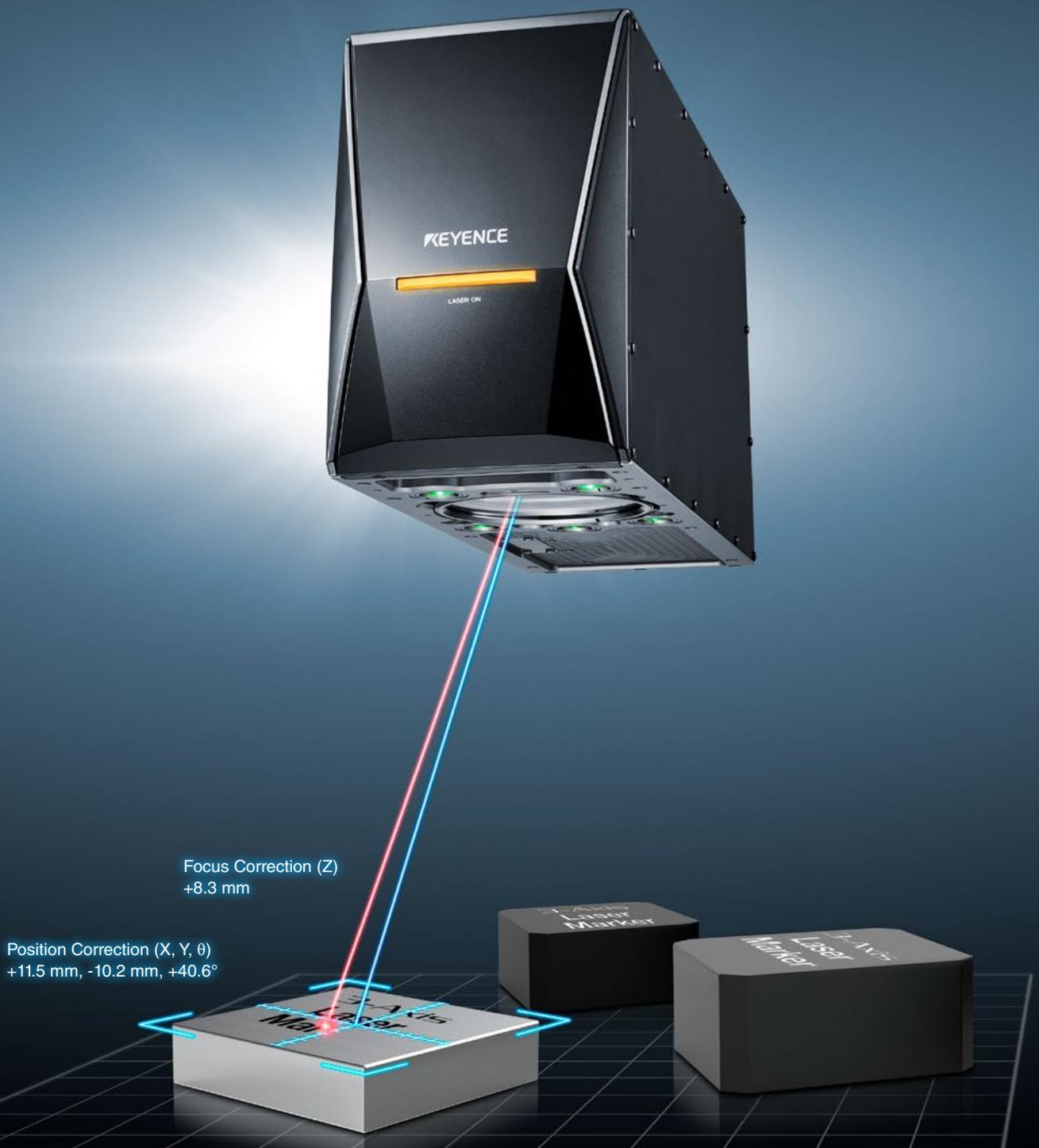




3-Axis Hybrid Laser Marker

NEW MD-X Series

Full-Field Auto-Focus



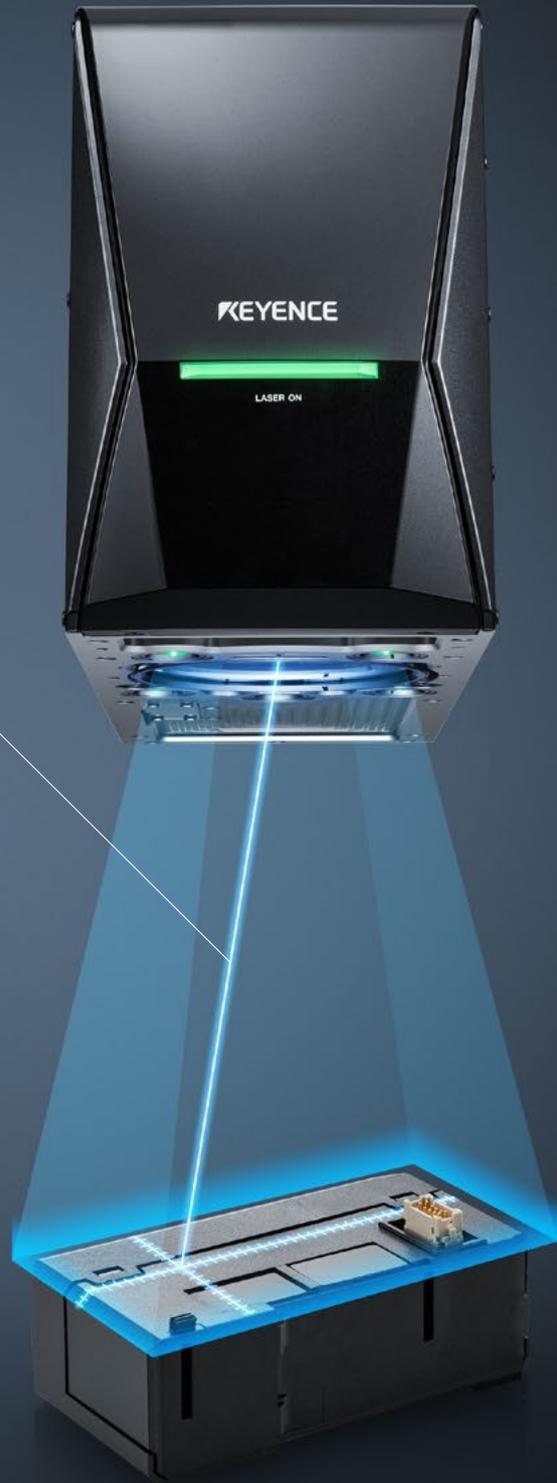
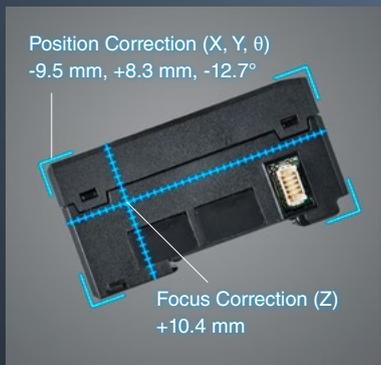
MD-X Series

Improve the entire marking process

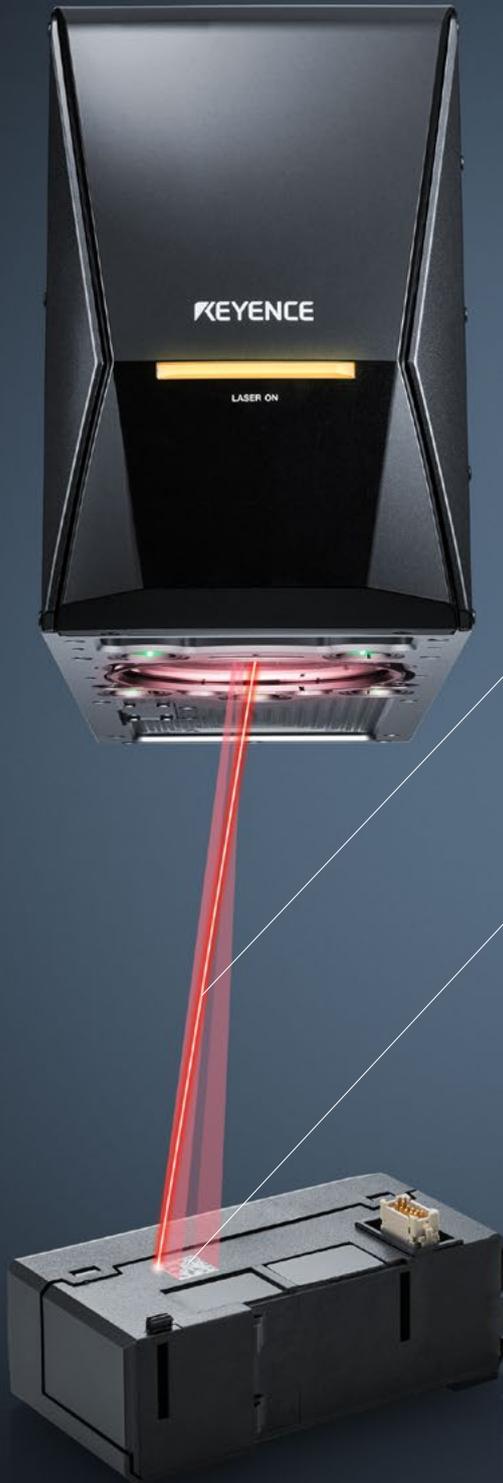
Detects and Automatically Corrects Distance and Position

Full-Field Auto-Focus

The built-in distance sensor and camera track positional and focal deviation of the target. These features prevent printing defects due to changes in part position, which can be a problem when laser marking.



Marking and Inspection with a Single Unit



NEW

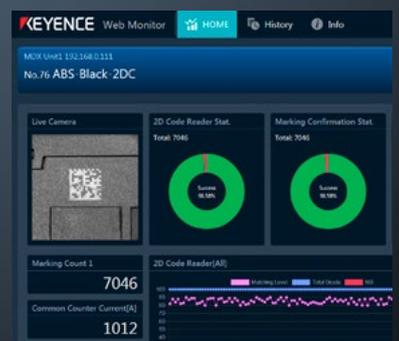
3-Axis Hybrid Laser Marker
MD-X Series

High Quality, High Output, Long Service Life

The MD-X Series provides both the high beam quality of YVO₄ lasers and the high output of fibre lasers. Clear and fast marking on both resin and metal can be performed reliably for a long period of time.

Print Inspection, Predictive Maintenance

Inspections can be performed after marking, without the need for external equipment. Predictive maintenance of the laser marking process is achieved by monitoring both the laser power and flaws on the lens.



Elimination of Marking Defects

Focused on Solving the Industry's Biggest Challenge

The Importance of Focusing

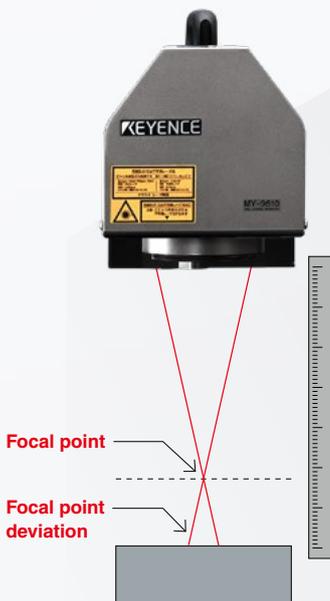
Laser markers use a lens to focus light to perform marking and processing. Deviation in the focal point may cause blurred or missing markings. Focusing is a prerequisite for stable marking.



1998 1st Generation

Fixed Focal Distance

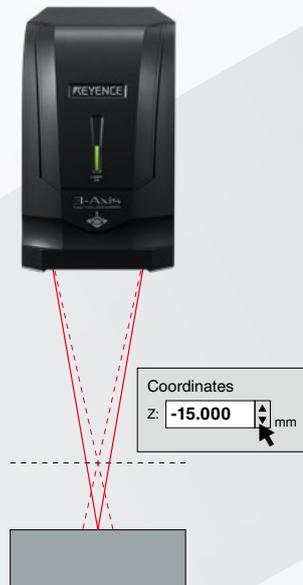
In order to focus, it was necessary to actually measure the distance from the head to the marking surface. It was then necessary to physically adjust the position of the jig and head to match the height of the target.



2007 2nd Generation

Variable Focal Distance

A built-in Z scanner allowed the focal distance to be set by the user. However, since there was no auto-focus feature, the actual values had to be input manually.



2014 3rd Generation

Origin Auto-Focus

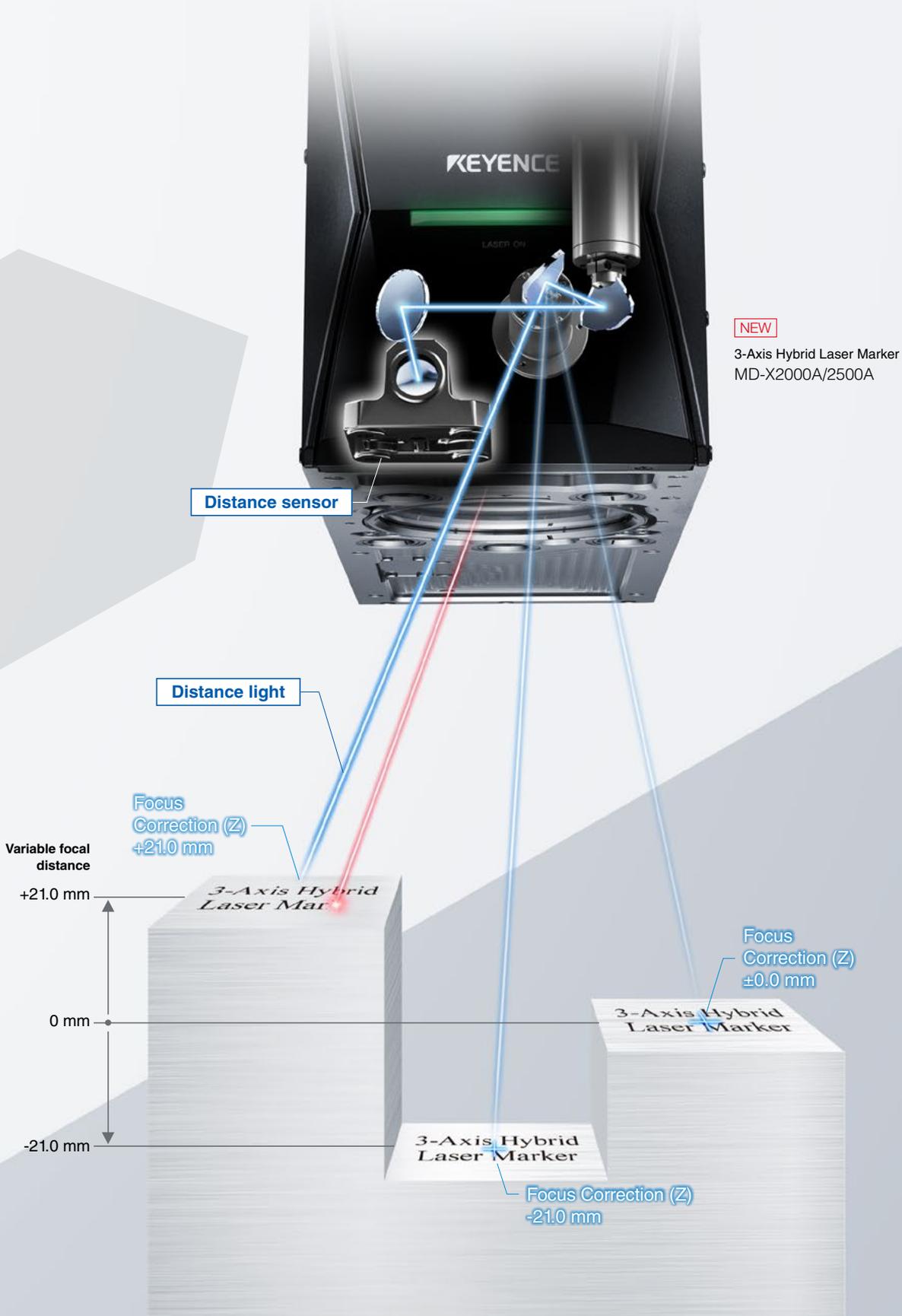
A built-in camera was added to automate focusing at the centre of the area (the origin of the marking area).



NEW 4th Generation

Focus Anywhere, with Full-Field Auto-Focus

A built-in distance sensor constantly measures the distance to the marking location and focuses on that location. By tracking unintentional deviation in the height or inclination of the target, marking defects can be prevented over the entire marking area.



Auto-Focus at Each Marking Location

| Z Tracking Function

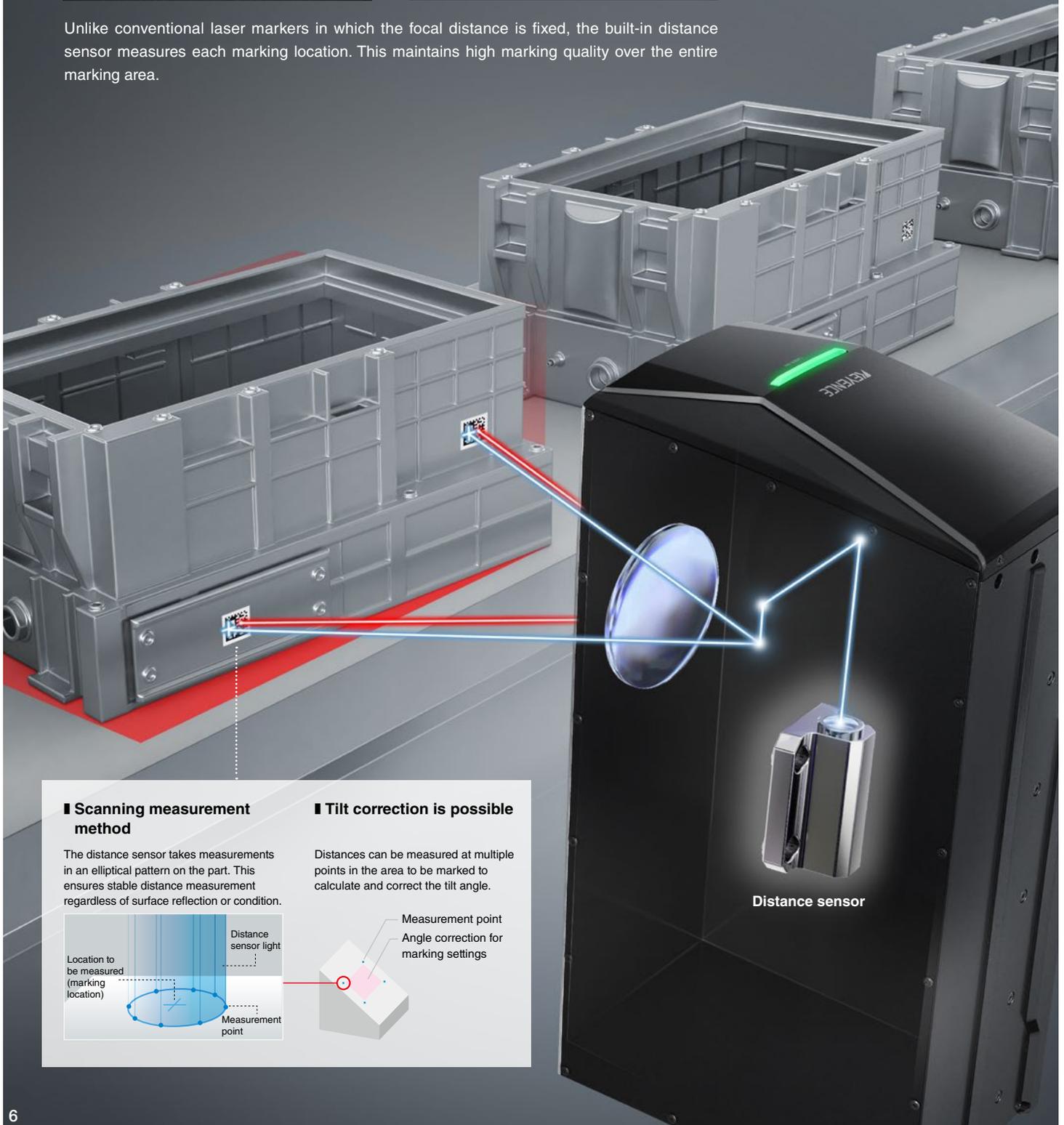
Conventional marking (focal point deviation)



MD-X marking (auto-focus)

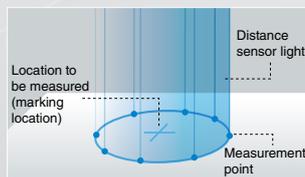


Unlike conventional laser markers in which the focal distance is fixed, the built-in distance sensor measures each marking location. This maintains high marking quality over the entire marking area.



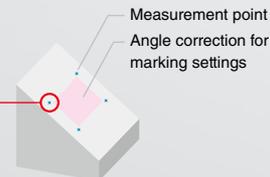
■ Scanning measurement method

The distance sensor takes measurements in an elliptical pattern on the part. This ensures stable distance measurement regardless of surface reflection or condition.



■ Tilt correction is possible

Distances can be measured at multiple points in the area to be marked to calculate and correct the tilt angle.



Distance sensor

Z Tracking Examples

Tilt Correction for Large Products

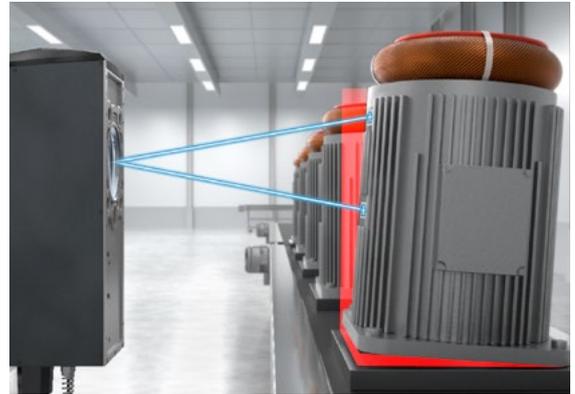
Problems with conventional methods

Slight tilting during mounting caused a deviation in focal distance, which led to irregularities in marking.



Resolved with MD-X

The MD-X accounts for tilt of the target, enabling stable marking.



Correct Deviations from Robotic Placement

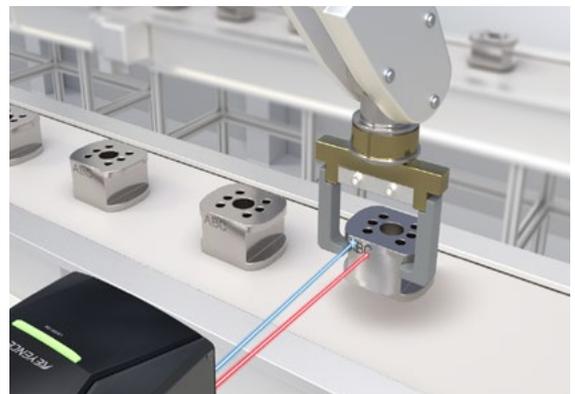
Problems with conventional methods

Deviation when chucking would cause a deviation in focal distance, which led to blurred marking.



Resolved with MD-X

The focal distance to the marking location is measured and corrected before marking.



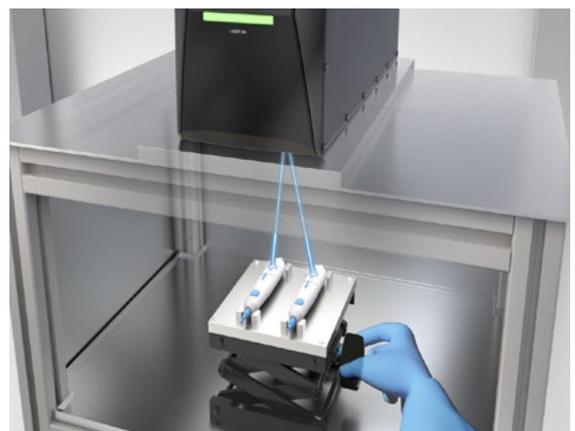
Eliminate Manual Height Adjustment

Problems with conventional methods

It was necessary to physically adjust the height each time the target for marking changed.

Resolved with MD-X

Since the laser marker focuses itself, troublesome adjustments and changeovers are not required.



Built-In Vision for Position Alignment

| XY Tracking Function

Conventional marking (positional deviation)



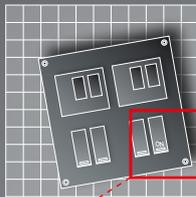
Marking with MD-X (auto-correction)



Two built-in cameras in the head allow alignment without the need for external equipment. This prevents marking errors due to positional deviation.

Full-view camera image

The full-view camera captures the entire marking area. Alignment is possible for a variety of target sizes in the entire area.



Coaxial camera image

Thanks to the built-in coaxial camera, calibration using external camera coordinates is unnecessary. As a result, alignment is simpler and more reliable.



Position Correction (X, Y, θ)
+4.1 mm, -2.5 mm, -26.0°

Position Correction (X, Y, θ)
+6.1 mm, -3.4 mm, -15.3°

XY Tracking Examples

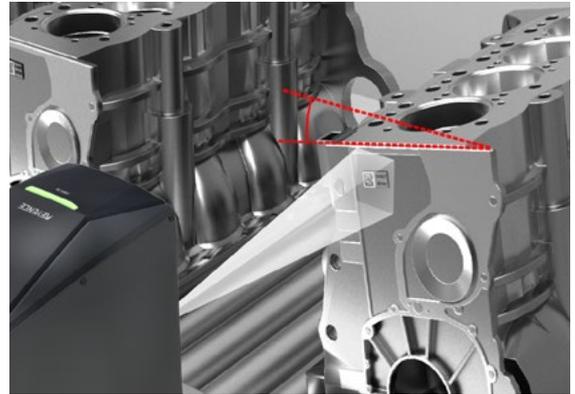
Correct Deviations from Product Handling

Problems with conventional methods

Positional deviation during mounting resulted in positional deviation when marking.

Resolved with MD-X

Deviation in the target is identified and automatically corrected, enabling stable marking.



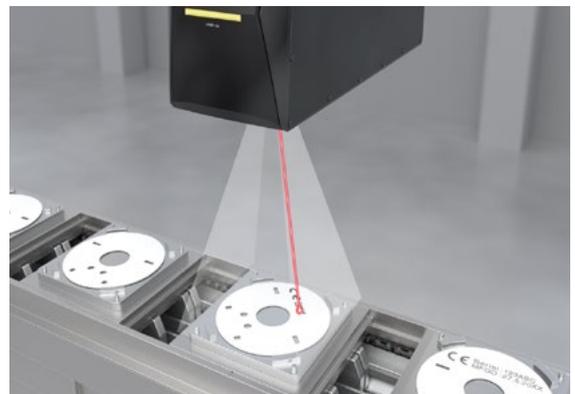
Easy Integration with Automatic Alignment

Problems with conventional methods

When positioning was difficult, such as with circular products, fine adjustment of the jig and installation of an external camera were necessary.

Resolved with MD-X

The MD-X adjusts the position before marking, which contributes to reduced costs for jigs and external devices.



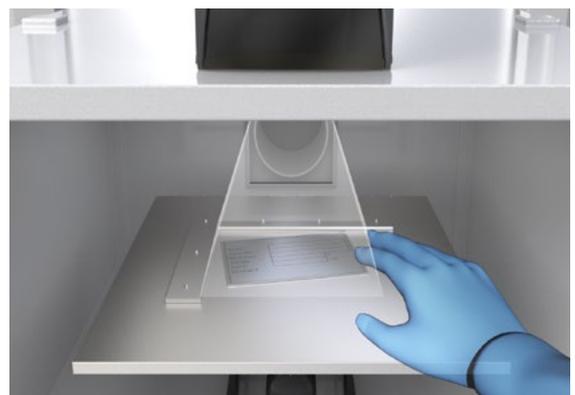
Eliminate Need for Fixturing

Problems with conventional methods

Marking defects occurred due to manual placement errors and jig deviations.

Resolved with MD-X

Marking is possible simply by placing the target in the marking area. Fine manual alignment and jig adjustments are not required.

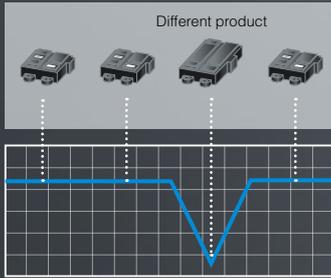


Eliminate Incorrect Marking

A judgment function that uses image results to prevent incorrect marking before it occurs

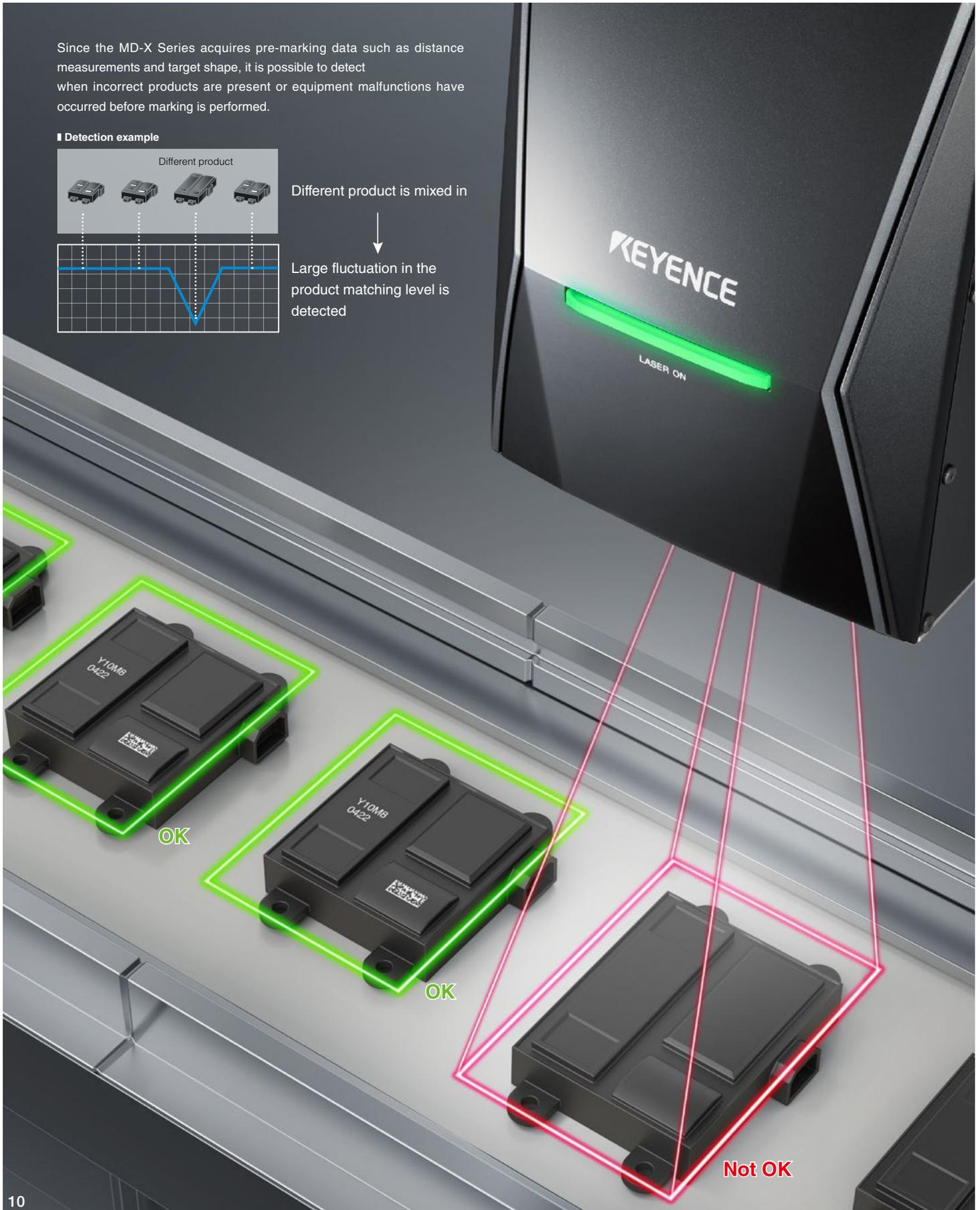
Since the MD-X Series acquires pre-marking data such as distance measurements and target shape, it is possible to detect when incorrect products are present or equipment malfunctions have occurred before marking is performed.

Detection example



Different product is mixed in

Large fluctuation in the product matching level is detected



Judgment function applications

Identification of different product types

Problems with conventional methods

There have been cases in which an operator accidentally places the wrong product on the line, resulting in scrap.

Resolved with MD-X

Differences in the product's shape are recognized, and the incorrect product is detected before marking.



Product presence/absence detection

Problems with conventional methods

In order to confirm whether products have been set in the fixture correctly, an external sensor and program were necessary.

Resolved with MD-X

Using the built-in distance sensor, the laser marker can check for the presence or absence of the product and determine whether or not it is seated correctly in the fixture.



Prevent marking the same product twice

Problems with conventional methods

There have been cases in which a product has been marked multiple times due to problems with repeated marking start signals.

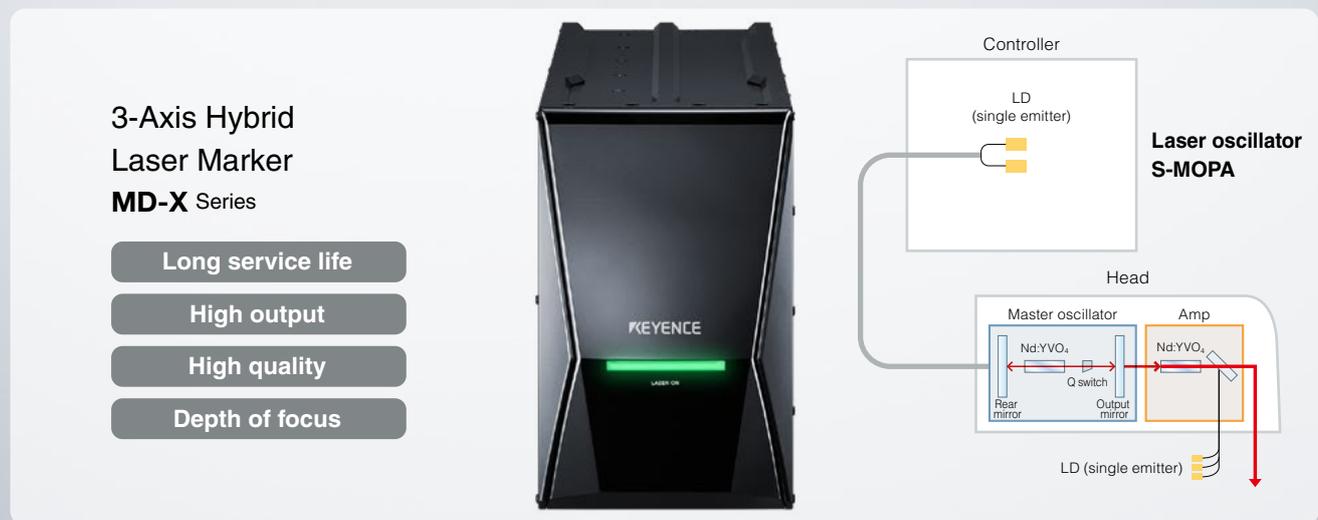
Resolved with MD-X

The built-in camera can capture a pre-marking image of the target and be used to determine whether or not it has already been marked.



High Quality × High Output × Long Service Life

Hybrid Laser Oscillator that Combines the Advantages of YVO4 and Fibre

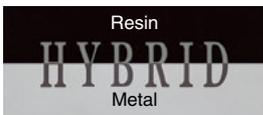


YVO4 × Fibre = Hybrid

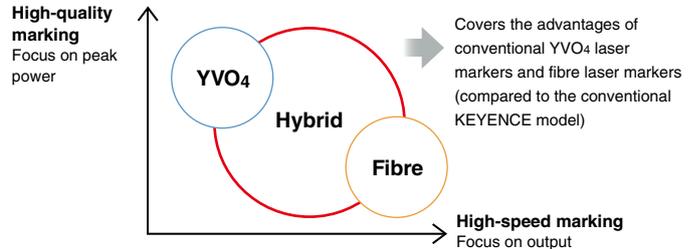
Built-In S-MOPA Laser Oscillator*

This unique laser oscillation method combines the best attributes of YVO₄ and fibre laser markers. Years of KEYENCE laser development in solid state and fibre oscillators has led to the invention of the hybrid oscillator powering our new MD-X Series laser marker.

■ Printing examples



Optimal marking conditions can be achieved for a variety of targets, such as delicate marking on resin and high-output marking on metal.

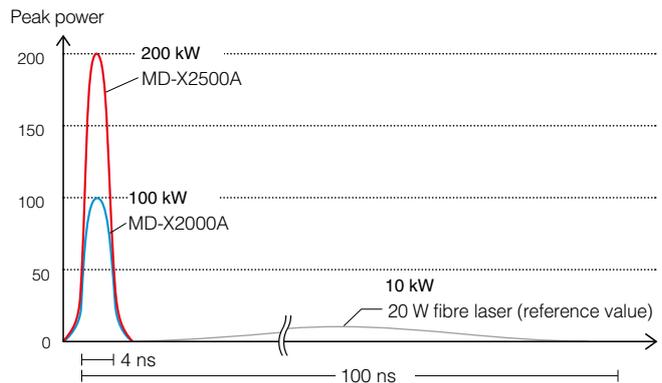


*Solid-state Master Oscillator Power Amplifier:

High output is achieved by combining the amplifier technology used in fibre lasers with the high quality beam of the YVO₄ laser oscillator. The LD (laser diode), which serves as the light source, uses a single emitter with high heat dissipation to achieve a longer service life.

High 200 kW Peak Power & Short-Pulse Laser

The peak power of the MD-X Series is 200 kW, twice that of a conventional YVO₄ laser. A high-output, short-pulse laser with a minimum pulse duration of 4 ns minimises thermal damage to the target. It is ideal for applications where users want to minimise the effects of heat, such as contrast marking on resin.



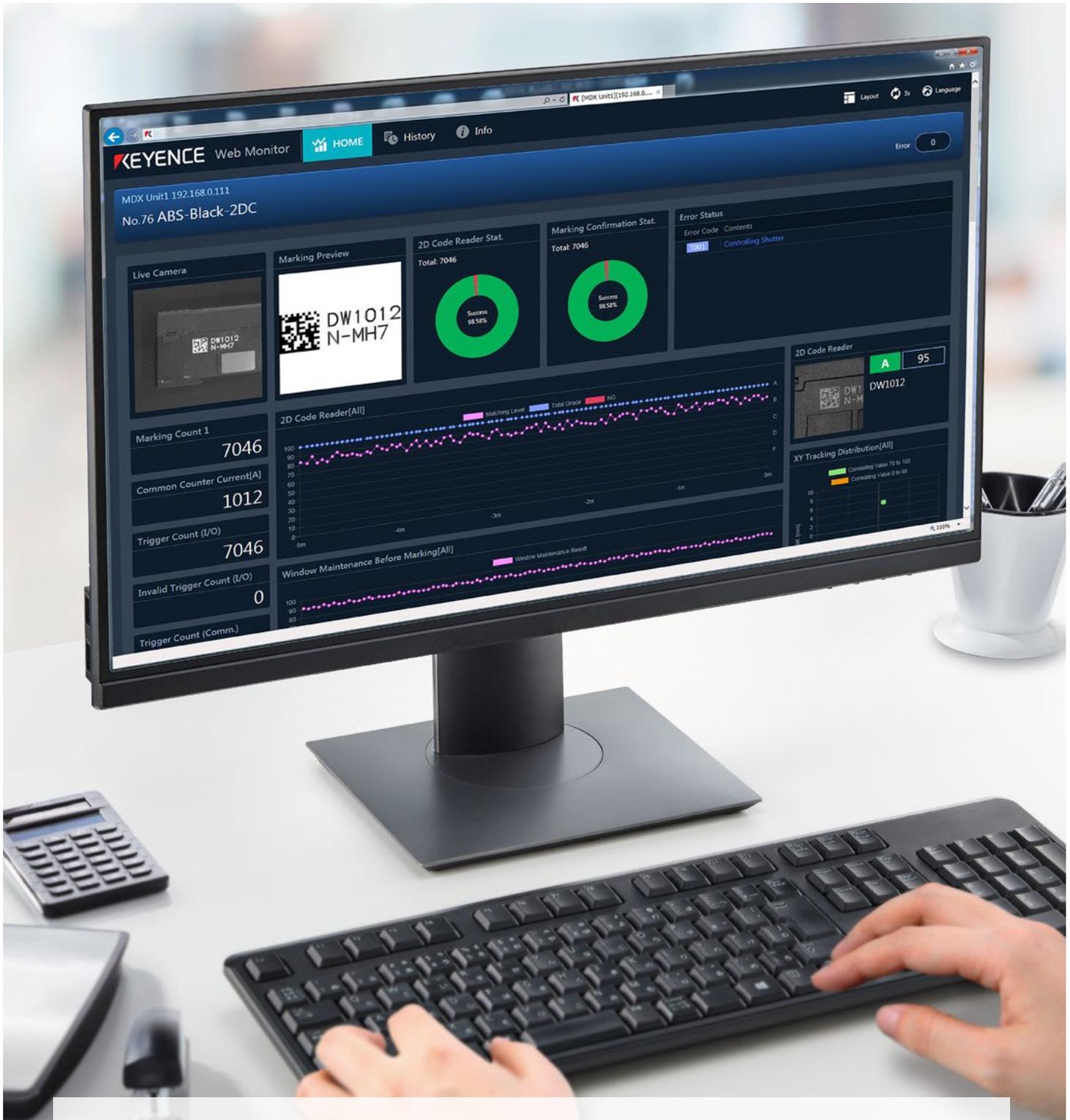
Maintain Greater Depth of Focus

The MD-X Series has a depth of focus that is characteristic of YVO₄ laser oscillators. Depth of focus is an important factor for basic performance in order to achieve and maintain marking quality. When used in combination with the Z tracking function, this also results in high tolerance to height deviation.

■ KEYENCE fibre laser marker		■ MD-X Series	
In focus	Grade: A	In focus	Grade: A
1 mm deviation	Grade: A	1 mm deviation	Grade: A
2 mm deviation	Illegible	2 mm deviation	Grade: A
3 mm deviation	Illegible	3 mm deviation	Grade: B
4 mm deviation	Illegible	4 mm deviation	Illegible

Understand Your Marking Process through Data

| Web Monitoring Function



No External Equipment Required for Predictive Maintenance or Troubleshooting

Various factors must be considered the cause of marking defects, from target position deviation, to lens flaws, to drops in output power. Marking defects that occurred suddenly were difficult to reproduce, and it was often difficult to identify the cause. The MD-X Series offers a wide range of monitoring functions, from predictive maintenance to cause analysis when a marking defect occurs, without the need for external equipment. By using the Web Monitoring function, the status of the marking process can be obtained accurately, even from a remote location.

■ Lens Inspection

A built-in sensor monitors flaws on the laser lens and outputs a warning if the threshold is exceeded. This prevents marking defects from occurring due to the laser beam being blocked.



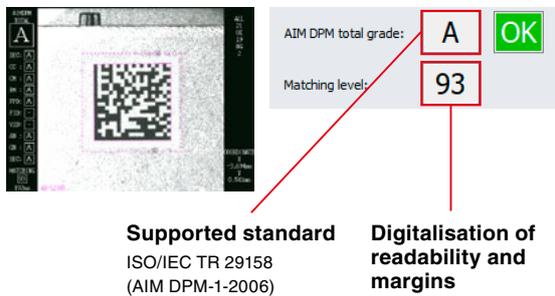
■ Power Monitor

The head is equipped with a built-in thermopile power monitor, which allows for easy, reliable, and quick output management, the most important part of laser marker equipment maintenance.



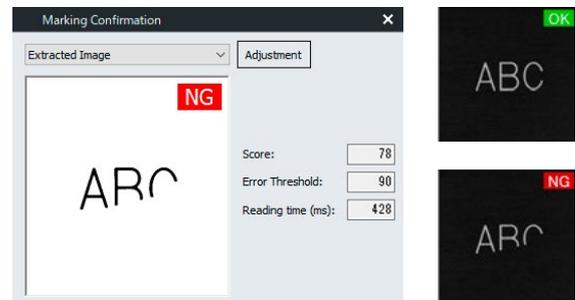
■ Confirmation of 2D Code Quality

The contents of a marked code can be read by the built-in 2D code reader, then verified in accordance with marking quality standards.



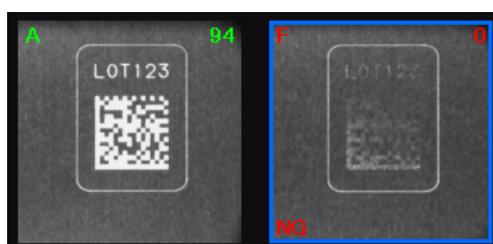
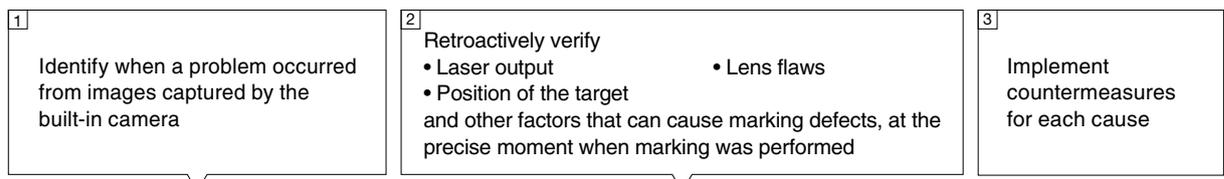
■ Marking Confirmation

The built-in camera captures an image of the target before and after marking. The images are then compared and checked for differences in contrast to identify missing markings.

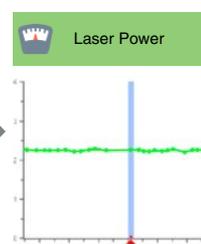


■ Diagnostic Tools

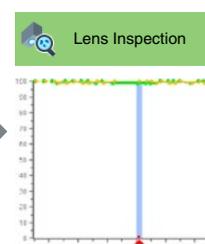
In the unlikely event of a marking defect, these tools can be used to analyse the cause and implement countermeasures.



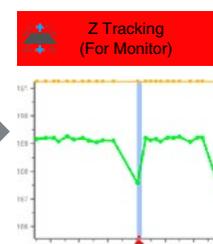
Defects identified in images



No problems



No problems

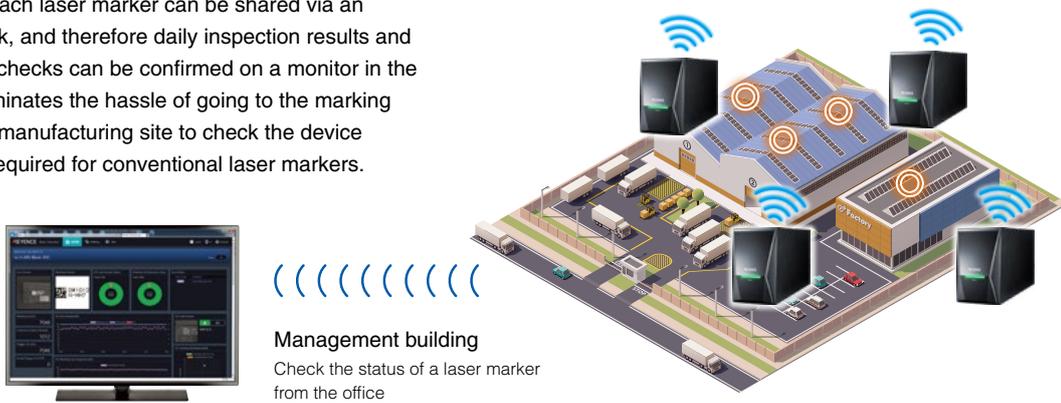


It is possible to take countermeasures, because the cause of the defect was found to be from misalignment.

Predictive Maintenance and Troubleshooting Examples

Check the Status of a Laser Marker from the Office

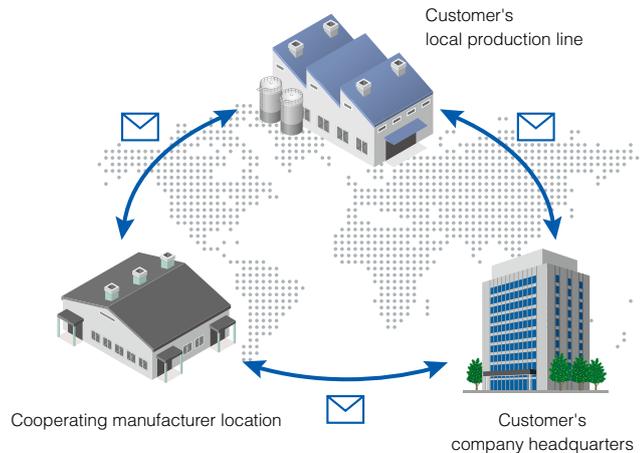
The status of each laser marker can be shared via an internal network, and therefore daily inspection results and internal status checks can be confirmed on a monitor in the office. This eliminates the hassle of going to the marking process at the manufacturing site to check the device directly, as is required for conventional laser markers.



Management building
Check the status of a laser marker from the office

Easily Obtain Device Information Even When Problems Occur Overseas

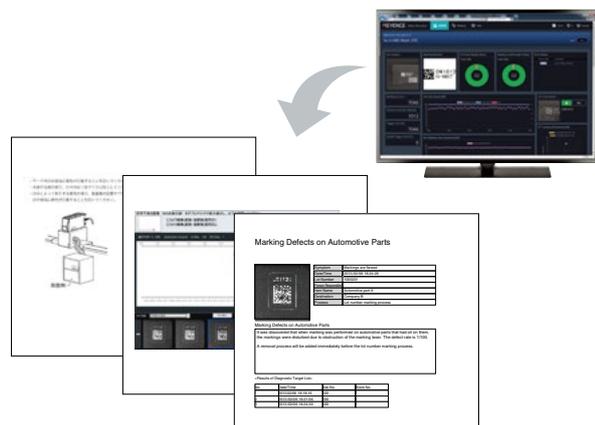
Even if a problem occurs with a laser marker that is used overseas, the cause and solution can be easily grasped by obtaining the device information. Problems with language, knowledge, and experience, make it difficult to accurately understand the content of problems that occurred at overseas sites with conventional laser markers.



Easily Report on Causes and Solutions

In the unlikely event that a problem occurs during the marking process, it is common practice to summarize the causes and solutions in a report in order to prevent recurrence.

The marking diagnostic tool has a report function that can easily output symptoms, causes, and solutions in PDF or Excel format.



Prevent Problems Due to Operator Error

Limits can be placed on operator's access which can prevent unintentional errors.

(Access level function)

Since the setting change history can be checked, it is easy to determine whether or not the settings change was the cause of a problem.

(Change history function)

	Manager	Operator	Viewing only
User management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment settings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Job management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change marking conditions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Change marking contents	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Job switching	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Trigger	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Viewing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Monitor Trends and Make Maintenance Plans

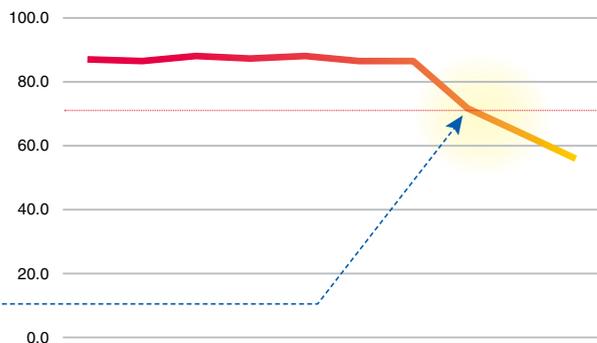
The most important thing to avoid when maintaining equipment is sudden, unexpected problems.

Since the internal state can be managed at all times, it is easy to make a maintenance plan. By monitoring lens contamination and laser power trends, the best timing for maintenance and cleaning can be determined.



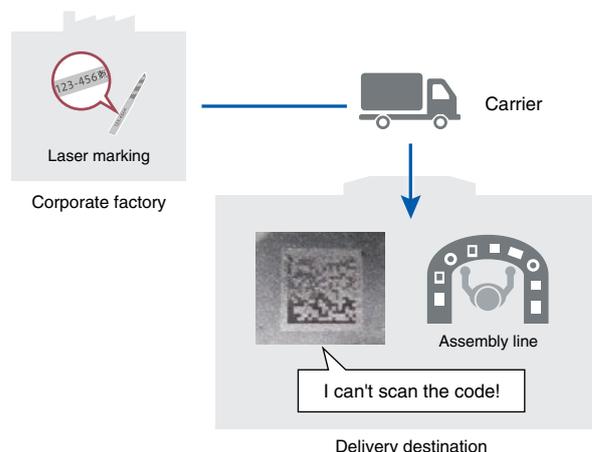
If the laser power falls below this level, I'll calibrate the power output.

■ Laser power



Save Image Data to Verify Non-Defective Parts

In some cases, although there was no problem immediately after laser marking, there were marking flaws due to subsequent processes. In such cases, the marked area was damaged during transportation or assembly. Since an image of the results can be saved when marking is performed, it is easy to determine whether the cause of the marking flaw occurred during an in-house process or during a post process.



Marking Builder Plus

Redesigned interface to easily achieve high performance. Even beginners can quickly go from concept to marking in minutes.

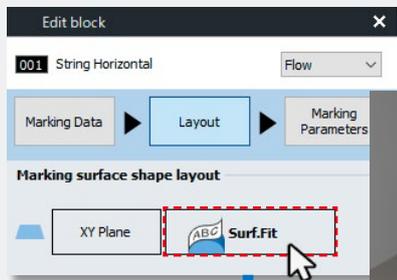


Easy Shape Settings

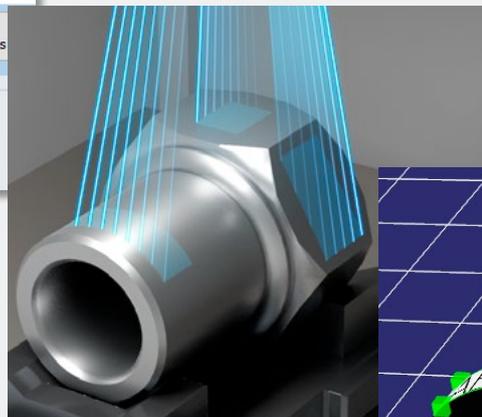
Surface Fitting Function

Scanning of marking location with built-in distance measurement sensor. The settings for markings on cylinders and sloped surfaces, which used to be complicated, can be completed with a single click.

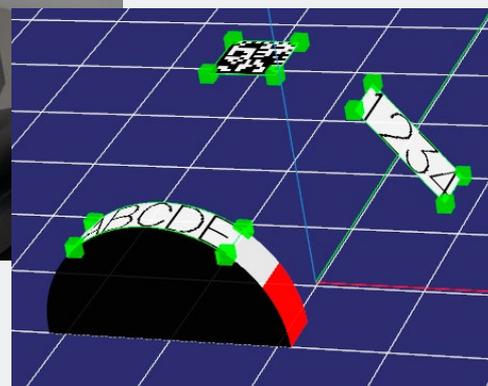
1 Click the Surface Fitting button.



2 The built-in distance measurement sensor scans the target surface.

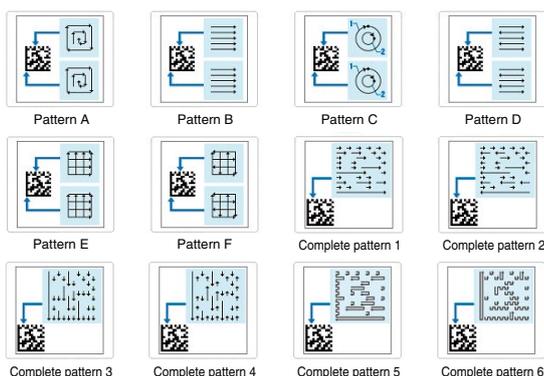


3 Shape settings and height adjustment are automatically performed.



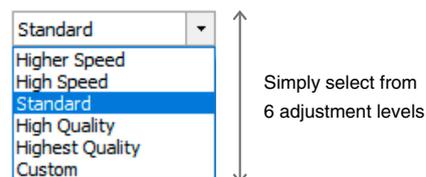
2D Code Pattern Selection

Users can select the 2D code marking pattern from multiple patterns to obtain optimal results for the code reader being used, marking size, and target material.



Quality Adjustment Level

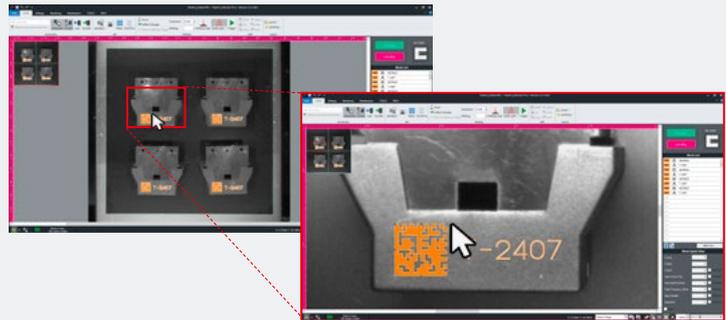
The software automatically calculates fine adjustments for detailed parameters required for selecting between higher quality and speed. Since complicated calculations are not required, anyone can easily make fine adjustments to optimise performance of the laser marker.



Easy Alignment

Built-In Camera

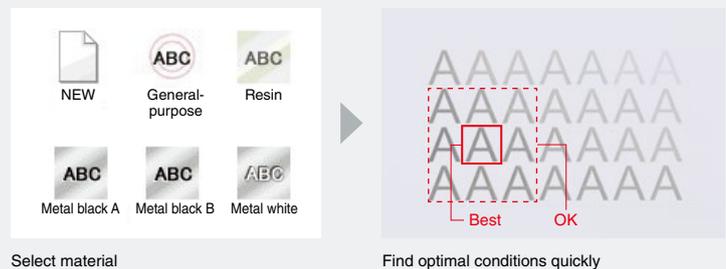
Alignment is possible by imaging the actual target with the built-in camera. Positioning can be performed by dragging and dropping, eliminating the need for complicated coordinate adjustments.



Easy Marking

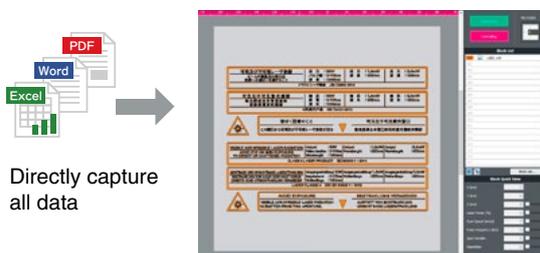
Sample Marking Function

The software automatically recommends marking parameters based on the material being marked. Optimal conditions can be found easily using the marking results list. Not only is it possible to make crisp, clean markings, but stable and optimal conditions are achieved by choosing the best condition.



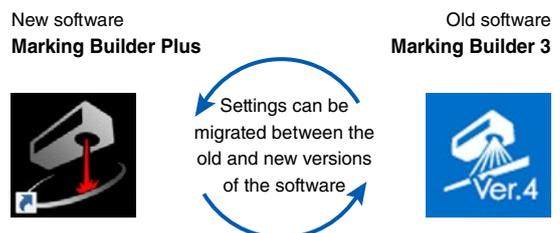
Printer Driver Function

All Excel/Word/PDF/Image files can be imported directly into the laser marker software. There is no need to convert and edit the data, so laser marking can be performed as easily as printing on an office printer.



Compatible with Previous Software

The new Marking Builder Plus software and the previous Marking Builder 3 software are compatible, allowing for simple migration of settings between the old and new software versions. This allows for worry-free use even on production lines with multiple units, spare units, or a mixture of old and new laser markers.



Robust Design for Industrial Use

The MD-X series was designed to maintain high performance on actual production lines.

Environmental Resilience

Tough in Any Environment

The MD-X series marking head meets IP64 environmental resistance specifications. This environmental resistance allows the laser to perform at a high level regardless of where it is used.



IP64 Marking Head

The MD-X Series uses a proprietary sealing method to securely protect optical components. This ensures that these components are not affected by factors such as dirt, dust, and water droplets, which provides environmentally resistant performance and allows for stable operation in even the harshest environments. The MD-X Series has an enclosure rating equivalent to that of the fanless marking head of our MD-F3200/F5200 Series fibre laser markers.

IP64

- Water splashed against the enclosure from any direction shall have no harmful effect.
- No ingress of dust.

All IP tests are performed for the prescribed time and using the prescribed method. This only guarantees that operation is possible during the time limits required by the test and do not guarantee that the product can be used under the test conditions for extended periods of time.

Lens Protection Filter

Since a dirty or scratched lens will lead to reduced marking quality, it is crucial to keep the lens free of flaws. The MD-X series comes with a lens protection filter already installed, making cleaning and onsite replacement easier than ever.



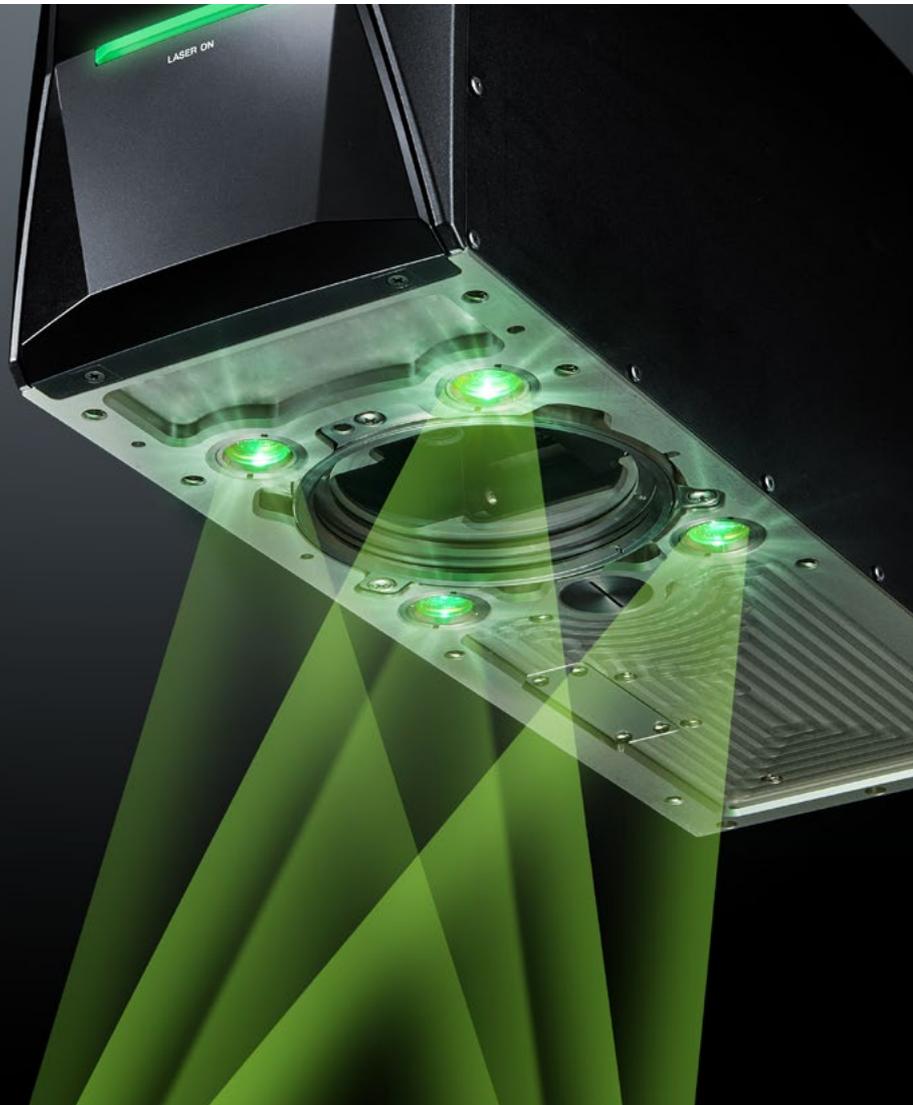
Included equipment
OP-88492

Built-In Lighting

Lighting built-in to the marking head eliminates the need for external lighting to align the target before marking and check results after.

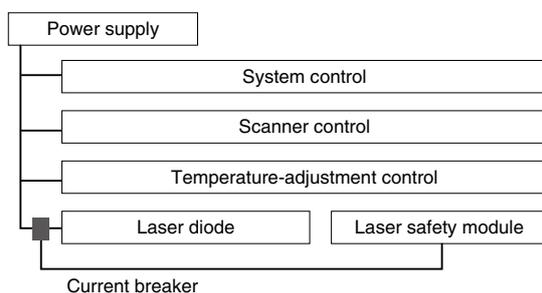
Built-In 2D Code Reader

Marked codes can be read by the laser marker, eliminating the need for an external barcode reader. Because marking and reading can be completed in a single process, the space required and cost of equipment can be reduced.



ISO13849-1 Compliant

An optional laser safety module is available to provide support for ISO13849-1. By attaching the module to the controller, it acts as a safety breaker which shuts off the power supply to the laser unit.



On-Board Industrial Communication

On-board Industrial communication protocols, such as EtherNet/IP®, PROFINET, and OPC UA, allow for easy integration with various devices. Users can operate and check the status of the on-site equipment from a remote location, and save the communication history without the need for external devices.

EtherNet/IP®

PROFI
NET

OPC UA

Application Examples

High-speed, high-quality marking is possible on both metals and resins.

Free marking and processing tests are available from your local KEYENCE office.

Metal Marking and Processing



White + Black-oxidised marking: Aluminium casting

Resin Marking and Processing



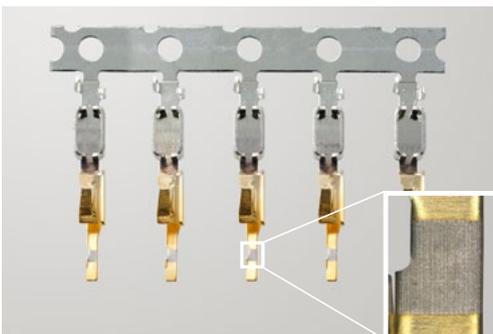
Contrast marking: Resin case



Damageless marking: Carbide tool



Damageless marking: Mould package



Thin film processing: Metal plated connectors



Coating removal: Switches for automotive instrument panels

Marking types

Character size (typical examples)	I Logo mark	I 2D code	I GS1 DataBar	I BMP/JPEG data
0123456789 ABCDEFGHIJKL abcdefghijkl				
	I Barcode 			

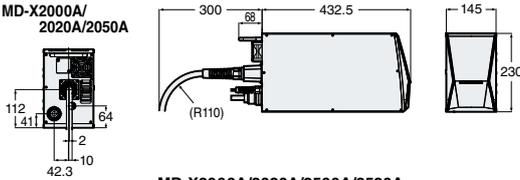
Basic Specifications

		25 W		13 W		
		Standard area	Wide area	Standard area	Wide area	Focused spot
Model	Marking unit (controller + head)	MD-X2500A	MD-X2520A	MD-X2000A	MD-X2020A	MD-X2050A
Marking laser	Output at contact point	25W		13W		
	Q-switch frequency	CW (continuous wave), 1 to 400 kHz				
Laser class	Marking laser	YVO, laser 1064 nm, Class 4 Laser Product ^{*1}				
	Distance laser	Semiconductor laser 683 nm Output: 5.0 mW Class 3R laser product ^{*1}				-
	Guide laser/ Distance pointer	Semiconductor laser 655 nm Output: 1.0 mW Class 2 laser product ^{*1}				
Marking area		125 x 125 x 42 mm	330 x 330 x 42 mm	125 x 125 x 42 mm	330 x 330 x 42 mm	50 x 50 x 30 mm
Standard working distance (±variable width)		189 mm (±21 mm)	300 mm (±21 mm)	189 mm (±21 mm)	300 mm (±21 mm)	100 mm (±15 mm)
XYZ 3-Axis simultaneous scanning method						
Marking method	XY scanner	Digital galvo scanner				
	Z scanner	Linear motor				
Optional model	3D Marking	MD-AD-3D				
	Built-in Camera alignment	MD-AD-XYT				-
	Automatic focus	MD-AD-ZT				-
	Built-in 2D code reader	MD-AD-2DR/MD-AD-2DRA (Supported standard ISO/IEC TR 29158 (AIM DPM-1-2006))				
	Handy console	MC-P1				
	Laser safety module	MD-C2A/MD-C2B				
Console (sold separately)		MB-PH1 ^{*2} (Marking Builder Plus, Marking Diagnostic Tool)				
Built-In Camera	Image sensor	CMOS image sensor (2.3 megapixels)				
	No. equipped	2 (total; coaxial)				1 (coaxial)
	Built-in light source	High-intensity green LED				-
Built-in power meter		Thermopile				
Logging function		Internal operation, terminal block, communication, errors, operating information, built-in camera images				
Predictive maintenance function		Marking energy check, auto-calibration, photographs before and after marking, web monitor, window inspection ^{*3}				
Character type	Font	KEYENCE original font, user font, TrueType font, OpenType font ^{*4}				
	Barcode	CODE39/ITF/2of5/NW7 (CODABAR) /JAN/CODE128/EAN/UPC-A/UPC-E/CODE93/GS1 DataBar				
	2D code	QR code, micro QR code, DataMatrix (ECC200/GS1 DataMatrix)				
	Logo image	DXF/BMP/JPEG/PNG/TIFF				
	Shape	Plane, 3D Shape (Slopes, Cylinders, Cones, Spheres, 3DCAD(STL)) ^{*5}				
Workpiece style		Stationary marking, Moving marking (constant, encoder) / Rotation marking				
Input/output		Terminal block I/O, MIL connector I/O, laser safety module control I/O ^{*6}				
Interface		RS-232C/USB2.0/Ethernet (100BASE-TX/10BASE-T) ^{*7}				
Marking head cable length		4.3 ±0.1 m				
Rated voltage		100 to 240 VAC ±10% 50/60 Hz		100 to 240 VAC ±10% 50/60 Hz		
Power consumption (maximum (VA)/average (W))		850 / 290		700 / 260		
Enclosure rating (marking head)		IP64				
Environmental resistance	Ambient temperature for transport/storage	-10 to 60°C (no freezing)				
	Ambient temperature for usage	0 to 40°C				
	Ambient humidity for transport/storage	Up to 85% RH (no condensation)				
	Ambient humidity for usage					
Weight	Controller	23.0 kg				
	Marking head	13.8 kg				12.6 kg
	Console	2.0 kg				
Applicable regulations		EU directives (EMC Directive, Low Voltage Directive, RoHS Directive)/ EN standards (EN61010-1, EN60825-1, EN62471, EN55011, EN61000-6-2, EN50581)/ CSA standards and UL standards (CAN/CSA C22.2 No.61010-1, UL61010-1)/ North American regulations (FCC Part 15B, ICES-001 Class A)/China RoHS/UKCA				

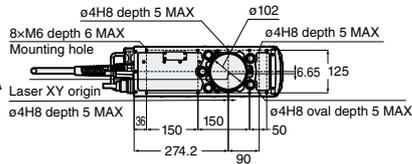
*1 The laser classification for FDA(CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50. *2 Languages:English/Japanese/Traditional Chinese/German/Korean/French/Spanish/Thai/Italian. *3 When using MD-AD-ZT. *4 Only TrueType fonts and OpenType fonts with the embedded fonts property set to "installable" or "editable" are supported. Confirm the property of [Font] from [Control panel]. *5 When using MD-AD-3D. *6 Only when the laser safety module (MD-C2A/MD-C2B) is attached *7 The USB ports are for USB memory/USB mouse/barcode reader (A connector) and the for connecting to a PC with Marking Builder Plus or ActiveX (B connector). The Ethernet port supports communication to a PC with Marking Builder Plus (ActiveX), Operation Monitor, and the diagnostic tool; TCP/IP communication; PROFINET; EtherNet/IP; the FTP client; and the OPC UA server.

Marking head

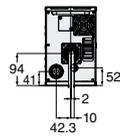
MD-X2000A/
2020A/2050A



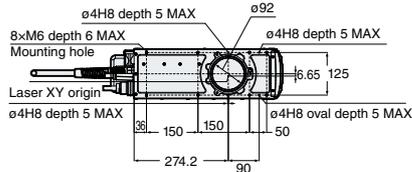
MD-X2000A/2020A/2500A/2520A



MD-X2500A/2520A

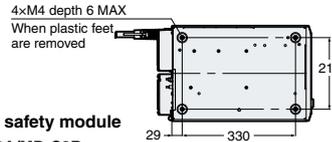
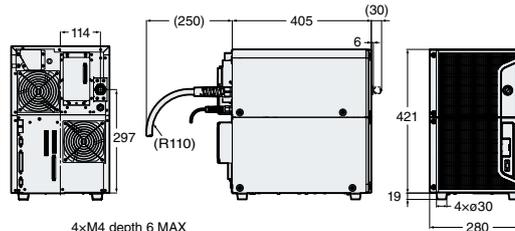


MD-X2050A

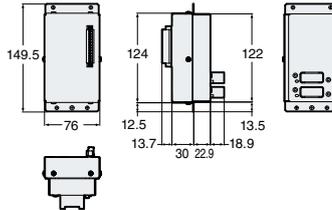


Controller

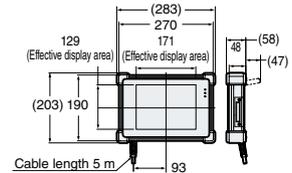
* When the laser safety module is installed



**Laser safety module
MD-C2A/MD-C2B**



**Console
MC-P1**



SAFETY PRECAUTIONS

- Be sure to read the manual and fully understand its contents before using the product.
- Do not allow your eyes or skin to be exposed to a directly irradiated laser beam or a diffused reflection laser beam.

LASER MARKERS USED AROUND THE WORLD

The MD-X Series supports various international standards and regulations. Through our world-wide direct-sales network, KEYENCE provides its customers with direct support no matter what country our customers are in.



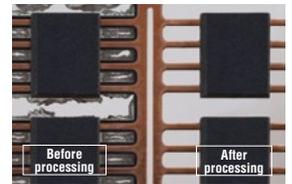
LOCAL, IN-HOUSE TESTING LABS



Our customers have access to these test services provided by our dedicated sales engineers. To request a test, visit the KEYENCE website or contact your nearest KEYENCE office.



MARKING



PROCESSING

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