



Product Index

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Messe München GmbH, Messegelände, 81823 München, Germany

A Cluster Semiconductor

- 1 Semiconductor production**
 - 1.1 Wafer front-end processing
 - 1.2 Wafer back-end processing
 - 1.3 Production of power electronics (IGBT, Power MOSFET, Thyristors, etc.)
 - 1.4 Measurement, detection and control systems for semiconductor production
- 2 Production of displays, LEDs and discretes**
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 - 7.4 Generating circuit structure
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 - 7.8 Legend printing
 - 7.9 Molded Interconnect Device (MID) production
 - 7.10 Printed Circuit Board (PCB) handling
 - 7.11 Special machines for power electronics
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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
 - 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
- 9.4 Handling technology

10 Soldering and joining technology for PCBs

- 10.1 Solders and soldering aids
- 10.2 Paste application systems and stencils
- 10.3 Soldering units
- 10.4 Soldering facilities
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- 11.1 Visual inspection, image processing
- 11.2 Materials testing
- 11.3 Measurement technology for non-electrical parameters
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- 11.7 Laboratory/test station equipment

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- 12.1 Repair and rework
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- 12.4 Hybrids
- 12.5 Housings
- 12.6 Electronic protective devices (EMC/ESD)

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- 13.2 Drive technology
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- 14.2 Purchasing
- 14.3 Merchandise management systems
- 14.4 Logistics management
- 14.5 Material-flow control
- 14.6 Transportation and conveyor technology
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- 18.1 Sensor- and actuator networks, Cyber Physical Systems
- 18.2 Software: basic systems and development tools
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- 18.4 Manufacturing software
- 18.5 Business software
- 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
- 19.4 Battery/storage technologies, usage

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- 20.3 Inspection and test systems
- 20.4 Applications and devices

21 3D Printing, Additive Manufacturing

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- 21.2 Sub systems and machine components
- 21.3 Materials

F Overall Production Support

22 Production materials/equipment and environmental technology

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- 22.2 Preliminary products and semi-finished goods, non-metallic
- 22.3 Process materials
- 22.4 Plant equipment
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- 22.6 Recirculation systems, supply, recycling

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- 23.2 Production services except EMS
- 23.3 Used machines, systems, plants
- 23.4 Brainware and Sales
- 23.5 Other services

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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

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1.1.1.2.1.2 Gas-phase growth

1.1.1.2.1.3 Flux growth

1.1.1.2.1.4 Tempering ovens

1.1.1.2.2 Wafer saws

1.1.1.2.3 Polishing tools

1.1.1.2.4 Other tools for wafer processing

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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

1.1.2.3.3 Ion-beam sources

1.1.2.4 Mask handling systems

1.1.2.5 Mask inspection equipment

1.1.2.6 Mask repair stations

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 Full-field projection systems

1.1.3.1.4 Optical steppers

1.1.3.1.5 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

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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 Ion implantation equipment

1.1.4.2.5 Cathode sputter equipment, PVD

1.1.4.2.6 CVD equipment, MOCVD; PECVD; LPCVD; ALD; REALD; MVD

1.1.4.2.7 Electron-beam deposition equipment

1.1.4.2.8 High-vacuum evaporation equipment

1.1.4.2.9 Ion-beam coating equipment

1.1.4.2.10 Oxidation equipment

1.1.4.2.11 Planar magnetrons for sputtering

1.1.4.2.12 Plasma coating systems

1.1.4.2.13 Plasma polymerization units

1.1.4.2.14 Vacuum coating equipment

1.1.4.2.15 Vacuum components

1.1.4.2.16 Evaporator inserts

1.1.4.2.17 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

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1.1.6.2 UV dryers, thin-film

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 pretreatment equipment

1.1.7.6 Protective coating strippers for wafers

1.1.7.7 Wafer-cleaning systems

1.1.7.8 Wafer saws

1.1.7.9 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 Module combinations, substrate handling

1.1.9.9 Marking equipment

1.1.9.10 Wafer/substrate handling systems, miscellaneous

1.2 Wafer back-end processing

1.2.1 Chip handling

1.2.1.1 Component handlers

1.2.1.2 Production-line feeder systems

1.2.1.3 Component-handling machines, specialized

1.2.1.4 Die sorters

1.2.1.5 Sorting equipment for components



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- 1.2.1.6 Lifter modules
- 1.2.1.7 Frog-leg modules
- 1.2.1.8 Coordinate tables
- 1.2.1.9 Piezo actuators
- 1.2.1.10 Process carriers
- 1.2.1.11 Transport carriers
- 1.2.1.12 Micromanipulators
- 1.2.1.13 Micropositioning
- 1.2.1.14 Positioning systems, miscellaneous
- 1.2.1.15 Chip-handling equipment, miscellaneous
- 1.2.2 Bonding**
- 1.2.2.1 Pre-contacting processes
- 1.2.2.2 Plasma cleaning and activation equipment
- 1.2.2.3 Chip carriers**
- 1.2.2.3.1 Leadless chip carriers (LLCC)
- 1.2.2.3.2 Chip carriers, with leads (LCC)
- 1.2.2.3.3 Semi-finished CC goods (metal/plastic)
- 1.2.2.3.4 CC manipulation equipment
- 1.2.2.3.5 Plastic-chip carriers (PCC)
- 1.2.2.3.6 Ceramic-chip carriers (including LTCC configurations)
- 1.2.2.4 Connection tools**
- 1.2.2.5 Internal connections**
- 1.2.2.5.1 Bonding wires/tapes
- 1.2.2.5.2 Die bonders
- 1.2.2.5.3 Flip-chip bonders
- 1.2.2.5.4 Bonders, miscellaneous
- 1.2.2.5.5 Bumping systems
- 1.2.2.5.6 Dispensing systems
- 1.2.2.6 Tools**
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- 1.2.2.6.2 Ultrasonic generators
- 1.2.2.6.3 Ultrasonic transducers
- 1.2.2.6.4 Ultrasound metrology
- 1.2.2.6.5 Contacting equipment, miscellaneous
- 1.2.2.6.6 Welding equipment for microconnections
- 1.2.2.6.7 Resistance soldering/welding equipment
- 1.2.2.6.8 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 Chip carrier encapsulations
- 1.2.3.2.4 DIL encapsulations
- 1.2.3.2.5 Flat-pack encapsulations
- 1.2.3.2.6 Ball-grid array packages
- 1.2.3.2.7 Potting compounds, encapsulations
- 1.2.3.2.8 QFP encapsulations
- 1.2.3.2.9 PGA encapsulations
- 1.2.3.2.10 Special component encapsulations, miscellaneous
- 1.2.3.2.11 Encapsulation materials, miscellaneous
- 1.2.3.2.12 Encapsulations and encapsulation equipment, miscellaneous
- 1.2.3.2.13 Epoxy-processing equipment
- 1.2.3.2.14 Sealants
- 1.2.3.2.15 Molding presses
- 1.2.3.2.16 Molding tools
- 1.2.3.2.17 Multi-chip module-compatible encapsulations
- 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 Continuous automatic extruders
- 1.2.3.4.2 Potting mixing/dosing equipment
- 1.2.3.4.3 Vacuum potting systems
- 1.2.3.4.4 Atmospheric potting systems
- 1.2.3.4.5 R&D and specialized potting systems
- 1.2.3.4.6 Automatic pressure gelation (APG)
- 1.2.3.4.7 Bearings and conveyor equipment for cast resins
- 1.2.3.4.8 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 Guidance technology equipment, miscellaneous
- 1.4.4 Positioning controllers
- 1.4.5 Control equipment, miscellaneous, application-specific
- 1.4.6 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 Glass polishing machines
- 2.1.1.2 Aligners, exposer systems for displays
- 2.1.1.3 CVD equipment for displays
- 2.1.1.4 Sputtering equipment for displays
- 2.1.1.5 Laser-annealing systems
- 2.1.1.6 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 Liquid crystals
- 2.1.2.4 Phosphors
- 2.1.2.5 Functional organic materials
- 2.1.2.6 Photomasks
- 2.1.2.7 Target materials
- 2.1.2.8 Color filters
- 2.1.2.9 Image masks
- 2.1.2.10 Functional films, laminates
- 2.1.2.11 Resins, adhesives
- 2.1.2.12 Materials, parts, miscellaneous
- 2.1.3 Panel processing**
- 2.1.3.1 Alignment layer deposition
- 2.1.3.2 Printers**
- 2.1.3.2.1 Screen printers
- 2.1.3.2.2 Inkjet printers
- 2.1.3.2.3 Flexo printers
- 2.1.3.2.4 Printers OLED
- 2.1.3.2.5 Spacer spray systems
- 2.1.3.2.6 Bonding systems for displays
- 2.1.3.2.7 Display separation equipment
- 2.1.3.2.8 Liquid cristal injection systems

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2.1.3.2.10	Devices for applying/aligning color filters	3.1.7	Process chemicals
2.1.3.2.11	Panel processing, miscellaneous	3.1.8	Sputter targets
2.2	Manufacturing of Light Emitting Diodes (LED)	3.1.9	Materials for evaporation and CVD
2.2.1	Materials, components	3.1.10	Solder pastes
2.2.1.1	Substrates (Sapphire, SiC, bulk Si, bulk GaN, composites, InP; SiGe, etc.)	3.1.11	Carriers
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2.2.1.3	Material for emitter layers, compound semiconductors	3.1.13	Adhesives
2.2.1.4	Phosphors	3.1.14	Foils, laminates for encapsulation/modular technology
2.2.1.5	Optical components	3.1.15	Fresnel-lenses for concentrator photovoltaics (CPV)
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2.2.1.7	Components for LED Package	3.2.1	Equipment for wafer-based photovoltaics
2.2.1.8	Masks	3.2.1.1	Ingot and wafer production
2.2.1.9	Resins, material for sealing	3.2.1.1.1	Crystal growing equipment
2.2.2	Manufacturing equipment	3.2.1.1.2	Ingot casting equipment
2.2.2.1	Sapphire wafer equipment (crystal growth, sawing, grinding)	3.2.1.1.3	Ingot production processes, miscellaneous
2.2.2.2	Silicon carbide wafer equipment (crystal growth, sawing, grinding)	3.2.1.1.4	Wafer saws
2.2.2.3	Wafer equipment for other LED-related semiconductors	3.2.1.1.5	Wafer cleaning
2.2.2.4	Lithography	3.2.1.1.6	Wafer grinding and polishing equipment
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2.2.2.6	Metallization	3.2.1.2	Cell production
2.2.2.7	Dicing	3.2.1.2.1	Wafer texturing
2.2.2.8	Binning, wave prober	3.2.1.2.2	Diffusion furnaces
2.2.2.9	Pick-and-place	3.2.1.2.3	Etching equipment (wet etch, laser)
2.2.2.10	Die attach	3.2.1.2.4	Deposition equipment (PECVD, Sputtering)
2.2.2.11	Bonding	3.2.1.2.5	Printers for front and backside contacts
2.2.2.12	Phosphor coating	3.2.1.2.6	Print screens for metallisation
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2.2.2.15	Equipment for epitaxy	3.2.1.2.9	Equipment for cell production, miscellaneous
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2.2.2.15.3	Organic/Organo-metallic vapour phase deposition (OMVPE, MOCVD)	3.2.1.3.2	Tabbers/Stringers/Soldering ovens/Bonder
2.2.3	Test systems	3.2.1.3.3	Laminators
2.2.3.1	Life time test systems	3.2.1.3.4	Framing units
2.2.3.2	Photometric test systems	3.2.1.3.5	Module test/Quality inspection
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2.3	Manufacturing of discrete components (resistors, capacitors, transistors, diodes)	3.2.1.4	Equipment for crystalline photovoltaics, miscellaneous
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2.3.2	Equipment for manufacturing of discrete components	3.2.1.4.2	Loaders/Unloaders
2.3.2.1	Small parts precision manufacturing equipment	3.2.1.4.3	Automation, assembly and handling equipment
2.3.2.2	Vacuum technology equipment	3.2.1.4.4	Laser processing equipment (sawing, drilling, edge isolation, marking, ...)
2.3.2.3	Laser-processing equipment for discrete components	3.2.1.4.5	Resistance-/laser-welding equipment
2.3.2.4	Surface-finishing equipment	3.2.1.4.6	Surface processing equipment/priming/conditioning/resin coating
2.3.2.5	Continuous furnaces	3.2.1.4.7	Vacuum technology
2.3.2.6	Drying/curing equipment, miscellaneous	3.2.1.4.8	Measurement tools/process control/environmental monitoring
2.3.2.7	Finishing equipment for discrete components	3.2.2	Equipment for thin-film module production
2.3.2.8	Manufacturing equipment for capacitors	3.2.2.1	Substrate conditioning equipment (loading/unloading, cutting, testing)
2.3.2.9	Manufacturing equipment for resistors	3.2.2.2	Cleaning equipment
2.3.2.10	Manufacturing equipment for transistors/diodes	3.2.2.3	Deposition equipment (CVD, PVD)
2.3.2.11	Film casting equipment	3.2.2.4	Surface processing equipment/Priming/Conditioning/Resin coating
2.3.2.12	Processing equipment for discrete component manufacture, others	3.2.2.5	Laser processing equipment (sawing, drilling, edge isolation, marking, ...)
3	Photovoltaics production	3.2.2.6	Mechanical structuring equipment
3.1	Materials for Photovoltaics	3.2.2.7	Encapsulation systems/Laminators
3.1.1	Polysilicon, wafers (silicon, III-V semiconductors, aso.)	3.2.2.8	Soldering equipment
3.1.2	Materials for organic photovoltaics and novel solar cells	3.2.2.9	Module test/Quality inspection
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3.1.4	Crucibles and materials for ingot production	3.2.2.11	Vacuum technology
3.1.5	Materials for wafer saws, polishing and grinding materials	3.2.2.12	Measurement tools/process control/environmental monitoring
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- 3.2.3 Equipment for new generation solar cells**
- 3.2.3.1 Equipment for organic solar cells (OPV)
- 3.2.3.2 Equipment for dye-sensitized solar cells
- 3.2.3.3 Equipment for concentrator photovoltaics (CPV)
- 3.2.3.4 Equipment for other novel solar concepts
- 3.3 Factory planning and -equipment for photovoltaics**
- 3.3.1 Waste-gas abatement/Waste-water treatment
- 3.3.2 Turnkey solutions
- 3.3.3 Facility management
- 3.3.4 Factory design and commissioning
- 3.3.5 Clean room and factory logistics
- 4 micronano-production/MEMS**
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- 4.1.2 Nanomaterials
- 4.1.3 Materials for micro/nano technology, miscellaneous
- 4.2 Production equipment**
- 4.2.1 Mask and artwork generation**
- 4.2.1.1 CA mask generation
- 4.2.1.2 Resist-coating systems
- 4.2.1.3 Exposure tools**
- 4.2.1.3.1 Pattern generators
- 4.2.1.3.2 Laser writing equipment
- 4.2.1.3.3 Exposure equipment, miscellaneous
- 4.2.1.3.4 CA systems for exposure equipment
- 4.2.1.4 Mask handling systems**
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- 17.1.5 Tooling and mouldmaking, miscellaneous
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- 17.2.1 Erosion machines and systems
- 17.2.2 Follow-on assembly tools
- 17.2.3 Standards for stamping and shaping tools
- 17.2.4 Press tools
- 17.2.5 Cutting tools
- 17.2.6 Injection moulding tools
- 17.2.7 Stamping tools
- 17.2.8 Deep-drawing tools
- 17.2.9 Separating tools
- 17.2.10 Tool-handling and tool-fastening systems
- 17.2.11 Bending tools
- 17.2.12 Tool-clamping devices
- 17.2.13 Tools, miscellaneous
- 17.3 Assembly and handling technology, periphery**
- 17.3.1 Substances and strip stocks
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- 17.3.3 Destacking systems

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- 17.3.4 Strip position control systems
- 17.3.5 Strip-storage systems
- 17.3.6 Strip-straightening machine
- 17.3.7 Strip-lubricating systems
- 17.3.8 Strip welding machines
- 17.3.9 Container filling systems
- 17.3.10 Oiling systems
- 17.3.11 Removal systems
- 17.3.12 Feeders, feed technology
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- 17.3.14 Reels
- 17.3.15 Hot runners
- 17.3.16 Plastic feeder systems
- 17.3.17 Cooling equipment and systems
- 17.3.18 Assembly equipment and systems
- 17.3.19 Robots
- 17.3.20 Cleaning equipment
- 17.3.21 Lubricating equipment and systems
- 17.3.22 Equipment, spare parts and accessories for assembly and handling technology and periphery, miscellaneous

17.4 Stamping

- 17.4.1 Presses
- 17.4.2 Stamping presses
- 17.4.3 Stamping machines and systems
- 17.4.4 Service-providers—stamping
- 17.4.5 Equipment, spare parts and accessories for stamping, miscellaneous

17.5 Shaping

- 17.5.1 Bending machines and systems
- 17.5.2 Lathes
- 17.5.3 Roll bending machines
- 17.5.4 Special-purpose machines
- 17.5.5 Service-providers—shaping
- 17.5.6 Equipment, spare parts and accessories for shaping, miscellaneous

17.6 Surface-finishing equipment, refinement

- 17.6.1 Etching machines and systems
- 17.6.2 Coating machines and systems
- 17.6.3 Electroplating machines and systems

- 17.6.4 Marking systems and equipment
- 17.6.5 Polishing machines and systems
- 17.6.6 Cleaning machines and systems
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- 17.6.9 Equipment, spare parts and accessories for surface treatment and refinement, miscellaneous

17.7 Injection molding for plastics

- 17.7.1 Processing machines and systems
- 17.7.2 Extruders
- 17.7.3 Cooling equipment
- 17.7.4 Injection molding machines and systems
- 17.7.5 Service-providers—injection molding
- 17.7.6 Equipment, spare parts and accessories for injection molding for plastics, miscellaneous

17.8 Metal/plastic composite technologies

- 17.8.1 Assemblies (mounted in plastic)
- 17.8.2 Inserts (plastic injection around inserted part)
- 17.8.3 Outserts (part surrounds injected plastic)
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17.9 Process and quality control/Automation

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- 17.9.7 Compression force control systems
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- 17.9.9 Process control and automation
- 17.9.10 Process monitoring
- 17.9.11 Traceability equipment
- 17.9.12 Sensors
- 17.9.13 Regulation and control equipment
- 17.9.14 Tool-safety equipment
- 17.9.15 Tool monitoring
- 17.9.16 Equipment, spare parts and accessories for process and quality control, miscellaneous

E Cluster Future Markets

18 IT to Production, Industry 4.0

18.1 Sensor- and actuator networks, Cyber Physical Systems

- 18.1.1 Autarkic nanocomputers, sensor and actuator networks, wireless sensor networks
- 18.1.2 Cyber Physical Systems (CPS)
- 18.1.3 Energy harvesting
- 18.1.4 Human machine interfaces active/passive (touch panel displays, barcode reader, RFID systems, augmented reality devices, aso.)
- 18.1.5 Information security/IP protection (embedded)
- 18.1.6 Equipment with integrated sensor- and actuator networks, CPS
 - 18.1.6.1 Condition Monitoring
 - 18.1.6.2 Predictive Maintenance
 - 18.1.6.3 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
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- 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
- 18.3.6 Online documentation

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

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18.4.8	Maintenance and service	19.1.7	Electrode foil
18.4.9	Communication software	19.1.8	Activated carbon
18.5	Business software	19.1.9	Hydrogen-absorbing alloys
18.5.1	Engineering (CAD, CAM, CAE, EDM, PDM, VR, DMU, etc.)	19.1.10	Housing
18.5.2	Variant configuration	19.1.11	Materials and components for battery modules
18.5.3	Supplies/stock/ordering	19.1.12	Materials/Components, other
18.5.4	Supply Chain Management (SCM)	19.2	Equipment for batteries and electrical energy storage
18.5.5	ERP, PPS, order processing	19.2.1	Electrode and separator manufacturing equipment
18.5.6	Business process management	19.2.1.1	Grinding mill
18.5.7	Project management	19.2.1.2	Blender/Agitation equipment
18.5.8	Business Intelligence	19.2.1.3	Coating equipment
18.5.9	Quality management	19.2.1.4	Film casting equipment
18.5.10	Technical product documentation	19.2.1.5	Drying equipment
18.5.11	Product Lifecycle Management	19.2.1.6	Rolling press machine
18.5.12	E-Business/E-Commerce/E-Market	19.2.1.7	Calender
18.5.13	Service management	19.2.1.8	Slitter
18.6	Software services	19.2.2	Cell manufacturing equipment
18.6.1	System development/-integration	19.2.2.1	Cutter
18.6.2	Order specific software development	19.2.2.2	Stamping equipment
18.6.3	Quality and project management	19.2.2.3	Electrode assembly equipment
18.6.4	Documentation services	19.2.2.4	Electrode plate winding equipment
18.6.5	Software maintenance	19.2.2.5	Stacking machines
18.7	Application specific software	19.2.2.6	Electrolyte filling equipment
18.7.1	Process control software for semiconductor and display production	19.2.2.7	Current collector welding machines
18.7.2	Process control software for photovoltaics production	19.2.2.8	Cell packaging machines
18.7.3	Process control software for the production of electrical energy storage/batteries	19.2.2.9	Degassing equipment
18.7.4	Process control software for PCB production	19.2.2.10	Initial charge equipment
18.7.4.1	Gerber data processing programs	19.2.3	Automation equipment
18.7.4.2	Drill data processing programs	19.2.4	Assembly and handling equipment
18.7.4.3	Grind data processing programs	19.2.5	Battery module equipment, battery pack assembly
18.7.4.4	PCB data generation systems	19.2.5.1	Cell current collector contacting equipment (soldering, welding, screwing)
18.7.4.5	Check data processing programs	19.2.5.2	Battery Management Systems and sensors mounting equipment
18.7.4.6	Software for printing tools, miscellaneous	19.2.5.3	Cooling plate mounting equipment
18.7.5	Process control software for pick-and-place technology	19.2.5.4	Housing assembly and handling equipment
18.7.5.1	Automation software	19.2.5.5	Assembly and handling equipment battery pack
18.7.5.2	Visualizing software	19.2.5.6	Screwing equipment battery pack
18.7.5.3	Process software, miscellaneous	19.2.6	Manufacturing equipment for batteries and energy storage, other
18.7.6	Measurement and test software	19.2.7	Clean room technology
18.7.6.1	Simulators	19.3	Inspection and test systems for batteries and electrical energy storage
18.7.6.2	Measurement technology software	19.3.1	Filling measuring equipment
18.7.6.3	ATE software/postprocessors	19.3.2	Charge/discharge test equipment
18.7.6.4	Fault-detection software	19.3.3	Insulation tester
18.7.6.5	Fault-detection software with user prompting	19.3.4	Life cycle tester, ageing
18.7.7	Control software for material processing	19.3.5	Impedance measuring equipment
18.7.8	Software for Material-flow control	19.3.6	Internal resistance test equipment
18.7.8.1	Warehouse management and control systems	19.3.7	Leak tightness test equipment
18.7.8.2	Commissioning systems	19.3.8	Safety test equipment
18.7.8.3	Production logistics systems	19.3.9	Battery simulators for system test (grid buffers for renewable energy, e-mobility, etc.)
18.7.8.4	Software solutions for floor conveyors and hoisting devices	19.3.10	Inspection/Testing/Evaluation equipment, other
18.7.8.5	Visualization systems for material flow and warehouse logistics	19.4	Battery/storage technologies, usage
19	Production technologies for batteries and electrical energy storage	19.4.1	Primary batteries (non-rechargeable)
19.1	Materials and components for batteries and electrical energy storage	19.4.2	Secondary batteries (accumulators)
19.1.1	Cathode material, cathodes	19.4.2.1	Lithium-ion battery
19.1.2	Anode material, anodes	19.4.2.2	Lithium polymer battery
19.1.3	Electrolytes	19.4.2.3	Nickel metal hydride battery
19.1.4	Separators	19.4.2.4	Nickel cadmium battery
19.1.5	Binders	19.4.2.5	Lead acid battery
19.1.6	Current collector	19.4.2.6	Sodium sulfur/Lithium sulfur batteries



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- 19.4.3 Fuel cells
- 19.4.4 Supercaps/Ultracaps
- 19.4.5 Usage
 - 19.4.5.1 Mobile use, high power (automotive, e-mobility)
 - 19.4.5.2 Mobile use, low power/consumer (smart phone, laptop, etc.)
 - 19.4.5.3 Stationary use (photovoltaics, renewable energy, buffer systems)

20 Organic and printed electronics

20.1 Materials and components

- 20.1.1 Substrates
- 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, others

20.2 Manufacturing equipment

20.2.1 Print technology

- 20.2.1.1 Gravure print equipment
- 20.2.1.2 Offset print equipment
- 20.2.1.3 Screen printing equipment
- 20.2.1.4 Flexographic printing equipment
- 20.2.1.5 InkJet printers
- 20.2.1.6 Nano imprint equipment

20.2.2 Vacuum processes

20.2.3 Photolithography

20.2.4 Laser deposition equipment

20.2.5 Solution coating (spin coating, dip coating, etc.)

20.2.6 Encapsulation and gluing

20.2.7 Roll-to-roll process

20.2.8 Assembly and packaging technology, system integration

- 20.2.8.1 Electrical contacting (flip chip, bonding, etc.)
- 20.2.8.2 Lamination equipment
- 20.2.8.3 System integration
- 20.2.8.4 Hybrid systems (polytronics)
- 20.2.8.5 Assembly and packaging technology, system integration, other

20.2.9 Manufacturing equipment, other

20.3 Inspection and test systems

- 20.3.1 Electrical characterization
- 20.3.2 Physical/optical characterization
- 20.3.3 Chemical characterization

- 20.3.4 Simulation/Circuit optimization
- 20.3.5 Lifetime testing
- 20.3.6 Quality/process control
- 20.3.7 Inspection and test systems, others

20.4 Applications and devices

- 20.4.1 Integrated Circuits (IC)
- 20.4.2 Transistors and diodes
- 20.4.3 Passive components
- 20.4.4 Antennas
- 20.4.5 Memory devices
- 20.4.6 Batteries
- 20.4.7 RFID labels
- 20.4.8 Sensors
- 20.4.9 Displays and lighting
- 20.4.10 Organic photovoltaics (OPV)
- 20.4.11 Speakers
- 20.4.12 Smart objects/Smart textiles
- 20.4.13 Full polymer electronics, other applications
- 20.4.14 Partial polymer electronics (polytronics), other applications

21 3D Printing, Additive Manufacturing

21.1 Production equipment and process technology

- 21.1.1 Stereo lithography
- 21.1.2 Laser Sintering
- 21.1.3 Selective Laser Melting
- 21.1.4 Fused Layer Manufacturing/Fused Deposition Modeling
- 21.1.5 PolyJet Modeling
- 21.1.6 3D Printing/Binder Jetting
- 21.1.7 Laminated Object Manufacturing
- 21.1.8 Digital Light Processing
- 21.1.9 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 Plastic granulates and -powders
- 21.3.3 Metal granulates

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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

- 22.1.4.1 Granulates
- 22.1.4.2 Conductive granulates

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 Bimetallic parts
- 22.1.6.3 Lathed parts
- 22.1.6.4 Ferrite parts
- 22.1.6.5 Ferroelectric ceramicware
- 22.1.6.6 Memory components
- 22.1.6.7 Galvanic molded parts
- 22.1.6.8 Graphite parts, pure/ultra-pure
- 22.1.6.9 Cooling parts
- 22.1.6.10 Laser-cut molded parts
- 22.1.6.11 Microstructure preliminary products
- 22.1.6.12 Metal tubes
- 22.1.6.13 Punch-pressed flexible parts
- 22.1.6.14 Drawn parts/semi-finished goods
- 22.1.6.15 Contact parts/semi-finished goods
- 22.1.6.16 Molded parts, miscellaneous
- 22.1.6.17 Mechanical components, miscellaneous
- 22.1.6.18 Semi-finished goods in electrical engineering, miscellaneous
- 22.1.6.19 Semi-finished parts, metallic/mineral, miscellaneous

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

22.2.1 Pre-products

- 22.2.1.1 Grommets, compound material
- 22.2.1.2 Duroplastic molded parts/semi-finished goods
- 22.2.1.3 Plastic preforms (elastomers)
- 22.2.1.4 Semi-finished goods, miscellaneous, organic
- 22.2.1.5 Resin-bonded molded parts/semi-finished goods
- 22.2.1.6 Piezo-ceramicware
- 22.2.1.7 Molded glass parts/semi-finished goods
- 22.2.1.8 Resin-bonded fabric
- 22.2.1.9 Plastic semi-finished goods
- 22.2.1.10 Industrial laminates (sheets, rods, tubes)
- 22.2.1.11 Thermoplastic molded parts/semi-finished goods
- 22.2.1.12 Silicones and silicone parts

- 22.2.1.13 Molded ceramic parts/semi-finished goods, miscellaneous
- 22.2.1.14 Plastic parts, miscellaneous
- 22.2.1.15 Semi-finished goods in electrical engineering, miscellaneous
- 22.2.1.16 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
- 22.3.1.5 Conductive 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
- 22.3.2.4 Memory alloys
- 22.3.2.5 Structural mock-ups, metal
- 22.3.2.6 Metals, miscellaneous

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
- 22.3.4.2 Laminating resins
- 22.3.4.3 Impregnation insulating materials
- 22.3.4.4 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 CFC substitutes
- 22.3.6.2 Gases for semiconductor technology
- 22.3.6.3 Industrial gases
- 22.3.6.4 Gases, miscellaneous

22.3.7 Dielectrics

22.3.8 Process materials, miscellaneous

- 22.3.8.1 Glass powders
- 22.3.8.2 Ceramic powders
- 22.3.8.3 Crystal materials
- 22.3.8.4 Compound materials

22.4 Plant equipment

22.4.1 Clothing

- 22.4.1.1 Antistatic clothing
- 22.4.1.2 Clean-room garments
- 22.4.1.3 Clean-room footwear

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



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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
- 22.4.3.6 Monitoring-room equipment

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 Pressure-control systems
- 22.4.6.3 Workshop equipment, miscellaneous
- 22.4.6.4 Protection materials, miscellaneous

22.5 Decontamination, cleaning, disposal (environmental management)

22.5.1 Decontamination

22.5.2 Cleaners

- 22.5.2.1 Cleaning brushes
- 22.5.2.2 Solvents/cleaners
- 22.5.2.3 Defluxers
- 22.5.2.4 Stencil cleaners
- 22.5.2.5 Ultrasonic cleaning equipment
- 22.5.2.6 Cleaning agents, miscellaneous

22.5.3 Strippers

- 22.5.3.1 Photo-laminate strippers
- 22.5.3.2 Solder mask strippers
- 22.5.3.3 Tin strippers
- 22.5.3.4 Strippers, miscellaneous

22.5.4 Systems

- 22.5.4.1 Final-cleaning equipment (before population)
- 22.5.4.2 Degreasing systems
- 22.5.4.3 Sterilization equipment, UV
- 22.5.4.4 Desalination equipment
- 22.5.4.5 Semi-aqueous cleaning systems
- 22.5.4.6 Lead-frame cleaning systems
- 22.5.4.7 Film/surface cleaning units
- 22.5.4.8 Low-profile component cleaning systems
- 22.5.4.9 Plasma-cleaning systems
- 22.5.4.10 Screen-washing equipment
- 22.5.4.11 Underside cleaning
- 22.5.4.12 Rinsing equipment, specialized
- 22.5.4.13 Substrate-cleaning equipment
- 22.5.4.14 Reflow cleaning equipment
- 22.5.4.15 Workshop-cleaning units/machines
- 22.5.4.16 In-line washing stations
- 22.5.4.17 Ionizers
- 22.5.4.18 Cleaning equipment, miscellaneous specialized
- 22.5.4.19 Washing/rinsing equipment, miscellaneous specialized
- 22.5.4.20 Ultrasonic cleaning systems

22.5.5 Peripheral systems

- 22.5.5.1 Post-treatment equipment, miscellaneous
- 22.5.5.2 Pre-cleaning equipment, miscellaneous

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 Waste disposal equipment, miscellaneous
- 22.5.6.4 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

- 22.6.1.1 Waste preparation equipment
- 22.6.1.2 Ultra-pure water preparation equipment
- 22.6.1.3 Preparation equipment, miscellaneous
- 22.6.1.4 Reprocessing equipment, miscellaneous

22.6.2 Consumables for preparation equipment

- 22.6.2.1 Filter materials
- 22.6.2.2 Filters for liquid; oil
- 22.6.2.3 Ultra-pure water filtration systems
- 22.6.2.4 Filtration equipment, miscellaneous
- 22.6.2.5 Resist filter systems in recirculation
- 22.6.2.6 Exhaust gas absorbers
- 22.6.2.7 Waste-water treatment chemicals
- 22.6.2.8 Consumables, miscellaneous

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

- 22.6.4.1 Ion exchangers
- 22.6.4.2 Heat exchangers
- 22.6.4.3 Cooling machines
- 22.6.4.4 Exchangers, miscellaneous

22.6.5 Armatures

- 22.6.5.1 Valves, connectors
- 22.6.5.2 Vacuum valves
- 22.6.5.3 Fittings/unions for fluids
- 22.6.5.4 Pumps and pumping systems
- 22.6.5.5 Vacuum pumps
- 22.6.5.6 Leakage test systems
- 22.6.5.7 Armatures, miscellaneous

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 Heat recovery systems
- 22.6.7.3 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



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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
- 23.2.1.3 Contacting services

23.2.2 Services for material machining

- 23.2.2.1 Wire erosion
- 23.2.2.2 Laser welding/cutting
- 23.2.2.3 Plating subcontractors
- 23.2.2.4 Surface treatment
- 23.2.2.5 Metal machining
- 23.2.2.6 Manufacturing precision lathed and milled parts

23.2.3 Production services for components

- 23.2.3.1 Belting services
- 23.2.3.2 Inductive component/coiled-products manufacturing services
- 23.2.3.3 Testing/adjusting of component connections

23.2.4 Services for cable processing

- 23.2.4.1 Cabling

23.2.5 Test and measurement services

- 23.2.5.1 Test and test design services
- 23.2.5.2 Measurement and calibration services
- 23.2.5.3 Acceptance and approval services

23.3 Used machines, systems, plants

- 23.3.1 Plants
- 23.3.2 Machines
- 23.3.3 Systems
- 23.3.4 Used machines, systems and plants, miscellaneous

23.4 Brainware and Sales

23.4.1 Consulting

- 23.4.1.1 Research institutes
- 23.4.1.2 Professional and trade associations
- 23.4.1.3 Information services and training
- 23.4.1.4 Consultants, miscellaneous

23.4.2 Engineering services

- 23.4.2.1 Production line optimization
- 23.4.2.2 Set-up concepts

23.4.3 Process optimization

- 23.4.3.1 Training
- 23.4.3.2 Education
- 23.4.3.3 Process optimization
- 23.4.3.4 Quality analysis

23.4.4 Sales

- 23.4.4.1 Assembly sales
- 23.4.4.2 Equipment sales
- 23.4.4.3 Used-electronics sales
- 23.4.4.4 Electronic-equipment leasing
- 23.4.4.5 Sales of production services
- 23.4.4.6 Manufacturers representation; distributors; sales, other

23.5 Other services

- 23.5.1 Procurement services
- 23.5.2 Financial services
- 23.5.3 Parylene coatings
- 23.5.4 Maintenance services
- 23.5.5 Repair services
- 23.5.6 Disposal services
- 23.5.7 Assembly parts packaging (product lines)
- 23.5.8 Packaging of material and liquids
- 23.5.9 Component database generation
- 23.5.10 Other services, miscellaneous