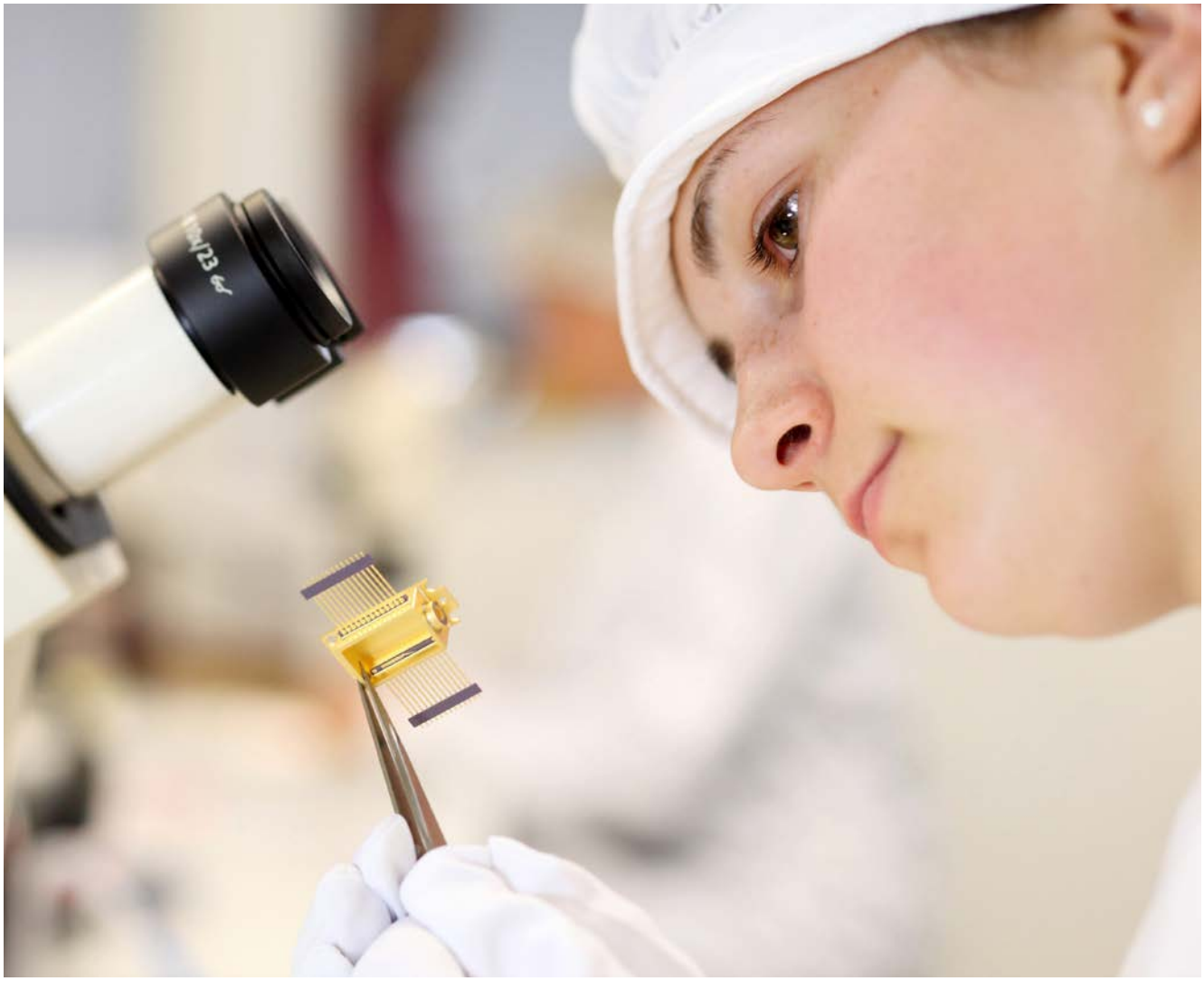
SCHOTT
glass made of ideas

Hermetic. Safe.

Reliable packaging for sensitive electronics



Content

SCHOTT is a leading international technology group in the areas of specialty glass and glass-ceramics. With more than 130 years of outstanding development, materials and technology expertise we offer a broad portfolio of high-quality products and intelligent solutions that contribute to our customers' success.

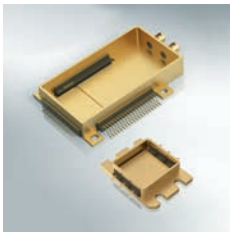
Electronic Packaging, a business unit within SCHOTT, is a leading developer and manufacturer of hermetic housings and other components for the reliable, long-term protection of sensitive electronics. Our core technologies are glass-to-metal and ceramic-to-metal sealing, thermal sensing components as well as a variety of cutting-edge specialty glass competences.

A world leader in hermetic packaging technologies

Electronic Packaging is a business unit that emerged from the so-called "electronic glass" applications. From as early as 1939, we have been a world leading developer and manufacturer of hermetic packaging technologies for the protection of highly sensitive electronics and other components. In fact, we are a leading company with a command of all of the technologies that are used to manufacture hermetic enclosures:

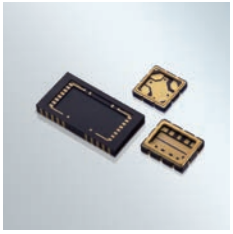
Glass-to-metal sealing

For more than 75 years, SCHOTT has been developing and manufacturing vacuum-tight assemblies of glass with metal to feed electrical signals through the walls of hermetically sealed packages. Extensive stress tests show that this glass-to-metal bond remains completely sealed, even in harsh conditions such as aggressive chemicals as well as extreme pressure and temperatures. Our perfectly matched window or lens caps protect electronic components and can furthermore act as an optical interface.



Ceramic-to-metal sealing

Hermetic packages with ceramic-to-metal seals are used when miniaturized packages are required. Due to the possibility of combining opto-electronic components with a large number of electrical and optical interfaces, this technology offers increased performance and is suitable for complex re-routing and cross wiring package designs.



Full ceramic packages

Full ceramic packages are ideal for micro-electronic-mechanical systems (MEMS) and high frequency applications because such packages enable a large number of complex electrical feedthroughs within very small spaces.

Thermal fuse/cutoff technology

Thermal cutoff devices are integrated into the electric circuit of appliances where temperature detection is required. The current is conducted in the device through an internal mechanism containing a thermal pellet made of an organic material or fusible alloy. In order to produce hermeticity, each device is resin-sealed.

A world leader in special glass materials and processing

As a business unit of SCHOTT, we can offer our customers access to a wide variety of specialized glass types and material formats as well as more than 130 years of experience in glass development and processing. This core competence represents an essential building block for virtually all our products and enables us to meet the highest requirements in terms of quality and reliability.

Glass powder compositions and processing

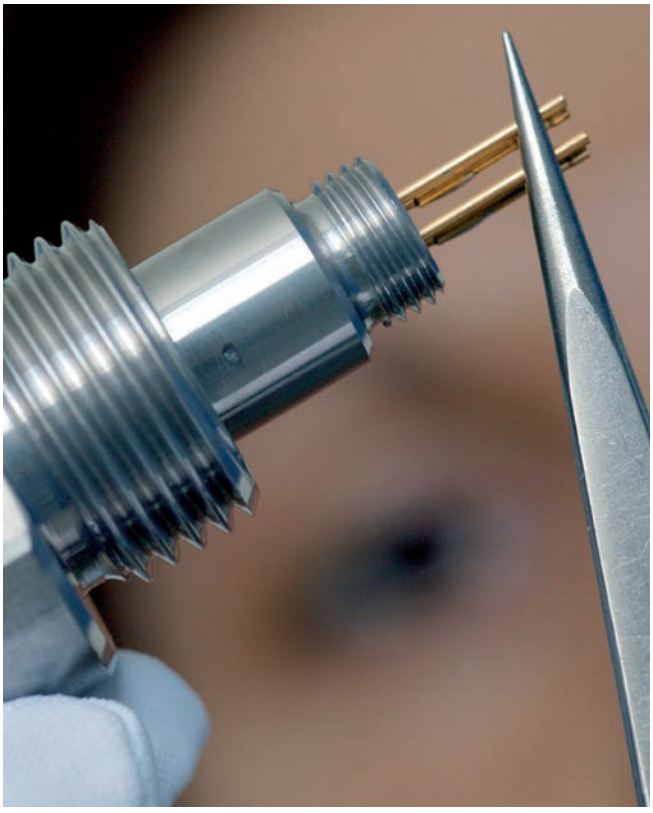
Glass powders are used in a broad range of technical applications, either directly in the final application or further processed into pastes, granulates or preforms. With this know-how, SCHOTT offers glasses for sealing and soldering to obtain hermetic and electrically insulating seals between different materials such as metal and ceramics. While glass powders do not "flow" easily due to their irregular shape, granulates do. They provide the basis for producing so-called "preforms". Preforms are pressed and sintered glass beads, rods or spacers of various shapes that are mostly used for the production of hermetic glass-to-metal seals. These connections remain reliably sealed even under extremely harsh conditions.

Optical glasses

In opto-electronics, the lid or cap fulfills two primary functions: First, it protects the optical components and second, it acts as an optical interface. Hence, the optical properties of the window or lens installed in the cap must fulfill extremely high requirements. Due to our experience in developing optical glasses, SCHOTT can offer a wide range of standard materials as well as customized glass types to suit unique customer requirements.

Precision-cut glass tubes

Since glass tubing segments are used for the hermetic encapsulation of sensitive electronic components such as reed switches, lamps, or RFID transponders for animal identification, they must meet stringent requirements in terms of quality and purity. Thanks to custom-made glass formulations, specially developed in-house equipment and close product control, our precision-cut glass tubing segments can meet the high requirements demanded in these applications.



Innovative solutions

Flexible and creative high-tech solutions that meet your individual needs.

Standard or customized

Close customer cooperations enable us to offer perfectly optimized packaging solutions according to specific requirements of the application. In addition to standard products, the design (e.g. pin count, layout, materials) of our housings and feedthroughs can be customized. Similarly, the manufacturing process can also be adjusted to meet individual customer requirements.

From extremely small to large-scale products

Our product portfolio ranges from solutions for even the smallest housings that are not much larger than the head of a pin (1.2 millimeters) to very large high-voltage feedthroughs with diameters up to 600 millimeters.

From prototype to series production

Thanks to a flexible production set-up we can offer products on a small scale as well as mass production level.

Existing and new applications

Based on our strong technology know-how and core competency of glass sealing, we are also continuously working on a large number of innovative projects to serve entirely new markets.

Globally trusted supplier

Customer satisfaction is at the core of the business of Electronic Packaging. With five production facilities in the United States, Germany, the Czech Republic, Singapore and Japan, we are close to our customers around the world.

Quality without compromise

Through worldwide technology and know-how transfer we are able to consistently offer high quality across all production sites. Furthermore, the international set-up of the business unit provides customers with the benefit of close proximity to our product specialists and therefore first-class service on a local basis.

SCHOTT. Glass made of ideas

This is not just our slogan, it is our business philosophy. Each product is only as good as the idea behind it. With this in mind, we have repeatedly managed to set new standards ever since the company was formed in 1884. Working with our customers rather than for them has made us a world leading manufacturer of special glass.

SCHOTT offers a broad product portfolio for various applications.

Automotive Electronics

- Airbag ignitor feedthroughs
- Battery endseals
- Glass-to-aluminium sealed terminals for lithium-ion electric vehicle batteries
- Precision glass tubes for reed switches and RFID transponders

Sensors

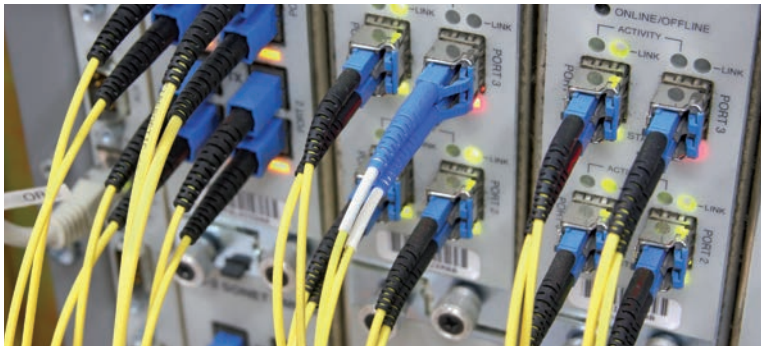
- Feedthroughs for automotive sensors
- Industrial sensor housings
- Pressure/temperature sensor housings
- Housings for infrared sensors

Consumer Electronics

- Cylindrical quartz housings
- HC/UM packages
- Thermal cutoffs for lithium-ion batteries

Energy & Nuclear Safety

- Electrical penetrations for nuclear power plants
- Terminal headers and connectors for Liquefied Natural Gas (LNG) applications
- Microelectronic packages and connectors for oil and gas applications
- Glass and glass-ceramic sealants for solid oxide fuel cells (SOFC)



Data/Telecom

- Transistor outline (TO) housings (headers & caps)
- Microelectronic packages
- Products for high frequency applications

Medical Electronics

- Microelectronic packages for medical sensors
- Hermetic housings for autoclavable electronics
- Autoclavable LED packages and modules for medical and dental applications
- Glass wafer substrates
- Precision glass vials for transponders in veterinary applications

Home Appliances

- Housings for compressor seals
- Thermal cutoffs

Defense, Aviation & Space

- Sensor packages
- Battery endseals
- Thermal battery covers
- Connectors
- Ordnance products
- Microelectronic packages
- Bulkhead penetrators and connectors for submarines

Automotive Electronics

Customized housing solutions for enhanced automotive safety

For several decades, our automotive division has been a leading developer and manufacturer of custom-designed feedthroughs and housing components for the hermetic protection of highly sensitive electronic components that contribute to the safety and comfort of vehicle passengers.

Reliable protection for safety-relevant devices

Airbags and seatbelt pretensioners are the most well-known among automotive safety devices. Our special glass-to-metal sealed housings reliably encapsulate some of their vital components so that they can function at all times, even after many years.

Hermetic housings for automotive sensors

Our housings and feedthroughs are also used to protect a large variety of sensors that can be found in engine management, in-car climate modulation, energy technology and vehicle stability control (e.g. tire pressure sensors). The glass-to-metal sealed components are extremely resistant to temperature fluctuations, pressure and aggressive substances.

Innovative technology solutions for e-mobility

Based on more than 20 years of experience in producing hermetically sealed feedthroughs for primary batteries, SCHOTT's new glass-to-aluminium sealing technology for lithium ion battery housings is expected to have a significant impact on improving the safety and lifetime of these devices. Our product portfolio for electric vehicles furthermore includes thermal cutoffs as well as high quality power feedthroughs.

Housings for safety devices

Housings for automotive sensors

Packaging solutions for e-mobility e.g. lithium ion batteries – SCHOTT GTAS®


1000BASE-X SFP
ONLINE/OFFLINE
ACTIVITY
LINK
LINK
PORT 3
PORT 2
Ethernet
1000BASE-X
ONLINE/OFFLINE
ACTIVITY
LINK

Data/Telecom

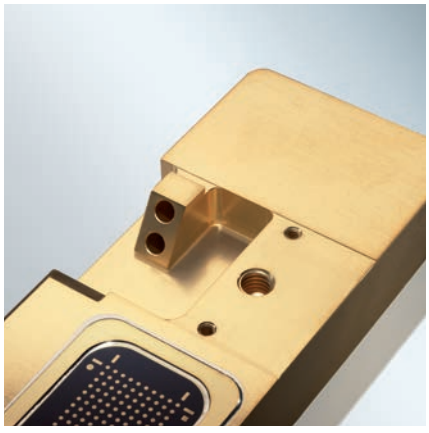
Complete hermetic housing technologies from one source

Reliable protection for sensitive opto-electronic components

Opto-electronic components used in the high-speed data and tele-communications industries are susceptible to the effects of humidity, temperature fluctuations and other physically and chemically demanding environmental conditions. With the growing trend of replacing electrical signals with optical ones, the importance of protecting these opto-electronic components is also growing.

Custom-made and standardized hermetic housings

SCHOTT is the global supplier offering the complete range of hermetic sealing technologies, namely glass-to-metal sealing, ceramic-to-metal sealing as well as full ceramic solutions, from one source. As a leading supplier of optoelectronic housings, we have extensive in-house experience in developing both customized and standard hermetic packages.



Customized SCHOTT CerTMS® package

TO PLUS® header (high frequency)

TO PLUS® headers

Soldered seal and molded caps

Sensors

Sensor housings for reliable protection in harsh application conditions

Despite remaining unnoticed in most applications, sensors form an essential part of everyday life by measuring and controlling temperatures, humidity or pressure in a vast variety of applications. To be suitable for extremely harsh operating environments such as industrial, automotive, medical, and opto-electronic use, the highly sensitive electronic sensor components require hermetic and long-term protection from external influences.

Custom solutions for the highest requirements

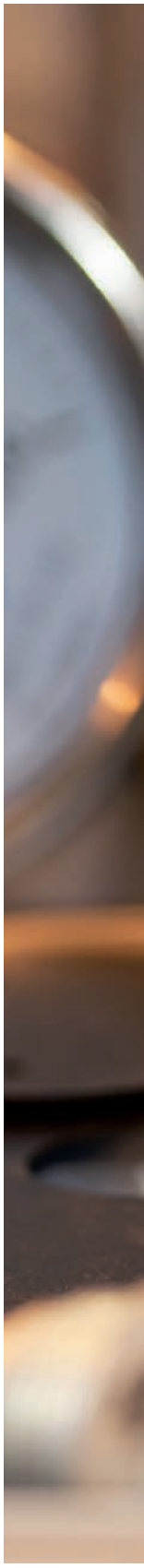
Based on our broad technology expertise, SCHOTT can customize sensor packages according to diverse customer requirements. All our high-quality feedthroughs provide reliable resistance to humidity, temperature fluctuations, pressure, toxic and aggressive substances as well as other chemically demanding situations. Furthermore, SCHOTT's sensor packages also help to provide extremely accurate pressure and flow measurements.

TO-based header for pressure sensors

TO-based header for pressure sensors

Feedthrough for chemical sensors

Feedthrough for high pressure sensors

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Medical Electronics

Reliable, autoclavable housings and feedthroughs for implants and medical electronics

Hermetic sealing technology makes products autoclavable

SCHOTT's hermetic housings offer reliable long-term protection for electronic devices, but also provide continuous power supply and transmission of the information. Our proven sealing technologies prevent moisture from penetrating into the inside of the housing and causing internal corrosion. In addition to being autoclavable, the packages are highly temperature- and shock-resistant. Thanks to the broad range of materials and housing types, our products can be customized for use in all areas of medical technology.

LEDs for medical and dental applications

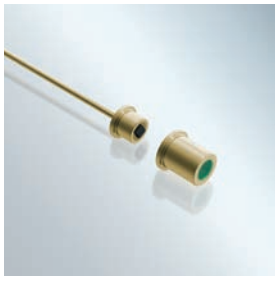
Based on this strong technology competence SCHOTT also offers hermetically sealed LED packages and modules that are fully autoclavable, thereby allowing entirely new application and design solutions for LEDs in medical and dental devices. The newly developed glass-to-copper sealing technology provides the added benefits of superior thermal conductivity and resistance which contributes to enhanced efficiency and lifetime of our LED packages.

Glass wafers enable hermetically-sealed, miniaturized MEMS designs

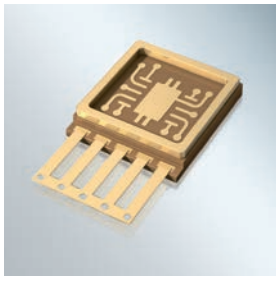
The unique housing concept called SCHOTT HermeS® specifically designed for use in micro-electro-mechanical systems (MEMS) offers superior hermeticity and enhanced electrical properties. As fine-pitched vias can be placed directly under the silicon MEMS device, it is an excellent aid to integrated, miniaturized MEMS designs as well as wafer level packaging.

TO headers

TO caps

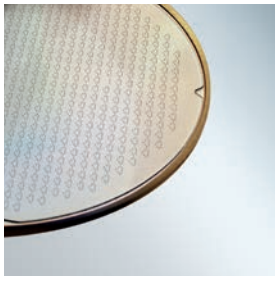


Pigtail



SCHOTT CerTMS® package

LED module



HermeS® glass wafer

Consumer Electronics

Hermetic protection for the safe and reliable usage of consumer electronics

Consumer electronics are often subjected to intensive use – 24 hours a day, 7 days a week. They are exposed to demanding environmental influences such as heat, humidity and stress, which can severely impair the performance of the electronic components found in these applications.

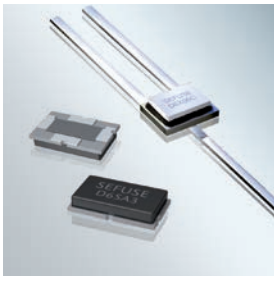
Reliable protection for timing devices

Quartz crystals that are found within time control devices of personal computers, mobile phones and watches for example are particularly sensitive. SCHOTT's hermetically sealed enclosures utilize a combination of glass and metal to protect the quartz crystals. This helps to fulfil important demands expected of quartz crystals such as reliability and long service life.

Thermal cutoffs for laptops and tablet PCs

We also offer thermal protection devices, widely known as SCHOTT SEFUSE®, specially designed to protect electrical equipment from catching fire by sensing overheating and immediately cutting off the electrical circuit. The D6 type is mainly used for battery packs and is also available with SMD-capability. Unlike a thermal cutoff, which is a single-use device, thermal protectors such as the SCHOTT SEREB® are used to protect against temporary over-heating. The device opens at high temperatures and automatically closes again as the voltage drops.

Cylindrical quartz housings for time control device in customer electronics



SEFUSE® thermal cutoffs – standard or SMD

SEREB® – thermal protector

Home Appliances

Dependable safety and reliable functioning of home appliances

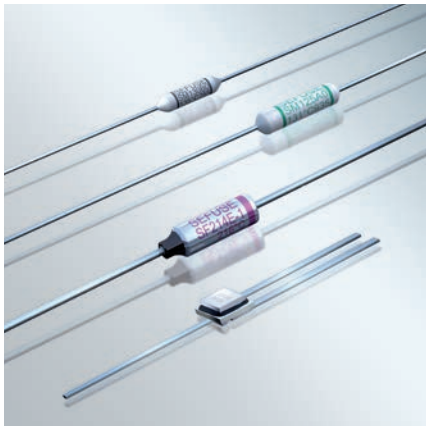
Thermal protection

All electrical home appliances – ranging from small devices, such as irons, coffee makers, rice cookers, bread makers and toasters, to larger ones such as refrigerators, dish washers, stoves and washing machines – all have thermal cutoffs. These thermal protection devices, widely known as SCHOTT SEFUSE®, protect electrical equipment from catching fire by sensing overheating and immediately cutting off the electrical circuit.

Increasing the lifetime of hermetically sealed compressors

Leveraging on the company's extensive know-how in hermetic sealing, SCHOTT's compressor terminals utilize optimal combinations of materials and manufacturing processes to provide reliable protection against adverse environmental conditions such as humidity, pressure, vibration and chemical elements. This is essential for the longterm operation of compressors in demanding applications such as refrigerators and air-conditioners.

SEFUSE® – Thermal fuses for the protection of electrical equipment form catching fire



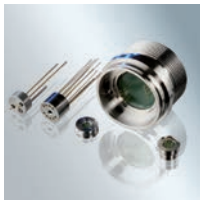
Compressor seals for applications such as refrigerators and air-conditioners

Energy & Nuclear Safety

Hermetic protection for demanding energy technology applications

A wide range of energy sources have been and are being continuously developed, including conventional gas generators, nuclear power plants and innovative renewable energies such as fuel cells and lithium-ion batteries. In order to prevent hazardous substances from escaping into the environment, hermetic seals play an important role in the safe and reliable supply of energy. Based on our unique know-how, SCHOTT offers special feedthroughs and connectors that allow the safe conduction of electricity through hermetically sealed containments. When it comes to safety-relevant applications in energy generation, SCHOTT offers the most reliable choice in hermetic sealing technology.

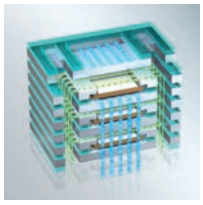
Terminal headers and connectors for liquefied natural gas (LNG) and compressed natural gas (CNG) applications For several decades, SCHOTT has provided glass-to-metal sealed terminal headers for more than 2500 pumps worldwide. These headers are used for the safe conduction of electrical data and power through the pressure-resistant and tightly-sealed containment walls of storage tanks and LNG transportation ships, as well as for CNG power generators. The headers are explosion-proof certified (ATEX), can survive significant accelerations and are insensitive to temperature, pressure, thermo-cycling and thermo-shock as well as aging periods.



Feedthroughs, microelectronic packages and connectors for oil & gas applications Equipment used in the oil and gas exploration industry is exposed to challenging temperatures and pressures during downhole and underwater drilling. SCHOTT supplies advanced, state-of-the-art single and multi-pin connectors and various special feedthroughs and microelectronic packages to meet those challenges. Our customizable products are also capable of withstanding even the most severe and chemically corrosive environments.

Electrical penetration assemblies and connectors for nuclear power plants Since the 1960s, SCHOTT's glass-to-metal sealed electrical penetration assemblies have been installed in more than 50 nuclear power plants around the world. Due to the non-aging technology, these electrical penetrations continue to operate at optimal performance and maintenance-free, through the fire-protective, pressure-resistant and hermetically sealed containment walls, like they have been since the time they were installed.

Battery terminals for wind and solar energy applications With the growing interest in renewables, the demand for energy storage solutions is continuously rising. SCHOTT has more than 20 years of experience in producing glass-to-metal sealed feedthroughs for primary batteries and now also offers glass-to-aluminium sealed terminals for lithium-ion batteries, providing significant advantages in terms of battery lifetime and safety.



Glass and glass-ceramic sealants for solid oxide fuel cells Solid oxide fuel cells (SOFC) are considered among the most promising methods for the efficient and environmentally friendly production of energy. Due to harsh conditions that the SOFC operates in, such as high operating temperatures (about 650 °C to 850 °C) and aggressive environments within the cells (fuel, air and humidity), all the materials used for this application must be carefully selected to enable the safe, reliable and continuous operation of the SOFC. SCHOTT offers specially formulated glasses and glass-ceramics as sealing materials, that can withstand the harsh environments and high operating temperatures of solid oxide fuel cells.

Defense, Aviation & Space

Hermetic packages for the protection of sensitive electronics in defense applications

Dependable and long-established partner

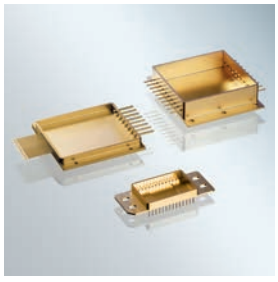
SCHOTT is a recognized leader in specialized glass solutions for the military and aerospace market and has been in the industry for over 130 years. Our long-term expertise in this area allows the development of custom-made solutions, that are perfectly adapted according to our customers' needs.

Applications, where safety comes first

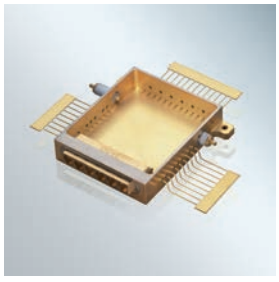
Due to the high quality standards and reliable performance of our products, we have been a trusted and dependable supplier to customers in the avionics, space and defense industries as we help to address the distinctive challenges inherent in such industries. This includes the highest requirements with regards to safety and absolute reliability.

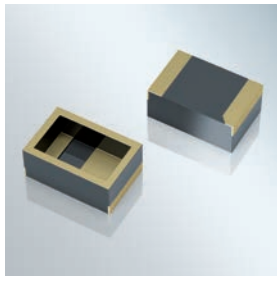
Sophisticated products for challenging requirements

Around the globe, SCHOTT develops, produces and supplies hermetic packages for the protection of sensitive electronics and large hermetic penetrators for bulkheads in nuclear powered carriers and submarines. Our hermetic packages, including hybrid packages, transistor outlines (TO) and other demanding feedthroughs are made of highly reliable glass-to-metal seals, ceramic-to-metal seals and/or full ceramic packages.



Customized power packages and microelectronic packages





Full ceramic packages

Quality Assurance

We strive to provide reliable products of the highest standards and therefore maintain a comprehensive quality management system that has been certified according to DIN EN ISO 9001 : 2008 since 1992. Hence, our global network of quality testing laboratories is well-equipped to provide the most stringent quality tests.

Quality without a compromise

Hermetically sealed products from Electronic Packaging undergo vigorous testing and quality assurance programs to provide the high quality our customers expect from our products. The test procedures are conducted according to the requirements of various standards and specifications such as MIL STD 883, MIL PRF 38534 or JEDEC Telcordia.

Industry-specific quality tests and certifications

By working closely with our customers, we can furthermore adapt the quality and test procedures according to individual product requirements. In line with this approach, SCHOTT is already certified according to the stringent controls of various industry-specific quality management standards such as ISO/TS 16949 : 2009 for the automotive industry or ASME NPT for Nuclear Safety.

Environmental management

Constant commitment to the environment is demonstrated by SCHOTT in holding ISO 14001 certification and adhering to the requirements of international directives, such as 2002/95/EC (Restriction of Hazardous Substances Directive (RoHS)).

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