

# Our Core Markets

## Medical & laboratory

Precision, reliability, low noise and life time are still the top criteria for components in medical equipment. The magnetic concept of the hybrid stepper motor itself gives high precision. Sonceboz takes it to the next level; our designs, our dedicated solutions, and our expert production process give unrivaled reliability and lifespan.

- Cool-running multi-function electronic driver
- Reduced power consumption by 25 %
- Integrated electronics and controllers available

## Agriculture & Mobile Hydraulics

Wherever the solution to ever-increasing demand for efficiency and precision involves better hydraulic valves regulation, Sonceboz smart actuators are right in front. They include a flat hybrid stepper motor linked to a gearbox and an output rack as well as an CAN bus electronics and sensorless closed-loop control algorithms. This high-tech combination provides robustness, positional rigidity, and security in a compact and slim form factor.

- Temperature -40°C + 110 °C
- Force up to 340 N
- Integrated electronics in a flat, thin package

## Automotive & Truck

In today's roadgoing realm, OEMs need dependable, long-lived and reliable hybrid stepper motors from Sonceboz for innovative, highly efficient system engineering solutions. Our brushless concept delivers high torque to volume ratio, a wide speed range, and great robustness. Our ISO TS 16949 certification and our relentless drive toward 0-ppm quality demonstrate our excellence in design and industrial production.

- Torque up to 750 mNm
- Integrated connector
- Automatic and reliable production line

## Automation

Because of its specific design, the hybrid stepper motor provides high torque and high positional resolution. Therefore, it is suitable for many industrial machines and automated devices. Such a motor can be used in direct drive concept - no gearbox - for a precise and cost-effective solution.

- Torque up to 9 Nm
- Resolution 1.8 ° / full step, micro-steps available
- Customer specific solutions

## Telecom

Whether mounted in an antenna or used to tune adjustable filters, hybrid steppers are well suited for outdoor applications, where systems operate only few times a year, but movements must be guaranteed under all circumstances. When built into a system that can combine position sensors, a spur- or planetary-gear drive box, or a lead-screw and nut, they deliver the high mechanical precision required for accurate positioning of antennas.

- Positioning precision (self locking) < 10 µm
- Temperature -40 °C to +85 °C
- Tested tough against humidity and salt fog



## SONCEBOZ Motion systems

Our core competencies consist of design, development and production of **mechatronic drive systems** and **electric motors** that operate in **harsh environments**. We are committed to improving safety, decreasing energy consumption and minimizing the impact on the environment. Our focus on **innovation, best in class quality** and **exceptional service** is our key to success for worldwide OEM customers and their suppliers.

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SONCEBOZ

## HYBRID STEPPER MOTORS

# Motion systems for challenging applications



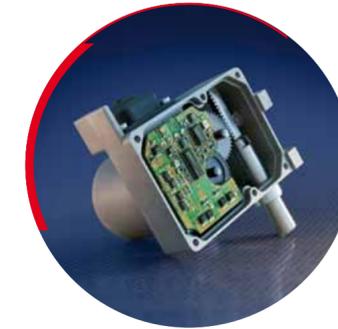
# Case Studies

## Valve adjustment

**The task:** to control and position the spool in a servo valve.

**The challenges:** The solution must be compact, robust, accurate and failsafe, and must operate with high precision under harsh off-road vibration and at temperatures from a bitter -40 °C to a burning 100 °C.

**The ideal solution:** A Sonceboz linear actuator based on a hybrid stepper, integrating rack, pinion and an electronic driver with CAN interface. This electric actuator drives the spool valve quickly, efficiently, and accurately no matter the hydraulic flow rate, eliminating the need for a pilot circuit. The rugged Sonceboz linear actuator can deliver up to 340 N of force at speeds of up to 100 mm per second. Resolution is finer than 0.1 mm with no hysteresis over travel of ±12 mm.

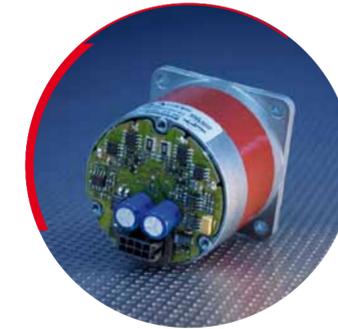


## Peristaltic pump

**Task:** to drive a pump head over a wide speed range with highly precise regulation and low noise.

**Challenge:** The solution must be quiet, reliable and highly efficient, robust and cost-effective for the drive system in medical applications.

**Solution:** A Sonceboz hybrid stepper motor with integral closed-loop driver. This offers high torque at low rotation speed. In a peristaltic pump, the Sonceboz hybrid stepper neatly eliminates the need for a gear box, and its cost, complexity, and noise. The closed-loop operation boosts motor efficiency while lowering the operating temperature and further hushing noise. Up to 6 Nm of torque is available at speeds from 0 to 500 rpm, with speed accuracy finer than 0.2%.

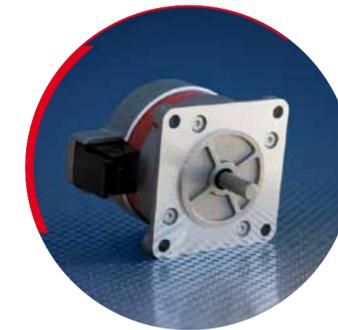


## Selective Catalytic Reduction pump (SCR)

**Task:** to drive membrane pump for precise liquid dosing, mounted on vehicle chassis

**Challenge:** meeting high lifetime expectancy with no maintenance (30'000 hours), high resolution and stiffness, large speed range and wide temperature range operation (-40 °C to 105 °C) under vibration levels.

**Solution:** a hybrid step motor with 200 steps per revolution, extended air gap and strengthened shaft and bearings. Thermopotted winding with laser soldered components guarantee the performance under vibration exposure and secures the automatic assembly process. Torque up to 750 mNm over speed range from 0 to 750 rpm and 220 millions of turns summarize the motor performances.

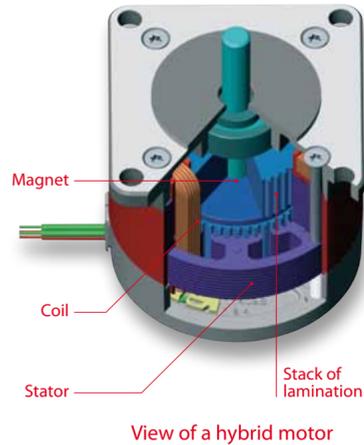


SONCEBOZ  
from mind to motion

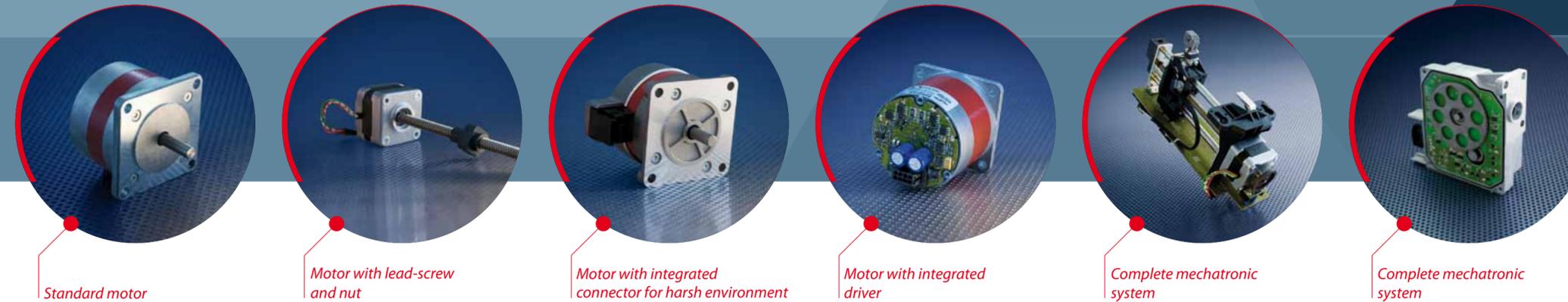
## Technology overview

This motor applies a principle of variable reluctance linked to a permanent magnet motor principle; it is a polarized reluctant motor. The rotor consists of an axially-magnetized magnet assembled between two silicon-iron (FeSi) lamination stacks. These have a series of teeth along their outer diameter which are N-polarized on one side and S-polarized on the other. The two stacks display an angular offset of half a period, so that alternating N-S poles can be simulated on the outer diameter of the rotor. The number of teeth in a stack is then equivalent to the number of pairs of poles in a permanent magnet motor. In our case the motor presents **200 natural steps/revolution** for high precision, stiffness and torque at low speed.

The stator consists of a stack of FeSi laminations forming several poles, each surrounded by a coil. These poles end in teeth polarized N-S, depending on the direction of current. Several poles - usually four of them - constitute a single phase. The current is electronically commuted. This type of motor has no wearing parts and thus boast **excellent reliability and long lifespan**.



# Hybrid Stepper Motors



## From mind to motion

### Development & industrialization



Product design

Process & tool design

Validation

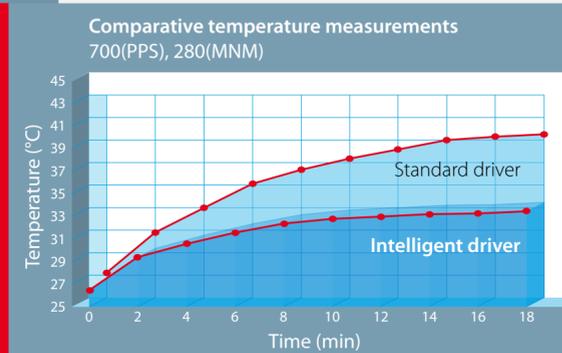
## LoadSense

### Intelligent driver with Closed Loop Control Load Sensing

The closed-loop control is a vector mode and load adapting technology. An algorithm estimates the rotor location to compute commutation time and load level. Appropriate power is sent to the stator windings to move the rotor into the proper location, with the proper amount of force. This principle allows an **optimal self-adaptation** between the power consumed and the workload, which in turn increases efficiency and reduces heat and noise. Sonceboz' intelligent LoadSense driver can be used with sensors for very low speed regulation or sensorless for cost-effective solutions in harsh environments.

#### Benefits

- Guarantees zero step loss
- Reduces heat and noise
- Reduces electrical consumption
- Allow condition monitoring and predictive maintenance
- Analytic and information processing loop (feedback)
- No gearbox: compact form factor for easier assembly
- All-in-one, easy-to-use motion system
- Reliable and precise drive



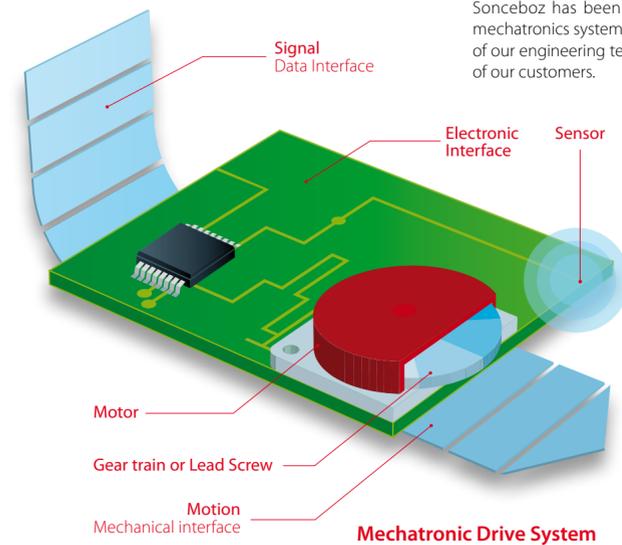
## Custom solutions

Sonceboz has been active and recognized for years as experts in advanced mechatronics systems tailored to customer needs. The competence and flexibility of our engineering team is aimed at developing a win-win partnership with each of our customers.

Depending on your requirements, all sorts of adaptations are possible without altering the overall reliability and precision of the hybrid stepper technology:

- output screws for linear motion
- gear train
- nonstandard shafts and connectors
- embedded drive electronics
- integrated encoder
- integrated sensor

The choice of basic motor (technology, performance, winding), driver and mechanics allow many parameters to be optimized according to your specifications for such parameters as torque, speed, resolution, and noise. Hybrid stepper motors therefore constitute a **simple, reliable and cost-effective** foundation to solve many precise E-actuation problems.



## Available standard products

Some Sonceboz stepper motors are available as standard products with better-than-standard performance. They offer great precision and high reliability for the performance you need under extreme conditions

- Step angle: 1.8°
- Size: 42 - 57 - 86 mm Ø
- Holding torque: 130 to 9000 mNm

Type	Max. hold. torque (mNm)	Diameter (mm)	Length (mm)
NEMA 17	90 - 240	42	32.5 - 45
NEMA 23	358 - 1950	57.2 - 57.4	38.7, 50.8, 76.2
NEMA 34	2750 - 9000	86	62.25, 94.25, 127.25

Please refer to motor datasheets at [www.sonceboz.com](http://www.sonceboz.com)

### Manufacturing process



Winding

Stator assembly

Final control