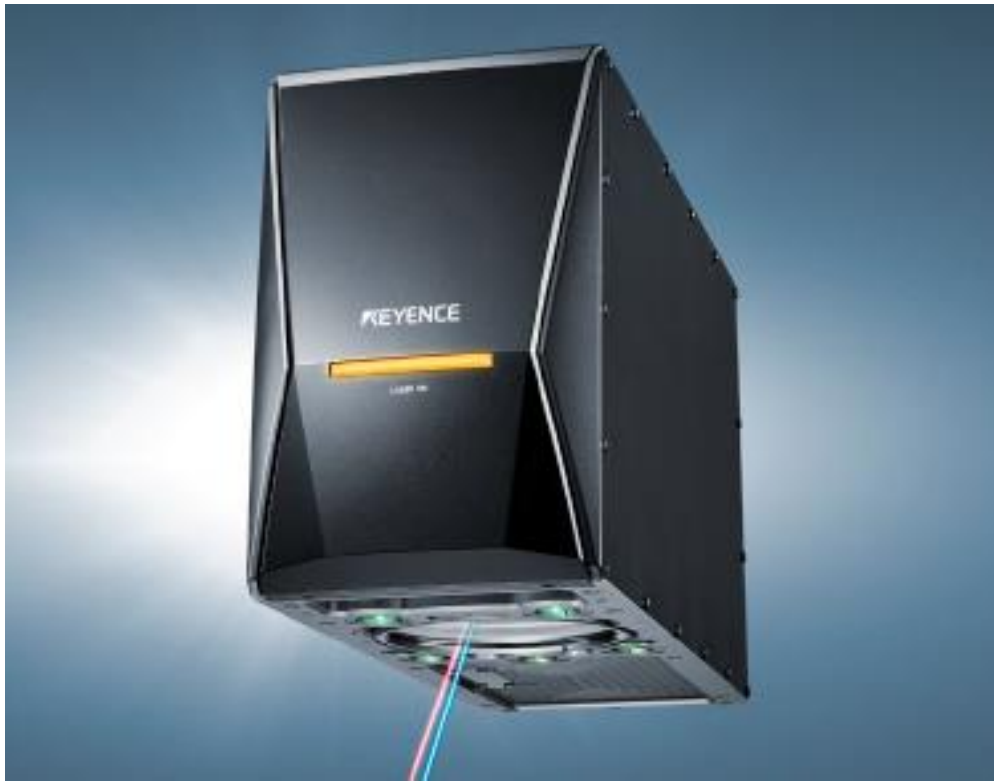




Decorative Laser Marking

Ben Chleboski Keyence Laser Technology



Agenda

Who am I? What is Keyence?

What is Laser Marking?

What is UV technology? Why is it important?

Instances of laser marked designs, patterns, images

Brief Demonstration

Questions

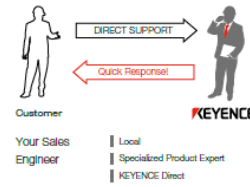
Who are we? What do we do?

The logo for Keyence, featuring a red stylized 'K' icon followed by the word 'KEYENCE' in a bold, black, sans-serif typeface.

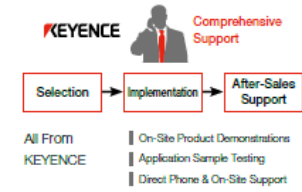
KEYENCE



Direct Sales Network



Direct Support



KEYENCE VALUE



Since 1974, KEYENCE has steadily grown and innovated to become a world leader in the development of automation and quality assurance solutions

Keyence

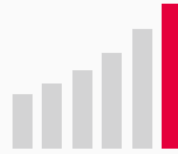
- Automation and Quality Assurance solutions
 - Manufacturing
 - Packaging/Logistics
 - Machine Building
 - Distribution
- Safety Solutions
- Measurement
- Metrology
- Inspection
- Inventory Tracking
- Part Marking

Same-Day Shipping



Products ordered by 4:00 PM CST are shipped from our warehouse center in Chicago the same day!

Keyence Continued



Sales
\$7.0B

Average annual growth of over 10% for the past 25 years



Products featuring World's First or Industry's First
Technology
70%

Investment in the Technology of the future



Global Network
350,000 Clients
250 Offices 46 Countries



Innovative Companies
TOP 100 in the World
Forbes List 2011-2018
The World's Most Innovative Companies

Corporate Information

Global Headquarters: Osaka, Japan
Founded: May 1974
Capital: 281,078,000 USD
2019 Global Sales: 5,062,782,000 USD
Worldwide Employees: 8,419

Note: US dollar amounts are converted from Japanese yen for convenience only at 109 JPY = 1 USD, the approximate exchange rate on March 20, 2020.



- KEYENCE provides ADDED VALUE solutions for engineers in nearly all industries.
- We provide the tools that let manufacturers and researchers stay competitive in the global marketplace.

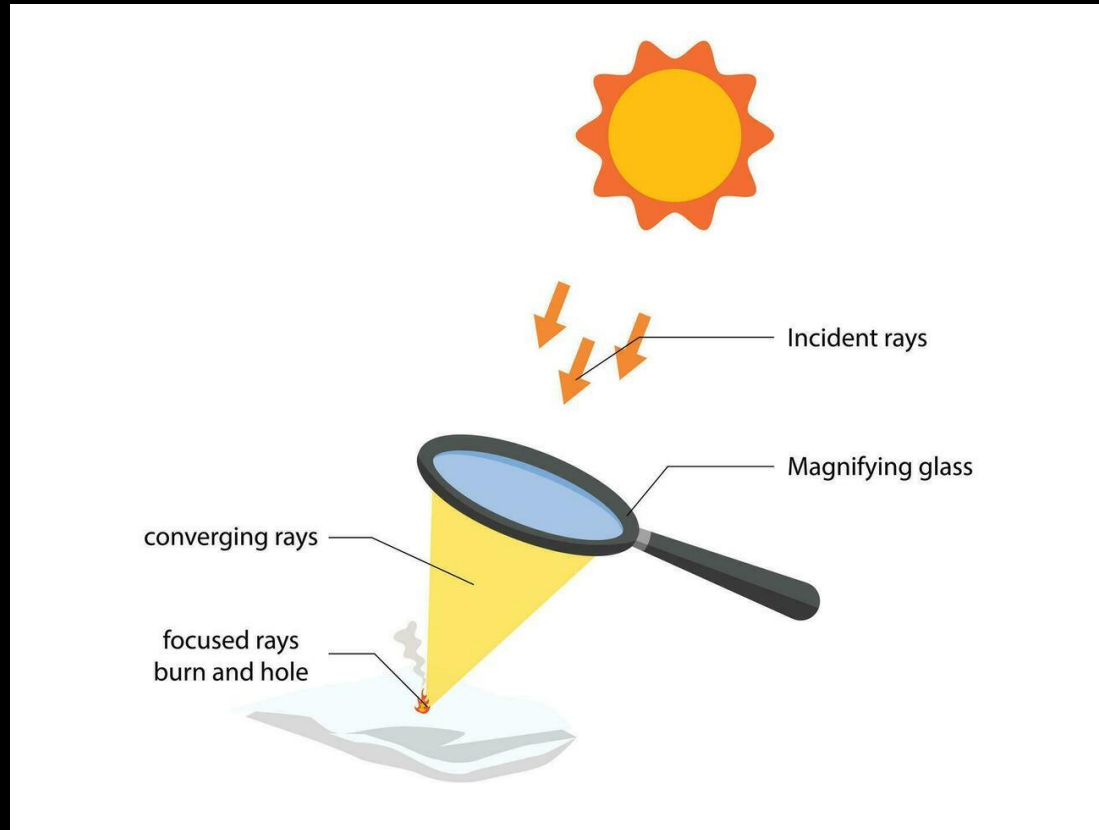
Products

Products



What is Laser Marking?





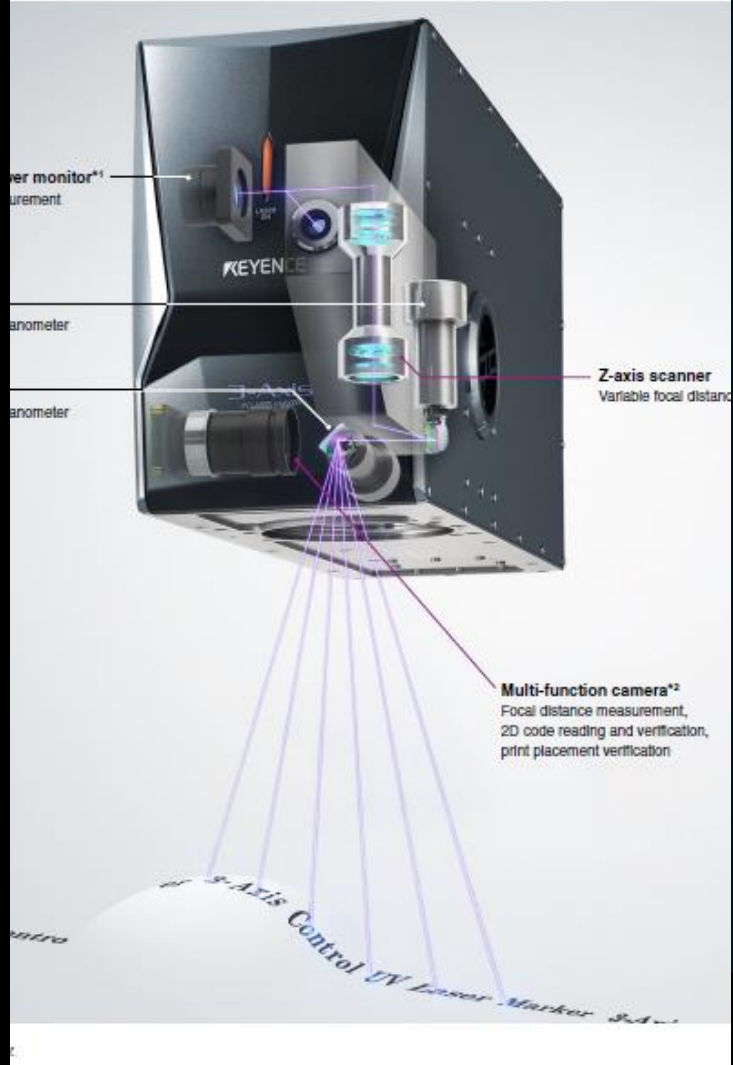
What is Laser Marking?

- Light
- Amplification (by)
- Stimulated
- Emission (of)
- Radiation

Design of the 3-Axis System

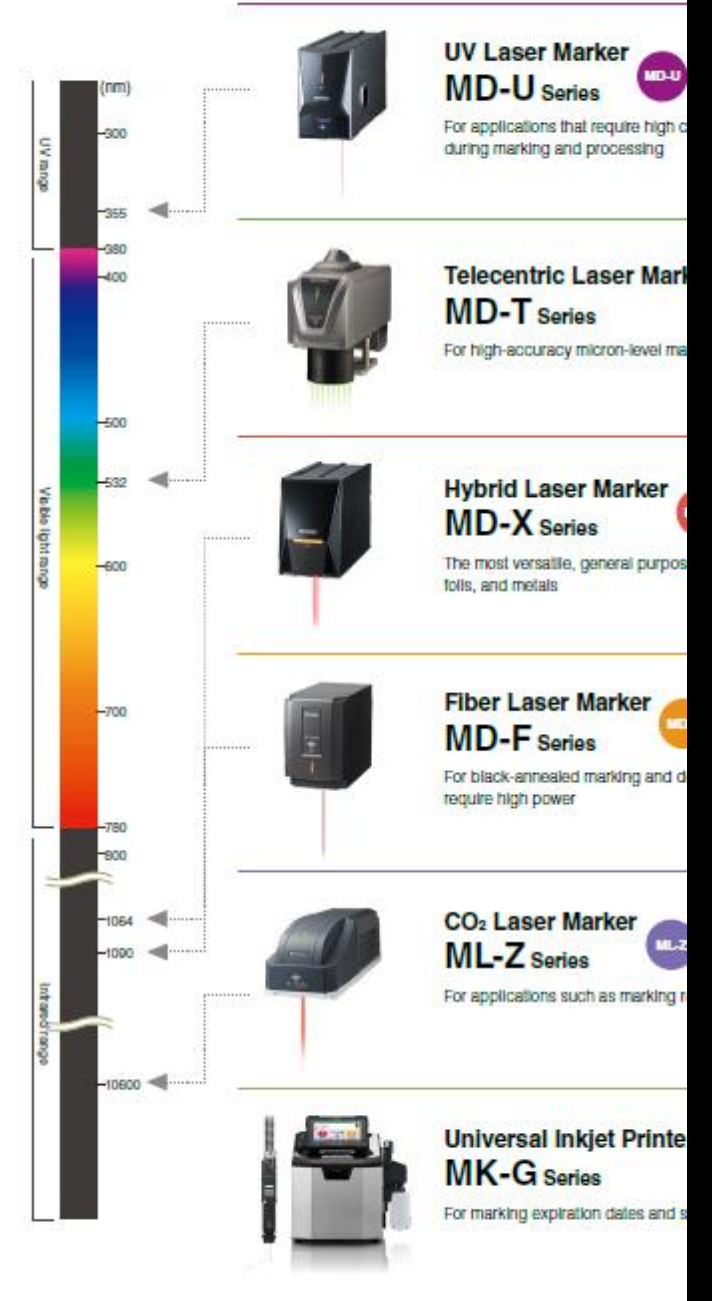


It uses a 2-Axis X and Y scanner to scan laser light across a level surface. A 3-Axis control laser marker scanner in addition to the X and Y axis scanners. It achieves three-dimensional laser tracking by simultaneously. "3-Axis Technology" was first developed by KEYENCE and installed in their marking system. This technology makes it possible to program complex shapes and saves countless engineering hours. These innovations are indispensable and allow for reliable consistency on every mark.

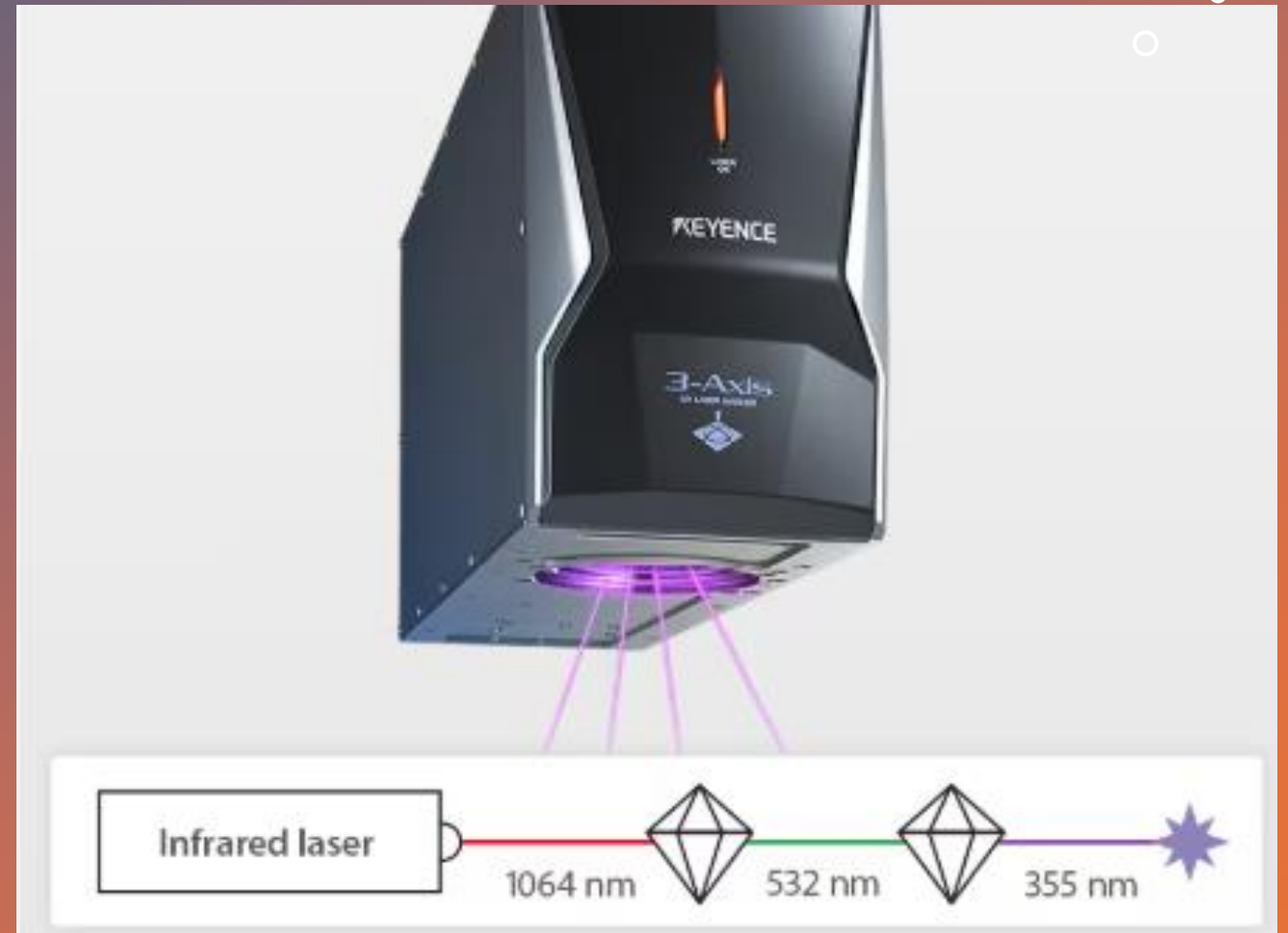


Keyence Laser Marking

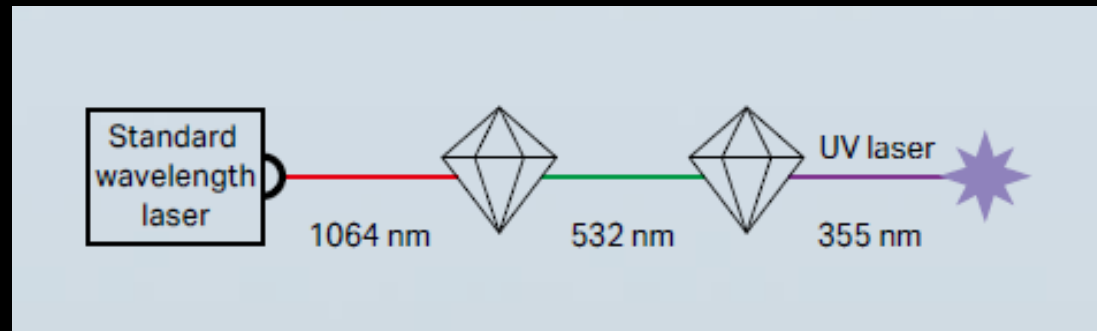
- 5 Main Laser Types
- 3D Marking / Curved Surfaces
- Adjusting Focal Distance
- Variable Beam Spot
- Built-In Camera



MD-U2: UV Laser Marking Technology



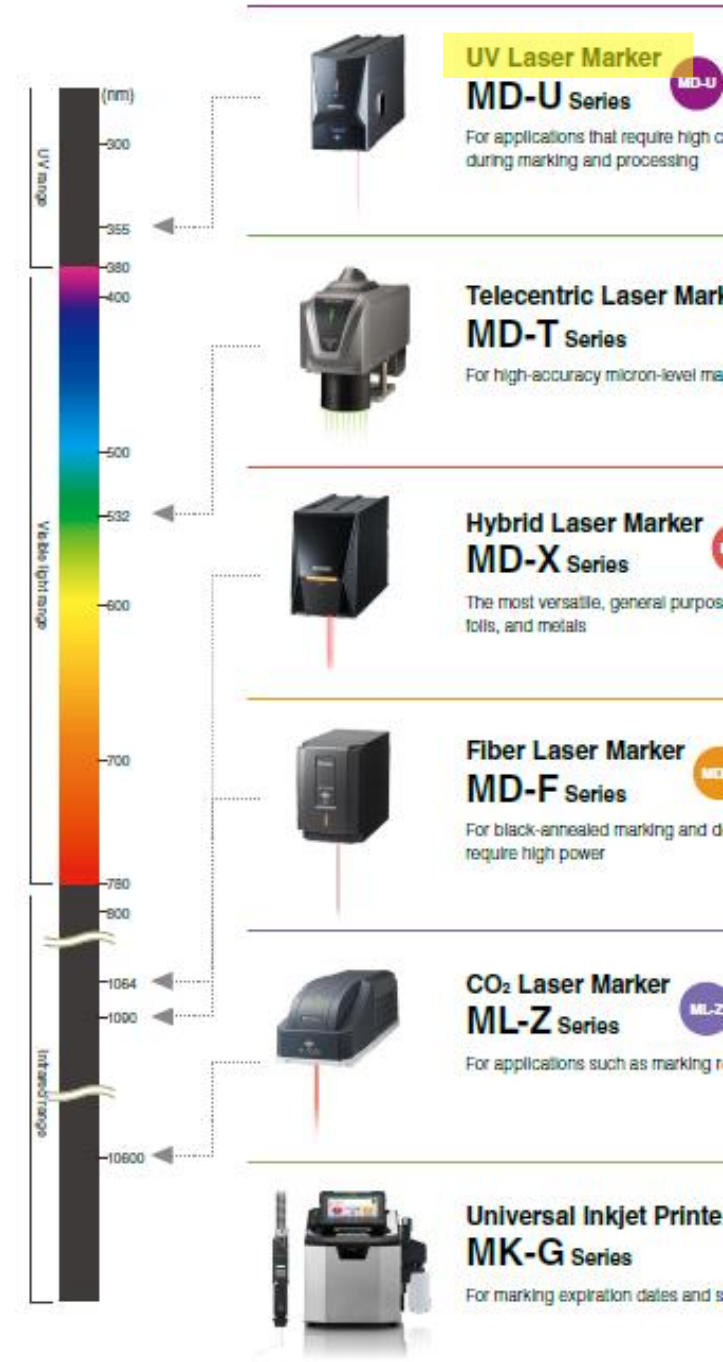
How it Works?



What is a UV laser?

A UV laser has a wavelength that is one third that of the standard wavelength (1064 nm). They are called THG (Third Harmonic Generation) lasers.

Marking using these lasers is called "Cold Marking," which refers to how they can perform marking and processing with minimal heat stress due to their incredibly high absorption rate on a variety of materials.



The Difference it Makes

Why UV? MD-U

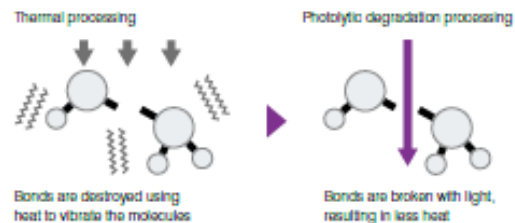
Cold Marking with a UV Laser

Cold marking refers to marking and processing that is performed with minimal heat stress. UV lasers can be used to achieve this result thanks to their incredibly high absorption rate on a variety of materials. A UV laser is simply the Third Harmonic Generation (THG) of a standard wavelength (1064 nm) laser. By passing a standard wavelength laser through a non-linear crystal, and then again through another crystal, the wavelength is effectively reduced to 355 nm, creating the ideal UV laser.



Photolytic Degradation Processing with 355 nm Wavelength

The high-energy photons in UV lasers allow for photolytic degradation processing that breaks the bonds between molecules directly. This allows for marking and processing without heat being applied to surfaces, thus minimizing damage.



Why Hybrid? MD-X

Medical equipment (polycarbonate)

Conventional

MD-U

LOT.00325
MH4N2L650

LOT.00325
MH4N2L650



High Contrast and Damage-free Marking

High absorption UV wavelength P. 4 to 7

355 nm wavelength creates high-contrast marking while minimizing damage to the workpiece

Marking in half the time of conventional models

High-power digital scanner with new controls P. 8 to 9

Marking time is substantially reduced due to improved digital scanner control and increased laser power (7 W at the workpiece surface)

Automatic correction of focal and positional misalignment

Full-field auto-focus P. 10 to 11

Positional Alignment P. 12 to 13

Built-in distance sensor and cameras track workpiece positioning and correct for misalignments, preventing marking defects.

3-Axis UV Laser Marker
MD-U Series

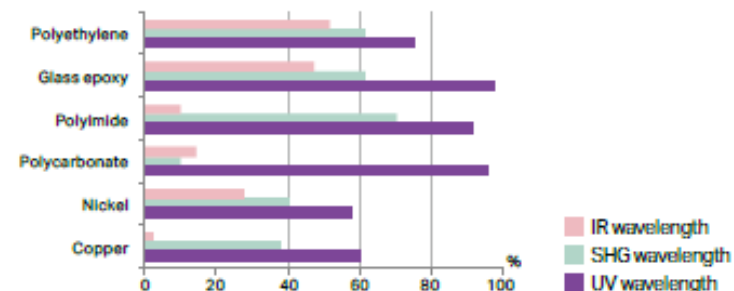


The Benefits

High contrast marking due to high absorption rate

UV lasers normally have a superior absorption rate on materials compared to standard wavelength lasers (IR/1064 nm) and green lasers (SHG/532 nm), as well as being more efficiently absorbed on the marking surface. As a result, high contrast marking is possible. In addition, the short wavelength enables the beam spot to be narrowed down, allowing for high-definition, easy-to-read marking in limited spaces.

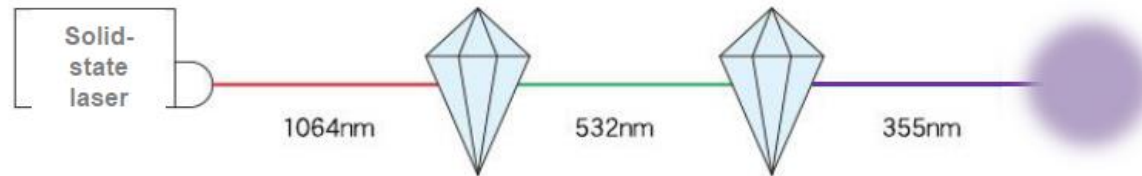
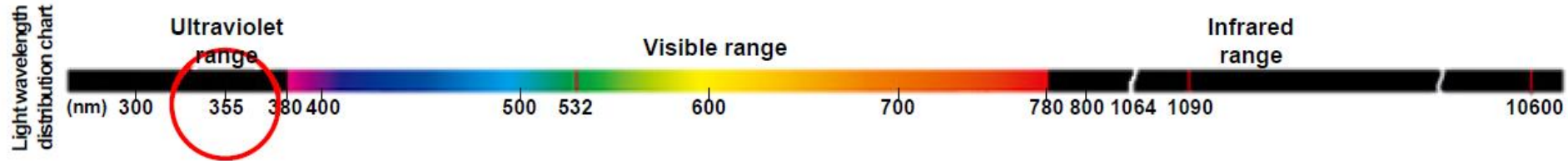
Absorption rate for each material:



*This value varies depending on thickness and surface condition, so it is a reference value.

What is UV laser?

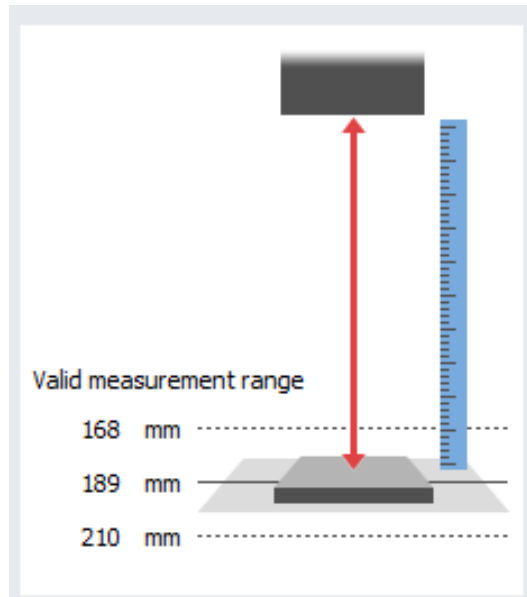
The name “UV laser” comes from laser light in ultraviolet range, wavelength of which is one third of fundamental wavelength.



A wavelength of 532 nm is converted from the fundamental wavelength that has passed into a non-linear crystal (SHG LBO - Lithium Triborate), and then this 532 nm wavelength aligned with the fundamental wavelength passes into another monocrystal (THG LBO) to be converted to a 355 nm wavelength.

Advantages of UV laser

- High absorption rate on each material makes marking **excellent in contrast**.
- Small beam spot for a **marking process fine**.
- Marking can be carried out with **minimized damage/heat impact** on products.

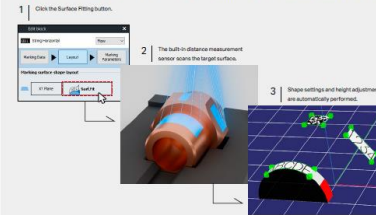


Marking Builder Plus

From setting the marking position to setting various marking conditions, it is easy for anyone to configure the settings regardless of experience level.

Easy Shape Settings

Surface Fitting Function
Scanning of marking location with built-in distance measurement sensor.
Building programs for marking on cylinders and slanted surfaces, which used to be complicated, can be completed with a single click.



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.



Fine-tuning Made Easy

With ultra-small marking, even slight misalignments and focus deviations greatly affect marking quality. KEYENCE small beam spot type laser markers have both a Z scanner and a coaxial camera, making it easy to fine-tune and significantly reducing the time and effort required for setup.

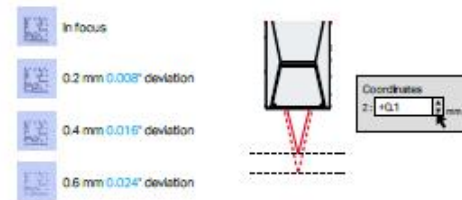
Simple Positioning

The coaxial camera makes it possible to easily position marking in a very small space, which is impossible with visual alignment.



Simple Focusing

The small spot size means that even slight focus deviations greatly affect marking quality. The Z scanner makes it easy to set any focal length.



Ease of Use Functions

- Automatic Focal Distance Correction
- Easy Alignment with built-in camera
- Surface Fitting

Common Industries for Laser Marking



DEFENSE AND
AEROSPACE



FOOD AND
PACKAGING



MEDICAL



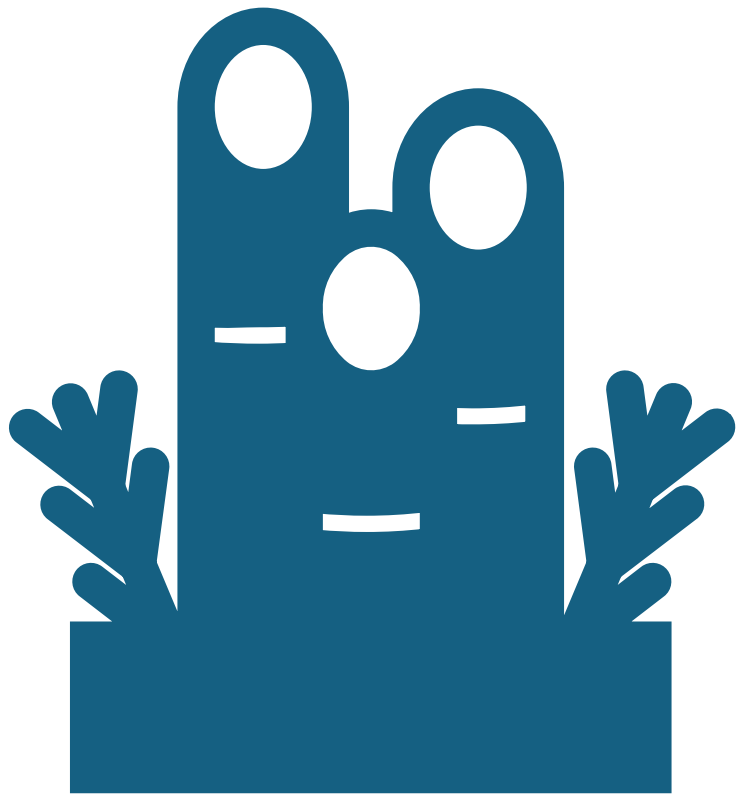
AUTOMOTIVE



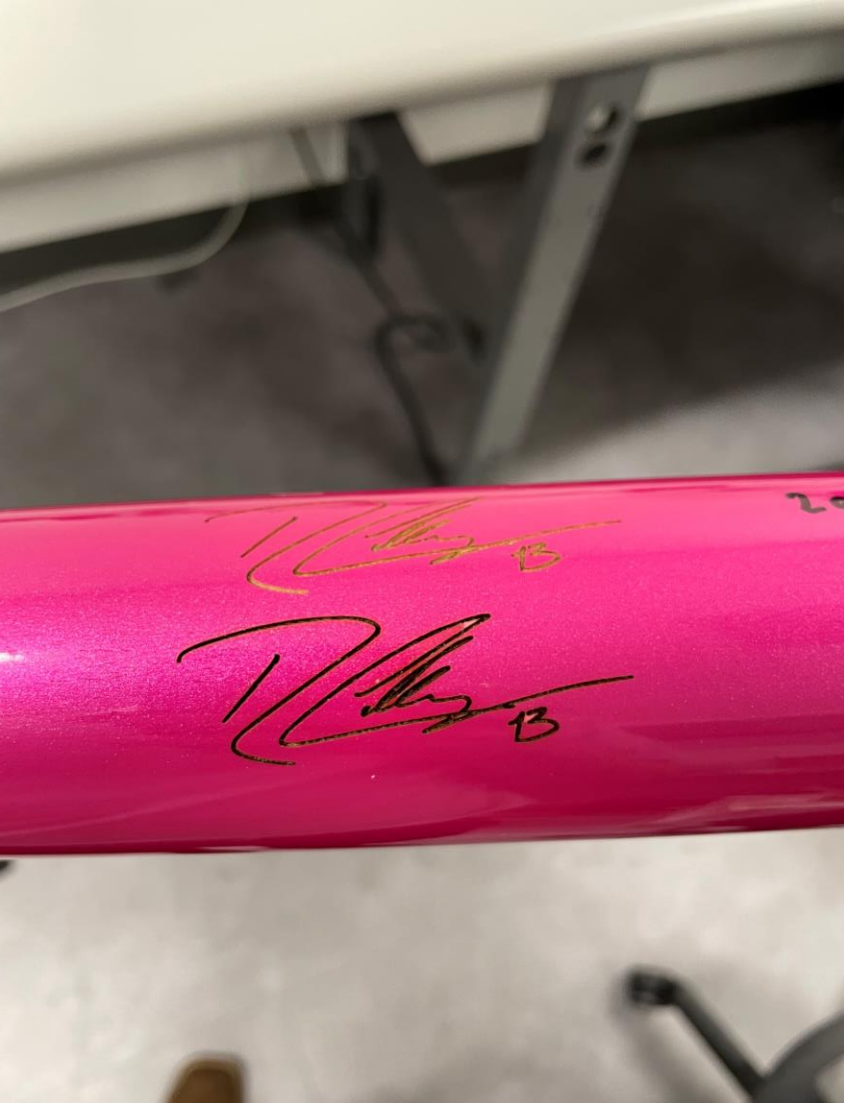
OIL AND GAS



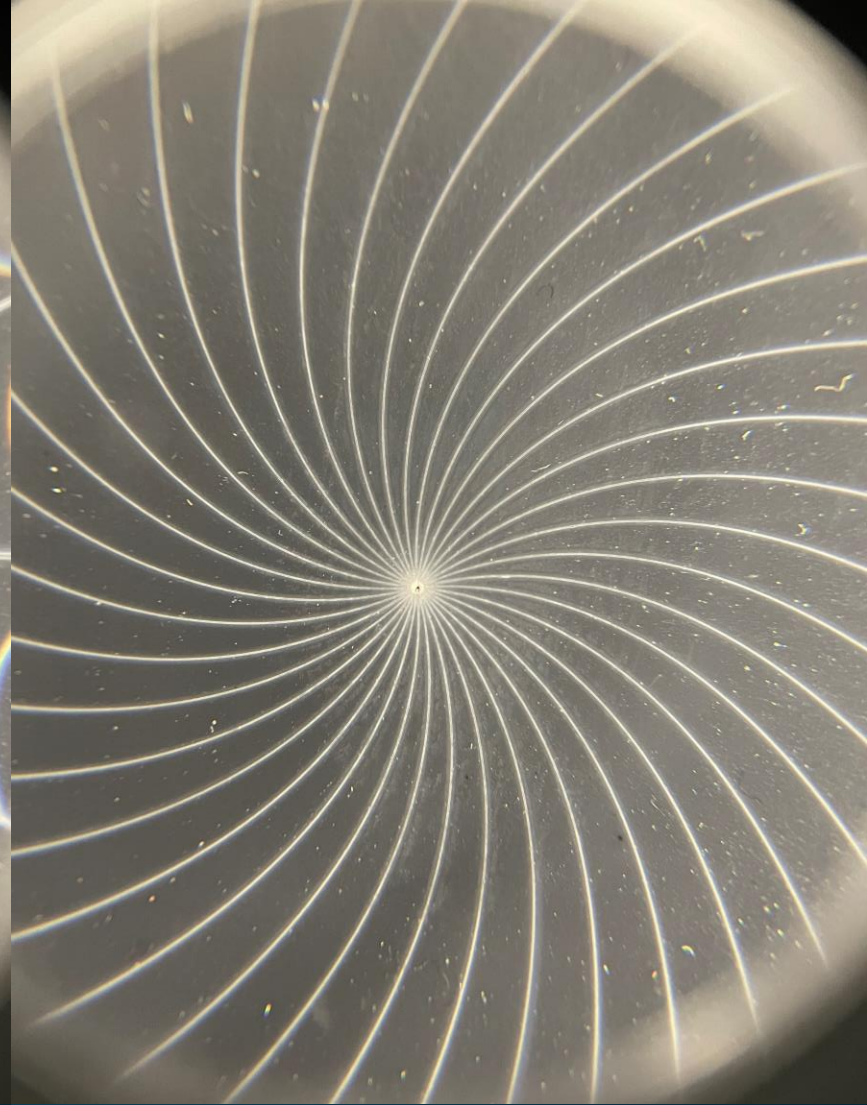
WINDOW
MANUFACTURING



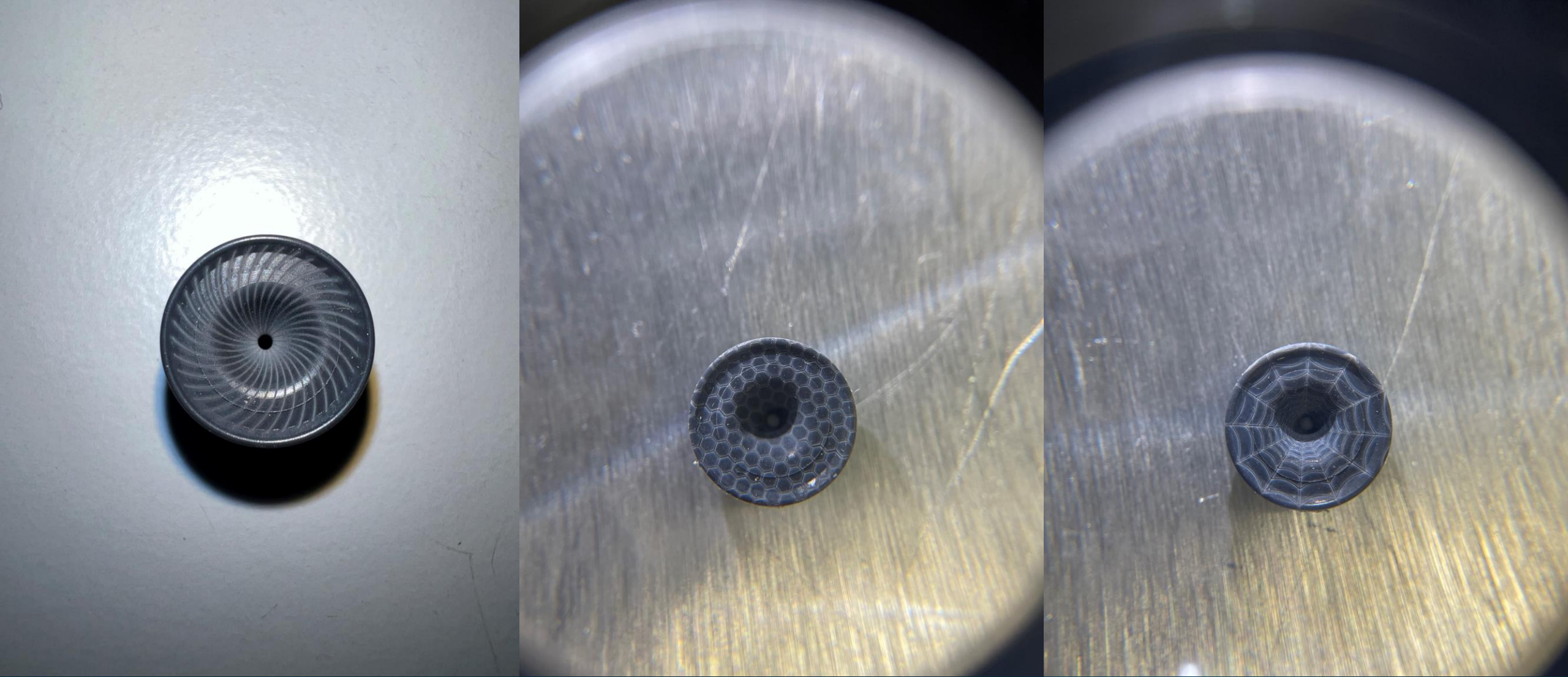
Decorative-Specific
Examples of Laser Marking



Baseball Examples

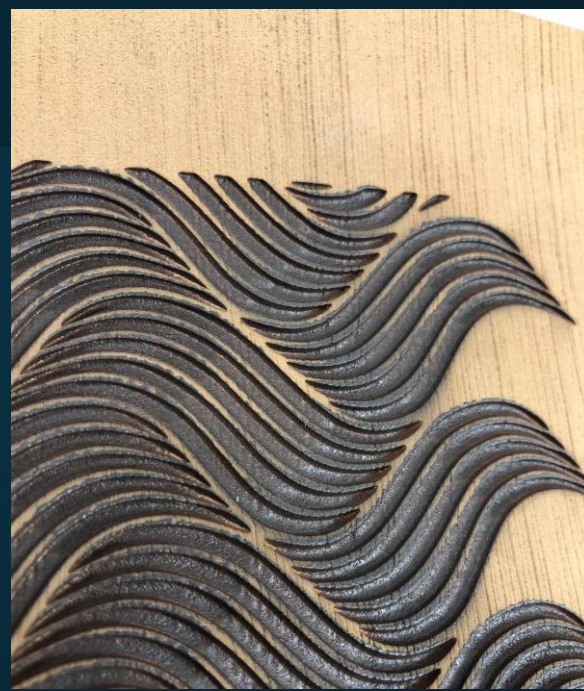


Silicone



Silicone continued

Foam Examples

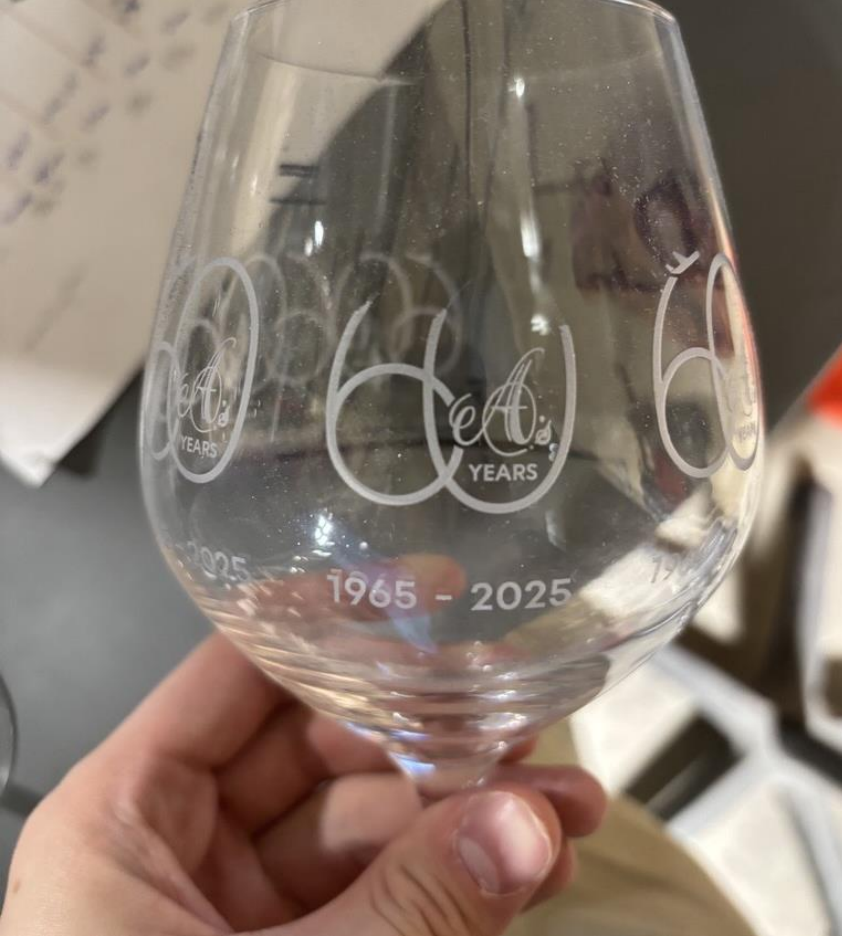




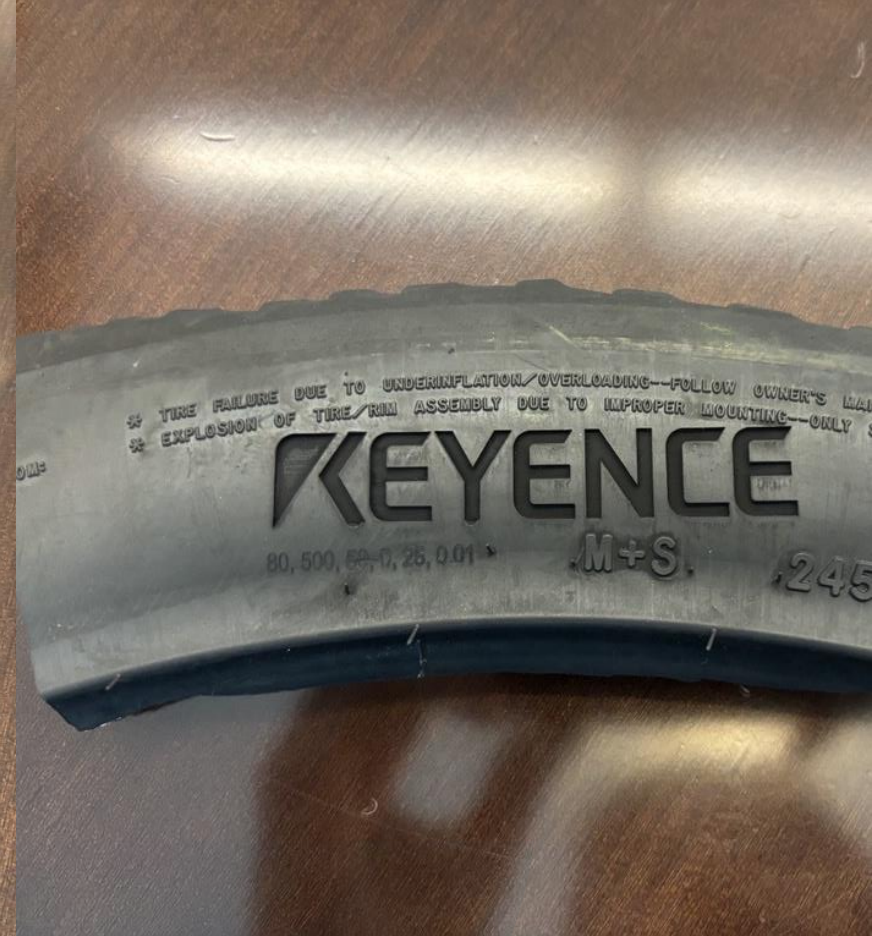
Ceramic Examples



Glass Marking



Glass Continued



Rubber



Miscellaneous

How Support Works

- Regional Support
- Based on Product Division
- Free Support
- No Service Contracts



Contact me for more information



- Direct: 412-764-4943
- Cell: 724-996-6841
- E-mail:
ben.chleboski@keyence.com
- www.Keyence.com