

Gerhard Fessler Robert Bosch GmbH

2004-02-10

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Agenda

- Bosch - Short Overview
- Software in Automotive Components
- Bosch's Strategy
- Next Steps
- Summary



Bosch - Short Overview

Founded 1886 in Stuttgart by Robert Bosch

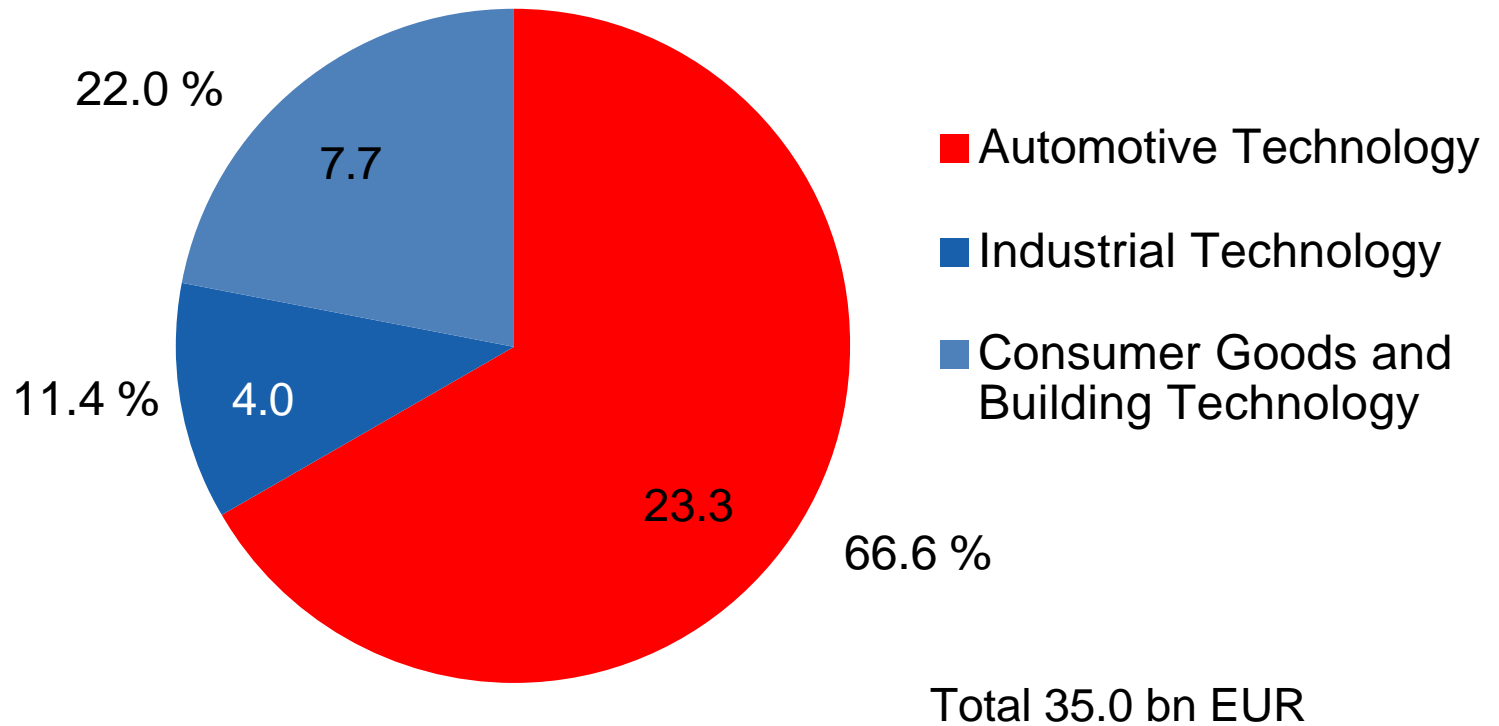
Currently operating in:

- Automotive Technology,
- Automation Technology,
- Packaging Technology,
- Power Tools,
- Thermotechnology,
- Household Appliances,
- Security Technology, and
- Broadband Networks.



Distribution of Sales 2002

By business sectors





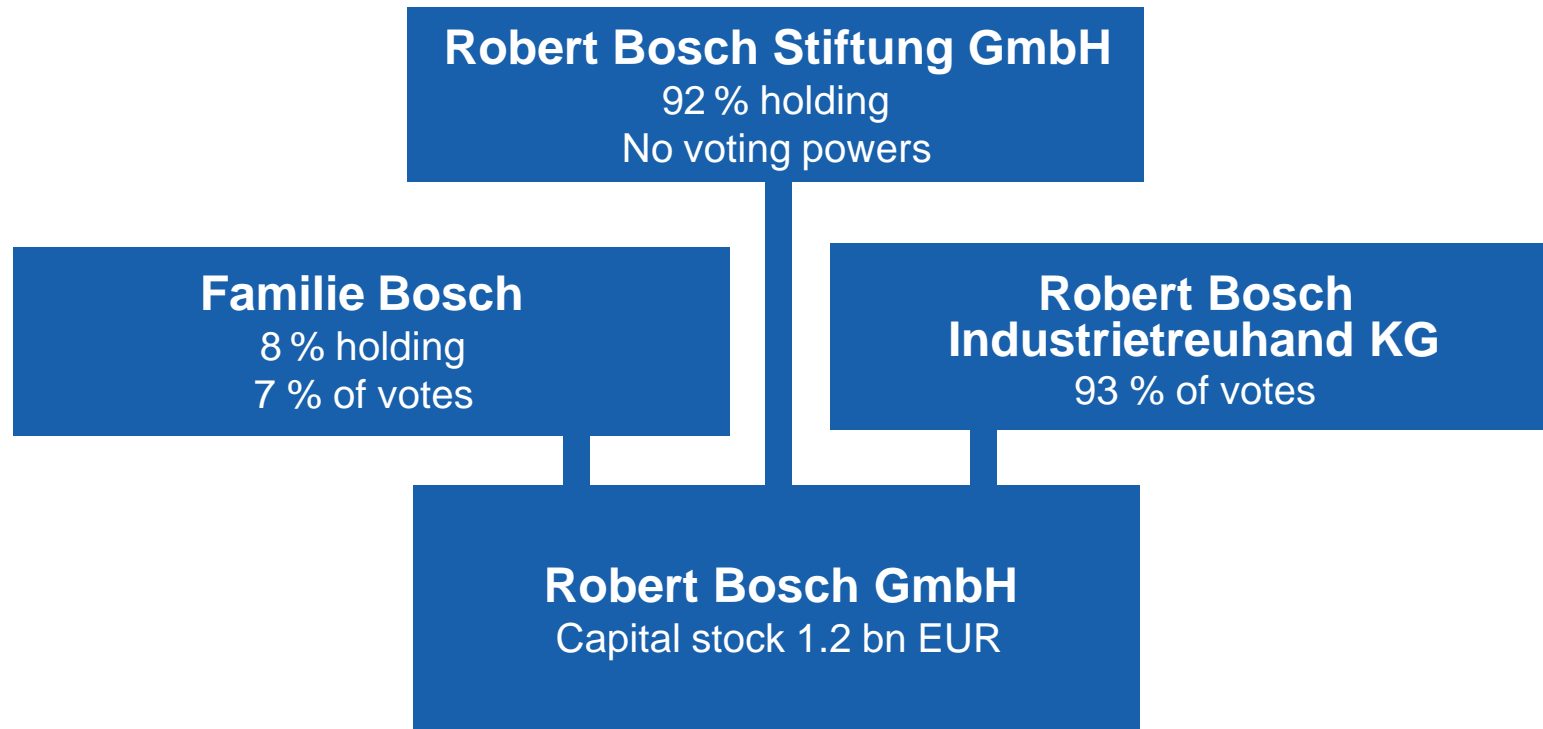
The Bosch Group - Facts

	2001	2002
Sales	34,029	34,977
Foreign sales as a percentage of total sales	72	72
Average number of employees	218,377	225,897
in Germany	98,975	102,685
outside Germany	119,402	123,212
Investments in tangible fixed assets	2,368	2,006
Expenditures for research and development	2,274	2,487
Net income	650	650

Amounts in million EUR



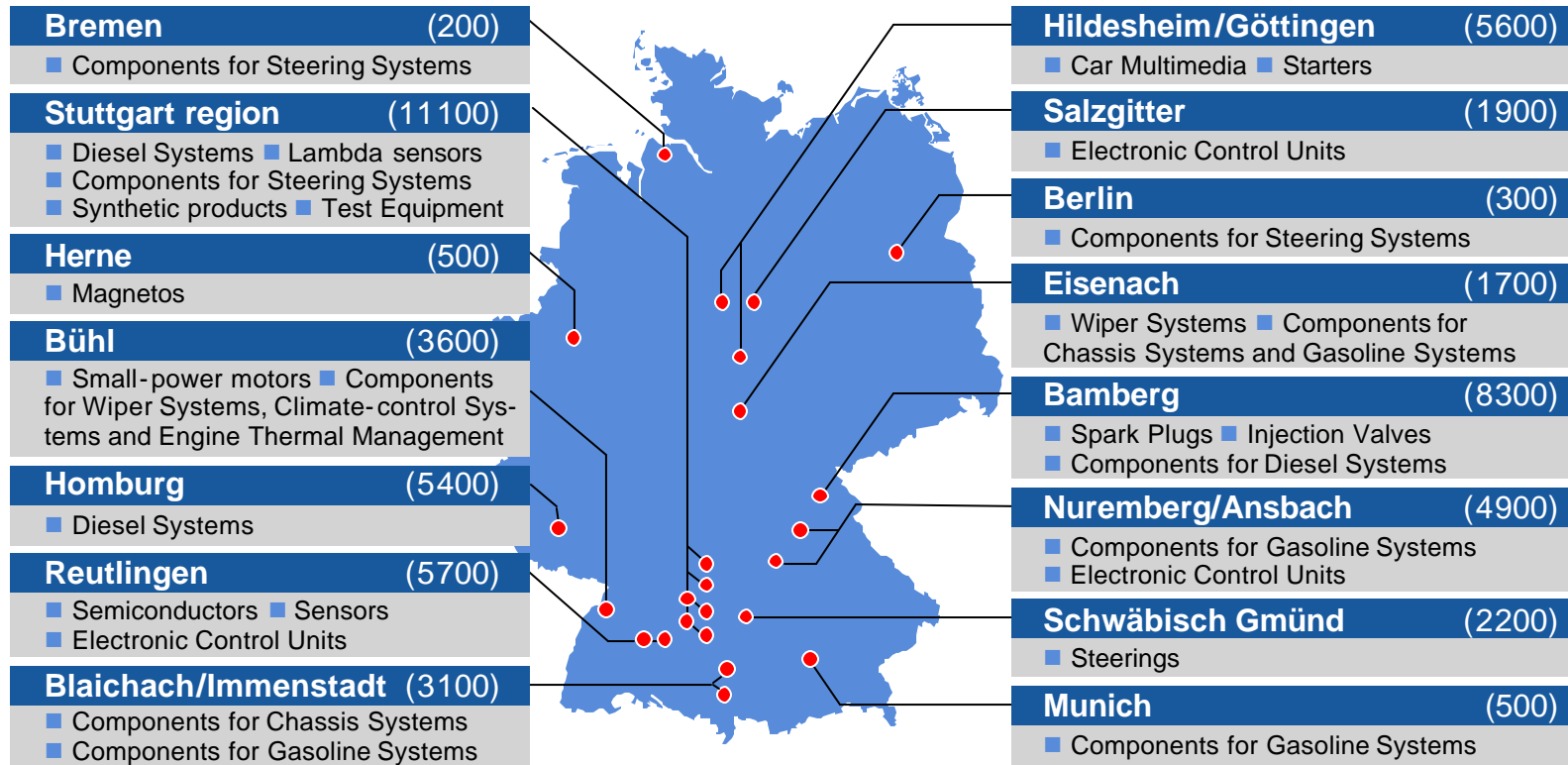
The Bosch Constitution





Automotive Production Sites in Germany*

24 locations (55 000 employees)

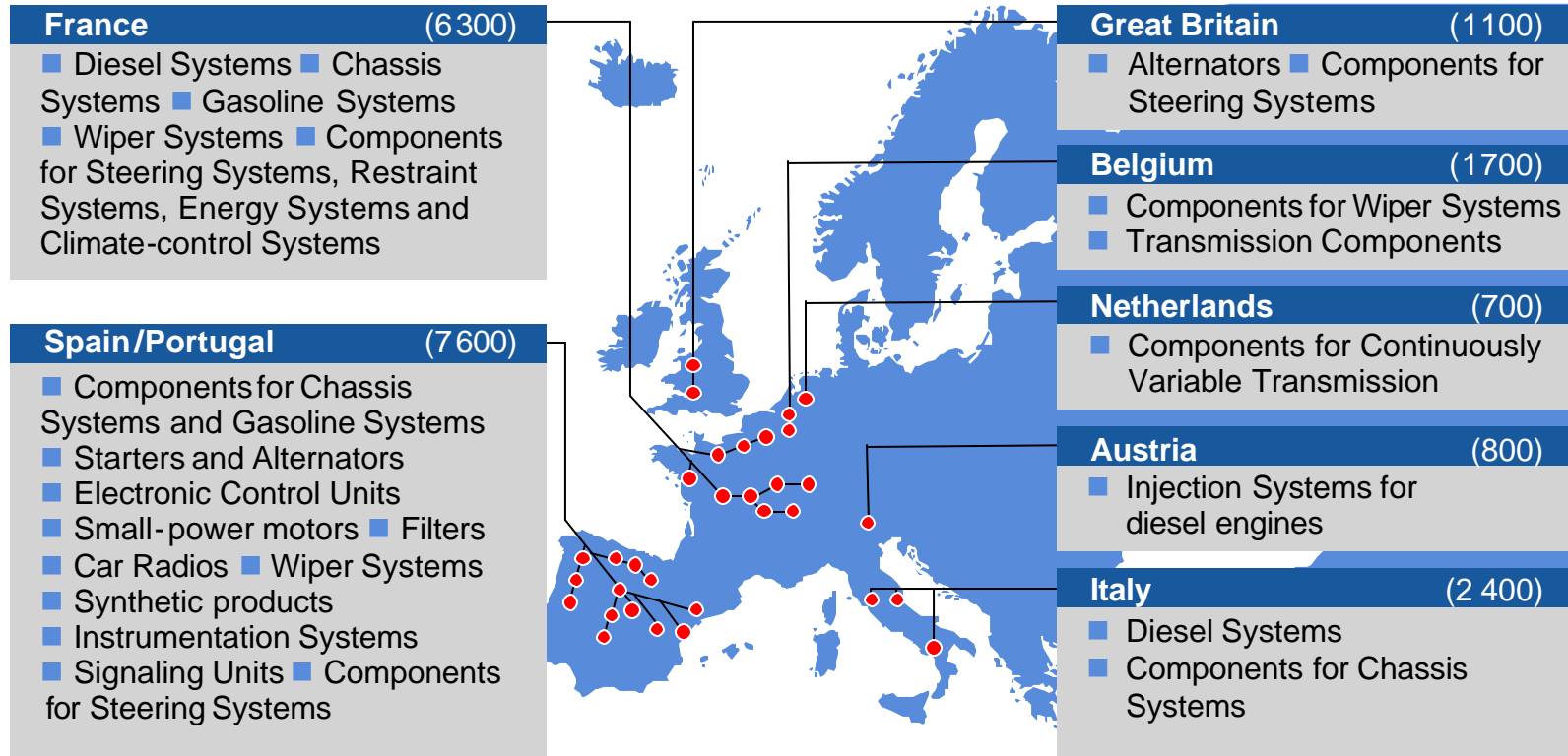


*Valid 01.01.2003, incl. Joint Ventures with a Bosch share of $\geq 50\%$



Automotive Production Sites in Europe (West)*

32 locations in 8 countries (20 600 employees)



*Valid 01.01.2003, excl. Germany, incl. Joint Ventures with a Bosch share of $\geq 50\%$



Automotive Production Countries Worldwide*

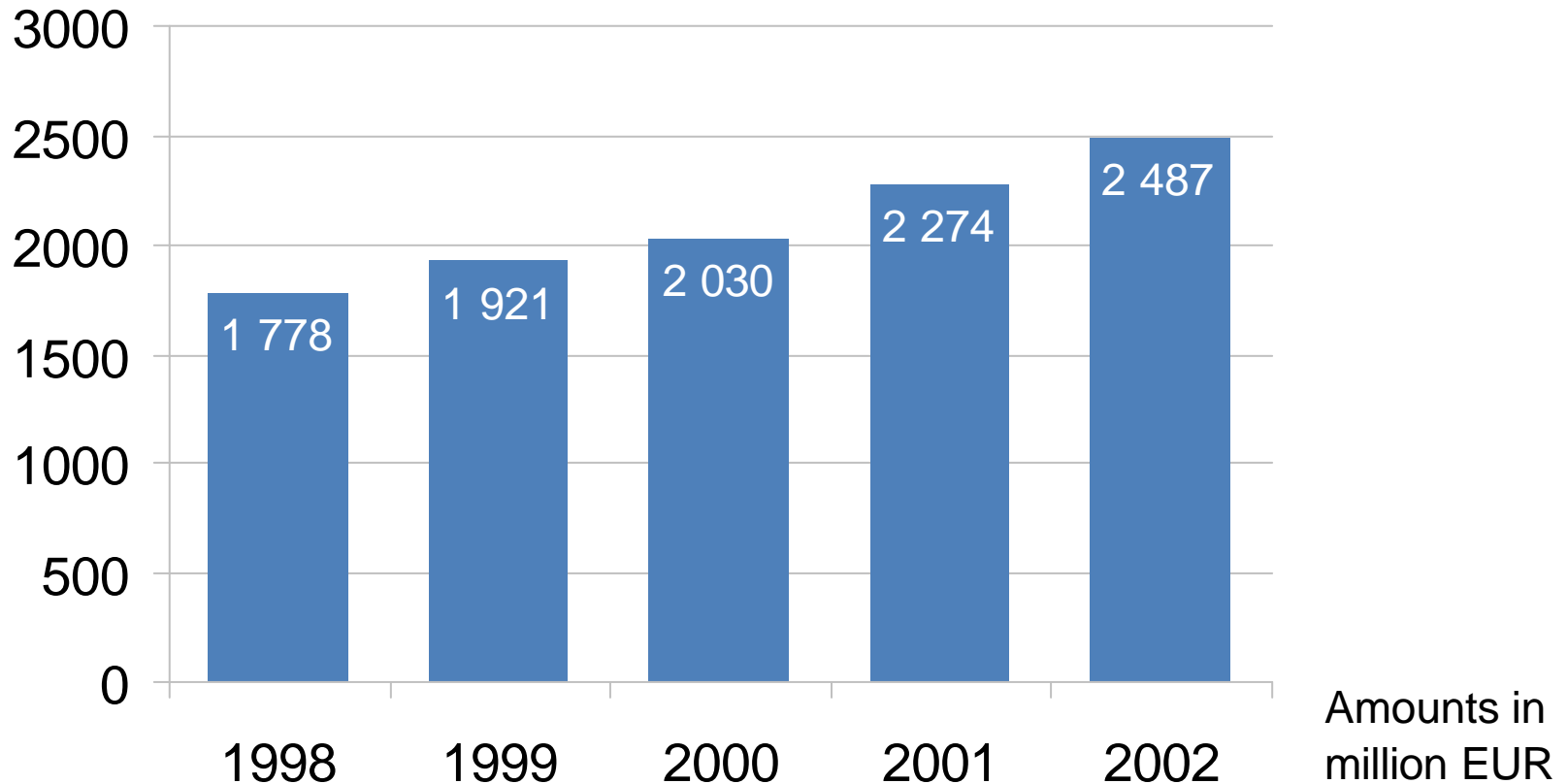
133 locations in 28 countries, 134 800 employees



*Valid: 01.01.2003, each production country is indicated with one dot

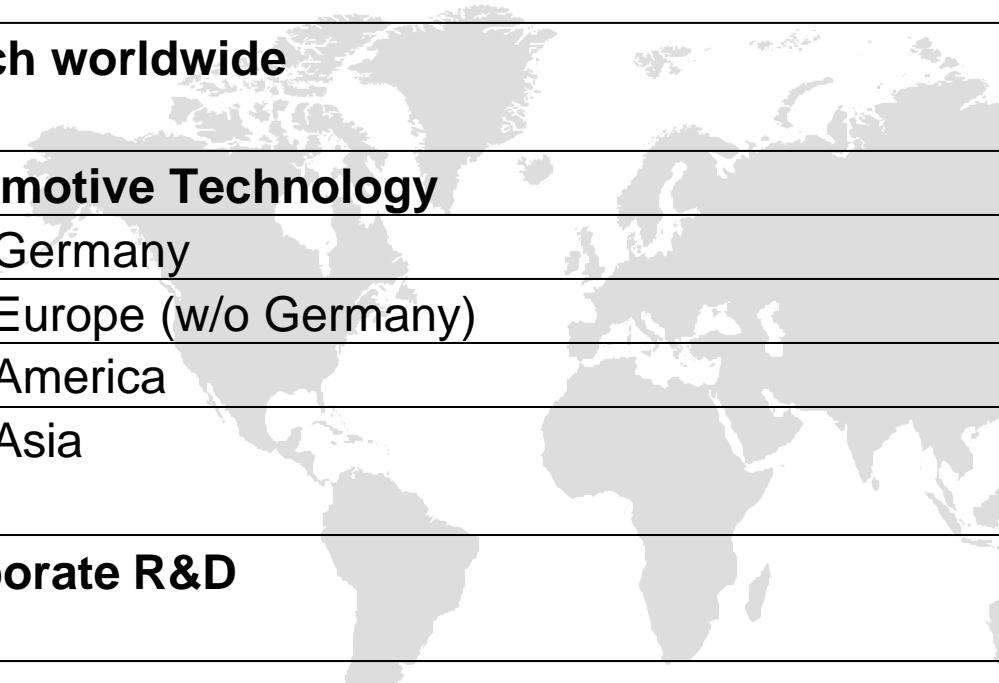


Expenditures for Research and Development





Employees in R&D*



→ Bosch worldwide	20 500
→ Automotive Technology	15 530
Germany	10 350
Europe (w/o Germany)	1 660
America	1 550
Asia	1 970
→ Corporate R&D	1 200

*Valid 01.01.2003, Germany including ETAS and ZFLS complete



Robert Bosch's Quality Principle



It is an unbearable thought to me that while checking one of my products, somebody could show that I in some way performed inferior work. For this reason, I have always endeavored to only deliver work which will pass any objective test, work that is, so to say, the very best of the best.

Robert Bosch, 1918



Bosch Quality Principles (1/2)

1. Our goal is to fully satisfy our customer's expectations through the quality of our products and services.
2. Quality and quality improvement is every associates responsibility and ultimate goal - from the board of directors to apprentices.
3. Our directives, processes, systems and goals are based on requirements from international standards, customer expectations, our knowledge and experience. Knowledge of and compliance with these directives and processes is the foundation of our quality.
4. Quality means doing the detail from the beginning, thus preventing failures in the end. Continuous improvement of the quality of processes lowers costs and increases productivity.

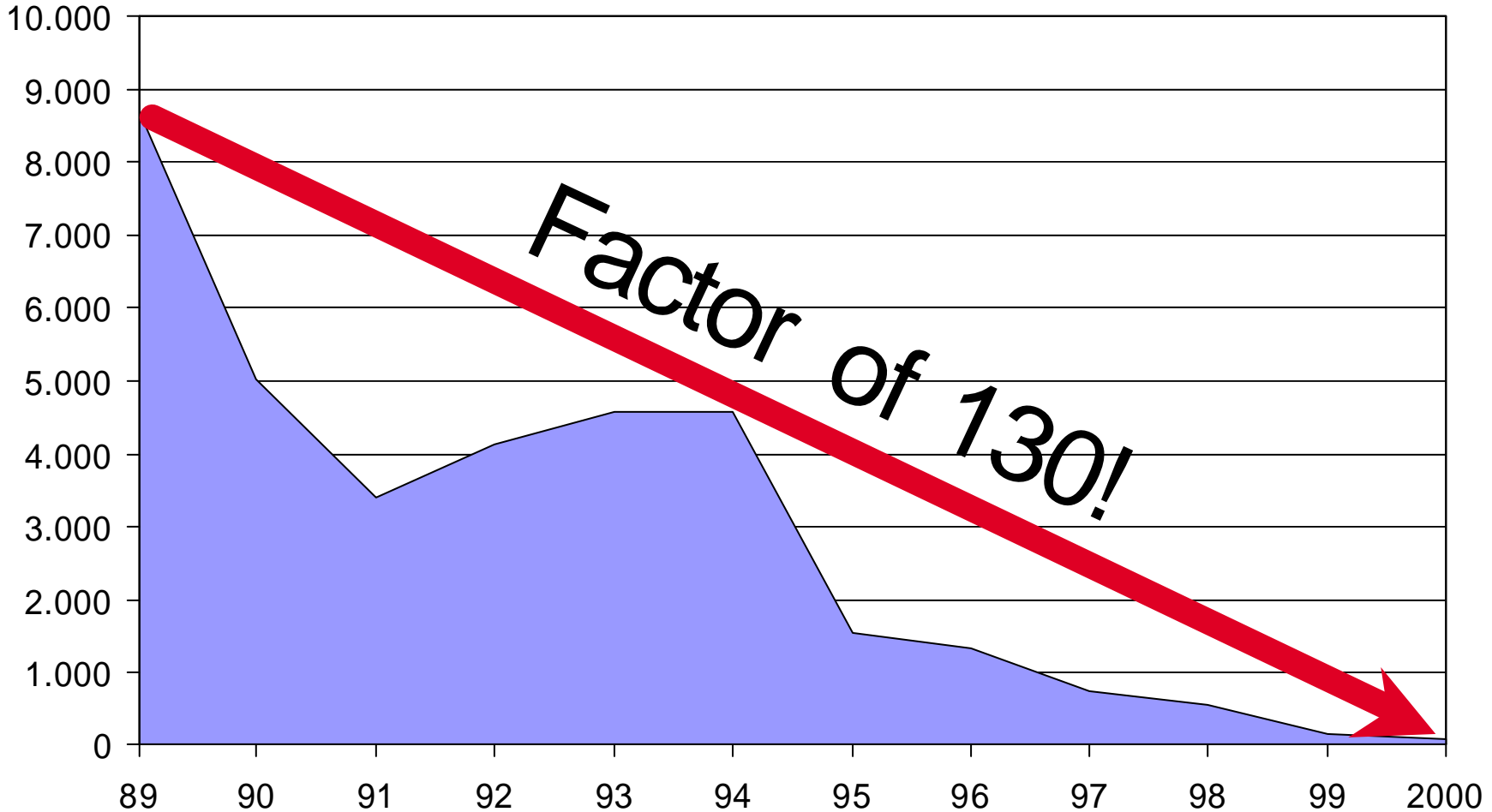


Bosch Quality Principles (2/2)

5. Avoiding failures is more important than eliminating defects. We apply methods and tools for preventive quality assurance systematically, learn from mistakes and eliminate their root causes without delay.
6. Our suppliers contribute substantially to the quality of our products and services. Therefore our suppliers must live up to the same high quality standards we have adopted.



0-km Failure History of a Mechanical Product



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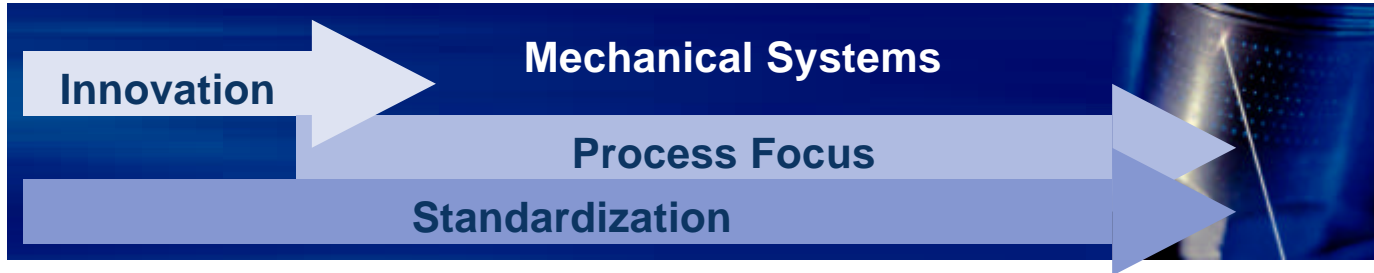
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Paradigms for Automotive Innovation

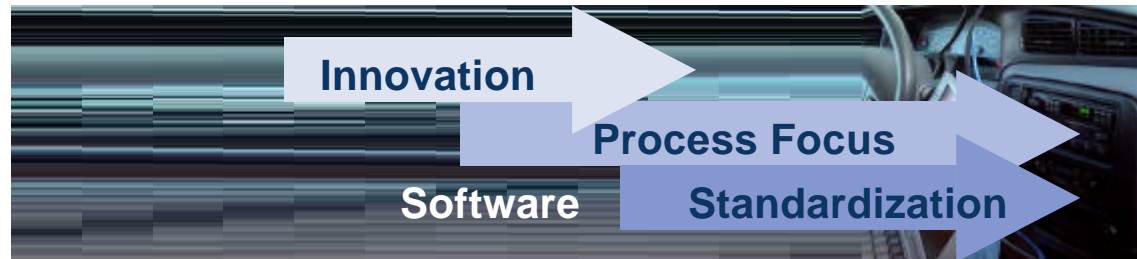
1880
-
1960



1960
-
1990

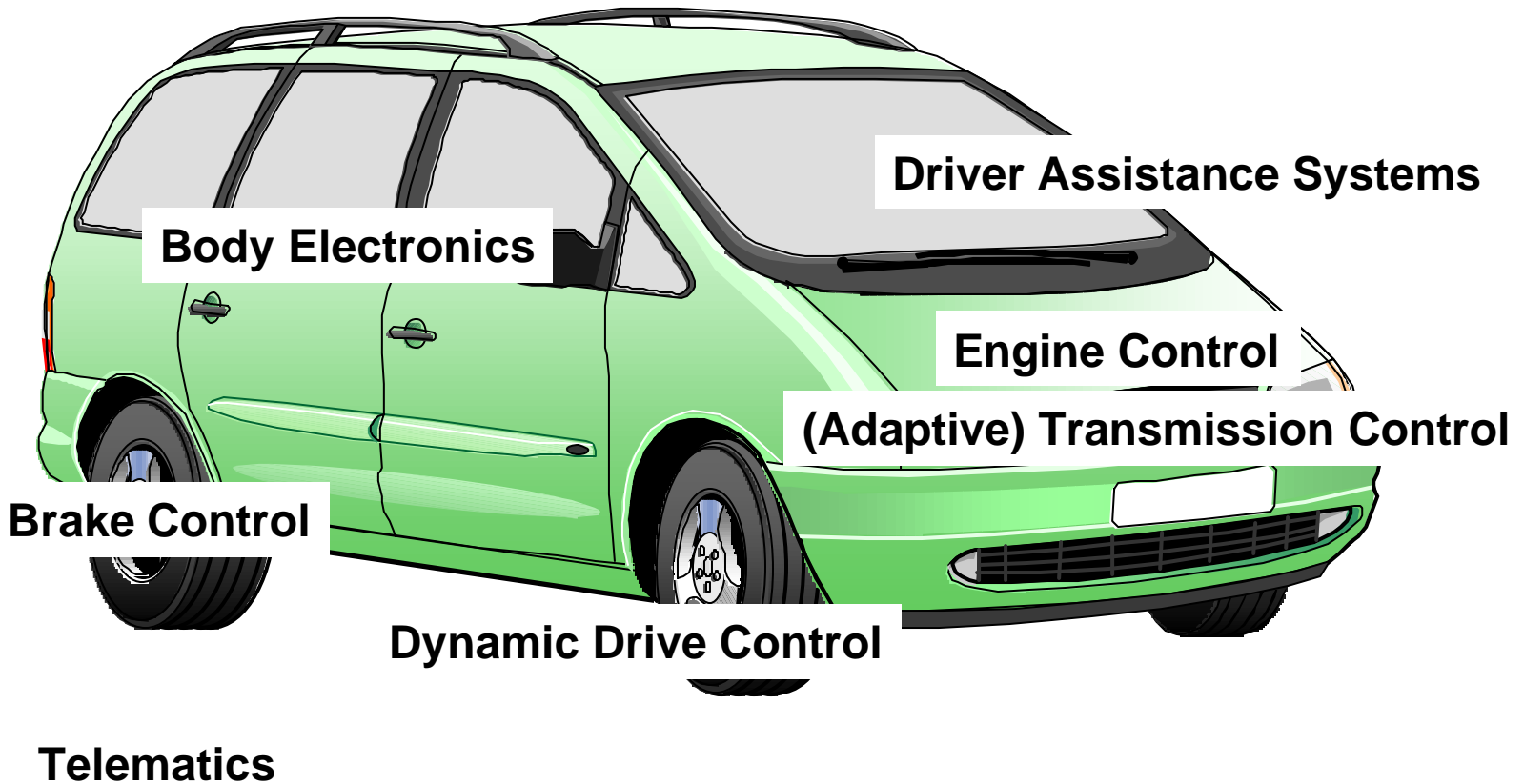


since
1980





Automotive Electronic Systems



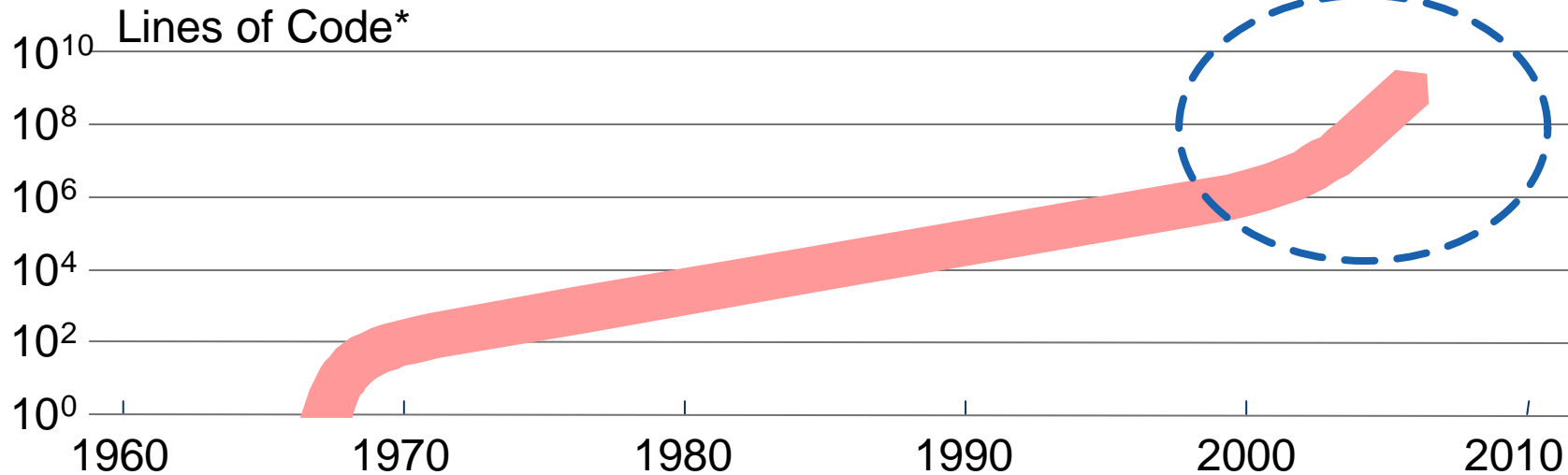


“Explosion” of Functionality

Stand-alone systems
(interactions by
dedicated wires)

In-Vehicle
networking

Vehicle linked
to environment



*All systems in a car (Source: DaimlerChrysler 2002)



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BOOTSTRAP

- An ESPRIT project of the European Union
- Bosch participation

- Results:
 - Reference model for software producing units
 - Continuous maturity model
 - Assessment method

- Experiences:
 - Suitable, but
 - it worked only in two of Bosch's business units



SW-CMM

- 1999: Switch-over to SW-CMM by a formal decision of the Bosch top management

- Objectives:
 - CMM Level 2 in all software producing units until end of 2001 ("Breitensport")
 - afterwards: further improvement of the maturity level of each software producing unit
 - maturity level has to be shown by an "official" CMM assessment

- Corporate-wide institutionalized as an initiative (BISS: **B**osch **I**nitiative for **S**oftware-determined **S**ystems)



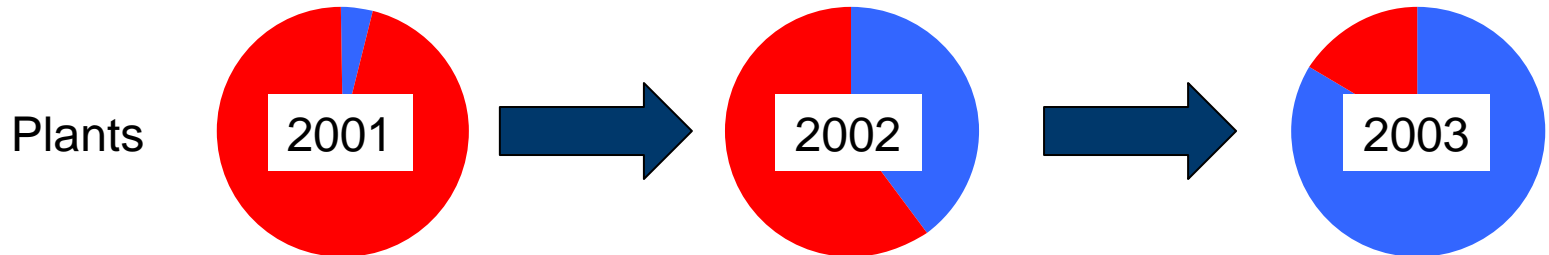
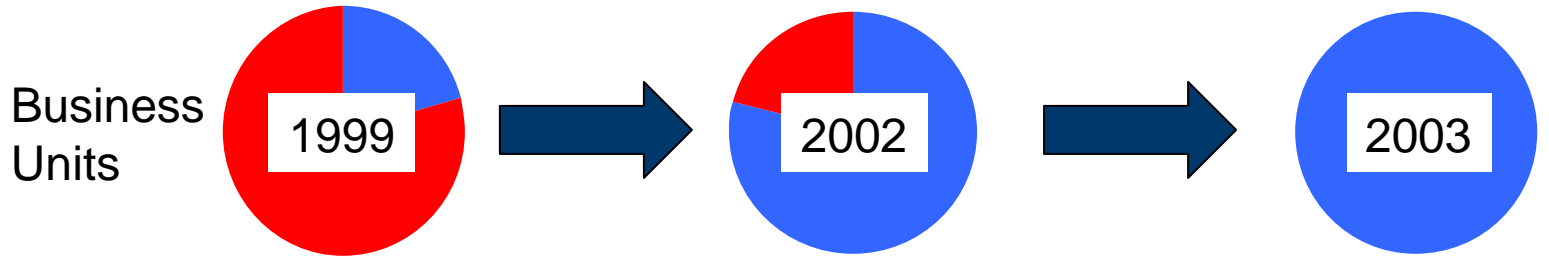
BISS



- Institutionalized as a corporate initiative with members from several corporate departments
- Management steering committee with top management participation

- Contracts with business units:
 - documented commitment
- Coordination of assessments, lead assessors, and assessment team members
- Status tracking and reporting to top management
- Process improvement mentors for business units
- Management information on process improvement
- Coaching of process improvement staff
- Process improvement network



BISS Results - "Breitensport"



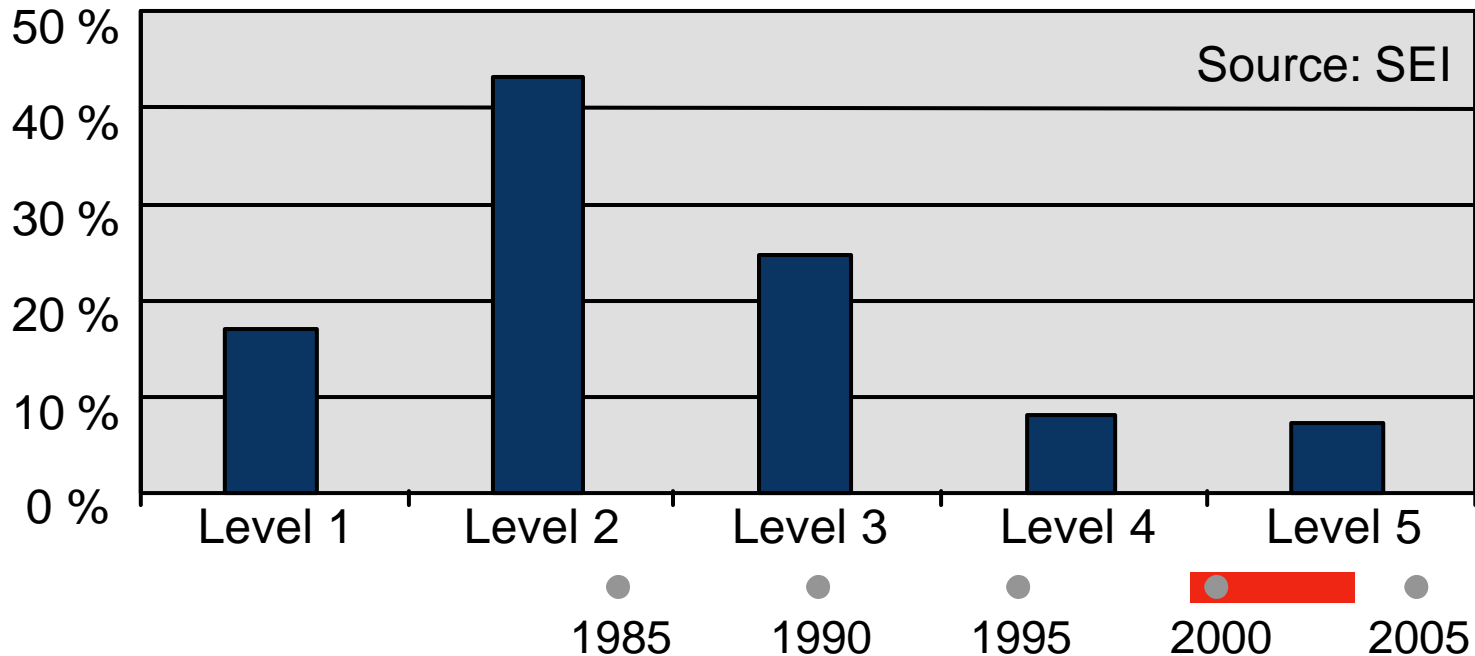
 within BISS
 not yet within BISS





BISS Results - CMM Assessments

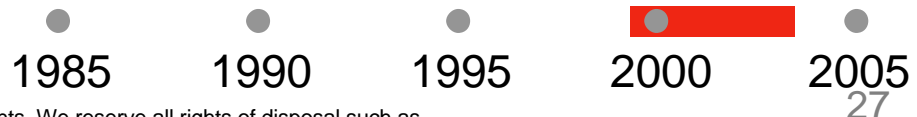
- Currently 8 SEI-authorized SW-CMM lead assessors inside Bosch (and 3 associated with Bosch)
- 38 CMM Assessments





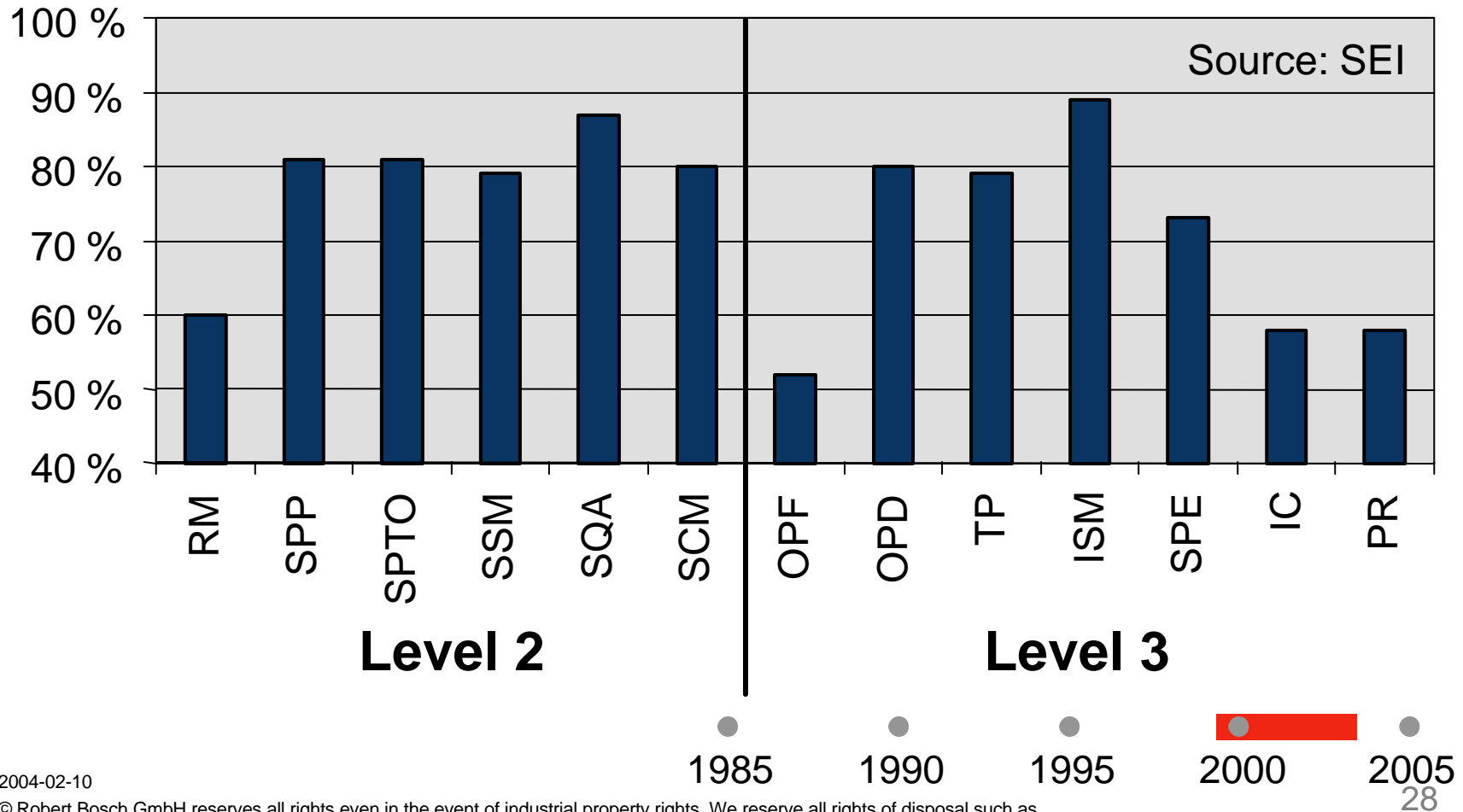
CMM Assessments - Experiences

- Very thorough analysis of the process landscape of an organization
 - Documentation of key process issues
- Not an audit
- High credibility of results
- High impact on process improvement
- Basis for process know how transfer between business units
- Suitable for small and large engineering organizations
- Suitable not only for software engineering



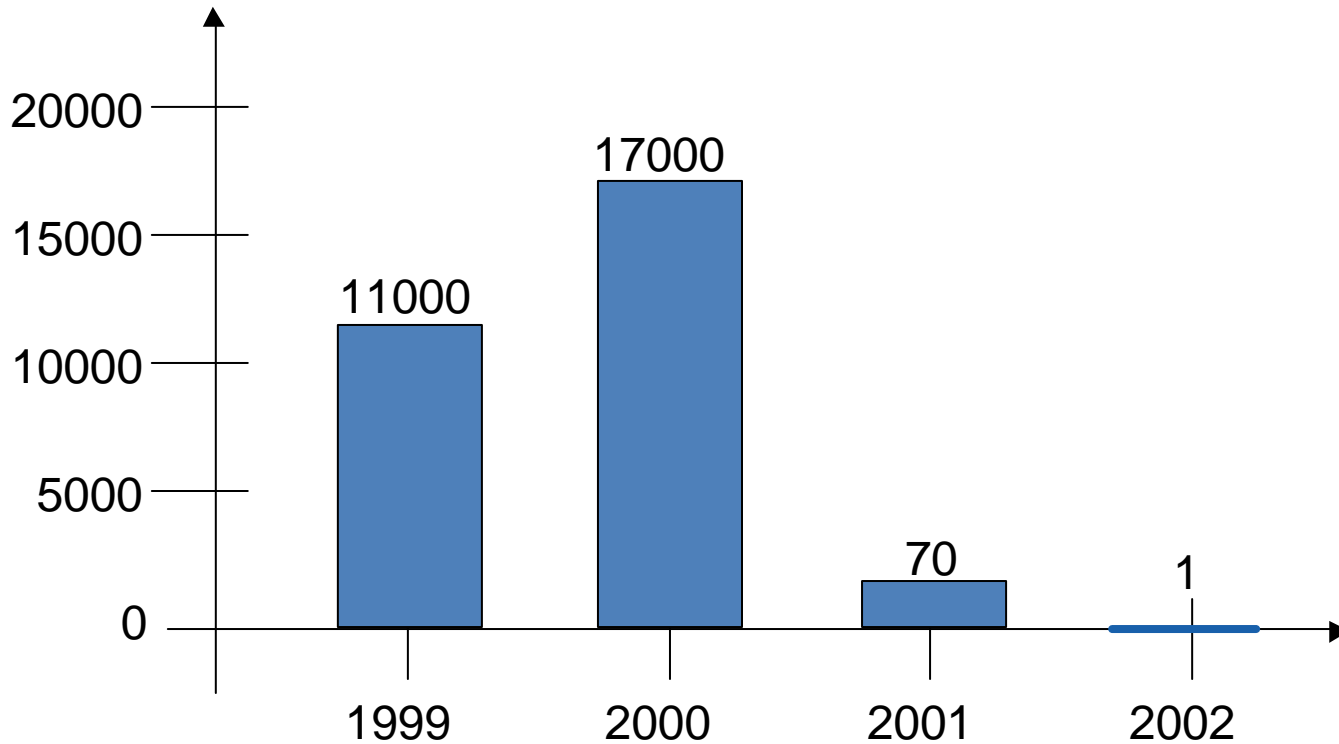


CMM Assessments - Problem Areas





0-km Failures Caused by Software Defects



According to manufacturing date of electronic control units
(relative numbers: 2002 \cong 1)



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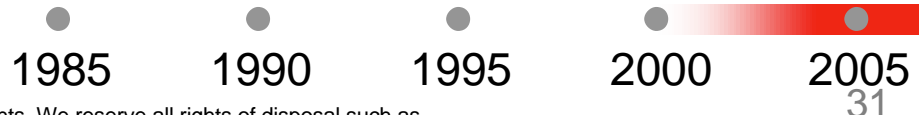
Software Engineering

- "Breitensport" for Level 3
- Further improvement to higher levels

- Structured, corporate-wide know how transfer
- Definition and implementation of corporate-wide trainings

- Usage of CMM assessments as internal system and process audits according to ISO 9000:2000

- Piloting CMMI





Non-Software Engineering

- Transfer of process know how to non-software disciplines
- Starting points are:
 - Project Management
 - FMEA
- Some business units already use SW-CMM in an adapted form for non-software engineering

- Piloting CMMI



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Summary

Bosch uses CMM assessments to benchmark its software producing business units

CMM assessments gave an accurate picture of the process capabilities of an organization

Bosch will extend its experiences with CMM(I) assessments to non-software disciplines