

## **ELECTRONIC SURVEYING INSTRUMENTS AND THEIR USES**

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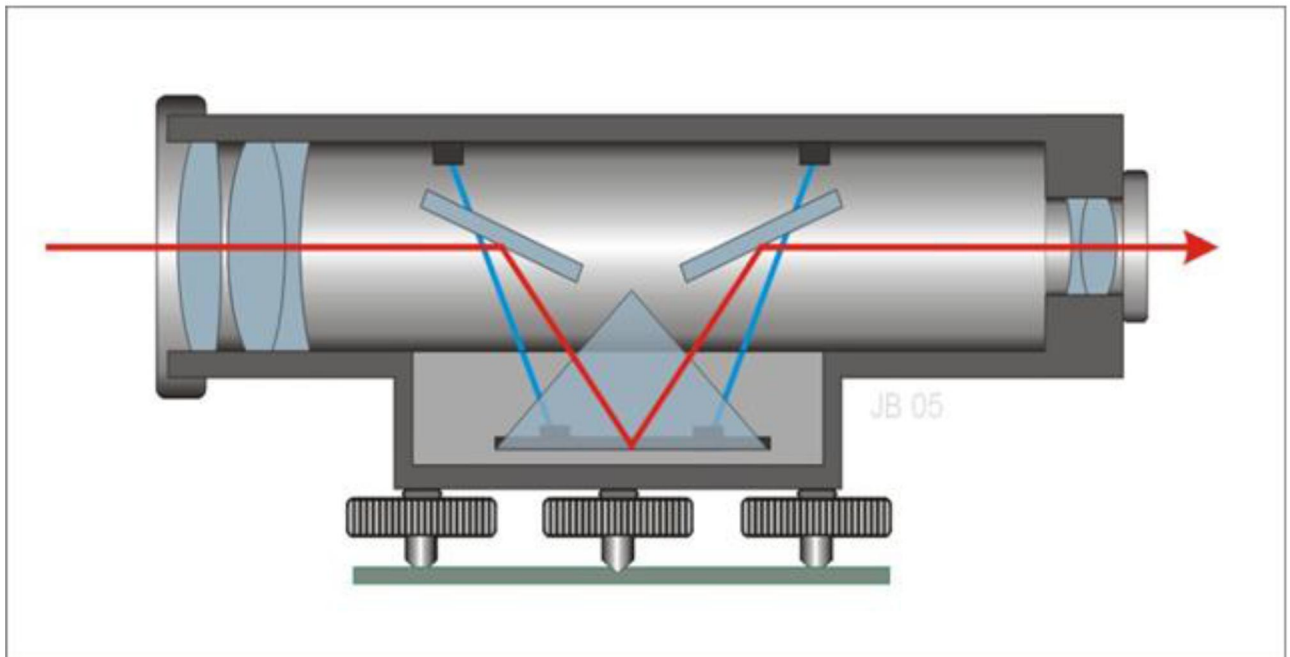
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Today, modern surveying instruments provide faster and more precise surveying than conventional instruments.

Geodetic instruments are used in field measurements, which aim to determine the position of points and directions of lines on the earth's surface. Horizontal and vertical angles, distances and elevations are measured with the help of geodetic instruments.

The most commonly used devices are theodolites, electronic levels, rangefinders, GPS-receivers and other measuring tools.

Theodolite is used for angular measurements, namely for measuring horizontal angles. It is mounted on a tripod stand with three lifting screws that attach to the tripod head. The vertical plane is determined by a telescope that rotates around its axis. The most important benefit of theodolites is their accuracy [2, p. 84].



Pic.1. Level with compensator

Levels are used to create a horizontal viewing space (Pic.1). Depending on the type of surveying task, levels of I, II, III and IV classes are used. There are two types of levels: optical and electronic, digital levels. Working with optical levels you need to use scale rail, while electronic levels do all the measuring tasks automatically [2, p. 244].

Modern optical levels are equipped with an automatic compensator - a device for automatic installation of the visual axis of the device in a horizontal (working) state. In levels with a compensator, a cylindrical level parallel to the axis of the telescope may be absent. Most levels also have a round level for rough leveling of the tool.

All optical levels also have a thread rangefinder to determine the distance along the rail. This is due to the need to control the equality of the shoulders when leveling in the "middle" way. [1, p.105-106]

According to the accuracy all the levels are divided into high-precision, accurate and technical. High-precision optical levels are equipped with a micrometric plate or with a capacitive nozzle for sampling on a dashed invar rail. Cup rails are usually used for technical leveling, as well as leveling of III and IV accuracy classes.

In addition to optical, in recent years, digital levels have become widespread. They are used together with a special bar code rail, which allows you to automate the start of the reading.

Digital levels are usually equipped with a storage device, which allows you to store the results of observations.

Phase rangefinders consist of four elements: a transmitter, a receiver of a phase measuring device and a reflector. First-generation rangefinders use an optical modulator that works synchronously with the transmitter modulator under the influence of voltage from a single oscillation generator. Today, first-order rangefinders, which convert light flux into photocurrent, are used [3, p.97].

Ground-based GPS receivers are sophisticated and high-precision electronic devices. The microprocessor controls the operation of the entire receiver and performs some calculations. The memory device stores the originally processed signals received from satellites and information entered by the operator during scheduling and processing as well as control commands. From it the information is transcribed into the personal computer for the further calculations [3, p.303].

To sum up, it must be said that electronic surveying instruments are widely used not only in surveying but also in other engineering fields to solve certain scientific or practical problems.

## **References**

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