



KNORR-BREMSE



Fact Book

2020

1 Introduction

2 Key Company Highlights

3 Rail Vehicle Systems (RVS)

4 Commercial Vehicle Systems (CVS)

5 R&D Focus

6 Financials

7 Sustainability

8 Capital Markets Summary

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The Knorr-Bremse leadership team



Bernd Eulitz
CEO

- 2019-present: Knorr-Bremse *CEO*
- 2004-2019: Linde AG
Exec. Vice President Americas COO EMEA
- 2000-2004: A.T. Kearney
- Diploma in Process/Chemical Engineering

Professional Experience

25

Years with Knorr-Bremse

1



Dr. Peter Laier
Head of CVS

- 2016-present: Knorr-Bremse
Head of CVS
- 2014-2015: Benteler International
COO
- 2013-2014: Osram Licht
CTO
- 2000-2012: Continental
Executive Vice President
- PhD and Diploma in Mechanical Engineering

Professional Experience

23

Years with Knorr-Bremse

4



Dr. Jürgen Wilder
Head of RVS

- 2018-present: Knorr-Bremse *Head of RVS*
- 2015-2017: DB Cargo AG *CEO*
- 2013-2015: Siemens AG
Mainline Transportation Global Business Unit CEO
- 2011-2013: Siemens AG
Head of Strategy Infrastructure and Cities Sector
- Doctorate in Physics

Professional Experience

19

Years with Knorr-Bremse

2

Notes: RVS - Rail Vehicle Systems; CVS - Commercial Vehicle Systems

Knorr-Bremse – One of Germany’s most successful industrial companies



KNORR-BREMSE



Family-Ownership,
heritage and unique DNA



Global market leader
for braking systems



Shared pneumatics
experience between RVS
and CVS



Technology leadership

2019 key financials

Sales
€6.9bn
(**>10% CAGR¹⁾**
since 1989)

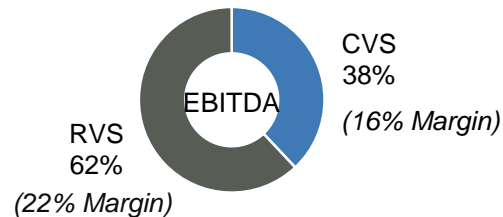
op. EBITDA
€1.3bn
(**margin 18.8%**)

op. EBIT
€1.1bn
(**margin 15.1%**)

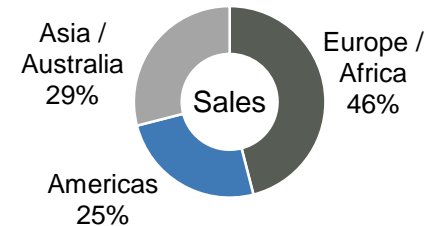
R&D
€397m
(**~5.7% of sales**)

Aftermarket
~34% of sales

Balanced portfolio²⁾ ...



... and diversified global footprint with high local content



- 30+ countries
- 100+ sites
- c. 29k employees³⁾

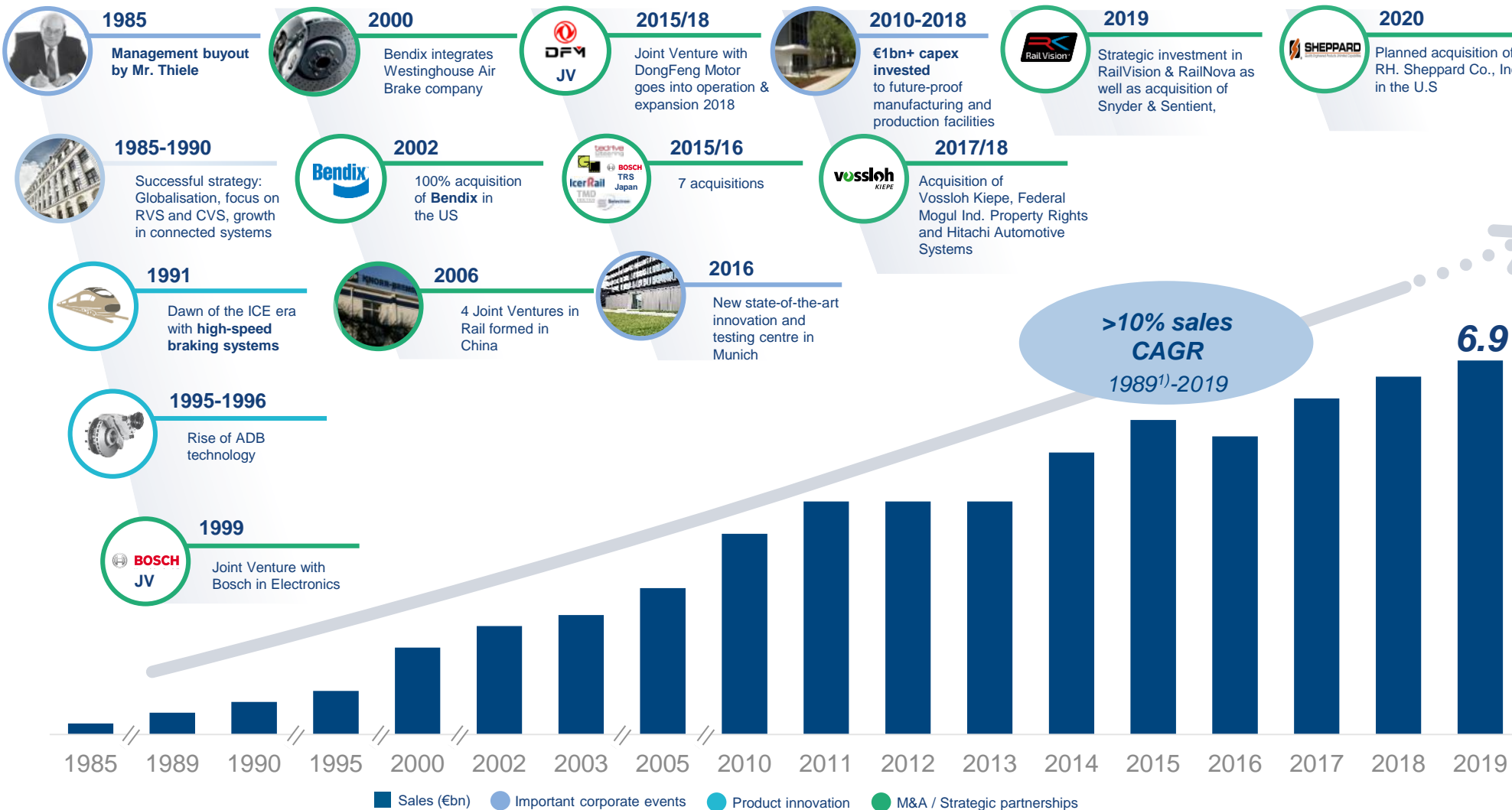
Notes: Sales, EBITDA, EBITA, and EBIT for 2019 based on annual report prepared in accordance with IFRS, other financial figures for 2019 prepared in accordance with German GAAP (HGB); Aftermarket share based on German GAAP (HGB) where BilRUG sales allocated proportionally between OE and aftermarket; RVS – Rail Vehicle Systems; CVS – Commercial Vehicle Systems;

1) CAGR 1989–2019 based on German GAAP (HGB), 1989 – first year when consolidated accounts are available; 2) Excluding consolidation/other; 3) Including human resources leased staff;

Source: Knorr-Bremse information



Over 30 years of consistent strong growth



Notes: 1986-2018 based on financial statements prepared in accordance with German GAAP (HGB) and 2017-2019 based on financial statements prepared in accordance with IFRS. 1) 1989 – first year when consolidated accounts are available; Source: Knorr-Bremse information

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Knorr-Bremse – A best-in-class industrial company with resilient outperformance thanks to high-quality business model

- 1 Global #1**

Number one supplier for braking systems and a leading supplier of other safety critical rail and commercial vehicle systems protected by high barriers to entry
- 2 Synergistic business**

Technology and scale benefits between rail and commercial vehicles
- 3 Market outperformance**

Consistent outperformance of attractive end-markets driven by megatrends and increasing content per vehicle
- 4 The industry innovator**

Driving innovation in mobility and transportation technologies through R&D, quality excellence and edge in connected systems
- 5 Resilience**

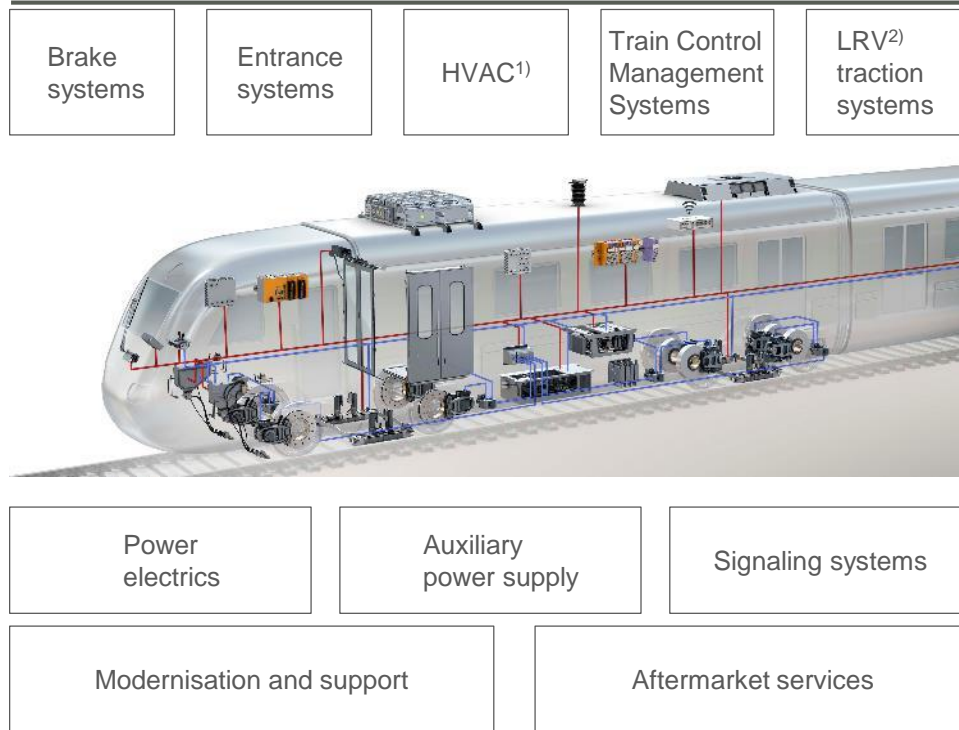
Resilient business model, supported by broad geographical and customer diversification, high aftermarket exposure and strong localisation
- 6 Superior financial profile**

Strong growth, profitability, and cash generation with high earnings visibility
- 7 Leadership excellence**

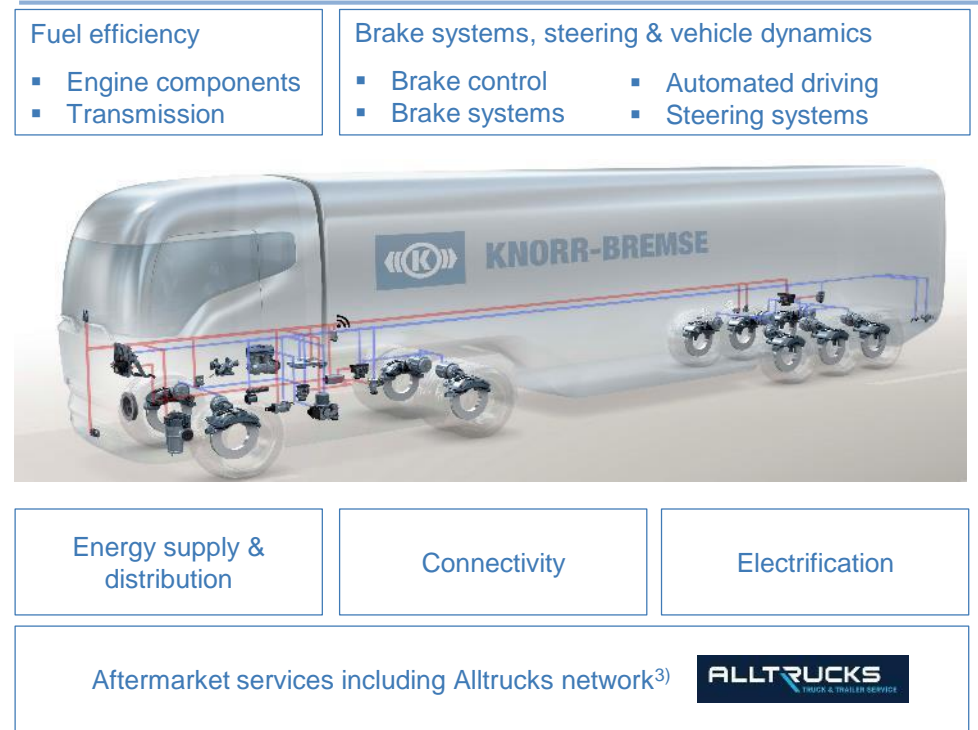
Highly experienced management team with strong track record and clear vision for future value creation and firm commitment to Knorr-Bremse

1 Global #1 – The world's leading supplier of safety critical rail and commercial vehicle systems

RVS offering (2019: 53% of sales, 62% of EBITDA)



CVS offering (2019: 47% of sales, 38% of EBITDA)



Preferred partner for all major OEMs⁴⁾ and operators across the globe



Notes: 2019 financials based on IFRS excluding consolidation/other; 1)HVAC – Heating, ventilation and air conditioning; 2)LRV – Light rail vehicle; 3) Joint Venture between Bosch, Knorr-Bremse and ZF providing a range of workshop services relating to the repair and maintenance of commercial vehicles across all brands; 4) OEM – Original Equipment Manufacturer; Source: Knorr-Bremse information

1 Global #1 – ... protected by high barriers to entry

Barriers to entry for RVS and CVS markets

✓ Regulation / homologation

✓ Low volumes, high number of variants with high level of customisation

✓ High initial capital requirements, highly protected IP landscape and economies of scale

✓ Highest quality and safety requirements

✓ Long lifecycle with resulting customer loyalty, long gestation period for aftermarket

✓ Same industry leaders since creation of the industry over 100 years ago

Market specifics

RVS

Only supplier worldwide

certified for all global and local standards and norms (GOST, UIC, AAR, ARA)

Vast array of product variants to homologate

(e.g. >100k active brake articles by Knorr-Bremse)

Homologation time typically 4-8 years

for recent Knorr-Bremse products

CVS

One of only two suppliers able to offer harmonised products globally

Continuously increasing safety and emission standards requirements

2 Synergistic business – Technology and scale benefits between Rail and Commercial Vehicles

Interdependence of RVS and CVS today

- ✓ Same core technologies
- ✓ Shared components and materials
- ✓ Comprehensive research and IP base

Future technology development

- ✓ Shared research centres
- ✓ ADAS¹⁾ / HAD²⁾ technology transfer
- ✓ Condition monitoring, condition-based and predictive maintenance
- ✓ Electrification and connectivity
- ✓ Electromechanical brake systems

Unique scale benefits

- ✓ ~2x size of main competitors³⁾
- ✓ Balance sheet strength for M&A
- ✓ Global footprint

RVS

CVS



*Electric compressors
Friction materials
Air disc brakes (ADB)*

*Driver assistance
Trailer control valve
Electronic air supply*

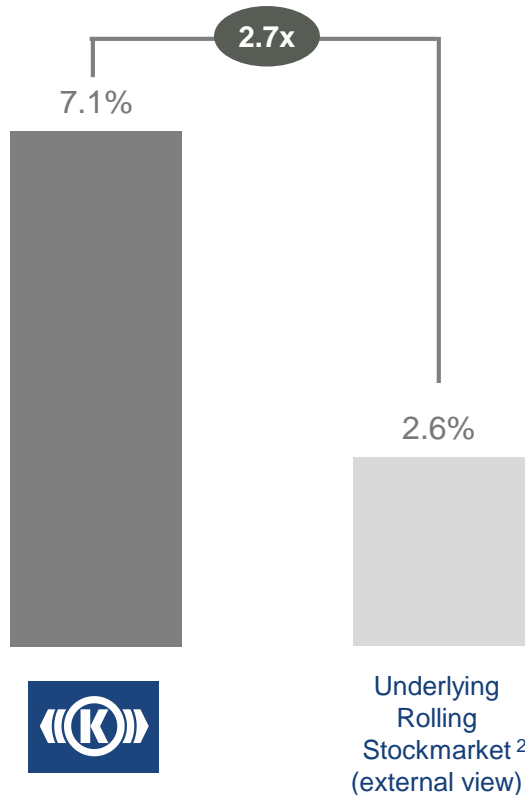
Notes: 1) ADAS – Advanced driver assistance system; 2) HAD – Highly automated driving; 3) Based on 2017 sales and status quo pre-Wabtec merger with GE Transportation; 2017 €/USD FX: 0.83346 used as of 31 December 2017; Source: Knorr-Bremse information; WABCO and Wabtec / Faiveley information based on Annual Report 2017

3 Market outperformance – Knorr-Bremse is well positioned to deliver continued growth above rail industry levels



Knorr-Bremse with strong track record of industry outperformance

CAGR (2010-2019) RVS sales¹⁾ (HGB) and market



Key future growth drivers

Asia Growth <ul style="list-style-type: none"> Chinese high-speed esp. AM Mass urban transport in APAC Expansion and upgrade of Indian rail rolling stock CRRC international expansion 	Outsourcing <ul style="list-style-type: none"> Outsourcing from rail OEM's (trend towards de-verticalisation)
Digitisation <ul style="list-style-type: none"> Increasing demand for connected systems and other digital solutions 	Aftermarket <ul style="list-style-type: none"> Global rail services and aftermarket for rolling stock

- ✓ Certification capability for all global core markets
- ✓ Partner of many Chinese OEMs and large installed base
- ✓ Leading control and monitoring technology
- ✓ Excellent engineering and R&D system and a connected systems innovation leader

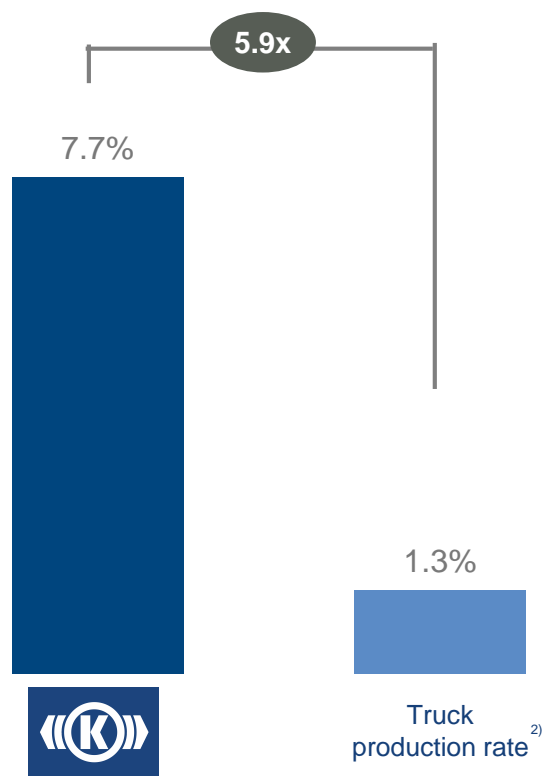
Notes: 1) Based on German GAAP (HGB); 2) Unife: average market growth 2015-2017 and 2021-2023 Source: Knorr-Bremse information

3 Market outperformance – Strong growth in content per vehicle expected to result in continued outperformance of global commercial vehicle market



Knorr-Bremse with strong track record of industry outperformance

CAGR (2010-2019) CVS sales¹⁾ (HGB) and market



Key future growth drivers

Megatrends and conversion of regulatory standards

- Global megatrends provide attractive growth opportunities
- Convergence of regulatory standards drives global adoption of technologies
- Disc brakes replacing drum brakes

Content increase

- Traffic Safety
- Fuel efficiency

Market share gains

- Product upgrading
- Regional expansion strategy

- ✓ Market leader in a consolidated industry with only 2 global players
- ✓ A strong technology innovator shaping the industry
- ✓ Multiple trends driving growth independent of underlying market dynamics
- ✓ Ideally positioned to win in market defining trend towards ADAS/HAD⁴⁾

Notes: 1) Based on German GAAP (HGB); 2) CAGR 2010-2019 Global Truck and Bus market excluding aftermarket and Trailer; Source: LMC Automotive Global Commercial Vehicle World Truck Query Q3 2019 3) Addressable Truck, Bus and Trailer OE market for "Brake Systems & Vehicle Dynamics (incl. Automated Driving)", "Energy Supply & Distribution" and "Fuel Efficiency" 4) Advanced Driver Assistance Systems/Highly Automated Driving; Source: Knorr-Bremse information; LMC Automotive for truck production rate



4 Strong R&D secures our Technology leadership

~12,000 single patents granted and applied

Targeted R&D ratio:
6-7% of revenue

~3,600 R&D employees¹

INDUSTRY TRENDS

addressing industry trends with superior technological solutions

COMMERCIAL VEHICLE SYSTEMS



Traffic Safety



Emission Reduction + E-Mobility



Automated Driving



Connectivity

RAIL VEHICLE SYSTEMS



Transport Capacity



Availability



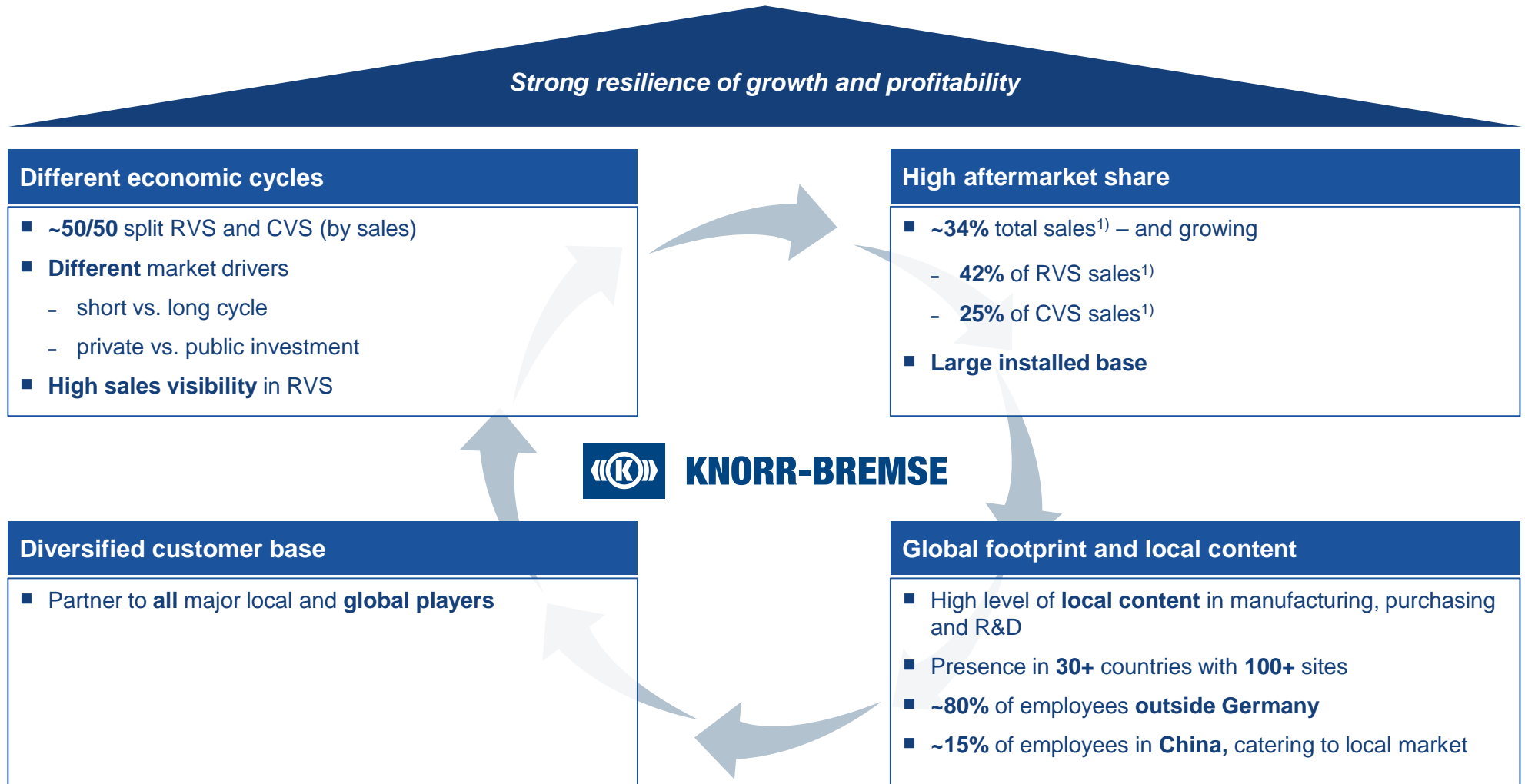
Eco Friendliness



Life Cycle Management

1) FTE at YE19

5 Resilience – Business model supported by high aftermarket exposure, broad geographical and customer diversification and strong localisation

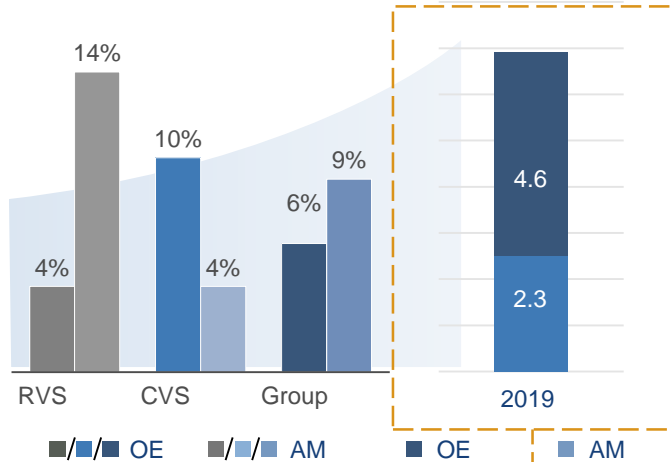


Notes: 1) Based on German GAAP (HGB) for 2019; BilRUG sales allocated proportionally between OE and aftermarket; Source: Knorr-Bremse information

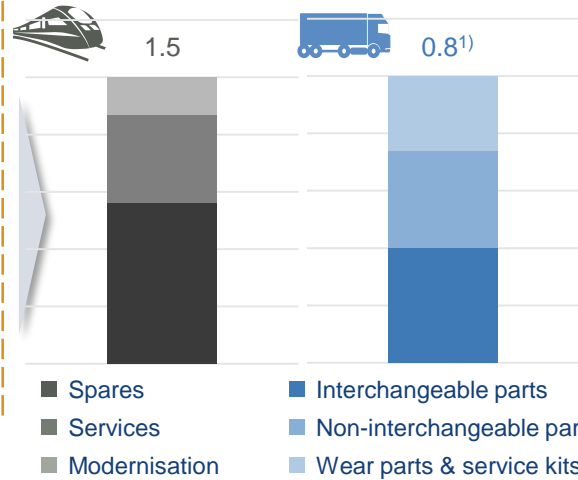
5 Resilience – Attractive aftermarket business with comprehensive service offering drives profitability and contains high future potential

Aftermarket is the growth and resilience backbone

Sales CAGR (2010-2019) HGB (€bn)



Aftermarket sales 2019 (€bn)



Share of aftermarket 2019 (%)



34%

share of aftermarket as % of sales 2019

Key features

Annuity-like

- Regulated maintenance intervals
- Leverages high installed base
- 20-30 year long relationships

Close to the customer

- RVS:
 - 36 service centres²⁾
 - 20 service locations at customers' premises
- CVS:
 - >1,600 certified service partners
 - >700 Alltrucks workshops

Strong customer retention

- High switching costs
- Focus on safety and quality
- IP protection

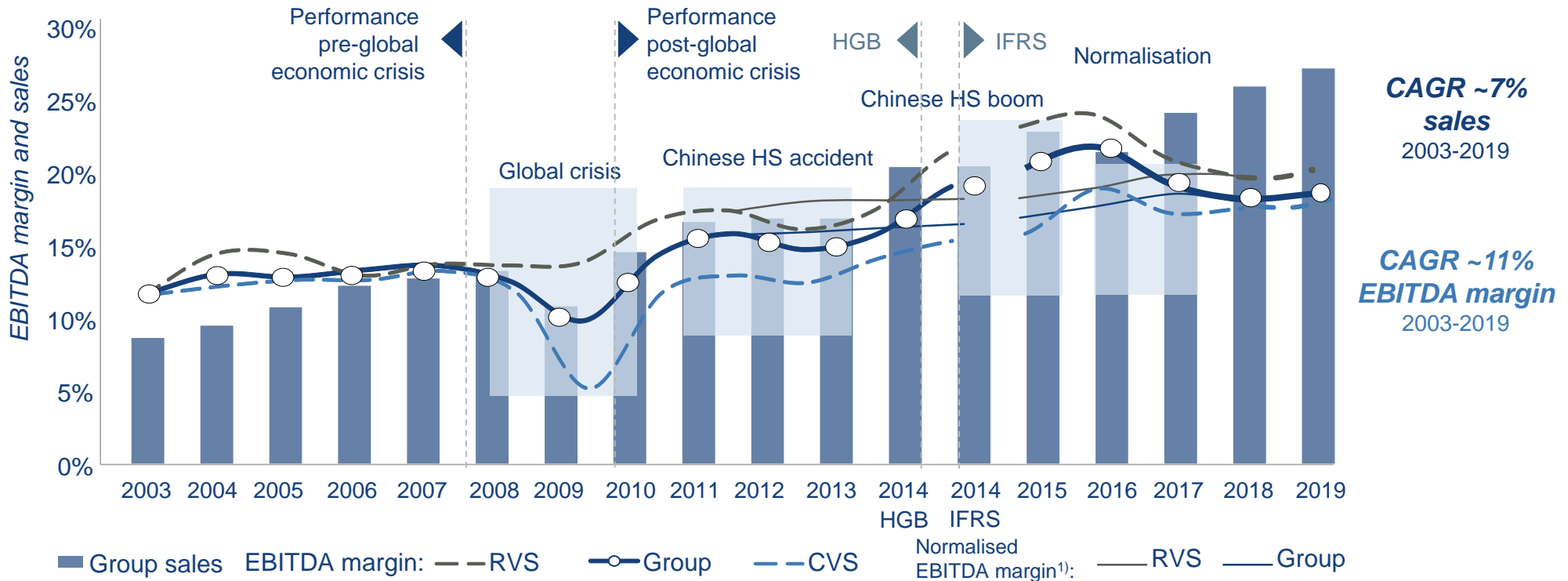
Innovative business model

- New connectivity-based business models
- Preventive
- Predictive

Notes: Based on prelim. German GAAP (HGB); BilRUG sales allocated proportionally between OE and aftermarket; 1) Total CVS aftermarket sales and independent aftermarket sales EMEA (excl. South Africa & Skach) as proxy for the global split; 2) Does not include service locations at customers' premises; Source: Knorr-Bremse information

6 Superior financial profile – strong track record of growth and profitability improvement

Strong track record of resilient and profitable growth

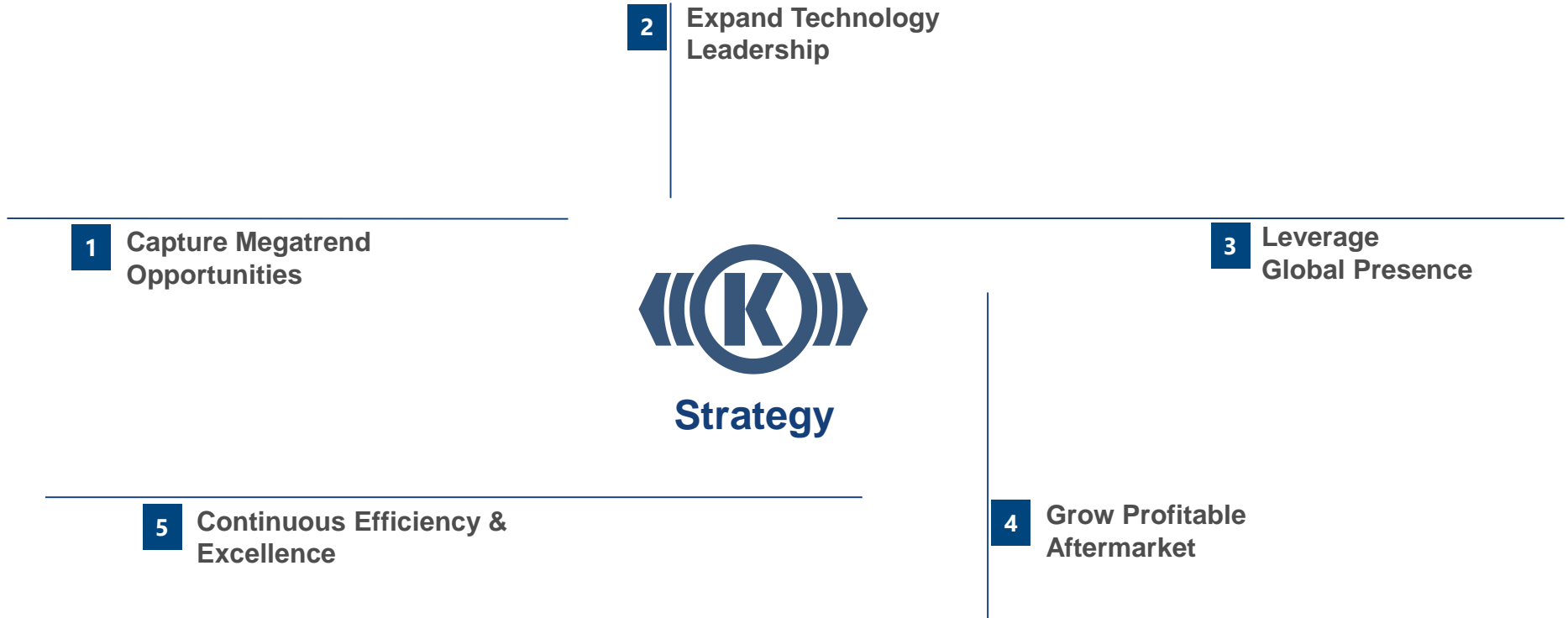


Notes: Financials based on German GAAP (HGB) prior to 2014 and IFRS 2014-2019; Data presented in accordance with German GAAP (HGB) may not be comparable to data prepared in accordance with IFRS; 1) Normalised margin estimate for China accident impact and recovery; Estimate based on Knorr-Bremse assumptions; Source: Knorr-Bremse information



7 Leadership excellence – Clear vision for future value creation

We confirm and continue our successful strategy



▶ **Targets until 2022¹: organic revenue growth of 4.5-5.5% p.a. and EBITDA margin expansion by +150bps**

1) Base year FY17

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RVS with high-quality business model – Outperformance and resilience

1	Market leadership	<u>Global market leader</u> , scale advantage
2	Technology leadership	<u>Strong technology innovator</u> shaping industry standards, return on R&D spend outperforming peers
3	High barriers to entry	<u>Safety-critical products</u> with significant homologation barriers, RVS only supplier certified for all standards and norms globally
4	Strong growth profile	Attractive transportation and mobility end-markets, <u>long track record of outperforming underlying markets</u> – through both OE and AM business
5	Resilience	Steadily growing business through customer/region/product mix, <u>strong aftermarket</u>
6	Profitability	<u>Outstanding profit margins</u> and track record of margin expansion and cost management

Rail Vehicle Systems – Nucleus of Knorr-Bremse’s success: the leading safety critical systems supplier for rail with a track record of market outperformance



Highlights

2019 key financials

2019 sales split⁴⁾



Rail brake systems supplier globally¹⁾

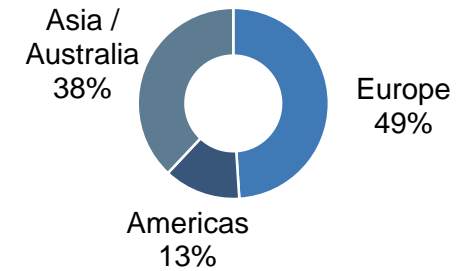
€3.7bn sales

by region (€ 3.7bn)



Rail entrance systems supplier globally¹⁾

6.8% CAGR 2010-2019³⁾



HVAC systems supplier globally¹⁾

€815m op. EBITDA (22.3% margin)

by channel



Global brakes market share¹⁾

€697m op. EBIT (19.1% margin)



Present in 50-55% of global installed base²⁾

42% aftermarket share⁵⁾



c.16k employees

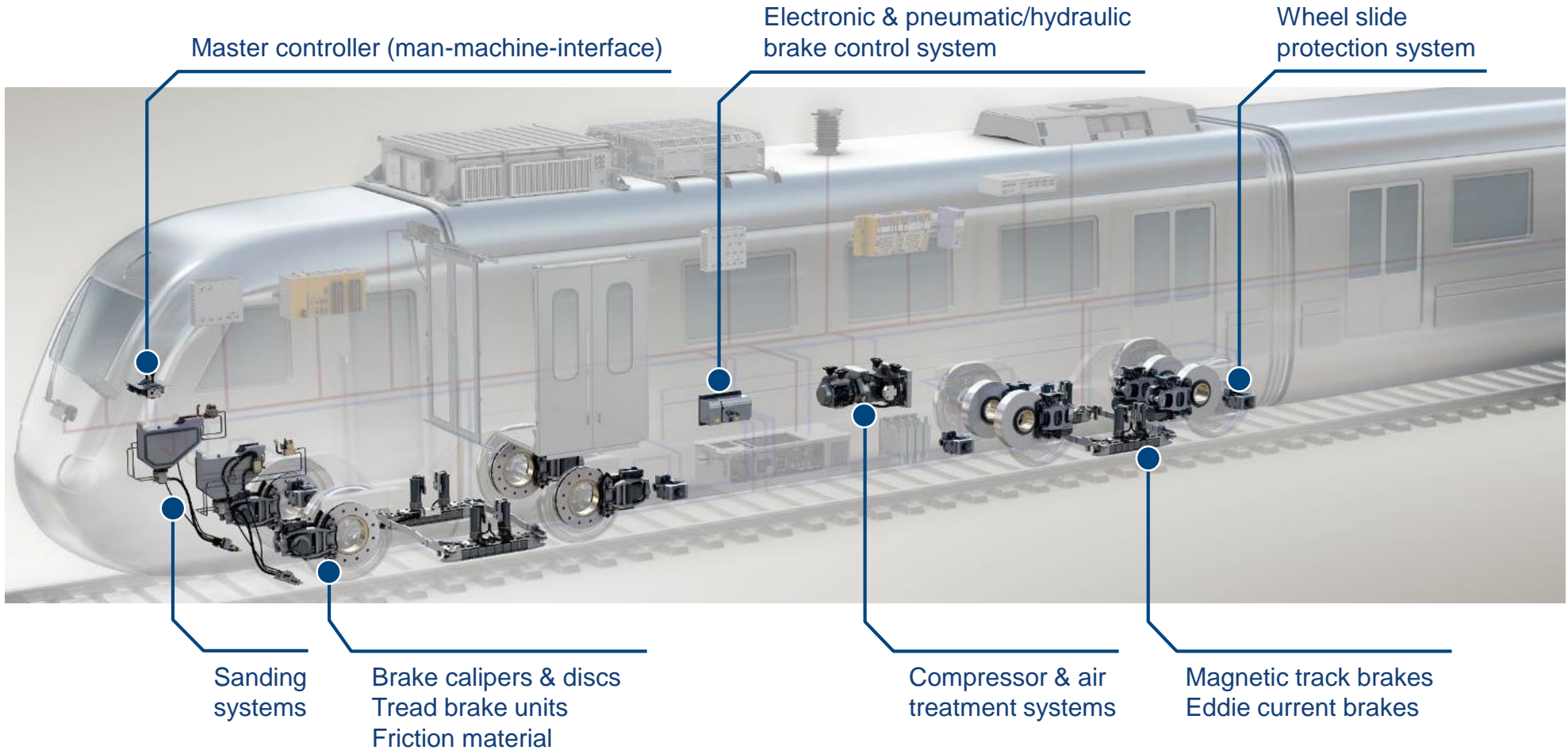
Notes: Sales, EBITDA and EBIT based on IFRS, other figures based on German GAAP (HGB), BilRUG sales allocated proportionally between OE and aftermarket; 1) 2017 RVS market share estimates for OE and aftersales without labour; 2) All active rail vehicles without freight cars with a minimum of one Knorr-Bremse system related to brakes, entrance systems and HVAC installed; 3) Total reported RVS sales growth including OE and aftermarket at actual currency based on German GAAP (HGB); 4) Sales split by region based on IFRS; Other splits based on German GAAP (HGB); 5) Based on German GAAP (HGB) for 2019; BilRUG sales allocated proportionally between OE and aftermarket;

Source: Knorr-Bremse information and internal market research



Deep dive into RVS braking technologies of Knorr-Bremse (1/2)

Key elements of a braking system in RVS



Source: Knorr-Bremse information



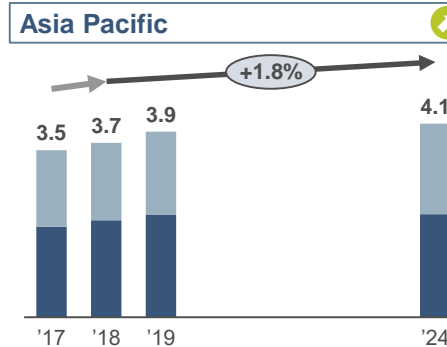
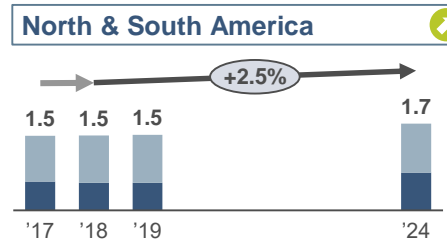
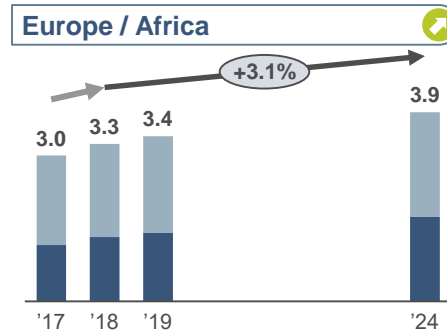
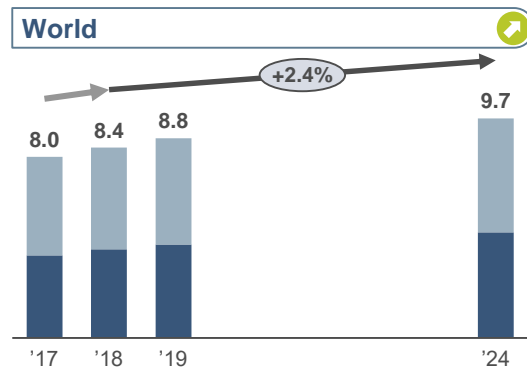
Knorr-Bremse Group

Underlying global rail market with steady and robust growth

Development of markets

Market volume Brakes, Doors, HVAC, incl. labour [€bn, CAGR in %]

■ AM ■ OE



Original Equipment (OE)

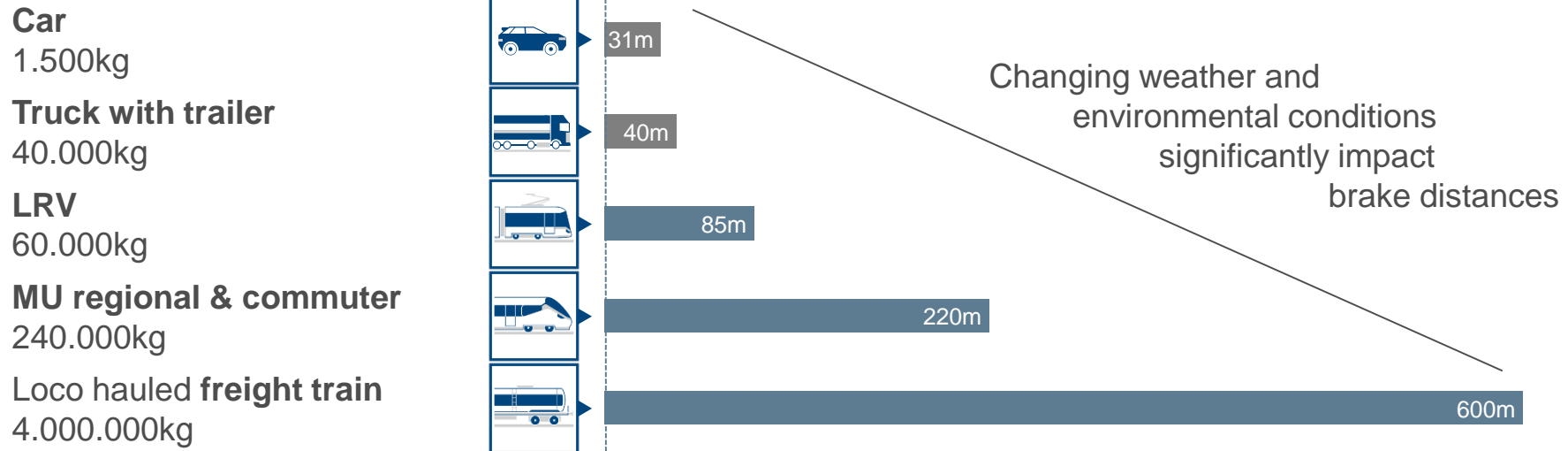
- Europe and Asia Pacific will see a further increase in the Passenger market until 2021
- North America expects a slow down in Freight business, but an increase in Passenger business from 2020 on

Aftermarket (AM)

- Aftermarket growth in all regions, volume wise mainly in Europe and Asia Pacific

The enormous brake distances in Rail require outstanding braking performance

Different braking distances at 80km/h

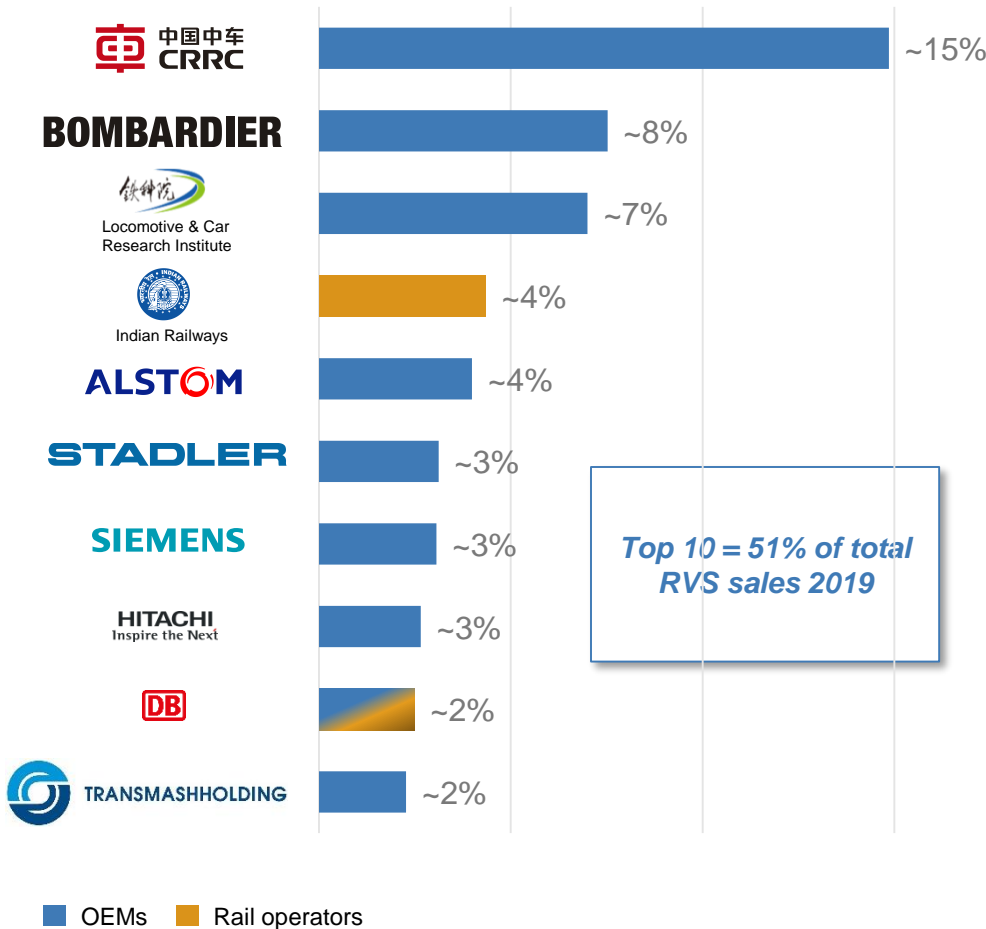


Different braking distances at 330km/h



Global Tier-1 partner of choice for OEMs and rail operators in all regions

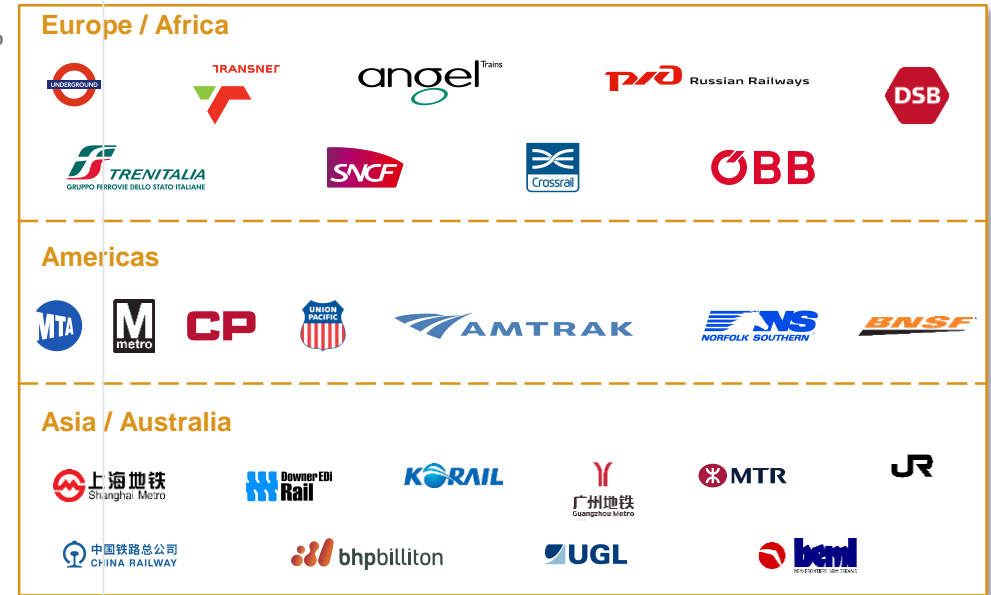
Top 10 customers 2019 (% of sales)



Top 10 = 51% of total RVS sales 2019

Other major Knorr-Bremse customers

>>300 Relevant rail operator customers



>50 Relevant OEM customers



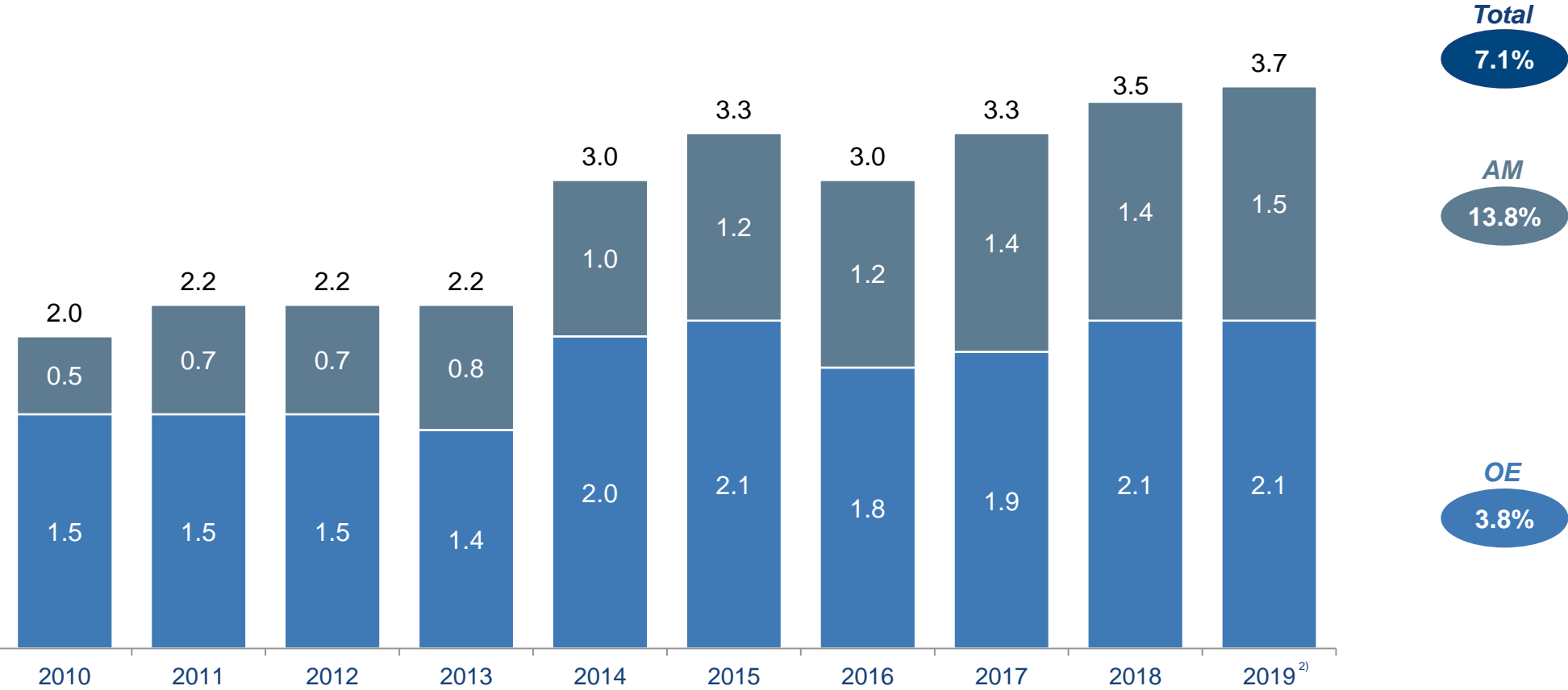
Notes: Sales based on German GAAP (HGB); Share of top 10 customers as % RVS sales 2019 may not add up due to rounding; Source: Knorr-Bremse information

Significant historical market outperformance through consistent focus on fastest growing markets and segments especially in aftermarket

Strong growth both in OE and AM

RVS sales by type (until 2017 HGB, 2018-2019 IFRS, €bn, 2010-2019)¹⁾

CAGR (2010-2019)



Notes: 1) BilRUG sales allocated proportionally between OE and aftermarket; 2) CVS sales split 2019 may not add up due to rounding

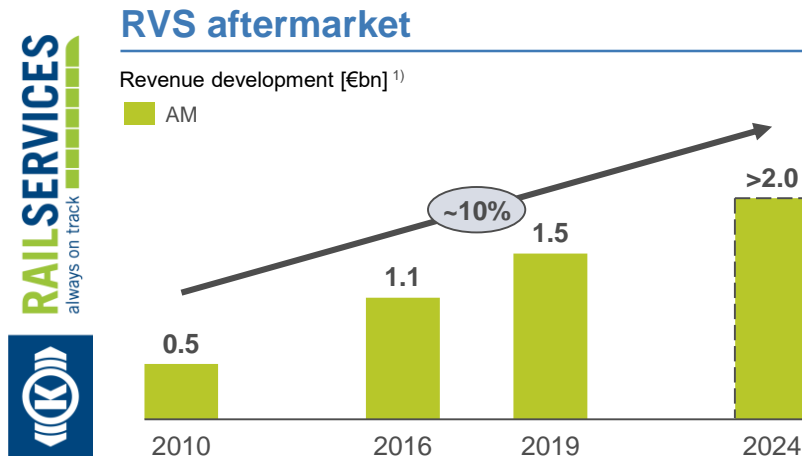
Aftermarket (RailServices) business expected to grow beyond € 2bn by 2024

Characteristics aftermarket

- Long customer relationships & loyalty of >30 years
- Through tear & wear very attractive, high margin business
- Underlying global Rail market +2.6%²⁾

Development aftermarket

- Higher focus on **lifecycle costs** and **availability commitments** (contractually binding)
- **Digitization** with new players
- Increased business demand for **reduced energy** consumption



- **Global footprint with a strong local presence**
- **High installed base**
- **High customer retention rate**
- **Additional data driven business models**
- **Development of energy efficient solutions**

















Notes: 1) Revenue based on external (third party) sales German GAAP (HGB); Values recognize FX rates; 2) Unife: average market growth 2015-2017 and 2021-2023

Knorr-Bremse is the only supplier worldwide certified for all local standards and norms

Market protected by unique level of complexity ...



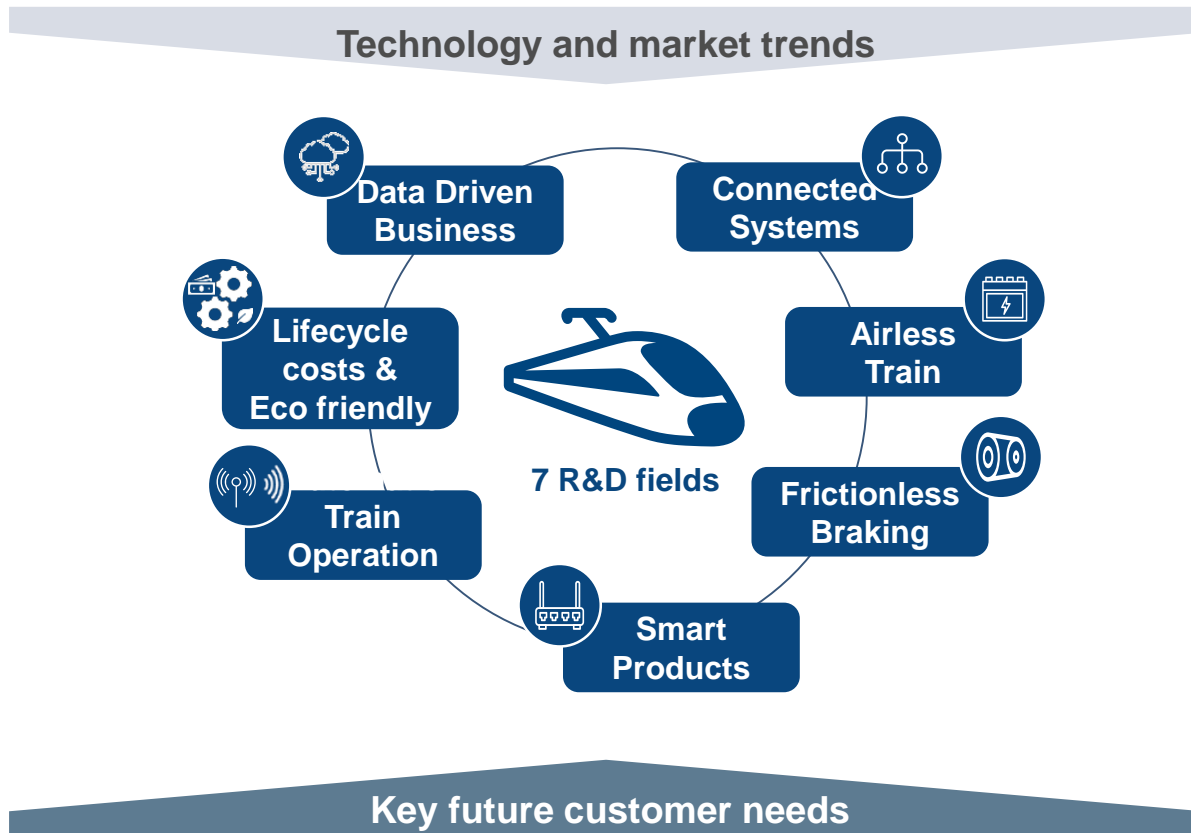
... and long homologation time for each component

Standard ¹⁾	Key regions	Typical time-to-market	
		Development (yrs) ²⁾	Certification (yrs) ²⁾
			
			
			
			

Combination of IP ownership and homologation creates high barriers to entry

Notes: 1) GOST based on actual recent homologation process, other norms based on expert estimates by Knorr-Bremse; 2) Estimated average required "time-to-market" of a basic freight car solution
Source: Knorr-Bremse information

RVS' R&D agenda is focused on customers' needs – staying ahead of competition



Deep Dive Knorr-Bremse solutions for specific customer needs

- Optimized lifecycle costs
- Standardized solutions
- More intensive use of existing infrastructure
- Reliability & passenger comfort

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CVS with high-quality business model – Outperformance and resilience

1	Market leadership	<u>Global market leader</u> with increasing market share
2	Technology leadership	<u>Technology leader</u> with innovation power shaping major industry trends
3	High barriers to entry	<u>Safety-critical highly technological products</u> One of only two suppliers with global technology know-how and capabilities
4	Strong growth profile	<u>Attractive end market</u> in goods and people transport (incl. buses) Continuously <u>outperforming markets</u> through content and market share growth
5	Resilience	<u>Strong aftermarket share</u> and <u>content per vehicle growth</u> Strength in cost efficient operations
6	Profitability	<u>Attractive margins</u> based on differentiation, scale advantage and consequent cost management

Commercial vehicle systems – Knorr-Bremse is one of two global leaders with an outstanding position in braking and safety relevant systems



Highlights



Global market position¹⁾



Technology leader



Global market share



c.12k Employees

2019 key financials

€3.3bn sales

7.6% CAGR 2010-2019²⁾

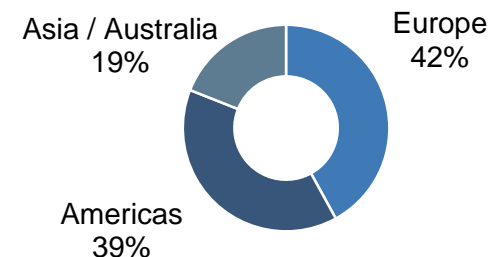
€523m op. EBITDA (16.0% margin)

€404m op. EBIT (12.3% margin)

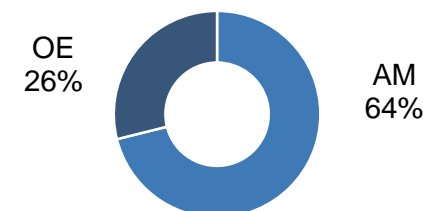
26% aftermarket share

2019 sales split³⁾

by region



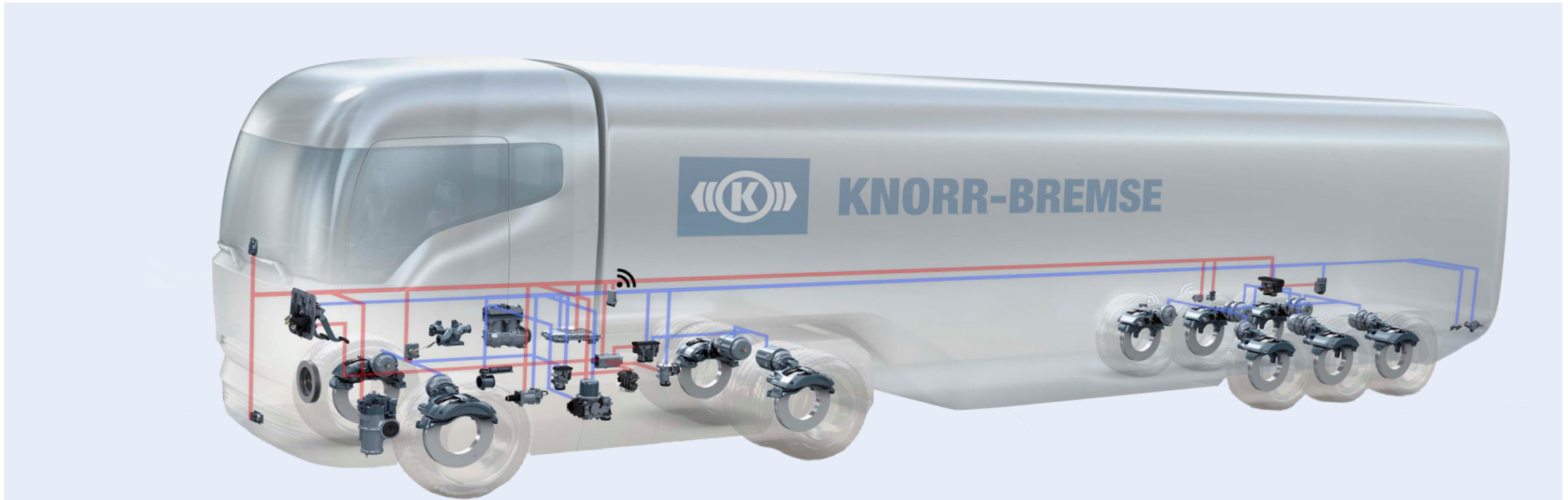
by end-market



Notes: Sales, EBITDA, EBIT and respective margins based on IFRS; other figures based on German GAAP (HGB); BilRUG sales allocated proportionally between OE and aftermarket; 1) 2017 global addressable Truck, Bus and Trailer OE market, including "Brake Systems & Vehicle Dynamics (incl. Automated Driving)", "Energy Supply & Distribution" and "Fuel Efficiency"; excluding aftermarket; Knorr-Bremse data based on market intelligence and experts estimate in 2017; 2) Total reported CVS sales growth including OE and aftermarket at actual currency, 2017; based on German GAAP (HGB); 3) Sales split by region based on IFRS; Other splits based on German GAAP (HGB); Source: Knorr-Bremse information and internal market research

Complementary product portfolio provides foundation for positioning as key integrated systems and services provider

Knorr-Bremse CVS comprehensive offering



Brake Systems & Vehicle Dynamics¹⁾ (incl. Automated Driving)

- Brake System
- Brake Control
- Electronic Levelling Control
- Steering
- Automated Driving



Energy Supply & Distribution

- Air Treatment
- Compressors



Fuel Efficiency²⁾

- Engine Components
- Transmission Sub-systems

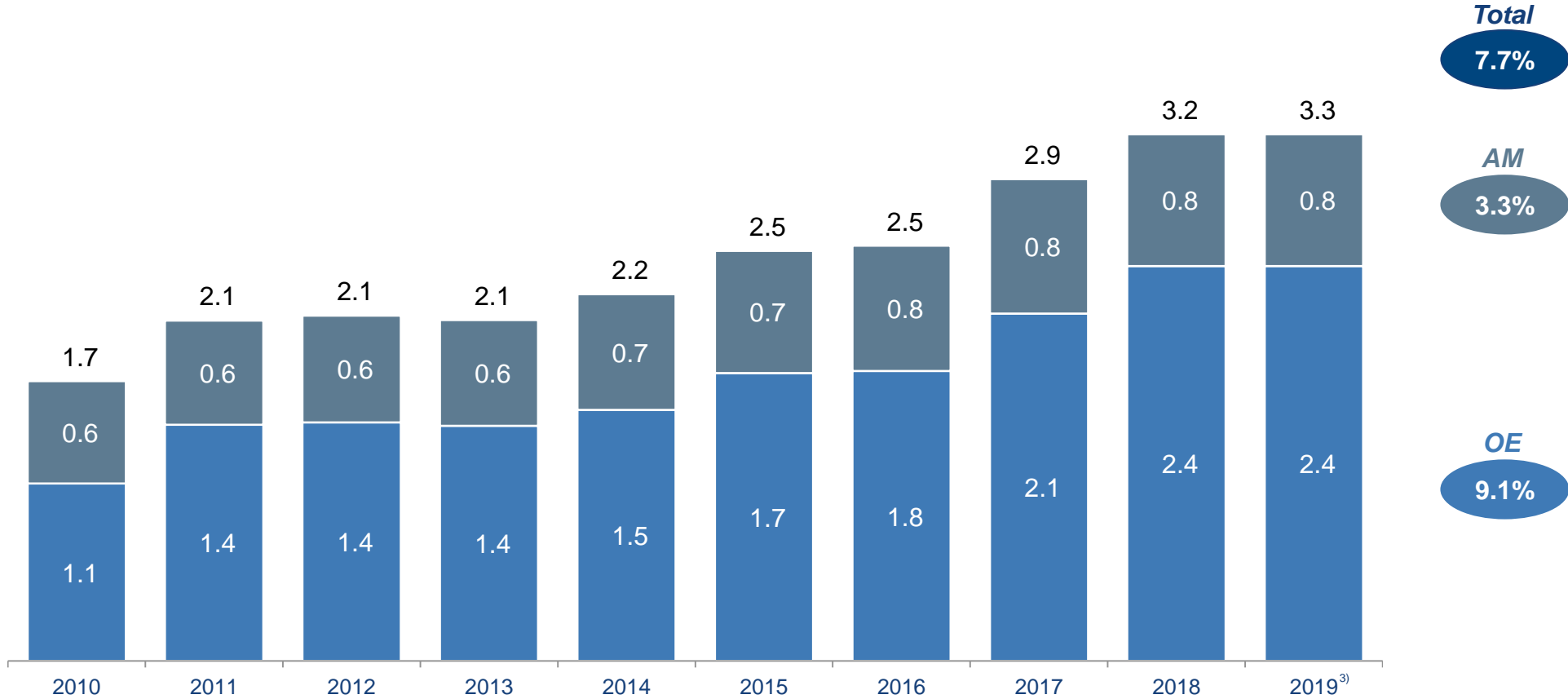
Notes: Sales split by product as of 2019 based on OE only; based on German GAAP (HGB); 1) Air Disc Brake, Valves / Pedal Unit, Actuators, Foundation Drum Brake, Steering, ABS, EBS, ESP, DAS, ELC; including segment Others; 2) Vibration Dampers, Engine Air Control, Transmission - Gear Actuation, Transmission - Clutch Actuation; Source: Knorr-Bremse information

Historical market outperformance with strong position to take further advantage of the highly attractive and stable aftermarket opportunity

Strong growth both in OE and AM

CVS sales by type (HGB, €bn, 2010-2017)¹⁾ 2018-19 IFRS

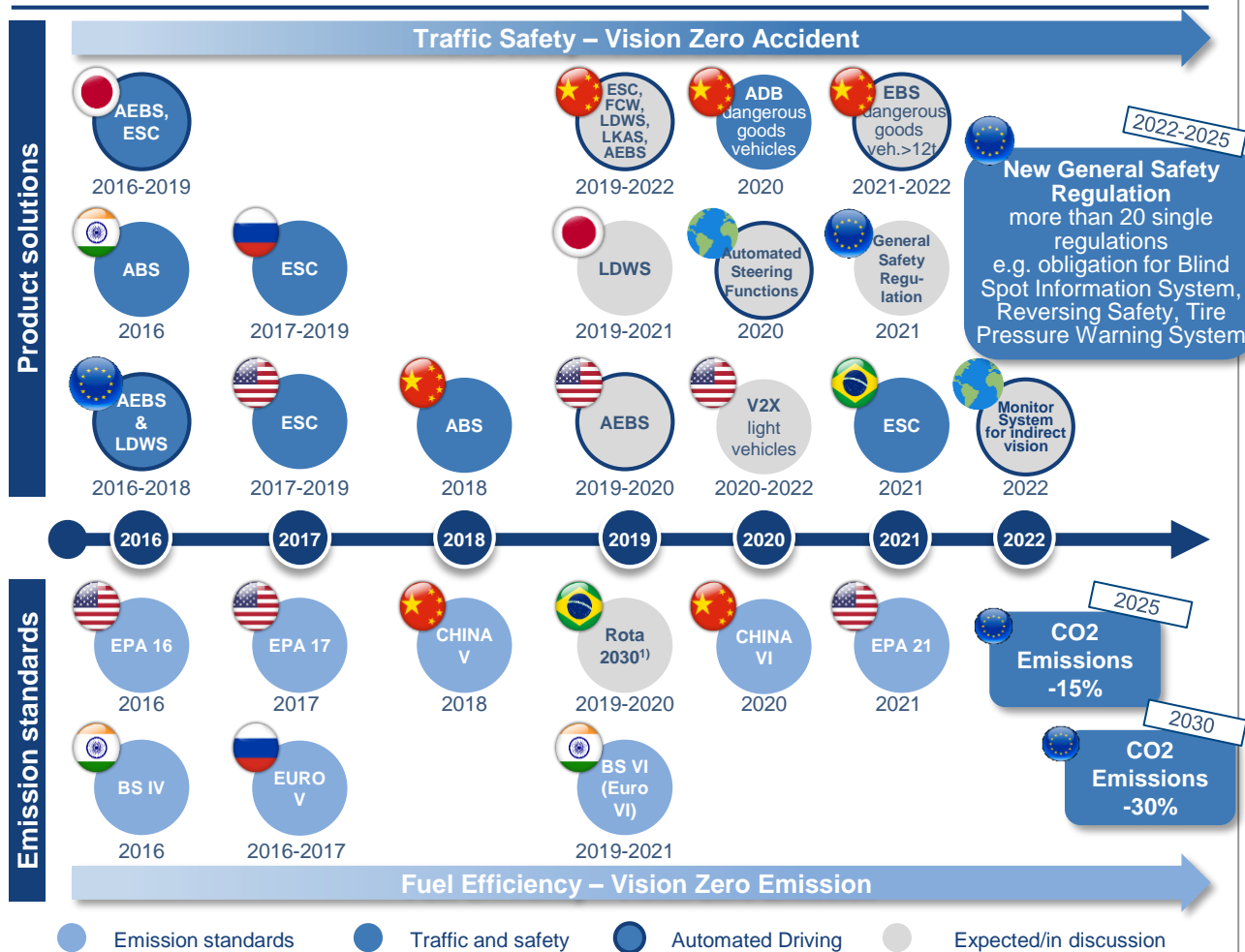
CAGR (2010-2019)



Notes: 1) BilRUG sales allocated proportionally between OE and aftermarket; 2) Global Truck and Bus market excluding aftermarket and Trailer; Source: Knorr-Bremse information and internal market research; IHS for truck production rate; 3) CVS sales split 2019 may not add up due to rounding

Conversion in legislation drives the global adoption of technologies provided by Knorr-Bremse

Convergence of legislation creates growth opportunities for products respectively



Case studies

- ### 1 Blind Spot Assistant

 - New framework for general safety and protection of vulnerable road users²⁾
 - Mandatory measures for trucks:
 - Blind Spot Information System
 - 3 Reversing Safety measures
 - Tire Pressure Monitoring System
- ### 2 Air Disc Brake

 - Increase safety of dangerous goods vehicles
 - 2020 onwards: Need to be equipped with disc brakes³⁾
 - Affects both, truck & trailer brakes
- ### 3 Engine Air Management Valves & Dampers

 - Increasing legislative emission standards
 - Technology as enabler to achieve norms
 - supports fulfilment of strictest standards

Legislative decisions foster demand for Knorr-Bremse solutions

Notes: 1) Approved in May 2018, government intends to stimulate efficiency & vehicle safety; 2) European Commission: COM(2018) 286 & Vulnerable Road Users Directive (VRUD); 3) General Administration of Quality Supervision, Inspection & Quarantine of People's Republic of China, technical specification for safety of power driven vehicles operating in roads; Source: Knorr-Bremse internal market research; Roland Berger market study: Trends in the truck & trailer market (August 2018)

Continued content growth expected in all regions

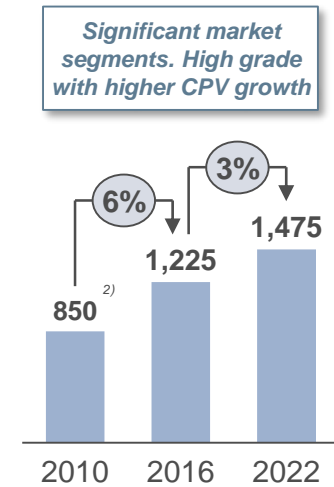
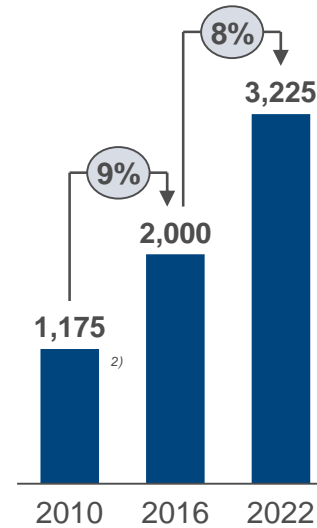
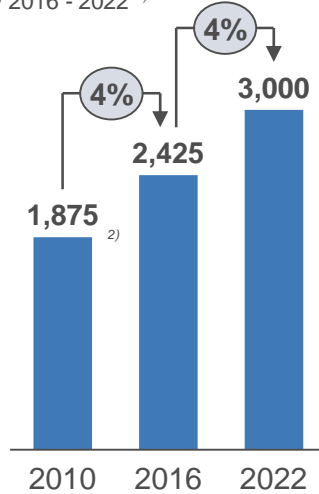
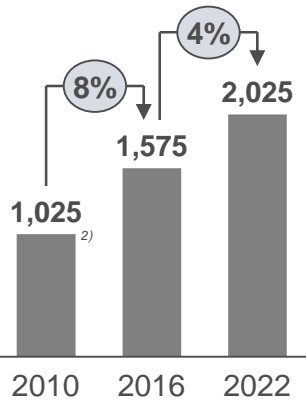
World

Europe

North America

Asia / Pacific

% CAGR Content per Vehicle 2010 - 2016 / 2016 - 2022 ¹⁾

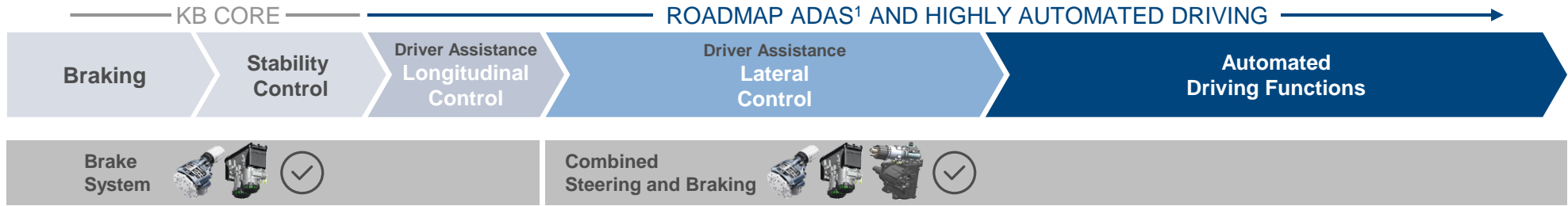


Growth of content per vehicle mainly driven by local regulation and total cost of ownership

Notes: CPV data rounded to nearest €25; 1) CPV for four specific categories analysed in Roland Berger market study: Trends in the truck & trailer market (August 2018): Braking systems, Powertrain, Steering and ADAS; Roland Berger scope excludes Valves / Pedal Unit, Actuators, Compressors, Air Treatment and Others; 2) Implied; applying Knorr-Bremse proprietary market growth CAGR 2010-2016 (made comparable to Roland Berger's market definition) to Roland Berger's 2016 absolute CPV data; Source: Knorr-Bremse internal market research for the CAGRs 2010-2016 and commentary; Roland Berger market study: Trends in the truck & trailer market (August 2018) for 2016 and 2022 CPV data as well as for the CAGRs 2016-2022; Data for Asia/Australia for 2016-2022 calculated based on separate Roland Berger data for (i) Asia/Pacific without China and (ii) China



Commercial Vehicle Systems: EXAMPLE steering Business



→ Successful M&A strategy
→ KB Global #2 steering supplier

The diagram shows four puzzle pieces representing strategic moves:

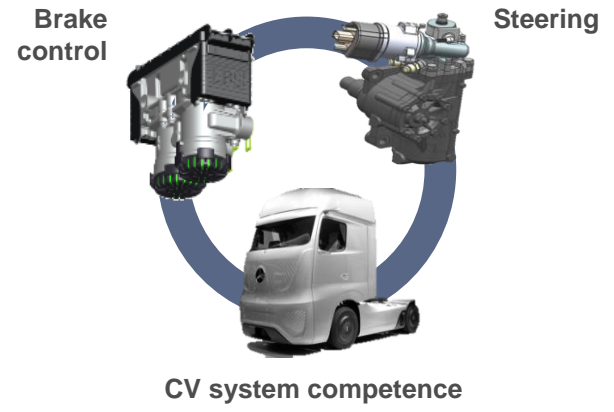
- 2016**: Acquisition of **STEERING SYSTEMS** (European Union flag).
- 2020**: Acquisition of **SHEPPARD** (USA flag).
- 2018**: CV steering business of **HITACHI** (Hitachi Automotive Systems, Japan flag).
- 2019**: JV with **DFM** (China flag).

KB driving steering innovation and vehicle content growth

The diagram shows three levels of steering technology evolution:

- Base steering gear**: A simple mechanical gear.
- Torque overlay steering (TOS) for ADAS^[1] functions and Automated Driving**: A more complex gear with additional sensors and actuators.
- Electric Power Steering**: A fully electric steering system.

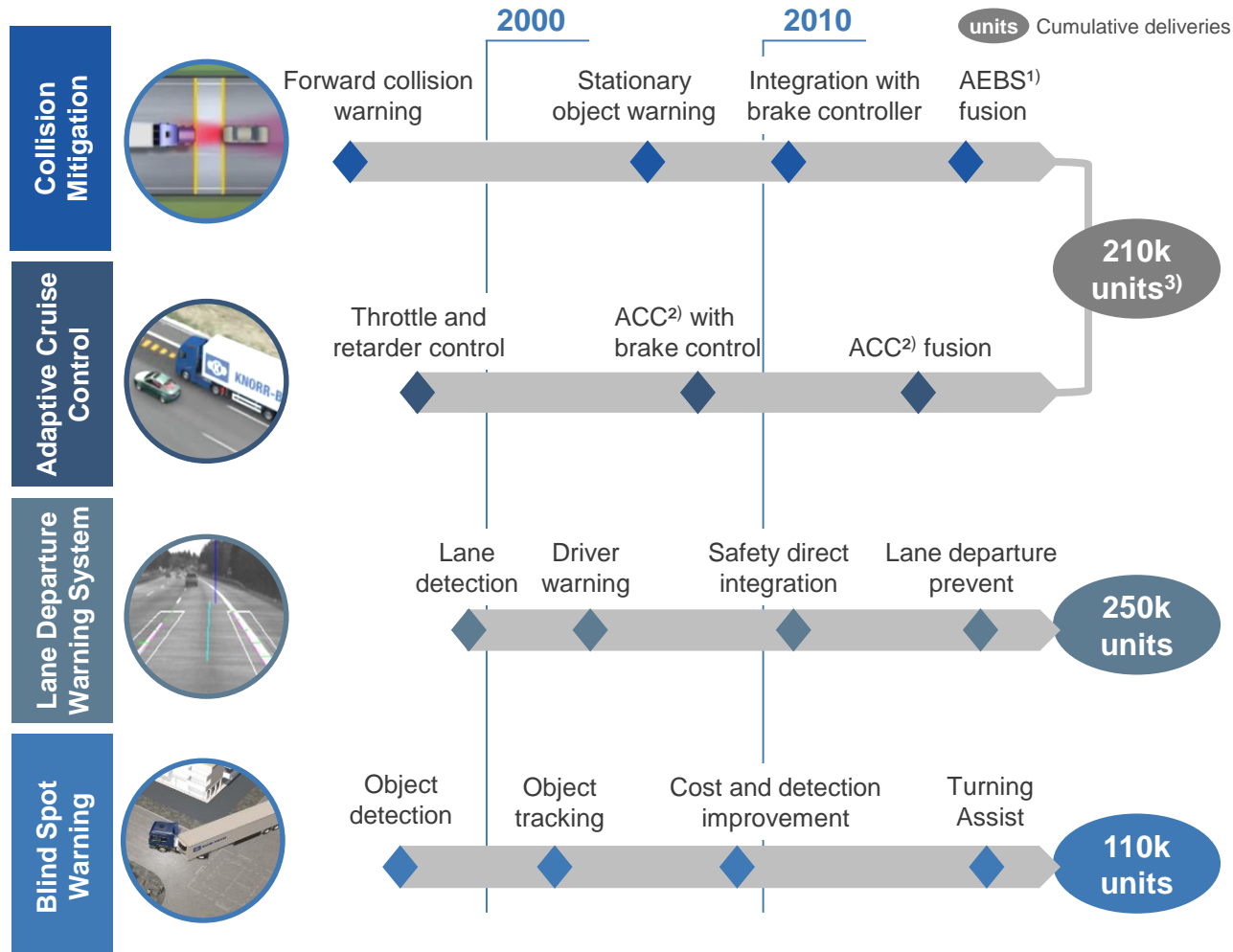
Combined braking and steering for superior vehicle dynamic control and obligatory redundancy



Notes: 1) ADAS = Advanced Driver Assistance Systems

Automated Driving: Knorr-Bremse is a technology leader in Driver Assistance Systems

Timeline of Knorr-Bremse's product innovation in Driver Assistance Systems

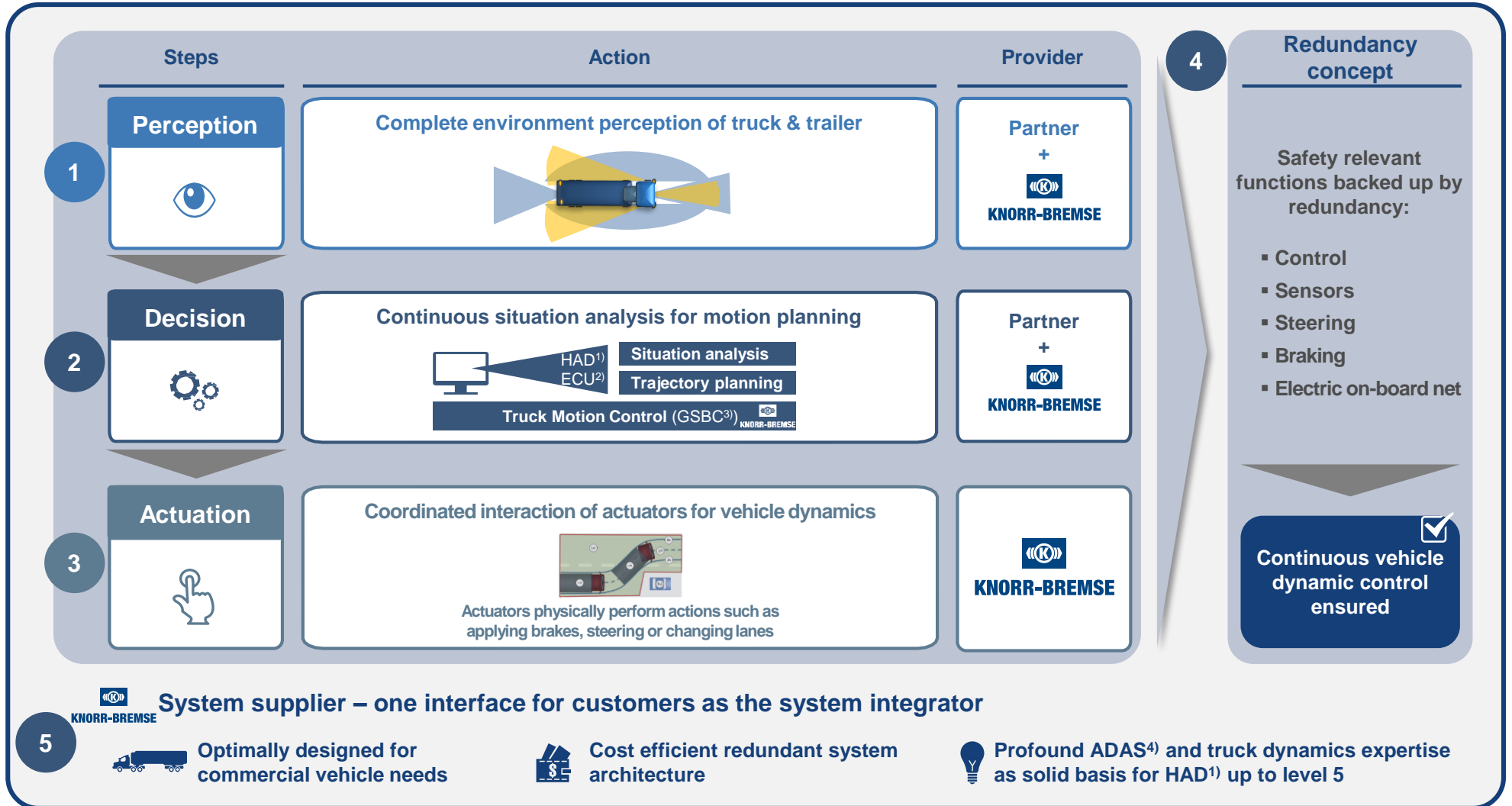


Knorr-Bremse capabilities

- ✓ > 20 years of experience
- ✓ ~ 600k units installed base globally
- ✓ Technology leadership: (e.g. Brake Systems, Steering, ADAS⁴⁾)
- ✓ System know-how & system supplier
- ✓ Broad customer base
- ✓ Retrofit initiative in North America
- ✓ Competence in driving dynamics
- ✓ Know-how in vehicle model simulation

Notes: 1) Advanced Emergency Braking System; 2) Adaptive Cruise Control; 3) Collision Mitigation and Adaptive Cruise Control are based on same hardware today, but applications use different software; often sold in a bundle; 4) Advanced Driver Assistance Systems; Source: Knorr-Bremse information

Knorr-Bremse with clear strategy to be leading system supplier for Automated Driving



Notes: 1) Highly Automated Driving; 2) Electronic Control Unit; 3) Global Scalable Brake Control; 4) Advanced Driver Assistance Systems; Source: Knorr-Bremse information

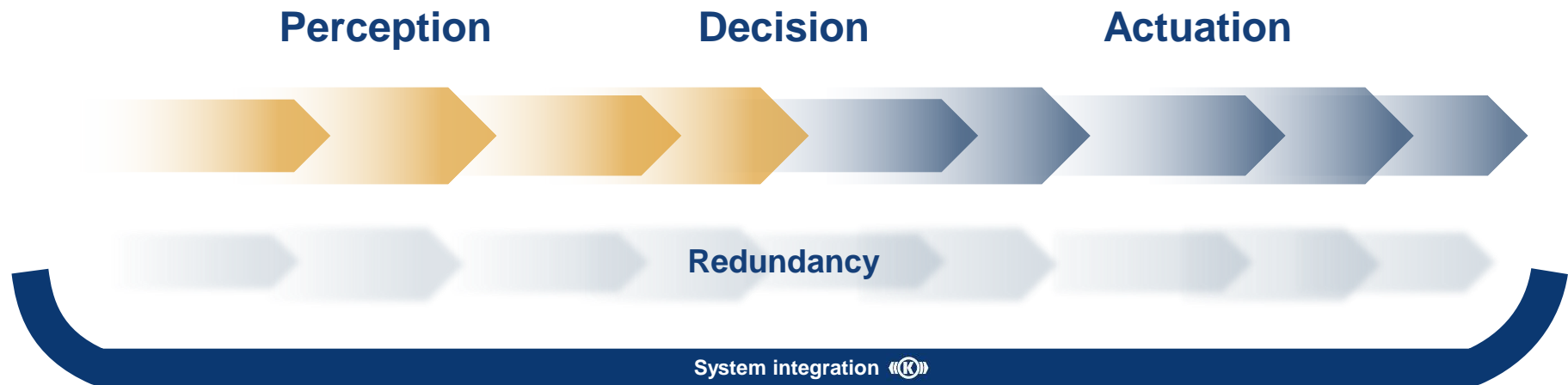
Knorr-Bremse teams up with Continental to become a leading Automated Driving system supplier for commercial vehicles



- Function know-how based on passcar experience & carryover from passcar
- Hardware for localization (radar, camera) and Automated Driving Control Unit



- Truck- & trailer-specific vehicle dynamics: Vehicle guidance and stability control
- Fail-operational architecture
- Commercial vehicle-specific function development, application and release



Consumer Benefits

- Industry benchmark perception decision and actuation from the one source
- Superior performance through full-system approach
- Cost-optimized systems for commercial vehicles

Joint Project Scope

- Development of systems, components and functionality for Automated Driving
- Validation and release of complete highly Automated Driving systems
- Collaboration in joint project house

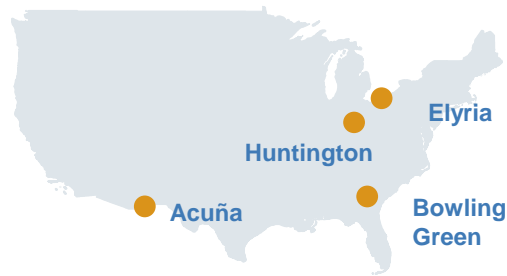
Internationalisation: Global growth strategy focuses on North America penetration as well as Chinese and Indian market share expansion

Exploit leading position

Leverage local presence

Expand market share

Footprint



- Bendix acquisition as enabler for footprint expansion
- Capitalisation of technological expertise and brand
- Increased content per vehicle (technology as driver)
- Continuous cost structure improvements

- Intensive localisation with key local players
- Capitalise on strong position in OE channel
- Increased content per vehicle (technology as driver)
- Expand network to establish truck aftermarket
- Exploit position in electric bus

- Strong business growth with major Indian customers
- Expansion of product portfolio (dampers, drum brakes)
- Localisation programme creating scale effects

Notes: Based on German GAAP (HGB); FTE includes leasing (EOP) 1) Plant under expansion; Source: Knorr-Bremse information

1 Introduction

2 Key Company Highlights

3 Rail Vehicle Systems (RVS)

4 Commercial Vehicle Systems (CVS)

5 R&D Focus

6 Financials

7 Sustainability

8 Capital Markets Summary

9 Appendix

R&D is at the very core of Knorr-Bremse's DNA

With over 12,000 patents¹⁾

Knorr-Bremse secures the future innovation roadmap. Largest patent portfolio in the industry²⁾

5 state of the art R&D centres

globally complemented by 23 local engineering entities with customer proximity

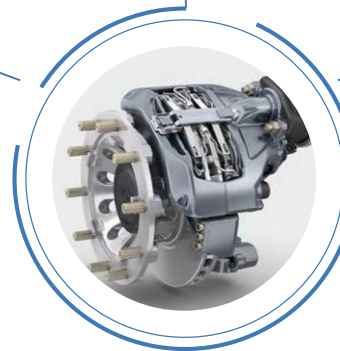
Focused & disciplined approach

ensuring highest efficiency

Significant synergies between RVS and CVS

More than **80%** of the most industry-defining **innovations** over the last decades came from Knorr-Bremse







Extensive external network with over **15 R&D partnerships**

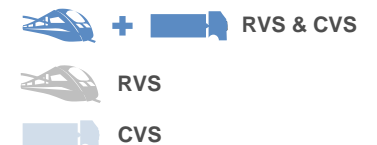


Targeted R&D ratio:
6-7% of revenue³⁾

Notes: 1) Granted and applied patents; 2) Based on published number of patent families (granted and applied); 3) Knorr-Bremse 2019 R&D financial information based on IFRS
Source: Knorr-Bremse information

R&D portfolio synergies between RVS and CVS...

 Services	 Vehicle control & automated driving	 Chassis systems	 Braking	 Driving	 Energy Supply & Distribution
Telematics (iCom maintenance, iTAP-push)	Driver assistance (ACC, AEB, ASR, LEADER)	Hydraulics	Wheelend/ bogie equipment	Conventional actuation	Compressed air
Remote & on-demand maintenance and diagnostics	Motion control	Electronics	Disc brake	Combustion engine components	Compressed air generation
Training drivers/ work shops (Safety direct, dimulator)	Brake control	HMI & driver information (iTAP, etc.)	Brake actuator	Electronic actuation (Kiepe)	Air treatment
Spare parts	ABS / wheel slide protection	Level control	Wear-resistant brakes	E-motor	
Remanufacturing	Emergency brake	Electronic board net / Charge regulation (Kiepe)	Electrodynamic brakes / recuperation	Converter / traction control	
Energy measurement	V2X communication	Pantograph (Kiepe)	Tread brake	Automated manual transmission	
Ticketing	Vehicle control (TCMS / UCS)	Windscreen wiper and wash systems	Electromagnetic brake system		
Transport and logistics optimisation	Brake distance management/ sanding	Entrance systems / doors	Eddy current brake		
	Dynamic driving control (ESP)	Air conditioning	Drum brake & adjuster		
	Vehicle dynamics	Conventional steering	Exhaust brake		
	Torque overlay steering system				

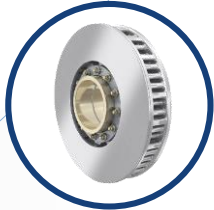


In **>50%** of Knorr-Bremse's portfolio the underlying technology can be applied to **both divisions**

...resulting in synergies and cross-proliferation

Cross-divisional R&D examples

1990:
Air Disc Brake

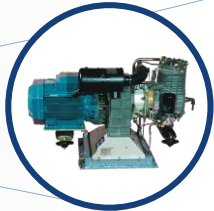


Technology transfer for ADB
from RVS to CVS



1992:
Air Disc Brake

1985:
Screw
Compressor



RVS Screw Compressor
technology adopted for CVS
applications



2011:
Screw
Compressor

2021/2022:
Collision
Avoidance



Collision Avoidance for RVS
based on CVS system know-
how within the field of sensor
technology



2008:
Collision
Avoidance



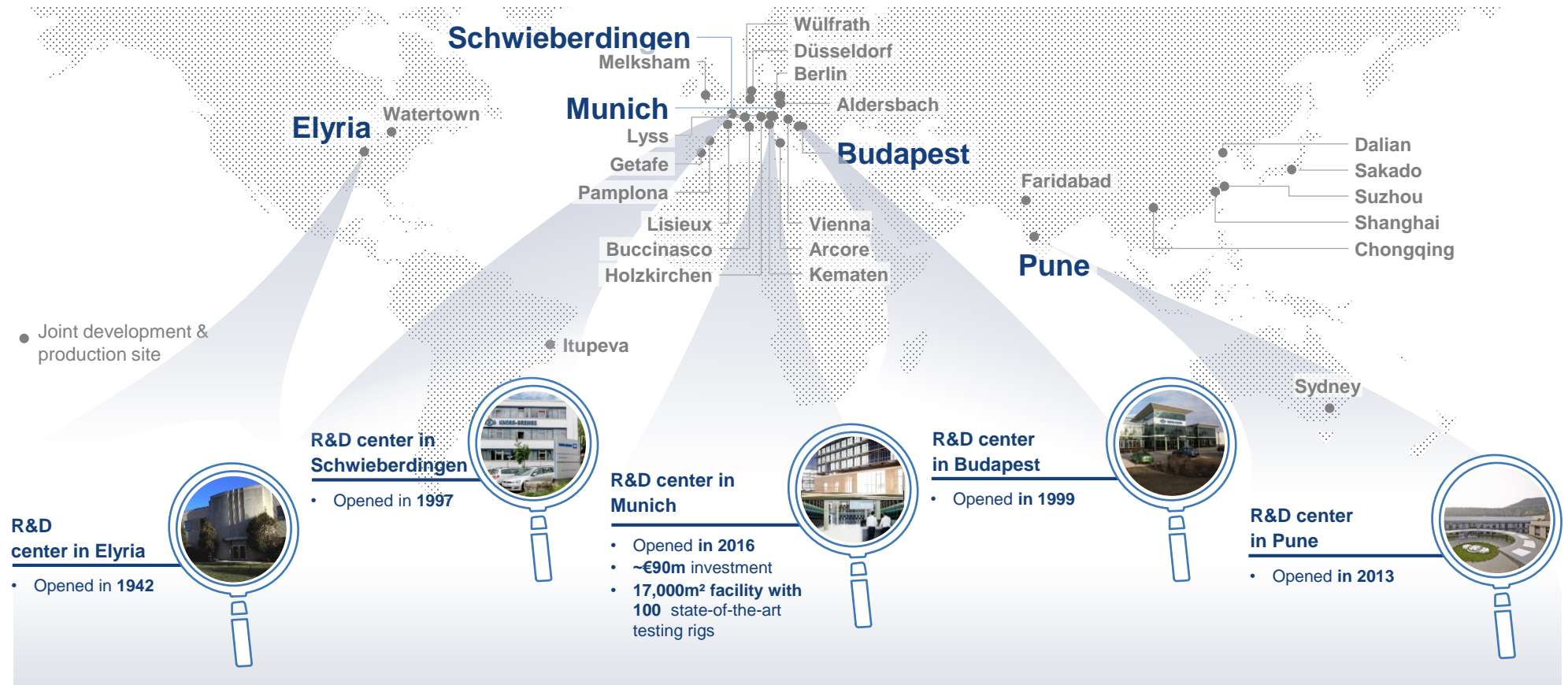
Source: Knorr-Bremse information



Knorr-Bremse Group

Leveraging Knorr-Bremse's synergies & partnerships: centres of excellence as basis for sustained technology leadership

Globally Σ ~3.600 FTE¹⁾



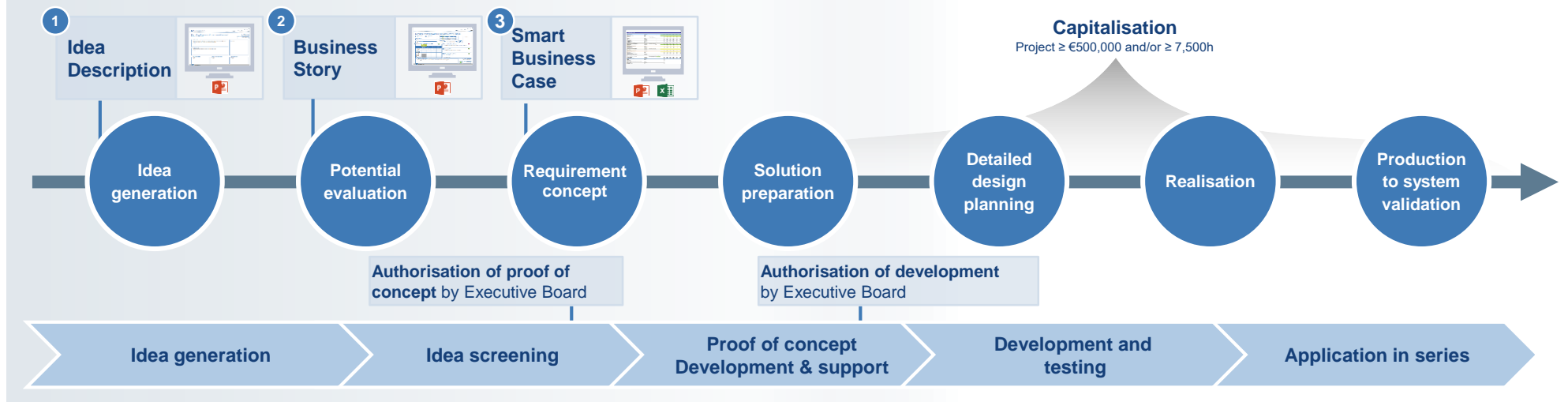
Knorr-Bremse's innovations are supported by a network of specialized development centres with joint production and R&D

Notes: 1) FTE refers to number of employees in R&D function (includes engineers, technicians, merchants) EOP 2019, TCI allocated to Asia

Source: Knorr-Bremse information

Knorr-Bremse deploys structured and effective processes to drive innovation results

Knorr-Bremse R&D process



Knorr-Bremse's innovations are designed for clear customer impact...

- Optimisation of TCO¹⁾
- Reduction of energy consumption, noise, weight
- Safety & reliability
- Connectivity, wireless solutions, ethernet
- Adaption to regulation

...and maximum economic benefit for Knorr-Bremse

- All projects assessed based on NPV²⁾
- Prioritisation of projects according to IRR³⁾
- Optimise time to market
- Short payback time of investment
- Ability to leverage innovation across customer portfolio

Notes: 1) TCO refers to total cost of ownership; 2) NPV refers to net present value; 3) IRR refers to internal rate of return; Source: Knorr-Bremse information

Close cooperation with customers & strategic partners

GOVERNMENT PARTNERSHIPS

- Shift2Rail: EU supported initiative amongst suppliers and OEMs to jointly develop an efficient transportation system
- VDA¹⁾ participation in ~20 committees
- ✓ Design of norms/standards
- ✓ Early anticipation of industry trends
- ✓ Grants/subsidies



VC PARTNERSHIPS WITH STARTUPS

- Partnerships with accelerators
- Investment in start-ups
- ✓ Technology access
- ✓ R&D acceleration



PARTNERSHIPS WITH UNIVERSITIES

- Research cooperations
- ✓ Access to future talent
- ✓ Scouting of new technologies at minimal cost



JVS WITH OEMS / TECHNOLOGY PARTNERS

- 18 joint ventures globally
- Joining complementary competences to extend product and service lines, and capacities
- ✓ IP protection
- ✓ Local presence
- ✓ Flexible solutions for customers



 Countries Knorr-Bremse is present

Notes: 1) VDA - Verband der Automobilindustrie (German Association of the Automotive Industry); Source: Knorr-Bremse information

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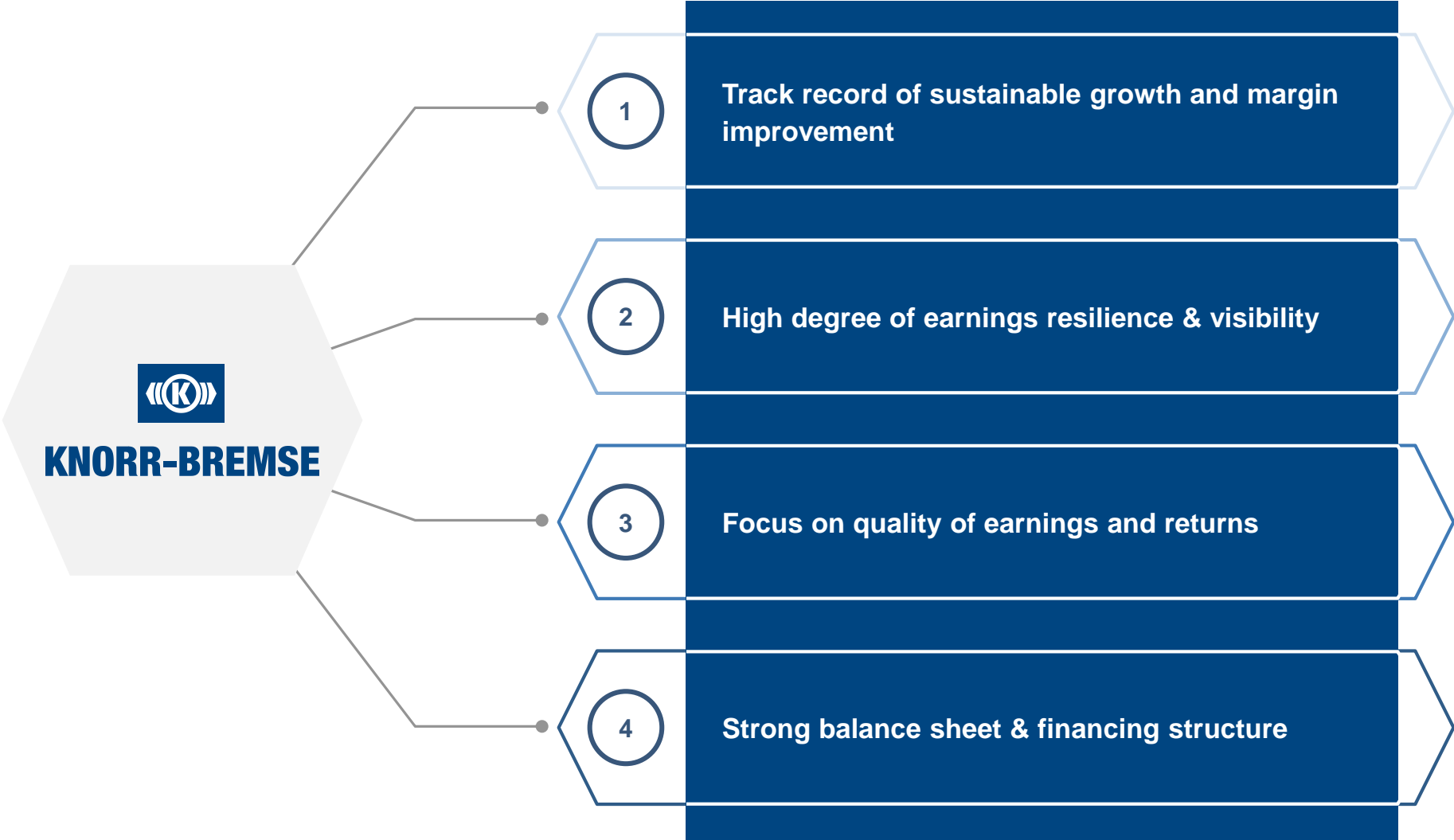
6 Financials

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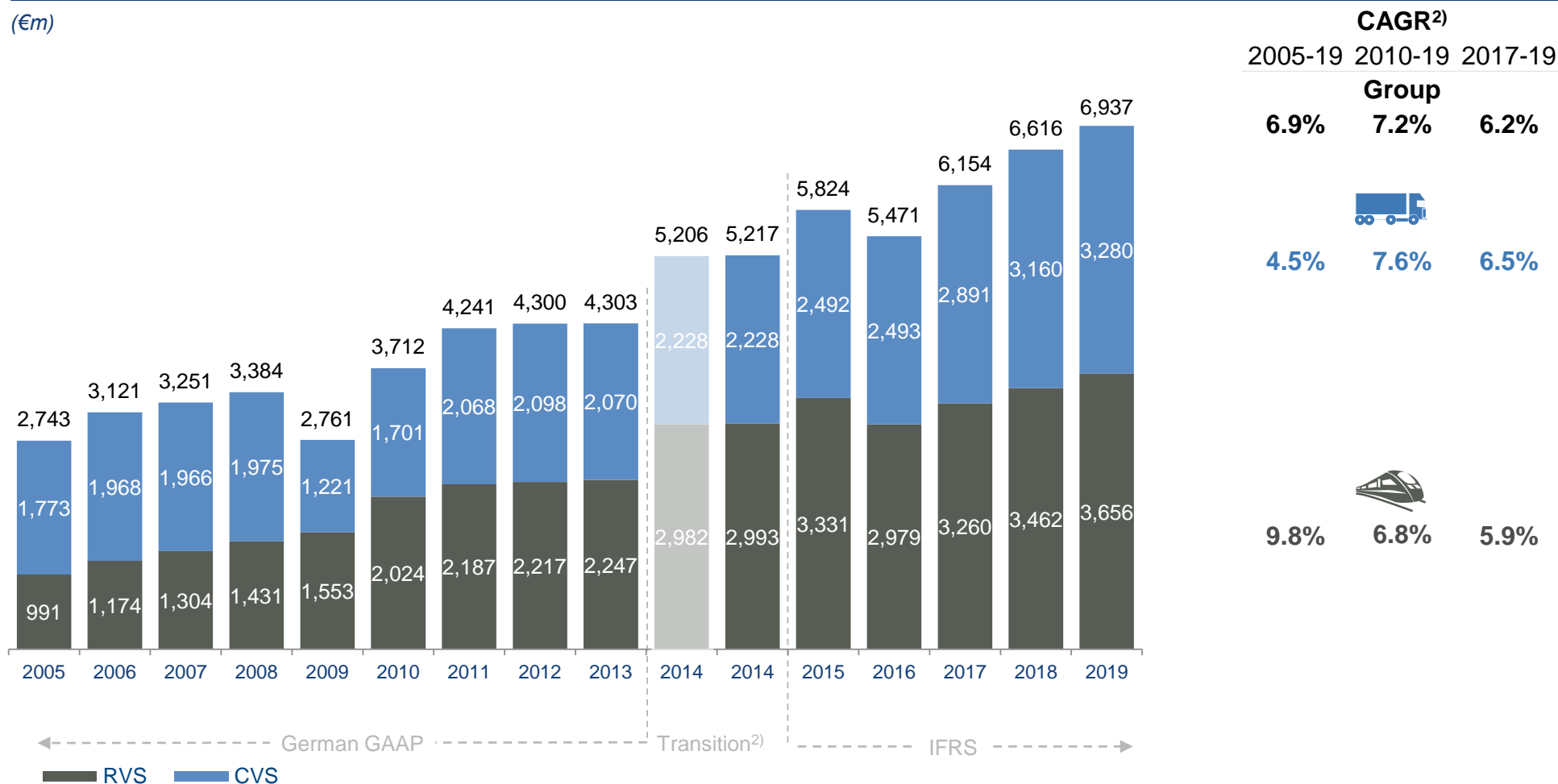
Review of Knorr-Bremse financial profile



Track record of strong and sustainable top-line growth ...

Historical sales¹⁾²⁾ by division

(€m)

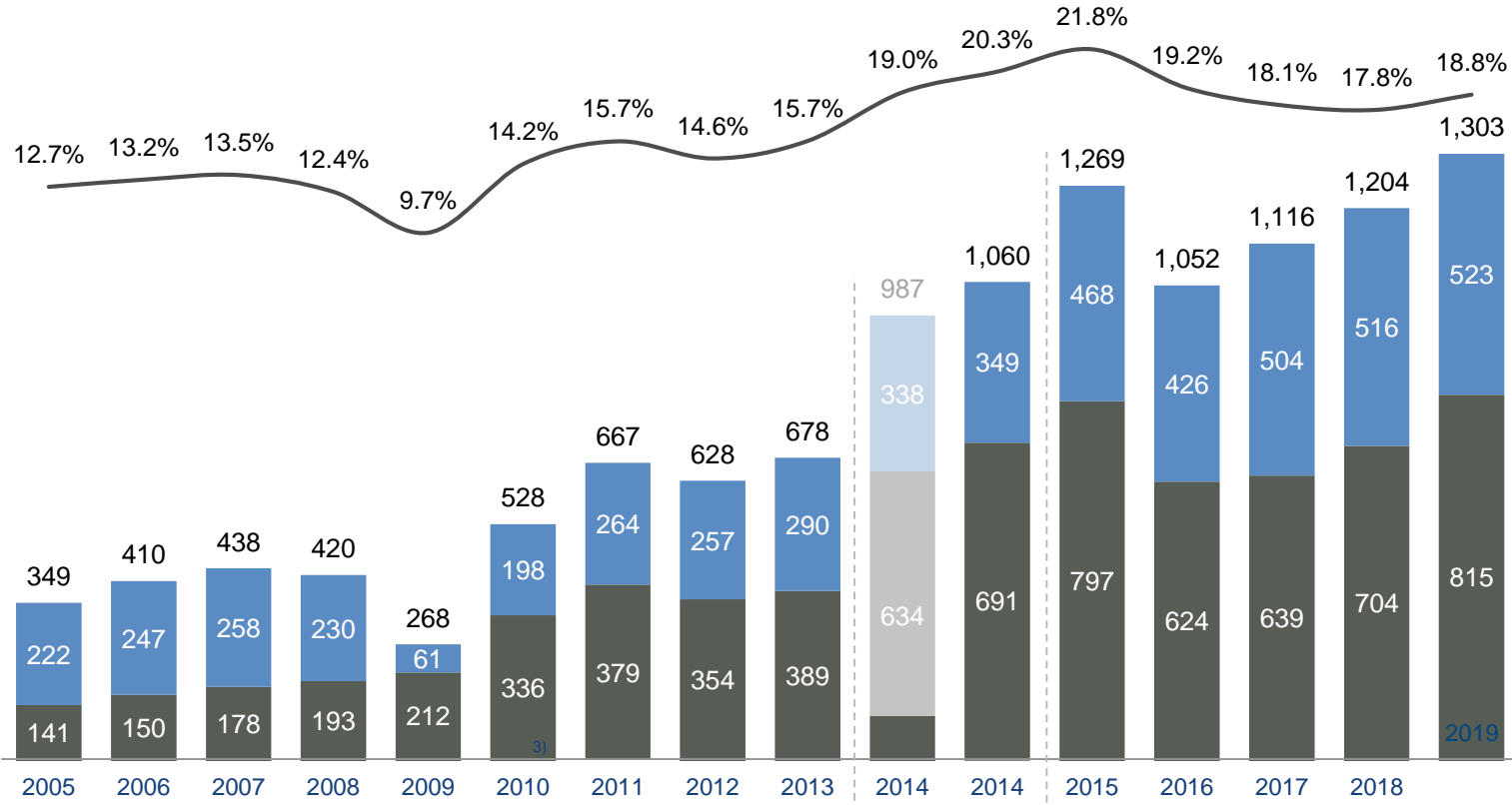


Notes: 1) Divisional historic figures do not add up to group sales excluding consolidations/other; 2) 2014 represents the first year that Knorr-Bremse prepared its financial statements in accordance with IFRS. Prior to 2014, financial statements were only prepared in accordance with German GAAP (HGB). IFRS differs in certain aspects from German GAAP (HGB), and accordingly data presented in accordance with German GAAP (HGB) may not be comparable to data prepared in accordance with IFRS; Source: Knorr-Bremse information


... combined with disproportionate EBITDA growth

Historical EBITDA¹⁾²⁾ profitability


(€m)



	CAGR ²⁾		
	2005-19	2010-19	2017-19

Group	2005-19	2010-19	2017-19
	9.9%	10.6%	8.1%

	6.3%	11.4%	1.9%
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	13.4%	8.9%	12.9%
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← German GAAP Transition²⁾ IFRS →

■ RVS ■ CVS — EBITDA Margin (%)

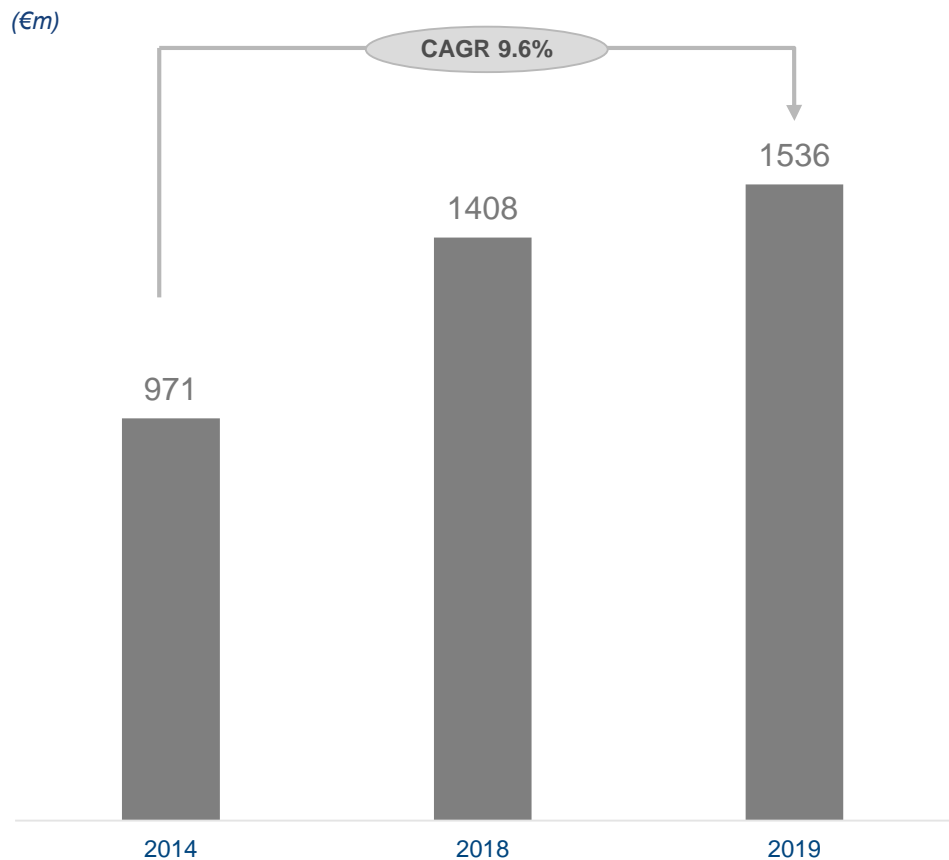
Op. EBITDA
incl. IFRS 16

Notes: 1) Divisional historic figures do not add up to group EBITDA excluding consolidations/other; 2) 2014 represents the first year that Knorr-Bremse prepared its financial statements in accordance with IFRS. Prior to 2014, financial statements were only prepared in accordance with German GAAP (HGB). IFRS differs in certain aspects from German GAAP (HGB), and accordingly data presented in accordance with German GAAP (HGB) may not be comparable to data prepared in accordance with IFRS; 3) EBITDA 2010 including extraordinary expenses due to BilMOG; Source: Knorr-Bremse information

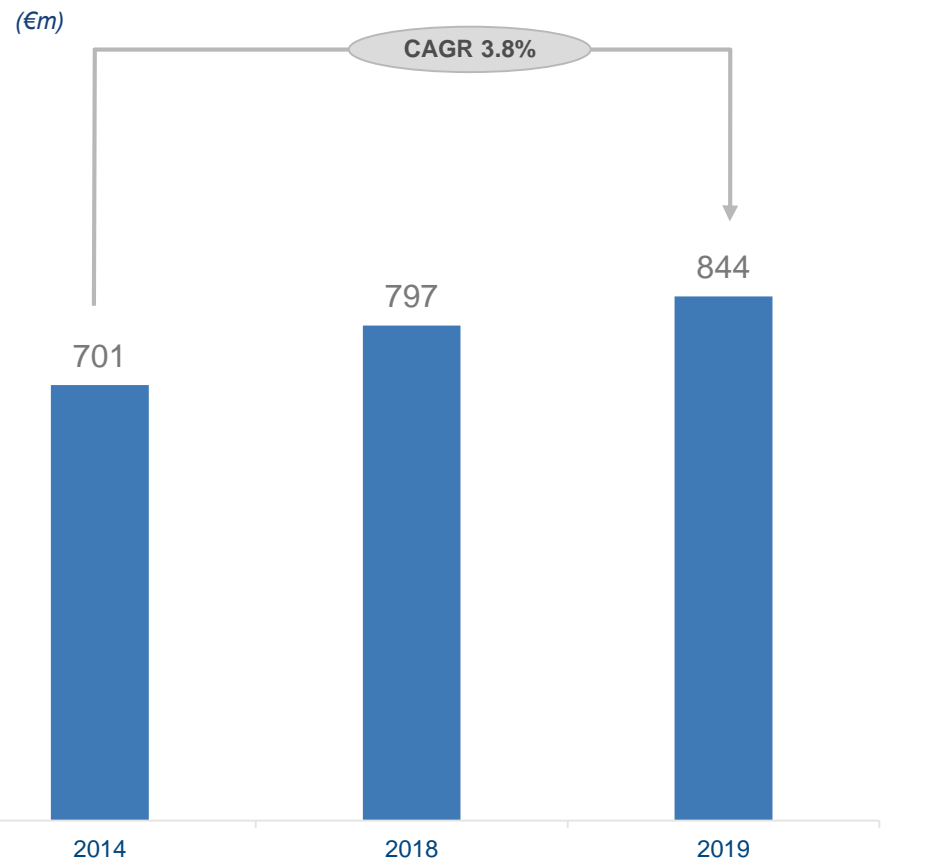
... all supported by strong aftermarket sales growth



RVS – Aftermarket sales ¹⁾



CVS – Aftermarket sales ¹⁾

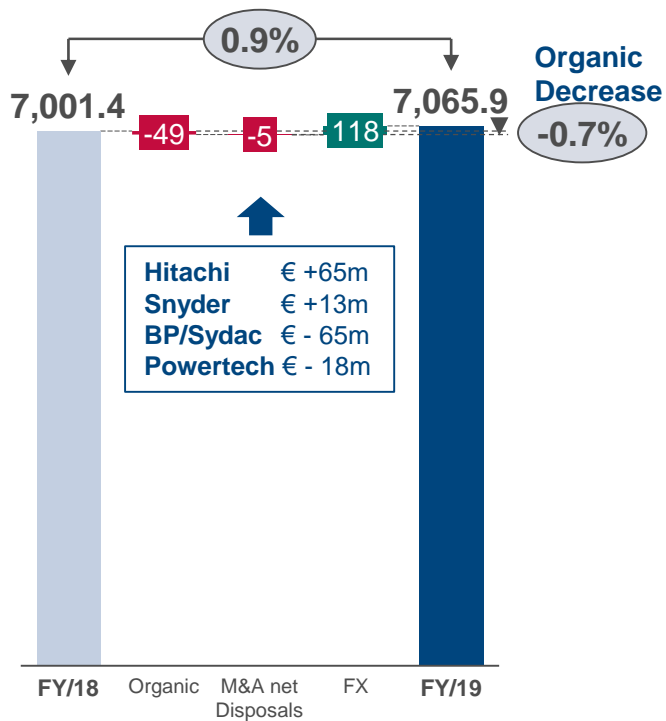


Notes: 1) Based on IFRS; BilRUG sales allocated proportionally between OE and aftermarket; Source: Knorr-Bremse information

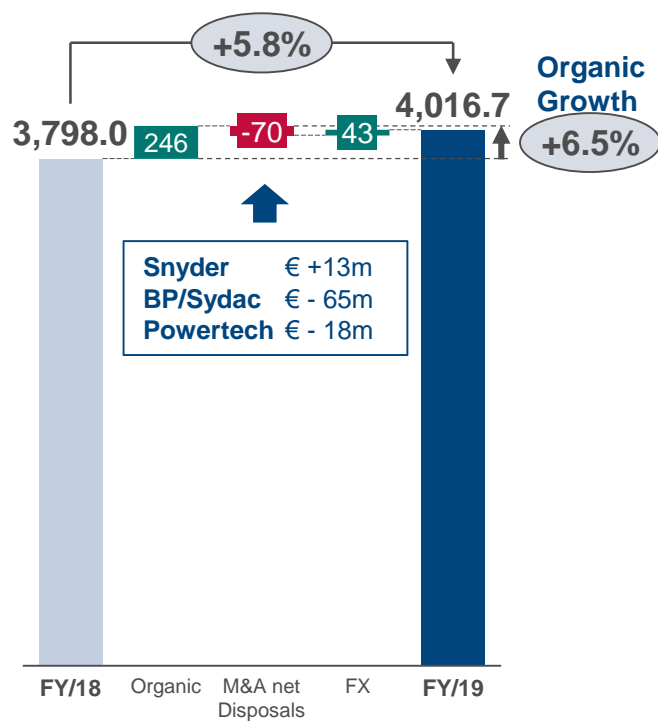


Order Intake for Group, RVS & CVS FY/19

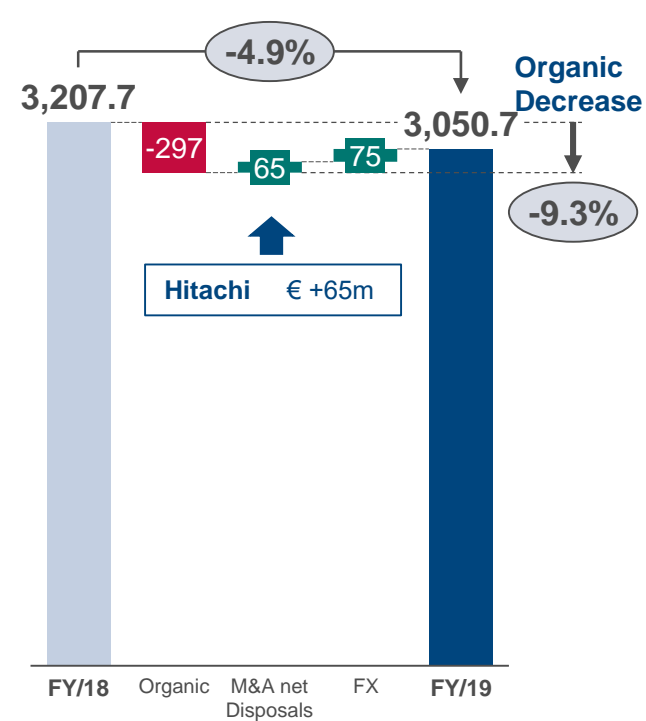
Group
€m



RVS
€m

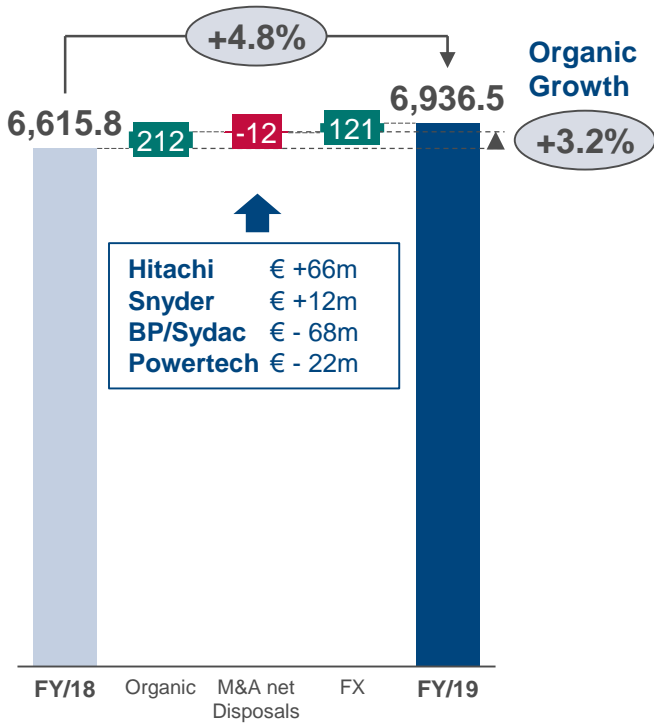


CVS
€m

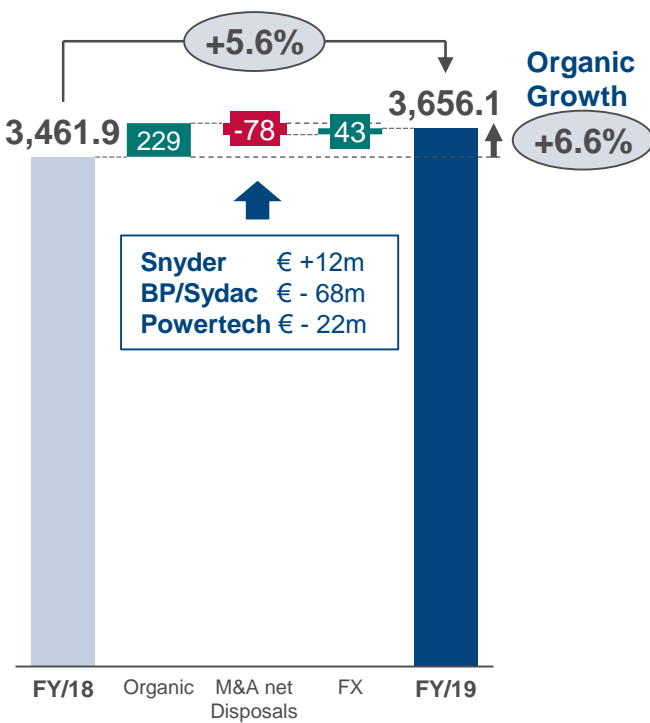


Revenue for Group, RVS & CVS FY/19

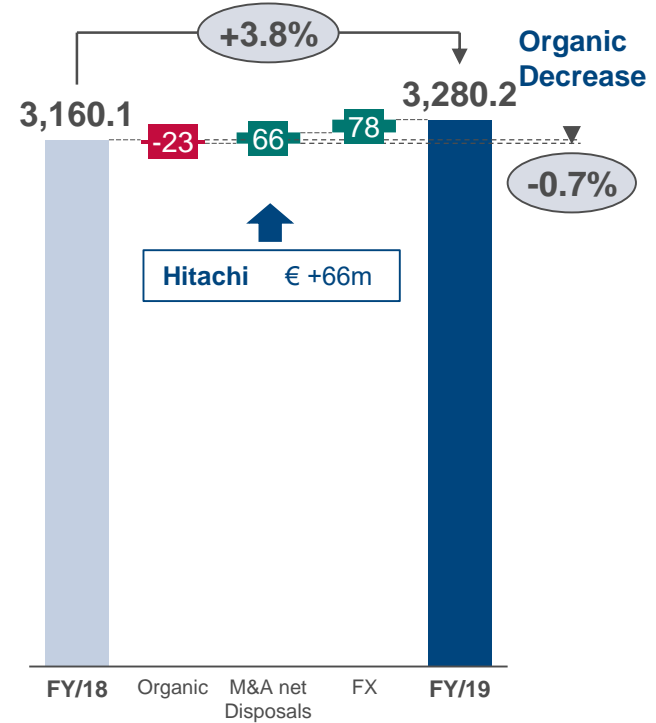
Group
€m



RVS
€m



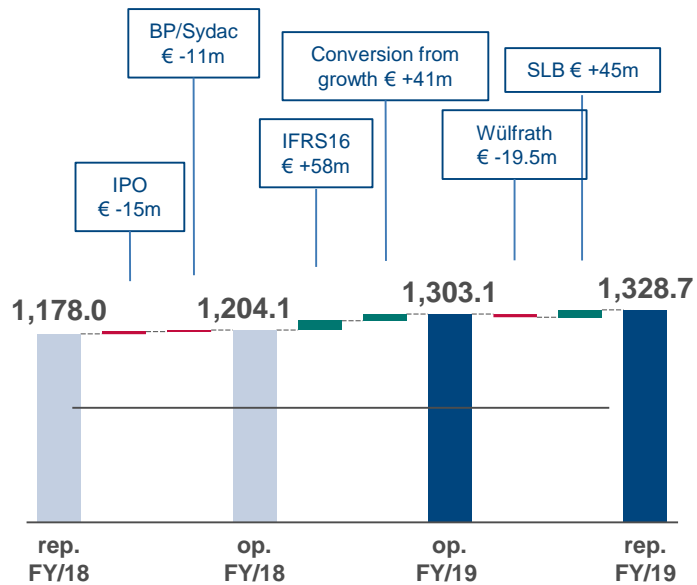
CVS
€m



EBITDA for Group, RVS & CVS FY/19

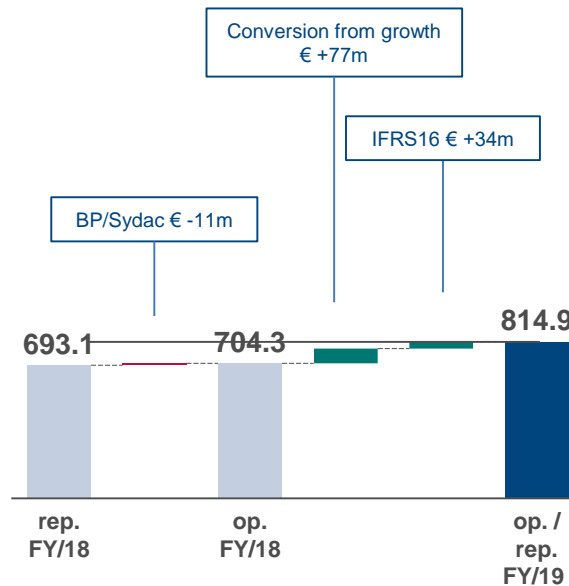
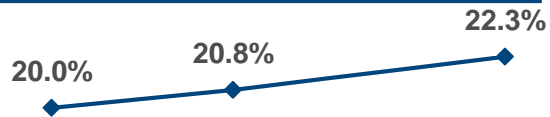
Group

€m



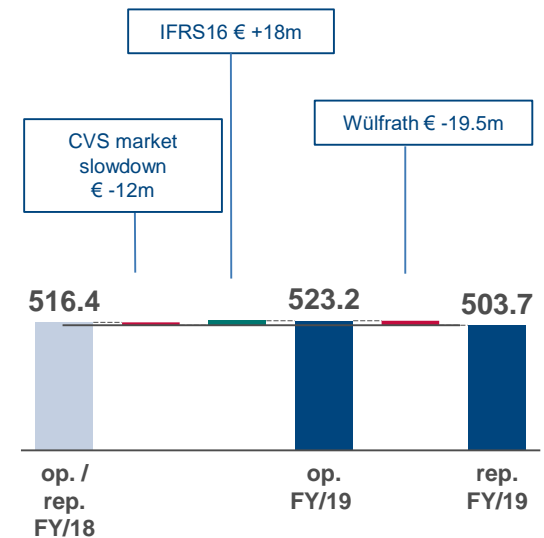
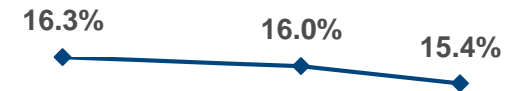
RVS

€m



CVS

€m



◆ EBITDA Margin

Focus on quality of earnings – a closer look at key P&L items

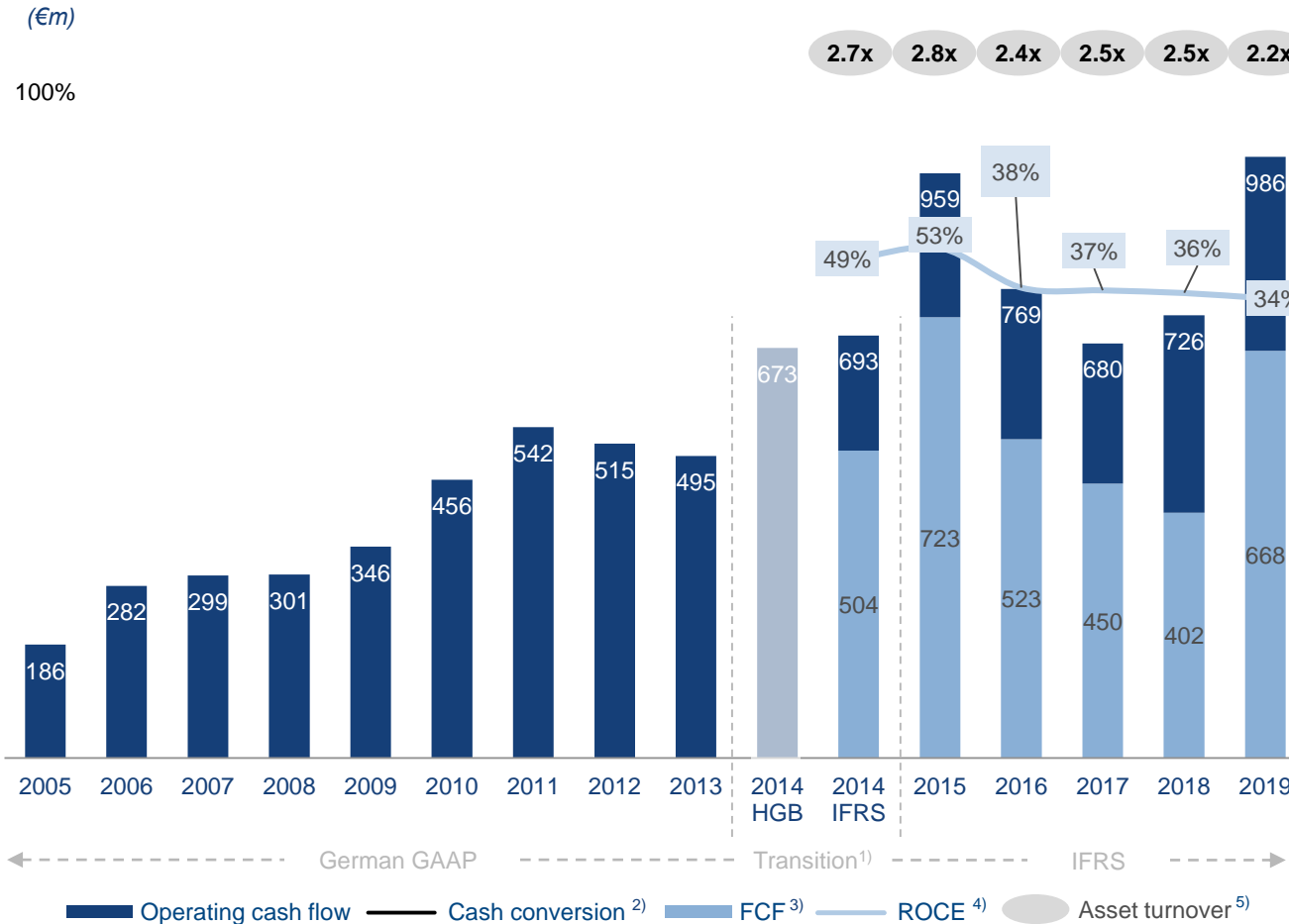
Key items

€m	2015	2016	2017	2018	2019
Net sales	5,824	5,471	6,154	6,616	6,937
<i>% growth</i>	11.6%	(6.0%)	12.5%	7.5%	5.4%
Changes in inventory of finished and unfinished goods	(7)	(11)	39	34	6
Own work capitalised	19	21	32	48	73
Total operating performance	5,836	5,481	6,224	6,698	7,016
Other operating income	89	83	81	66	117
Material expenses	(2,747)	(2,571)	(3,010)	(3,318)	(3,429)
Personnel costs ¹⁾	(1,272)	(1,272)	(1,439)	(1,497)	(1,594)
Other operating expenses	(636)	(669)	(741)	(771)	(782)
EBITDA	1,269	1,052	1,116	1,178	1,329
<i>Margin, %</i>	21.8%	19.2%	18.1%	17.8%	19.2%
Depreciation / Amortisation	(170)	(166)	(211)	(206)	(266)
EBIT	1,099	886	904	972	1,063
<i>Margin, %</i>	18.9%	16.2%	14.7%	14.7%	15.3%
Financial result	(51)	(45)	(52)	(97)	(156)
EBT	1,048	841	852	876	907
<i>Margin, %</i>	18.0%	15.4%	13.9%	13.2%	13.1%
Income tax	(337)	(274)	(265)	(246)	(275)
<i>Effective tax rate</i>	32.2%	32.6%	31.1%	28.1%	30.3%
Net income	711	567	587	629	632

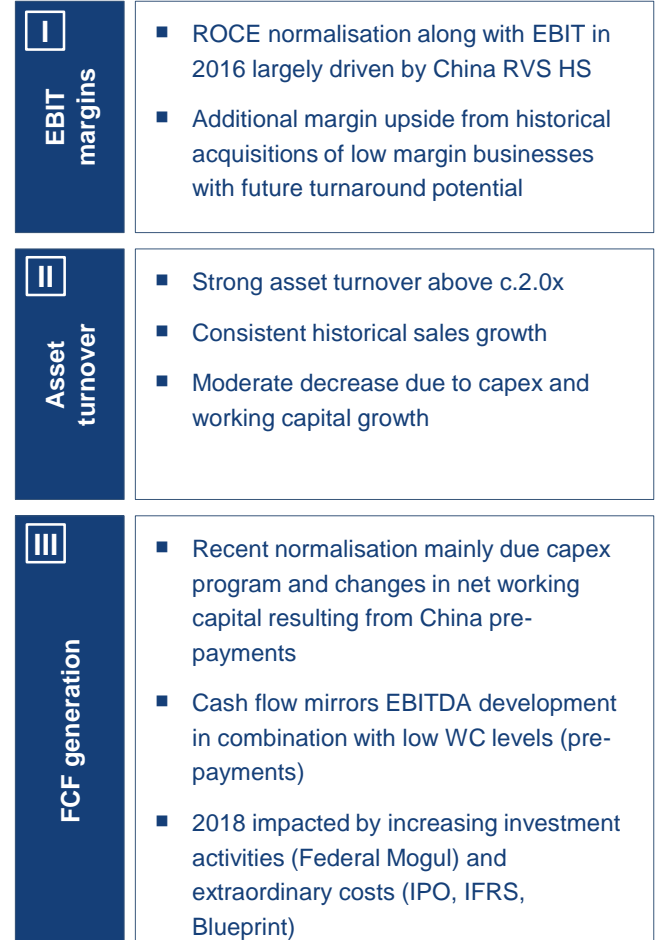
Notes: Based on financial statements prepared in accordance with IFRS; 1) Including leased personnel; Source: Knorr-Bremse information

Knorr-Bremse is a high return and cash generative business

Strong cash generation abilities



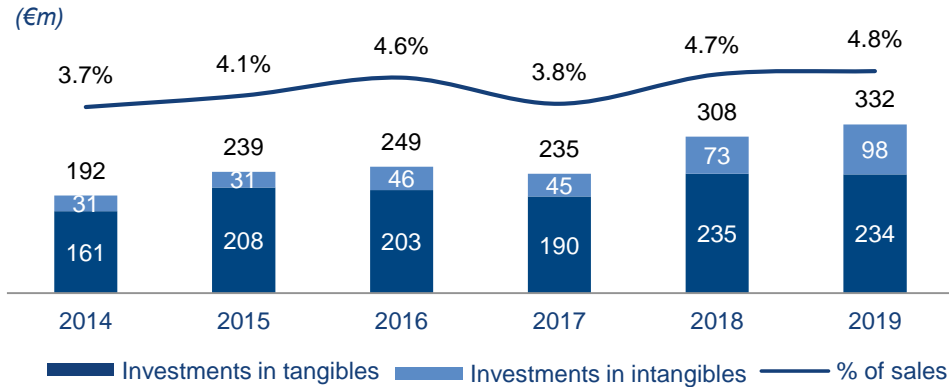
Key drivers and factors



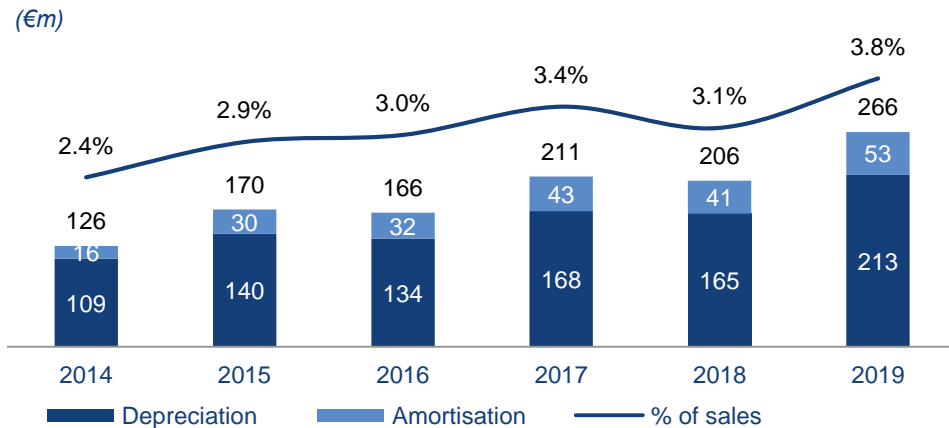
Notes: 1) 2014 represents the first year that Knorr-Bremse prepared its financial statements in accordance with IFRS. Prior to 2014, financial statements were only prepared in accordance with German GAAP (HGB). IFRS differs in certain aspects from German GAAP (HGB), and accordingly data presented in accordance with German GAAP (HGB) may not be comparable to data prepared in accordance with IFRS; 2) Cash conversion defined as: (OCF - investments in fixed assets - investments in intangible assets) / net income; 3) FCF (Free Cash Flow) defined as cash flow from operations minus cash-relevant capex; 4) ROCE defined as EBIT divided by capital employed (Fixed assets + Intangible assets + Net working capital); 5) Asset turnover defined as sales divided by capital employed; Source: Knorr-Bremse information

Fully invested asset base driving low capex requirements

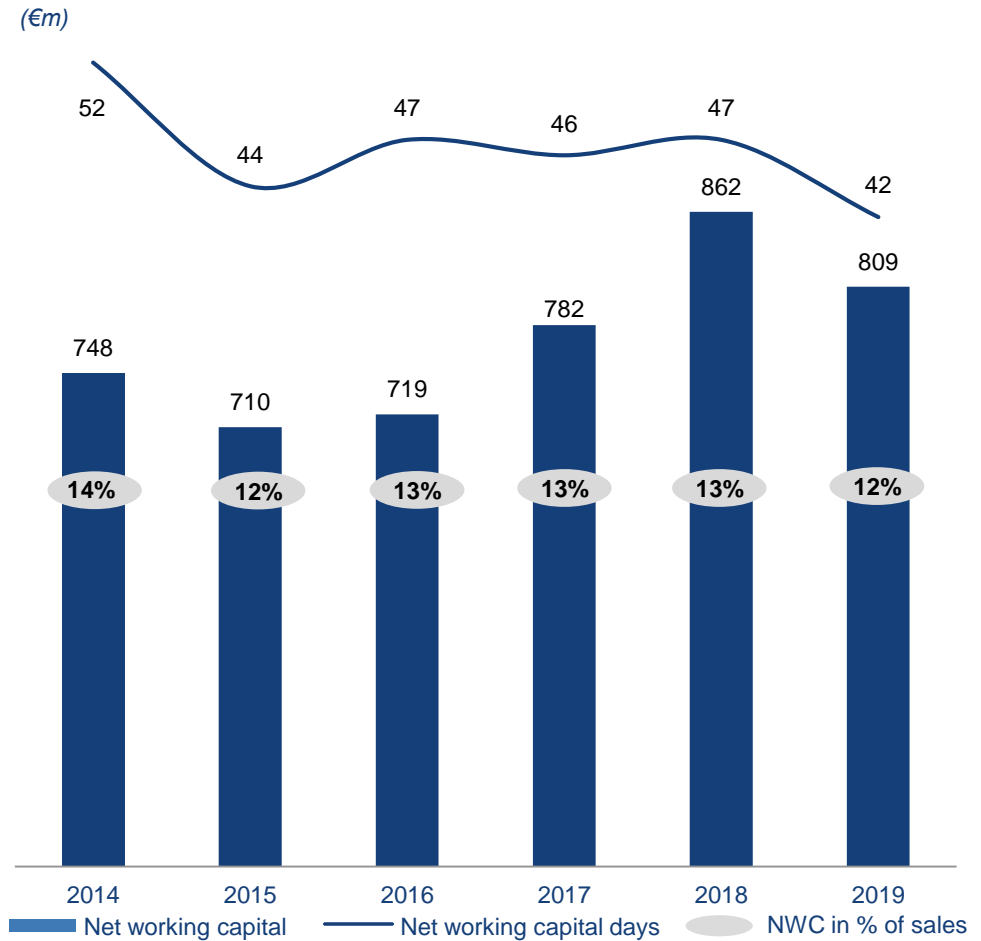
Capex¹⁾



D&A



Net working capital²⁾

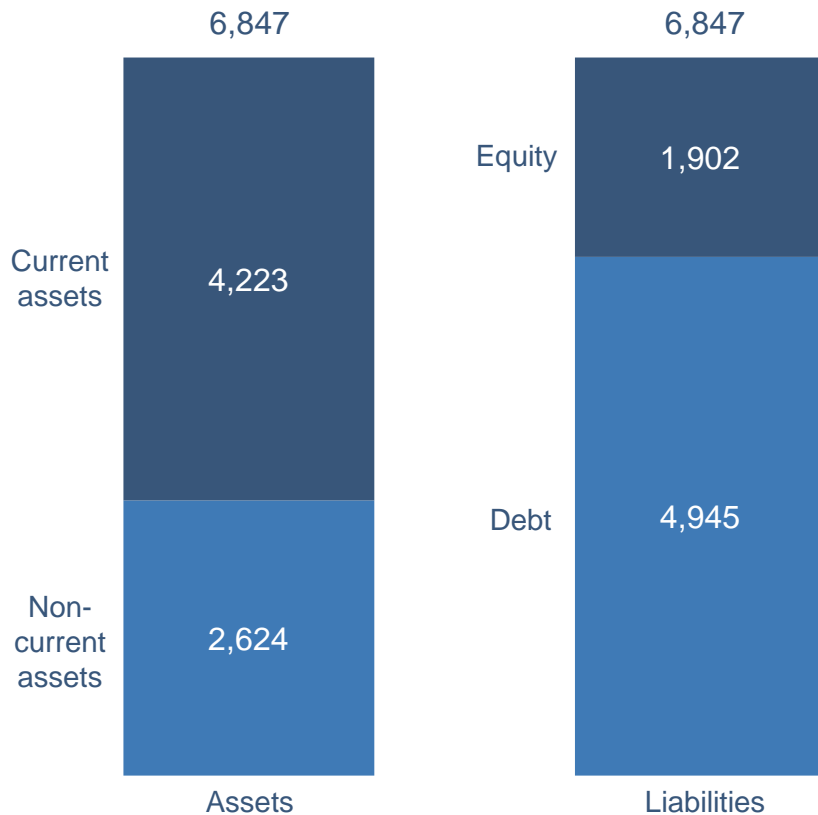


Notes: Based on financial statements prepared in accordance with IFRS; 1) As per asset register, defined as investments in fixed and intangible assets incl. finance leasing; 2) Net working capital defined as Inventory + Accounts receivables + Construction contracts with positive balances - Accounts payables - Construction contracts with negative balances - Prepayments received; 3) Step-ups from key PPA's (Selectron, Powertech, GT & Kiepe Electric); 4) Including €25m from impairment of assets held for sale; Source: Knorr-Bremse information

Healthy capital structure and financial position

Capital structure as of December 31, 2019

(€m)



Solid financial position as of December 31, 2019

- Equity ratio: 27.8%
- Net cash: €59m
- Cash and cash equivalents: €1,881m
- Additionally, €750m drawn from credit lines in March/April 2020

Notes: Based on financial statements prepared in accordance with IFRS; Source: Knorr-Bremse information

Knorr-Bremse mid term guidance

Assumptions

- Stable political and macro environment
- Stable FX, based on current rates

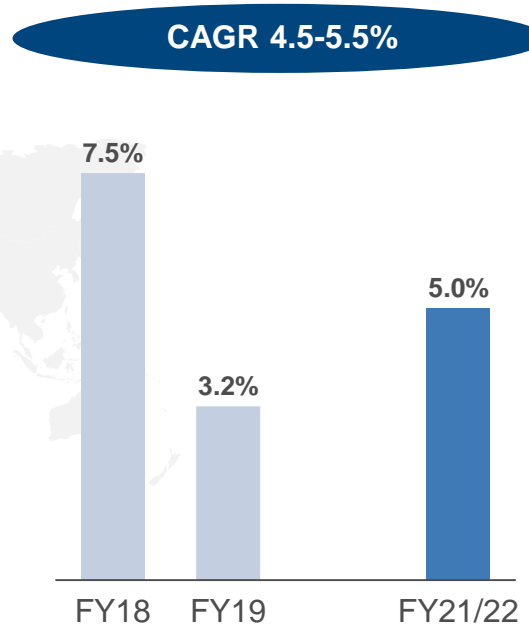
RVS

- Successful execution of AM strategy
- Continued solid growth of passenger rail with strong support from global ESG initiatives

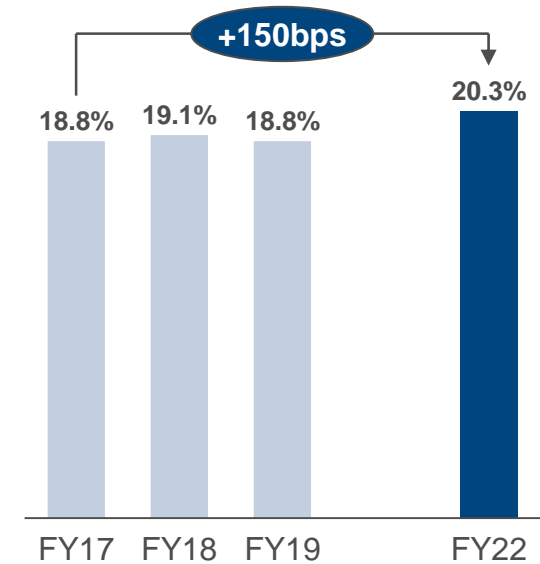
CVS

- TPR recovery in 2021 and 2022
 - Assumption: CAGR of 1%
- Continued content per vehicle growth
- Initially, steering margins dilutive
- Successful execution of efficiency program

Organic revenue growth



Operating EBITDA margin



Note: All years include the IFRS 16 impact of ~ 70bps

Knorr-Bremse ticks all the boxes of a best-in-class industrials company

Track record of organic growth market outperformance

~7% sales CAGR (2010–2019)¹⁾ plus selective, value-added M&A



Strong profitability & cash flow vs. peers

Sustainable EBITDA margin range of ~18–20% (2014–2019)²⁾



Sustainable cash conversion range of ~80–90% (2014–2019)²⁾



Consistent high return on capital

ROCE range of ~34–53 % (2014–2019)²⁾



Proven resilience through the cycle

Aftermarket exposure of ~30–35% of sales (2014–2019)



Well-balanced regional and divisional sales mix



Notes: 1) Based on financial statements prepared in accordance with German GAAP (HGB); Group net sales including BilRUG without acquisitions for RVS and CVS; 2) Based on financial statements prepared in accordance with IFRS; Source: Knorr-Bremse information

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Knorr-Bremse to become carbon neutral from 2021

CARBON NEUTRALITY FROM 2021

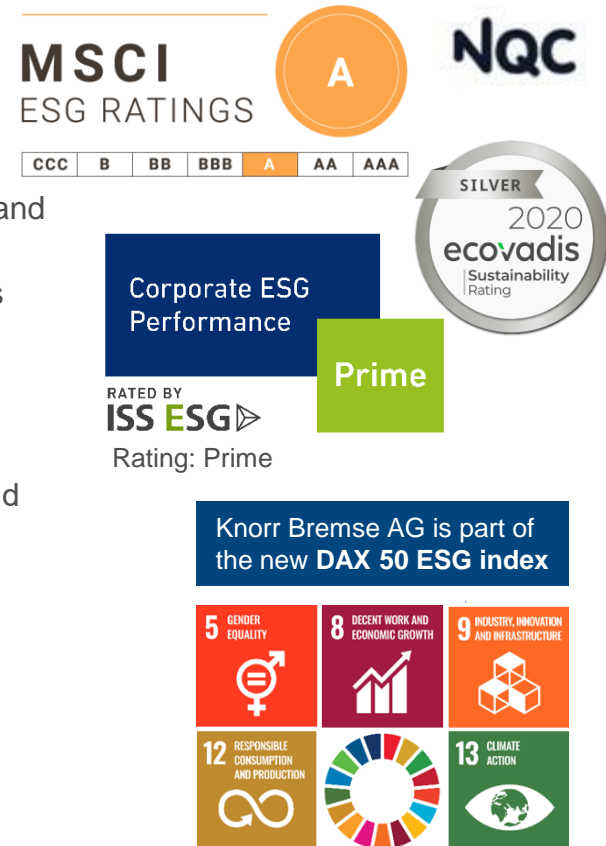
- KB renews its climate strategy with even more ambitious targets
- 50% CO₂ emission reduction by 2030
- Additionally: Increasing purchase of renewable energy and carbon offsetting
- Starting point of CO₂ emissions in 2018 at 143,000 tons

CONTRIBUTION BY OUR PRODUCTS

- Rail is a cornerstone of eco-friendly transport solutions
- Truck products support lower fuel consumption
- ~9% of KB's revenues are driven by remanufactured and recycled products
- Circular economy supported by remanufactured and overhauled products

FOCUS ON 5 SDGs

- In 2018 ~150 top managers of KB committed to 5 core United Nations Sustainability Development Goals
- Sponsorship of Executive Board Members to drive initiatives around the KB world



Knorr-Bremse takes active part in corporate memberships throughout the world



United Nations Global Compact (participation since 2010)



APTA - American Public Transportation Association, USA



AAR - Association of American Railroads, USA



AIAG - Automotive Industry Action Group, USA



MEMA - Motor & Equipment Manufacturers Association, USA



New York and New Jersey Minority Supplier Development Council, USA

UNIFE - Sustainable Transport Committee of the Union des Industries Ferroviaires Européennes, BEL



VDA - Verband der Automobilindustrie e. V., GER Working Groups: Sustainable supply chain & products



Railsponsible – founding member (sustainable rail supply chain initiative)



VDB - Fachgruppe Umwelt im Verband der Bahnindustrie e. V., GER



APRA - Automotive Parts Remanufacturers Association - Chairman Europe



Achieved CSR ratings and awards

CSR Ratings



C+



Silver

NQC

95%



C

Awards



Top employer
5th time in a row



Supplier
Sustainability
Award 2014



Industrial
Sustainability
Supplier 2015



Special Price:
"Green Award"
2018

Our CR policy and focus areas



Strategy and management

We aim for **sustainable value creation**. By this we understand achieving long-term economic success while at the same time acting responsibly towards our employees and business partners as well as the environment and society.

We are committed to **sustainable corporate governance** that includes environmental and social aspects in strategic planning, management and corporate processes.

We act and work according to **legal and ethical principles** laid down in our Group-wide Code of Conduct.



Products and partners

We consistently work on developing **innovative products** and solutions that combine a high degree of customer value with a contribution to sustainable development. Safety is always our overriding goal.

We **work closely with our customers and suppliers** to jointly ensure continuous improvement of product quality and minimal undesirable impact on the environment and society.

We take into account and support the activities of our **business partners aimed at improving their environmental and social compatibility**.



Commitment and society

We are involved, as a member of society, in **social issues** and are engaged world-wide as a **good corporate citizen**. We supplement the activities of the charitable organization Knorr-Bremse Global Care e.V. with social projects implemented directly at our production sites (Local Care).

We encourage and support **social involvement on the part of our employees**.

We see ourselves as **partners for the regions** in which we live and work, and we support their long-term development.



Employees and governance

We create an attractive working environment in which the principles of **mutual trust, team-work, diversity and equality of opportunity** as well as fair and respectful treatment of each other are recognized and practiced.

We offer a **safe and healthy working environment** and enable our employees to develop their **own individual potential**.

We conduct an ongoing **dialogue with our managers** on the subject of value-oriented, sustainable corporate governance.



Environment and climate

We accept our **responsibility for ensuring a clean environment and protecting the climate** and operate in compliance with our **HSE Policy** (Health, Safety and Environment).

We have set ourselves the goal of handling **resources in a responsible manner**, consistently reducing **CO2 emissions, minimizing** and where possible **avoiding undesirable impact** on nature and the environment and actively using opportunities to **protect the environment**.

We are concerned to optimize the **environmental compatibility** of our products across their **entire life-cycle**.



Communication and co-operation

We seek constructive **dialogue with our stakeholders** and provide them with regular and transparent updates on our sustainability activities.

We support social, educational and environmental projects and enter into **partnerships with organizations** that contribute towards sustainable development.

The basis of our responsibility

Our values

Growing with Values.



- Entrepreneurship
- Technological Excellence
- Reliability
- Passion
- Responsibility

UN Global Compact



Commitment to ten basic principles:

- Human rights
- Labor standards
- Environmental protection
- Anti-corruption

CR Policy



- Comprises our understanding of Corporate Responsibility
- Sets down guidelines for our CR focus areas
- Points out the main focus of our efforts to realize social and environmental responsibility

In 2018 Knorr-Bremse selected its Core Sustainable Development Goals (SDGs)



Our 9 material (non-financial) corporate responsibility areas

Evaluation of non-financial facts was carried out in the workshop on the basis of qualitative considerations regarding the extent of business relevance and its impact (2018)

Anti-corruption and fair competition

Product and system safety

Ecological product design

Energy and CO₂ emissions

Personnel development

Sustainability standards in the supply chain

Employment conditions

Occupational safety and health protection

Diversity and equality

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Share data

Type of share	Bearer shares with no-par value
Bloomberg ticker	KBX
Reuters ticker	KBX.DE
German security identification number (WKN)	KBX100
ISIN	DE000KBX1006
Shares outstanding as at December 31, 2018	161.200.000

The Corporate Bonds of Knorr-Bremse AG

Security Identification Number	A2LQP5	Security Identification Number	A2DARP
International Securities Identification Number	XS1837288494	International Securities Identification Number	XS1531060025
Issuer	Knorr-Bremse AG	Issuer	Knorr-Bremse AG
Issuer ratings	A2/outlook stable (Moody's), A/outlook stable (Standard & Poor's)	Issuer ratings	A2/outlook stable (Moody's), A/outlook stable (Standard & Poor's)
Volume	EUR 750 million	Volume	EUR 500 million
Term	7 years	Term	5 years
Settlement	June 14, 2018	Settlement	December 6, 2016
Maturity	June 13, 2025	Maturity	December 8, 2021
Coupon	1.125% p. a.	Coupon	0.5% p. a.
Reoffer spread	1.188% p. a.	Reoffer spread	0.571% p. a.
Listing	EURO MTF Luxembourg	Listing	EURO MTF Luxembourg
Denomination	EUR 1,000	Denomination	EUR 1,000
Applicable law	German law	Applicable law	German law

Strong current rating: S&P (A) and Moody's (A2)

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Glossary (1/2)

%	Percentage	CF	Cash flow	ELC	Electronic leveling control
ABS	Anti-lock brake system	CFO	Chief Financial Officer	EOP	End of period
ACC	Adaptive Cruise Control	CKR	Czech Koruna	ESP	Electronic stability program
AD	Automated Driving	CNY	Chinese Yuan	EU	Europe, European Union
ADAS	Advanced driver-assistance systems	CVS	Commercial Vehicle Systems	EUR	Euro
ADB	Air Disk Brake	D&A	Depreciation & Amortization	FTE	Full-time equivalent
AEBS	Advanced Emergency Braking System	DE	Germany	GAAP	Generally Accepted Accounting Principles
AG	Aktiengesellschaft (German: Stock Corporation)	DoI	Date of Implementation	GBP	British Pound
AM	Aftermarket	e	Expected	GDP	Gross domestic product
BDM	Brake Distance Management	EAC	Electronic Air Control	GSBC	Global Scalable Brake Control
bn	billion	EBIT	Earnings before Interest, Tax	HQ	Headquarters
CAGR	Compound Annual Growth Rate	EBITDA	Earnings before Interest, Tax, Depreciation, Amortization	HSR	High-speed rail
CAPEX	Capital expense	EBS	Electronic brake system	HU	Hungary
CEO	Chief Executive Officer	EGR	Exhaust Gas Reduction	HUF	Hungarian Forint

Glossary (2/2)

HVAC	Heating, ventilation & air conditioning	LDW	Lane Departure Warning	TCO	Total cost of ownership
IAA	International Automobil-Ausstellung (German: International Motor Show)	m	million	TPR	Truck Production Rate
IAM	Independent Aftermarket	M&A	Merger & acquisitions	UIC	International union of railways
iCOM	Intelligent Condition-Oriented Maintenance	OEM, OE	Original equipment manufacturer	US	United States
IFRS	International Financial Reporting Standards	OES	Original equipment service	USD	US Dollars
IN	India	OPEX	Operating expense	WC	Working Capital
IoT	Internet of Things	p.a.	per annum		
IPO	Initial Public Offering	PWM	Private Wealth Management		
JV	Joint venture	R&D	Research & Development		
KB	Knorr-Bremse	ROE	Return on Equity		
KB2020	Knorr-Bremse 2020	ROS	Return on Sales		
KPI	Key Performance Indicator	RVS	Rail Vehicle Systems		
LCC	Life-cycle cost	TCMS	Train Control Management System		

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