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1.5 Packaging and assembly materials

1.6 Electronic components

1.7 Electronic applications

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2.1.2.3 Functional organic materials (OLED)
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2.1.2.5 Functional films, laminates for displays
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2.1.3.1.2 Inkjet printers
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2.1.3.1.4 Display separation equipment

2.2 Manufacturing of Light Emitting Diodes (LED)

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2.2.2.7 Dicing
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2.2.3.1 Life time test systems
2.2.3.2 Photometric test systems
2.2.3.3 LED test systems, miscellaneous

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2.3.2.3 Laser-processing equipment for discrete components

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2.3.2.10 Manufacturing equipment for transistors/diodes
2.3.2.11 Film casting equipment
2.3.2.12 Processing equipment for discrete component manufacture, miscellaneous

3 Photovoltaics production

3.1 Materials for Photovoltaics

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3.1.2 Materials for organic photovoltaics and novel solar cells
3.1.3 Glass substrates for thin-film photovoltaics
3.1.4 Process chemicals
3.1.5 Sputter targets
3.1.6 Materials for evaporation and CVD
3.1.7 Solder pastes
3.1.8 Ribbons
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4 micronano-production/MEMS

4.1 Materials/substances

4.1.1 Substrate materials for microtechnology
4.1.2 Nanomaterials
4.1.3 Materials for micro/nano technology, miscellaneous

4.2 Production equipment

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4.2.8 Microdrive technology

4.2.8.1 Piezo-electric actuators
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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
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4.6.3 Nanomanufacturing
4.6.4 Nanoelements/Nanosystems

5 Clean room technology

5.1 Clean rooms

5.1.1 Clean rooms, built-in
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5.1.3 Clean hoods
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5.1.5 Laminar flow equipment
5.1.6 Dust-free workstations

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5.3 Clean-room equipment

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5.4 Clean-room equipment for personnel

5.4.1 Air shower cabins, personnel
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6.1.1.3 Special drilling machines
6.1.1.4 Milling machines
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6.1.2.5 Scoring machines

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6.1.3.4 Edge-finishing machines, miscellaneous

6.1.4 Surface treatment

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6.1.4.4 Polishing equipment and materials
6.1.4.5 Equipment for surface treatment, miscellaneous

6.1.5 Tools and accessories

6.1.5.1 Drills
6.1.5.2 Milling cutters
6.1.5.3 Drilling aids
6.1.5.4 Brushes for surface treatment
6.1.5.5 Grinding discs
6.1.5.6 Surface treatment materials, miscellaneous

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6.3.3 Ultrasonic welders for metal
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6.3.9 Shielding gases for welding

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6.4.1 Chemical processing

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6.4.1.2 Machines for etching, pickling and other chemical processing

6.4.1.2.1 Etching equipment/machines
6.4.1.2.2 Continuous etching lines
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6.7 System periphery for laser-based manufacturing

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6.7.11 Laser vapor extraction systems
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7 PCB and circuit-carrier manufacturing

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7.1.1.2 Conducting strips
7.1.2 Foils
7.1.2.1 Cu/Al/Cu sandwich foil sets
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7.1.5.2 Lamination presses
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7.1.5.5 Lamination registration equipment, ML
7.1.5.6 Multilayer production equipment, miscellaneous
7.1.5.7 Lamination aids
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7.2.1.1.3 Film storage
7.2.1.1.4 Photographic materials, miscellaneous
7.2.1.2 Exposure equipment
7.2.1.2.1 Photographic tools
7.2.1.2.2 Spotlight equipment
7.2.1.2.3 UV exposure equipment
7.2.1.2.4 UV cold-light exposure systems
7.2.1.2.5 UV post-polymerization equipment
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7.2.2.2.2 Screen-print masks

7.2.2.2.3 Screen-printing inspection units
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7.2.2.2.5 Stencil production tools, miscellaneous
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7.3.2 Drills for PCBs
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7.3.4 Milling machines for PCBs
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8 Electronic Manufacturing Services (EMS)

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8.1.2 Artwork production services
8.1.3 ML lamination/drilling services
8.1.4 Coating services
8.1.5 Laser engraving
8.1.6 Wire erosion
8.1.7 Laser welding
8.1.8 Laser cutting and singulation of IC carriers
8.1.9 Plating services
8.1.10 Reflow services
8.1.11 Surface treatment
8.1.12 Production services for component/chip carrier manufacturing, miscellaneous

8.2 EMS for component assembly and device manufacturing and Advanced Packaging

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8.2.3 Solder mask services
8.2.4 Hybrid implementation
8.2.5 Component assembly
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C Cluster SMT

9 Component mount technology, pick & place

9.1 Component preparation

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9.3 Production

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9.3.3 Production lines for assembly, component placement, connections, etc.
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9.4 Handling technology

9.4.1 Material supply systems
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9.4.1.2 Clamping/fixing systems
9.4.1.3 Loading/unloading equipment for machines/workstations
9.4.1.4 Parts transfer systems
9.4.1.5 Bulk material feeder modules (component)
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9.4.2 Automation
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10.5 Soldering accessories

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D Cluster Cables, Coils & Hybrids

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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 Metal/plastic composite technologies, miscellaneous

17.9 Process and quality control/Automation

17.9.1 Production data-acquisition (PDA) systems
17.9.2 Measuring, testing and inspection equipment
17.9.3 Process measuring technology
17.9.4 Process control and automation
17.9.5 Process monitoring
17.9.6 Traceability equipment
17.9.7 Sensors
17.9.8 Regulation and control equipment
17.9.9 Equipment, spare parts and accessories for process and quality control, miscellaneous

E Cluster Future Production—Smart Factory

18 Industry 4.0

18.1 Autonomous inter-connected micro systems, sensor and actuator networks, cyber physical systems

18.1.1 Autonomous inter-connected micro systems, sensor and actuator networks, wireless sensor networks
18.1.2 5G-Technology
18.1.3 Machine Leaing/Big Data Analytics
18.1.4 Cyber Physical Systems (CPS)
18.1.5 Energy harvesting
18.1.6 Human machine interfaces active/passive (touch panel displays, barcode reader, RFID systems, augmented reality devices, aso.)
18.1.7 Information security/IP protection (embedded)
18.1.8 Product Security
18.1.9 Digital twin
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

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
22.5.4.17	Ultrasonic cleaning systems
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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23.2.1.3	Contacting services
23.2.2	**Services for material machining**
23.2.2.1	Laser welding/cutting
23.2.2.2	Plating subcontractors
23.2.2.3	Surface treatment
23.2.2.4	Metal machining
23.2.2.5	Manufacturing precision lathed and milled parts
23.2.3	**Production services for components**
23.2.3.1	Belting services
23.2.3.2	Testing/adjusting of component connections
23.2.4	**Services for cable processing**
23.2.4.1	Cable assembly
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	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	Setup 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	Equipment sales
23.4.4.2	Sales of production services
23.4.4.3	Manufacturers representation; distributors; sales, miscellaneous
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	Packaging of material and liquids
23.5.8	Component database generation
23.5.9	other services, miscellaneous