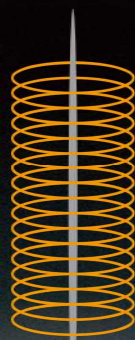


Inspection Device for
the Surface of Drilled Hole

Inspection for Internal Surface of Metallic
Workpiece with Laser Scanning System

GYRO SCAN



Easy

Precise

Stable



Inspection for Internal Surface of Metallic
Workpiece with Laser Scanning System

GYRO SCAN



Perform stably an accurate
inspection by a simple action

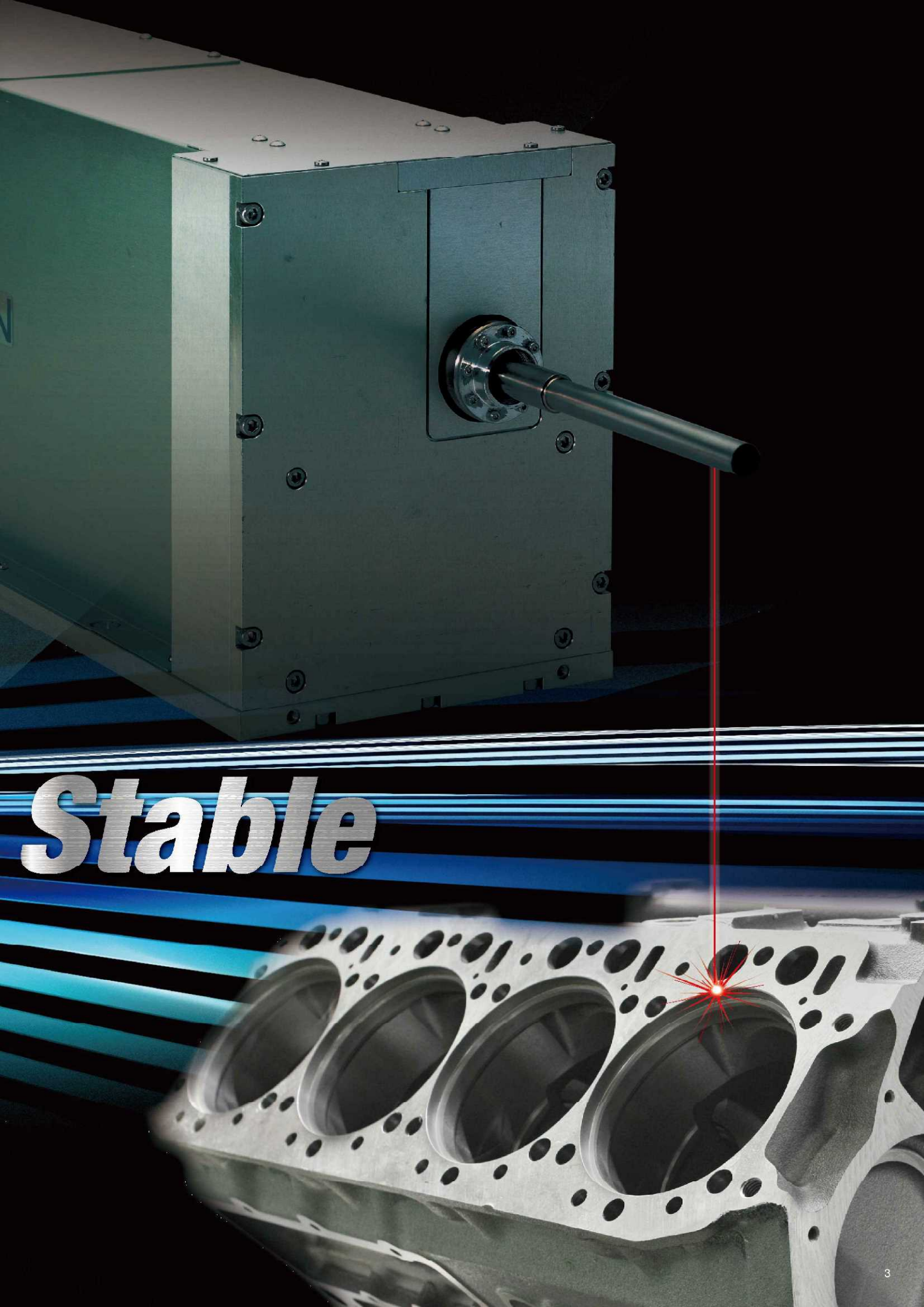
LSU series the laser inspection device

An ideal inspection device on which our company, who has seen manufacturing scenes for more the 30 years as a production machinery manufacturer, targets is the one that the three elements "Easy", "Precise", "Stable" are integrated at a higher level. If even one of them is lacking, it will have a negative impact on the production site. GYRO SCAN, it is the inspection device to raise production efficiency and to improve product quality.

Easy × Precise ×



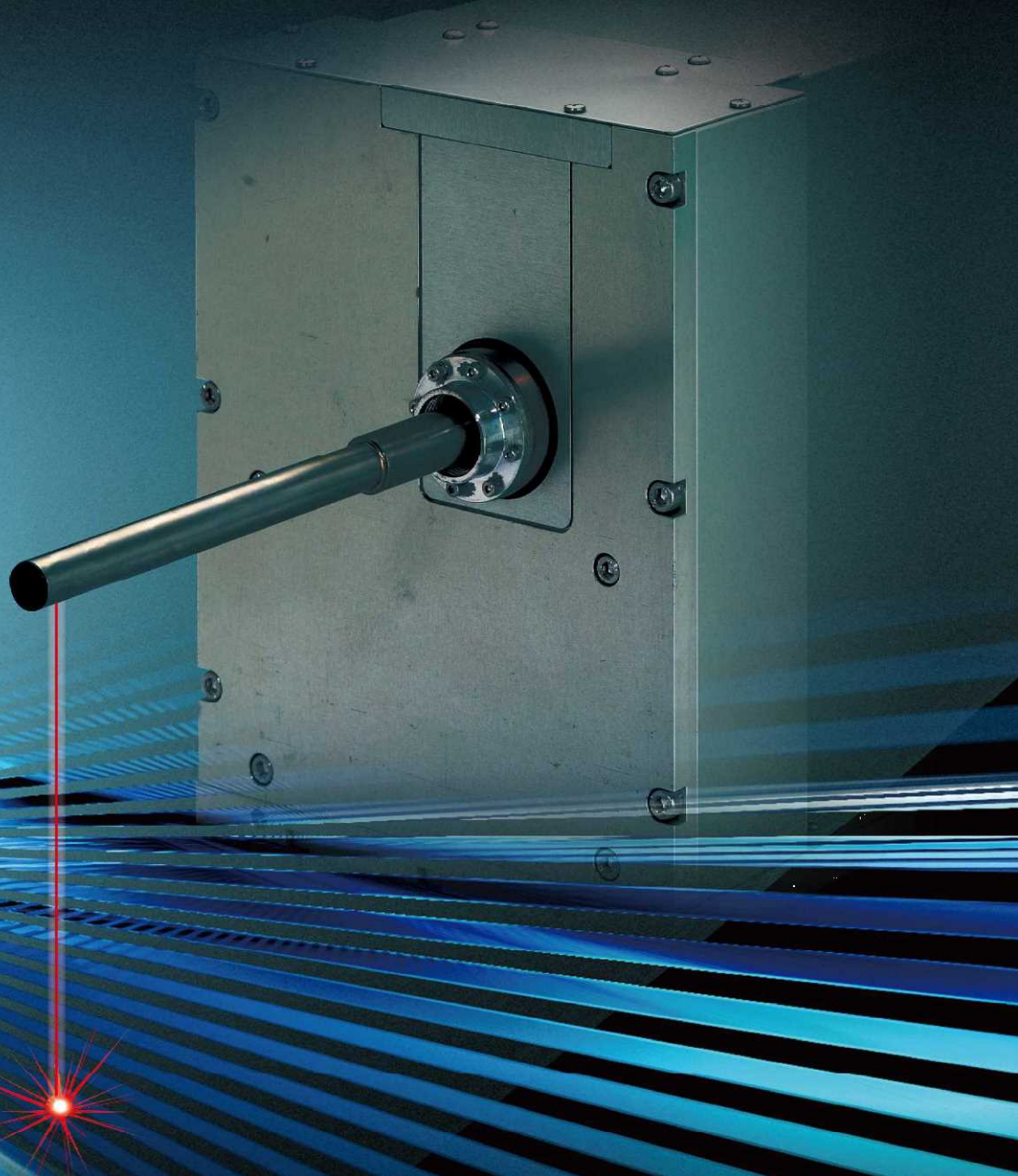
GYRO SCAN
LSU series



Stable

Easy

No matter how highly-accurate and multifunctional inspection device we produce, it would be pointless if you make full use of it on the site. We realized "an easy-to-use, high performance device". You can introduce an automatic inspection on every production site.



Cylinder block



Master cylinder

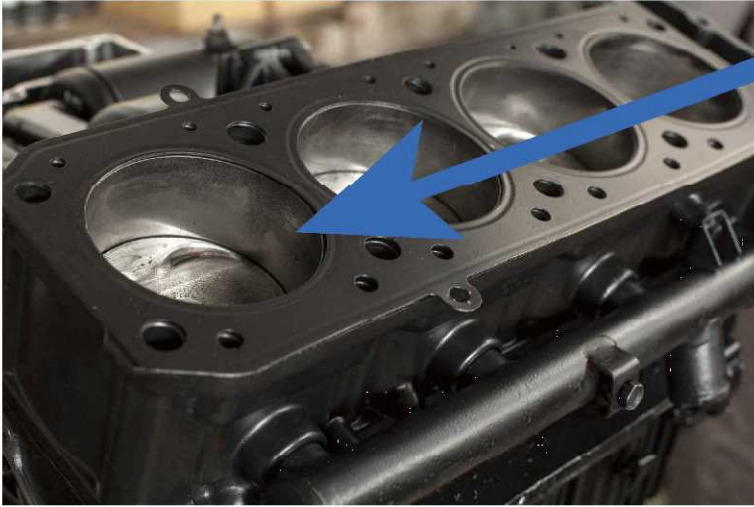


Piston

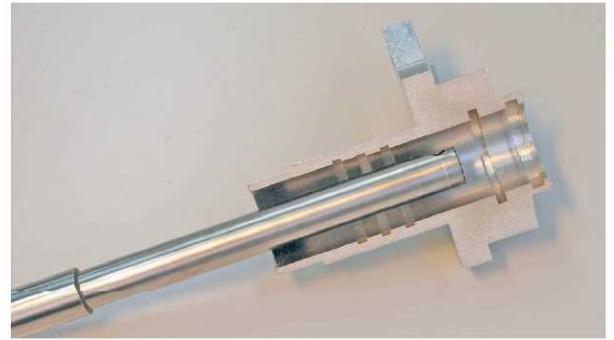


You can inspect a surface of drilling hole automatically, wonderfully simply.

Inspection for inside wall of a cylinder

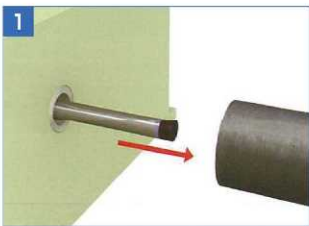


This device inspects whether there are defects on the surface of the inside wall of cylinder by putting an inspection probe in a cylinder like this. Automating the visual inspection will be able to improve a power saving and the correctness of the inspection.

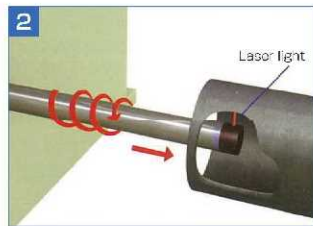


Laser scanning system

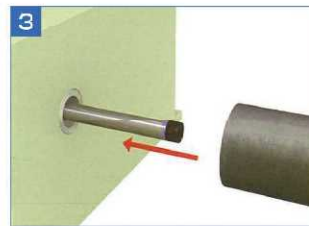
This device performs an examination by rotating laser light in a circumferential direction. Each time laser light goes round, it moves from place to place and inspects the whole. This device has a higher resolution because it performs an examination by using laser light of the micro optical spot.



1 Set the work.



2 Inject a laser probe in the heart of the works by spinning it.



3 The laser probe reverts to the first.



4 Make an OK / NG judgment by image processing while displaying a development image of the inner surface of the cylinder.

Application example

For example, in the sphere of automobile products, this device can perform an automatic examination of the inner surface of cylinders such as valve bodies, master cylinders, pistons. You can use it to other products in the same way.

Inspection for blowhole

- Engine bore
- Cylinder liner
- Master cylinder
- Valve body
- Piston etc...



Suitable for the inspection difficult to see with the bare eye.

Inspection for chips [Contamination inspection]

- Brake caliper
- Master cylinder
- Piston etc...



It can be seen in the ditch very much.

Detection of the presence or absence of chamfering at Vibrating part

- Master Cylinders
- Piston etc...

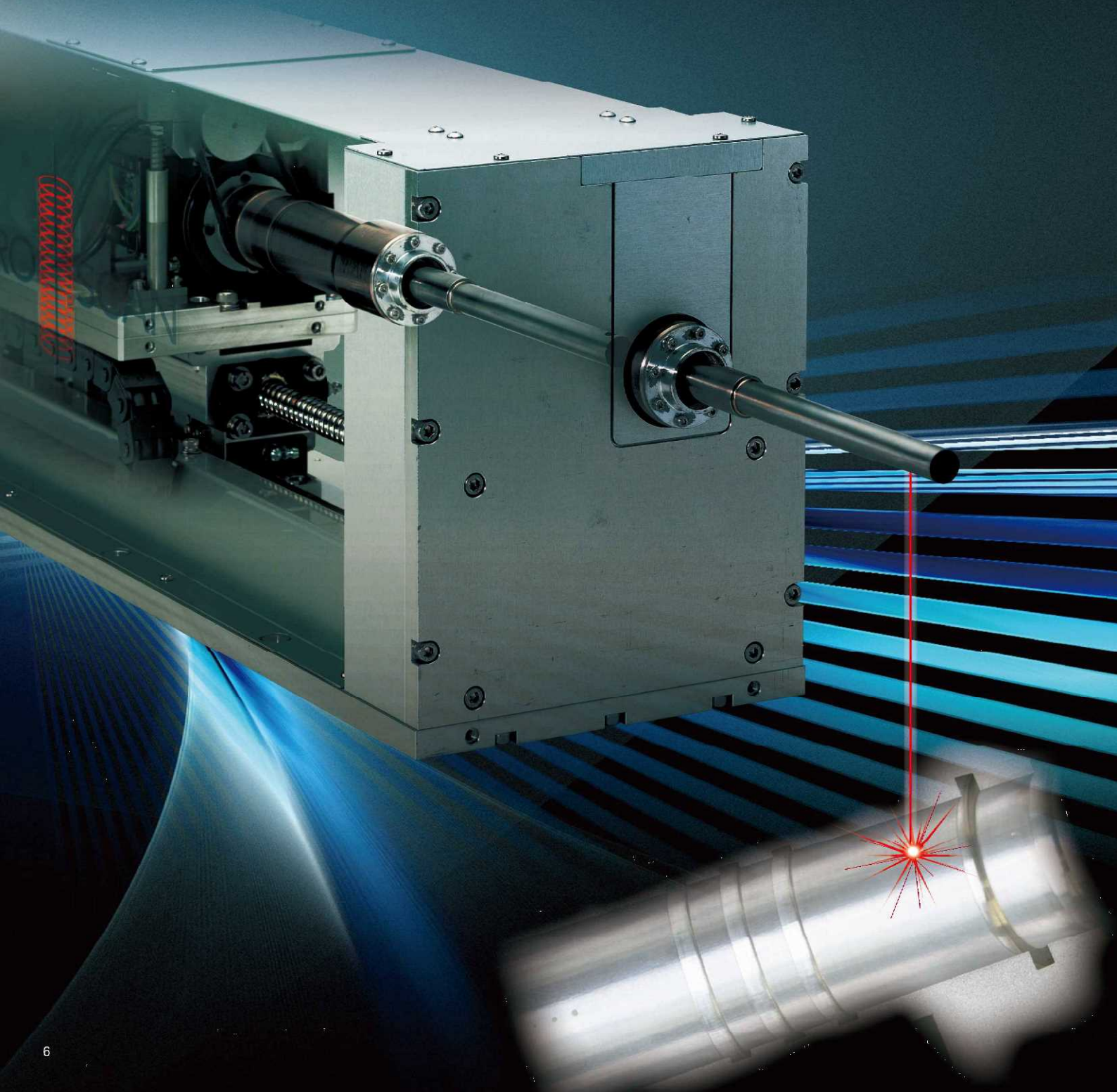


The edge of a sliding portion or a sealed portion can be seen very much.

Precise

There is a closer inspection that Varifocal laser scanning system can only realize.

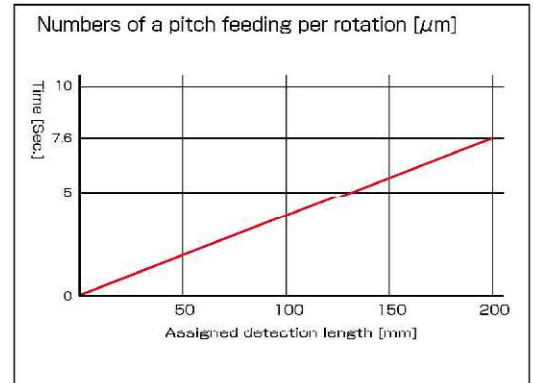
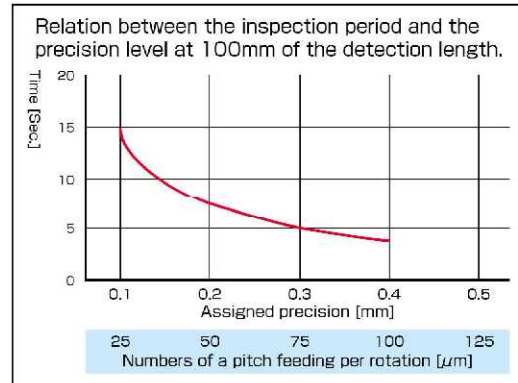
Closer inspection of $\phi 0.05\text{mm}$ the minimum detectable size will contribute to production quality improvement.



High-speed scanning although high accuracy, so you can use this device at your production site.

High-speed inspection

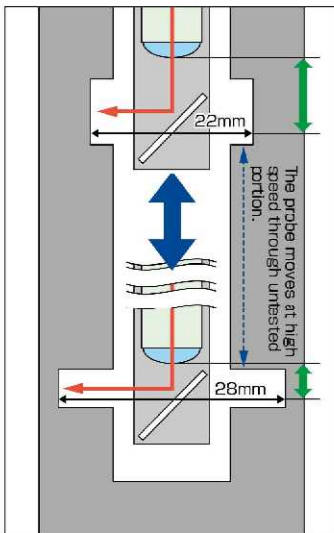
LSU3000 made possible an inspection with high-speed rotation 16,000 RPM. So, it realized that the inspection time has been reduced by half compared with our conventional equipment. On the other hand, you can perform more than twice the high-definition examinations when you take some time to inspect.



Above-referenced graph shows a scanning time. It takes 3 - 5 seconds to ascend/descend the laser probe and to respond the external signal in actual inspection time.

Variable focus

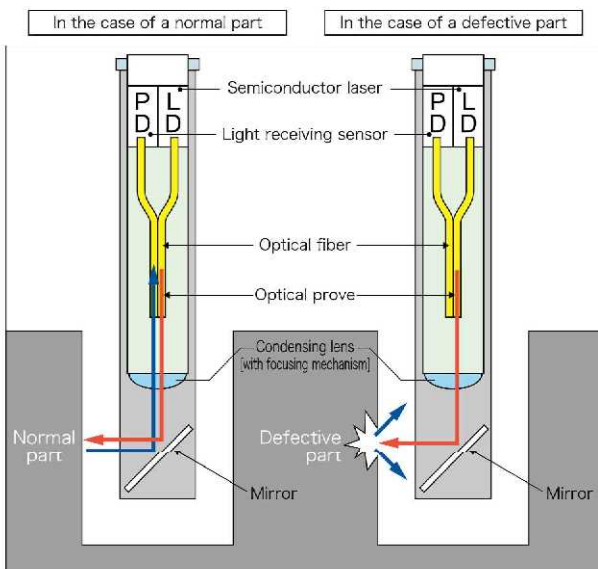
Patented



A Varifocal type of probe has been adopted on GYRO SCAN. So, it can always obtain a sharp image in focus and detect micro defects like minimum $\phi 0.05$ mm. And, it is possible to perform an examination directly with the same probe, even if there exists another examination part that has a different diameter in the works.



High accuracy



GYRO SCAN performs an examination with "the condition", not "the color". Therefore, it is less affected by color alteration caused by watermarks, color shading or different lot.

Although its judgment standard is so divided into 256 shades, it is possible to do a comparative linear operation because it has a one-dimensional resolution.

What's more, GYRO SCAN realizes very highly-reproducible inspection. It performs an examination respectively at the spot with laser light. It is possible to detect mutation sites in real time, and to compile traceability data.

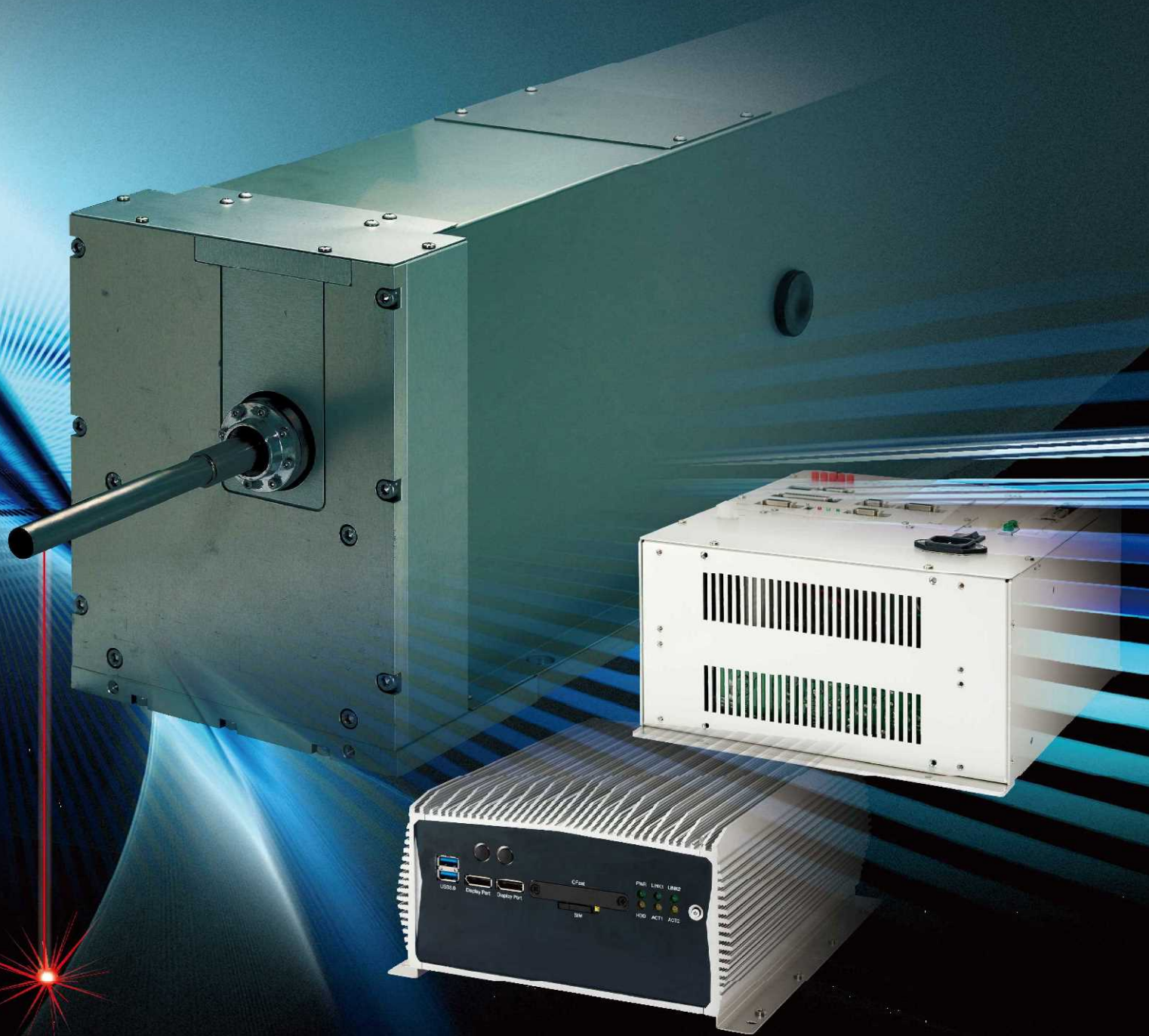
With the probe of GYRO SCAN, only its mirror spins around. It has also superior durability because of no rotation of optical system other than a mirror, in addition that you can run a check at ease. Furthermore, if you damage the probe, there is a possibility you may be able to change out and fix only mirror units.

Stable

For example, factory illumination and lot-to-lot variation, there are many things at a production site that you fail to prevent various changes in environment or materials completely.

The important thing is that you can always produce same inspection results in such a situation.

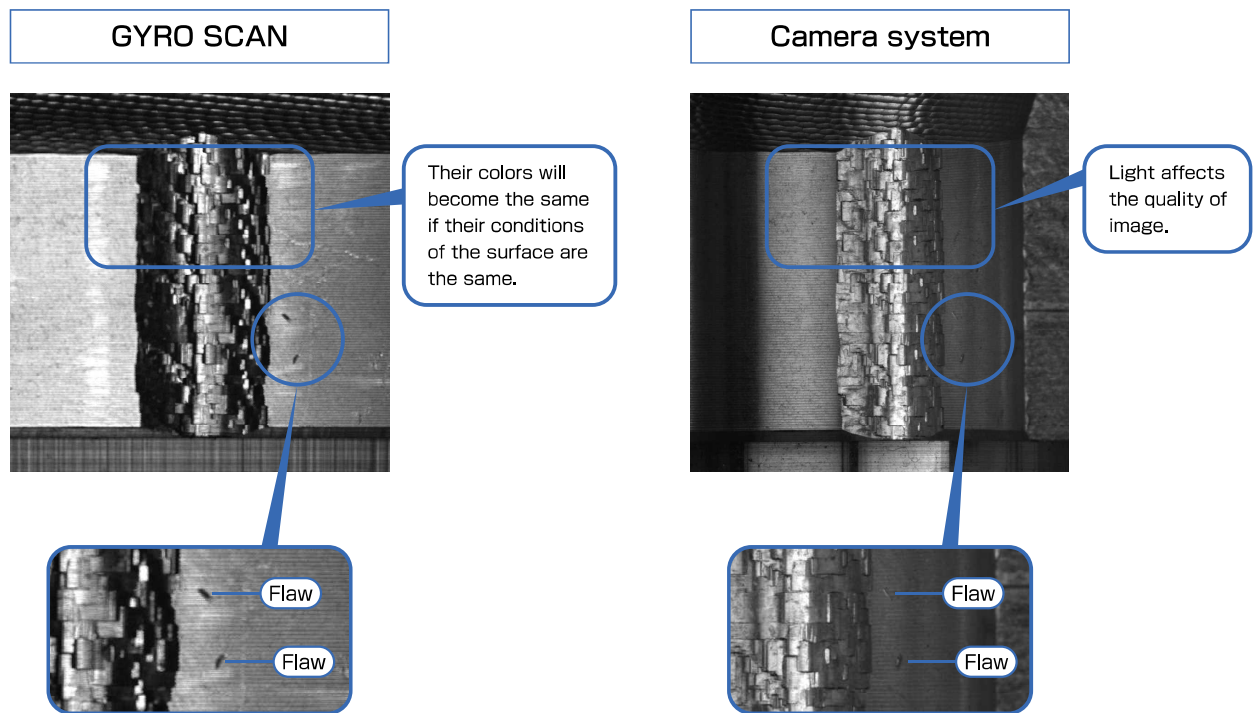
GYRO SCAN has been selected at a production site because it can do that.



Thanks to laser scanning system, we realized stability available for the production site.

Comparisons with Camera system

GYRO SCAN enables you to use an overwhelming high resolution simply and stably. If the device is too hard to use, or if its inspection is poorly reproducible in spite of its high-resolution inspection machine, it will be difficult to deliver high performance on the examination of your production line. On the other hand, even if the device is easy to use, or if its inspection is highly reproducible, it will become short of its correctness when it has a poor energy resolution. If any one from among Correctness, Simplicity, and Stability becomes deficient, it may lead to increase in cost on your production site because you can't help but raising inspection standards and excessively detecting defects. This is the reason why GYRO SCAN finds an overwhelming favor from each production site.



	GYRO SCAN	Camera system	The beauty of GYRO SCAN
Decision factor	Surface condition	Surface condition	GYRO SCAN is excellent at its repeatability because it is insulated from the influence of color variation with color shading or different lot.
Capturing method	Sweeping	Photography	It's possible to perform an examination flexibly because you can separate an inspection area and set out the decision criterion individually.
Information unit	Dot	Surface	You can define the inspection criterion because GYRO SCAN divides into 256 shades at measurement point, depending on only direct data, not indirect value. Because of its defined inspection standard, it's possible to do a comparative operation accurately, to increase repeatability and to reduce an excess screening and detection.
Information content	256 gradation by each dot	Color of surface	
Minimum defect	φ0.05mm	φ0.2mm	You can also detect slight flaws [Ex. 0.05×several millimeters]. You can make a judgment decision strictly because GYRO SCAN can quantify the size of absent parts with a high degree of accuracy.
Light source	Unnecessary	Essential	It is easy to install GYRO SCAN, because you don't have to adjust the light source to sharpen flaws and blowholes. GYRO SCAN has superior repeatability because it is not influenced by the quality of tuning the device or installation environment.

We support usability in aspects of “Software” and “Hardware”.

Inspection screen

Our device detects flaws and blowholes with a combination of various algorithm on inspection screen.

The screenshot displays the inspection software interface. At the top, two panels are labeled: "GYRO SCAN image" and "Image processing [defect detection image]". The main area shows a grid of images with defects highlighted by dashed blue circles. Labels point to "Chips", "Stains", and "A blowhole defect".

Annotations on the left side of the image grid:

- The size and location of the defects can be displayed when you open this window.
- You can measure an edge width.

Annotations on the right side of the image grid:

- Only a processed surface is automatically selected.
- Mask processing is done to the chase of drilled hole. [Untested processing]

The bottom control panel includes:

- A large red "NG" indicator.
- A table showing inspection results:

検査種	エラーNo	結果	欠陥画像詳細	開始~終了
1	1	NG	195	0:10~0:075
1	2	OK	238	0:00~0:00
2	1	OK	272	0:00~0:00
4	-	-	0	0:00~0:070

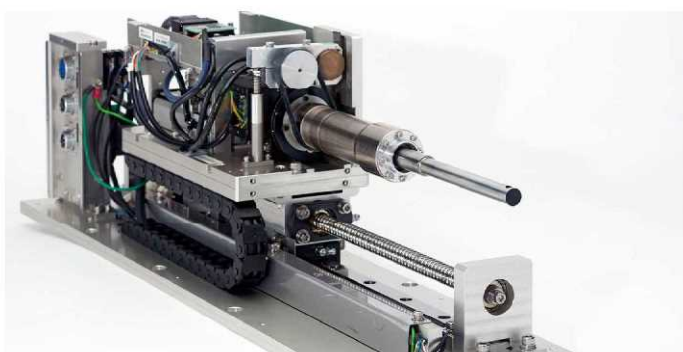
- Buttons for "検査開始" (Start Inspection) and "検査停止" (Stop Inspection).
- Buttons for "不良品" (Defective) and "良品" (Good).
- Buttons for "検査時間: 0:00" (Inspection Time) and "検査終了: NG(平均濃度値96)" (Inspection End).
- Buttons for "設定変更" (Settings Change) and "検査" (Inspection).
- Buttons for "縮小" (Zoom In) and "拡大" (Zoom Out).
- Buttons for "表示画像" (Display Image) and "平均比較検査" (Average Comparison Inspection).
- Input fields for "品種名" (Product Name), "検査位置" (Inspection Position), and "検査直径" (Inspection Diameter).
- Buttons for "検査開始" (Start Inspection) and "検査停止" (Stop Inspection).

Annotations at the bottom of the control panel:

- Up to 60 classes product information can be registered.
- *These defects data and images are saved automatically.
- Click this button to start inspection.
- Specify the detecting location.
- Input inner diameter.

Incorporation of inspection shaft

An actuator that activates a probe is built-in GYRO SCAN. You don't have to work GYRO SCAN for inspection. It's possible to check just to set the works in place. So, you can easily incorporate in carrier device. In addition, it's possible to perform an accurate, highly-reproducible test because of the advance combination of drive-line and measuring system



We perform sample tests, too. We also deal with specialized instrumentation tailored to each production site.

We not only produce a sample at our showroom or development testing room, but also produce a device as our own specialized one by utilizing our longtime knowhow of device production. Please feel free to inquire and confer with us.

Our main plant



Development testing room



An example of instrumentation



We are accepting appointments of our
showroom and development testing room.

Design fabrication of specialty processing machine

We are good at design fabrication of specialty processing machine. We also produce a transfer machine that can do from half process to multiple working process in the machine. It is possible to manufacture a processing machine with built-in inspection function, with a combination of such a specialty device and GYRO SCAN.

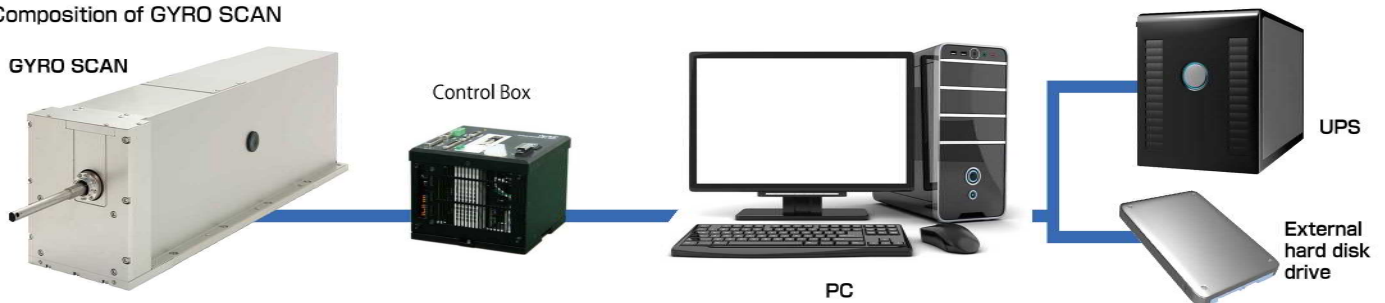
Carrier device and assembly equipment

We design and manufacture every production installation upon your request. We deal with various automated equipment, for examples, we produce an automatic inspection device by building GYRO SCAN into a carrier device, and we produce the assembly equipment that only retrofits acceptable products by building GYRO SCAN into assembly equipment.

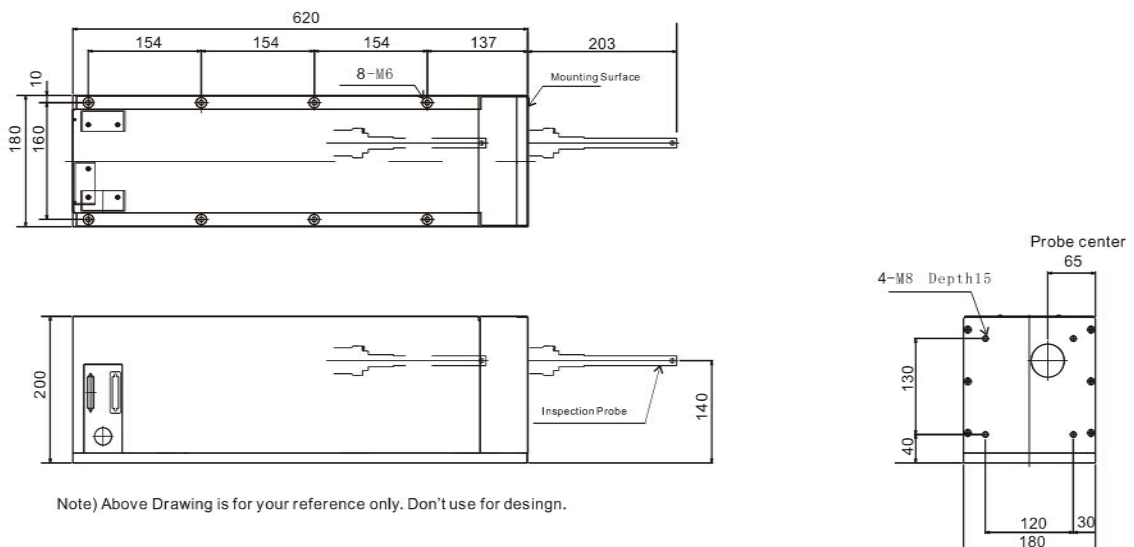
Installation Specification

■ Main Specification	Inspection items	Blow hole, crack, scratch, chips, foreign substances, the presence or absence of grooving process and chamfering process. Processing defect of waviness and roughness, and processed width measurement etc.		
	Inner diameter	φ 1.5 mm~φ320mm		
	Maximum testable length	200mm (*1)		
	Minimum detectable size	Approx. φ0.05mm (*2)		
	Minimum Pixel Resolution	25 μm×25 μm / pix (*3)		
	Positioning accuracy	Less than ±0.2mm (*4)		
	Detectable Defect Information	Number of defects, dimension, length, position of defects etc.		
	External Input Signal	Start of test, Emergency stop, emergency alarm reset, information about product class etc.		
	External Output Signal	Ready, Complete, OK, NG, Apparatus abnormality etc.		
	External Input/output terminal	D-Sub 25 pin		
	Control Box Dimension	170×165×125mm	2kg	*1 It depends on the inner diameter. Please direct the enquiries to the person in charge of our company for details.
	Control Box Mounting	DIN Rail		*2 This figure is based on the inspection capability of high-performance edition. It differs by virtue of the condition of inspection area.
	Direction of installation	All Directions		*3 It varies based on the inner diameter and the testable length. Please direct the enquiries to the person in charge of our company for details.
	Main Body Dimension	180×200×620mm	15kg	*4 It varies by the inner diameter and the required accuracy. Please direct the enquiries to the person in charge of our company for details.
	Power Source	Single Phase 100V, 50/60Hz 5A		*5 Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 , dated June 24, 2007
	Laser class	Class 2 (IEC 60825-1:2007)		(*5)
	Other function	Image storage function Self-diagnosis function		

■ Composition of GYRO SCAN



Dimensional Outline Drawing



■ Contact Us

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■ Agency