

Figure 1: Guitar played by maxon motors. © 2011 TeamDARE

## maxon motor hits the right note.

**In the field of robotics, there are many interesting applications, from industrial robots and autonomous vehicles to humanoids. But have you ever heard of a complete robot orchestra? A project team from the Netherlands has been letting robots make music for several years now. Motors by maxon motor ensure that they hit the right note.**

With a robot orchestra no drummers, guitarists or panpipe players are required any more – all these instruments are played completely by robots. All features needed for the orchestra, from the mechanical components, to the electronics and the software, were developed by TeamDARE from the Netherlands. This team consists of a group of enthusiastic engineers that share a hobby in their free time: building robots. The project originated from an internship at the Eindhoven University of Technology in 2001. Ever since, TeamDare has been participating in various competitions, such as the "Eurobot" international robotic contest and the "Artemis Orchestra Competition". The objective of TeamDARE is to show, in a playful way, what is currently possible with robotics. With the music robots, the team proves that, to a certain extent, it is already possible to replace musicians with technology. The strength of the team lies in the balance and synergy between the different subject fields, from mechanical engineering and electronics to computer science. Thus a multi-disciplinary team has formed that closely cooperates to develop more music robots. The shared passion for technology is the largest motivation for the eight team members.

### **maxon motors for the right sound**

Simplicity, robustness and the reliability of the individual components are important prerequisites for the implementation of the respective robot projects. However, the robots also frequently have to be transported to other locations for presentations. This demands great care, because any repairs that become necessary cost time that could otherwise be used for new projects.

"Therefore we have been counting on motors by maxon for many years," says Bart Janssen, the team leader. The heart of the orchestra are the 17 maxon motors built into the three music robots. For example, the panpipe robot is equipped with three RE 25 maxon DC motors, with GP 32C planetary gearheads for driving the instrument. A total of eight motors are behind the beat of the complex drummer kit. This includes three maxon RE35 DC motors. The centerpiece of the DC motors is the worldwide patented ironless rotor.

"Using maxon's motors gives us great creative freedom. Especially as the large variety offered by maxon includes the right solution for every function," explains Janssen. In June 2010, the engineers completed the development of the panpipe robot. After a short break, the team is already hard at work on the next instrument. At the moment, TeamDARE will only reveal that the new music robot will not simply supplement the current "band members"—instead, it will surpass all the other instruments built until now in both scope and complexity. The suspense continues... Which musical robot will soon jam with the rest of the orchestra?

Authors: Kim Funke, Marketing, maxon motor benelux bv; Anja Schütz, Editor, maxon motor ag  
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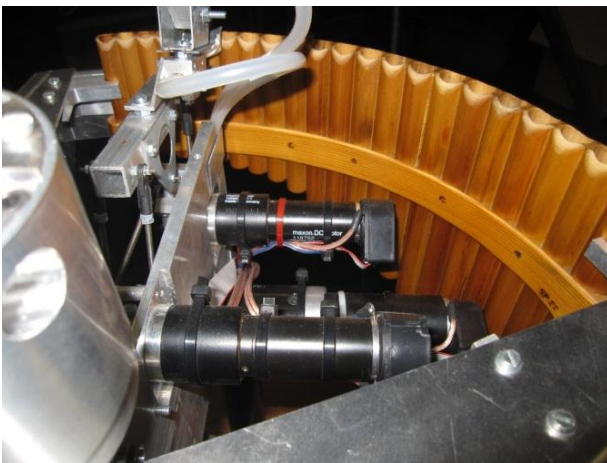


Figure 2: Three RE maxon DC motors with a planetary gearhead and an encoder drive the panpipe. © 2011 TeamDARE



Figure 3: The crash and hi-hat of the drum kit are equipped with one maxon drive each. © 2011 TeamDARE

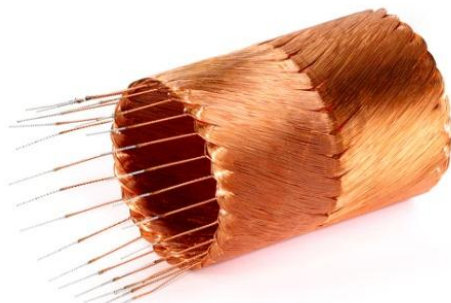


Figure 4: The centerpiece of the maxon motor is the globally patented ironless winding, System maxon, © 2011 maxon motor.

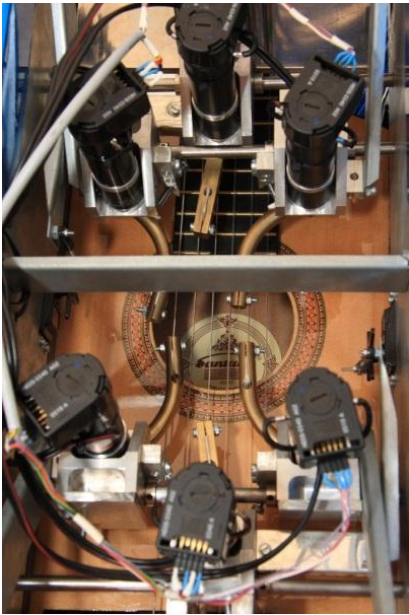


Figure 5: The guitar strings are driven by three maxon motors. © 2011 TeamDARE



Figure 6: The robot-only orchestra, with no "real" musicians. © 2011 TeamDARE

For additional information, contact:

maxon motor ag  
Brünigstrasse 220  
Postfach 263  
CH-6072 Sachseln  
Telephone +41 (41) 666 15 00  
Fax +41 (41) 666 16 50  
Web [www.maxonmotor.com](http://www.maxonmotor.com)

**Vereniging TeamDARE**  
Zijpendaal 9  
5655GA Eindhoven  
E-mail: [frank.van.heesch@gmail.com](mailto:frank.van.heesch@gmail.com)

[www.teamdare.nl](http://www.teamdare.nl)