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**Non-destructive testing — Automatic
inspection system for inner diameter
surface of machining holes — Part 2:
Method of testing for performance
characteristics of laser inspection
system**

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Foreword

This Japanese Industrial Standard has been established by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Act.

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JIS Z 2324 series consists of the following 4 parts under the general title *Non-destructive testing — Automatic inspection system for inner diameter surface of machining holes —*:

Part 1: Standard test blocks

Part 2: Method of testing for performance characteristics of laser inspection system

Part 3: Method of testing for performance characteristics of camera inspection system

Part 4: Method of testing for performance characteristics of eddy current inspection system

Non-destructive testing — Automatic inspection system for inner diameter surface of machining holes — Part 2 : Method of testing for performance characteristics of laser inspection system

1 Scope

This Japanese Industrial Standard specifies the method for verifying the performance of an inspection system that is designed to perform automatic flaw inspection of the inner diameter surface (hereafter referred to as the inspection surface) of machining holes used mainly in automobile and industrial machine components (hereafter referred to as the inspection system) by means of laser beam with the use of standard test blocks specified in **JIS Z 2324-1**.

The principle of flaw detection carried out by the inspection system is detailed in Annex A.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 1609-1 *Illuminance meters Part 1 : General measuring instruments*

JIS Z 2300 *Terms and definitions of nondestructive testing*

JIS Z 2324-1 *Non-destructive testing — Automatic inspection system for inner diameter surface of machining holes — Part 1 : Standard test blocks*

JIS Z 8120 *Glossary of optical terms*

JIS Z 8401 *Rounding of numbers*

JIS Z 9110 *General rules of recommended lighting levels*

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions, and those given in **JIS Z 2300**, **JIS Z 2324-1** and **JIS Z 8120** apply.

3.1

probe

part of an inspection system which irradiates the inspection surface with laser light and receives the reflected light

3.2

misalignment

state in which the axial centre of a probe is not in agreement with the axial centre of the inside diameter of a standard test block

3.3

amount of misalignment

distance out of alignment in misalignment

3.4

centring

bringing the misaligned axial centres into alignment

3.5

raw data

data output from a probe immediately after analogue-to-digital conversion

3.6

verification conditions

set of conditions consisting of the conditions for acquiring raw data such as a waiting position, scanning start position, scanning end position and probe feed rate (hereafter referred to as measurement conditions) and the conditions for judging a flaw from raw data (hereafter referred to as judgement conditions)

3.7

expanded image

plan view image obtained by expanding the entire circumference of an inner diameter surface

3.8

lightness waveform

graph, usually in waveform, which shows the lightness of one circumference obtained on any circumference in the expanded image of a standard test block

3.9

pixel size

actual dimension, in millimetres or micrometres, of one side in each direction per one pixel in an expanded image

It refers to the crosswise direction length in the case of a row, and the lengthwise direction length in the case of a column.

3.10

repeat accuracy

degree of agreement among results obtained by measuring the same artificial flaw of the selected standard test block repeatedly within a short amount of time

The measurement is performed using the same measuring method and the same inspection system of the same laboratory by the same test operator.

3.11

ambient light

light which enters from outside the inspection system and exerts an influence on the inspection result

4 Performance test items of inspection system

The performance of an inspection system shall be verified on the following test items.

- a) Repeat accuracy
- b) Misalignment
- c) Inspection time
- d) Ambient light

5 Test atmosphere

The test atmosphere for an inspection system shall be as follows.

- a) The temperature and relative humidity in the laboratory should be $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and 35 % to 85 %, respectively.
- b) The illuminance in the laboratory shall be that applied to the ordinary visual work in general production process specified in 5.4 of **JIS Z 9110**. Other illuminance may be applied upon agreement between the parties concerned with delivery.
- c) The inspection system shall not be exposed to direct sunlight.

6 Inspection system and standard test block

6.1 Inspection system

The inspection system mainly consists of a probe, a probe feed mechanism, a control unit and a personal computer (hereafter referred to as PC). An example of the composition of an inspection system is shown in Figure 1. The specification of an inspection system is given in Annex B.