Global Markets

Wanted: New Business-Power

The current financial and economic crisis threatens to incur some far-reaching consequences for the manufacturers of passenger jets. Undeniably, the order intake levels of the past years are no longer being attained by a wide margin.
Sensitive electronics need the right packaging

In terms of reliability and resistance to leaks, glass/ceramic-to-metal casings are unbeatable. No surprise, therefore, that they have been a popular choice on aircraft for more than two decades — for example for sensors or for optoelectronic data transmissions. However, the real capabilities and possibilities of glass/ceramic-to-metal casings are still frequently underappreciated, and as a consequence electronic components are still being housed in plastic enclosures. This is an avoidable risk.

Sensors, minicomputers, airbag ignition units — modern cars are packed with electronic components. Because they often have to do their job under harshest conditions — a good example of this being a temperature sensor which sits in the oil pan — they have to be hermetically sealed. Here, the perfect packaging takes the form of so-called glass-to-metal housings, where the electronic chip or sensor is encapsulated in a metal casing from which several, in some cases even dozens of connecting wires lead outside the component, where they establish data exchange and power supply connections. In order to prevent short-circuits these connections must not touch the housing — yet the feedthroughs must be perfectly sealed, even under high-temperature or high-pressure conditions. Fused glass/ceramic-to-metal composite components provide electrical insulation and seal off the electronics from their surroundings. In terms of reliability and resistance to leaks, glass/ceramic-to-metal casings are unbeatable. No surprise, therefore, that they have been a popular choice on aircraft for more than two decades — for example for sensors or for optoelectronic data transmissions. However, the real capabilities and possibilities of glass/ceramic-to-metal casings are still frequently underappreciated, and as a consequence electronic
example in electrical seat adjustment systems. Any such failure, however, is completely unacceptable if it affects the safety of passengers.

Potential trouble spots on aircraft include proximity sensors, which monitor a closing function, for example. These sensors signal whether or not the cabin doors are closed or the landing gear is extended. Failure of one of these sensors costing just a few Euros is a frequent cause of flight delays and can cause major follow-up costs. Consequently, it is important that the components perform their duty without developing faults or requiring replacement throughout the entire service life of the aircraft.

Schott Electronic Packaging, the market leader in hermetic housings and one of the business divisions of the Schott AG technology group, pursues a zero-fault-strategy in production, and the components are certified to stringent standards.

To show how high these quality standards are, here are a few numbers: Schott guarantees a leakage rate of $10^{-6}$ millibars × liters per second, and generally the glass/ceramic-to-metal casings even achieve values of $10^{-11}$ millibars × liters per second. Even extreme temperatures are no problem for the housings, which are subjected to temperature shocks of $-65$ to $+150 \, ^\circ C$ and pressures of up to 4,500 bar in the laboratory. Special versions with selected metals have even proved successful at temperatures from $-270$ to $+450 \, ^\circ C$. These properties would be completely beyond the scope of plastic or epoxy housings.

Further applications are to come

Apart from sensors, relays and optoelectronic components, glass/ceramic-to-metal feedthroughs also seal containers containing gas or fluids – including for example fuel tanks or hydraulic fluid reservoirs on an aircraft. Here, cables are routed through the glass seal. These cables conduct high currents and drive pumps which float in the liquid or in the gas.

Further potential applications in aircraft are in the pipeline. For example, aircraft designers are increasingly exploiting the potential of fiber-glass data transmissions, e.g. in order to transmit diagnostic data into the cockpit. This saves weight and allows faster transmission rates. In addition, passengers in economy class are now also increasingly enjoying individual entertainment programs, which increase data volumes again dramatically and demand reliable optoelectronic components. Thanks to their high proportion of metal on the housing, glass/ceramic-to-metal housings offer excellent shielding against electromagnetic interference. In order to match these properties, plastic casings generally require an additional layer of packaging. As well as this, these housings offer high fire resistance and do not release any toxic fumes in the event of fire – an important requirement in the aviation industry. Finally, significant weight reductions can be achieved with lightweight metals like aluminum or titanium.

Bernd Müller ←