bedra
intelligent wires

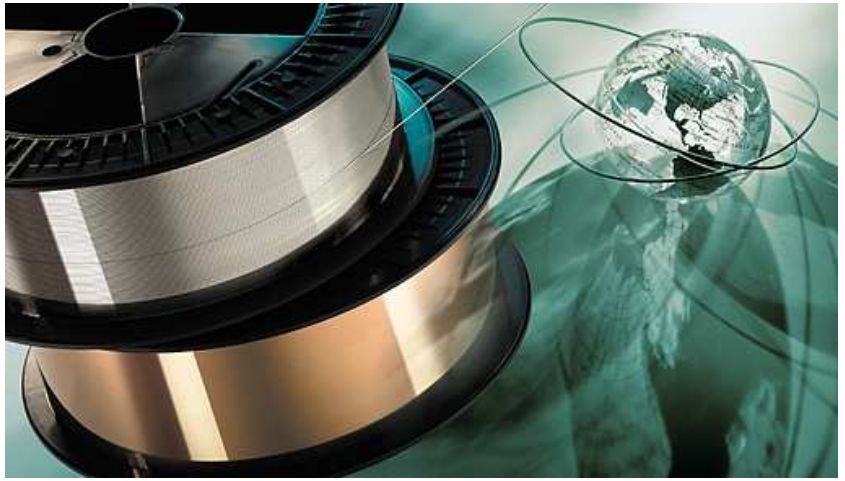
Berkenhoff GmbH

Company profile

Berkenhoff in detail

Under its corporate trademark **bedra** (**Be**rkenhoff **Dra**ht)
Berkenhoff produces and distributes innovative non-ferrous wires for

- **spark erosion**
- **welding**
- **electronics & special applications**



Berkenhoff in detail

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- 2 production sites
  - ➢70 km north of Frankfurt

- distribution agencies and partners in more than 80 countries

Berkenhoff in detail

Key figures Berkenhoff

Employees	Areal	Turnover	Capacity
▪ 470	▪ 346.110 m²	▪ 111 Mio. €uro	▪ 11.000 to / year

Berkenhoff in detail

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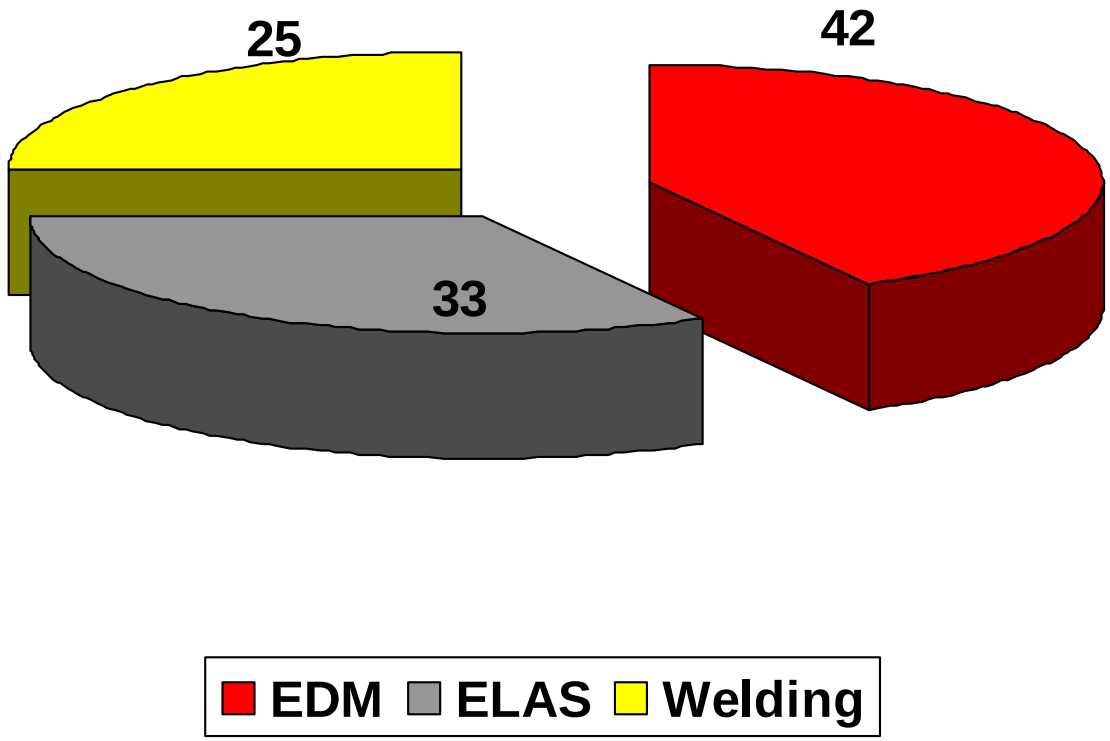
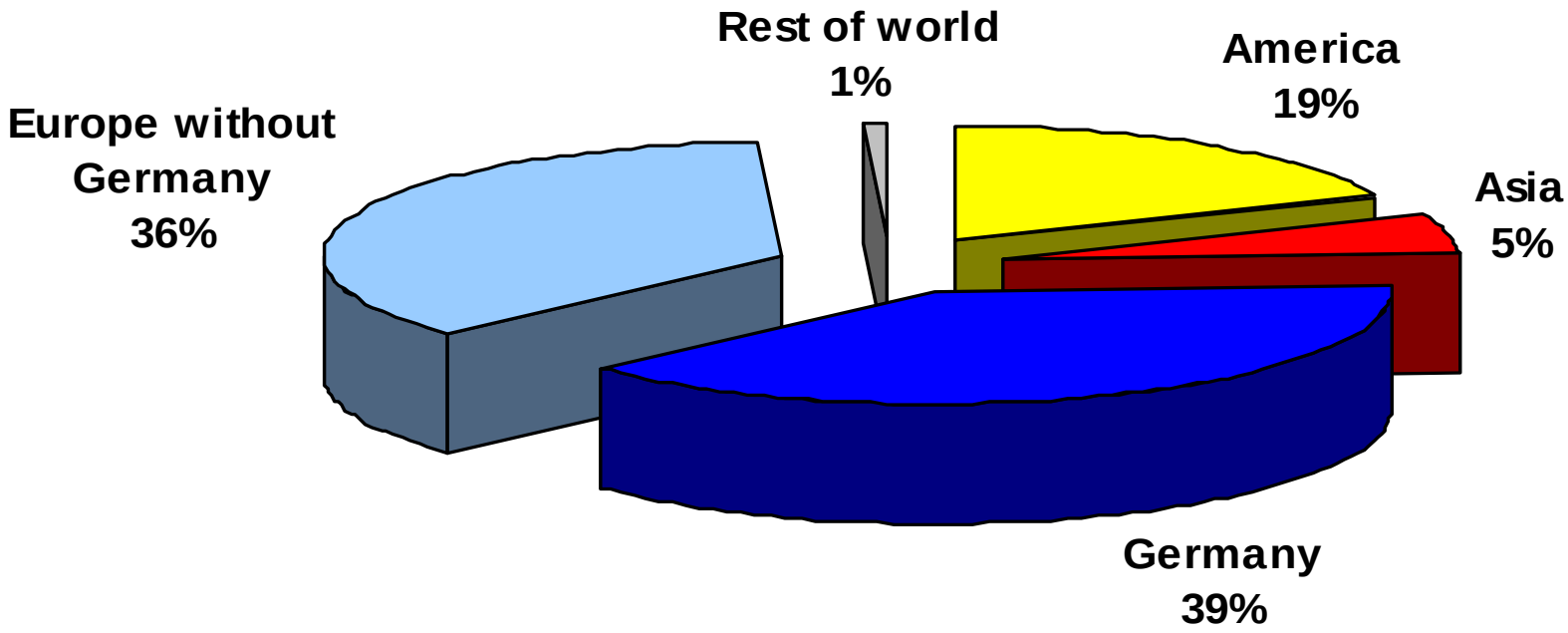
Turnover by business unit (%)



Berkenhoff in detail

Turnover by region



Production Process

Plant Kinzenbach

smelting, continuous casting, cold rolling, annealing, drawing

welding wire, optical & special wire, redrawing wire

bedra pre-material

Plant Merkenbach

primary drawing, annealing, electroplating, fine drawing, profiling

EDM wire, electronic wire anchor wire, special wire

Production Process

- **All from one source: the Berkenhoff in-house concept**
- **Own R&D department, numerous patents**
- **Certificated allover quality testing programme**
  - DIN EN ISO 9001:2008
- **From melting to final packaging:**
  bedra products are completely made in Germany
- **Our in-house concept allows complete traceability and quality control**
- **The production process at a glance:**

Production Process

- **Foundry**

- More than 100 different alloys
- Only high-grade virgin metals are used → High-level quality, reproducible alloys
- Extensive analysis → Tightest alloy tolerances

Production Process

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- **Annealing**

- Prior to rod drawing: long-time annealing under protective atmosphere
- Followed by: Annealing passes after each rolling / drawing pass if required

→ Gentle microstructure transformation

→ Embrittlement of the metal excluded

→ Optimal formability

Production Process

- **Wire drawing / rolling**

- Fine drawing with diamond dies
- Permanent laser monitoring
- Process integrated annealing

→Optimal wire surface, e.g. no grooves

→ Highly precise wire diameter

→ constant quality

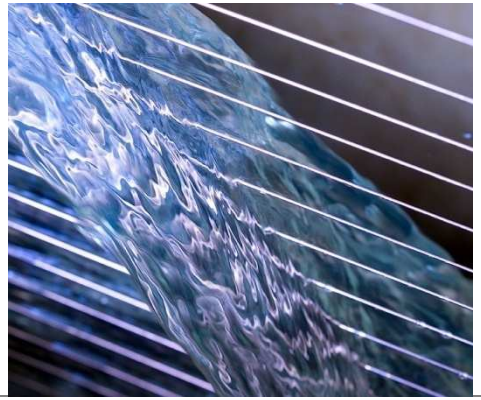
drawing

rolling

Production Process

- **Electroplating**

▪ Modern, high performance electrolytes	→ Various coating variants
▪ Highly pure tin anodes	→ Consistent surface quality
▪ Multilayer -, Reflow technology	→ Certified quality on the highest level
▪ Internal inspections in own laboratory	→ Strict fulfilment of all environmental guidelines



Overview of the alloys

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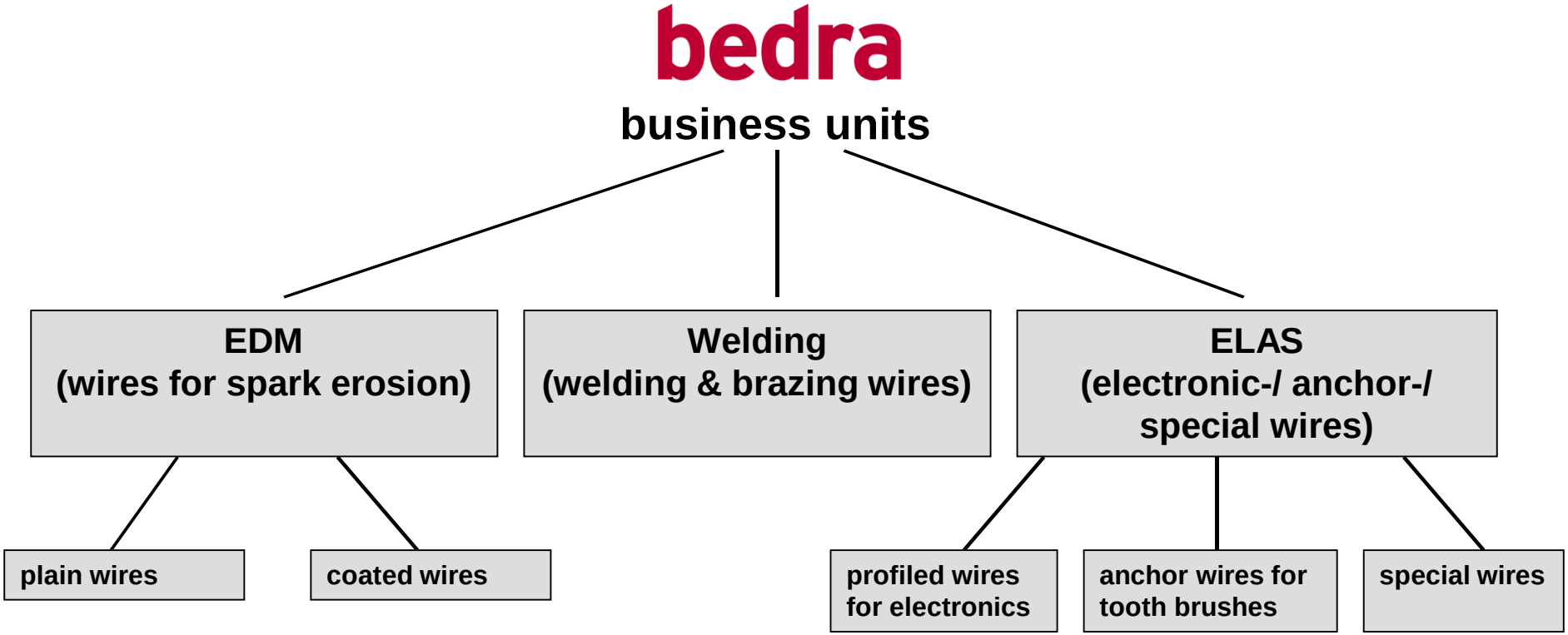
Copper wires	Brass wires	Tin bronze wires	Nickel silver wires
0,10 mm to 8,00 mm	0,05 mm to 8,00 mm	0,02 mm to 8,00 mm	0,05 mm to 11,50 mm
plain, electro tin-plated, silver-plated and zinc-plated	plain, electro tin-plated and zinc-plated, with Ni and/ or Cu barrier layer	plain, electro tin-plated and silver-plated, with Ni and/ or Cu barrier layer	plain, electro tin-plated and silver-plated, with Ni and / or Cu barrier layer

Special alloys on request

Business Units



Business Units

Wire electrodes for spark erosion

Materials

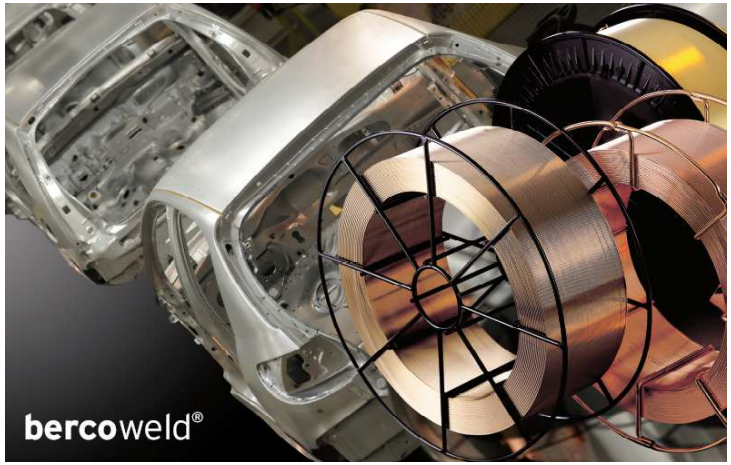
- Plain brass alloys
- Coated brass alloys
- Diffusion annealed brass alloys
- Composite materials

bedra markets

- Tool- and Mouldmaking industry
- Automotive industry
- Household appliances
- Electronics industry
- Machine building ind.
- Mechanical engineering
- Telecommunications
- Packaging industry
- Watch making industry
- Toys industry
- Aviation industry
- Optical industry
- Medical technology

Business Units

Wires for brazing & welding



Materials:

- Low alloyed copper alloys
- Tin bronzes
- Aluminium bonzes
- Copper nickel alloys

bedra markets

Transportation engineering
- Automotive industry
- Track construction
- Shipbuilding
- Motor bike industry
- Bicycle industry
- Agricult. mach. ind.
- Military engineering

Plant engineering
- Offshore / Onshore
- Turbine building
- Mould and tool making
- Mining
- Container building

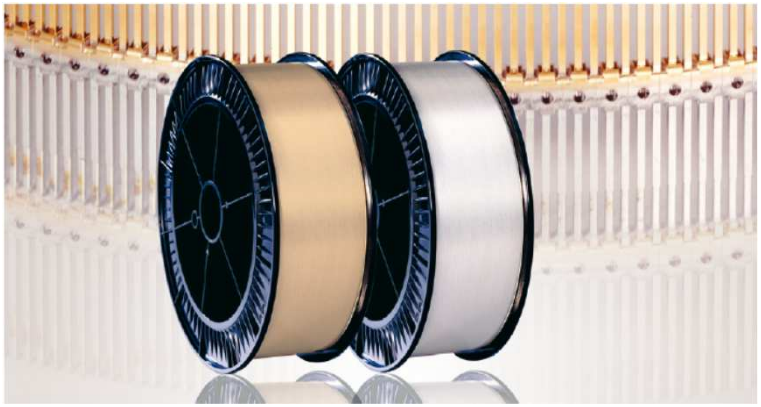
Building industry
- Civil engineering
- Building machinery

bedra customers

- VW
- Audi
- Fiat
- Seat
- BMW
- Skoda
- Opel
- Ford
- PSA
- Daimler
- Hyundai
- Daewoo
- Renault
- Honda
- Suzuki
- Yamaha
- Maersk
- MTU
- ABB

Business Units

Profiled wires for electronics



Materials

- Tin bronze alloys
- Brass alloys
- Nickel silver alloys
- Copper materials
- Highly conductive alloys
- Spinodal alloys
- Special alloys

bedra markets

- Automotive industry
- Industrial electronics
- Telecommunications
- Information technology
- Consumer electronics
- Medical technology
- Military engineering
- Aviation and aero-space technology
- Lighting engineering
- Civil engineering
- Agriculture & forestry

bedra customers

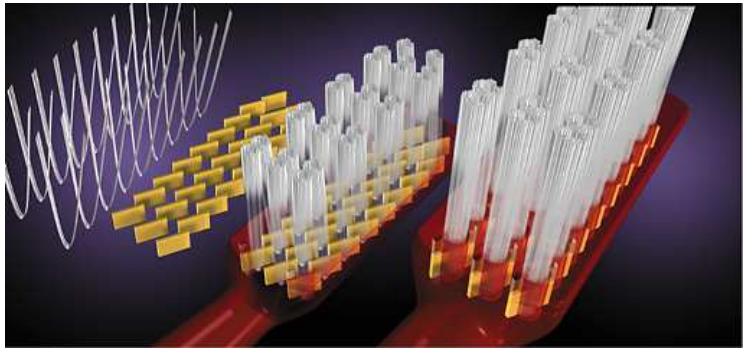
- Tyco
- Molex
- Bosch
- FCI
- Delphi
- Valeo

Wire geometries: Round wires, Square profiles, Flat profiles, Serrated wires, Special profiles on request

Surface refinement: Electroplated wires, Multi-layer technology, Reflow technology

Business Units

Anchor wires



bedra markets

- Toothbrush industry

bedra customers

- Colgate-Palmolive
- Oral-B
- Braun
- Gillette
- Procter & Gamble

Materials

- Nickel silver alloys
- Brass alloys
- Special alloys

Wire geometries: Flat profile grooved, Flat profile ungrooved

Business Units

Special wires

bedra markets

- Medical instruments
- Optical industry
- Jewellery
- Bottle nets
- Springs, pins, rivets
- Decoration, gift articles

Summary of the key facts

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What makes **bedra** a **premium product?**

Product range:

- More than 100 alloys
- All packagings
- Varied diameters

Berkenhoff:

- Made in Germany
- Complete in-house production
- Highly qualified employees
- Expertise in wire
- 120 years of experience
- Environmental Management System certified acc. to ISO 14001
- Own R&D department

Quality:

- Certified Quality Management System acc. to ISO 9001
- Complex product inspection at each stage of manufacture
- Tightest tolerances for optimum processing results

Service:

- Global sales
- On-site Service
- Customized solutions
- Extensive sampling
- Free 3.1 inspection certificate

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What makes **bedra** a **premium product?**

Berkenhoff:	**Competition:**
Own foundry – homogeneous initial microstructure, extensive alloy quality control	Purchase of redrawing material – variations in quality
Use of virgin metals – high-purity alloys	Use of scrap – undesired accompanying elements
Tightest alloy tolerances – highest process stability	Wide alloy tolerances acc. to international standards– instable process
Use of natural diamonds as drawing dies, **own die polishing shop** – homogeneous surfaces	Industrial diamonds, die polishing performed by outside contractors – non-uniform wire surfaces
Long-time annealing – gentle microstructural transformation – homogeneous, fine-grained microstructure, reliable straightness	Fast continuous annealing – high porosity of the surface, embrittlement of the wire
Inhouse R&D – customized alloys	Production of standard alloys
Reproducible quality at the highest level	Variations in quality, lack of process stability