SCHAEFFLER

Technology

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Agenda

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1 Overview

2 R&D excellence

3 Flagship initiative "Digitalization"

4 Outlook

5 Summary and key statements

Technology – At a glance

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Key aspects

- 6,650 R&D staff worldwide at 17 R&D centers and additional locations in 19 countries
- Unrivalled experience and expertise in product and systems development
- State-of-the-art R&D and testing facilities
- Widespread network of partners and co-operations

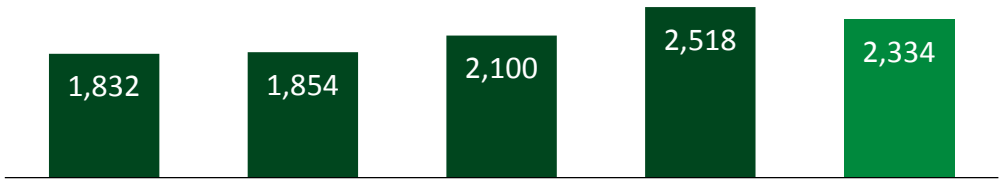
Selected Innovation Awards

- **PACE-Award** (Torque Converter with Centrifugal Pendulum Absorber)
- **Innovation of the Year** (E-Wheel Drive)
- **Eurobike Award** (FAG-VELOMATIC)
- **German Innovation Prize 2016** (Anti-roll stabilizer)
- **Greentec Award 2016** (E-clutch)

German Innovation Award 2016

Best-in-class innovation platform

No. of patents registered[1)]

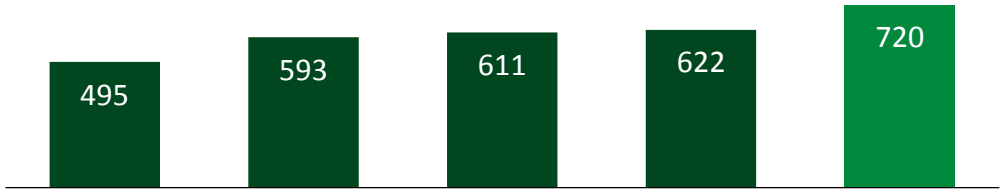


	2011	2012	2013	2014	2015
Rank in Germany	#4	#4	#4	#2	#2

[1)] German Patent and Trademark Office

R&D expenditure

EUR mn



	2011	2012	2013	2014	2015
in % of sales	4.6%	5.3%	5.5%	5.1%	5.4%

Global R&D network

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Germany
- Bühl
- Herzogenaurach
- Homburg
- Schweinfurt

Hungary
- Szombathely

France
- Haguenau

Romania
- Braşov

Slovakia
- Kysucké Nové Mesto

Europe

USA
- Fort Mill
- Troy
- Wooster

Mexico
- Puebla

Brazil
- Sorocaba

China
- Anting

Japan
- Yokohama

South Korea
- Changwon

India
- Pune

Increasing complexity and digitalization

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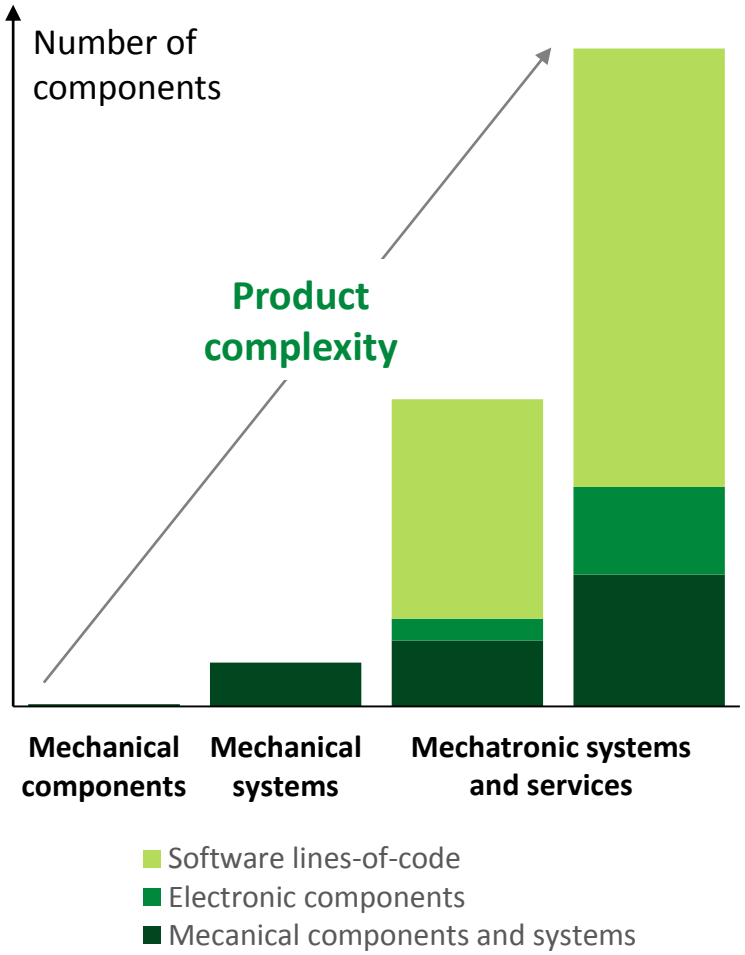
Increasing complexity



Digitalization

907
Billions US$

annual global **investments for Industry 4.0 in 2020**. 50% Software, 30% Hardware and 20% Education.

Source: PwC, 2016

10
times

more globally **generated data in 2020 compared to 2013**.

Source: EMC, 2014

90
percent

of **decisions are data controlled in 2020** compared to 52% in 2016.

Source: PwC, 2016

82
percent

Digital added value in Germany in 2020 (33 % in 2016).

Source: PwC, 2016

4.1
percent

Annular efficiency increase by Industry 4.0 in Germany till 2020.

Source: PwC, 2016

Our strategic concept "Mobility for tomorrow"

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Key mega trends

Society trends

- Urbanization
- Population growth

Technology trends

- **Increasing complexity**
- **Digitalization**

Environmental trends

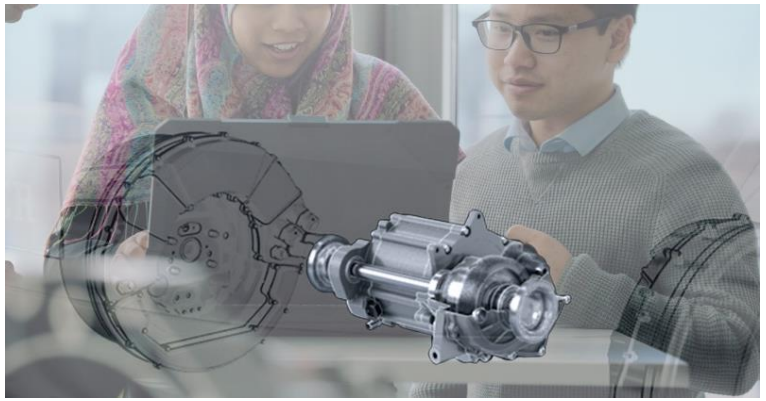
- Renewable energies
- Availability of resources

Economic trends

- Globalization
- Affordability

4 focus areas

Eco-friendly drives



Urban mobility

Interurban mobility

Energy chain

Managing complexity

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Key challenges…

Increasing complexity and digitalization require ...

- ... adaption of R&D processes
- ... new and extended competencies
- ... working in R&D networks

… and how we meet them

1. Early identification of trends
2. Mechanical, electronical and software know-how
3. Strong global network of partnerships and collaborations

1 Early identification of trends – Deep systems understanding and component knowledge

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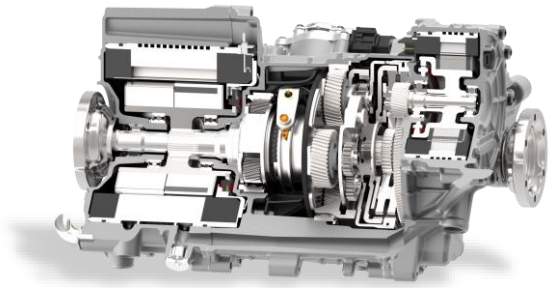
Deep understanding of application and systems environment

- We understand the end customers' needs
- We understand our customers' requirements
- We understand the application environment for our systems

Advanced Research

Understanding and development of systems



- We are an early-stage development partner
- We develop solutions for the mobility for tomorrow
- We deliver high-quality, cost-efficient solutions

Continuous component optimization down to the last detail

- We have unique and broad components expertise
- We continuously optimize our components
- We deliver high-quality, cost-effective designs

Research & Development

1 Early identification of trends – Example: E-Mobility

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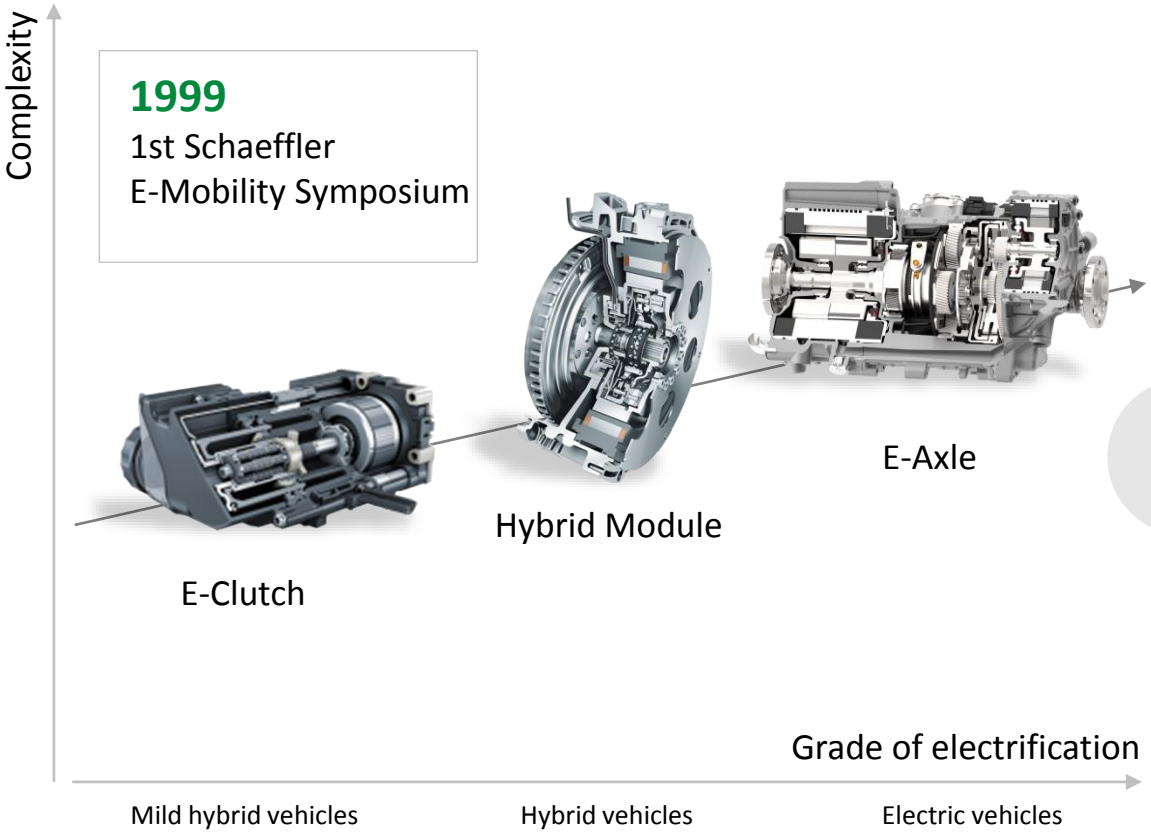
Early build-up of E-Mobility expertise



Initiation within Corporate R&D Department, then transfer to R&D Automotive Division

Next steps

Initiation within Corporate R&D Department

2 Mechanical, electronical and software know-how

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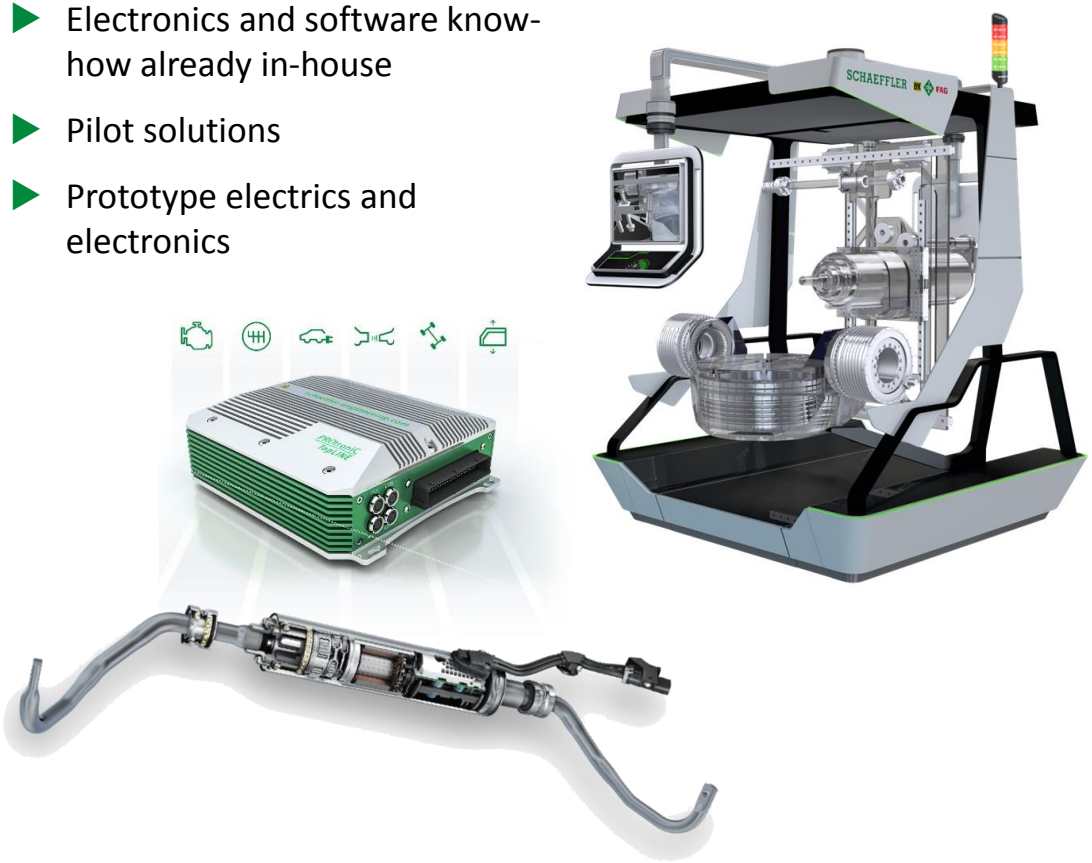
Mechatronics and software

- Electronics and software know-how already in-house
- Pilot solutions
- Prototype electrics and electronics



Today: 1,200 employees

Digitized business models and analytics

- Digitized use cases
- Smart products
- Smart processes

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DIGITAL AGENDA

2020: 1,200 additional employees

3 Strong global network of partnerships and collaborations

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Organizations

FVA Forschungsvereinigung Antriebstechnik e.V.
FAT
EPTDA Member
VDMA
FVV
APM Aktionskreis gegen Produkt- und Markenpiraterie e.V. react germany
MTZ
IHK
VDI
GVA
ATZ
VDA
DIN
Stifterverband für die Deutsche Wissenschaft

Universities

KIT Karlsruhe Institute of Technology
Technische Universität Darmstadt
Fraunhofer
TUM
Georg-Simon-Ohm Hochschule Nürnberg
Universität Stuttgart
FAU Friedrich-Alexander Universität Erlangen-Nürnberg
Tongji University 1907
RWTH Aachen University
Hochschule für angewandte Wissenschaften München
Technische Universität Chemnitz
FHWS
TU Clausthal
Technische Universität Ilmenau
Technische Universität Kaiserslautern
Universität Bremen
Hochschule Offenburg University of Applied Sciences
Hochschule Karlsruhe Technik und Wirtschaft University of Applied Sciences

Highlights

- Creation of "Schaeffler Hub for Automotive Research in E-Mobility" at the Karlsruhe Institute of Technology with around 60 engineers
- More than 30 publicly funded research projects in Germany alone
- Partnership research with renowned Tongji University in Shanghai focusing on China-specific technologies since 2006
- Numerous research collaborations working on topics around digitalization

Schaeffler´s Digital Agenda

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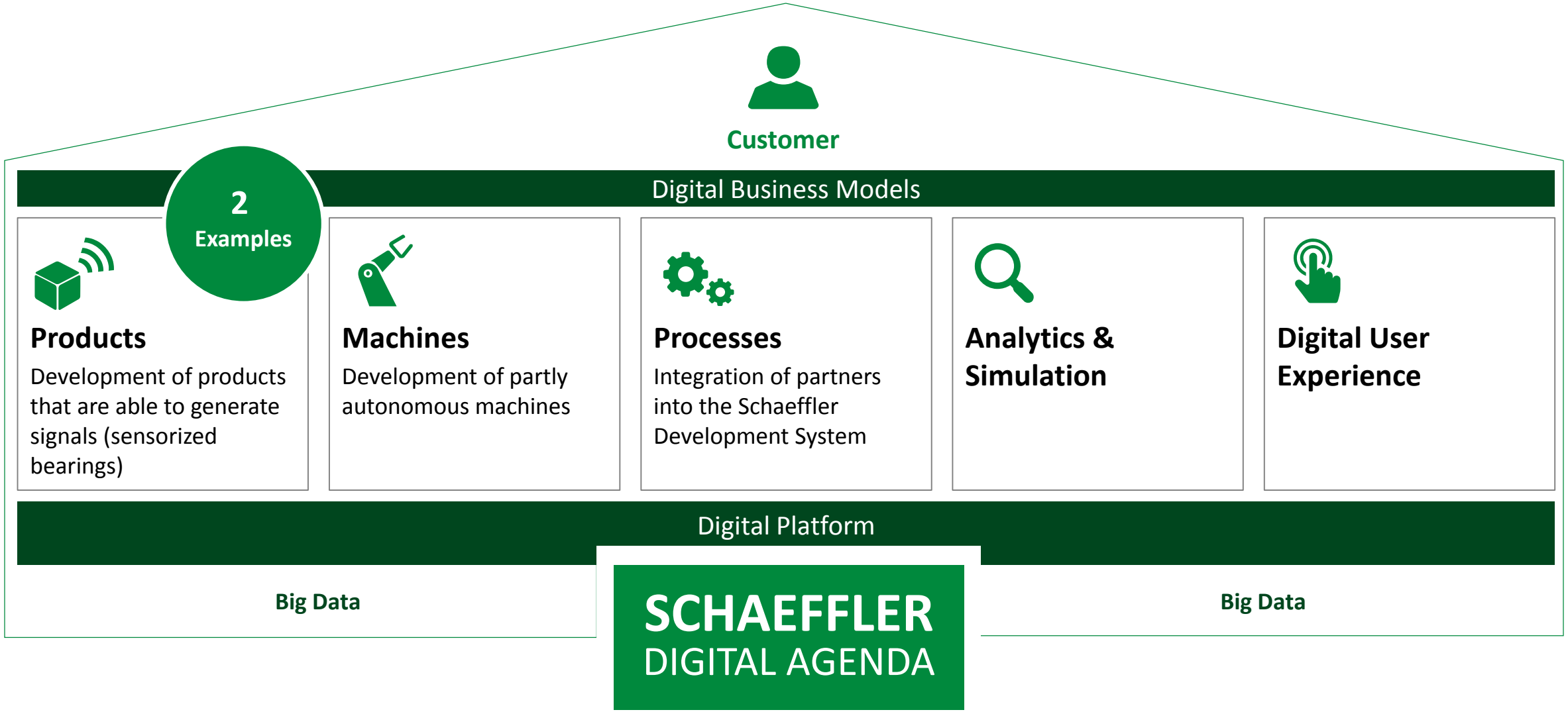

New products with architecture for networked driving applications

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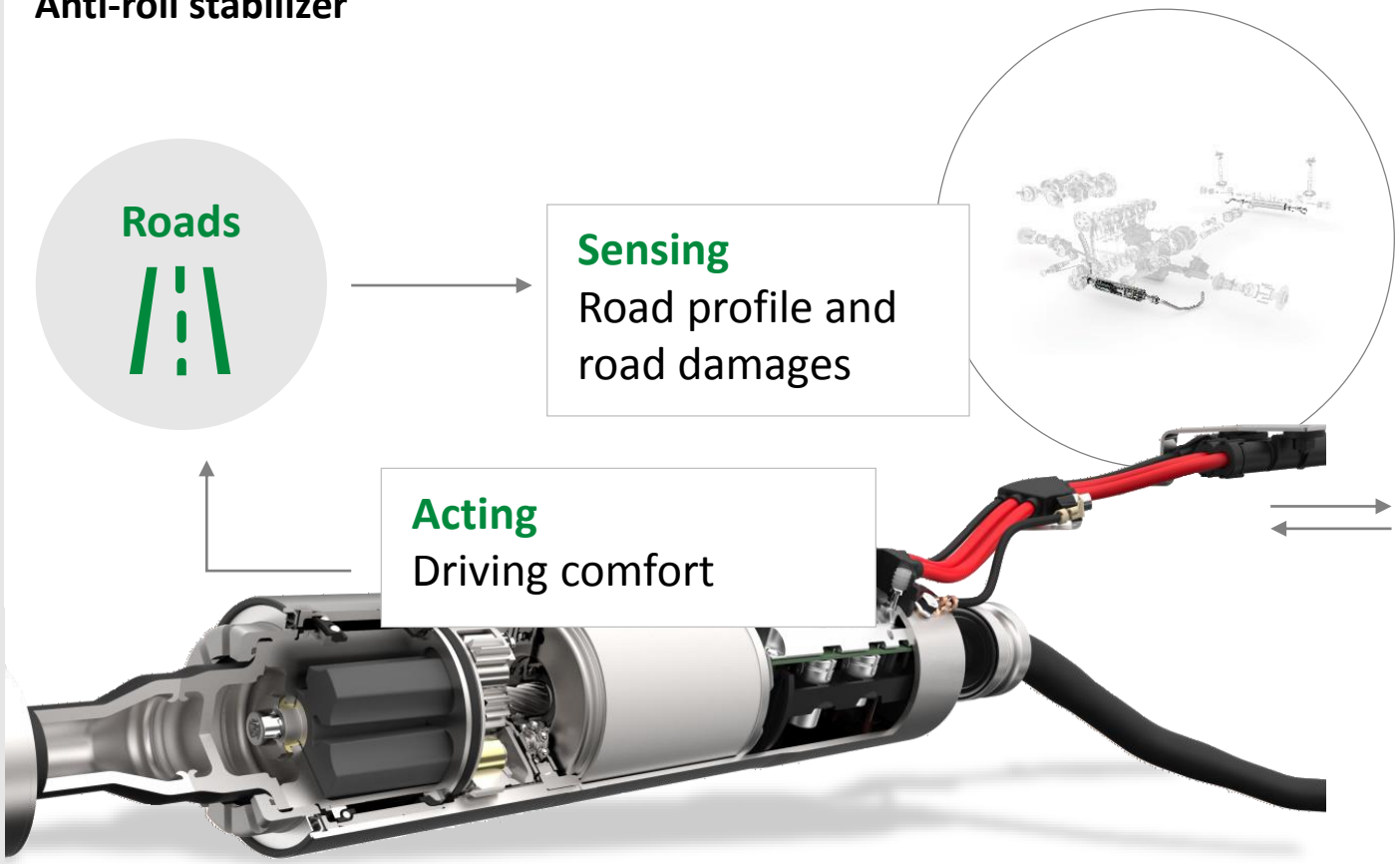
Anti-roll stabilizer



Roads

Sensing
Road profile and road damages

Acting
Driving comfort

Cloud

Other vehicles
Use of road data for predictive chassis control

Infrastructure
Tailored road maintenance

High speed train monitoring and maintenance

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Bearing as a sensor

Tracks

Sensing
Track conditions

Acting
Monitoring for safety at high speed

Cloud

Surveillance
Track conditions

Infrastructure
Predictive maintenance

6 new or extended R&D centers until 2020

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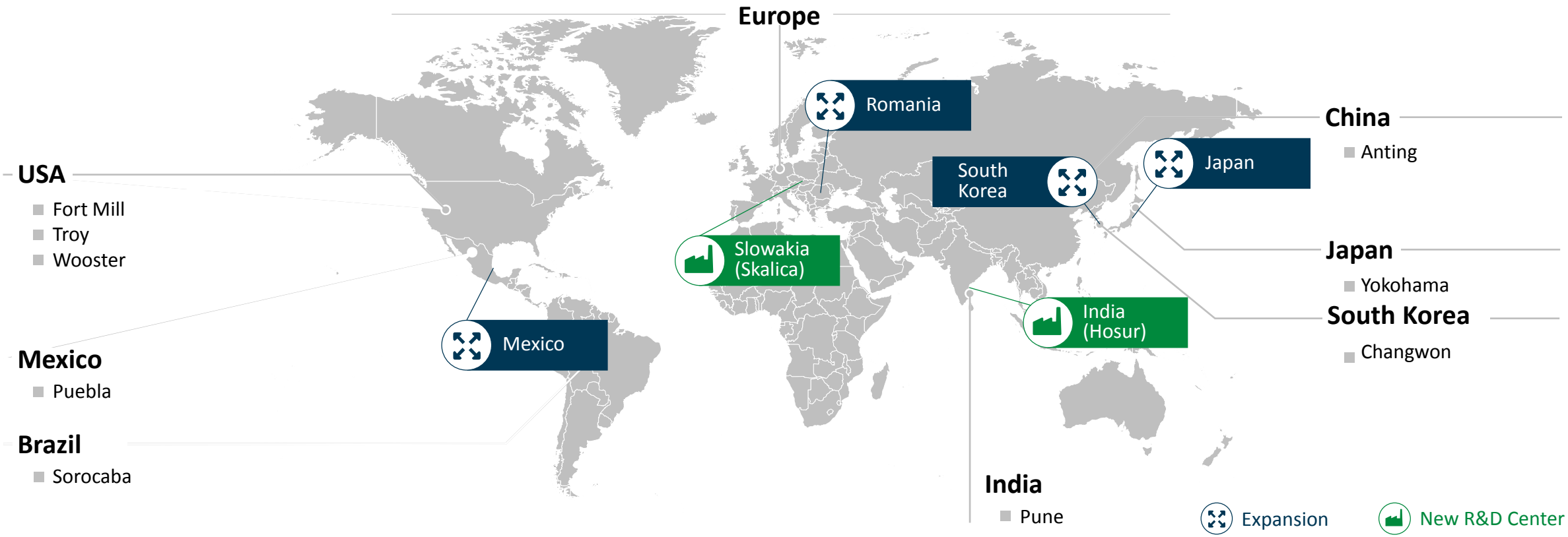
Germany
- Bühl
- Herzogenaurach
- Homburg
- Schweinfurt

Hungary
- Szombathely

France
- Haguenau

Romania
- Braşov

Slovakia
- Kysucké Nové Mesto



R&D expenditures in percent of sales expected to remain stable

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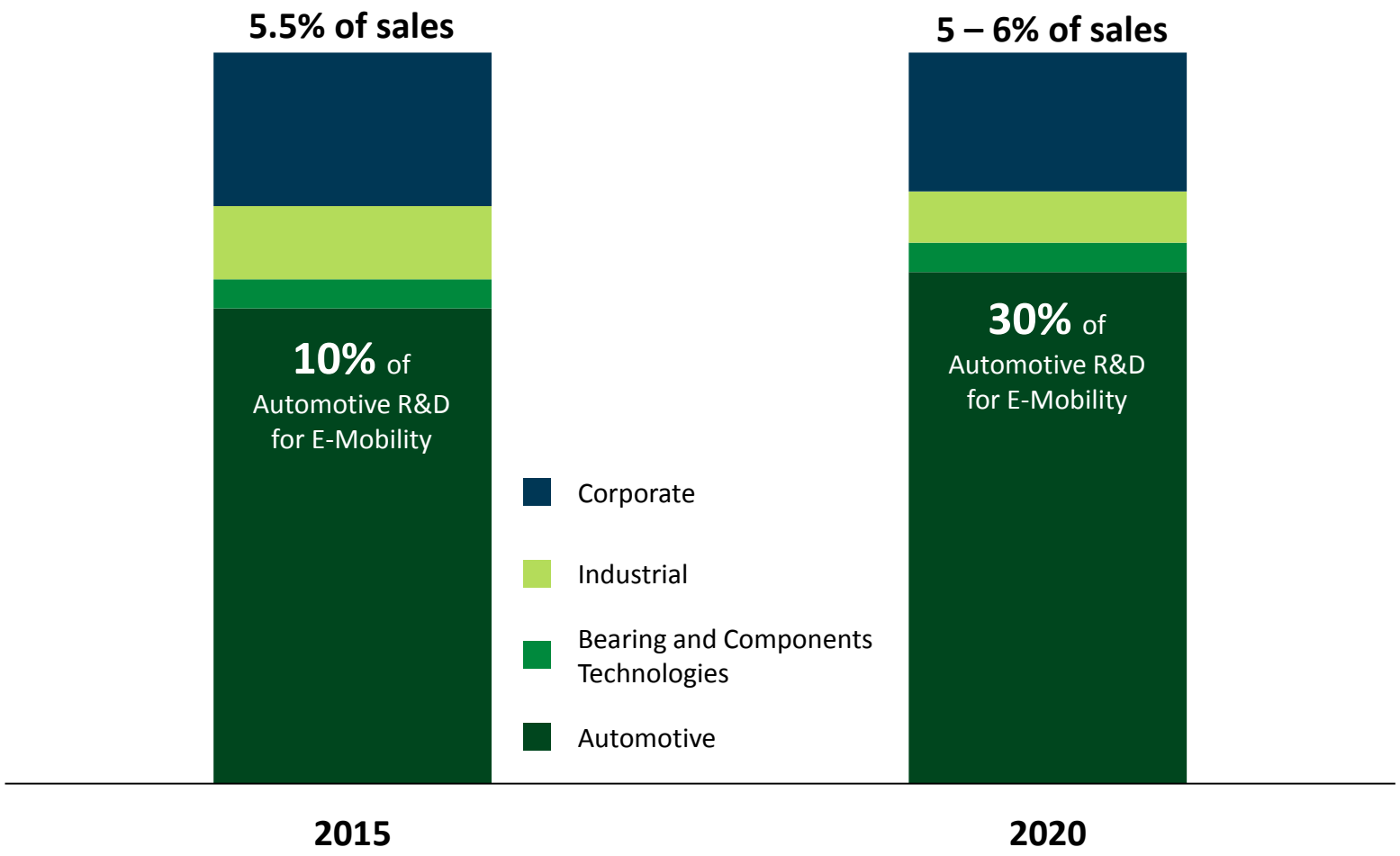
R&D expenses



Key aspects

- Total R&D spending expected to remain at 5 to 6% of sales
- R&D spending for E-Mobility will increase from 10% to 30% of total Automotive R&D (EUR 500 mn accumulated from 2016 to 2020)
- R&D spending in Industrial and Bearing and Components Technologies will shift from hardware design to mechatronics and software driven solutions
- 1,200 additional employees in R&D and manufacturing of mechatronics, hybrid technologies and e-mobility to be hired until 2020

Key messages

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1. R&D for **E-Mobility and environmentally friendly** solutions will be further enhanced

2. R&D for standard product business will shift to **mechatronics and software driven solutions**

3. Our **R&D ratio** is expected to remain **stable at 5 – 6% of sales** until 2020

4. With our Digital Agenda we are gradually becoming a **solution provider for digital business models**

R&D EXCELLENCE