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# ANALYSIS OF THE MEASUREMENT SITUATION IN THE STANGENCIRCUL

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**Abstract**
In this article, the barbell circuit, its role in mechanical engineering and the resulting errors are analyzed and recommendations are given.

**Keywords:** Measuring instrument, error, grading, scheme.

## Introduction

In recent times, digital instruments have become more and more widely used, because their readings are easily recorded, and it is convenient to include them in EHM. The structure of digital instruments allows for greater accuracy in measurement than analog instruments. At the same time, there is no reading error when digital instruments are used. But analog instruments are much simpler and cheaper than digital instruments.

In indicating instruments, numerical values are read from a scale or digital board. Recording devices provide for the recording of readings on chart paper or digital printing. Combined instruments display and record the measured quantity at the same time. In integrating devices, the measured quantity is integrated over time or over another arbitrary variable. Indications in summing devices are functionally connected with the sum of two or more quantities supplied to it by different channels [1].

Measuring devices are distinguished in practice by direct-acting and comparison measuring devices.

In a direct measuring device, the measurement result is obtained directly from its display device. Examples of such devices are an ammeter, a pressure gauge, and a mercury-glass thermometer. Direct-acting measuring instruments are designed for measurements by the direct evaluation method.

Depending on the task performed in the measurement process, measuring instruments are divided into working, standard sample and standard measuring instruments.

Work measuring devices are designed for practical measurements in all sectors of the national economy. They are divided into precision measuring instruments and

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technical measuring instruments. Standard sample gauges serve to compare and rank work gauges against each other. Standard instruments serve to restore and store combinations of physical quantities, to transfer their dimensions to work measuring instruments used in the national economy through sample measuring instruments.

A standard sample is a measure to reproduce the unit of quantities characterizing the properties or composition of substances and materials. For example, ferromagnetic materials whose chemical elements are specified are standard examples of properties. Standard sample measuring instruments serve to compare and rank working measuring instruments.

Standard measuring instruments - a measurement consisting of a substance that has certain properties that are restored when the conditions of preparation are observed, specified in the approved specification. For example, "pure" gases, "pure" metals, "pure" water.

Standard instruments serve to restore and store combinations of physical quantities, to transfer their dimensions to work measuring instruments used in the national economy through sample measuring instruments. In this way, the size of the units of physical quantities is transferred from standards to other measuring devices using sample measuring devices.

In order to identify errors in the readings of measuring instruments or to correct their readings, it is called comparing the readings of measuring instruments with the readings of sample measuring instruments.

The operation of assigning values expressed in units of measurement to the units of comparison of a scale instrument is called grading.

The physical quantities being measured with the help of measuring instruments are converted into an output quantity, which is used as a measurement information signal.

When measuring a physical quantity, the measuring device (instrument) moves the physical quantity in proportion to the indicator:

$$\varphi = f(B)$$

here, $\varphi$ — angular or linear displacement of the instrument indicator, $V$ — physical quantity being measured.

Yuqorida keltirilgan bogʻlanish asbob shkalasining **tenglamasi** yoki **tasnifi** deyiladi. Har qanday oʻlchov asbobining ishi oqibat natijada oʻlchanadigan kattalikni koʻrsatkichning siljishiga moslab oʻzgaririshga keltiriladi.

Therefore, the measuring device can be viewed schematically as a transducer that changes the measured physical quantity V to the amount of mechanical displacement of the indicator φ. Depending on the number of intermediate changes, the tool can be

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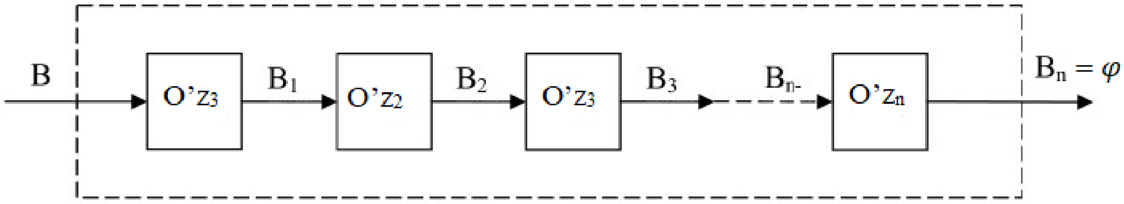
divided into links, each of which changes the amount V within the tool in a certain way. This set of joints changes the required change of the measured quantity to the displacement of the indicator [2].




Scheme 1. Schematic structure of the measuring instrument

Regardless of the structural scheme of the desired measuring instrument, its operation, principle, measuring joints connected in series Oz1, Oz2, Oz3,....., Ozn , can be described as a chain composed of
The input value for the first term Uz1 is the quantity V. The output value of each link serves as the input value for the next link. The last O'zn, the output value of the joint means the displacement of the pointer Vn = φ.
In general, depending on the principle of construction of the structural scheme of the measuring instruments, it can be divided into two groups: the measuring scheme with a direct change and the measuring scheme with an adaptive signal. According to the principle of correct conversion, the quantity being measured in the measuring devices of the device comes to the primary converter or to the sensitive element, which is part of its measuring chain. In the measuring chain, it is usually performed by changing the signal of a carrier of information (electric current strength or voltage, compressed air pressure, etc.) of the measured quantity. Then this signal is amplified and transmitted to the counting device. In the simplest version, only a sensitive element and a counting device can remain from this circuit. Correct converter circuits are simple, reliable, fast enough, and inexpensive. But they cannot be used in practice for measuring small signals.
Let's get acquainted with some of the most commonly used measuring devices [3].

**1. In the mechanical engineering system**

The most common measuring tools include calipers, micrometers, and nutrometers. All of them allow for very accurate results, but even with the best tools, measurement error exists. As a rule, its value is indicated in the technical passport and it directly affects the price of the device. The lower the error, the higher the measurement

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accuracy, which means that the price can be significantly different from the price of the same caliper or a simpler model of a micrometer.

A vernier caliper is an instrument consisting of a frame with a solid metal ruler (rod), a vernier and measuring sponges. The division of the rod reaches the mark of 0.5 mm and the vernier is 0.02 mm. There is a special screw on the ruler to correct the risks. Measuring sponges are divided into upper and lower parts. The first is used to take internal measurements (mainly holes in parts), and the second to take external dimensions of products.

**Method of operation**

The bottom measuring sponges are separated to the sides, the detail between them, and then the sponges move all the way. To measure the part, the upper sponges are moved, inserted into the measuring hole and opened there. When working with a caliper, it is important to hold the tool perpendicular to the part so that the sponges fit snugly against the surface being measured. The measurement results are determined by the main scale and vernier. In addition to conventional calipers, there are also electronic models of the instrument that display the measurement value on the dashboard.

The main reasons that lead to incorrect data during measurement are the inability to use the tool, the use of a damaged tool, contamination of the working surfaces of the tool and the measured object, measuring a heated or cooled part. Therefore, it is very important to store measuring instruments in protective cases, remove dirt from them in time, and check that the first mark on the scale corresponds to zero. In most cases, the standard temperature at which parts (especially metal) are measured is +20 [4].

Another way to reduce the error is to perform a series of measurements of one parameter and calculate the arithmetic mean. This practice is widely used when using inexpensive instruments, and also does not hurt when measuring with professional models, where the error is very small.

The principle of operation of this device is based on the fact that the eye better captures the correspondence of the divisions of the main and auxiliary scale, than the mark between the divisions. Also, a vernier zero value indicates a whole division, and a division number corresponding to a main scale division indicates a fraction. The use of a vernier makes it possible to achieve results with accuracy up to tenths of a millimeter.

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