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Scale of Measured Quantities and their Types

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Abstract: This article describes in detail information about defects that occur in the production of machine building parts, and errors that occur during the measurement process, ways to prevent and eliminate them, as well as the procedure for using measuring instruments.

Keywords: Measurement, tool, error, rod, micrometer, indicator, scale, method, size, device.

An ordered set of magnitude values, which serves as the starting basis for measuring a given magnitude, is called a magnitude scale (Fig. 1). In the theory of measurements, there are five main types of measurements: nominal scale, ordinal scale, interval scale, ratio scale, and absolute scale.

The main types of measuring scales.

Named scales are:

- equivalence relations can be used
- order relationship (for example, "greater-smaller") is not used
- the relation of proportionality is not applied
- aggregation relation is not applied
- zero criterion does not exist
- there is no unit of measurement.

Ordinal (row) scale – dimensions of measured quantities in ascending or descending order, which are:

- equivalence relation is used
- order relation ("big-small" type) is used
- the relation of proportionality is not applied
- aggregation relation is not applied
- the concept of zero exists or not
- there is no unit of measurement.

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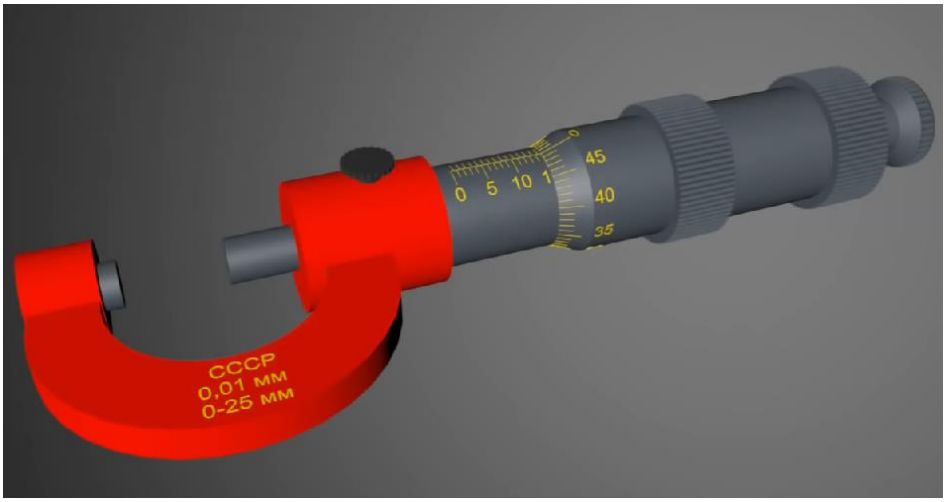

a)

b)

b) Figure 1.8. Measurement methods and tools. a) micrometer; b) barbell curl.

Example Mechanical hardness scale of metals (Brinnel, Vickers, Rockwell, Shore, etc.) hardness scales of objects light sensitivity scales (light sensitivity) alkaline, iodine, hydroxyl, ether numbers wind strength score (Beaufort scale , strength of earthquakes (according to the Richter scale), explosions in nuclear power plants (according to the IAEA scale) and resistance to damage.

The interval scale will be:

- equivalence relation is used
- the major-small order relationship is used
- the relationship of proportionality is used
- aggregation relation is used
- there is a concept of zero established by agreement
- there is a unit of measurement set according to the agreement.

Oraliq shkalasida o'lchanadigan kattaliklarning o'lchamlari aniq intervallarda (oraliqlarda) joylashtiriladi.

Example

1. The international temperature scale, whose values are accepted by agreement between the countries of the metric convention and made up of reference points determined on the basis of accurate measurements, serves as the initial basis for temperature measurement.
2. Scale of time intervals. It is possible to add (subtract) intervals (intervals) on the time interval scale and compare how much one interval is larger (smaller) than another, but there is no point in adding the time of some event.
3. Length scale (length measurements rulers, rulers, calipers, clamps, etc.
4. Celsius, Fahrenheit, Reomura and other temperature scales.

The ratio scale will be:

- equivalence relation is used;
- "major-minor" order relationships are used;
- the summation relation can be applied;
- one-valued, there is a natural criterion of zero;
- there is a unit of measurement determined by agreement;

Absolute scales are:

- equivalence relation is used;
- the relation of rows (for example, "big-small") is used;
- the relationship of proportionality is used;
- there is a one-valued, natural zero criterion;
- there is a concept of measurement unit.

There are standards and such types of measurements that directly reproduce the scale, and it is not appropriate to apply the concept of a unit of measurement to them. Examples of this type of measurement are, for example, very common (internationally) measurements of light sensitivity of photomaterials on a numerical scale, and measurements of body hardness on a numerical scale. It is common to measure colors using a color atlas, and the color samples are labeled with their names or conditional numbers.

In addition, there are international scales without a special reference device, for example, the international scale of earthquake force, the scale of wind force according to Beaufort, etc.

So:

a) a scale can be without a standard, but a standard cannot be without a scale;

b) a scale can be without a unit of measurement, but a unit of measurement cannot be without a scale.

All this means that metrology is a general and fundamental concept in relation to the concept of "scale of measurements", "unit of measurements".

In some cases, in practice, it is necessary to transfer the value of a quantity from one scale to another, and it is carried out according to the following expression:

$$y = (x - x_1)\frac{y_2 - y_1}{x_2 - x_1},$$

Where x and u are points on the first and second scales; x1, x2, y1, y2 are the first and second reference points on the scale.

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