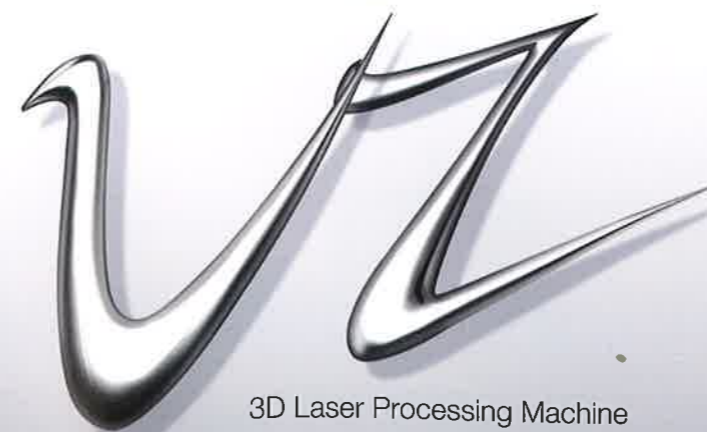
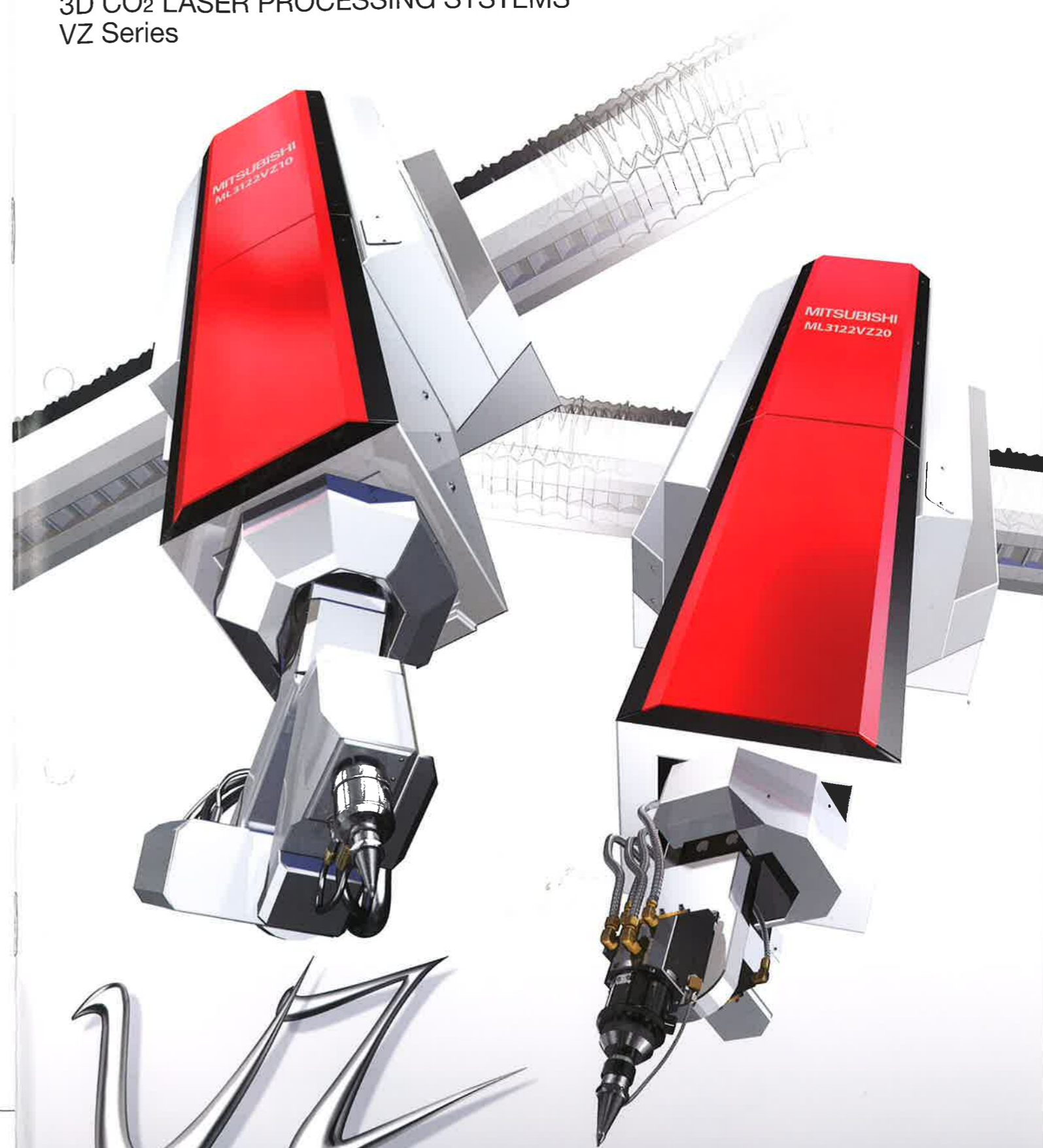




# MITSUBISHI ELECTRIC

## 3D CO<sub>2</sub> LASER PROCESSING SYSTEMS

### VZ Series



3D Laser Processing Machine

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001 (standards for quality assurance management systems)

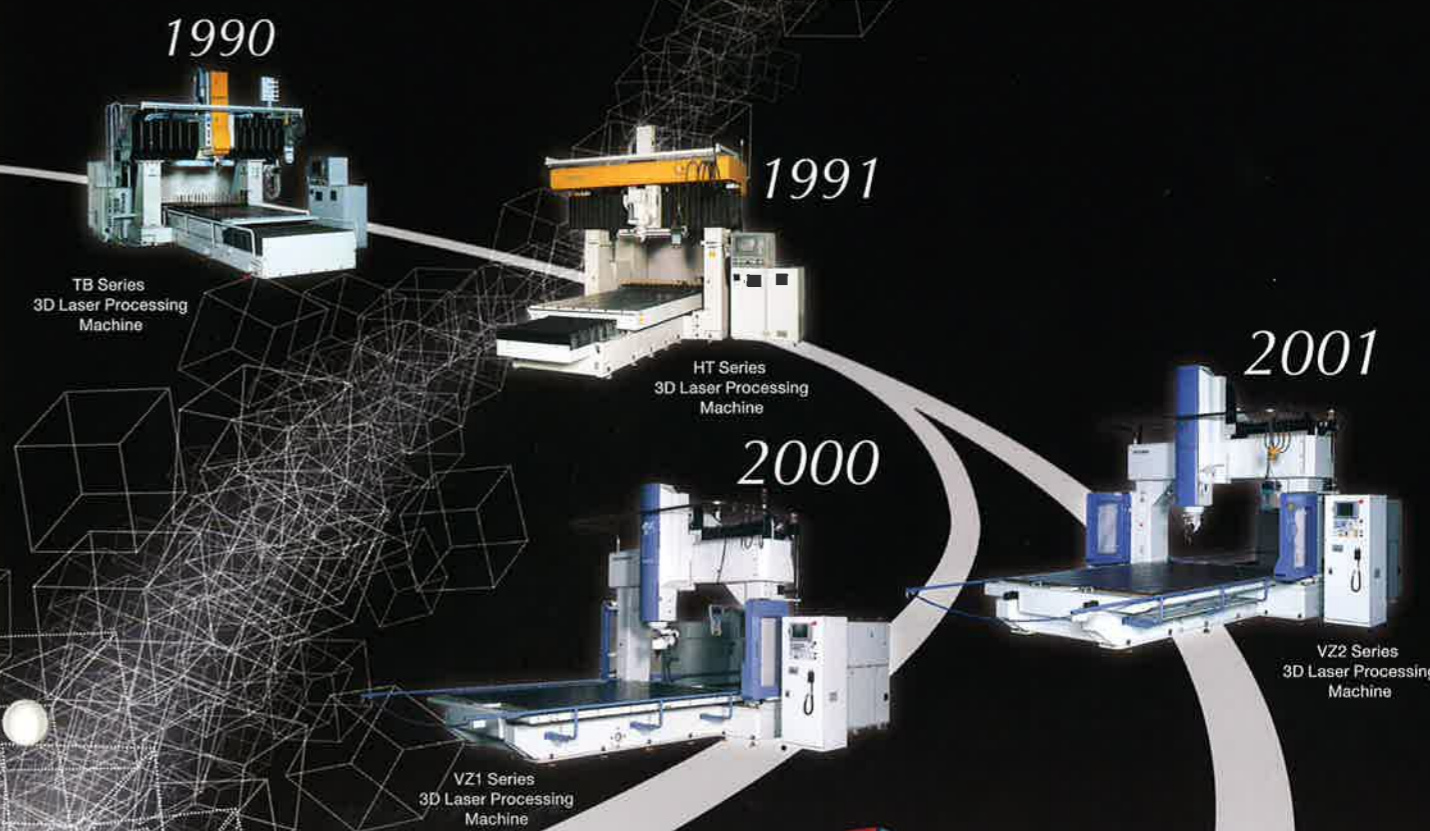
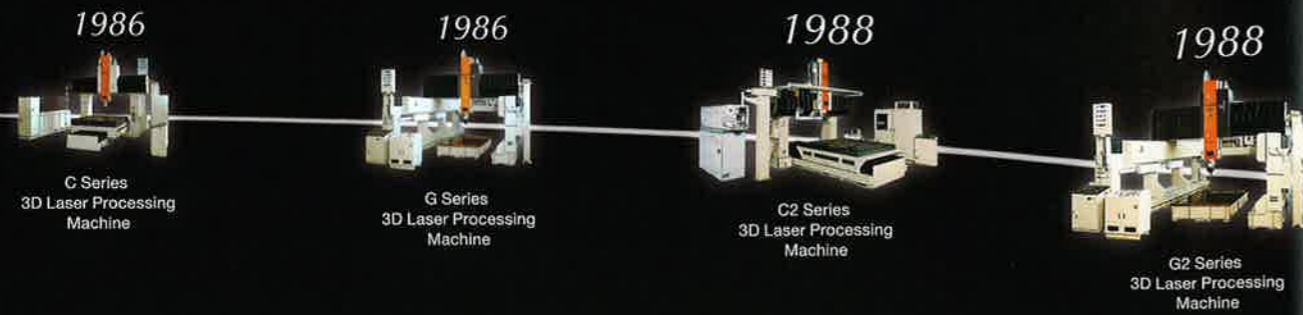


#### Safety Warning

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

 **MITSUBISHI ELECTRIC CORPORATION**  
HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN  
<http://Global.MitsubishiElectric.com>





# The Latest VZ Series, Delivering the Utmost Performance

Ongoing innovations have further evolved Mitsubishi Electric's VZ Series. Provides high level performance required for all 3D laser applications.



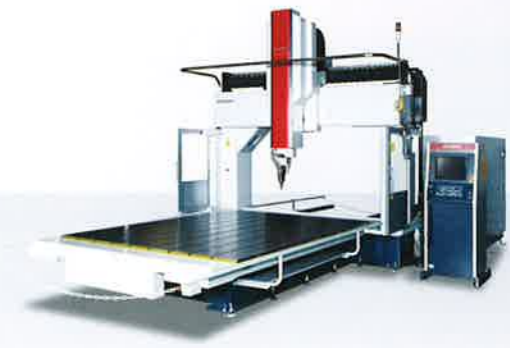
## Zero-offset type VZ10 Series

- For existing users of zero-offset lasers
- For those whose main purpose is to cut pre-formed 3D parts
- For those who require shorter processing time
- For those who prioritize a wider processing range



## Offset type VZ20 Series

- For existing users of offset type lasers
- For those who frequently process deep-drawn parts
- For 3D welding applications\*1
- For 2D thick sheet cutting\*2



\*1, \*2: Requires optional attachments

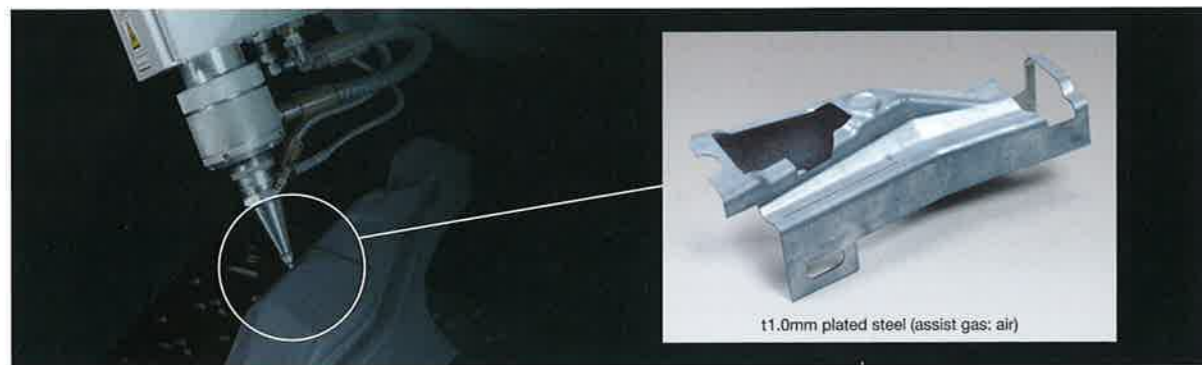
# High productivity Processing performance

## VZ10 High Productivity and Performance

Unparalleled speed and accuracy

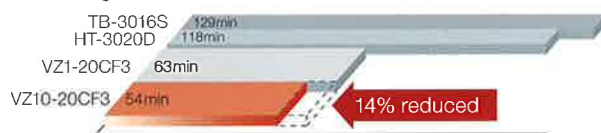
### High productivity

Delivers greatly improved productivity, shorter processing time and lower running cost utilizing the latest control technologies, in addition to faster axial movement and higher processing speed

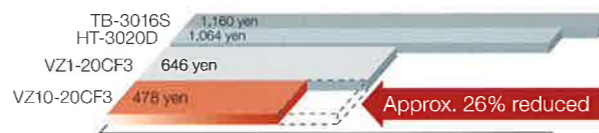


■ Comparison when cutting 100 of the work piece shown above

#### Processing time



#### Operating cost



#### Test conditions

Electricity	Laser gas	Assist gas
20 yen/kWh	8.94 yen/ℓ	0 yen/ℓ

### Technologies Supporting High Productivity

#### Faster axial movement

Faster axial movement and latest control technology offers fast cutting speeds at corners, two times faster than the predecessor model

	Max. cutting speed [m/min.]	Rotation speed [°/sec]
Zero-offset VZ10	Currently: 25 New: 35	Currently: 180 New: 360



#### Independent height control axis

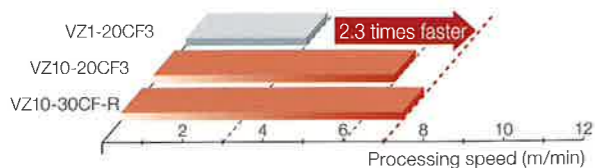
Height calibration using the independent height control axis allows for faster cutting speeds.



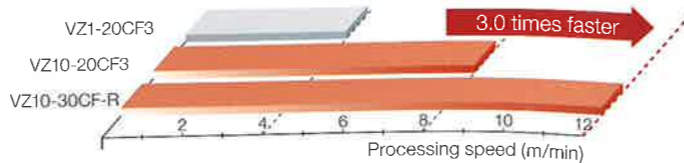
#### Faster processing speeds

NC control of high-pressure gas, assist gas optimization technology, and 3kW resonators deliver faster cutting speeds.

■ Stainless-steel (SUS304), Thickness: t1.0mm, Assist gas: nitrogen

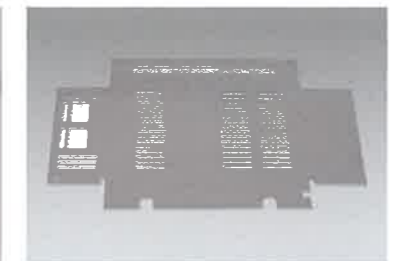


■ Aluminum alloy (A5052), Thickness: t1.0mm, Assist gas: air



### High-speed thin sheet cutting

Equipped with DR (dross reduction) control as standard, delivering fast and high-quality cutting with less dross at corner sections.

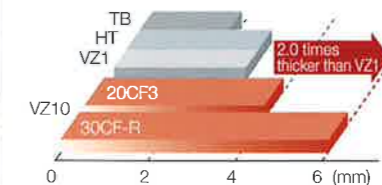


### 2D parts

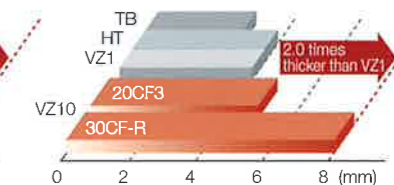
Capable of cutting thicker stainless and aluminum sheets due to NC control of high-pressure gas and assist gas optimization technology.



■ Material: Stainless (SUS304), Assist gas: Nitrogen

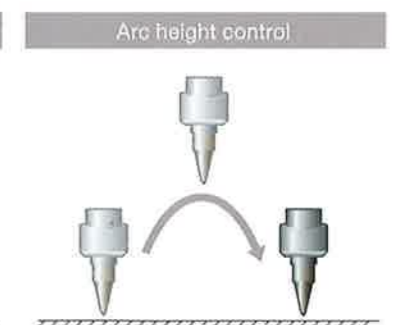
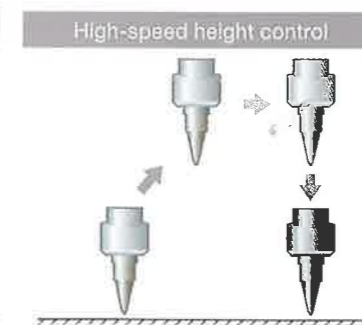
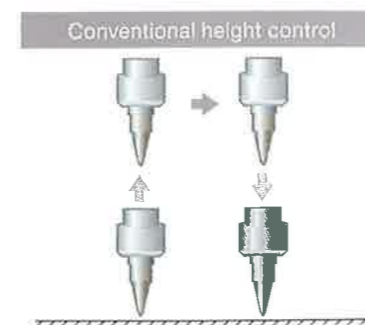


■ Material: Aluminum alloy (A5052), Assist gas: Air



Left: t6mm stainless (assist gas: nitrogen)  
Right: t8mm aluminum (assist gas: air)

3 types of height control to choose from, depending on the desired cutting time and stability (only for 2D programs, head pointing down)



### Laser tube cutting

Six-axis simultaneously controlled NC turn table allows for all types of tubes to be cut



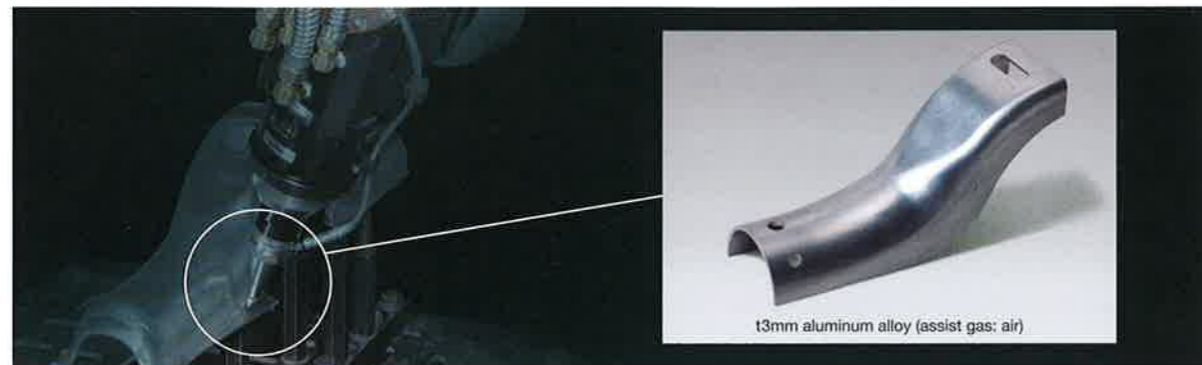
# High productivity Processing performance

## VZ20 High Productivity and Performance

Unlimited Versatility and Possibilities

### High productivity

Delivers greatly improved productivity, shorter processing time and lower running cost utilizing the latest control technologies, in addition to faster axial movement and higher processing speed

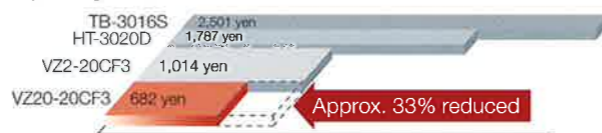


■ Comparison when cutting 100 of the work piece shown above

#### Processing time



#### Operating cost



#### Test conditions

Electricity	Laser gas	Assist gas
20 yen/kWh	8.94 yen/l	0 yen/l

### Technologies Supporting High Productivity

#### High-speed, highly accurate control

Achieves shorter cutting time due to 2 times faster axial movement compared to the predecessor model and the same HP control of the processing head as the zero-offset type.



With DR control Without DR control

	Max. cutting speed [m/min.]	Rotation speed [°/sec]
Offset VZ20	Currently: 20 ⇒ New: 35	Currently: 180 ⇒ New: 360

#### Independent height control axis (optional)

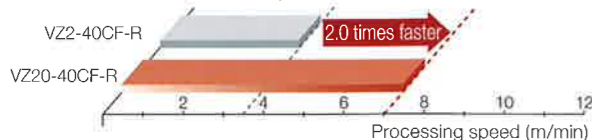
The independent height control axis delivers high-speed cutting while following the surface irregularities.



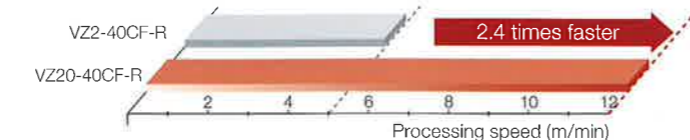
#### Faster cutting speed

NC control of high-pressure gas and assist gas optimization technology delivers much faster cutting speeds on stainless and aluminum sheets.

■ Stainless (SUS304), Thickness: t1.0mm, Assist gas: nitrogen



■ Aluminum alloy (A5052), Thickness: t1.0mm, Assist gas: air



### Laser cutting on deep-draw parts

Slim offset head with advanced work accessibility reduces interference with deep-draw parts



t3.0mm aluminum alloy (assist gas: air)



t1.6mm high-tensile steel (assist gas: oxygen)



t1.0mm mild steel (assist gas: oxygen)

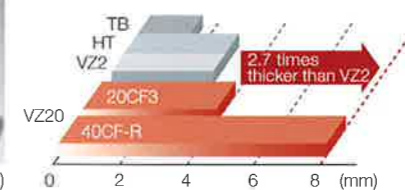
### 2D parts

Capable of cutting thicker stainless and aluminum sheets due to NC control of high-pressure gas and assist gas optimization technology.

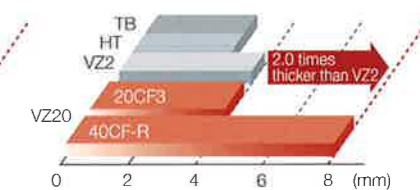


Left: t8.0mm stainless (assist gas: nitrogen)  
Right: t8.0mm aluminum alloy (assist gas: air)

■ Material: Stainless (SUS304), Assist gas: Nitrogen



■ Material: Aluminum alloy (A5052), Assist gas: Air



### Processing Using Various Options

#### NC turn table

6-axis simultaneous control delivers precise cutting of various types of parts including beveling.



■ Thick sheet cutting head  
High-quality cutting of mild steel up to t16.0 mm thick, using a 2D processing nozzle attachment



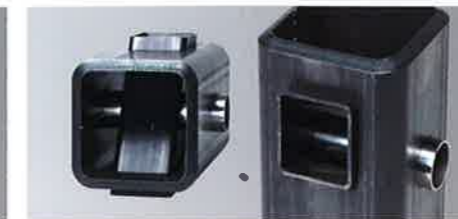
■ Welding head  
It may be used for laser welding applications by changing the processing head. Applicable to tubes and pipes when used in combination with an NC turn table.

#### Thick mild steel cutting



t16.0mm mild steel (assist gas: oxygen)

#### Laser tube cutting using the NC turn table



t2.0 and t9.0mm mild steel tube (assist gas: oxygen)  
t2.0 mm stainless tube (assist gas: nitrogen)

#### Laser tube welding using the welding head



Stainless tube, thickness: t2.0mm  
Coated tube, thickness: t2.0mm  
Butt weld (assist gas: argon)

# Easy to Use Operability

# Seamless Human-Machine Interface



## GUI Interface

The GUI-based 15-inch TFT touch panel offers easy operation with Help screens for new users.



Processing conditions screen

Editing screen

Processing Help screen

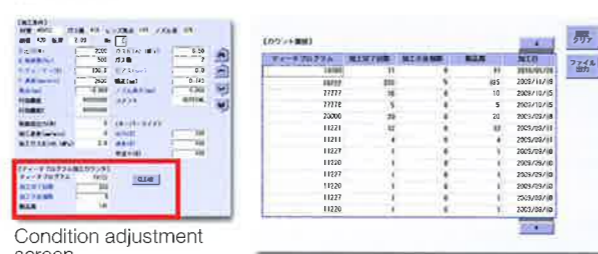
## Self-check Function

Checks the main parts of the machine on a regular basis and notifies the result. Preventive maintenance supports long-term stable operation.



## Counter Function

Equipped with a counter function which keeps a count and records the number of times a program has been executed on the control unit.



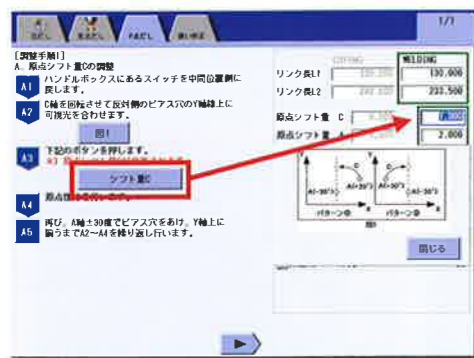
Condition adjustment screen

Counter Log screen

## Shorter Setup Times

### P point setting

Automatically calculates the link length and shift volume by following the procedures on the screen and pressing the set button (VZ20).



### Focus adjustment

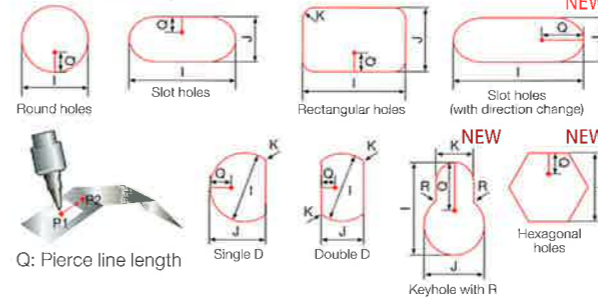
Focal point may be adjusted by turning the focus adjustment dial without having to remove the head. (VZ20)



## Teaching Function

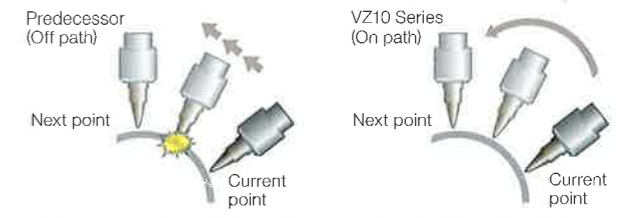
### Upgraded hole cutting functions

Additional cutting functions of keyholes with radius, hexagonal holes and horizontal slot holes. Compatible with beam offset using the D command.



### On-path Control

Avoids collision between head and work piece during step feed/return (circular interpolation).



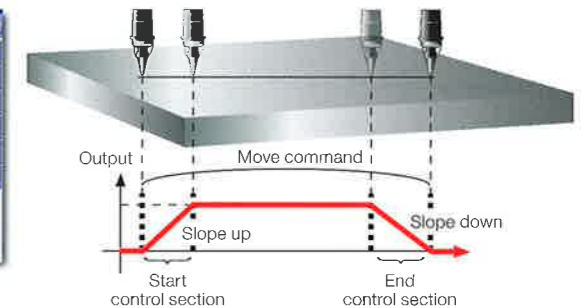
The head may collide with the work piece at the next point when stopping and restarting with "Step feed/return".

The head will travel precisely over the teaching line when stopping and restarting with "Step feed/return".

## Welding Function

### Slope up/down function

Slope up/down commands using the start and end conditions will reduce the number of teaching points.



## Offline conversion

Enhanced functions related to off-line teaching.

### Space shifting

Reference points P1, P2 and P3 created by offline teaching are automatically input by pressing a button. The point shift function using a fixed rotation axis has been added.



## Spring-type Damage Reduction

Reduces the damage in case of a collision between the nozzle and work piece caused by a teaching error.



Spring-type shock reduction with one-touch head removal and recovery. The shear-pin damage control system absorbs severe damage to sensitive parts.

## Enhanced 2D cutting functions

Equipped with cutting functions available on Mitsubishi's control unit LC30B for 2D laser machines, such as "Retry", "Slope/Arc retraction", "PG control", "End joint" and "Automatic gas purge". Delivers improved cutting quality and stability (only for 2D programs, head pointing down).

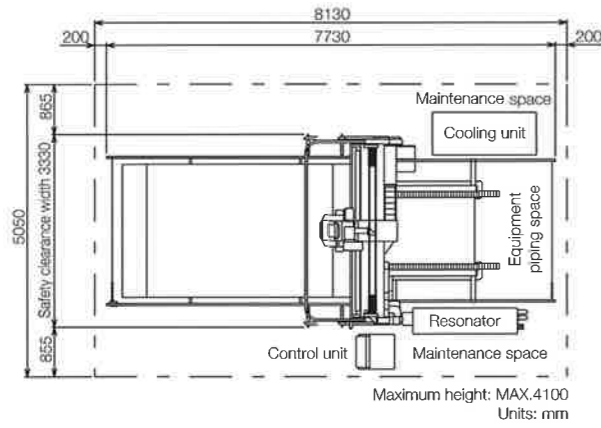
# Layout and Specifications VZ10



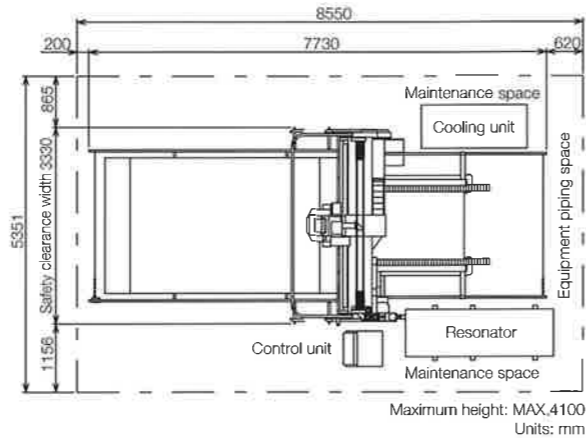
# Layout and Specifications VZ20



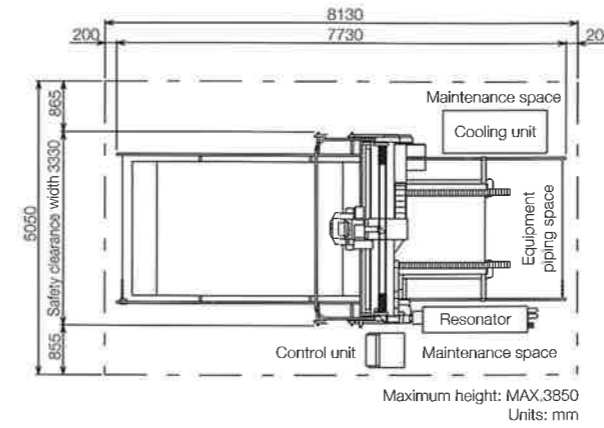
ML3122VZ10-20CF3 (water-cooled)



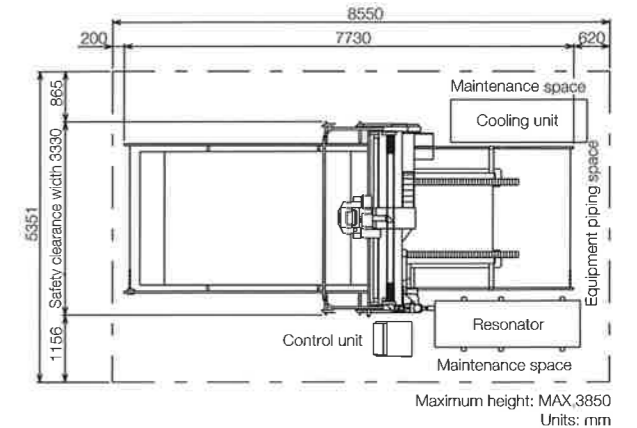
ML3122VZ10-30CF-R (water-cooled)



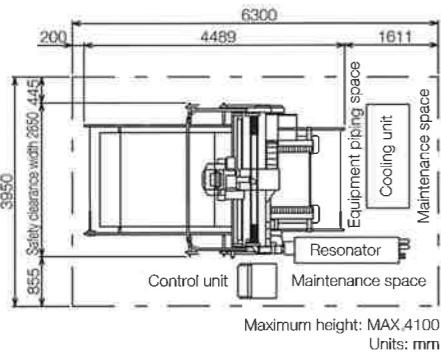
ML3122VZ20-20CF3 (water-cooled)



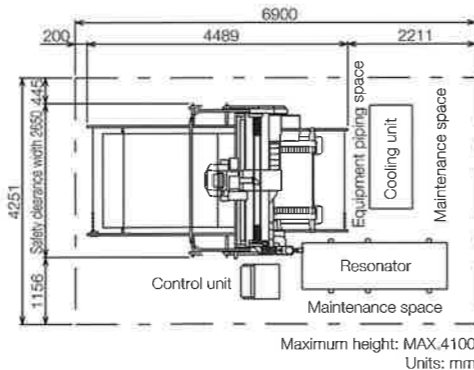
ML3122VZ20-40CF-R (water-cooled)



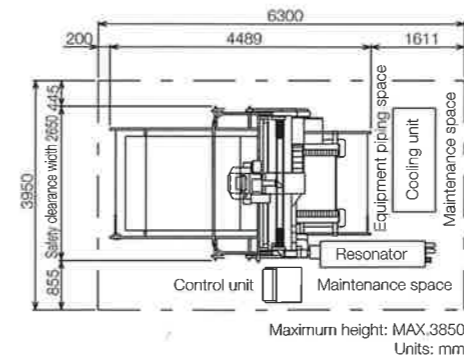
ML1515VZ10-20CF3 (water-cooled)



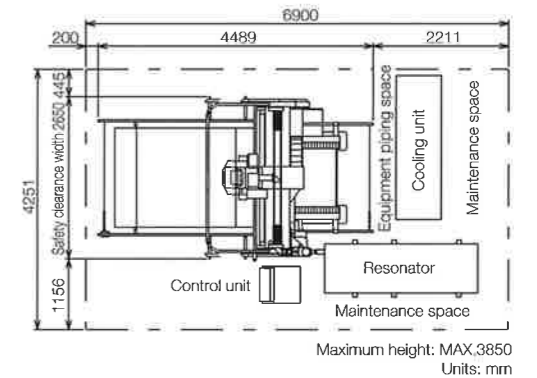
ML1515VZ10-30CF-R (water-cooled)



ML1515VZ20-20CF3 (water-cooled)



ML1515VZ20-40CF-R (water-cooled)



## Specifications

Model	ML1515VZ10	ML3122VZ10
Operation type	Hybrid	
Processing head structure	Zero offset	
Focal length of collimator lens	f127mm (f5")	
Control axes	X-Y-Z-W-U 5-axis, simultaneous control	
Work piece dimensions	1520×1520×850	3100×2200×850
Maximum 2D work piece size (C-axis 90° fixed)	1520×1520	3100×2200
Stroke	[X,Y,Z] (mm) [W,U] (°)	1520×1520×850 3100×2200×850 W: ±360 U: ±90
Maximum feed	[X,Y,Z] (m/min.) [W,U] (°/s)	X, Y: 45 / Z: 35 360 X, Y, Z: 35
Maximum cutting speed	[X,Y,Z] (m/min.) [W,U] (°/s)	35 360
Repeatability (mm)	±0.015	
Height control methods (mm)	Independent height axis control, 3-axis NC height control (enter M code in program)	
Table weight (kg)	700	2000
Passline (mm)	650	
External dimensions (W×D×H) (mm)	2732×4870×4100	3412×7805×4100
Weight (kg)	Approx. 6000	Approx. 8000
Resonators	ML20CF3, ML30CF-R	

## Processing performance table

Resonator	Material	Assist gas	Maximum thickness (mm)										
			2	4	6	8	10	12	14	16			
ML30CF-R	Mild steel (SS400)	Oxygen	[Bar chart showing performance up to 16mm]										
		Standard air	[Bar chart showing performance up to 12mm]										
		High-pressure air*	[Bar chart showing performance up to 10mm]										
	Stainless (SUS304)	Oxygen	[Bar chart showing performance up to 12mm]										
		Standard nitrogen	[Bar chart showing performance up to 10mm]										
		High-pressure nitrogen*	[Bar chart showing performance up to 8mm]										
ML20CF3	Aluminum alloy (A5052)	Standard air	[Bar chart showing performance up to 10mm]										
		High-pressure air*	[Bar chart showing performance up to 8mm]										
		High-pressure nitrogen*	[Bar chart showing performance up to 6mm]										
	Mild steel (SS400)	Oxygen	[Bar chart showing performance up to 16mm]										
		Standard air	[Bar chart showing performance up to 12mm]										
		High-pressure air*	[Bar chart showing performance up to 10mm]										
Stainless (SUS304)	Oxygen	[Bar chart showing performance up to 12mm]											
	Standard nitrogen	[Bar chart showing performance up to 10mm]											
	High-pressure nitrogen*	[Bar chart showing performance up to 8mm]											
Aluminum alloy (A5052)	Standard air	[Bar chart showing performance up to 10mm]											
	High-pressure air*	[Bar chart showing performance up to 8mm]											
	High-pressure nitrogen*	[Bar chart showing performance up to 6mm]											

- The values in the above processing performance table are based on the conditions described in the specifications.
- The processing performance and quality may vary depending on the surface condition, material components, etc., even if the material complies with the same standards.
- The processing performance and quality may vary according to the cut shape.
- \*Option.

## Specifications

Model	ML1515VZ20	ML3122VZ20
Operation type	Hybrid	
Processing head structure	Offset	
Focal length of collimator lens	f190.5mm (f7.5")	
Control axes	X-Y-Z-C-A 5-axis, simultaneous control	
Work piece dimensions	920×920×550	2500×1600×550
Maximum 2D work piece size (C-axis 90° fixed)	1520×1320	3100×2000
Stroke	[X,Y,Z] (mm) [C,A] (°)	1520×1520×850 3100×2200×850 C: ±360 A: ±90
Maximum feed	[X,Y,Z] (m/min.) [C,A] (°/s)	X, Y: 45 / Z: 35 360
Maximum cutting speed	[X,Y,Z] (m/min.) [C,A] (°/s)	35 360
Repeatability (mm)	±0.015	
Height control methods (mm)	Independent height axis control (optional), 3-axis NC height control (enter M code in program)	
Table weight (kg)	700	2000
Passline (mm)	650	
External dimensions (W×D×H) (mm)	2732×4870×3850	3412×7805×3850
Weight (kg)	Approx. 6000	Approx. 8000
Resonators	ML20CF3, ML40CF-R	

## Processing performance table

Resonator	Material	Assist gas	Maximum thickness (mm)														
			2	4	6	8	10	12	14	16	18	20					
ML40CF-R	Mild steel (SS400)	Oxygen	[Bar chart showing performance up to 20mm]														
		Standard air	[Bar chart showing performance up to 16mm]														
		High-pressure air*1	[Bar chart showing performance up to 12mm]														
	Stainless (SUS304)	Oxygen	[Bar chart showing performance up to 16mm]														
		Standard nitrogen	[Bar chart showing performance up to 12mm]														
		High-pressure nitrogen*1	[Bar chart showing performance up to 8mm]														
ML20CF3	Aluminum alloy (A5052)	Standard air	[Bar chart showing performance up to 12mm]														
		High-pressure air*1	[Bar chart showing performance up to 8mm]														
		High-pressure nitrogen*1	[Bar chart showing performance up to 6mm]														
	Mild steel (SS400)	Oxygen	[Bar chart showing performance up to 20mm]														
		Standard air	[Bar chart showing performance up to 16mm]														
		High-pressure air*1	[Bar chart showing performance up to 12mm]														
Stainless (SUS304)	Oxygen	[Bar chart showing performance up to 16mm]															
	Standard nitrogen	[Bar chart showing performance up to 12mm]															
	High-pressure nitrogen*1	[Bar chart showing performance up to 8mm]															
Aluminum alloy (A5052)	Standard air	[Bar chart showing performance up to 12mm]															
	High-pressure air*1	[Bar chart showing performance up to 8mm]															
	High-pressure nitrogen*1	[Bar chart showing performance up to 6mm]															

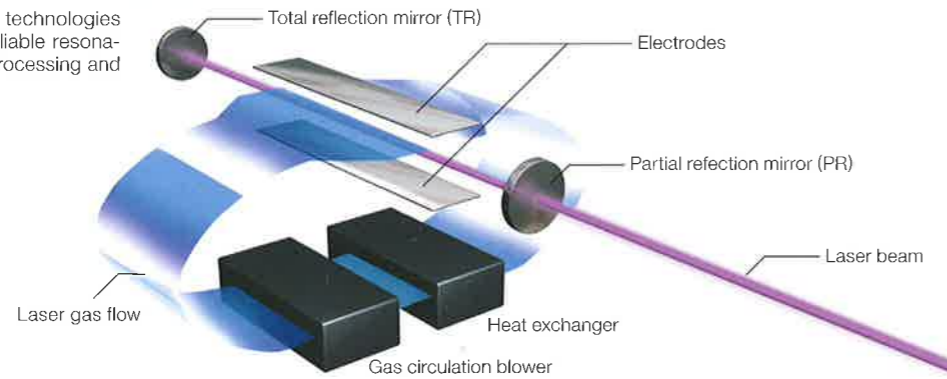
- The values in the above processing performance table are based on the conditions described in the specifications.
- The processing performance and quality may vary depending on the surface condition, material components, etc., even if the material complies with the same standards.
- The processing performance and quality may vary according to the cut shape.
- \*1 Option.
- \*2 When using the flat, thick-plate cutting head option.

# Resonator 3-axis cross flow SD (silent discharge) excited resonator



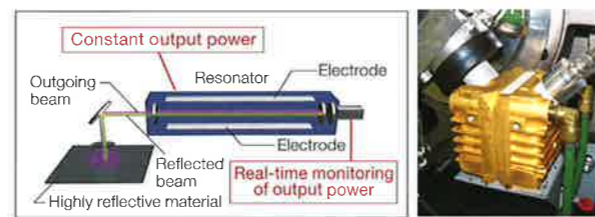
## Unique Technologies Supporting High Reliability

Mitsubishi Electric's unique technologies are the basis of our highly reliable resonators which provide superior processing and stability.



## High-speed power sensor

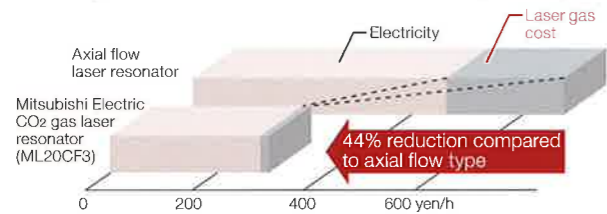
Equipped with Mitsubishi's unique "high-speed power sensor" which monitors the laser output in real time. Strictly maintains the specified power, and the power stability is less than ±1%. Able to cut highly reflective materials such as aluminum and copper.



Patent No. 1836228 Ta tegongping 4-56479 Ta

## Gas-sealed operation

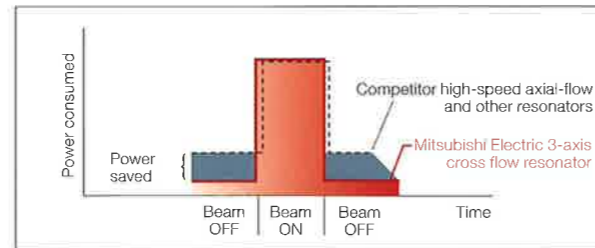
The gas-sealed mechanism cuts back on laser gas consumption to about one cylinder per year (2400 annual operating hours on ML20CF3). Ensures operation at rated power for 24 hours continuously without having to refill mixed gas. Leads to drastic reduction in running cost and eliminates the need for frequent gas change.



\* Comparison on 1.2mm thick SPCC, 50% operation rate (resonator only, processing machine not included)

## Just-On-Time Discharge

The Just-On-Time discharge method drastically cuts down on electricity cost by reducing power consumption when beam is OFF and supplying power instantly while the beam is ON.



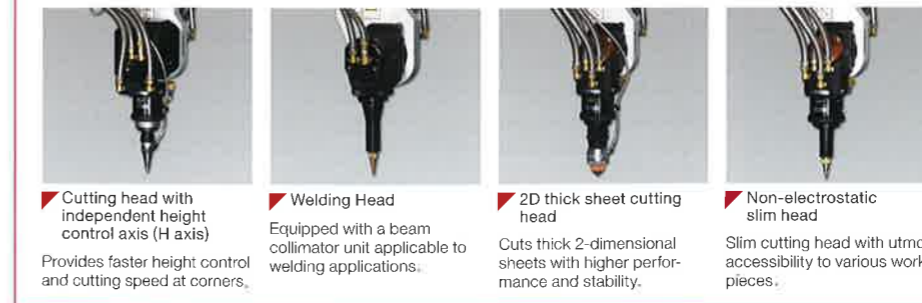
## Resonator Specifications

Model		ML20CF3	ML30CF-R	ML40CF-R
Excitation Method		Three-axis cross flow SD excitation		
Laser output Specifications	Rated output (W)	2,000	3,000	4,000
	Beam mode	Low level (TEM <sub>01</sub> * Main Component)		
	Output stability (%)	< ±1% at output control (vs rated output)		
	Output variation range (%)	0-100		
Laser gas mixture		CO <sub>2</sub> : CO : N <sub>2</sub> : He = 8 : 4 : 60 : 25		
Laser gas consumption (ℓ/h)		Approx. 1	Approx. 3	Approx. 3
Power supply (resonator only) (kVA)		33	60	63
External dimensions (mm)		2,040×450×1,620	2,500×800×1,810	2,500×800×1,810
Weight (resonator only) (kg)		Approx. 1,200	Approx. 2,200	
Optional functions		Beam Shutter, Visible Laser, High-speed Power Sensor		

## Cooling unit Specifications

Item		Specification		
Resonator model		ML20CF3	ML30CF-R	ML40CF-R
Water-cooled	Model	LCU10WIX	LCU12WIX	LCU20WIX
	Power supply (cooling unit only) (kVA)	18	20	32
	External dimensions (mm)	1,790×735×1,720	1,790×735×1,720	2,350×735×1,720
	Weight (cooling unit only) (kg)	Approx. 800	Approx. 800	Approx. 1,000
Air-cooled	Model	LCU10AIX	LCU20AIX	LCU20AIX
	Power supply (cooling unit only) (kVA)	20	40	40
	External dimensions (mm)	1,970×1,010×2,027	2,980×1,010×2,027	2,980×1,010×2,027
	Weight (cooling unit only) (kg)	Approx. 800	Approx. 1,100	Approx. 1,100

# Equipment Main Components/Options



- ▶ **Cutting head with independent height control axis (H axis)**  
Provides faster height control and cutting speed at corners.
- ▶ **Welding Head**  
Equipped with a beam collimator unit applicable to welding applications.
- ▶ **2D thick sheet cutting head**  
Cuts thick 2-dimensional sheets with higher performance and stability.
- ▶ **Non-electrostatic slim head**  
Slim cutting head with utmost accessibility to various work pieces.



- ▶ **Welding Gas Supply Unit**  
This unit adjusts the flow rate of shield-gas for welding.



- ▶ **NC Turntable**  
The six-axis simultaneously controlled turntable supports tube cutting.



- ▶ **2D sheet processing pallet**  
Equipped with manual clamps and scrap drawer.



- ▶ **Work Support Pins and Clamps**  
Supports 2D work pieces.



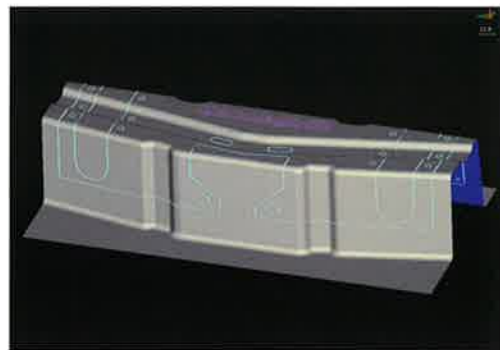
- ▶ **Teaching Sensor**  
Used to teach points automatically by pressing the tip pin against the work piece.
- ▶ **Teaching Panel with Joystick**  
The joystick allows for intuitive axial movement.
- ▶ **Manual Operation Controller**  
This remote operation box starts and stops the program at remote locations away from the main program controller.

## Options

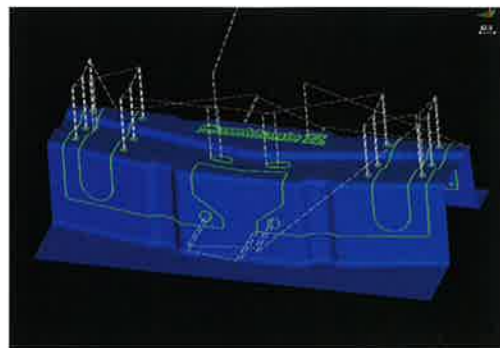
Item	Model	
	VZ10	VZ20
Processing Head	Electrostatic cutting head with independent height control axis (H-axis)	Standard
	Electrostatic Cutting Head	○
	Non-Electrostatic Slim Head Unit	Standard
	Welding Head	○
	2D Thick Sheet Cutting Head	○
Processing Machine	Teaching Sensor	○
	NC Turntable	○
	2D Sheet Processing Pallet	○
	Lens Monitoring Function	○
	Work piece Support Pins	○
Assist Gas	Work piece Clamp	○
	Table Cover	○
	High-pressure Gas NC control	○
	High-pressure Air NC control	○
	Welding Gas Supply Unit	○
Control Systems	Teaching Box with Joystick	○
	Manual Operation Controller	○
	Network Interface Unit	Standard
	Network Download Function	○
Solution	External I/O	○
	Offline Teaching	○

○: Option

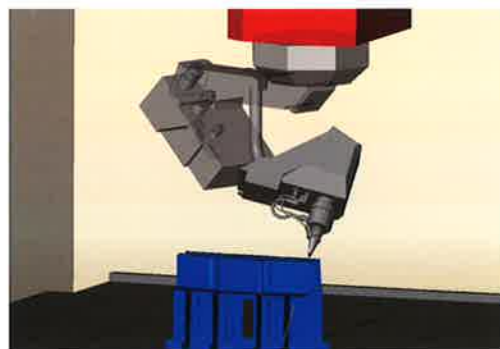
Offline teach functions available on computers maximize productivity



Reading model



Creating cutting path



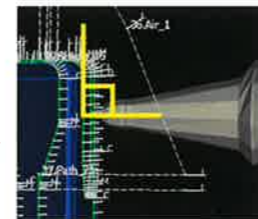
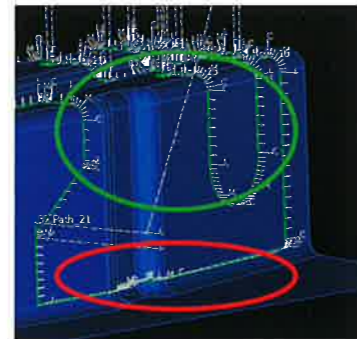
Checking path



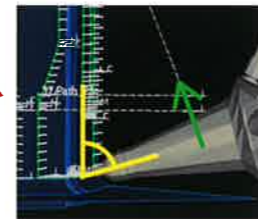
Creating NC data

### Nozzle Angle Data Output

The new VZ10/20 delivers higher cut quality at sections where the nozzle is not perpendicular to the surface of the work piece by automatically setting the optimum cutting speed according to the tilt angle. The nozzle tilt data from CamMagic TL-II will further reduce the time for speed correction and the number of cutting defects.



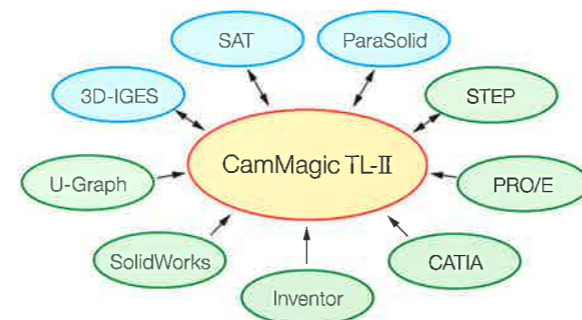
Cuts at normal speed if nozzle is perpendicular to the work piece



Slows down cutting speed if nozzle is not perpendicular to the work piece

### Compatible with various CAD data

The converters in blue are provided as standard; the converters in green are optional.



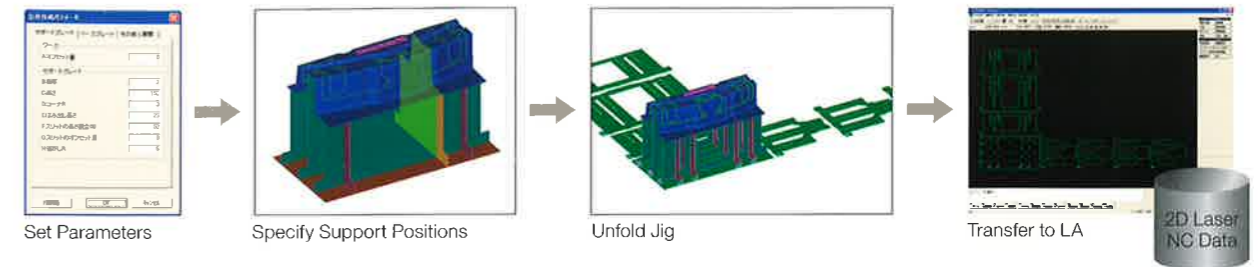
CATIA is a registered trademark of Dassault Systems SA; PRO/E is a registered trademark of Parametric Technology Corporation; U-Graph is a registered trademark of Unigraphics Solutions Inc.; Inventor is a registered trademark of Autodesk; SolidWorks is a registered trademark of SolidWorks Corp.

### Compatible models

- ML1515VZ10 • ML3122VZ10 • ML1515VZ20 • ML3122VZ20
- ML2015VZ1 • ML3122VZ1 • ML2015VZ2 • ML3122VZ2
- ML2012HT • ML3020HT

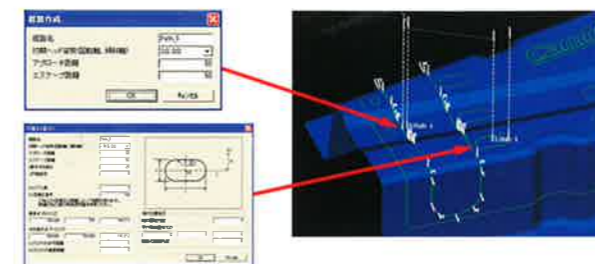
### Creating Jigs

Capable of creating jigs simply by setting parameters and specifying the support positions of the jig. Drastically reduces production time. 2D NC data may also be created when used in combination with CamMagic LA.



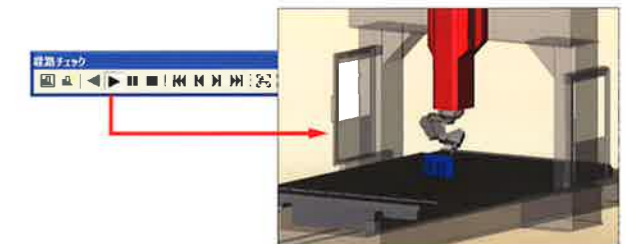
### Creating the Cut Path

Creates cut paths with the nozzle perpendicular to the surface of the work piece by setting the pierce and cutting direction. Automatically identifies openings on flat surfaces and enables simple setting of macro programs.



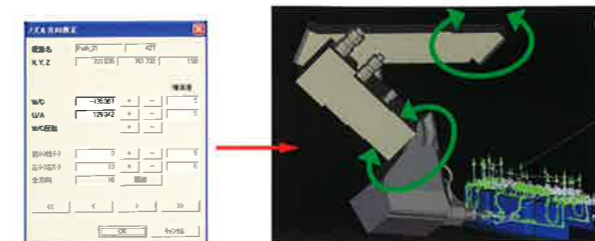
### Checking the Cut Path

Checks for stroke overruns and possible collisions between the processing head and work piece. Also checks the changes in axis angle and tilt of the head against the surface of work piece to avoid any cutting defects that may occur.



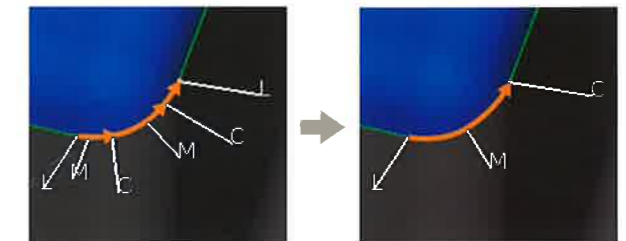
### Adjusting the Nozzle Direction

Adjusts the nozzle direction to prevent interference with the work piece. Also corrects the movement of the head to achieve a smoother cut surface.



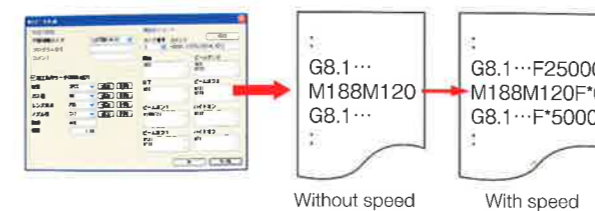
### Adjusting Teaching Points

Teaching points are created automatically, but positions and types may not always be as intended. In this case, teaching points may be added, changed and deleted as you wish.



### Creating NC Data and Setting the Speed

Modify start and end codes, beam ON/OFF codes, etc. as you wish. Cutting speed may be set according to the created NC data. (Same function available on the processing machine)



### NC Reverse Conversion

NC data modified on the processing machine may be re-converted to path data where new data may be added and nozzle direction may be corrected.

