The chiller



The Electronics cooling plate



24V Coolant Pump



Oil Management Module



Humidifier for fuel cells

Mahle New Ventures GmbH

- Expansion of corporate start-up activities
- Strategic support for VC investments
- Establishment of a start-up eco-system to scale up new business areas
 - MAHLE start up incubator program





Purpose

Creating a better world of mobility, responsibly

Core Values

Think Big

Take responsibility

Never Settle

Be Collaborative

Key Strategic Diversity & Inclusive Priorities

Build Awareness

Creative & Inclusive Workplace

Strategic Partnerships

Business Overview

Revenue: \$36.2 Bn (FY21)

No. of Employees: 171,000

Headquarters: Ontario, Canada

No. of Locations: 341

Manufacturing, 88 R&D in 29 Countries

Magna Groups

Magna Cosma

- Body, Chassis and Engineering Solutions

Magna Exteriors

- Material development, manufacturing and assembly

Magna Powertrain

- Powertrain design, development, testing, and manufacturing

Magna Electronics

- Technology for automated driving to secure connectivity and vehicle electrification

Mechatronics, Mirrors, and Lighting

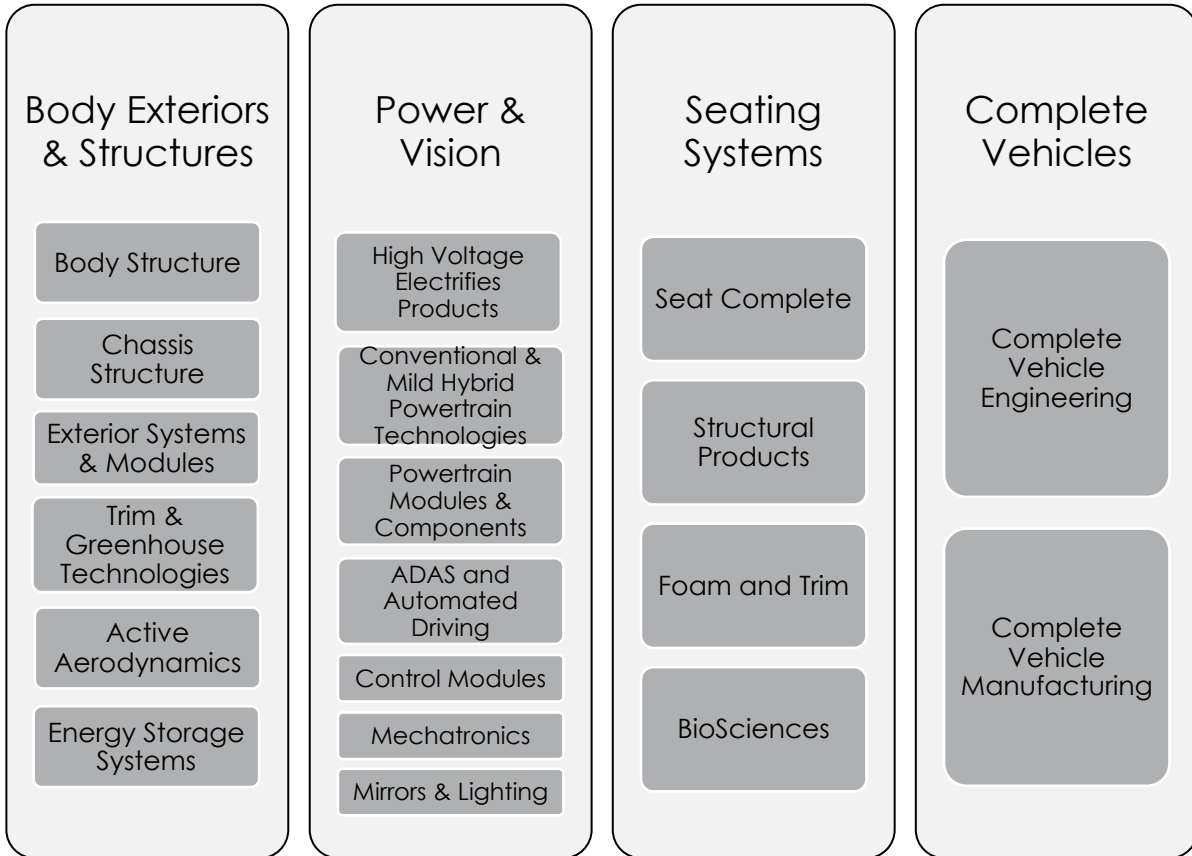
- Forward and rear lighting systems, exterior and interior vision systems, and complete mechatronic power systems

Magna Steyr

- Vehicle Contract manufacturer – conventional drives, plug-in hybrids and all-electric vehicles

Magna Seating

Product Range



Innovation

Eco Innovation

- **“Exceptional driving experiences that are kinder to the planet.”**
- EtiligentReach BEV Powertrain
- Active Aerodynamics
- Integration of alternative propulsion systems

Distinction & Experience

- **“Redefining the very concept of consumer experience and design.”**
- SmartAccess (B-Pillarless Power Door System)
- FlectsForm
- Morphing Surfaces

New Mobility

- **“Leveraging deep product knowledge and complete vehicle expertise to deliver on tomorrow’s mobility challenges”**
- Reconfigurable Seating/ Structural Products
- Complete Vehicle Manufacturing
- Complete Vehicle Engineering

Driver Assistance

- **“Bridging the human interface with vehicle technology”**
- Front integration panels
- ICON Digital Radar
- Driver Monitoring System





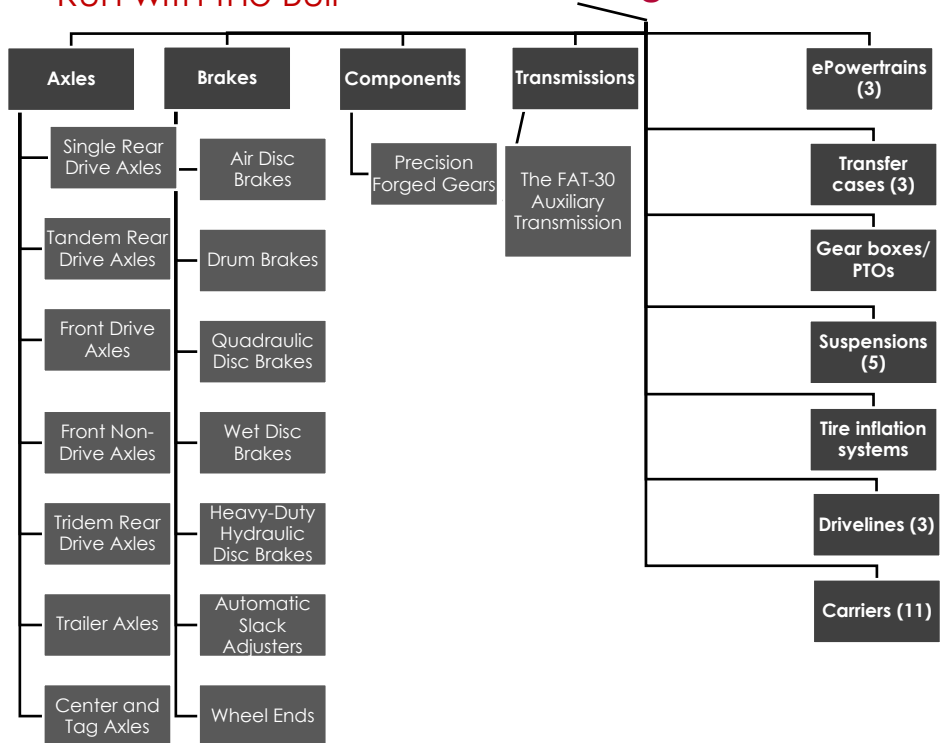
MERITOR

“Run with the Bull”

Vision: To be the recognized leader in providing advanced drivetrain, mobility, braking, and aftermarket solutions for the global commercial vehicle and industrial markets.

Revenue: \$3833 Mn (FY21) – They are now a part of Cummins.

Product Range



Technology

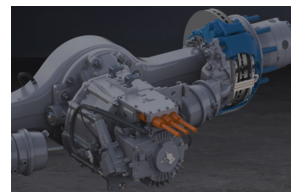
New products in electrification

Blue Horizon

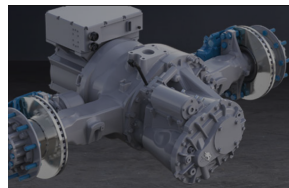
12Xe ePowertrain



14Xe ePowertrain



17Xe ePowertrain



Revenue Break down

Axles, Suspension Systems and Driveline **73%**
 Brakes and Brake-related Components **21%**
 Other **6%**

Industries

- Truck & Trailer
- Electrification
- Ground Service
- Bus & Coach
- Heavy Haul, OH Construction & Utility
- Material Handling
- Defense/ Rail service
- Mobile Cranes
- Fire and Rescue



mitsubishi
ELECTRIC



Purpose: “We, the Mitsubishi Electric Group, will contribute to the realization of a vibrant and sustainable society through continuous technological innovation and ceaseless creativity.”

Attitude: “Always strive to achieve better.”

Commitment: “Changes for the Better.”



Our Values:

- Trust
- Quality
- Technology
- Ethics and Compliance
- Humanity
- Environment
- Society

Business Overview

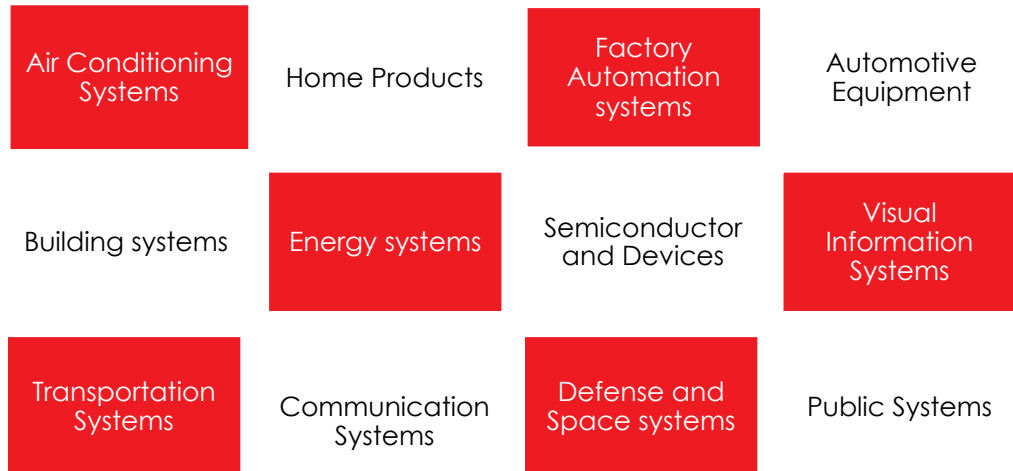
Revenue: 5 Tr Yen (March 31, 2023)

No. of Employees: 149,655

Headquarters: Japan

No. of Locations: 209 (118 outside Japan, 91 in Japan)

Industries



Energy & Electric Systems

Revenue Percentage:
26.8%

Railway Lifecycle Management Solution (LMS)

Network Camera System

Electricity ICT Solution Package BLEnDer

Natural Ester Oil Power Transformer MELCORE-NEO

NEXIEZ Machine-room-less Elevators

Mitsubishi u series Escalators

Information & Communication

Revenue Percentage:
26.3%

Programmable Logic Controllers

AC Servos

Computerized Numerical Controllers CNCs

Electric Power Steering (Motors & Controllers)

Car Navigation System

Motors and Inverters for eMotor Vehicles

Electronic Devices

Revenue Percentage:
8.0%

Video analysis solution "kizkia"

Network Security Service

Operation-Specific Solutions

DS2000 Standard Satellite Platform

Satellite Observation Solution

CIS (Contact Image Sensor)

Industrial Automation

Revenue Percentage:
4.3%

Power Semiconductor Modules

SiC Power Semiconductor Devices

Optical Devices for Optical Communication

GaN High Frequency Devices

Thermal Diode Infrared Sensor MeIDIR

TFT-LCD Modules

Home Appliances

Revenue Percentage:
21.9%

AC & Refrigeration Systems

Home Equipment

Home Appliances

Light Fixtures and Light Bulbs

Recycling Consumer Electronics & Home Appliances

The Depth of Products

Factory automation systems

- Industrial Computer
- Controllers
 - Programmable Controllers MELSEC
 - Motion Controllers
- Computerized numerical Controllers (CNCs)
- FA Sensor
- Drive products
 - AC servos-MELSERVO
 - Inverters-FREQROL
 - Geared Motors
- HMI
- Robots
 - Industrial Robots-MELFA
 - Collaborative Robot-ASSISTA
- Low-voltage Power Distribution Products
 - Low-voltage Circuit Breakers
 - Contractors and Motor Starters
 - Power Management Meters
- Medium-voltage Power Distribution Products
- Energy Saving Supporting Devices
- Laser processing Machines
- Electrical Discharging Machines
- Electron Beam Machines

Automotive equipment

- Powertrain products
 - Hybrid/Electric Vehicle
 - Inverter
 - Motor
 - 48V ISG system
 - EV control unit
 - Battery Management unit
 - On-Board Charger
 - Gasoline/ Diesel engine Vehicles
 - Alternator
 - Starter
 - Flywheel ACG
 - Engine Management Products
 - EGR Valve
 - Purge Control Solenoid Valve
 - Turbo Actuator
 - Actuator Drive Unit
 - Gasoline Engine Control Unit
 - Air-flow sensor
 - Pressure Sensor
 - Injector
 - Fuel Pump Module
- Vehicles Control Products
 - ADAS Products/ Body Control Products
 - Electric Power steering system

Energy systems

- Power Generations
- Transmission & Distribution
- Nuclear Systems
- Power Information & Communication Technology
- Medium & Low voltage Switchgear & systems
- Advanced Metering Infrastructure (AMI)

Semiconductors and Devices

- Power Modules
- High Power Devices
- Driver IC, Sensors
- High Frequency Devices
- Optical Devices
- Contact Image Sensors (CIS)

HYUNDAI
MOBIS



HYUNDAI

MOBIS

Mobility Beyond Integrated Solution

Seoul, South Korea

Vision

Innovation for Humanity, Mobility for tomorrow

Philosophy

“We think creatively and keep challenging ourselves to help create a new future and eventually make humankind’s dream a reality”

Core Values

Customer First	Daring Execution	Communication	People First	Go Global
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Business Status

Automotive System Solution

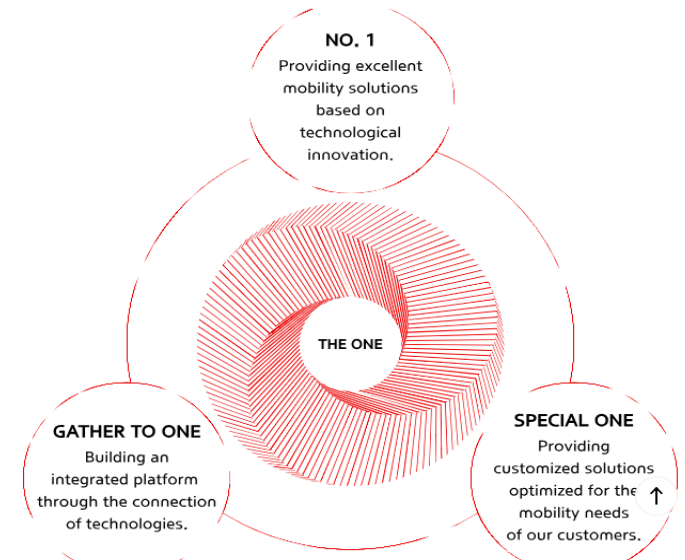
14 Tn, 72.1 Bn Won

Automotive Module Manufacturing

19 Tn, 193.3 Bn Won

Automotive A/S Parts

8 Tn, 436.8 Bn Won



Sustainability

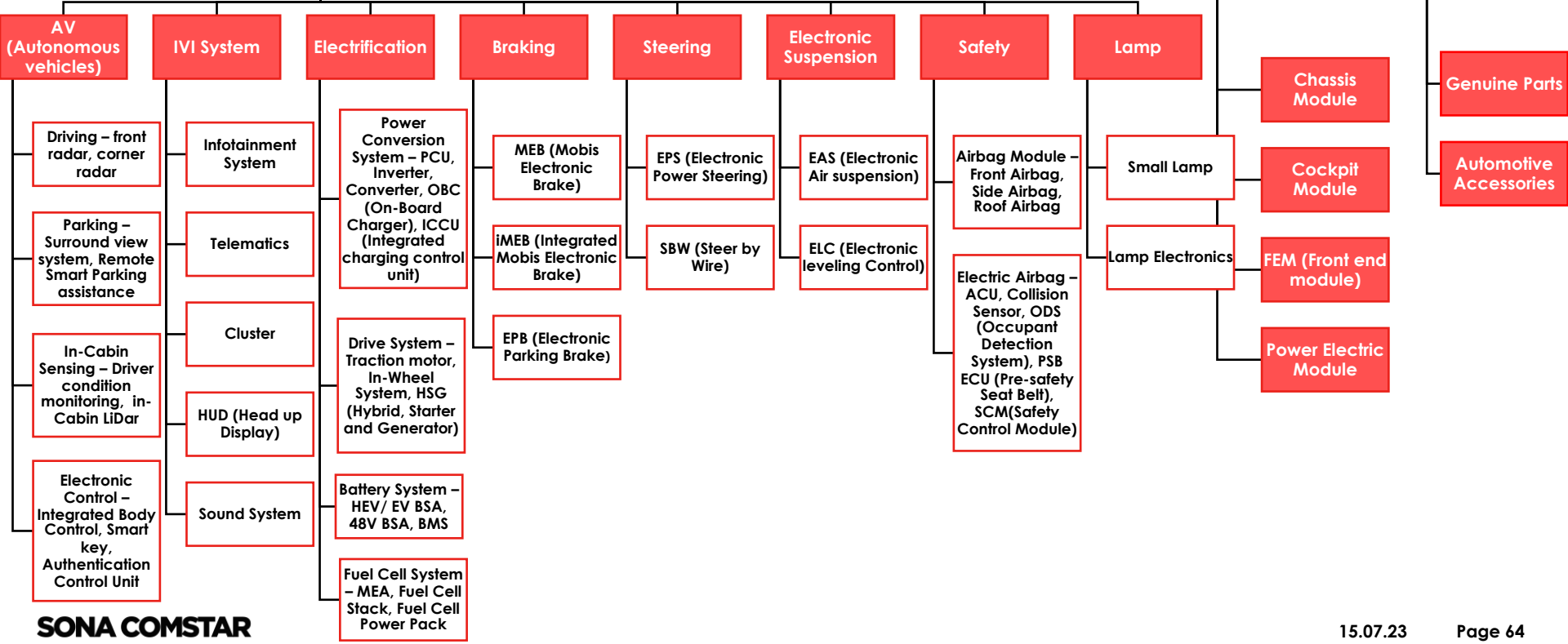
- Innovation with Responsibility, Mobility by Clean Technology
 - Three objectives
 - Green Acceleration – Green Transition for future generations and the earth
 - Inclusive Business – Mutual growth with employees and society
 - Responsible Growth – Responsible and sustainable management

Product Range

Automotive Systems Solutions

Automotive Module Manufacturing

Automotive A/S Parts



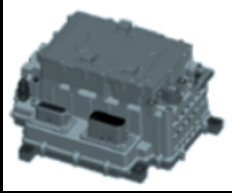
Portfolio EV Core Driving Parts Supply

Electrification



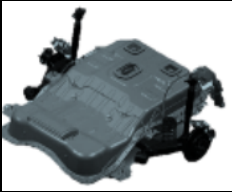
PE System

Transform electricity into mechanical energy (Traction Motor)



Controller

Supply/ Transform voltage and frequency to motor (Inverter, Converter)



Battery System

Current calculation such as battery charge state (Battery control system)



Fuel Cell

Electricity Generation by chemical reaction of hydrogen/ Oxygen (Fuel Cell, Driving Module)

Development of Key Technology



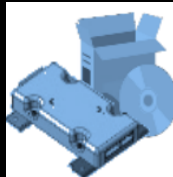
In-wheel Motor (Direct Drive)

- Premium In-wheel system (completed)
- Direct drive In-wheel system (In-progress)



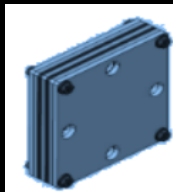
Driving Module (Integrated)

- 3 in 1 PE System (Motor, Inverter, Reducer) (In-production)
- High-performance Motor for D-seg (In-progress)



SW (Battery System SW)

- Development of In-house Logic Estimating Battery State (In-progress)



Fuel Cell (MEA)

- High Active, High Durability, Fuel Cell Development (In-progress)
 - Low Cost Structure Design Technology Development (In-progress)

Business Strategies

Captive

- Supply of EV Line-up (Hybrid/ Battery/ FCEV Parts)
- Cost Saving by Dedicated Platform
 - Global Expansion
- Supply System Establishment Responding to Increase in HKMC Production

Non-Captive

- Diversification of Selling Partners by Supplying Electrification Parts Targeting Global OE
- Achieving Economies of Scale by Utilizing Standardized Parts



Musashi's 100th Year vision:

Break barriers and go on adventures

Overview

Philosophy

Our origin

Consistent Sincerity

Simple and Sturdy

Our purpose

Passion
Technology

Wisdom
Innovation

Harmony
Sustainable

Enriched Earth

Our way

Customer First

Integrity

Be unique, creative

One Musashi

Try first, Learn fast

Smile and Thanks

Leadership and ownership

Sustainability

Target

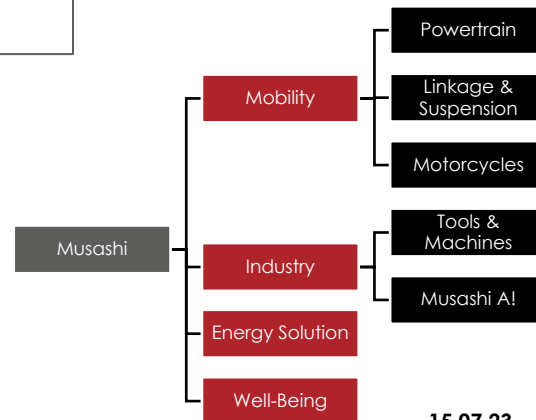
Achieve Carbon Neutrality by 2038 – 100th Anniversary of Musashi

Net Sales: 52,572 Mn Yen (March 2022)

No. of Employees: 15,807

Headquarter: Toyohashi-shi, Aichi, Japan

No. of locations: 35 locations, 14 countries



Mobility Products

Powertrain

Differential Mechanism



Final Gear
Welding



2 Pinion



Enclosing, 2
Pinion



Enclosing, 4
Pinion



Differential
Gear

Linkage & Suspension



Suspension
Arm Assembly



Suspension
Arm Assembly



Suspension
Ball joints



Steering Ball
joints (Tie-rod
End)



Steering Ball
joints (Rack
end)

Motorcycles

Power transmitting mechanism



Cover
Assemblies
(Large
Motorcycles)



Dual Clutch
Transmission
(Large
Motorcycles)



Transmission
Assembly (Small
Motorcycles)



Transmission
Assembly (Large
Motorcycles)



Reduction
Gears for
scooters



Other Gears
(Large & Small
Motorcycles)

Engine intake and exhaust mechanism



PF Camshafts (For
medium and small
motorcycles)



Camshafts (for
large
motorcycles)

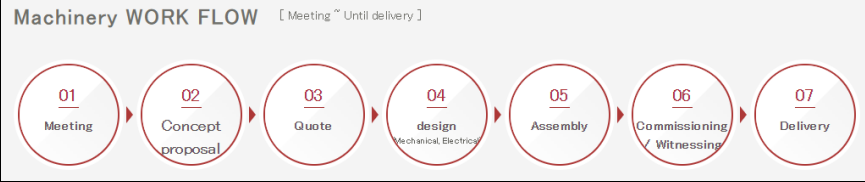


Assembles
camshafts (for
general purpose
engines)

Industry Solutions

Tools and Machines

Machinery



Product Example: Automatic Conveying equipment, Automatic assembly equipment, IN line inspection machines

Prototype



Product Example:



Cutting Tool



Energy Solutions

Prismatic Cell Module, High Voltage Module, Pre-lithiation Treatment, Laminated Cell (EOL), Laminated Cell Module (EOL)

In-House Startups

Agritrio

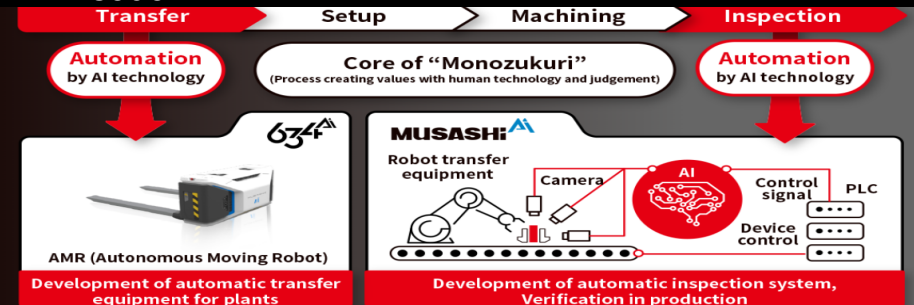


An app-based communication between farmers and people who are interested their work.



Agricultural Care is a contract-type agriculture-welfare collaboration platform, connecting welfare facilities and farmers.

Musashi AI





Mission Shaping past, present and the future of mobility

Four Guiding Principles

Passion for Innovation Operational Excellence

Global Strength Commitment to Responsibility















48V Mild Hybrid Technology

Overall Benefits

- Cost effective solution for CO2 reduction
- Low integration effort
- Powerful 48V on-board network, which can serve as redundancy for autonomous driving functions in hybrid cars
- Increasing driving comfort through functions like boosting, coasting and soft comfort start
- Safe voltage level with no need for expensive additional protection requirements (e.g. for contact voltage)

Benefits for Manufacturers

- 48V integrates three aspects that are very attractive for automobile manufacturers, especially in combination: Significant reduction of CO₂ emissions, marketable benefits for the end consumer, and cost-effective integration into existing vehicle platforms.

				
	Mild hybrid	Full Hybrid	Plug-in-hybrid	BEV
Motorization				
Energy source				
E-driving				
Hybridization effort	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	—

SEG Automotive Products

High Voltage E-machines

HV traction E-machines



HV auxiliaries



48V E-machines

Mild hybrid E-machines

Boost Recuperation Machine (BRM)



Electric Machine (EM) 48V Platform



Light Electric Mobility Machines

48V Light Electric Machine Series (LEM)



EM 1.2, 1.5, 1.8



48V Hub Mount Electric Machine Series (HEM)



Generator

Passenger Cars

Base line



Power Density Line



Commercial vehicles

Classic line



HSD Generator

Starter Motors

Passenger Cars

C60/ SC60



C70/ SC70



Commercial Vehicles

HXF



T-starter Motor

Valeo





Mission

To play a major role in tomorrow's mobility

Company Overview

Revenue: Euros 20.037 Bn FY21

No. of Employees: 109,900

No. of Locations: 29 countries, 183 production sites, 65 R&D centers

Headquarters: Paris, France

Revenue Break up

Break down by Geography

- Europe – **44%**
- Asia – **34%**
- China – 50%
- Japan – 20%
- South Korea – 19%
- India – 4% (-6% sales, +*% Production)
- North America – **20%**
- South America – **2%**

Strategy

Accelerating today in tomorrow's key mobility markets

Growth Model

- Acceleration of electrification
- Acceleration of ADAS
- Reinvention of the interior experience
- Lighting everywhere

Sustainability

Targets

- Carbon Neutrality by 2050
- Commit to cut scope 3 downstream emissions by 50% in 2030
- Ecosystem based vision of mobility
- A product portfolio electrifying mobility

Innovation

Developing future mobility

Environmental sustainability

Increasing eco-efficiency

Workplace

Supporting our employees

Society

Committing to corporate citizenship

Product Range

Image from Valeo Strategic & Financial Outlook 2022-23

GROWTH DRIVERS

VALEO'S BUSINESS GROUPS

KEY PRODUCTS

ELECTRIFICATION ACCELERATION

POWERTRAIN SYSTEMS (PTS)

48V & HV eMOTORS



48V & HV INVERTER



48V & HV eDRIVE



48V & HV DCDC & OBC



CHARGING STATION



ADAS ACCELERATION

THERMAL SYSTEMS (THS)

COOLANT eHEATER



BATTERY COOLER



ELECTRIC COMPRESSOR



HEAT PUMP



FLEX HEATER



INTERIOR EXPERIENCE REINVENTION

COMFORT & DRIVING ASSISTANCE SYSTEMS (CDA)

CAMERAS



ULTRASONIC SENSORS



RADARS



LIDAR



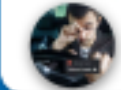
DOMAIN CONTROLLER



LIGHTING EVERYWHERE

VISIBILITY SYSTEMS (VIS)

DRIVER MONITORING



DISPLAYS & CLUSTERS



HEAD UP DISPLAY



MICROPHONE



SMART SURFACE



FRONT



REAR



NEAR FIELD PROJECTION



INTERIOR LIGHTING



SENSOR CLEANING & WIPING



January 15, 2022

Valeo Technology

Valeo Scala Lidar

- **Autonomous vehicle sensors essential to the development of autonomous cars**

48V affordable hybrid system

- **Level 1**
 - Hybrid4all - 5% fuel savings, regenerative braking (storage of energy), Torque assist, Electrical supply
- **Level 2**
 - Hybrid with 100% electric propulsion, around 15% fuel savings with greater comfort and power

PictureBeam Monolithic, adaptive headlights

- **Enables the control of the light intensity and preciseness by managing each pixel individually**

Interior Cocoon

- **Driver Monitoring System**
 - Detection of distraction and drowsiness, driver identification and facial emotion recognition.
- **Cabin Monitoring System**
 - Analyses the occupants and adapts – air temperature, driving mode, deployment timing of airbag

Valeo Charging station

- **Smart and Environment friendly**
 - Recharges when electricity is at its lowest cost, or when it is provided by a green source
- **Easy Installation and Ultra-fast activation**
 - Equipped with a “Connect & Charge” system

360-degree light projection

- **Road projection** – a safe and personalized approach
- **Welcome Light and extended signaling**

Sensor Cleaning

- **A complete system which removes rain, snow, debris and prevents soil accumulation on sensors lenses of Autonomous vehicles and ADAS.**

Valeo Xtravue Trailer

- **A rear-view camera system that enables drivers to see what is happening on the road behind the trailer by making the trailer virtually transparent.**

Future Mobility

Vision for the car of the future

Cleaner

Valeo develops smart electrification, automated transmission system, and clean engine solutions for all types of vehicles.

Enjoyable for the driver

Technologies maintaining driving pleasure for the driver

Safer

Lighting of the future, a safe and stress-free communication tool.

Connected

Enabling communication between cars through increased mobile connectivity and on-board telematics helping them connect with the environment

Intuitive

Through driving assistance systems which offer the driver smart technologies like detection of obstacles and other vehicles, and fully automated parking

Autonomous

Our automated driving solutions enable safer and more comfortable mobility for all.

Valeo.ai

AI research center for automotive applications based in Paris, to conduct ambitious research projects, regarding assisted and autonomous driving

Partnerships

CarLab Valeo, Valeo.ai

Academic Partnerships:

French National Institute of IT and Automation Research (INRA), Telecom ParisTech, Mines ParisTech, French Alternative Energies and Atomic Energy Commission (CEA), Stanford University, Liège Université, Ecole Polytechnique Fédérale de lausanne

Strategic Partnerships :

Asaphus Vision, Meituan, Capgemini, Safran, Indigo Group, Mobivia, Total, EDF

Start-ups:

CarTech, Maniv Mobility, Iris Capital, Cathaycapital, Navya, Kuantic

Thank You

