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**Calibration Specification for Linear Displacement Sensors
(English Translation)**

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1 Scope

This Specification applies to the calibration for linear displacement sensors.

2 Normative references

This Specification refers to the following documents.

JJF 1001-1998, General Terms in Metrology and Their Definitions

JJF 1059-1999, Evaluation and Expression of Uncertainty in Measurement

JJF 1094-2002, Evaluation of the characteristics of measuring instruments

GB/T 7665-2005, General terminology for transducers

GB/T 13606-2007, Instrument for geotechnical engineering -- General specifications of vibrating wire sensor

GB/T 18459-2001, Methods for calculating the main static performance specifications of transducers

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies to this Rules.

3 Terms

3.1

linear displacement sensor

A device that can sense changes in length and size and convert them into a usable output signal.

3.2

sensitivity

The ratio of the change in sensor output to the change in the corresponding input.

3.3

linearity

The percentage of the maximum deviation of the sensor's actual average characteristic curves in forward and reverse strokes relative to the reference straight line and the full-scale output.

NOTE: Depending on the reference line, there are various linearities. This Specification uses the least squares line or the optimal line as the reference line.

3.4

full scale output

Under specified conditions, the algebraic difference between the upper and lower limits of the sensor output.

NOTE: For vibrating wire (strain) displacement sensors, due to the special nature of their output, the full-scale output is the algebraic difference between the square of the upper limit output frequency and the square of the lower limit output frequency within the sensor's output range. If the vibrating wire (strain) displacement sensor uses the frequency modulus (the square of the output frequency divided by 1000) as its output, then the full-scale output is the algebraic difference between the upper limit output frequency modulus and the lower limit output frequency modulus.

4 Overview

Linear displacement sensors are widely used in engineering testing to measure length dimensions such as displacement, distance, position, and strain. Linear displacement sensors output various types of signals. Most output electrical signals, such as pulse signals of different frequencies, voltage, or current-analog quantities. Some linear displacement sensors also integrate signal conversion functions, enabling them to directly output length dimensions digitally or in other ways.

The simplified schematic diagrams of typical linear displacement sensors are shown in Figures 1~4.

1 - Measuring rod; 2 - Outer casing; 3 - Coil; 4 - Moving iron core; 5 - Signal processing unit; 6 - Cable

Signal processing unit; 6 - Cable

5 Metrological characteristics

The main metrological characteristics of a linear displacement sensor include.

sensitivity, basic error, linearity, hysteresis error, and repeatability.

For linear displacement sensors that can output length dimensions directly in digital or other ways, only the three metrological characteristics (basic error, hysteresis error, and repeatability) need to be calibrated.

The metrological characteristics of typical linear displacement sensors are shown in Tables 1~7.

5.1 Inductive displacement sensor

The metrological characteristics of the inductive displacement sensor are shown in Table 1.

5.2 Differential transformer type displacement sensor (including DC differential and AC differential transformer types)

The metrological characteristics of differential transformer displacement sensors (including DC differential and AC differential transformer types) are shown in Table 2.

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