



Product Index

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Messe München GmbH, Am Messesee 2, 81829 München, Germany

A Cluster Semiconductor

1 Semiconductor production

- 1.1 Wafer front-end processing
- 1.2 Wafer back-end processing/Advanced Packaging
- 1.3 Production of power electronics (IGBT, Power MOSFET, Thyristors, etc.)
- 1.4 Measurement, detection and control systems for semiconductor production
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- 1.6 Electronic components
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8 Electronic Manufacturing Services (EMS)

- 8.1 EMS for component/chip carrier manufacturing
- 8.2 EMS for component assembly and device manufacturing and Advanced Packaging
- 8.3 Development-related services

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C Cluster SMT

- 9 Component mount technology, pick & place**
- 9.1 Component preparation
 - 9.2 Component mount techniques, component mounting
 - 9.3 Production
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- 10 Soldering and joining technology for PCBs**
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 - 14.7 Storage technology and commissioning systems
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D Cluster Cables, Coils & Hybrids

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- 16.1 Materials for coilware
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- 17.4 Stamping
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- 17.8 Metal/plastic composite technologies
- 17.9 Process and quality control/Automation

E Cluster Future Production—Smart Factory

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- 18.1 Autonomous inter-connected micro systems, sensor and actuator networks, cyber physical systems
- 18.2 Software: basic systems and development tools
- 18.3 Machine software
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- 18.6 Software services
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19 Production technologies for batteries and electrical energy storage

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- 19.3 Inspection and test systems for batteries and electrical energy storage
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20 Organic and printed electronics

- 20.1 Materials and components
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- 20.4 Applications and devices

21 3D Printing, Additive Manufacturing

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- 21.3 Materials

F Overall Production Support

22 Production materials/equipment and environmental technology

- 22.1 Preliminary products and semi-finished goods, metallic
- 22.2 Preliminary products and semi-finished goods, non-metallic
- 22.3 Process materials
- 22.4 Plant equipment
- 22.5 Decontamination, cleaning, disposal (environmental management)
- 22.6 Recirculation systems, supply, recycling

23 Services

- 23.1 Information provision
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- 23.4 Brainware and Sales
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A Cluster Semiconductor

1 Semiconductor production

1.1 Wafer front-end processing

1.1.1 Wafers and substrates

1.1.1.1 Materials

- 1.1.1.1.1 Wafers made of semiconductor material
- 1.1.1.1.2 Ceramic substrates
- 1.1.1.1.3 Thin-film substrates (glass/ceramic)
- 1.1.1.1.4 Glass wafers
- 1.1.1.1.5 Semiconductor semi-finished parts, miscellaneous
- 1.1.1.1.6 Ceramic foils
- 1.1.1.1.7 Process gases

1.1.1.2 Production equipment

1.1.1.2.1 Crystal growing systems and substrate treatment

- 1.1.1.2.1.1 Melt growth
- 1.1.1.2.1.2 Gas-phase growth
- 1.1.1.2.1.3 Tempering ovens
- 1.1.1.2.2 Polishing tools
- 1.1.1.2.3 Other tools for wafer processing

1.1.2 Mask and artwork generation

- 1.1.2.1 Mask production equipment
- 1.1.2.2 Resist-coating systems
- 1.1.2.3 Beam sources for exposure equipment

- 1.1.2.3.1 Lasers for exposure equipment
- 1.1.2.3.2 UV exposure light sources

1.1.3 Lithography

1.1.3.1 Lithography equipment

- 1.1.3.1.1 Microlithography equipment
- 1.1.3.1.2 Contact exposure equipment
- 1.1.3.1.3 Optical steppers
- 1.1.3.1.4 Laser writing equipment

1.1.3.2 Lithography materials

- 1.1.3.2.1 Resists, Developers & Ancillaries (incl. Adhesion promoter HMDS); Primer
- 1.1.3.2.2 AR coatings
- 1.1.3.2.3 Developers

1.1.4 Thin-film generation

1.1.4.1 Materials

- 1.1.4.1.1 Epitaxial materials
- 1.1.4.1.2 Process materials, thin-film technology, miscellaneous
- 1.1.4.1.3 Quartzware (silicon carbide, fused quartz glass, sapphire), ceramics
- 1.1.4.1.4 Vapor deposition materials
- 1.1.4.1.5 Strippers
- 1.1.4.1.6 Sputter targets
- 1.1.4.1.7 Lapping, polishing and grinding agents
- 1.1.4.1.8 Process chemicals, Cleaning Chemicals, Solvents, miscellaneous

1.1.4.2 Production equipment

- 1.1.4.2.1 Diffusion ovens
- 1.1.4.2.2 Dosing devices
- 1.1.4.2.3 Heat treatment equipment for microstructuring, miscellaneous
- 1.1.4.2.4 Cathode sputter equipment, PVD
- 1.1.4.2.5 CVD equipment, MOCVD; PECVD; LPCVD; ALD; REALD; MVD
- 1.1.4.2.6 Electron-beam deposition equipment
- 1.1.4.2.7 High-vacuum evaporation equipment
- 1.1.4.2.8 Ion-beam coating equipment
- 1.1.4.2.9 Oxidation equipment
- 1.1.4.2.10 Plasma coating systems
- 1.1.4.2.11 Plasma polymerization units
- 1.1.4.2.12 Vacuum coating equipment
- 1.1.4.2.13 Vacuum components

- 1.1.4.2.14 Evaporator inserts
- 1.1.4.2.15 Reactors for epitaxy

1.1.5 Etching equipment

- 1.1.5.1 Ion-etching equipment
- 1.1.5.2 Wet-etching equipment
- 1.1.5.3 Etching plasma generators
- 1.1.5.4 Spray etchers
- 1.1.5.5 Plasma-, sputter-etching equipment

1.1.6 Drying equipment

- 1.1.6.1 Continuous dryers
- 1.1.6.2 UV dryers
- 1.1.6.3 IR dryers
- 1.1.6.4 Vacuum dryers

1.1.7 Equipment for mechanical machining

- 1.1.7.1 Polishing devices/machines for semiconductor technology
- 1.1.7.2 Scribes and automatic scribes
- 1.1.7.3 Lapping equipment
- 1.1.7.4 Separating/trimming/scribing lasers
- 1.1.7.5 Wafer-cleaning systems
- 1.1.7.6 Wafer saws
- 1.1.7.7 Wafer dicing equipment

1.1.8 Manufacturing and machining equipment, miscellaneous

- 1.1.8.1 Plasma equipment, miscellaneous
- 1.1.8.2 Spray process machines, miscellaneous
- 1.1.8.3 Photoresist stripping systems
- 1.1.8.4 Substrate-cleaning systems
- 1.1.8.5 Wafer washers
- 1.1.8.6 Semiconductor technology process equipment, miscellaneous
- 1.1.8.6.1 Gas; liquid delivery panels as subsystems
- 1.1.8.6.2 Handling; transfer; loading systems; lifting devices
- 1.1.8.6.3 Temperature sensing; control; recirculators; chillers; heat exchangers

1.1.9 Wafer/substrate handling

- 1.1.9.1 CTC wafer-handling equipment
- 1.1.9.2 Wafer-cassette equipment
- 1.1.9.3 Wafer storage/shipping containers
- 1.1.9.4 Wafer mounters
- 1.1.9.5 Wafer/tape laminators/de-laminators
- 1.1.9.6 Wafer transfer systems
- 1.1.9.7 Wafer/chip manipulators
- 1.1.9.8 Marking equipment
- 1.1.9.9 Wafer/substrate handling systems, miscellaneous

1.2 Wafer back-end processing/Advanced Packaging

1.2.1 Chip handling

- 1.2.1.1 Component handlers
- 1.2.1.2 Component-handling machines, specialized
- 1.2.1.3 Die sorters
- 1.2.1.4 Sorting equipment for components
- 1.2.1.5 Lifter modules
- 1.2.1.6 Coordinate tables
- 1.2.1.7 Piezo actuators
- 1.2.1.8 Process carriers
- 1.2.1.9 Transport carriers
- 1.2.1.10 Micromanipulators
- 1.2.1.11 Micropositioning
- 1.2.1.12 Positioning systems, miscellaneous
- 1.2.1.13 Chip-handling equipment, miscellaneous

1.2.2 Bonding

- 1.2.2.1 Pre-contacting processes
- 1.2.2.2 Plasma cleaning and activation equipment

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- 1.2.2.3 Chip carriers**
 - 1.2.2.3.1 Semi-finished CC goods (metal/plastic)
 - 1.2.2.3.2 Plastic-chip carriers (PCC)
 - 1.2.2.3.3 Ceramic-chip carriers (including LTCC configurations)
- 1.2.2.4 Internal connections**
 - 1.2.2.4.1 Bonding wires/tapes
 - 1.2.2.4.2 Die bonders
 - 1.2.2.4.3 Flip-chip bonders
 - 1.2.2.4.4 Bonders, miscellaneous
 - 1.2.2.4.5 Bumping systems
 - 1.2.2.4.6 Dispensing systems
- 1.2.2.5 Tools**
 - 1.2.2.5.1 Ultrasonic bonders
 - 1.2.2.5.2 Ultrasonic generators
 - 1.2.2.5.3 Ultrasonic transducers
 - 1.2.2.5.4 Ultrasound metrology
 - 1.2.2.5.5 Contacting equipment, miscellaneous
 - 1.2.2.5.6 Welding equipment for microconnections
 - 1.2.2.5.7 Resistance soldering/welding equipment
 - 1.2.2.5.8 Bonding tools, miscellaneous
- 1.2.3 Chip packaging**
 - 1.2.3.1 Housings
 - 1.2.3.2 Caps and encapsulations, encapsulation equipment**
 - 1.2.3.2.1 Protective component caps
 - 1.2.3.2.2 Glass, passivation/encapsulation
 - 1.2.3.2.3 Ball-grid array packages
 - 1.2.3.2.4 Potting compounds, encapsulations
 - 1.2.3.2.5 Encapsulation materials, miscellaneous
 - 1.2.3.2.6 Encapsulations and encapsulation equipment, miscellaneous
 - 1.2.3.2.7 Epoxy-processing equipment
 - 1.2.3.2.8 Sealants
 - 1.2.3.2.9 Molding presses
 - 1.2.3.2.10 Molding tools
 - 1.2.3.3 Protective coatings for devices**
 - 1.2.3.3.1 Impregnating equipment for devices**
 - 1.2.3.3.1.1 Impregnating machines for metal
 - 1.2.3.3.1.2 Vacuum pressure impregnating machines
 - 1.2.3.3.1.3 Atmospheric pressure impregnating machines
 - 1.2.3.3.1.4 Impregnating machines for laboratory and special applications
 - 1.2.3.4 Potting equipment**
 - 1.2.3.4.1 Potting mixing/dosing equipment
 - 1.2.3.4.2 Vacuum potting systems
 - 1.2.3.4.3 Atmospheric potting systems
 - 1.2.3.4.4 R&D and specialized potting systems
 - 1.2.3.4.5 Automatic pressure gelation (APG)
 - 1.2.3.4.6 Bearings and conveyor equipment for cast resins
 - 1.2.3.4.7 Additional potting equipment, miscellaneous
 - 1.2.3.5 Drying and hardening systems
- 1.3 Production of power electronics (IGBT, Power MOSFET, Thyristors, etc.)**
 - 1.3.1 Materials
 - 1.3.2 Machines and production equipment
 - 1.3.3 Housing and components
- 1.4 Measurement, detection and control systems for semiconductor production**
 - 1.4.1 Monitoring and control units for clean-room technology
 - 1.4.2 Monitoring systems, process-specific
 - 1.4.3 Positioning controllers
 - 1.4.4 Control equipment, miscellaneous, application-specific
 - 1.4.5 Computer; control; communication; data acquisition systems
- 1.5 Packaging and assembly materials**
- 1.6 Electronic components**
- 1.7 Electronic applications**
 - 2 Production of displays, LEDs and discretes**
 - 2.1 Display manufacturing**
 - 2.1.1 Substrate processing for displays**
 - 2.1.1.1 Aligners, exposer systems for displays
 - 2.1.1.2 CVD equipment for displays
 - 2.1.1.3 Laser-annealing systems
 - 2.1.1.4 Substrate processing for displays, miscellaneous
 - 2.1.2 Materials, parts**
 - 2.1.2.1 Substrate materials
 - 2.1.2.2 Spacers for displays
 - 2.1.2.3 Functional organic materials (OLED)
 - 2.1.2.4 Photomasks
 - 2.1.2.5 Functional films, laminates for displays
 - 2.1.2.6 Resins, adhesives for displays
 - 2.1.2.7 Materials, parts, miscellaneous
 - 2.1.3 Panel processing**
 - 2.1.3.1 Printers**
 - 2.1.3.1.1 Screen printers
 - 2.1.3.1.2 Inkjet printers
 - 2.1.3.1.3 Flexo printers
 - 2.1.3.1.4 Display separation equipment
 - 2.2 Manufacturing of Light Emitting Diodes (LED)**
 - 2.2.1 Materials, components**
 - 2.2.1.1 Substrates (Sapphire, SiC, bulk Si, bulk GaN, composites, InP, SiGe, etc.)
 - 2.2.1.2 Material for buffer layers
 - 2.2.1.3 Material for emitter layers, compound semiconductors
 - 2.2.1.4 Optical components
 - 2.2.1.5 Reflectors
 - 2.2.1.6 Components for LED Package
 - 2.2.1.7 Resins, material for sealing
 - 2.2.2 Manufacturing equipment**
 - 2.2.2.1 Sapphire wafer equipment (crystal growth, sawing, grinding)
 - 2.2.2.2 Silicon carbide wafer equipment (crystal growth, sawing, grinding)
 - 2.2.2.3 Wafer equipment for other LED-related semiconductors
 - 2.2.2.4 Lithography
 - 2.2.2.5 Etching
 - 2.2.2.6 Metallization
 - 2.2.2.7 Dicing
 - 2.2.2.8 Pick-and-place
 - 2.2.2.9 Die attach
 - 2.2.2.10 Bonding
 - 2.2.2.11 Phosphor coating
 - 2.2.2.12 Packaging, sealing, housing
 - 2.2.2.13 Equipment for epitaxy**
 - 2.2.2.13.1 Organic/Organo-metallic vapour phase deposition (OMVPE, MOCVD)
 - 2.2.3 Test systems**
 - 2.2.3.1 Life time test systems
 - 2.2.3.2 Photometric test systems
 - 2.2.3.3 LED test systems, miscellaneous
 - 2.3 Manufacturing of discrete components (resistors, capacitors, transistors, diodes)**
 - 2.3.1 Materials for discrete components
 - 2.3.2 Equipment for manufacturing of discrete components**
 - 2.3.2.1 Small parts precision manufacturing equipment
 - 2.3.2.2 Vacuum technology equipment
 - 2.3.2.3 Laser-processing equipment for discrete components

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2.3.2.5	Continuous furnaces	3.2.3	Equipment for new generation solar cells
2.3.2.6	Drying/curing equipment, miscellaneous	3.2.3.1	Equipment for concentrator photovoltaics (CPV)
2.3.2.7	Finishing equipment for discrete components	3.2.3.2	Equipment for other novel solar concepts
2.3.2.8	Manufacturing equipment for capacitors	3.3	Factory planning and -equipment for photovoltaics
2.3.2.9	Manufacturing equipment for resistors	3.3.1	Waste-gas abatement/Waste-water treatment
2.3.2.10	Manufacturing equipment for transistors/diodes	3.3.2	Turnkey solutions
2.3.2.11	Film casting equipment	4	micronano-production/MEMS
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3.1	Materials for Photovoltaics	4.1.2	Nanomaterials
3.1.1	Polysilicon, wafers (silicon, III-V semiconductors, aso.)	4.1.3	Materials for micro/nano technology, miscellaneous
3.1.2	Materials for organic photovoltaics and novel solar cells	4.2	Production equipment
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3.1.6	Materials for evaporation and CVD	4.2.1.3	Exposure tools
3.1.7	Solder pastes	4.2.1.3.1	Pattern generators
3.1.8	Ribbons	4.2.1.3.2	Laser writing equipment
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3.2.1.3	Module production	4.2.4	Tool and mould making
3.2.1.3.1	Tabbers/Stringers/Soldering ovens/Bonder	4.2.4.1	Micro tools
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3.2.2	Equipment for thin-film module production	4.2.5.8	Ultrasonic machines
3.2.2.1	Cleaning equipment	4.2.5.9	Micro-optic production machines
3.2.2.2	Deposition equipment (CVD, PVD)	4.2.5.10	Production machines for micro hot stamping
3.2.2.3	Surface processing equipment/Priming/Conditioning/Resin coating	4.2.5.11	Production machines for micro system technology, miscellaneous
3.2.2.4	Laser processing equipment (sawing, drilling, edge isolation, marking)	4.2.5.12	Micro reaction systems
3.2.2.5	Encapsulation systems/Laminators	4.2.5.13	Microdosing systems
3.2.2.6	Soldering equipment	4.2.5.14	Production tools for microsystem technology, miscellaneous
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- 4.2.7.1 Component mount techniques
- 4.2.7.2 Component mounting in microsystems
- 4.2.7.3 Micro technology mounting & assembly systems
- 4.2.7.4 Joining and interconnection techniques
- 4.2.7.5 Micro filters
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- 4.2.7.7 Nanorobotics
- 4.2.8 Microdrive technology**
- 4.2.8.1 Piezo-electric actuators
- 4.2.8.2 Micro motors
- 4.2.8.3 Micro gears
- 4.2.8.4 Micro positionings
- 4.3 Test, measurement and adaptation equipment for microtechnology**
- 4.4 Assembly and packaging technology for microintegration**
- 4.4.1 On-Chip Integration, System-on-chip (SoC), Wafer-level packaging
- 4.4.2 On-Board Integration, Chip-on-Board (CoB)
- 4.4.3 Flip-chip assembly
- 4.4.4 System-in-Package (SiP), Multi-chip modules, 3D integration
- 4.5 Microtechnology applications**
- 4.5.1 Micro manufacturing, precision technology
- 4.5.2 Lab-on-Chip, micro-process technology
- 4.6 Nanotechnology**
- 4.6.1 Nanochemistry, -materials, -substances
- 4.6.2 Nano tools, Nano analysis
- 4.6.3 Nanomanufacturing
- 4.6.4 Nanoelements/Nanosystems
- 5 Clean room technology**
- 5.1 Clean rooms**
- 5.1.1 Clean rooms, built-in
- 5.1.2 Clean-room boxes, incl. walk-in
- 5.1.3 Clean hoods
- 5.1.4 Flow boxes
- 5.1.5 Laminar flow equipment
- 5.1.6 Dust-free workstations
- 5.2 Clean-room maintenance and control**
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- 14.8.2.1.2 Packaging machines for component packaging

14.8.2.2 Machines for compiling load units

- 14.8.2.2.1 Film-sealing systems
- 14.8.2.2.2 Robots for packaging technology
- 14.8.2.2.3 Packaging machines, miscellaneous

14.9 Complete solutions and turnkey systems for logistics

- 14.9.1 Planning services for logistics systems
- 14.9.2 Consulting for logistics systems
- 14.9.3 Delivery of turnkey systems

D Cluster Cables, Coils & Hybrids

15 Production technologies for cables and connectors

15.1 Cable and wire processing

- 15.1.1 Sheath-stripping equipment
- 15.1.2 Insulation-stripping equipment
- 15.1.3 Wire-trimming equipment
- 15.1.4 Wire croppers for low-profile undersides
- 15.1.5 Wire-bending units
- 15.1.6 Wire-coding units
- 15.1.7 Cable-winding equipment
- 15.1.8 Cable-assembly systems
- 15.1.9 Cable and wire processing aids, miscellaneous
- 15.1.10 Cable-assembly equipment
- 15.1.11 Winding tools (wire strands)

15.1.12 Thermal treatment

- 15.1.12.1 Stress relieve annealing
- 15.1.12.2 Other

15.2 Tools for wiring

- 15.2.1 Wire-crimping units
- 15.2.2 Cable-harness production equipment
- 15.2.3 Ultrasonic welders for cable harnesses
- 15.2.4 Resistance welders for wire harnesses
- 15.2.5 Cable strippers
- 15.2.6 Cable splicing equipment
- 15.2.7 Wiring machines
- 15.2.8 Wiring aids
- 15.2.9 Coax strippers
- 15.2.10 Cable ties and guides
- 15.2.11 Wiring tools, miscellaneous

15.3 Cable-processing equipment

- 15.3.1 Crimping tools
- 15.3.2 Bench-top crimping presses
- 15.3.3 Crimping units/machines, miscellaneous
- 15.3.4 Post crimp soldering equipment
- 15.3.5 IDC tools
- 15.3.6 Coax stripping tools
- 15.3.7 Optical-fiber stripping tools

15.4 Others

- 15.4.1 Cable ring binder equipment
- 15.4.2 Contacting units, miscellaneous
- 15.4.3 Control systems for cable-assembly systems

15.5 Cable-protection devices

- 15.5.1 Corrugated sheath processing machines
- 15.5.2 Heat shrinkable sleeves
- 15.5.3 Protective devices for cable harnesses, miscellaneous

15.6 Processing equipment for cable-protection devices

- 15.6.1 Corrugated sheaths
- 15.6.2 Corrugated sheaths, slotted

15.7 Technology for detachable connections, connectors

- 15.7.1 Connector strips
- 15.7.2 Single-conductor connectors
- 15.7.3 Ribbon cable connectors
- 15.7.4 Cables with connectors
- 15.7.5 Cable terminals
- 15.7.6 Wire end ferrules
- 15.7.7 Crimp connectors and accessories
- 15.7.8 Terminals
- 15.7.9 Enameled-wire connectors
- 15.7.10 Plugs and sockets
- 15.7.11 Plug sockets, all types
- 15.7.12 Plug connectors for household appliances
- 15.7.13 Plug connectors for industrial electronics
- 15.7.14 Plug connectors for automotive electronics
- 15.7.15 Plug connectors for laboratory/test equipment
- 15.7.16 Plug connectors for aerospace
- 15.7.17 Plug connector parts, miscellaneous
- 15.7.18 Plug connectors, miscellaneous complete

16 Coilware production

16.1 Materials for coilware

- 16.1.1 Coil cores
- 16.1.2 Cut and toroidal coil cores
- 16.1.3 Enameled wire, copper-, silver-
- 16.1.4 Superconducting wires
- 16.1.5 Transformer production aids, miscellaneous
- 16.1.6 Coil-winding technology materials, miscellaneous

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16.2	Production equipment for coilware	17.3.9	Cleaning equipment
16.2.1	Stator coil winders	17.4	Stamping
16.2.2	Fine-wire coil winders, automatic	17.4.1	Presses
16.2.3	Coiled-product assembly lines	17.4.2	Stamping presses
16.2.4	Manual coil winders	17.4.3	Stamping machines and systems
16.2.5	Layer winders	17.4.4	Service-providers—stamping
16.2.6	Linear winders, automatic	17.5	Shaping
16.2.7	Modular winding systems	17.5.1	Bending machines and systems
16.2.8	Toroidal coil winders	17.5.2	Lathes
16.2.9	Welding/soldering equipment for coiled-product connections	17.5.3	Roll bending machines
16.2.10	Transfer winding robots	17.5.4	Special-purpose machines
16.2.11	Bench-type coil winders	17.5.5	Service-providers—shaping
16.2.12	Bobbin winders	17.5.6	Equipment, spare parts and accessories for shaping, miscellaneous
16.2.13	Coil winders, miscellaneous	17.6	Surface-finishing equipment, refinement
16.2.14	Coil-manufacturing aids, miscellaneous	17.6.1	Etching machines and systems
16.2.15	Coil-winding technology tools, miscellaneous	17.6.2	Coating machines and systems
16.3	Applications for coilware	17.6.3	Electroplating machines and systems
16.3.1	Electric motor	17.6.4	Marking systems and equipment
16.3.2	Generators	17.6.5	Polishing machines and systems
16.3.3	Transformers	17.6.6	Cleaning machines and systems
16.3.4	Relays	17.6.7	Grinding machines and systems
16.3.5	Electric magnets	17.6.8	Service-providers—surface technology
16.3.6	Coilware for actuators, miscellaneous	17.6.9	Equipment, spare parts and accessories for surface treatment and refinement, miscellaneous
16.3.7	Coilware for sensors, miscellaneous	17.7	Injection molding for plastics
17	Hybrid-component manufacturing	17.7.1	Processing machines and systems
17.1	Tooling and mouldmaking	17.7.2	Extruders
17.1.1	Die making, tool making	17.7.3	Cooling equipment
17.1.2	Rapid prototyping	17.7.4	Injection molding machines and systems
17.1.3	Tooling and mouldmaking, miscellaneous	17.7.5	Service-providers—injection molding
17.2	Tools, tool equipment	17.7.6	Equipment, spare parts and accessories for injection molding for plastics, miscellaneous
17.2.1	Follow-on assembly tools	17.8	Metal/plastic composite technologies
17.2.2	Press tools	17.8.1	Assemblies (mounted in plastic)
17.2.3	Cutting tools	17.8.2	Inserts (plastic injection around inserted part)
17.2.4	Injection moulding tools	17.8.3	Metal/plastic composite technologies, miscellaneous
17.2.5	Stamping tools	17.9	Process and quality control/Automation
17.2.6	Deep-drawing tools	17.9.1	Production data-acquisition (PDA) systems
17.2.7	Separating tools	17.9.2	Measuring, testing and inspection equipment
17.2.8	Bending tools	17.9.3	Process measuring technology
17.2.9	Tools, miscellaneous	17.9.4	Process control and automation
17.3	Assembly and handling technology, periphery	17.9.5	Process monitoring
17.3.1	Reeling/unreeeling machines	17.9.6	Traceability equipment
17.3.2	Destacking systems	17.9.7	Sensors
17.3.3	Feeders, feed technology	17.9.8	Regulation and control equipment
17.3.4	Conveyor systems	17.9.9	Equipment, spare parts and accessories for process and quality control, miscellaneous
17.3.5	Reels		
17.3.6	Cooling equipment and systems		
17.3.7	Assembly equipment and systems		
17.3.8	Robots		

E Cluster Future Production—Smart Factory

18	Industry 4.0	18.1.5	Energy harvesting
18.1	Autonomous inter-connected micro systems, sensor and actuator networks, cyber physical systems	18.1.6	Human machine interfaces active/passive (touch panel displays, barcode reader, RFID systems, augmented reality devices, aso.)
18.1.1	Autonomous inter-connected micro systems, sensor and actuator networks, wireless sensor networks	18.1.7	Information security/IP protection (embedded)
18.1.2	5G-Technology	18.1.8	Product Security
18.1.3	Machine Learning/Big Data Analytics	18.1.9	Digital twin
18.1.4	Cyber Physical Systems (CPS)	18.1.10	Equipment with integrated sensor and actuator networks, CPS
		18.1.10.1	Condition Monitoring
		18.1.10.2	Predictive Maintenance

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- 18.1.10.3 Process controlling
- 18.2 Software: basic systems and development tools**
- 18.2.1 Embedded systems
- 18.2.2 Development tools
- 18.2.3 Simulation systems
- 18.2.4 Programming systems
- 18.2.5 Networks and communication
- 18.2.6 Expert systems (AI-technologies)
- 18.3 Machine software**
- 18.3.1 Machine control software
- 18.3.2 Measurement technology (embedded into machines)
- 18.3.3 NC/CNC-path software
- 18.3.4 Bus systems
- 18.3.5 Machine vision software
- 18.4 Manufacturing software**
- 18.4.1 Production control center, production data acquisition (PDA), operating and machine data logging
- 18.4.2 Manufacturing Execution Systems (MES)
- 18.4.3 Advanced Planning & Scheduling (APS)
- 18.4.4 Process optimisation and simulation
- 18.4.5 Material flow control
- 18.4.6 Automated Process Control (APC)
- 18.4.7 Factory automation; cell controller software
- 18.4.8 Maintenance and service
- 18.5 Business software**
- 18.5.1 Engineering (CAD, CAM, CAE, EDM, PDM, VR, DMU, etc.)
- 18.5.2 Variant configuration
- 18.5.3 Supplies/stock/ordering
- 18.5.4 Supply Chain Management (SCM)
- 18.5.5 ERP, PPS, order processing
- 18.5.6 Business process management
- 18.5.7 Project management
- 18.5.8 Business Intelligence
- 18.5.9 Quality management
- 18.5.10 Technical product documentation
- 18.5.11 Product Lifecycle Management
- 18.5.12 E-Business/E-Commerce/E-Market
- 18.5.13 Service management
- 18.6 Software services**
- 18.6.1 System development/-integration
- 18.6.2 Order specific software development
- 18.6.3 Quality and project management
- 18.7 Application specific software**
- 18.7.1 Process control software for semiconductor and display production
- 18.7.2 Process control software for photovoltaics production
- 18.7.3 Process control software for PCB production**
- 18.7.3.1 Gerber data processing programs
- 18.7.3.2 Drill data processing programs
- 18.7.3.3 PCB data generation systems
- 18.7.3.4 Check data processing programs
- 18.7.3.5 Software for printing tools, miscellaneous
- 18.7.4 Process control software for pick-and-place technology**
- 18.7.4.1 Automation software
- 18.7.4.2 Visualizing software
- 18.7.4.3 Process software, miscellaneous
- 18.7.5 Measurement and test software**
- 18.7.5.1 Measurement technology software
- 18.7.5.2 ATE software/postprocessors
- 18.7.5.3 Fault-detection software
- 18.7.5.4 Fault-detection software with user prompting
- 18.7.6 Control software for material processing
- 18.7.7 Software for Material-flow control**
- 18.7.7.1 Warehouse management and control systems
- 18.7.7.2 Commissioning systems
- 18.7.7.3 Production logistics systems
- 18.7.7.4 Visualization systems for material flow and warehouse logistics
- 19 Production technologies for batteries and electrical energy storage**
- 19.1 Materials and components for batteries and electrical energy storage**
- 19.1.1 Cathode material, cathodes
- 19.1.2 Current Collector
- 19.1.3 Electrode Foil
- 19.1.4 Activated Carbon
- 19.1.5 Materials and components for battery modules
- 19.1.6 Materials/Components, miscellaneous
- 19.2 Equipment for batteries and electrical energy storage**
- 19.2.1 Electrode and separator manufacturing equipment**
- 19.2.1.1 Coating equipment
- 19.2.1.2 Film casting equipment
- 19.2.1.3 Drying equipment
- 19.2.1.4 Rolling Press Machine
- 19.2.2 Cell manufacturing equipment**
- 19.2.2.1 Cutter
- 19.2.2.2 Stamping equipment
- 19.2.2.3 Stacking machines
- 19.2.2.4 Current collector welding machines
- 19.2.2.5 Cell packaging machines
- 19.2.2.6 Degassing equipment
- 19.2.3 Automation equipment
- 19.2.4 Assembly and handling equipment
- 19.2.5 Battery module equipment, battery pack assembly**
- 19.2.5.1 Cell current collector contacting equipment (Soldering, welding, screwing)
- 19.2.5.2 Battery Management Systems and sensors mounting equipment
- 19.2.5.3 Assembly and handling equipment battery pack
- 19.2.5.4 Screwing equipment battery pack
- 19.2.6 Manufacturing equipment for batteries and energy storage, miscellaneous
- 19.2.7 Clean room technology
- 19.3 Inspection and test systems for batteries and electrical energy storage**
- 19.3.1 Charge/Discharge Test Equipment
- 19.3.2 Insulation Tester
- 19.3.3 Life cycle tester, ageing
- 19.3.4 Impedance measuring equipment
- 19.3.5 Leak tightness test equipment
- 19.3.6 Battery simulators for system test (grid buffers for renewable energy, e-mobility, etc.)
- 19.3.7 Inspection/Testing/Evaluation equipment, miscellaneous
- 19.4 Accumulators**
- 19.4.1 Fuel cells
- 19.4.2 Supercaps/Ultracaps
- 19.4.3 Usage**
- 19.4.3.1 Mobile use, high power (automotive, e-mobility)
- 19.4.3.2 Mobile use, low power/consumer (smart phone, laptop, etc.)
- 19.4.3.3 Stationary use (photovoltaics, renewable energy, buffer systems)
- 20 Organic and printed electronics**
- 20.1 Materials and components**
- 20.1.1 Substrates

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- 20.1.2 Conductors
- 20.1.3 Semiconductors
- 20.1.4 Dielectrics
- 20.1.5 Encapsulation materials and resins
- 20.1.6 Components for hybrid systems
- 20.1.7 Materials and components, miscellaneous

20.2 Manufacturing equipment

20.2.1 Print technology

- 20.2.1.1 Screen printing equipment
- 20.2.1.2 Ink-jet printers
- 20.2.2 Vacuum processes
- 20.2.3 Laser deposition equipment
- 20.2.4 Solution coating (spin coating, dip coating, etc.)
- 20.2.5 Roll-to-roll process

20.2.6 Assembly and packaging technology, system integration

- 20.2.6.1 Electrical contacting (flip chip, bonding, etc.)
- 20.2.6.2 Lamination equipment
- 20.2.6.3 System integration
- 20.2.6.4 Hybrid systems (polytronics)
- 20.2.7 Manufacturing equipment, miscellaneous

20.3 Inspection and test systems

- 20.3.1 Optical characterisation
- 20.3.2 Chemical characterisation
- 20.3.3 Quality/Process control
- 20.3.4 Inspection and test systems, miscellaneous

20.4 Applications and devices

- 20.4.1 Integrated Circuits (IC)
- 20.4.2 Passive components
- 20.4.3 Antennas
- 20.4.4 RFID labels
- 20.4.5 Displays and lighting
- 20.4.6 Speakers
- 20.4.7 Smart objects/smart textiles
- 20.4.8 Polymer electronics, other applications

21 3D Printing, Additive Manufacturing

21.1 Production equipment and process technology

- 21.1.1 Laser Sintering
- 21.1.2 Selective Laser Melting
- 21.1.3 3D Printing/Binder Jetting
- 21.1.4 Digital Light Processing
- 21.1.5 other additive manufacturing processes

21.2 Sub systems and machine components

- 21.2.1 Tools, nozzles, print heads
- 21.2.2 Support structures, object platforms, retractable tables
- 21.2.3 Software, CAD platforms
- 21.2.4 other sub systems and machine components

21.3 Materials

- 21.3.1 Plastic filaments
- 21.3.2 Metal granulates

F Overall Production Support

22 Production materials/equipment and environmental technology

22.1 Preliminary products and semi-finished goods, metallic

22.1.1 Sheet metal, strips

- 22.1.1.1 Strips, metal
- 22.1.1.2 Laminations and metal foils

22.1.2 Wires

- 22.1.2.1 Wires, bare
- 22.1.2.2 Wires for component connections
- 22.1.2.3 Copper wires, insulated
- 22.1.2.4 Silver wires, insulated
- 22.1.2.5 Wires, specialized cross-section
- 22.1.3 Springs

22.1.4 Plastics

22.1.5 Cables

- 22.1.5.1 Ribbon cables
- 22.1.5.2 RF cables
- 22.1.5.3 Coaxial cables
- 22.1.5.4 Round cables
- 22.1.5.5 Stranded wires for mains/low frequency
- 22.1.5.6 Cables, miscellaneous

22.1.6 Semi-finished goods

- 22.1.6.1 Etched parts
- 22.1.6.2 Lathed parts
- 22.1.6.3 Punch-pressed flexible parts
- 22.1.6.4 Drawn parts/semi-finished goods
- 22.1.6.5 Contact parts/semi-finished goods
- 22.1.6.6 Molded parts, miscellaneous
- 22.1.6.7 Mechanical components, miscellaneous
- 22.1.6.8 Semi-finished goods in electrical engineering, miscellaneous

22.2 Preliminary products and semi-finished goods, non-metallic

22.2.1 Pre-products

- 22.2.1.1 Duroplastic molded parts/semi-finished goods
- 22.2.1.2 Resin-bonded molded parts/semi-finished goods
- 22.2.1.3 Molded glass parts/semi-finished goods
- 22.2.1.4 Resin-bonded fabric
- 22.2.1.5 Plastic semi-finished goods
- 22.2.1.6 Industrial laminates (sheets, rods, tubes)
- 22.2.1.7 Thermoplastic molded parts/semi-finished goods
- 22.2.1.8 Silicones and silicone parts
- 22.2.1.9 Molded ceramic parts/semi-finished goods, miscellaneous
- 22.2.1.10 Plastic parts, miscellaneous
- 22.2.1.11 Insulated molded parts/semi-finished goods, miscellaneous

22.2.2 Materials, miscellaneous

- 22.2.2.1 Masks (including UV-curable)
- 22.2.2.2 Sealants
- 22.2.2.3 Seals
- 22.2.2.4 Foils, insulating

22.3 Process materials

22.3.1 Lacquers

- 22.3.1.1 Photographic laminates (resists)
- 22.3.1.2 Protective lacquers
- 22.3.1.3 Solder mask lacquers
- 22.3.1.4 Insulating paints/lacquers

22.3.2 Metals

- 22.3.2.1 Precious metals
- 22.3.2.2 Metals/alloys, pure/ultra-pure
- 22.3.2.3 Metallic powders

22.3.3 Chemicals

- 22.3.3.1 Electronics chemicals
- 22.3.3.2 Process chemicals, miscellaneous
- 22.3.3.3 Solvents
- 22.3.3.4 Chemicals, miscellaneous

22.3.4 Insulating materials

- 22.3.4.1 Insulating resins

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- 22.3.4.2 Impregnation insulating materials
- 22.3.4.3 Insulating materials, miscellaneous
- 22.3.5 Plastics**
- 22.3.5.1 Elastomers
- 22.3.5.2 Polyester materials
- 22.3.5.3 Polyamides
- 22.3.5.4 Polymer materials, miscellaneous
- 22.3.5.5 Antistatic PE foam
- 22.3.5.6 Plastics, miscellaneous
- 22.3.6 Gases**
- 22.3.6.1 Gases for semiconductor technology
- 22.3.6.2 Industrial gases
- 22.3.6.3 Gases, miscellaneous
- 22.3.7 Process materials, miscellaneous**
- 22.3.7.1 Glass powders
- 22.3.7.2 Compound materials
- 22.4 Plant equipment**
- 22.4.1 Clothing**
- 22.4.1.1 Antistatic clothing
- 22.4.1.2 Clean-room garments
- 22.4.2 Furniture**
- 22.4.2.1 Office/lab furniture
- 22.4.2.2 Vibration-proof tables
- 22.4.2.3 Lab desks
- 22.4.2.4 Stand-up aids
- 22.4.3 Equipment**
- 22.4.3.1 Workstations, specialized
- 22.4.3.2 Lighting equipment
- 22.4.3.3 Floor coverings, specialized
- 22.4.3.4 Climate control equipment
- 22.4.3.5 Modular workstation systems
- 22.4.4 ESD protection**
- 22.4.4.1 ESD working environment
- 22.4.4.2 ESD personnel grounding
- 22.4.4.3 ESD floor systems
- 22.4.4.4 ESD clean-room products
- 22.4.4.5 ESD protection
- 22.4.4.6 EGB workstation equipment
- 22.4.4.7 ESD packaging
- 22.4.4.8 Antistatic products, miscellaneous
- 22.4.5 Work safety equipment
- 22.4.6 Plant fittings, miscellaneous**
- 22.4.6.1 Power supplies higher than 3 kW
- 22.4.6.2 Workshop equipment, miscellaneous
- 22.4.6.3 Protection materials, miscellaneous
- 22.5 Decontamination, cleaning, disposal (environmental management)**
- 22.5.1 Decontamination
- 22.5.2 Cleaners**
- 22.5.2.1 Solvents/cleaners
- 22.5.2.2 Defluxers
- 22.5.2.3 Stencil cleaners
- 22.5.2.4 Ultrasonic cleaning equipment
- 22.5.2.5 Cleaning agents, miscellaneous
- 22.5.3 Strippers**
- 22.5.3.1 Photo-laminate strippers
- 22.5.3.2 Tin strippers
- 22.5.3.3 Strippers, miscellaneous
- 22.5.4 Equipment and systems**
- 22.5.4.1 Final-cleaning equipment (before population)
- 22.5.4.2 Sterilization equipment, UV
- 22.5.4.3 Semi-aqueous cleaning systems
- 22.5.4.4 Lead-frame cleaning systems
- 22.5.4.5 Film/surface cleaning units
- 22.5.4.6 Low-profile component cleaning systems
- 22.5.4.7 Plasma-cleaning systems
- 22.5.4.8 Screen-washing equipment
- 22.5.4.9 Underwipe cleaning
- 22.5.4.10 Rinsing equipment, specialized
- 22.5.4.11 Substrate-cleaning equipment
- 22.5.4.12 Reflow cleaning equipment
- 22.5.4.13 In-line washing stations
- 22.5.4.14 Ionizers
- 22.5.4.15 Cleaning equipment, specialized, miscellaneous
- 22.5.4.16 Washing/rinsing equipment, specialized, miscellaneous
- 22.5.5 Peripheral systems
- 22.5.6 Waste gas abatement**
- 22.5.6.1 Waste gas abatement/exhaust extraction equipment
- 22.5.6.2 Chip/dust extraction equipment
- 22.5.6.3 Environmental protection equipment, miscellaneous
- 22.5.7 Scrapping**
- 22.5.7.1 Scrap-electronics disassembly equipment
- 22.5.7.2 Obsolete electronic parts reprocessing equipment
- 22.6 Recirculation systems, supply, recycling**
- 22.6.1 Preparation equipment, miscellaneous
- 22.6.2 Consumables for preparation equipment**
- 22.6.2.1 Filter materials
- 22.6.2.2 Ultra-pure water filtration systems
- 22.6.2.3 Filtration equipment, miscellaneous
- 22.6.2.4 Resist filter systems in recirculation
- 22.6.2.5 Exhaust gas absorbers
- 22.6.2.6 Waste-water treatment chemicals
- 22.6.3 Supply systems**
- 22.6.3.1 Chemical supply/feed systems
- 22.6.3.2 Ultra-pure gas supply systems
- 22.6.3.3 Ultra-pure water supply systems
- 22.6.3.4 Rinse-water circulation systems
- 22.6.3.5 Gas management systems
- 22.6.4 Exchangers, miscellaneous
- 22.6.5 Armatures**
- 22.6.5.1 Valves, connectors
- 22.6.5.2 Vacuum valves
- 22.6.5.3 Pumps and pumping systems
- 22.6.5.4 Vacuum pumps
- 22.6.6 Cleaning**
- 22.6.6.1 Process-water purification equipment (recirculation)
- 22.6.6.2 Waste-water treatment equipment
- 22.6.6.3 Etching-solvent reclamation equipment
- 22.6.6.4 Cleaning equipment, miscellaneous
- 22.6.7 Recycling**
- 22.6.7.1 Metal recycling
- 22.6.7.2 Reclamation equipment, miscellaneous
- 23 Services**
- 23.1 Information provision**
- 23.1.1 Technical books
- 23.1.2 Technical journals and periodicals
- 23.1.3 Publications, miscellaneous
- 23.1.4 Databases, incl. online accessible
- 23.1.5 Product-information systems
- 23.1.6 Information, miscellaneous
- 23.2 Production services except EMS**
- 23.2.1 Production services for semiconductors**
- 23.2.1.1 Chip bonding
- 23.2.1.2 Chip packaging

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23.4.1	Consulting	23.5.8	Component database generation
23.4.1.1	Research institutes	23.5.9	other services, miscellaneous
23.4.1.2	Professional and trade associations		
23.4.1.3	Information services and training		