

MITSUBISHI ELECTRIC CORPORATION
PUBLIC RELATIONS DIVISION
7-3, Marunouchi 2-chome, Chiyoda-ku, Tokyo, 100-8310 Japan

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Customer Inquiries

Media Inquiries

Industrial Automation Machinery Dept.
Industrial Automation Machinery Marketing Division
Mitsubishi Electric Corporation

Public Relations Division
Mitsubishi Electric Corporation

www.MitsubishiElectric.com/

prd.gnews@nk.MitsubishiElectric.co.jp
www.MitsubishiElectric.com/news/

Mitsubishi Electric to Launch ‘CV Series’ of 3D CO₂ Laser Processing Systems for Cutting CFRP

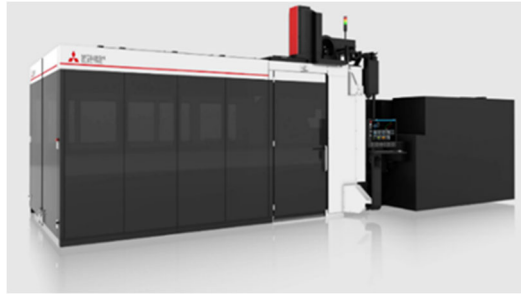
The world’s first unique orthogonal structure CO₂ laser oscillator will facilitate the mass production of CFRP products

TOKYO, October 14, 2021 – [Mitsubishi Electric Corporation](https://www.mitsubishielectric.com) (TOKYO: 6503) announced today that it will launch on October 18 two new CV Series models of 3D CO₂ laser processing systems for cutting carbon fiber reinforced plastics (CFRP), which are lightweight, high strength materials used in automobiles. The new models are equipped with CO₂ laser oscillators that integrate the oscillator and amplifier into the same enclosure – a world-first based on the company’s research as of October 14, 2021 – and together with the unique processing head of the CV Series, it helps achieve high-speed and precision processing. This will enable the mass production of CFRP products, so far unavailable using previous processing methods.

In recent years, there have been increased calls in the automobile industry for reductions in CO₂ emissions, improved fuel efficiency, and more lightweight materials enabling greater cruising ranges. This is driving the increasing demand for CFRP, which is a relatively new material. On the other hand, CFRP processing using existing technology has had issues such as high operating costs, low productivity and issues with waste treatment. A new processing method was required.

Mitsubishi Electric’s CV Series will overcome these challenges by achieving high productivity and processing quality far superior to existing processing methods helping to facilitate the mass production of CFRP products at a level that was hitherto unachievable. In addition, the new series will help to reduce the environmental burden by such means as a reduction in waste, thereby contributing to the realization of a sustainable society.

The new models will be exhibited at MECT 2021 (Mechatronics Technology Japan 2021) at Port Messe Nagoya, Nagoya International Exhibition Hall from October 20 to 23.



ML3122CV-12XM

Overview of Release

Product name	Model name	Oscillator power	Release date	Target unit sales
'CV Series' 3D CO ₂ laser processing systems for CFRP	ML1515CV-12XM	1.2kW	Oct. 18	100 machines (annually)
	ML3122CV-12XM			

Product Features

1) Unique 3-axis orthogonal type CO₂ laser oscillator achieves exceptional CFRP processing speeds

For laser cutting of CFRP, a material generated from carbon fiber and resin, the fiber laser widely used for cutting sheet metal is not suitable as the beam absorption rate is extremely low for the resin and so the resin needs to be melted by thermal conduction from the carbon fiber. In addition, although CO₂ lasers have a high laser energy absorption rate for both carbon fiber and resin, the conventional sheet metal cutting CO₂ lasers do not have a steep pulse waveform making them unsuitable for cutting CFRP due to the high heat input into the resin.

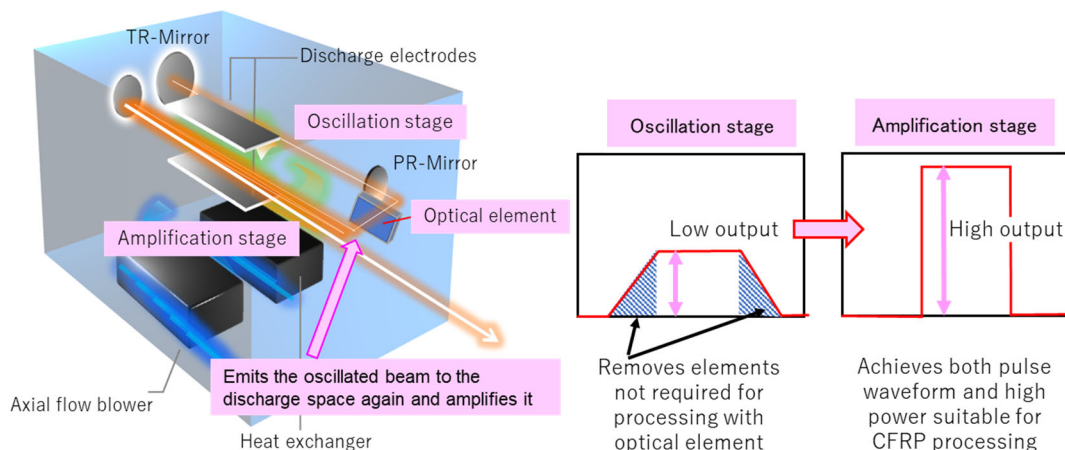
Mitsubishi Electric has developed a CO₂ laser oscillator for cutting CFRP by achieving both a steep pulse waveform and high output power. This Integrated-MOPA¹ system 3-axis orthogonal-type² CO₂ laser oscillator enables the integration of the oscillator and amplifier into the same enclosure; it converts the beam oscillated at low power into a steep pulse waveform suited for cutting CFRP, and puts the beam into the discharge space again, amplifying the output. It is then possible to emit a laser beam suitable for CFRP processing by a simple configuration (patent pending).

Combining steep pulse waveforms and the high beam power required for CFRP cutting achieves exceptional, class leading, processing speeds, about six times faster³ than existing processing methods such as cutting and waterjet, thereby helping to improve productivity.

¹ Master Oscillator Power Amplifier: main oscillator power amplifier composition

² 3-axes of laser optical axis, gas flow and discharge direction are at right angles to each other

³ A laser processing cutting speed of 6m/min compared with 1m/min while cutting thermosetting CFRP material with a thickness of 2mm.



System overview of laser oscillator

Image of pulse waveform

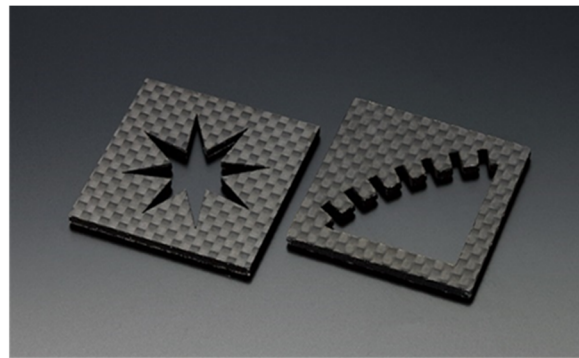
2) Unique single-pass processing head achieves superior processing and helps protect the environment

The single-pass processing head developed for CFRP cutting enables this new series to cut with a single laser scan as with sheet metal laser cutting. Therefore, higher productivity can be achieved compared to multi-pass processing, which scans laser beams on the same path many times.

The side gas nozzle on the processing head enables hot material vapor and dust generated during cutting to be removed until the very end of the cut material while still managing the thermal effects on the material, to achieve a superior processing quality unachievable using previous processing methods (patent pending). Also, as laser processing is non-contact, there are few consumables and no waste (e.g. waste liquid) is produced, which helps to reduce operating costs. This processing technology contributes to the realization of a sustainable society and the achievement of applicable UN Sustainable Development Goals.



3D shape
Material: CF-SMC
Thickness: t1.4mm



Edge cutting
Material: Prepeg molding item
(thermosetting, continuous fiber)
Thickness: t2mm

3) The installation of “path edit function” and utilization of IoT improve work efficiency and ease of maintenance

Conventionally, the revision of processing paths needs to be edited with CAM (computer-aided manufacturing) software. However, the path can be corrected in the field by installing path edit CAM software in the controller, which improves operators’ work efficiency.

Mitsubishi Electric’s remote service deploying IoT, “iQ Care Remote4U”,⁴ allows the operational status of laser processing machines to be checked in real time. This remote service also helps to improve production processes and reduce operating costs by using IoT to collect and analyze processing performance, setup time, and electricity and gas consumption.

Moreover, it is possible to perform remote diagnosis of customers’ laser processing machines directly from terminals installed in Mitsubishi Electric’s service center. Even if a processing machine fails, prompt response is guaranteed by means of remote operation. Preventive maintenance information, software version updates and the processing of condition changes are also provided.

⁴ A service supporting remote maintenance of machine tools through the collection and accumulation of various data.

Main Specifications

Model name	ML1515CV-12XM	ML3122CV-12XM
Movement system	Hybrid system (X axis: Table movement, Y axis: Optical movement)	
Processing head structure	Offset type	
Stroke (X×Y×Z) (mm)	1,520×1,520×850	3,100×2,200×850
Flat sheet processing maximum workpiece dimension (C axis Fixed at 90 degrees) (mm)	1,520×1,320	3,100×2,000
Laser oscillator power (rated output)	1.2kW	
Target material and maximum processing thickness	CFRP 3mm	
Main standard equipment	•CFRP cutting head •Assist gas high pressure specification (air) •Enclosure •Control unit built-in path edit CAM	
Main option	•Work support pin unit •Work clamp	

Contributing to the Environment

The new CV Series of 3D CO₂ laser processing systems contribute to lower the environmental impact of business operations and support the realization of a sustainable society by reducing equipment wear and avoiding waste.

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About Mitsubishi Electric Corporation

With 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Mitsubishi Electric enriches society with technology in the spirit of its “Changes for the Better.” The company recorded a revenue of 4,191.4 billion yen (U.S.\$ 37.8 billion*) in the fiscal year ended March 31, 2021. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥111=U.S.\$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2021