

DESIGN COMPONENTS

## Transducers ensure A380 Airbus doors lock

PI's vertically-integrated piezo assemblies can be customized for a wide variety of applications, including monitoring closing and locking mechanisms.

POSTED BY ELIZABETH ENGLER MODIC | OCTOBER 2017



The Airbus A380 employs a motorized mechanism to open and close its large doors.

Image courtesy of Airbus; Image courtesy of Holmberg GmbH

Doors on Airbus' massive A380 are too large and too heavy for manual operation, so they need to be closed by motor force, which in turn requires sensors and transducers to tightly monitor the closing and locking mechanisms. If the locking procedure is incomplete, a warning sound is generated; when doors are properly closed, an OK signal is emitted. To achieve this, 14 sound transducers are built into each airplane next to the doors.

Berlin, Germany-based Holmberg GmbH develops and produces electro-acoustic devices used by Airbus and many other airplane manufacturers, including sound transducers, for which the aerospace industry requires comprehensive certification of reliability and lifespan. Piezo sound transducers for airplane doors are subject to considerably higher quality requirements than conventional mass-produced commercial buzzers.

To meet the demanding requirements, Holmberg selected custom piezo ceramic discs manufactured by Physik Instrumente (PI) Ceramic, which offer the reliability, durability, and exact adherence to technical specifications.

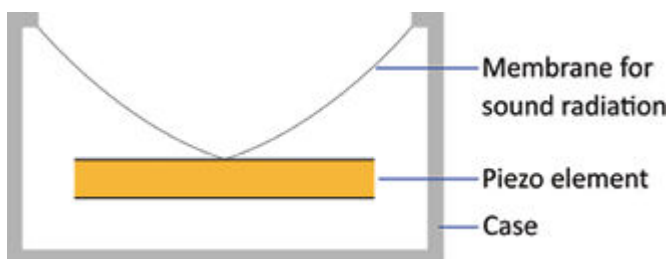


Fourteen sound transducers are built into each A380 airplane next to the doors.

## Sound transducers

The largest passenger airplane now in production is the Airbus A380, a double-deck, wide-body four-engine jet, with a wingspan of 262ft that can transport up to 850 travelers nearly 10,000 miles. Components used in the A380, and all airplanes, must be airworthy, reliable, durable, and as light and small as possible, including acoustic sound transducers.

Sound transducers consist of two piezo disks glued to each other, a plastic membrane, and a waterproof case. When electrical voltage is applied, the piezo ceramic deforms analogous to the drive frequency, known as the inverse piezo effect – the piezo element converts the electrical energy to mechanical energy. The motion is transferred to a membrane which then radiates sound waves. Depending on which of the piezo disks is operated, two different tones are generated according to the respective resonant frequency. The volume of the small sound transducer is 160dB, reduced after installation to 84dB.



## Piezo sub-assembly

“We obtain the two piezo disks which are already glued together. The piezo disks meet our high standards of

Basic design of a sound transducer, consisting of two piezo ceramic disks glued to each other, a plastic membrane, and a waterproof case. quality and are distinguished by a very low tolerance to all piezoelectric parameters relevant for sonic performance, such as resonant frequency, electrical capacitance, and coupling coefficients,” explains Peter Köppel, technical director at Holmberg.

The vertically-integrated piezo sub-assemblies can be adapted to any original equipment manufacturers’ (OEM) application because all production steps from the raw material, geometric design, and assembly are performed within a single manufacturing facility.

Piezo transducers start as mixtures of different, finely ground materials. The PZT (lead zirconate titanate) mixtures are then baked in high-temperature ovens with different formulations optimized for individual applications.

**Physik Instrumente LP (PI)**

[www.pi-usa.us](http://www.pi-usa.us)

---

---

## **Applications**

Piezo assemblies are available for sound transducers and ultrasonic transducers used in flow metering and distance measuring systems; and for motion control applications such as valve-control, precision dosing, and nano-positioning.

---