

June 3, 2024  
Diamond Electric Holdings Co., Ltd.

## **Diamond & Zebra Achieves World's Largest Output Energy per Volume in Its "Project A: Development of Ammonia Combustion Technology"**

- Prototype under Test Completed, Now Accepting Evaluation Sample Orders from Engine Manufacturers –

Diamond & Zebra Electric Mfg. Co., Ltd. (hereinafter "Diamond & Zebra"), an Osaka-based group company of Diamond Electric Holdings Co., Ltd., has completed a prototype of an ultra-high energy ignition system capable of stable combustion of ammonia and other flame-retardant fuels in its ongoing "Development of Ammonia Combustion Technology."



In recent years, along with efforts to electrify automobiles as a countermeasure against global warming, research on the combustion of ammonia as carbon-free fuel is progressing. Compared to conventional gasoline, one of the factors for stable combustion of flame-retardant fuels such as ammonia, a very high-energy spark discharge is required in the ignition system.

This ignition system achieves both ultra-high energy output and compact engine-installable size; moreover, it has the world's largest output energy per volume\*. The system is also capable to output various ignition patterns such as multiple ignition, including individual ignition, making it possible to stabilize combustion in each operating range of an engine.

\*According to the company's own research

This ignition system certainly enables stable combustion of flame-retardant carbon-free fuels such as ammonia. Furthermore, it may also improve the performance of various lean-burn engines. Diamond & Zebra is confident that it can make a significant contribution to the realization of reciprocating engines with environmental performance that contributes to a carbon-neutral society by providing this system to engine manufacturers --on the road, in the field, and over the sea.

Based on Diamond & Zebra's new vision stated in its medium to long-term management plan "Scrum of Fire": "Contribute to the Improvement of Global Environment by Connecting Cars and Homes with Manufacturing," the company, taking itself as an entity for the public, will continue to support its customers while contributing to the enrichment of society through united efforts of the entire company.

Related release: "*Diamond & Zebra Electric Mfg. Develops World's First Ammonia Combustion Technology - Aiming to Provide Ultra-High Energy Ignition System for Engine with Next-Generation Fuels Including Ammonia*" - "<https://www.diaelec-hd.co.jp/en/info-en/17371/>

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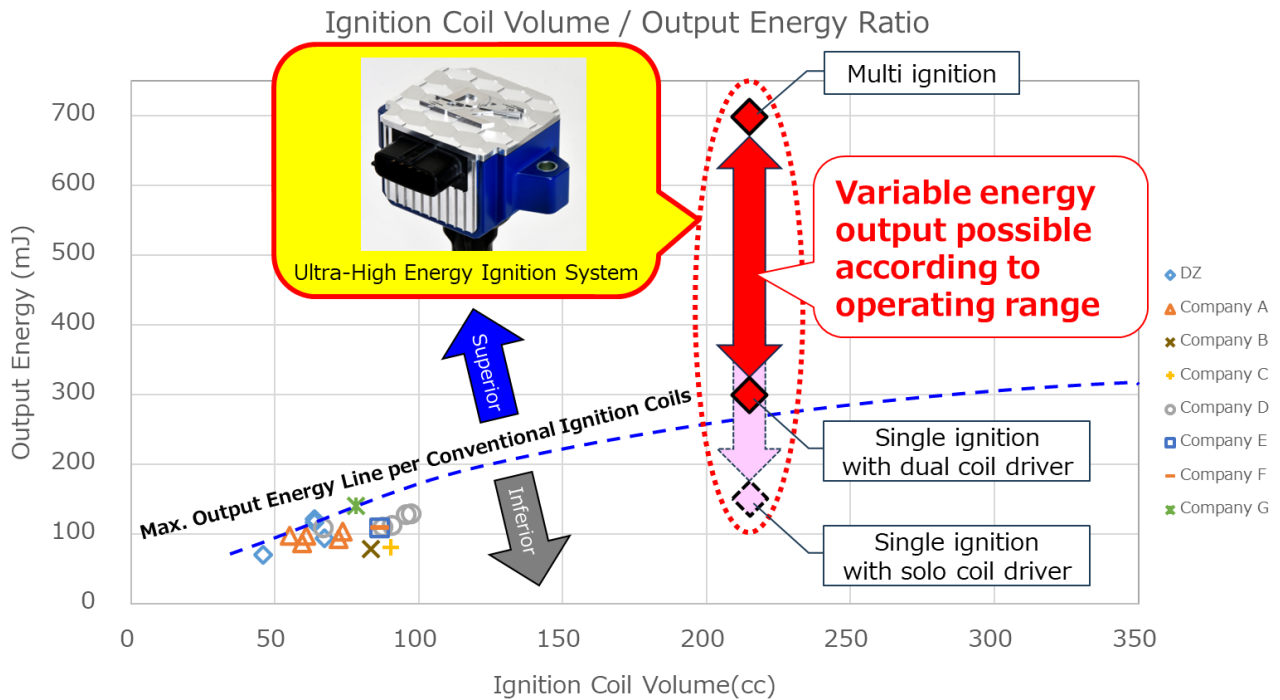
\*Please contact us by email for inquiries.

News Release

> **Conceivable applications**

- Spark-ignition engines in general
- Products related to ignition and combustion by spark ignition

> **Advantages of the ignition system in the market** (according to the company's survey in March 2023)



**World's No.1 Output Energy per Volume** (According to our own research)

> **Spark discharge comparison**

Conventional Products

Spark Plug Central Electrode

Air Flow

Spak Discharge

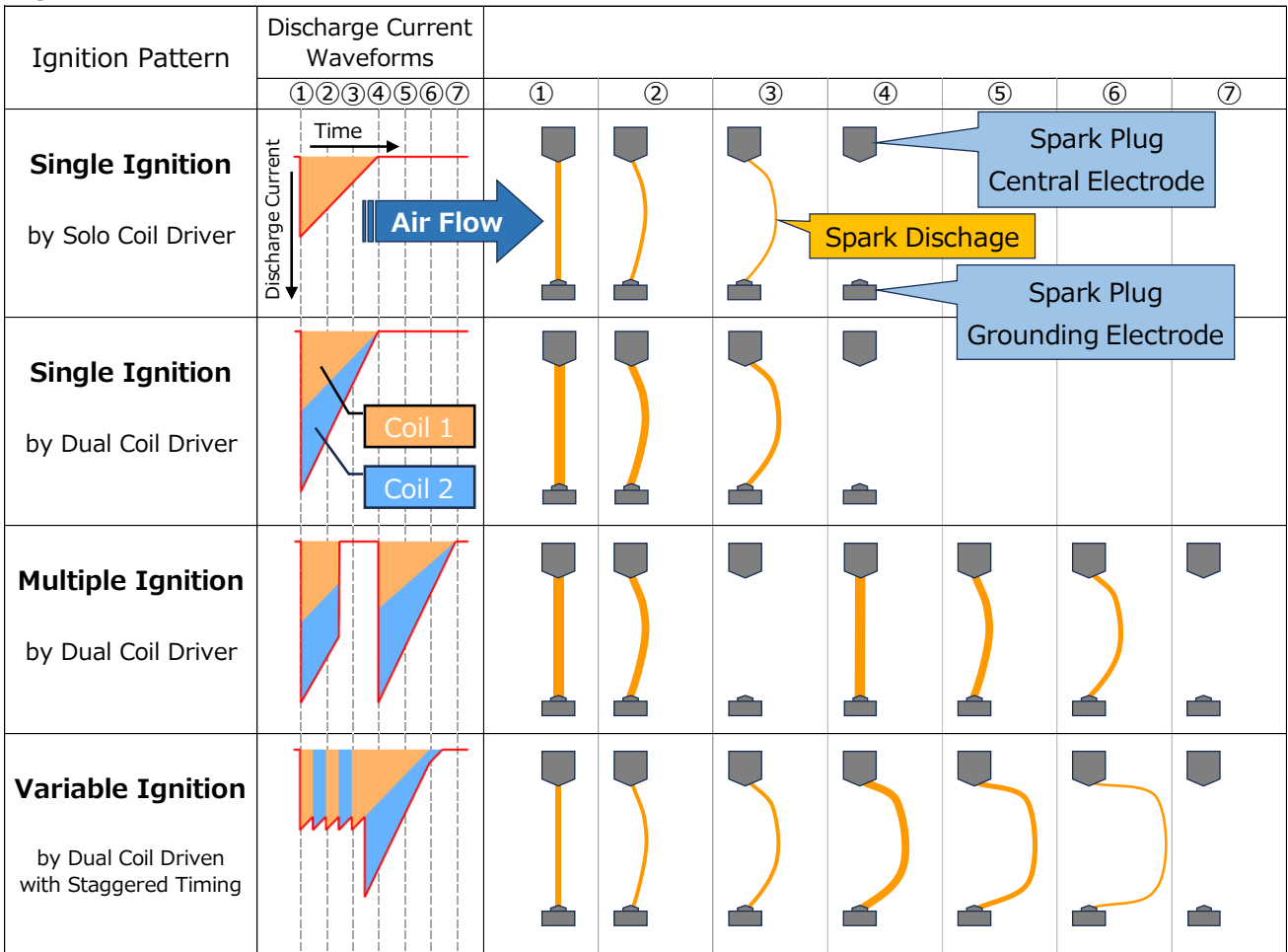
Spark Plug Grounding Electrode

Ultra-High Energy Ignition System

Air Flow

Ultra-high energy ignition system produces more powerful spark discharges than conventional products.

> Ignition pattern examples



The system is capable to output various ignition patterns such as multiple (including individual) ignition