

ACTIVE HAPTICS

SOLENOIDS AND VOICE COIL ACTUATORS FOR A PREMIUM HAPTIC FEEDBACK



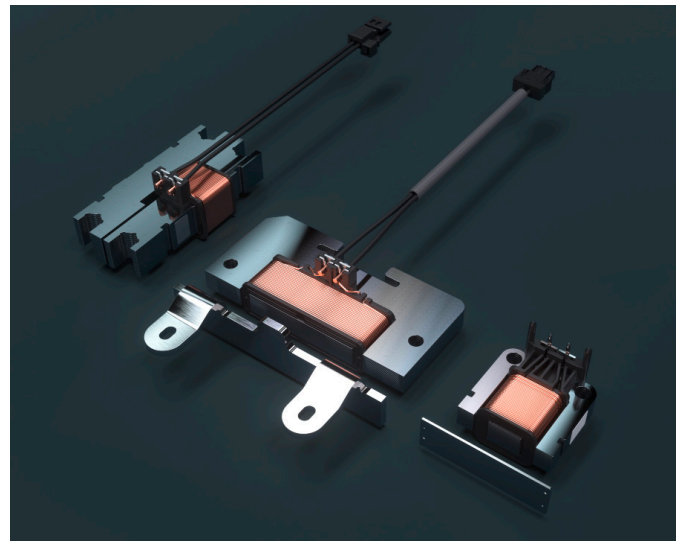
GRUNER HAS MANY YEARS EXPERIENCE IN DESIGNING ACTUATORS FOR ACTIVE HAPTIC SOLUTIONS. **WE CAN OFFER A VARIETY OF KEY BENEFITS FOR OUR CUSTOMIZED DEVELOPMENTS**

THE SOLUTION FOR MAJOR TASKS

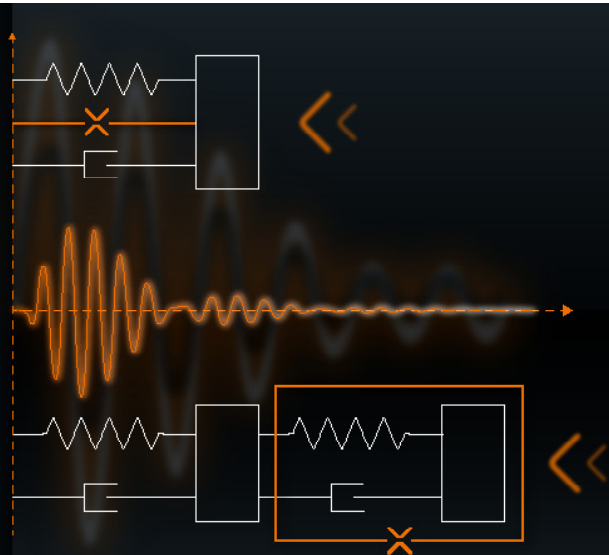
PULLING SOLENOID

Pulling solenoids can also be used as haptic actuators. These actuators can be integrated into single or coupled damped oscillation systems, which enables them to deal with big masses.

- › **Solder-free connection technology:** Reliable process contacting of stranded wires and enameled wires using insulation displacement connections (IDC) or directly with the printed circuit board (press-fit).
- › **Active damping:** With targeted double impulses, it is possible to influence the damping of an entire system.
- › **Rapid & high levels of force:** Measures involving reduced eddy currents achieve the required rapid build-up of flux and force.
- › **Dynamic properties:** Here, high forces can be achieved within 1-3 ms for moving masses of > 300 grams.



- > Close cooperation through agile development teams
- > Application in focus: We work with you to design the ideal mechanical and electrical interfaces
- > Scalable and project tailored production possibilities at our plants in Tunisia, Serbia and India
- > IATF 16949 certified
- > High quality product design to ensure reliable production processes and a stable, premium product quality

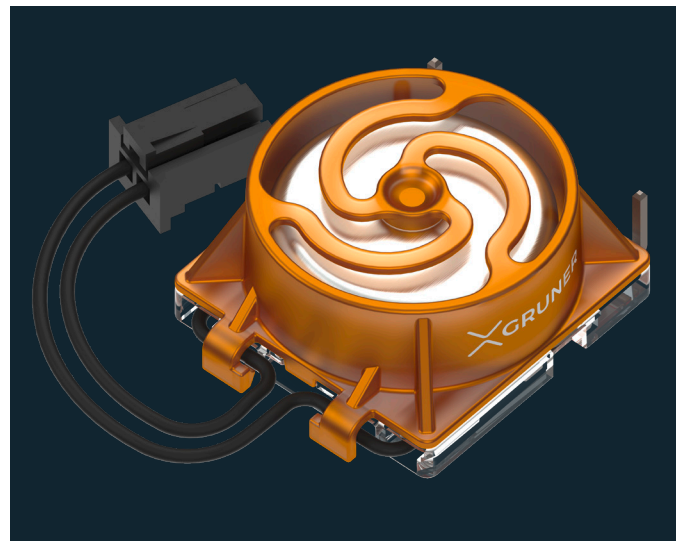


NEW IN OUR PORTFOLIO

VOICE COIL ACTUATOR

Voice coil actuators (VCA), also known as exciter actuators, servo actuators or moving coil actuators, are the most dynamic active haptic actuators in our portfolio. Voice coil actuators operate on the principle of linked oscillation and they can be matched precisely to the spring-mass system of our customers.

- > **Rapid design:** Our comprehensive simulation platform enables us to design the VCA to suit your requirements very rapidly. Since simulation parameters are based on real measured values, the simulation results can deliver a very accurate picture right from the outset.
- > **Easy to adapt:** With its modular layout, the actuator can cover a wide range of requirements with only minor adjustments
- > **Stable frequency range:** The design of this product enables it to achieve a very stable resonance frequency across the entire temperature range, meaning that undesirable eigenmodes only occur far outside the resonance frequency.

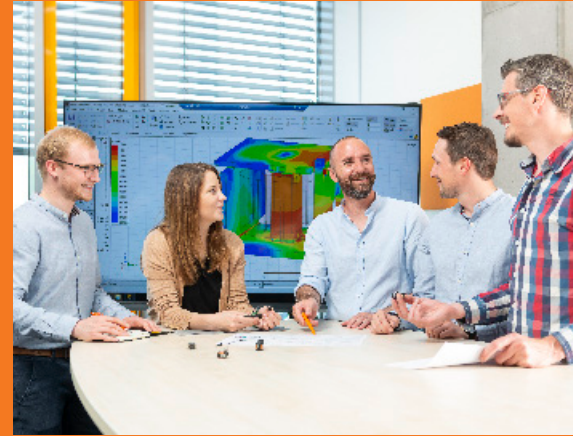


JUST ASK US

WOULD YOU LIKE TO KNOW MORE?

Are you looking for an actuator for a specific application? Would you like to learn more about the bespoke options available to you at Gruner? If so, please contact us. At Gruner, an entire team of specialists is there to meet your needs.

Telephone: +49 7426 / 948-480 or solenoids@gruner.de



THE SOLUTION FOR BIG TOLERANCE CHAINS

LINEAR SOLENOID ACTUATOR

These types of solenoids operate in active haptic systems that are based on the physical principle of an oscillating system with single damping. Due to the linearity across a wide range of linear solenoids, tolerance problems become a relatively minor issue.

- › **Plug & Play:** Depending on the solution, it is possible to achieve direct mounting and contacting with the PCB.
- › **Big tolerances:** Tolerances of > 1 mm can be achieved without any problem by influencing the characteristic curve in a targeted manner.
- › **Typical service life:** Depending on the application and the armature mounting, 1-5 million switching cycles are possible.

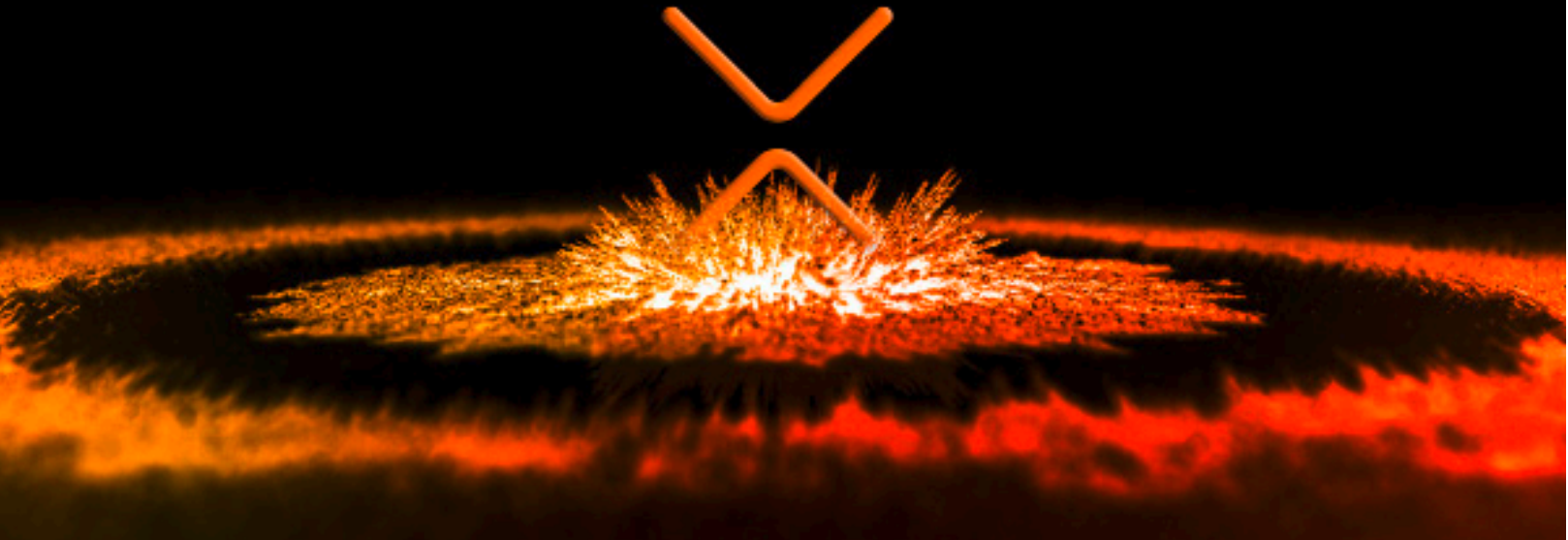


USE OUR DEVELOPMENT SKILLS FOR YOUR SYSTEM

We will be happy to provide you with further information personally.
Or visit us on the internet: gruner.de/elektromagnete, gruner.de/automotive

UNDERSTANDING SOLENOIDS

DEVELOPMENT AND SUPPORT FOR BETTER SOLUTIONS



CUSTOMIZED SOLENOIDS WITH ADDED VALUE

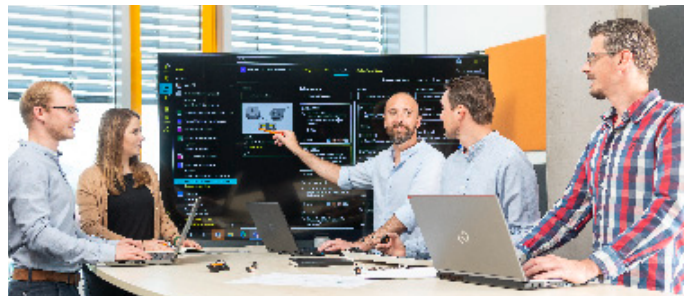
Our core competence is the joint development of solenoid solutions that focus precisely on your applicationspecific requirements.

Our agile development teams consist of dedicated experts who work in a cost-oriented and system-integrative manner. Through close collaboration, we identify the actual requirements of our customers and check which system approach provides added value.

Combined with our high vertical integration and scalable production capabilities, we are a reliable development partner for our customers.

5 GOOD REASONS FOR GRUNER

- › You develop innovative products with us
- › You gain a solution partner with real expertise
- › You work with a flexible and reliable volume manufacturer
- › You can work successfully with a responsive partner over an extended period
- › You benefit from the peace of mind of a family-run corporation



GRUNER AG, headquartered in Wehingen with around 1,500 employees, based in Germany, Tunisia, Serbia and India, is an exceptional manufacturer of actuators, relays and solenoids. Our system solutions for building management, the automotive industry and metering industry are in demand around the world, featuring compelling innovation and quality.

GRUNER AG

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