

# FAB S and LAB S

## KVG: The Hidden Champion of Quartz Crystal Technology



From a stately stone building in the heart of Neckarbischofsheim, Germany, KVG Quartz Crystal Technology pursues its long commitment to a technology at the heart of electronics. Any system with an oscillator or clock requires an accurate frequency reference, one that ideally introduces no phase noise or jitter and is stable with temperature and vibration. Quartz crystals have long been the predominant frequency reference for such sources, and KVG was one of the first companies to develop and commercialize the technology.

Formed in 1946 by physicist Kurt Klingsporn, Kristallverarbeitungsgesellschaft Neckarbischofsheim (translated as crystal processing company in Neckarbischofsheim), KVG has expanded its capabilities from crystals to designing and building the oscillators that use crystal technology, such as temperature compensated crystal oscillators (TCXO), oven-controlled crystal oscillators (OCXO) and voltage-controlled crystal oscillators (VCXO). KVG also develops crystal filters, typically Chebyshev or Butterworth designs with center frequencies between 5 and 200 MHz and bandwidths from 1.5 to 75 kHz.

Most KVG products are designed to meet customers' unique requirements, which reflects KVG's heritage of customer focus and taking on the most challenging problems. Known for low phase noise and low  $g$  sensitivity, KVG's oscillators are found in test and measurement instruments, telecommunications equipment, medical imaging and military systems, particularly suited for high vibration environments. To achieve the lowest phase noise, KVG combines its crystals with analog circuits designed using bipolar or CMOS transistors. The electrical design is complemented by mechanical and thermal designs that minimize performance variation caused by the environment.

As an example of the performance capability of its oscillators, KVG offers a 100 MHz OCXO that achieves a noise floor better than  $-185$  dBc/Hz at 100 kHz offset. Phase noise is less than  $-180$  dBc/Hz at 10 kHz offset and  $-138$  dBc/Hz at 100 Hz offset. The dynamic  $g$  sensitivity of the OCXO is less than 1 ppb/g for all three axes, which is 10x better than standard OCXOs.

With an extensive library of oscillator designs between 10 and 150 MHz, KVG's R&D is focused on expanding the TCXO and VCXO products and offering higher frequency options, i.e., from 500 MHz to 2 GHz. As systems move to higher frequency bands such as mmWave, designers want higher frequency references to simplify their local oscillator chains.

KVG is largely self-contained. Its team occupies approximately 6000 m<sup>2</sup> in several buildings located at one site, including the founder's home, which first housed the company, and its larger headquarters, once the district court in Neckarbischofsheim. 1200 m<sup>2</sup> is devoted to manufacturing and test, with full environmental testing for vibration, mechanical shock, temperature shock, salt spray and altitude.

Despite the pandemic, KVG's business grew over the past two years, attributed to the critical applications its products support. While it is well known and highly regarded by the customers it supports, KVG sees itself as a "hidden champion" in the market. To continue growing, the team intends to increase its visibility to attract more customers with demanding requirements. No doubt its loyal customer base will grow as more companies become aware of its 75-year history, vertically integrated capabilities and the performance of its oscillator and filter products.

[www.kvg-gmbh.de](http://www.kvg-gmbh.de)