



SEMICONDUCTOR MANUFACTURING EQUIPMENT

Excellent Precision and Reliability for Complex Systems

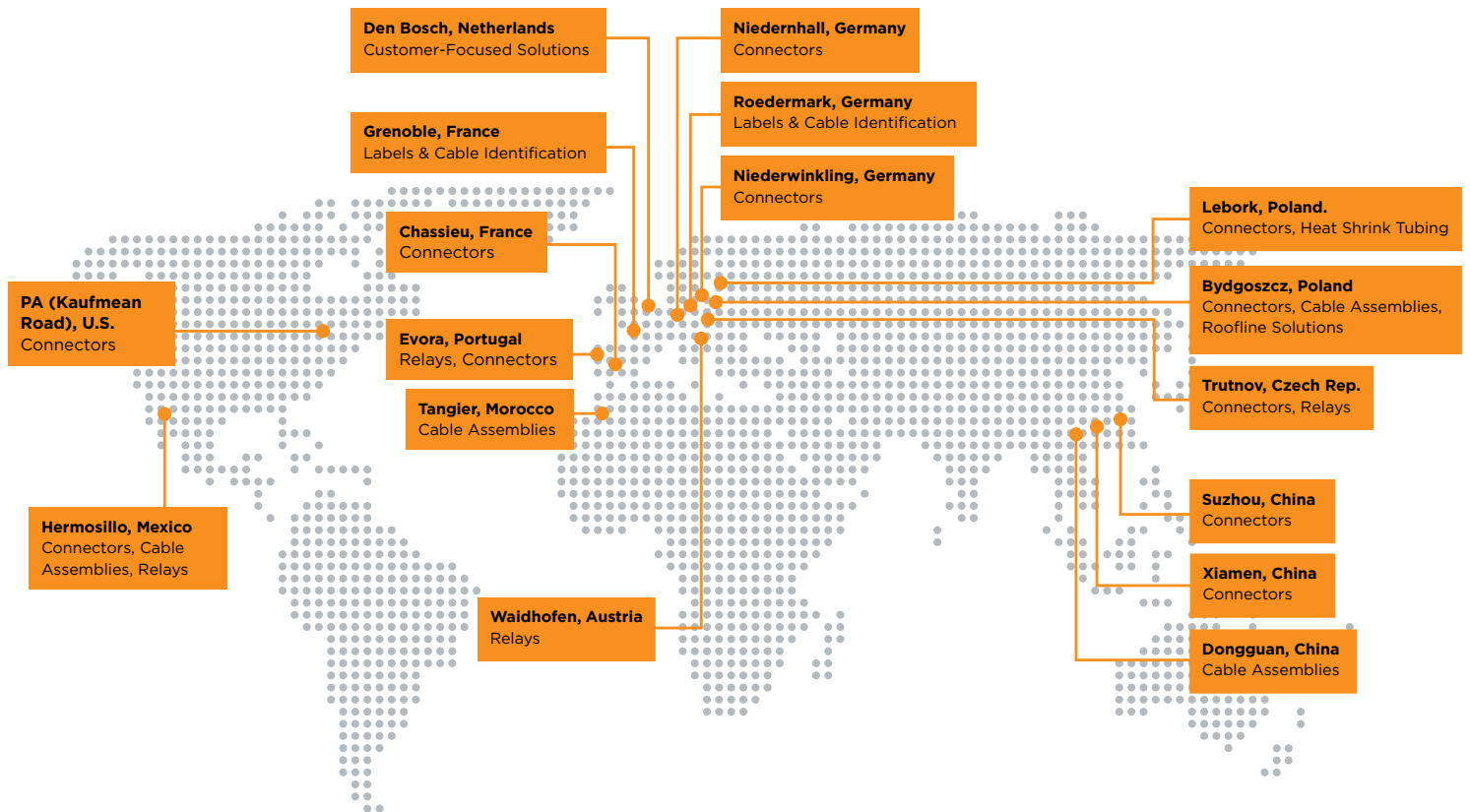
LET'S CREATE THE CONNECTIONS THAT COUNT.

TE Connectivity (NYSE: TE L) is a \$16 billion global leader in connectivity. The company designs and manufactures products at the heart of electronic connections for the world's leading industries, including automotive, energy and industrial, broadband communications, consumer devices, healthcare, and aerospace and defense. TE Connectivity's long-standing commitment to innovation and engineering excellence helps its customers solve the needs for more energy efficiency, always-on communications, and ever-increasing productivity. With nearly 90,000 employees in more than 50 countries, TE Connectivity makes connections the world relies on to work flawlessly every day.

To connect with the company, visit te.com.

RELIABLE TECHNOLOGY FOR TODAY AND TOMORROW.

Ensuring Gapless Quality, Traceability, and Cleanroom Readiness



As a global technical leader in connectors and sensors, TE Connectivity (TE) offers the products and integrated solutions that are precisely engineered to meet the strictest requirements of customers in terms of quality and performance excellence. For more than 60 years, we have maintained a partnership with the leading companies in major markets, such as Germany, Japan, and the United States.

TE provides customers with high-quality innovative solutions and fast, reliable services in the fields of automation and control, railways, and intelligent buildings. TE offers products that have demonstrated their superior performances in harsh environments, such as high pressure, vibrations, humidity, and high/low voltage.

With the arrival of Industry 4.0, TE plays a key role in the next level of industrial production and is committed to achieving win-win results with customers.

With TE as an innovative partner, you will find virtually everything you need to create and run a highly cost-effective and reliable production process. We connect materials to final products with smarter, faster, and better technology to cover all the areas of life. To help ensure each solution is optimized, TE actively rises to every challenge.

Visit [TE.com](https://www.te.com) to call, live chat, or email a product specialist today about your vision and connectivity needs.

THRIVING SEMICONDUCTOR MARKET PRESENTS ENGINEERING OPPORTUNITIES AND CHALLENGES.

Innovations in semiconductor technology drive big gains in performance at the same time that global supply chain disruptions challenge production.

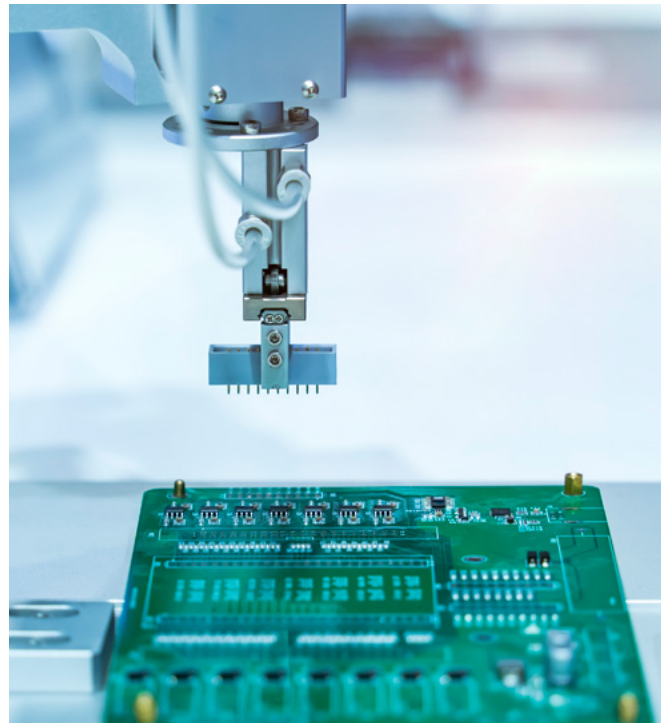
Global demand for semiconductors has increased significantly in recent years, driven by advances in 5G and AI, as well as the growing market for electric vehicles and products that connect to the internet of things (IoT). This thriving environment of innovation and demand has been a boon for semiconductor manufacturers.

However, semiconductor manufacturers and semiconductor manufacturing equipment makers also saw major disruptions to their businesses due to the COVID-19 pandemic as well as geo-political and economic pressures.

Semiconductor manufacturing equipment has always required complex machinery, with thousands of suppliers providing highly specialized, unique components that are built to precise specifications and come together in a cleanroom environment. But the pandemic caused delays that have never been experienced before, with plant closures, halted assembly lines, and worker shortages that are still impacting manufacturing.

With demand shifting and political barriers rising, semiconductor manufacturing equipment makers are thinking innovatively about how to make their manufacturing footprint more flexible, and also considering how the supply chain might look in the future. As semiconductor manufacturing equipment makers rethink their established supply chains, they will likely winnow down the list of suppliers to those who can produce a wealth of products and who have an agile global manufacturing footprint.

TE is proud to be a one-stop shop for the diverse products semiconductor manufacturers need around the world. TE is focused on providing integrated solutions to help simplify the complex supply chain and support virtually uninterrupted operations of semiconductor manufacturing equipment. Our team of experts brings the specialized application know-how and engineering consultation that OEMs need for customized, design-in support. And TE uses highly specific processes tailor-made for the semiconductor manufacturing equipment industry to help ensure that all components can be cleanroom ready and provide gapless quality traceability.



¹The Semiconductor Decade: A Trillion-Dollar Industry, McKinsey, April 1, 2022; <https://www.mckinsey.com/industries/semiconductors/our-insights/the-semiconductor-decade-a-trillion-dollar-industry>

BUILDING ADVANCED SEMICONDUCTOR TECHNOLOGY REQUIRES COMPLEX EQUIPMENT.

TE provides high-speed connectivity that enables Industry 4.0 manufacturing.

There are more than 1,000 steps involved in producing a semiconductor, according to the Semiconductor Industry Association, and the machines and equipment necessary to pull off those highly specialized processes are exceedingly complex. As such, semiconductor manufacturing equipment is capital intensive for manufacturers to purchase and for OEMs to build, which is why these machines are built to last and also built to exacting specifications. It is not uncommon to find a piece of semiconductor manufacturing equipment that is decades old and still in use.

However established the machines are, the manufacturing process itself has evolved remarkably for semiconductor equipment. OEMs in this sector have fully embraced the principles of Industry 4.0, bringing high-speed data connectivity to every part of their operation in order to optimize processes and ensure that machines deliver a reliable product that is as near to perfect as possible. The parts and components within each machine have evolved to match — packing more data density into ever-smaller packages.



TE PROVIDES INDUSTRY-LEADING CONNECTIVITY SOLUTIONS.

As your go-to engineering partner, we can simplify your supply chain and provide more reliable, tailor-made components.

Semiconductor manufacturing equipment is expected — and engineered — to be in service for many years, TE components are too. TE is a reliable, trusted supplier of the specialized connectivity solutions that semiconductor equipment OEMs need. Our tailored, individualized solutions use prequalified building blocks so you can help ensure an exact fit on components without compromising on quality.

When you work with TE, you can expect to:

- **Find a partner who will support the highly specialized components** that you need.
- **Gain efficiency** with one source for your multiple connectivity needs.
- **Trust in our reliable, high-performing solutions** that are designed to meet the many requirements of operating in cleanroom environments.
- **Consult with TE experts** and a network of authorized distributors to support you wherever you are located and help you select the right solutions.
- **Collaborate with our engineering team** to create custom solutions and leverage our thousands of patents.



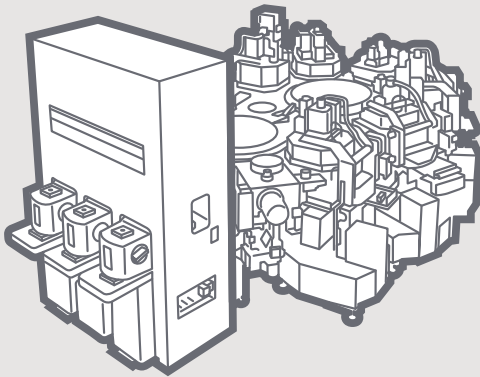
SUB-APPLICATION SOLUTIONS FOR SEMICONDUCTOR MANUFACTURING EQUIPMENT.

Thanks to TE's local engineering expertise, global manufacturing capabilities, and stock of raw materials, we can provide the consistent, reliable supply of components for the semiconductor manufacturing equipment industry, with the quality assurance you require.

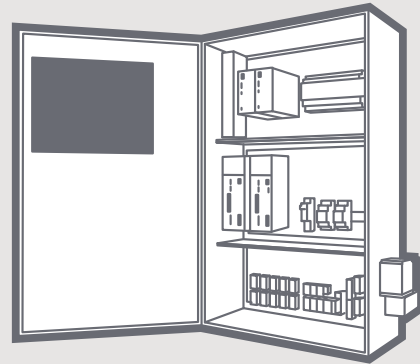
You can count on us to provide tailored solutions for your unique needs in **machine wiring**, **control cabinets**, **controllers and devices**, and **vacuum chambers**.

We know you have exacting requirements for every aspect of the manufacturing equipment you build. To help ensure product accuracy, our teams can meet your copy-exact needs, provides tailored build-to-print services, and inspects every component and cable before it ships. Plus, TE's thorough cable identification system provides more reliable, battle-tested labels that meet your requirements for traceability.

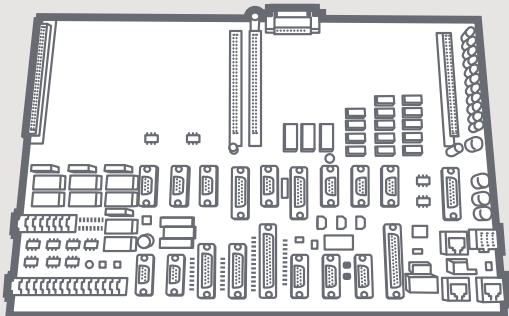
MACHINE WIRING



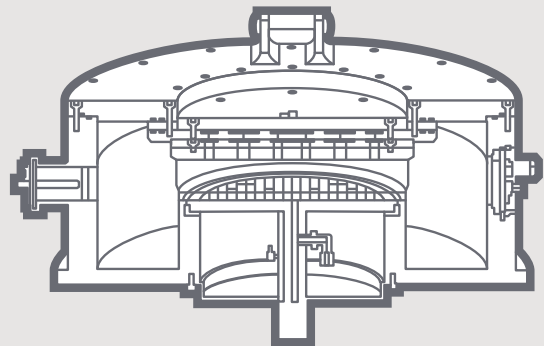
CONTROL CABINET



CONTROLLERS & DEVICES



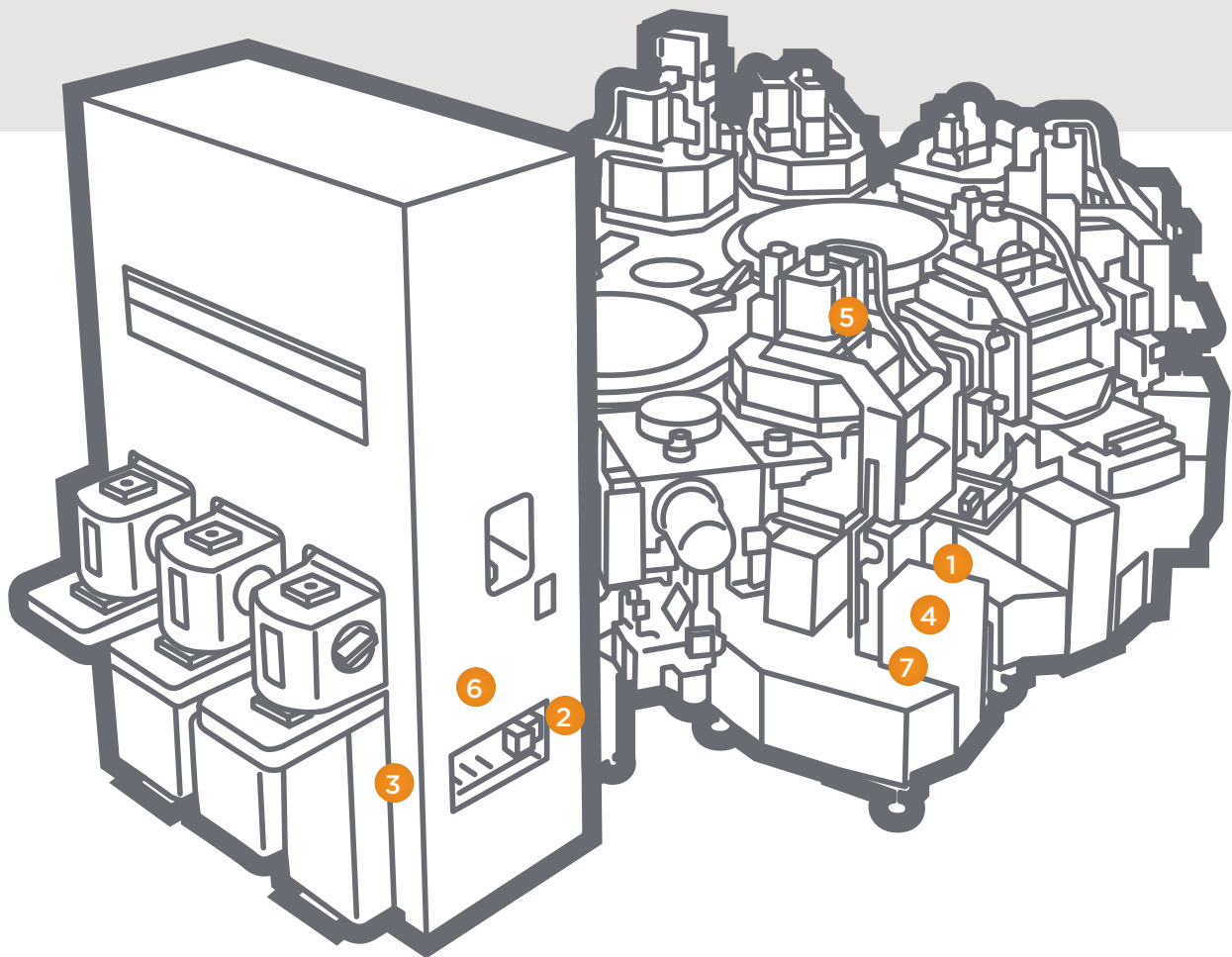
VACUUM CHAMBER



MACHINE WIRING

Used to distribute power, data, and signal within semiconductor manufacturing equipment, machine wiring is needed to connect controllers, sensors, actuators, motors, plasma generators, and other devices. In essence, the machine wiring is the nervous system that connects all the parts of the machine together so they are powered and can communicate with each other and function properly. Because of this, quality control and traceability are of utmost importance in machine wiring.

Some semiconductor manufacturing equipment requires that special materials be used in machine wiring to ensure cleanliness or to prevent outgassing. Regardless of the system, if needed, cable assemblies and cordsets go through specific testing, labeling, and packaging procedures to fit the exacting needs of each OEM.



- 1 Sensor & Signal Connectivity
- 2 Power Connectivity
- 3 Motor Connectivity
- 4 Ethernet Connectivity
- 5 RF Connectivity (Coax)
- 6 Wire/Cable Identification
- 7 Build-to-Print & Standard Cord Sets

SENSOR & SIGNAL CONNECTIVITY

POWER CONNECTIVITY

MOTOR CONNECTIVITY



Our portfolio of sensor and signal components provides more reliable connectivity over the lifetime of your machine, allows for high cabling density, and provides the flexibility you need with variable pin-count.

BENEFITS:

- Durable, vibration-resistant contact and housing design
- Available in a variety of interlocking mechanisms
- Push-on lock concept that allows easy mating and more secure locking
- Compact form that saves space

TE featured products:

M8/M12 Connectors

Dynamic or RITS Industrial Grade Signal & Power Connectors

Thermocouple Connectors

Amplimate D-Sub Connectors

When you need highly reliable connectivity in a variety of power levels, look to TE's extensive range of power connectors. With a large breadth of power, signal, and hybrid solutions available, our power connectors are flexible to fit your requirements and allow for high cabling density.

BENEFITS:

- Polarized interface for easy and reliable mating
- Rugged housing and high retention force
- Flexible, modular design

TE featured products:

Circular Plastic Connectors

Dynamic Industrial Grade Signal & Power Connectors

Heavy Duty Connectors

Ring Terminals

HDC Dynamic Connectors

Power Triple Lock Connectors

Specially designed for motor applications, our connectivity components are rugged enough to withstand a high-temperature environment, shielded to protect against EMI, and more reliable for the lifetime of the machine.

BENEFITS:

- Meets high EMC/EMI standard
- Power, signal, and hybrid connectors available
- Multiple contact points that enable high vibration tolerance
- Very compact design

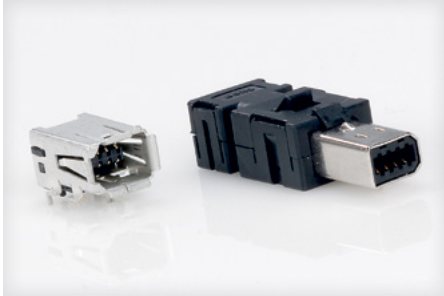
TE featured products:

INTERCONTEC Circular Motor Connectors

Micro Motor Compact Motor Connectors

Dynamic Series Wire-to-Board and Wire-to-Wire Connectors

ETHERNET CONNECTIVITY



Increase data transmission reliability and reduce package loss with TE's Ethernet connectivity solutions. Our industrial grade Ethernet products are tailor-made for intense environments.

BENEFITS:

- 100Mbit - 1Gbit capability; future-ready 10Gbit capability available
- Rugged housing, retention force, and locking mechanism
- Durable, vibration-resistant design

TE featured products:

[Mini I/O Industrial IP20 Ethernet Connectors](#)

[Industrial RJ45](#)

[M12 Ethernet Connectors](#)

RF CONNECTIVITY (COAX)



TE provides rugged RF connectivity solutions to reliably transmit high-frequency or sensitive analog signals.

BENEFITS:

- Broad portfolio of connectors, adaptors, terminators and cable assemblies
- Large variety of coax types and standards available
- Rugged design

TE featured product:

[Coax Connectors](#)

WIRE & CABLE IDENTIFICATION



Count on TE to provide durable cable and wire identification that will last the long haul so you can help ensure seamless product traceability.

BENEFITS:

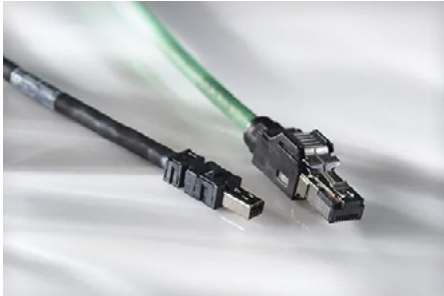
- Long-lasting reliable performance
- Extremely high printing durability
- Cost-efficient
- Large assortment available

TE featured products:

[Wrap-Around Labels](#)

[Printable Tubing, Standard Labels](#)

BUILD-TO-PRINT & STANDARD CORDSETS



Our highly reliable and traceable cordsets for signal and data connectivity go through advanced functional testing to help ensure that they are up to semiconductor manufacturing equipment standards.

BENEFITS:

- Cleanroom-ready cleaning and packaging
- Special materials available for cable, labels, and connectors
- Customizable to your unique needs

TE featured products:

[Mini I/O](#)

[M8 and M12 Standard Cordsets](#)

[Build-to-Print Cables](#)

TREND

INNOVATION IN CONNECTIVITY REDUCES ASSEMBLY TIME & ERRORS

Manufacturers no longer need to connect hundreds of wires to the different modules that join a semiconductor machine together. Instead OEMs are putting more effort into designing machines in a way that require just a few electrical connections with complete harnesses. This not only saves valuable time during machine assembly, it also reduces errors. And as semiconductor machines continue to grow larger – and the modules that make them up multiply – the reduced error and assembly time will become critical.

[LEARN MORE ►](#)

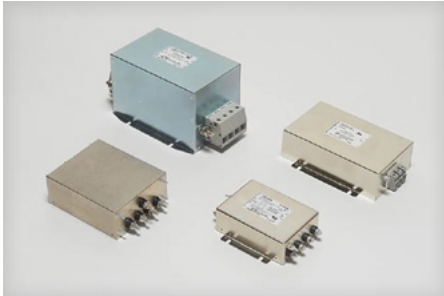
CONTROL CABINET

In semiconductor manufacturing, a significant number of controllers are based on proprietary electronics. Power and data connectivity inside the cabinet — as well as between the cabinet and the rest of the machine — continues to be important; as are EMI filters and devices to switch power. Semiconductor manufacturing equipment makers need flexible and reliable solutions to allow for uninterrupted operations. Perhaps most importantly, due to the exacting nature of the process for manufacturing semiconductors, the equipment is sensitive to electromechanical interference (EMI). To make matters tougher, a lot of the equipment itself, such as lasers and plasma generators, generates significant EMI of its own. Therefore it is critical that control cabinet connectivity includes RF/EMI filters so that production continues without interruption.



- 1 EMI Filters
- 2 In-Cabinet Power Distribution
- 3 Modular Machine Connectivity
- 4 Cordsets
- 5 Connecting/Disconnecting Power

EMI FILTERS



Choose the right filtering for EMI sensitive equipment with TE's extensive portfolio of 3-phase and 1-phase power line filters.

BENEFITS:

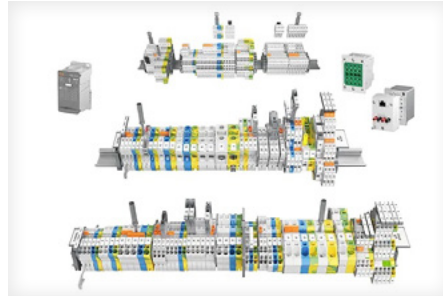
- 60+ years of EMI/EMC engineering and application experience
- DIN rail variant for easy mounting
- Trusted supplier for leading global semiconductor OEMs

TE featured products:

[Corcom 3-Phase AC Power Line Filters](#)

[Corcom Single Phase AC Power Line Filters](#)

IN-CABINET POWER DISTRIBUTION



TE provides safer and easier to use power distribution solutions that give you the flexibility you need and the reliability you require for virtually uninterrupted power.

BENEFITS:

- 50% space savings in the cabinet
- Reduced assembly time compared to conventional systems
- Large portfolio of options available

TE featured products:

[ENTRELEC Terminal Blocks](#)

[Identification Labels](#)

[Ferrules and Tabs](#)

MODULAR MACHINE CONNECTIVITY



Versatile and rugged with a cost-effective design, TE's portfolio of modular machine connectivity options provides more reliable and flexible wiring into the cabinet.

BENEFITS:

- High-density solution up to 288 pos
- Modular design that transmits power, signal, and data
- Quick connect/disconnect capability

TE featured products:

[Circular Plastic Connectors](#)

[Heavy Duty Connectors](#)

CORDSETS



Our highly reliable and traceable cordsets for signal and data connectivity go through advanced functional testing to help ensure that they are up to semiconductor manufacturing equipment standards.

BENEFITS:

- Cleanroom-ready cleaning and packaging
- Special materials available for cable, labels and connectors
- Customizable to your unique needs

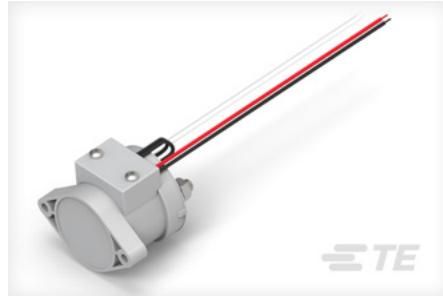
TE featured products:

[Mini I/O](#)

[M8 and M12 Standard Cordsets](#)

[Build-to-Print Cables](#)

CONNECTING & DISCONNECTING POWER



When you require a DC power disconnect solution with extreme reliability and traceability, test results on all parts, look no further than TE's IHV Series.

BENEFITS:

- DC high-current relay (DC 900V or 50A – 250A)
- High reliability via integrated economizer circuit
- Hermetically sealed

TE featured product:

[IHV Series DC Contactors](#)

TREND

INDUSTRY 4.0 DRIVES GREATER MACHINE COMPLEXITY

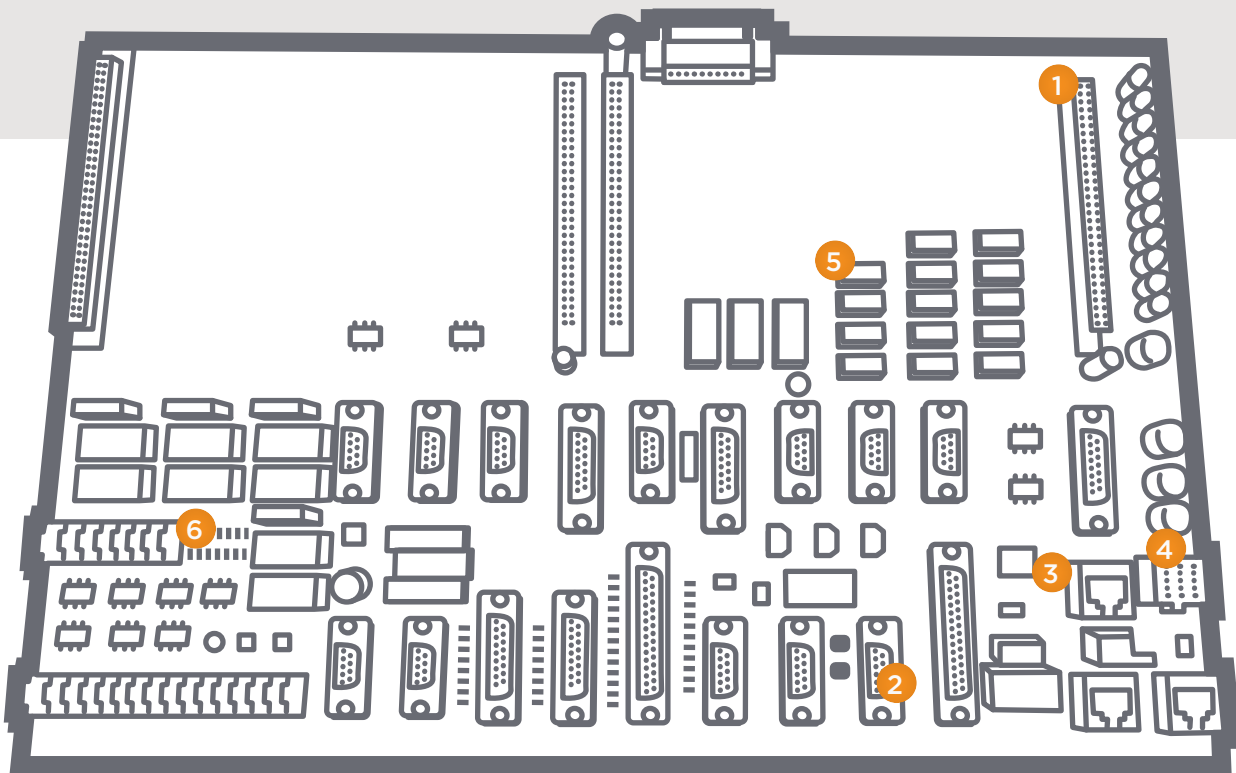
Every part of manufacturing this highly complex, specialized equipment is tested, tweaked and optimized in real-time. To capture those field-level insights, the machine components must be capable of high-speed data transmission. Many OEMs are currently in the process of transitioning their 100Mbps networks to 1Gbps Ethernet to make that possible.

[LEARN MORE ►](#)

CONTROLLERS & DEVICES

Accuracy is vital to semiconductor manufacturing equipment. Precise relays, and resistors are in high demand, as are reliable connectivity solutions. However, OEMs still require flexibility. Solutions that allow for high-mix/low-volume control systems have led to flexible backplane setups and other solutions to allow equipment makers to manage variance.

Controllers here connect to a multitude of special devices that are unique to semiconductor manufacturing equipment. These controllers and devices are often quite complex, consisting of multiple printed circuit boards (PCBs) and components. In addition, some devices need high-speed data transmission, leading OEMs to demand devices with higher bandwidth interfaces.

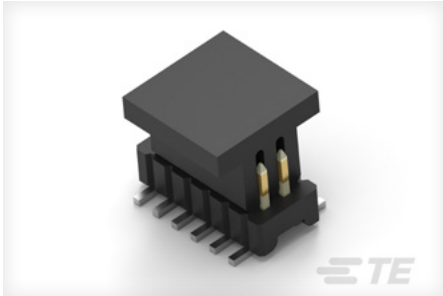


- 1 Interconnecting PCBs
- 2 Signal Connectivity
- 3 Ethernet Connectivity
- 4 High-Speed Connectivity
- 5 Relays
- 6 Precision Resistors
- 7 Sensors

INTERCONNECTING PCBS

SIGNAL CONNECTIVITY

ETHERNET CONNECTIVITY



These highly reliable connectivity products from TE feature high contact density, modular design capabilities, and an ultra-compact size to fit your needs for miniaturization.

BENEFITS:

- Extensive portfolio of interconnects, with customization available
- Compact connector that reduces occupied space on PCB
- High signal integrity with data ranges up to 56Gbit/s possible

TE featured products:

AMPMODU Modular Signal Interconnects
MiniBridge Connectors
Mini UML Power Distribution
Backplane Connectors

These signal connectivity components provide more reliable connectivity over the lifetime of your machine, high cabling density, and flexibility via variable pin-count.

BENEFITS:

- Durable, vibration-resistant contact and housing design
- Available in a variety of interlocking mechanisms
- Push-on lock concept for easy mating and more secure locking
- Compact form to save space

TE featured products:

M8/M12 Connectors
Dynamic or RITS Industrial Grade Signal & Power Connectors
Thermocouple Connectors, Amplimite D-Sub Connectors

Increase data transmission reliability and reduce package loss with TE's Ethernet connectivity solutions. Our industrial grade Ethernet products are tailor-made for intense environments.

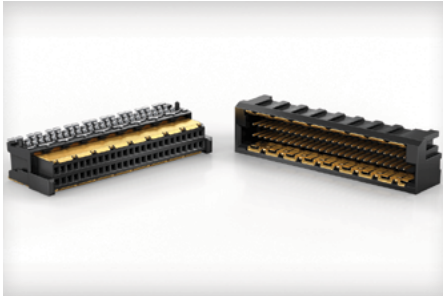
BENEFITS:

- 100Mbit - 1Gbit capability, future-ready 10Gbit capability available
- Rugged housing, retention force, and locking mechanism
- Durable, vibration-resistant design

TE featured products:

Mini I/O Industrial IP20 Ethernet Connectors
Industrial RJ45
M12 Ethernet Connectors

HIGH-SPEED CONNECTIVITY



Enable large rates of data transmission and low latency with our modular collection of high-speed connectors.

BENEFITS:

- High signal integrity and external shielding
- Flexible stacking heights that allow for multiple PCB mating options
- Extremely robust connector strength

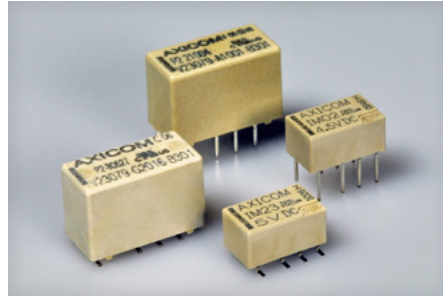
TE featured products:

[MicroSpeed Connectors](#)

[High-Speed Backplane Connectors](#)

[SAS and Mini-SAS Multi-Lane Interconnects](#)

RELAYS



For safer, more even switching applications choose from TE's portfolio of signal and force-guided relays. Our relays boast a small footprint, low power consumption and high durability.

BENEFITS:

- Extremely compact to reduce PCB real estate
- Multiple pole numbers and sizes available
- Significantly more durable and cost-efficient than solid-state solutions

TE featured products:

[AXICOM IM Signal Relays](#)

[Force Guided Relays](#)

PRECISION RESISTORS



Your high-precision electronics require high-precision passives. Our selection of compact surface-mount resistors outperform in the field and save space on the PCB.

BENEFITS:

- Highly reliable
- Package sizes between 0102 and 2512
- Tolerances as low as 0.01%

TE featured product:

[SMD Precision Resistors](#)

SENSORS



TE's combination of stable sensing technology and semi-compliant materials and surface finishes provides the highly accurate pressure and flow measurements you require.

BENEFITS:

- High media resistance and no media contamination
- Minimal recalibration required
- Custom designs available to meet your exact needs

TE featured products:

[Media-Isolated Pressure Sensors](#)

[Pressure Transducers and Transmitters](#)

TREND

INFLUENCED BY DATA CENTERS, OEMs PIVOT TO SMALL-PITCH, HIGH-SPEED BACKPLANE CONNECTORS

Semiconductor equipment manufacturers typically spec machines with mature product families, using components and parts that have proven themselves in the marketplace. Most of these proven product families have their origins in computer or data centers. However, that industry is undergoing a revolution of its own, as innovations in edge computing and AI drive demand for new high-speed and often highly integrated connectivity. Especially in backplane and board-to-board connectivity, OEMs are moving to the 1.27mm pitch connectors that are mainstream in industrial applications today.

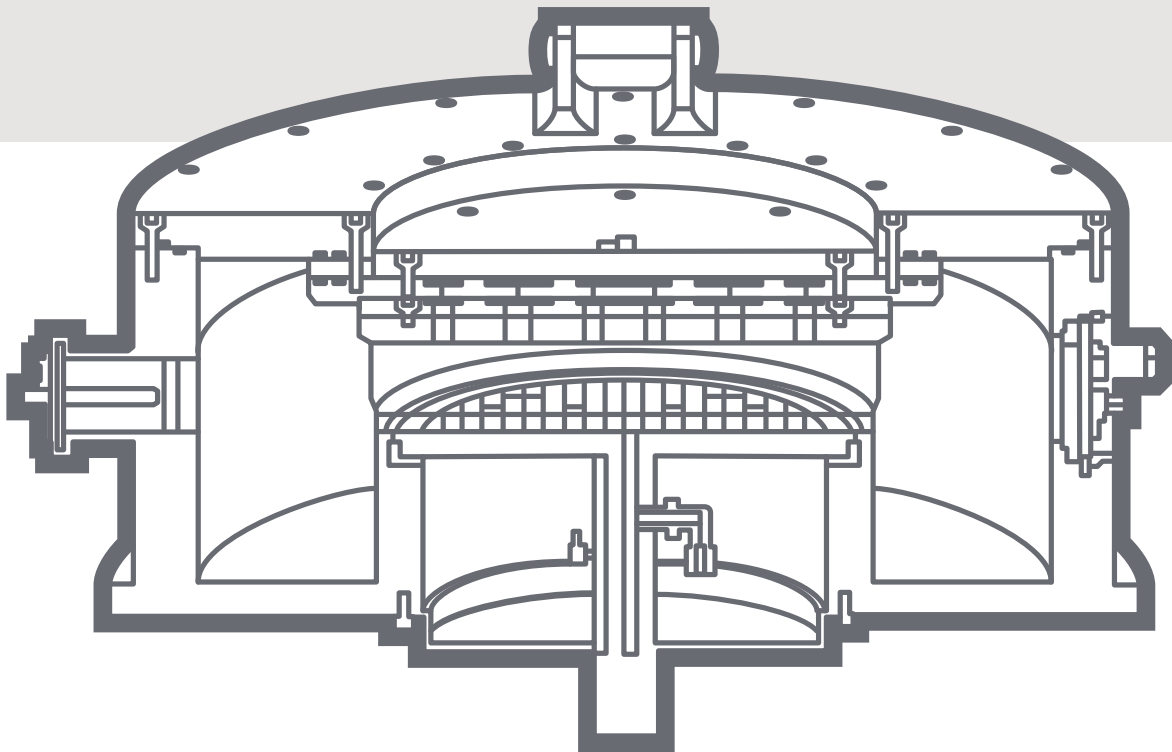
[LEARN MORE ►](#)

VACUUM CHAMBER

Vacuum chambers are used extensively in the semiconductor manufacturing process, including in the critical deposition and etching phases. Newer processes such as atomic layer deposition (ALD) require even higher vacuum levels than chemical vapor deposition (CVD) or physical vapor deposition (PVD) techniques. However, a vacuum chamber is notoriously difficult to build, operate, and maintain at a high-performing level.

Why? Each time a vacuum chamber is loaded and unloaded — as when silicon wafers enter or leave the machine in the manufacturing process — vacuum pressure must be reset to the exact same specifications. The larger the chamber volume, the more time and energy is required to reset the vacuum pressure. Over hundreds of process steps for a single silicon wafer, the extra time and effort gets expensive. So OEMs try to minimize the volume of the vacuum chamber as much as possible.

In addition, in order to not contaminate the process, it's critical for components and material used in the vacuum chamber to be low outgassing to prevent contamination. And electrical connections going in and out of the chamber must be sealed properly to keep contaminants from entering the system. As process needs increase and vacuum requirements rise, OEMs constantly control for all of these factors, which is another reason that so many have leaned into the smart manufacturing capabilities enabled by Industry 4.0.



1 Connecting into the Vacuum Chamber

2 Wires in Vacuum

CONNECTING INTO THE VACUUM CHAMBER

WIRES IN VACUUM



Made for extreme environments, our portfolio of hermetic connectors brings dependable electrical connectivity into the vacuum chamber while saving on chamber volume.

BENEFITS:

- Highly engineered for sensitive environments and applications
- Available in different pin counts, mechanical arrangements, and mounting variants
- Resistant to pressure, chemicals, vibration, and shock

TE featured products:

[Hermetic Connectors](#)

Help prevent contamination of the vacuum and silicon wafer with special wires made from low-fluoride material that significantly reduces outgassing.

BENEFITS:

- Rated for -65°C to 200°C
- Available in standard, shielded, coax, and Gbit Ethernet-ready

TE featured products:

[Space-Grade Wires](#)

CONNECT WITH US.

Get answers to your questions now

We make it easy to connect with our experts and are ready to provide the support you need, including:

- [Product comparisons for your project](#)
- [Product samples or downloadable virtual sample kit](#)
- [Discussions with TE engineers and product experts](#)
- [Project consultations](#)
- [TE design resources and tools](#)

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BROCHURE

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