



YANMAR

News Release

November 21, 2023
Yanmar Holdings Co., Ltd.

Yanmar Develops Next-Gen Electric Work Machine Prototype with Enhanced Force Control



Next-Gen work machine prototype with Force Control Technology.

Osaka, Japan (November 21, 2023) - Yanmar Holdings Co., Ltd. (Yanmar HD) has unveiled a prototype of a cutting-edge electric work machine with advanced force control at the Construction DX Challenge 2023, organized by the Japanese Ministry of Land, Infrastructure, Transport, and Tourism.

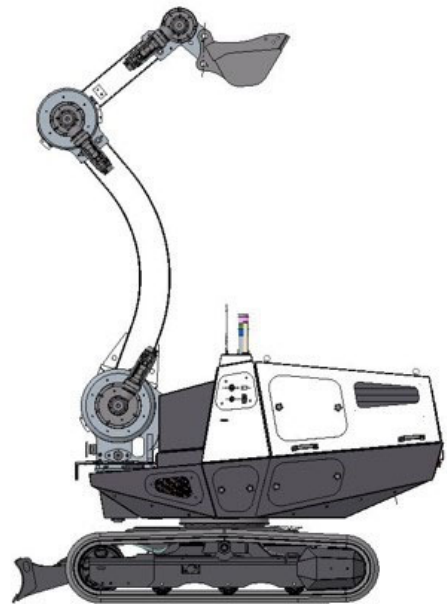
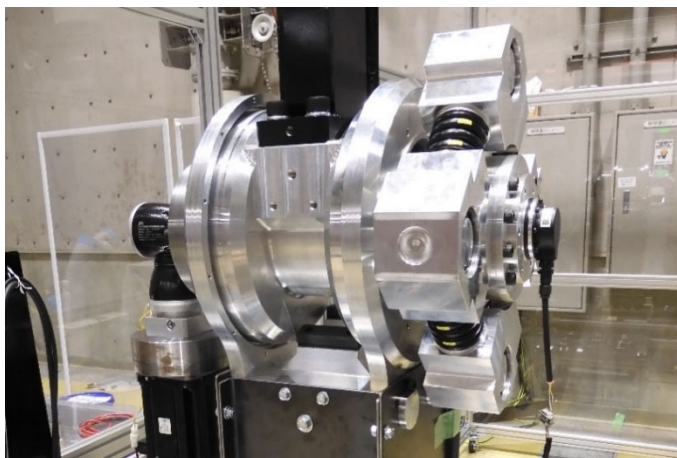
Developed in collaboration with JAXA's Space Exploration Innovation Hub Center^{※1}, the large SEA (Series Elastic Actuator), was part of a prototype for the next-generation work machine under the Moonshot Research and Development Program^{※2}. Yanmar HD successfully implemented force control capabilities, a challenge for conventional hydraulic systems. Using the SEA composed of an electric motor, reducer, and spring, the functionality was implemented in an electric mini-excavator.

This technology aims to automate fine manual tasks, addressing labor shortages at construction sites. Moving forward, the company plans to conduct further verification to realize the practical applications of next-generation work machines in construction sites and similar environments.

Aligned with the company's YANMAR GREEN CHALLENGE 2050, the Yanmar Group continues its commitment to realizing a sustainable society, contributing to customers' decarbonization efforts through ongoing developments in electrification and other forward-looking technologies.

Key Features:

- Test development of force control function using a large SEA that can be mounted on construction machinery.
- Development of a prototype incorporating this technology into a mini-excavator as part of the Moonshot Research and Development Program.
- Mechanization of delicate work in civil and construction sites, contributing to the labor-saving of material placement operations.
- Implementation of an articulated motor, not a conventional electric cylinder, to expand the range of motion through electrification, enabling high-altitude work like ceiling operations.



From left: The large Series Elastic Actuator (SEA) developed in cooperation with JAXA; Realizing an expanded range of motion through the adoption of joint motors.

Main Specifications (prototype)

Name	Next-generation work machine prototype with force control function
Base machine	Yanmar ViO25 mini-excavator
Weight	3t class
Rated load during lifting	209kg
Operating range (arm)	210 deg.
Emissions	Zero-emission

About Moonshot Research and Development System (Cabinet Office)

<https://www8.cao.go.jp/cstp/english/moonshot/top.html>

Ref.: Joint Research Results Verification Experiment on Control Technology of Construction Machinery for Moon Base Construction (Japan Aerospace Exploration Agency, Space Exploration Innovation Hub Center, September 21, 2023)

(Japanese) <https://www.ihub-tansa.jaxa.jp/topics/yanmar.html>

※1 Space Exploration Innovation Hub Center: Research and development of construction machinery with force control functions under the challenge name "Research and Development of Construction Machinery with Force Control Functions."

※2 Moonshot Research and Development Program Goal 3 " Collaborative AI robots for adaptation of diverse environments and innovation of infrastructure construction": Research and development of collaborative AI robots capable of flexible response to unforeseen situations and performing tasks in difficult environments, such as disaster sites or the moon.

About Yanmar

With beginnings in Osaka, Japan, in 1912, Yanmar was the first ever to succeed in making a compact diesel engine of a practical size in 1933. A pioneer in diesel engine technology, Yanmar is a global innovator in a wide range of industrial equipment, from small and large engines, agricultural machinery and facilities, construction equipment, energy systems, marine, to machine tools, and components — Yanmar's global business operations span seven domains. On land, at sea, and in the city, Yanmar provides advanced solutions to the challenges customers face, towards realizing A Sustainable Future. For more details, please visit the official website of Yanmar Holdings Co., Ltd.

<https://www.yanmar.com/global/about/>

Note: Information contained in the news release is valid at the time of publication and may differ from the most recently available information.

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