Capital Market Lunch

RALPH HEUWING I CFO
DR. PETER LAIER I HEAD OF CVS
DR. JÜRGEN WILDER I HEAD OF RVS

SEPTEMBER 12, 2019
## Knorr-Bremse Capital Market Lunch – Agenda

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<th>Introduction</th>
<th>Ralph Heuwing</th>
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<td>Ralph Heuwing</td>
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<td>Dr. Peter Laier</td>
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<td>Dr. Jürgen Wilder</td>
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<td>4.</td>
<td>Deep Dive RVS</td>
<td>Dr. Jürgen Wilder</td>
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Capital Market Lunch

Financial Results H1/19

RALPH HEUWING | CFO
SEPTEMBER 12, 2019
Financial highlights H1/19 – once again, we delivered on our IPO promise

- **Order intake**: €3.58bn, +1.8% yoy
- **Order book**: €4.54bn, +3.9% yoy
- **Revenue**: €3.60bn, +8.4% yoy
- **Operating EBITDA margin**
  - 1) 2019 operating EBITDA excl. restructuring regarding Wülfrath & incl. IFRS16: €1.88bn, +7.6% yoy
  - PY: 18.0%
- **Operating EBITDA**: €685m, PY: €590m
- **Operating EBITDA**: €1.73bn, +9.5% yoy
- **EPS**: €2.13, +21.1% yoy

1) 2019 operating EBITDA excl. restructuring regarding Wülfrath & incl. IFRS16
Resilient outperformance thanks to high-quality business model

<table>
<thead>
<tr>
<th></th>
<th>Global #1</th>
<th>Synergistic business</th>
<th>Market outperformance</th>
<th>The industry innovator</th>
<th>Resilience</th>
<th>Superior financial profile</th>
<th>Leadership excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
<td>Technology and scale benefits between rail and commercial vehicles</td>
<td>Consistent outperformance of attractive end-markets driven by megatrends and increasing content per vehicle</td>
<td>Driving innovation in mobility and transportation technologies through R&amp;D, quality excellence and edge in connected systems</td>
<td>Resilient business model, supported by broad geographical and customer diversification, high aftermarket exposure and strong localisation</td>
<td>Strong growth, profitability, and cash generation with high earnings visibility</td>
<td>Highly experienced management team with strong track record and clear vision for future value creation and firm commitment to Knorr-Bremse</td>
</tr>
</tbody>
</table>
Continued strong growth, clearly outperforming underlying markets and peers

Revenue

€m

By type

H1/18  Organic  M&A net disposals  FX  H1/19

3,322  225  -20  75  3,602

+6.8%  +8.4%

M&A net disposals

- Hitachi  € +21m
- Snyder  € +4m
- BP/Sydac  € -45m

By region

H1/18  H1/19

SA  Asia/Pacific

3,322  52  3,602  55

+5.7%  +23.5%  +2.4%

NA

937  681  1,013  841

+8.1%  +8.1%

EU

1,653  1,692

+2.4%

Notes:

- 6H growth compared to 6H 2018
- H1/19 includes Hitachi 52m, Snyder 4m, BP/Sydac 45m
- M&A net disposals
  - Hitachi 21m
  - Snyder 4m
  - BP/Sydac 45m

SA

Asia/Pacific

NA

EU
Healthy order book and continued good visibility

**Order intake**

<table>
<thead>
<tr>
<th>€m</th>
<th>3,517</th>
<th>34</th>
<th>65</th>
<th>3,581</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M&amp;A net disposals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FX</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H1/18</strong></td>
<td></td>
<td></td>
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</tbody>
</table>

**% Change**

- +1.8%
- +1.0%

**Order book**

<table>
<thead>
<tr>
<th>€m</th>
<th>4,372</th>
<th>4,542</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H1/18</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H1/19</strong></td>
<td></td>
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</tr>
</tbody>
</table>

**% Change**

- 3.9%

**M&A net disposals**

- Hitachi € +21m
- Snyder € +4m
- BP/Sydac € -60m

**Book-to-bill**

<table>
<thead>
<tr>
<th>Visibility in months defined as FY guidance (mid) × 12</th>
</tr>
</thead>
</table>
Strong EBITDA margin development in H1/19, particularly in Q2/19

Q2/19 with strongest quarterly operating EBITDA (€ 352m) since 2017

- Operating EBITDA margin increased by 210bps to 19.1% in Q2/19, despite lower AM share (down from 34% to 32%)

Both divisions contribute

- **RVS**: Healthy mix, strong AM, operating leverage, increased productivity, benefits from disposals
- **CVS**: Resilient performance, content per vehicle, market share gains
Strong EBIT margin development in H1/19, particularly in Q2/19

Operating EBIT strongly increased from € 244m (Q2/18) to € 285m (Q2/19)
- Growth solely driven by organic growth
- Operating EBIT margin advanced 100bps to 15.5% in Q2/19

D&A increase Q2/19 vs. Q2/18:
- Wülfrath € 10.4m
- IFRS16 impact € 11.2m
Strong improvements in operating and free cash flow in H1/19

**FCF & OCF**

<table>
<thead>
<tr>
<th></th>
<th>€m</th>
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<th>€m</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>FCF</td>
<td>OCF</td>
<td>FCF</td>
<td>OCF</td>
</tr>
<tr>
<td>H1/18</td>
<td>150</td>
<td>249</td>
<td>178</td>
<td>311</td>
</tr>
<tr>
<td>H1/19</td>
<td>30.6.18</td>
<td>+24.6%</td>
<td>30.6.19</td>
<td>+18.6%</td>
</tr>
</tbody>
</table>

**CapEx**

<table>
<thead>
<tr>
<th></th>
<th>% of sales</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H1/18</td>
<td>3.2%</td>
<td>106</td>
<td>30.6.18</td>
</tr>
<tr>
<td>H1/19</td>
<td>3.7%</td>
<td>134</td>
<td>30.6.19</td>
</tr>
</tbody>
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**NWC**

<table>
<thead>
<tr>
<th></th>
<th>Scope of days</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30.6.18</td>
<td>55.0</td>
<td>1,015</td>
<td>30.6.19</td>
</tr>
<tr>
<td>30.6.19</td>
<td>57.1</td>
<td>1,142</td>
<td></td>
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**op. ROCE**

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<thead>
<tr>
<th></th>
<th>%</th>
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<tbody>
<tr>
<td>H1/18</td>
<td>35.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1/19</td>
<td>35.5%</td>
<td></td>
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1) Before acquisitions and IFRS16 2) 2019 operating ROCE adjusted by Wülfrath (150bps) & IFRS16 (270bps)
**RVS: Strong order book and high visibility**

### Order intake

<table>
<thead>
<tr>
<th>€m</th>
<th>By type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.08</td>
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</tbody>
</table>

**Organic growth**

- 72 (1.9%)
- 20
- 56 (3.8%)

**Organic order intake up 3.8% in H1/19**

- Project rollover from Q2/19 to Q3/19 (temporary fluctuation)
- Freight & Locomotive, Mass transit and AM with strong growth in NA
- Growing order intake Asia through AM China and bulk order HVAC
- Tougher comps in Q2/18: Blueprint added € +48m (sold in H2/18) & one-time bulk order at Kiepe € +72m

### Order book

<table>
<thead>
<tr>
<th></th>
<th>FY guidance (mid) x 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>10.5</td>
</tr>
<tr>
<td>M&amp;A net disposals</td>
<td>10.7</td>
</tr>
<tr>
<td>FX</td>
<td></td>
</tr>
</tbody>
</table>

**Solid growth in order book continued: € +240m**

- Visibility of 11 months remaining on high level
RVS: Strong revenue growth with particularly strong margin expansion

Continued strong organic revenue growth of € +61m (+6.7%) more than compensated divestments (€ -25m) in Q2/19

- **EU**: Good development of regional/commuter, HS, freight and strong AM business (ex disposals)
- **Asia**: Strong growth of AM in China & India
- **NA**: Positive development in brakes, strong AM as well as locomotive and freight business
- **Organic AM increased by 6.3% in Q2/19 (revenue share AM Q2/19: 42%; Q2/18: 43% ex disposals)**

Particularly strong EBITDA margin development in Q2/19

- Operating leverage and performance improvement
- Improved OE/AM mix effect in Q2/19 vs. Q1/19
CVS: Order growth positive with help from FX and M&A

**Order intake**

<table>
<thead>
<tr>
<th>€m</th>
<th>By type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.03</td>
<td>+1.8%</td>
</tr>
<tr>
<td>0.96</td>
<td>-5.2%</td>
</tr>
</tbody>
</table>

H1/18: 1,629
-36
-2.2%
Organic growth

H1/19: 1,659
-21
-1.9%

**Order book**

Organic order intake Q2/19 slightly down by -1.9% y-o-y
- North America continued to support organic order intake in Q2/19, due to increase of content per vehicle (ADB, EBS, Steering) and market share gains
- Organic order intake down in Europe
- Double digit organic growth of order intake in Asia

Order book moderately lower with 4.8 months of visibility

- H1/18: 1,367
- H1/19: 1,296

Organic M&A net disposals

FX

Visibility in months defined as Order book FY guidance (mid) × 12
## CVS: Strong revenue growth at stable operating margin

### Revenue

<table>
<thead>
<tr>
<th></th>
<th>€m</th>
<th>By type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H1/18</td>
<td>Organic M&amp;A net disposals</td>
</tr>
<tr>
<td></td>
<td>1,577</td>
<td>+9.5%</td>
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### EBITDA

<table>
<thead>
<tr>
<th></th>
<th>rep.</th>
<th>rep.</th>
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<tbody>
<tr>
<td></td>
<td>op.</td>
<td>op.</td>
</tr>
<tr>
<td></td>
<td>15.3%</td>
<td>16.3%</td>
</tr>
<tr>
<td></td>
<td>16.5%</td>
<td>16.5%</td>
</tr>
</tbody>
</table>

- **Organic growth**
  - +5.1%
  - +9.5%

### Revenue growth drivers

- **Growing content per vehicle clearly outperforming TPR**
- **Global TPR on comparable level vs. H1/18 (-1%)**
- **EU**: Moderate OE growth vs. decreasing AM
- **Asia**: Strong OE growth, plus Hitachi € +21m in Q2/19
- **NA / SA**: Strong OE growth from market and content
- **AM revenue flat in Q2/19 y-o-y and revenue share at 22%; driven by strong OE and de-stocking of AM customers**

**Q2/19 operating EBITDA margin of 15.9%**

- **Adverse OE/AM mix effect**
- **Lower operational performance of Wülfrath**
- **Material cost and supply chain situation still challenging**
- **Continued R&D outspending in megatrend technologies and ADAS/HAD**

### Additional Notes

1) H1/19 operating EBITDA excl. restructuring regarding Wülfrath & incl. IFRS16
## Guidance confirmed for 2019

### Market developments and KB response

#### Market developments
- Political uncertainties, but supportive interest rate outlook
- CVS: slowing order momentum
- RVS: continued strong demand

#### KB response
- Global footprint and strong localisation
- CVS: cost program for margin stability and plant closure in Wülfrath
- RVS: ensuring strong conversion from growth
- Cash program (NWC, Capex)

### Revenue

<table>
<thead>
<tr>
<th></th>
<th>H1/19</th>
<th>2019 Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue (€m)</td>
<td>3,602</td>
<td>6,875 - 7,075</td>
</tr>
</tbody>
</table>

### op. EBITDA margin

<table>
<thead>
<tr>
<th></th>
<th>H1/19</th>
<th>2019 Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmed</td>
<td>19.0%</td>
<td>18.5 – 19.5%</td>
</tr>
</tbody>
</table>

1) 2019 operating EBITDA excl. restructuring measures & incl. IFRS16
Capital Market Lunch

Deep Dive CVS

DR. PETER LAIER | HEAD OF CVS
SEPTEMBER 12, 2019
### CVS with high-quality business model – Outperformance and resilience

|---|----------------------|--------------------------|--------------------------|-------------------------|-------------|-----------------|
|   | **Global market leader with increasing market share** | **Technology leader with innovation power shaping major industry trends** | **Safety-critical highly technological products**
One of only two suppliers with global technology know-how and capabilities | **Attractive end market in goods and people transport (incl. buses)**
Continuously outperforming markets through content and market share growth | **Strong aftermarket share and content per vehicle growth**
Strength in cost efficient operations | **Attractive margins based on differentiation, scale advantage and consequent cost management** |
1. CVS Revenue Development and Market Development

2. Drivers for Revenue Growth

3. Technology Leadership

4. Operational Excellence

5. Conclusion
CVS strongly outperformed – revenue CAGR +8% vs. TPR CAGR +3.5%

Growth surpassing TPR CAGR mainly driven by **content per vehicle** and **market share** increase.

Disproportional growth in OEM due to **strong acquisition of customer projects**.

**Revenue**

€m

<table>
<thead>
<tr>
<th>Region</th>
<th>2010</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe (EU)</td>
<td>1,701</td>
<td>3,160</td>
</tr>
<tr>
<td>North America (NA)</td>
<td>55%</td>
<td>27%</td>
</tr>
<tr>
<td>Asia/Pacific (SA)</td>
<td>6%</td>
<td>16%</td>
</tr>
</tbody>
</table>

**By region**

CAGR 2010 - 2018

+8%

2010

+6%

+10%

+15%

+8%

2018

+6%

+10%

+15%

**By channel**

CAGR 2010 - 2018

+8%

2010

+4%

+10%

2018

+10%

+63%

+73%

1) Region = domicile of entity
2) 2010 based on German GAAP and 2018 based on IFRS
3) Relevant truck classes in relevant truck markets; Source: Internal market research
## Truck cycle 2020 – leading indicators guide to weaker TPR in NA and Europe

<table>
<thead>
<tr>
<th>GDP growth</th>
<th>Industrial production rate</th>
<th>Truck tonnage / Freight transportation volume</th>
<th>Net orders heavy duty trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>![Directional Arrow]</td>
<td>![Directional Arrow]</td>
<td>![Directional Arrow]</td>
</tr>
<tr>
<td>Europe</td>
<td>![Directional Arrow]</td>
<td>![Directional Arrow]</td>
<td>![Directional Arrow]</td>
</tr>
<tr>
<td>Asia / Pacific</td>
<td>![Directional Arrow]</td>
<td>![Directional Arrow]</td>
<td>![Directional Arrow]</td>
</tr>
</tbody>
</table>

Source: Internal market research
Forecasts indicate TPR slowdown in 2020 from high levels

How will CVS respond to a possible slowdown in truck production?
North America 2016: proof point of CVS’ resilient business model

<table>
<thead>
<tr>
<th>Development 2015 – 2016</th>
<th>Reasons for resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPR NA</td>
<td>Strong BENDIX brand, market leading position and long-standing customer relationships</td>
</tr>
<tr>
<td>CVS NA revenue (^\d)</td>
<td>Product portfolio met market demands exactly at right time, e.g. ADAS</td>
</tr>
<tr>
<td>CVS NA EBIT margin</td>
<td>Localization of own manufacturing and supply base, incl. increase of footprint in Mexico</td>
</tr>
<tr>
<td>-16%</td>
<td>Market share increase and content per vehicle growth mitigated partly</td>
</tr>
<tr>
<td>-22%</td>
<td>Favorable FX</td>
</tr>
<tr>
<td>-30bps</td>
<td>CVS NA management introduced quick and effective counter-measures:</td>
</tr>
<tr>
<td></td>
<td>- Rigorous management of overheads, e.g. headcount reduction of -8%</td>
</tr>
<tr>
<td></td>
<td>- Consequent supplier management: stabilized gross margins</td>
</tr>
<tr>
<td></td>
<td>- Effective aftermarket campaigns: only ~2% revenue decrease in AM</td>
</tr>
<tr>
<td></td>
<td>- Premium freight reductions</td>
</tr>
<tr>
<td></td>
<td>- Further strict reductions incl. discretionary spend, labor savings, material savings</td>
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</table>

1) US$
Knorr-Bremse Capital Market Lunch – Deep Dive CVS

1. CVS Revenue Development and Market Development

2. **Drivers for Revenue Growth**

3. Technology Leadership

4. Operational Excellence

5. Conclusion
Revenue of CVS mainly supported by three growth drivers

**Organic growth**

<table>
<thead>
<tr>
<th>TPR</th>
<th>Content per Vehicle</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trucks produced by OEMs</td>
<td>Number of products and value sold per truck</td>
<td>Relative performance and share of wallet</td>
</tr>
</tbody>
</table>

**Non-organic growth**

<table>
<thead>
<tr>
<th>M&amp;A</th>
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<tbody>
<tr>
<td>Long track record of successful M&amp;A</td>
</tr>
</tbody>
</table>

Short term potential:

Medium term potential:
Continued content growth expected in all regions

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

Growth of content per vehicle mainly driven by local regulation and total cost of ownership
New regulations and emission standards will support CVS’ growth strongly in future

Traffic Safety – Vision Zero Accident

- ESC, FCW, LDWS, AEBS
- ADB dangerous goods vehicles
- EBS dangerous goods veh.>12t
- LDWS
- Assisted Steering Functions
- Framework for Automated Driving Functions expected

Traffic safety solutions

ABS
AEBS
V2X light vehicles

Emission standards

2018
CHINA V
BS VI (Euro VI)

2019
CHINA VI

2020
EPA 21

2021

2022

2023

2024

2025

2026

2027

2028

2029

2030

New General Safety Regulation
more than 20 single regulations
e.g. obligation for Blind Spot Information System, Reversing Safety, Tire Pressure Warning System

Fuel Efficiency – Vision Zero Emission

- CO2 Emissions -15%
- CO2 Emissions -30%

New General Safety Regulation expected 2022-2025

- ABS= anti-lock braking system, ESC= electronic stability control, FCW= forward collision warning, LDWS= lane departure warning system, LKAS= lane keeping assistance system, AEBS= advanced emergency braking system, ADB= Air Disk Brake, V2X = vehicle to X communication, EBS= electronic braking system

In discussion
Case study 1: Content per vehicle increase through legislation
The penetration of driver assistance systems is increasing globally

Goals and advantages

- Advanced safety features are able to reduce the number of accidents
- Reduction of Total cost of ownerships (TCO)
- Increased vehicle up-time
- New business models via connectivity and new functions

Drivers

- Advanced driver assistance systems (ADAS) add significant value to vehicle
- New regulation and legislation standards are major drivers for increasing penetration of ADAS
- Truck OEMs implement safety features to expand and differentiate their product portfolio
- Fleets invest in ADAS functions because they offer improved TCO and up-time

Market growth for CV ADAS systems at a CAGR of 16.5-18.5%¹ between 2018-2022.

CVS to participate in ADAS market growth through its strong product offering and stable order book.
CVS is market leader for ADAS in North America.

¹ Source: Roland Berger study
Case study 2: Content per vehicle increase through superior functionality
Shift from manual to automated manual transmissions (AMT)

Goals and advantages

AMT vs. MT (manual transmission):
- Reduced fuel consumption and increased comfort
- Miss-use protection (increased lifetime, increased up-time of vehicle)
- AMT enables advanced driver assistance and autonomous driving
- AMT share is increasing globally

Drivers for increasing penetration

- AMTs improve TCO for fleets via reduced fuel consumption and miss-use protection
- AMT systems attract young driver generations (counteracting driver shortage)
- High content of mechatronics increases content per vehicle

Penetration of AMT in Europe today already at 87%, market prospected to be nearly saturated by 2030.

- In North America currently at 40%; in 2030 expected to be at ~95%.
- In China today at 1%; in 2030 expected to be at 30-50%.

Business field extension

In April 2017 Knorr-Bremse acquired Bosch TRS:
- strengthen Asia Pacific AMT footprint
- access to Japanese/Korean AMT market & expansion of Chinese AMT market share
- access to additional technologies (e.g. electromechanic actuator)

Bosch TRS revenue 2018: ¥ 5.0bn (~ € 40m)

CVS offers full range of AMT actuators and control solutions with important customers in Europe and in China. Further projects for next generation AMTs in Europe and North America secured.
Case study 3: Content per vehicle increase through superior functionality
Shift from Foundation Drum Brake (FDB) to Air Disk Brake (ADB)

Goals and advantages
- ADB is a higher performing and reliable technology with improved brake control
- ADB shows a better serviceability in comparison to FDB

Drivers for increasing penetration
- Superior product technology ADB increases content per vehicle
- ADB revenue **CAGR 2017 – 2019 of ca. 19%**
- Increasing ADAS and automated driving functions additionally drive technology shift to ADB:
  - Improved brake performance required for emergency braking
  - Functions like platooning and highway pilot require superior brake performance

European market widely saturated (ca. 90%)
Growth market **North America**: ADB adoption rates expected to increase from 26% in 2018 to 47% in 2024
Next growth market **Asia / Pacific**, e.g. in China ADB penetration currently ca. 10%, leaving large untapped market potential

CVS as global market and technology leader (ADB market share of 61%) benefits overproportionally from shift to ADB.

1) Source: Internal analysis
Case study 4: Content per vehicle increase through superior functionality
Shift from manual to torque overlay steering

Goals and advantages

- Torque Overlay Steering (TOS) technology enables new ADAS functions such as lane keeping assistant
- TOS and brake control are the relevant actuators for vehicle dynamics control
- TOS is mandatory for highly automated driving (HAD)

Drivers

- New steering technologies support content per vehicle
- TOS based ADAS functions improve TCO through higher vehicle up time
- Knorr-Bremse CVS Truck Motion Control as a combined approach of TOS and brake control enables superior vehicle dynamics

Market growth for steering systems: CAGR 8-9%\(^1\) (2018-2022)

Steering Strategy

- Successful acquisition of Hitachi CV Steering Business
- KB Steering Japan is lead unit for global steering push
- KB Steering Japan is market leader for CV steering in Japan
- First projects won in NA and EU
- Integration well on track; business strategy and execution plan implemented

1) Source: Roland Berger study
Case study 5: Content per vehicle increase through market share increase
CVS with sustained growth in a volatile China market

**CVS China Revenue Development**

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue [mRMB]</th>
<th>CAGR 2012 – 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>428</td>
<td>+31.4%</td>
</tr>
<tr>
<td>2013</td>
<td>522</td>
<td>+16%</td>
</tr>
<tr>
<td>2014</td>
<td>652</td>
<td>-5%</td>
</tr>
<tr>
<td>2015</td>
<td>956</td>
<td>-22%</td>
</tr>
<tr>
<td>2016</td>
<td>1,490</td>
<td>+29%</td>
</tr>
<tr>
<td>2017</td>
<td>2,040</td>
<td>+34%</td>
</tr>
<tr>
<td>2018</td>
<td>2,199</td>
<td>+8%</td>
</tr>
</tbody>
</table>

**Key messages**

- Significant market share gain since 2012 through building up strong position in compressor, damper, electroncis, APU and ADB business
- Strong customer relationship and reputation with Top Chinese truck OEMs
- Established KB-DETC JV in 2015 and successfully integrated Dongfeng compressor business in 2018
- Market leadership in brakes business in Chinese market since 2018
- Breakthrough in Trailer business through close cooperation with top trailer axle manufacturers in 2018

1) German GAAP 2) Source: Market research
Case study 6: Content per vehicle increase through market share increase

Overall outperformance of TPR in North America

**Key messages**

- **Strong BENDIX brand, market leading position and long-standing customer relationships drove outperformance vs. market**
- **Strong relationship with truck OEMs and truck fleet operators; CVS convincing especially through high quality and technology leadership**
- **Continuously dominant market leadership in ADB and leading position in Advanced Driver Assistance technologies foster constant content per vehicle growth and market share gains**
- **Content per vehicle increase mitigated lower TPR in some years**
- **Aftermarket: Solid growth driven by increasing installed base**

**CVS NA Revenue Development**

CAGR 2012 – 2018

- TPR NA [% change] 2)
- Revenue [mUSD]

-8% → +19% → +8% → -22% → +11% → +24%

843 → 988 → 1,028 → 865 → 1,050 → 1,259

2012 → 2013 → 2014 → 2015 → 2016 → 2017 → 2018

Full Year Revenue

1) German GAAP 2) Source: Market research
Knorr-Bremse Capital Market Lunch – Deep Dive CVS

1. CVS Revenue Development and Market Development
2. Drivers for Revenue Growth
3. Technology Leadership
4. Operational Excellence
5. Conclusion
CVS‘s innovation agenda based on four major industry trends

**URBANISATION**
Advanced safety systems with highest reliability as lasting contribution for the Vision Zero Accident
- New Generation Air Disc Brake
- Lane Departure Warning System

**AUTOMATED DRIVING**
Complete systems for Automated Driving achieved by integration of braking and steering systems
- GSBC\(^1\) & Truck Motion Control
- Highway Pilot

**ECO-EFFICIENCY**
Solutions for efficient powertrains and electric driven vehicles
- Electronic Screw Compressor
- Automated Manual Transmission

**DIGITISATION**
Modular connectivity solutions with focus on fleet management, remote maintenance and driver safety
- Safety Direct
- ProFleet Connect

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\(^1\) Global Scalable Brake Control

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Knorr-Bremse Group
CVS continues R&D invest to maintain technical leadership

**CVS R&D cost development**

- Innovation in **core business fields**
- Constant focus on **VA/VE** (Value Analysis/ Value Engineering = systematic method to improve a product’s ratio of function to cost)
- Development of products in **new business fields** (e.g. steering)
- Development of products and technologies responding to **industry megatrends**

**TOP R&D priorities**

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D invest [mEUR]</th>
<th>R&amp;D / revenue ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>113</td>
<td>5.4%</td>
</tr>
<tr>
<td>2013</td>
<td>109</td>
<td>5.3%</td>
</tr>
<tr>
<td>2014</td>
<td>117</td>
<td>5.3%</td>
</tr>
<tr>
<td>2015</td>
<td>127</td>
<td>5.1%</td>
</tr>
<tr>
<td>2016</td>
<td>139</td>
<td>5.6%</td>
</tr>
<tr>
<td>2017</td>
<td>152</td>
<td>5.2%</td>
</tr>
<tr>
<td>2018</td>
<td>167</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

R&D invest strictly separated in base R&D projects for existing product portfolio and projects responding to industrial trends.
Megatrend: Automated Driving
From braking systems manufacturer to automated systems supplier

<table>
<thead>
<tr>
<th>1920s</th>
<th>1980s</th>
<th>2000s</th>
<th>today</th>
<th>2020+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deceleration</td>
<td>Stability Control</td>
<td>Driver Assistance</td>
<td>Driver Assistance</td>
<td>Automated Functions</td>
</tr>
<tr>
<td>actuator: braking</td>
<td>actuator: steering and braking together</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CVS’ core product: braking systems

- **Vehicle stability** on a basic level through electronic intervention in acceleration and deceleration
- **Automated deceleration and acceleration through** integration of advanced warning systems and control units
  - Examples: Adaptive Cruise Control, Advanced Emergency Braking System
- **Basic steering intervention** combined with automated acceleration / deceleration
  - Examples: Lane Keep Assist, Traffic Jam Assist, Highway Assist
- **Level 3+ automated driving** functions
  - Examples: Platooning Pilot, Highway Pilot

Combination of braking and steering systems will create new profitable growth markets

Knorr-Bremse Group | 36
Megatrend: Automated Driving

CVS supplies the entire system concept for automated driving

System

1. Perception
   - Complete environment perception of truck & trailer
     - Provider: KNORR-BREMSE + Continental

2. Decision
   - Continuous situation analysis for motion planning
     - Provider: KNORR-BREMSE + Continental

3. Actuation
   - Coordinated interaction of actuators for vehicle dynamics
     - Provider: KNORR-BREMSE

4. Redundancy concept
   - Safety relevant functions backed up by redundancy:
     - Control
     - Sensors
     - Steering
     - Braking
     - Electric architecture

5. System supplier - one interface for customers as the system integrator
   - KNORR-BREMSE
   - Optimally designed for commercial vehicle needs
   - Cost efficient redundant system architecture
   - Profound ADAS and truck dynamics expertise as solid basis for HAD up to level 5

Notes: 1) Highly Automated Driving; 2) Electronic Control Unit; 3) Global Scalable Brake Control; 4) Advanced Driver Assistance Systems
Knorr-Bremse Capital Market Lunch – Deep Dive CVS

1. CVS Revenue Development and Market Development
2. Drivers for Revenue Growth
3. Technology Leadership
4. **Operational Excellence**
5. Conclusion
CVS bottomline is backed by operational excellence

**Permanent programs**
- Continued cost focus KB 2020
  - Continuous site improvement program
  - Best in class purchasing with global set-up
  - Continuous VA/VE
  - High level of localization in best cost countries
  - Asset light approach

**Special programs**
- Margin stability
  - Program set up in each region in order to ensure expected profitability
  - Savings plan with dedicated programs for each subunit, e.g. relocation of valves manufacturing from Europe to India, planned closure of plant in Wülfrath
  - Regularly reviewed by Executive Board
  - Significant savings already achieved

- Market down-swing
  - Different measures designed for each region (e.g. TPR scenario -15% / -25%)
  - Launch of specific counter measures decided by region after strict investigation
  - Gradual implementation of measures by scenario and region; e.g.: flexibilization of variable costs, short-time work, focussed R&D

CVS is prepared in case of market downswing
Example cost saving measures:

**The production of valves was relocated from Europe to India resulting in savings**

<table>
<thead>
<tr>
<th>Year</th>
<th>NPV (€m)</th>
<th>Growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>5.8</td>
<td>+160%</td>
</tr>
<tr>
<td>2018</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>2019e</td>
<td>10.9</td>
<td></td>
</tr>
</tbody>
</table>

Production line for export in Pune

- Production of valves for European market was *moved from locations in Italy and Hungary to India*
- Relocation started in 2016, last steps to be finished *by 2021*
- Production cleared by customers
- **Net Present Value** is consequently increased through additional measures

The relocation of valves production is generating sustainable savings

1) As of mid-year for each year.
Knorr-Bremse Capital Market Lunch – Deep Dive CVS

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3. Technology Leadership
4. Operational Excellence
5. Conclusion
CVS confirms mid-term\(^1\) guidance of 4 to 5% revenue growth over the cycle

CVS is well prepared for the future and well positioned in the market

- Increase of **content per vehicle** in all markets mitigating TPR volatility
- **Market share** increases in growth markets
- Fostering of **technological leadership** through consequent invest in R&D
- **Operational excellence**
- Targeted **cost optimization programs** to protect margins
- Excellent **customer relationships**

\(^1\) Time frame for mid-term guidance 2017-2021/22
## RVS with high-quality business model – Outperformance and resilience

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Market leadership</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Technology leadership</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>High barriers to entry</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Strong growth profile</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Resilience</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Profitability</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Market leadership</em>: Global market leader, scale advantage</td>
<td></td>
</tr>
<tr>
<td><em>Technology leadership</em>: Strong technology innovator shaping industry standards, return on R&amp;D spend outperforming peers</td>
<td></td>
</tr>
<tr>
<td><em>High barriers to entry</em>: Safety-critical products with significant homologation barriers, RVS only supplier certified for all standards and norms globally</td>
<td></td>
</tr>
<tr>
<td><em>Strong growth profile</em>: Attractive transportation and mobility end-markets, long track record of outperforming underlying markets – through both OE and AM business</td>
<td></td>
</tr>
<tr>
<td><em>Resilience</em>: Steadily growing business through customer/region/product mix, strong aftermarket</td>
<td></td>
</tr>
<tr>
<td><em>Profitability</em>: Outstanding profit margins and track record of margin expansion and cost management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Market Opportunities</td>
</tr>
<tr>
<td>---</td>
<td>----------------------</td>
</tr>
<tr>
<td>2</td>
<td>Aftermarket Growth (RailServices)</td>
</tr>
<tr>
<td>3</td>
<td>Innovation</td>
</tr>
<tr>
<td>4</td>
<td>Summary</td>
</tr>
</tbody>
</table>
RVS sees continued growth with increasing profitability

Car builders confirm a positive market trend and report a strong order backlog

At € 40.0bn on June 30th, 2019, the current backlog provides strong visibility on future sales. — Alstom

Transportation’s backlog of USD 33.6bn […] positive market outlook for the rail industry remains unchanged. — Bombardier

Record year for train deliveries and orders. Order intake 12% higher than forecast at YEN 714.6bn with book-to-bill ratio of 1.16. — Hitachi

Orders rose on higher volume from large orders. — Siemens

Year-on-year growth of 44% in Rolling Stock net revenues and 10% in the Service and Components business. — Stadler

Intense order intake raised the CAF Group backlog to a new all-time high of € 8.8bn (+11%). — CAF

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Global market position of RVS

Brake systems

Entrance systems

HVAC systems

RVS revenue & EBITDA margin

[€m, IFRS]

Revenue CAGR

+7.8%

20.9%

19.6%

20.0%

22.2%

2016

2017

2018

1,876

H1/19

2,979

3,260

3,462
Underlying global rail market with steady and robust growth

Development of markets

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

**North & South America**
- 2017: 1.5
- 2018: 1.5
- 2019: 1.5
- 2024: 1.7

CAGR: +2.5%

**Asia Pacific**
- 2017: 3.5
- 2018: 3.7
- 2019: 3.9
- 2024: 4.1

CAGR: +1.8%

**Europe / Africa**
- 2017: 3.0
- 2018: 3.3
- 2019: 3.4
- 2024: 3.9

CAGR: +3.1%

**World**
- 2017: 8.0
- 2018: 8.4
- 2019: 8.8
- 2024: 9.7

CAGR: +2.4%

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

**Original Equipment**
- 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

Note: RVS market research, OE und AM incl. labour. Values recognize FX rates
Rail market will get additional tailwind from latest climate discussions

Megatrends with impact on the Rail industry

- Urbanisation
- ECO-EFFICIENCY
- Automated Driving
- Digitization
- Safety

CO₂ emissions in passenger transport

Transport is the only sector with an increase in emissions to a level well above their 1990 levels – despite a 60% reduction target by 2050¹)

Only with a shift to rail the climate targets in the transport sector will be reached

¹) White paper from European Commission  ²) https://www.dw.com
RVS is #1 in almost all strong growth markets

OE market development

<table>
<thead>
<tr>
<th>Market volume Brakes, Doors, HVAC [€m, CAGR in %]</th>
<th>CAGR '18-'24</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America &amp; Mexico MT</td>
<td>~6%</td>
</tr>
<tr>
<td>France</td>
<td>~11%</td>
</tr>
<tr>
<td>Italy</td>
<td>~13%</td>
</tr>
<tr>
<td>Russia &amp; CIS (High Grade)</td>
<td>~6%</td>
</tr>
<tr>
<td>Scandinavia</td>
<td>~17%</td>
</tr>
<tr>
<td>Spain &amp; Portugal</td>
<td>~35%</td>
</tr>
<tr>
<td>India (High Grade)</td>
<td>~5%</td>
</tr>
<tr>
<td>SEA Hong Kong &amp; Taiwan</td>
<td>~15%</td>
</tr>
<tr>
<td>Selected biggest growth markets</td>
<td>~9%</td>
</tr>
<tr>
<td>RoW</td>
<td>~2%</td>
</tr>
</tbody>
</table>

1) High Grade only, w/o conventional market  
2) Brakes, Doors, HVAC  
3) Rest of World w/o selected biggest growth markets & w/o China

Selected biggest growth markets

- North America & Mexico MT: ~6%
- France: ~11%
- Italy: ~13%
- Russia & CIS (High Grade): ~6%
- Scandinavia: ~17%
- Spain & Portugal: ~35%
- India (High Grade): ~5%
- SEA Hong Kong & Taiwan: ~15%
- Selected biggest growth markets: ~9%
- RoW: ~2%
**Example China: RVS growth is fueled by profitable aftermarket business**

### Market development

**High government spending**
- 5-year-plan with investment level at **RMB 3,500bn** (~ € 448bn as of 2017)

**Fastest growing Rail network globally**
- **175,000km total length** expected to reach by 2025
- Connect >80% of cities with >1m population by high speed train rail
- Improved development in rural areas
- ~60% urbanization ratio of permanent residents require further mass transit development, Metro growth
- Government projects (e.g. Belt and Road Initiative) creates significant long-term growth opportunity

**High number of recent installations drive aftermarket potential**

### RVS’ revenue China

[€m\(^1\), CAGR in %]

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>613</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>799</td>
<td>~4-5%</td>
</tr>
<tr>
<td>2019e</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- OE business with an overall stable development, with a RVS revenue increase in Metro business
- RailServices growth from a large installed base, esp. MU high speed deliveries
- Increased aftermarket share has positive impact on profitability
- Aftermarket share growing

Source: Chinese 13th 5-year-plan; RVS internal sources and market research, 1) Values recognize FX rates
Example India: Significant growth opportunity over next several years

**Market growth drivers**

- **Electrification**
  - 35,000km railway lines targeted, production of **E-Locos** from 250 to 600 p.a.

- **Passenger coach production growth**
  - ~5,000 – 6,000 LHB (Linke Hofmann Busch) coaches p.a.

- **EMUs development**
  - **Train 18, Train 20**: increased demands for Electric Multiple Units

- **High speed corridors**
  - 7 high speed corridors (10,000km) and € 140bn investment in next 10 years

- **Dedicated freight corridors**
  - 3,338km to be completed by Dec-20 for Western & Eastern freight corridor: Delhi – Mumbai (1,839km, until Dec-19) and Ludhiana–Dankuni (1,499km, until Dec-20)

- **Metro**
  - Currently 9 major cities covered\(^1\) with ~3,500 cars, potential for additional 26 cities (cities > 2m inhabitants)
  - ~550 cars p.a. for 2018 – 2023 expected

---

\(^1\) Delhi, Kolkata, Mumbai, Bangalore, Chennai, Hyderabad, Jaipur, Kochi and Lucknow

---
Example India: RVS with excellent market position based on local presence already since the 1990’s

Local production

- Brake control systems
- Bogie equipment
- Air dryers
- Contactors, resistors
- Dampers

RVS’ revenues and headcount

[€m \(^1\), CAGR in %]

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (€m)</th>
<th>FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>2019e</td>
<td>373</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (€m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>918</td>
</tr>
<tr>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>2019e</td>
<td></td>
</tr>
</tbody>
</table>

RVS growth factors for the future

- Addressing the market with a broad product portfolio since 1993
- Local manufacturing, engineering and service footprint
- State-of-the-art production facility in Palwal
- Capacity enhancement & factory expansion
- Further localization of production

Example India: RVS with excellent market position based on local presence already since the 1990’s
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Market Opportunities</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Aftermarket Growth (RailServices)</strong></td>
</tr>
<tr>
<td>3.</td>
<td>Innovation</td>
</tr>
<tr>
<td>4.</td>
<td>Summary</td>
</tr>
</tbody>
</table>
Aftermarket business is a local business – well served by RVS’ set-up

### Americas
- Major service locations at customers' premises: 5
- Service personnel: 250

### Europe
- Major service locations at customers' premises: 21
- Service personnel: 1,100

### Asia
- Major service locations at customers' premises: 14
- Service personnel: 700

**Total**
- Major service centers: 40
- Major service locations at customers' premises: 21
- Service personnel: 2k

Short lead time in repair business & local regulations can only be catered by local presence.

---

1) Does not include service locations at customers' premises
2) Includes RVS employees at customers' premises, as of December 2017, rounded
Aftermarket (RailServices) strategy targeting significant growth: ~45% of RVS’ revenue by 2024, coming from ~40% in 2018

**Servicing the installed base**
- Efficient spare part solutions
- Service of Knorr-Bremse products
- Obsolescence management

**Modernization**
- Modernization of Knorr-Bremse as well as non-Knorr-Bremse products
- Upgrade solutions
- Increased scope by cross-product solutions

**New service models & digital solutions**
- Digitization
- Development of new customer value driven service models
- Service of third party Rail components
- Co-operations & partnerships
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 2010-2016 CAGR 2-3%

Development aftermarket

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

RVS aftermarket

Revenue development [€bn] 1)

- Global footprint with a strong local presence
- High installed base
- High customer retention rate
- Additional data driven business models
- Development of energy efficient solutions
Knorr-Bremse Capital Market Lunch – Deep Dive RVS

1. Market Opportunities

2. Aftermarket Growth (RailServices)

3. Innovation

4. Summary
RVS’ R&D agenda is focused on customers’ needs – staying ahead of competition

Technology and market trends

7 R&D fields

- Data Driven Business
- Connected Systems
- Airless Train
- Frictionless Braking
- Smart Products
- Lifecycle costs & Eco friendly
- Automatic Train Operation (ATO)

Deep Dive Knorr-Bremse solutions for specific customer needs

- Optimized lifecycle costs
- Standardized solutions
- More intensive use of existing infrastructure
- Reliability & passenger comfort
IFE doors increase passengers’ comfort and provide shorter dwell times in stations

Key Facts

- Significant noise reduction is reached by the IFE patented lifting kinematics for sliding door systems
- Successful market launch:
  - 2 megacities decided in favor of this solution:
    - Beijing - Metro Line 17, Moscow - Metro 2020
  - further projects in the tender pipeline

Customer Benefits

- Setting a new standard for passenger comfort in metro applications of sliding door systems
  - better noise insulation (up to 32dB)
- Shortened opening and closing times compared to sliding plug doors
  - shorter dwell times in stations
  - increased passenger flow and capacity utilization of existing infrastructure
The enormous brake distances in Rail require outstanding braking performance.

Different braking distances at 80km/h:
- **Car**: 1.500kg - 31m
- **Truck with trailer**: 40.000kg - 40m
- **LRV**: 60.000kg - 85m
- **MU regional & commuter**: 240.000kg - 220m
- **Loco hauled freight train**: 4.000.000kg - 600m

Changing weather and environmental conditions significantly impact brake distances.

Different braking distances at 330km/h:
- **High speed train** at 330km/h - 3300m
New smart products keep us ahead of the competition

Unique Selling Proposition

- **Standardized** solution across train types reduces complexity at operators & car builders
- Reduced life cycle costs & increased reliability
- Lighter and requiring a **smaller installation envelope**
- **Software** updates provide **new features** e.g. for optimized braking performance

**New brake control system EP2002 3.0**

enabler for
Automatic Train Operations (ATO)
Urbanization demands increased Rail transport capacity, which can be most economically satisfied by improved use of existing infrastructure.
Reproducible Brake Distance is a key technology for automatic train operation (ATO) and higher utilization of infrastructure

**Situation**

- Unpredictable stopping accuracy in ATO
- Reduced operational stability
- High signal headways
- Inefficient infrastructure utilization

**Solution: Reproducible brake distance**

- Deceleration Control compensates brake system variations
- Wheel Slide Protection and Adhesion Management compensates track condition variations
- Reproducible Brake Distance
Environment Observation (EO) is not only a key enabler of ATO, it also opens up numerous additional growth opportunities

RailVision technology / application

Automatic environment recognition
- Detects objects in a distance of 2km under all weather conditions
- Very high resolution

| detection, identification and classification | challenge |
| modern sensors combined with artificial intelligence | solution |
| corrective (automated) actions | options / outcome |

Additional customer value proposition using EO technology:
- Platform & infrastructure monitoring
- Automated railway network mapping
- Visually assisted geo positioning
- Remote train operation
1. Market Opportunities
2. Aftermarket Growth (RailServices)
3. Innovation
4. Summary
RVS confirms positive market outlook and mid-term guidance of 5 to 6% revenue growth

- Steadily growing market with record backlog for RVS customers
- RVS #1 market position in key growth markets
- Dense service network & new service models will lead to > € 2bn aftermarket business by 2024
- Key innovations will open doors for software-based feature upgrades in products
- Margin expansion primarily through aftermarket growth and efficiency improvements

Note: Time frame for mid-term guidance 2017 – 2021/2022
BACKUP
## Financial calendar

### Upcoming events

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBS Quo vadis</td>
<td>20.09.19</td>
<td>Munich</td>
</tr>
<tr>
<td>Berenberg &amp; Goldman Sachs 8th German Corp. Conf.</td>
<td>23. &amp; 25.09.19</td>
<td>Munich</td>
</tr>
<tr>
<td>Baader Investment Conf.</td>
<td>24.09.19</td>
<td>Munich</td>
</tr>
</tbody>
</table>
Investor relations contact

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Mobile: +49 175 5281320
Email: Andreas.Spitzauer@knorr-bremse.com

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Revenue Group, RVS & CVS (H1/19)

**Group – Revenue**

<table>
<thead>
<tr>
<th>€m</th>
<th>H1/18</th>
<th>Organic</th>
<th>M&amp;A net Disposals</th>
<th>FX</th>
<th>H1/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,322</td>
<td>225</td>
<td>-20</td>
<td>75</td>
<td>3,602</td>
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</table>

Organic Growth +6.8%

- 45 BP/Sydac
+ 4 Snyder
+ 21 Hitachi

**RVS – Revenue**

<table>
<thead>
<tr>
<th>€m</th>
<th>H1/18</th>
<th>Organic</th>
<th>M&amp;A net Disposals</th>
<th>FX</th>
<th>H1/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,744</td>
<td>147</td>
<td>-41</td>
<td>26</td>
<td>1,876</td>
<td></td>
</tr>
</tbody>
</table>

Organic Growth +7.6%

- 45 BP/Sydac
+ 4 Snyder

**CVS – Revenue**

<table>
<thead>
<tr>
<th>€m</th>
<th>H1/18</th>
<th>Organic</th>
<th>M&amp;A</th>
<th>FX</th>
<th>H1/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,577</td>
<td>80</td>
<td>-21</td>
<td>49</td>
<td>1,727</td>
<td></td>
</tr>
</tbody>
</table>

Organic Growth +9.5%

+ 21 Hitachi

Organic Growth +5.1%
Revenue Group, RVS & CVS (Q2/19)

**Group – Revenue**

<table>
<thead>
<tr>
<th>Euro m</th>
<th>Organic</th>
<th>M&amp;A net Disposals</th>
<th>FX</th>
<th>Q2/18</th>
<th>Q2/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,708</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,846</td>
<td>+8.1%</td>
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<td></td>
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</tbody>
</table>

- 25 BP/Sydac
+ 3 Snyder
+21 Hitachi

**RVS – Revenue**

<table>
<thead>
<tr>
<th>Euro m</th>
<th>Organic</th>
<th>M&amp;A net Disposals</th>
<th>FX</th>
<th>Q2/18</th>
<th>Q2/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>911</td>
<td>+6.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 25 BP/Sydac
+ 3 Snyder

**CVS – Revenue**

<table>
<thead>
<tr>
<th>Euro m</th>
<th>Organic</th>
<th>M&amp;A net Disposals</th>
<th>FX</th>
<th>Q2/18</th>
<th>Q2/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>796</td>
<td>+10.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+ 21 Hitachi
Order Intake Group, RVS & CVS (H1/19)

Group – Order intake

€m
3,517
3,581

Organic Growth
+1.8%

M&A net Disposals
-34
-35
-65

Organic
+1.0%

- 60 BP/Sydac
+ 4 Snyder
+21 Hitachi

RVS – Order intake

€m
1,889
1,925

Organic Growth
+1.9%

M&A net Disposals
-72
-56
+20

Organic
+3.8%

- 60 BP/Sydac
+ 4 Snyder

CVS – Order intake

€m
1,629
1,659

Organic Growth
+1.8%

M&A
-36
+21

Organic
-2.2%

+21 Hitachi
Order Intake Group, RVS & CVS (Q2/19)

Group – Order intake

€m

Q2/18 | Organic | M&A net Disposals | FX | Q2/19
---|---|---|---|---
1,719 | -31 | 24 | 24 | 1,688

-1.8% Organic Growth

- 48 BP/Sydac
+ 3 Snyder
+ 21 Hitachi

RVS – Order intake

€m

Q2/18 | Organic | M&A net Disposals | FX | Q2/19
---|---|---|---|---
946 | -16 | 45 | 5 | 890

-5.9% Organic Growth

- 48 BP/Sydac
+ 3 Snyder

CVS – Order intake

€m

Q2/18 | Organic | M&A | FX | Q2/19
---|---|---|---|---
774 | -15 | 21 | 19 | 799

+3.3% Organic Growth

+ 21 Hitachi

-1.9%

Organic Growth
EBITDA Group (Q2/19)

EBITDA Q2/19

<table>
<thead>
<tr>
<th>€m</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.8%</td>
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</tr>
<tr>
<td>17.0%</td>
<td></td>
</tr>
<tr>
<td>19.1%</td>
<td></td>
</tr>
<tr>
<td>18.2%</td>
<td></td>
</tr>
</tbody>
</table>

Conversion from growth € +53.9m

BP/Sydac € -0.3m

IFRS 16 € +11.2m

Wülfrath € -16.4m

287 rep. Q2/18

287 oper. Q2/18

352 oper. Q2/19

335 rep. Q2/19

EBITDA Q2/19 Group (Q2/19)

€ 74
EBIT Group (Q2/19)

EBIT Q2/19

€m  Margin

14.2%  14.5%  15.5%  14.0%

Conversion from growth € +40.6m

BP/Sydac € +0.6m

IFRS 16 € +1.4m

285

Wülfrath € -26.8m

259

243  244  

rep. Q2/18  op. Q2/18  op. Q2/19  rep. Q2/19
Revenue and EBITDA RVS (Q2/19)

**Revenue**

<table>
<thead>
<tr>
<th>€m</th>
<th>Q2/18</th>
<th>Organic</th>
<th>M&amp;A net Disposals</th>
<th>FX</th>
<th>Q2/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>911</td>
<td>61</td>
<td>-22</td>
<td>15</td>
<td></td>
<td>965</td>
</tr>
</tbody>
</table>

- 25 BP/Sydac
+ 3 Snyder

**Revenue Growth** +6.7%

**EBITDA**

<table>
<thead>
<tr>
<th>€m</th>
<th>Q2/18</th>
<th>Rep. 18.2%</th>
<th>Op. 18.6%</th>
<th>IFRS 16</th>
<th>Q2/19</th>
</tr>
</thead>
<tbody>
<tr>
<td>165</td>
<td></td>
<td></td>
<td></td>
<td>+5.8m</td>
<td>218</td>
</tr>
</tbody>
</table>

rep. 22.5%
op. 22.5%

**EBITDA margin** +31.4%
Revenue and EBITDA CVS (Q2/19)

Revenue

€m

Q2/18  Organic  M&A  FX  Q2/19

796  36  21  28  881

+10.6%  Organic Growth

+4.5%

+ 21 Hitachi

EBITDA

Q2/18  Q2/19

127  140

+9.8%

IFRS 16
€ +6.1m

Wülfrath
€ -16.4m

rep. 16.0%  rep. 14.0%

oper. 16.0%  oper.¹ 15.9%

1) 2019 operating EBITDA excl. restructuring regarding Wülfrath & incl. IFRS16
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