

# Application News

Bench-Top X-Ray CT System XSeeker™ 8000

## Introducing the XSeeker 8000 Bench-Top X-Ray CT System

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### User Benefits

- ◆ The compact bench-top system is easy to install in cramped locations.
- ◆ The high output X-ray generator enables a wide range of objects to be imaged, such as plastic products and metal parts.
- ◆ Observation and analysis software comes as standard, so additional equipment is not needed to perform routine inspections and analysis.

### Introduction

Along with demands for higher performance and accuracy, the inspection and analysis requirements of instruments are diversifying. Because detecting internal defects that cannot be seen by visual examination is so important, there has been increasing demand for devices capable of non-destructive examinations. X-ray fluoroscopy and X-ray CT systems that can perform non-destructive inspections and analysis of the interiors of products already exist, but most are large, have many setting items, and are complicated to operate. To resolve these issues, Shimadzu Corporation has developed the XSeeker 8000 bench-top X-ray CT system, an instrument that can be installed on a bench top and is not complicated to operate. Unlike conventional floor type instruments, it is compact, so finding a location to install it is not a problem. Also, there are only three steps in the settings for taking images, so the operability is extremely high. Software for viewing and analyzing the images comes as standard, so the interiors of products can be observed and analyzed without the need for additional equipment. This article introduces the functions of the XSeeker 8000 bench-top X-ray CT system (Fig. 1) and gives examples of images taken.



Fig. 1 XSeeker™ 8000 Bench-Top X-Ray CT System

### XSeeker 8000

In the past, bench-top X-ray instruments had X-ray outputs of about 100 kV and were used for analyzing plastic products and small electronic devices. The XSeeker 8000 bench-top CT system has a high output of 160 kV, so it can be used to analyze not just plastic components but also metal products, such as aluminum die castings. With this instrument, it is possible to examine aluminum of about 100 mm thickness and iron of about 20 mm thickness. Before, automotive parts and products that are an assembly of parts used to require a floor type instrument, but now they can be examined with a bench-top. A minimum resolution of 0.1 mm can be achieved, so detailed parts can be observed, such as internal defects in die castings, missing parts in the interior of assemblies, and the condition of assembled parts, etc.

The dimensions are W 893×D 650×H 526 mm, and it weighs approximately 290 kg. A dedicated table is not required, and the instrument can be installed on a testing platform or something similar. The maximum size of a sample that can be loaded is  $\phi 300 \times H 320$  mm with a maximum weight of 10 kg, and the maximum image size that can be taken is  $\phi 100 \times H 80$  mm (Fig. 2).

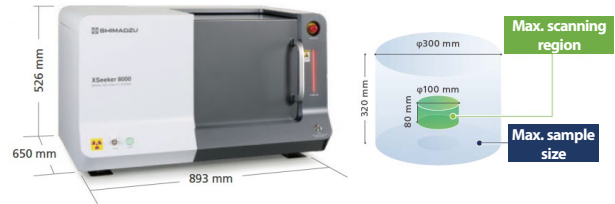


Fig. 2 Dimensions of XSeeker™ 8000 and Sample Size that can be Imaged

### XSeeker 8000 Operability

The main unit has a rotation table on which samples are placed for CT scanning. The guide light function (Fig. 3, left image) assists in positioning the sample. From the shadow of the sample projected onto the light receiving screen, the scanning range can be ascertained. Therefore, there is no need for an advanced scanning plan or projecting a fluorescent image. The image taking procedures are also extremely simple. Just place the sample on the table; close the door, press the CT scanning button and scanning will start, without the calibration that has been required for CT scanning until now (Fig. 3, right images). The scanning conditions can be set by just selecting the following four items: the material (plastic or metal) and the resolution (Fast: low resolution but quick, or Fine: high resolution but slow). So detailed setting conditions are not required. Until now image, quality depended on the skill of the user. But now ideal images can be taken regardless of the operator's proficiency level in as little as 12 seconds. After scanning is completed, multi-planar reconstruction (MPR) images and volume rendering (VR) images are displayed, which enables the interiors of parts and products to be observed easily and in a short time. Dimensional measurements can be taken on cross-sectional images, enabling not only pass/fail decisions to be made but also feedback to manufacturing lines in a short time.

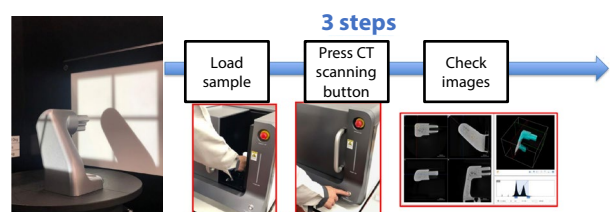


Fig. 3 Left: Guide Light / Right: Operational Steps

## Examples of Scanning

The following are examples of images created by the XSeeker 8000.

### (1) Aluminum Die Cast Parts

Aluminum die castings can be produced in various shapes and sizes. Since they are also strong, they are widely adopted not only in automobiles and motorcycles but also in electrical products. During the manufacture of aluminum die castings, internal defects can occur. If these defects occur on the processing surface, it can result in reduced strength or leaks. The white parts in Fig. 4 are aluminum die castings, and the black parts within the aluminum die castings are cavities or defects. Any cross section can be viewed with an MPR image, so the position and size of a defect can be easily observed, as can the three-dimensional shape and position of a defect using a VR display.

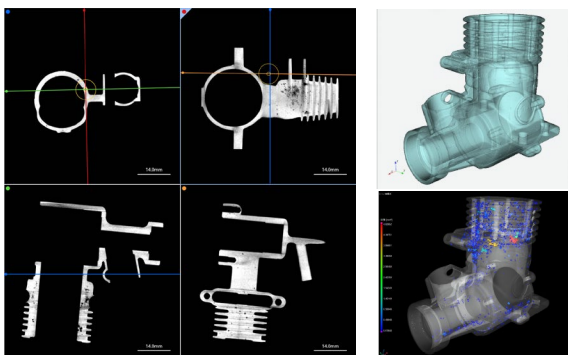


Fig. 4 Observation of Automotive Die Casting

### (2) Motorcycle Lamp Unit

The lamp unit is extremely important for ensuring safety. But because it is constantly exposed to the atmosphere, moisture from rain can penetrate it, leading to a short circuit of the electrical parts or power leakages. The sealing against water ingress at damaged parts (1, 2, and 3 in Fig. 5) and at the connections to plastic parts can be examined in three dimensions.

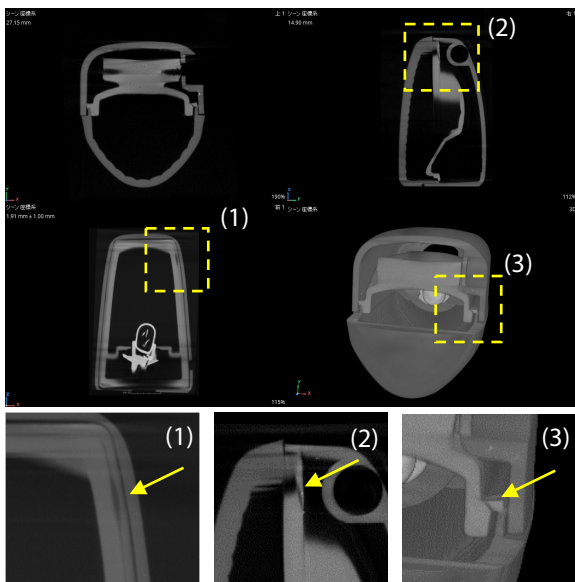


Fig. 5 Observation of a Motorcycle Lamp Unit

### (3) Plastic Molded Parts

In the images below, internal rubber parts, for fixing a cable to prevent slackness, and other parts can be seen. The shape of the rubber, its status of inclination, and the overall status of assembly can be observed. The number of parts and the status of interlocking can also be checked.

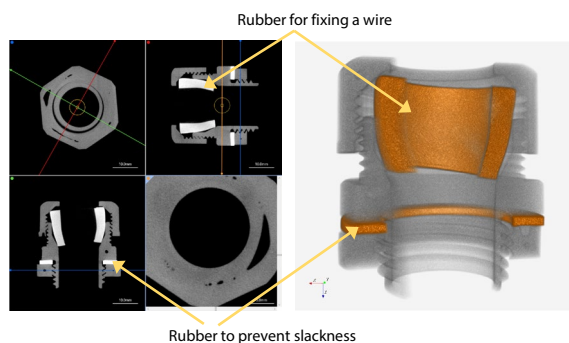


Fig. 6 Observation of Plastic Molded Parts

### (4) AC Adapter

In an AC adapter, the various electrical parts mounted on printed circuit boards, such as coils and fuses, can be observed. In the case of damage or burnout, the images are useful for inferring or identifying the cause of the failure.

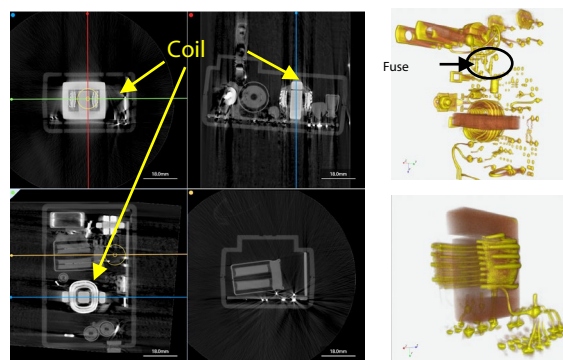


Fig. 7 Observation of an AC Adapter

## Conclusion

As shown above, despite the compactness of the XSeeker 8000 bench-top X-ray CT system, it is capable of observing and analyzing non-destructively and three-dimensionally the insides of a wide range of products, such as metal and plastic products and electrical equipment. In addition, the setting items are few and simple, so any user can operate it. Even with normal inspections, it is possible to make pass/fail judgments and check the status of an assembly. And because it can be used in product development and in failure analysis, product reliability and yields can be improved.

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