Data Precision and Measures for Computers, Sensors and Systems

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ABSTRACT: *The reliability and accurate values of measurements is possible now due to the use of electronic precision and sophisticated equipment. We can consider the magnetic fields which is a major input parameter and we can produce new kinds of sensors and measures. The accurate value of the measurement signals is possible based on computers and systems which collect data. We in this work, have proposed a system for measuring magnetic field. The IC was developed by a specific precision manufacturing is deployed for data measures.*

Keywords: Hall Sensors, Measuring of Magnetic Field, DAQ Systems, Virtual Instruments

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1. Introduction

Different types of sensors for measurement and detecting of magnetic field like as Hall elements, magnetoresistors, magnetotransistors,, magnetodiodes, magnetothyristors, magnetosensitive integrated circuits are known. Hall elements are among the widely used galvanomagnetic elements. Their planar structure [4] is absolutely compatible with modern integral technologies and is conductive to magnetosensitive integrated circuits making. They have good magnetic sensitivity, a wide change range of measured magnetic field and high reliability of output signal [1-4].

In much areas of automatics, instrumentation, electronics, machine building, chemical industry and etc is necessary to fulfill precise automatized measurements cheking and observation of different processes and quantities. A creating of a such kind apparatuses is possible but their bulk, reliability and operational period do not justify the experiments. In the modern electronic system it is made by fulfilling of virtual devices which enable information signals collection and their treatment, visualization, storage and decision taking for processes control.

The purpose of the present working is to create and investigate an automatized virtual system for measurement of magnetic field on a basis of magnetosensitive integrated circuit MLX242 manufactured by Melexis and DAQ-module USB6009 manufactured by National Instruments for data acquisition [5, 6].

2. Presentation

Block diagram of a realized virtual system is shown in a Figure 2. It is composed of magnetosensitive integrated circuit (IC) of the type MLX242. Its power supply leads UCC, GND and the output lead U_O are connected to DAQ–module for data acquisition and processing of the type USB6009 which is connected by USB interface to personal computer [6].

The chosen magnetosensitive IC is linear transducer of magnetic field to electrical vvstic $U_O = f(B)$ at U_{CC}= const is investigated and depicted in Figure 1. It is disposed in the first and fourth quadrants and shows a good linearity. The investigation is fulfilled for magnetic field $B = (-50 \div 50)$mT and supply U_{CC}= 5V. For this type sensor is typical that in magnetic field absence the output voltage is $U_O = 2,5$V at U_{CC}=5V. This chosen voltage enables to use the build in DAQ-module stabilized supply (5V).

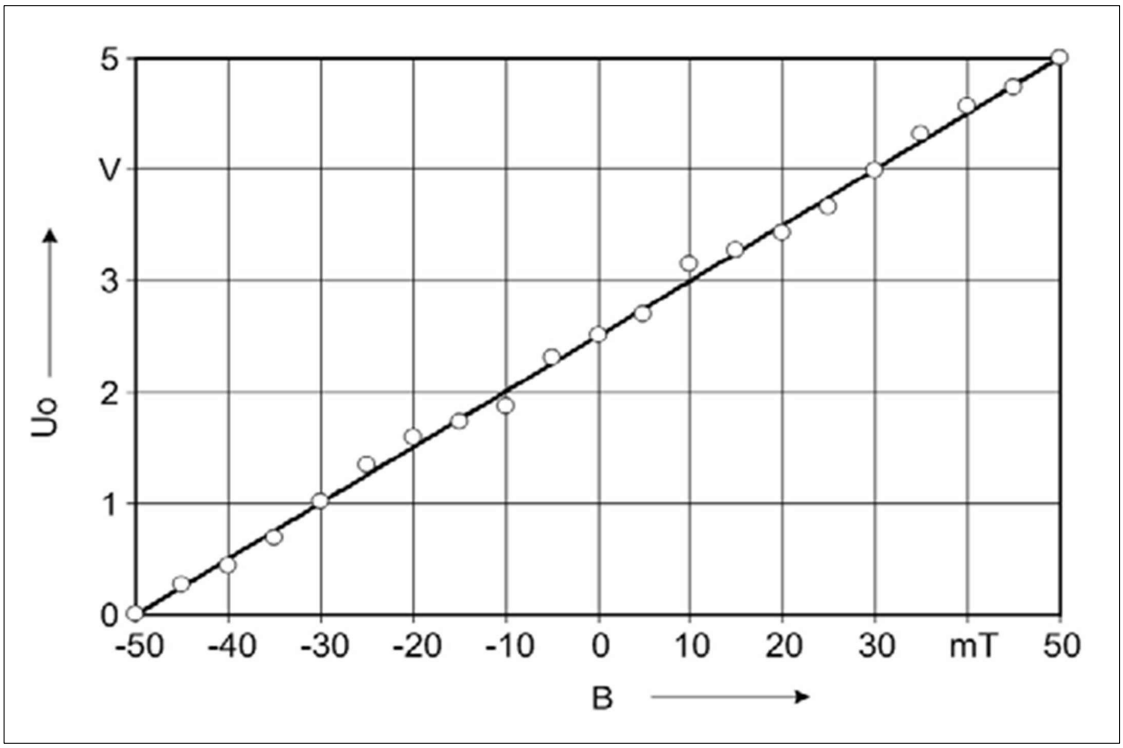

Figure 1. Conversion characteristic $U_o = f(B)$, U_{CC}=5V of magnetic field linear transducer MLX242

The module USB-6009 collects and treats an information. It has 14bits analog-to-digital converter with a system of 10 channels. A signal from an investigated galvanomagnetic sensor is handed to one of all converter input.

The software environment is provided by LabView v.8.5 program package manufactured by National Instruments. The created virtual device consists of two modules: instrumental in which are placed measuring instruments and program where is introduced a virtual system real software. They are depicted respectively in Figure 3 and Figure 4.

On the instrumental panel (Figure 3) are placed two identical measuring instruments for measurement of output voltage U_o from magnetosensitive I_C an of applied magnetic field inductance B.

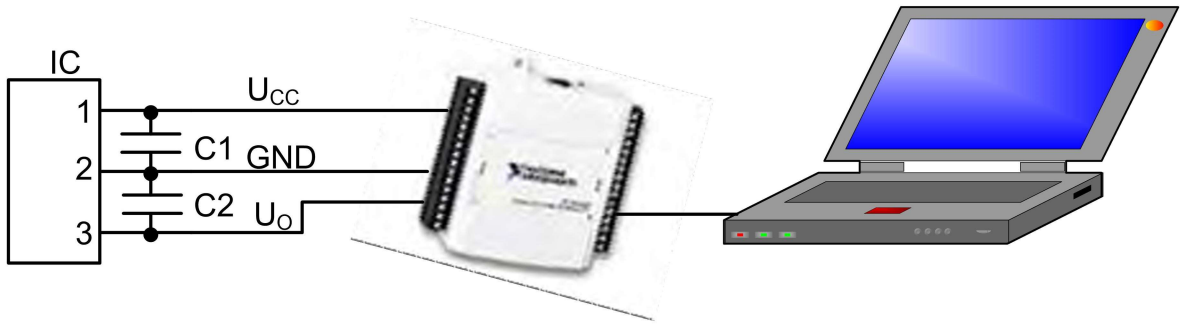

Figure 2. Block diagram of a system for magnetic field measurement

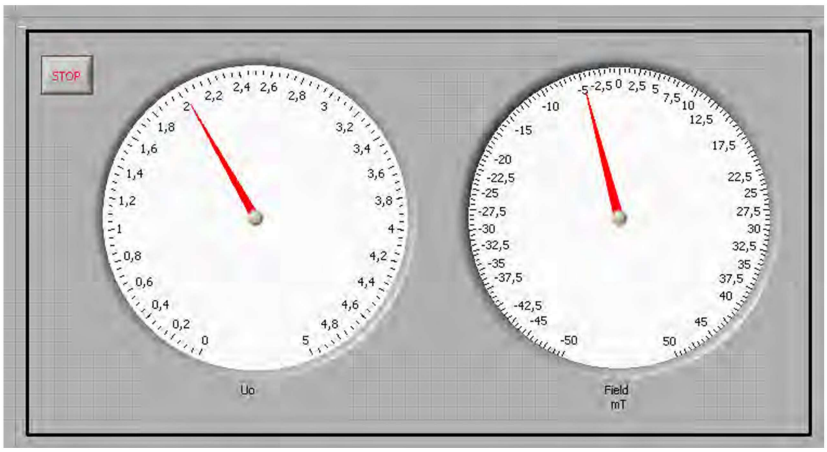

Figure 3. Instruments panel

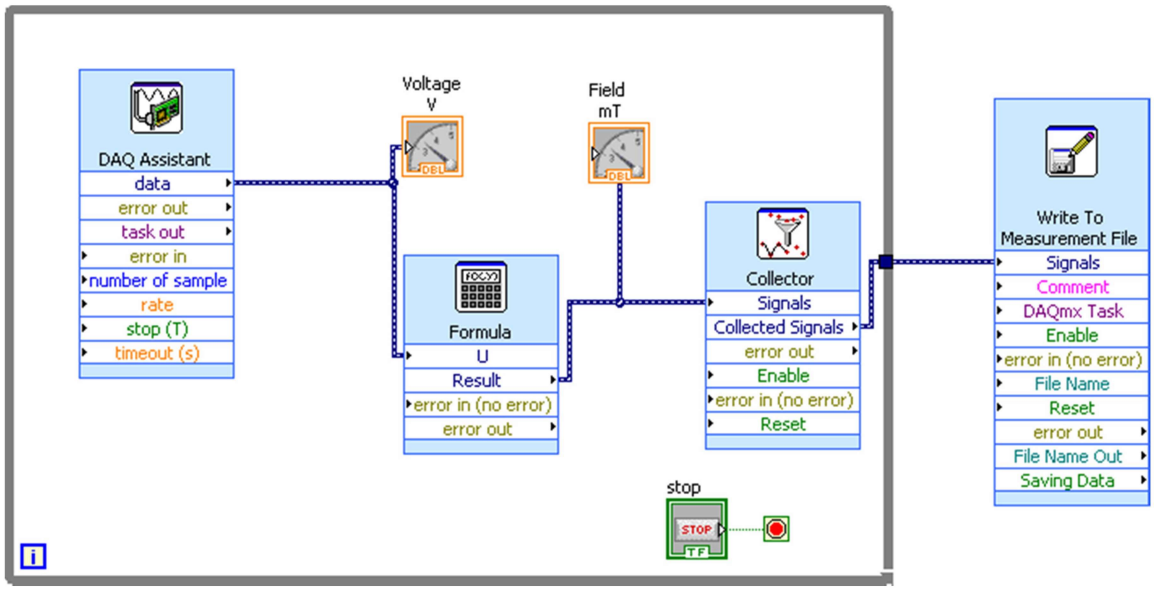

Figure 4. Software block schematic diagram

By means of depicted in Figure 2 experimental obtained conversion characteristic the output signal from magnetosensitive *IC* is transformed in magnetic field. By means of the lesser squares method is obtained a describing the conversion characteristic mathematical equation:

$$U_O = 0,0501\text{B} + 2,5001 \qquad (1)$$

For a magnetic field is necessary the obtained equation to be introduced in block Formula (Figure 4). To input *U* on the block diagram is handed the measured by DAQ Assistant signal which represents the magnetosensitive IC output voltage. The magnetic field measured magnitudes are obtained on output Result.

The results are storaged in generated by a program package file. For this purpose in block diagram (Figure 4) blocks Collector and Write To Measurement File are introduced. The first gives for the recording of measurements necessary number. The second shows an address and a file type with data.

3. Conclusion

Virtual system for measurement of magnetic field on a basis of magnetosensitive integrated circuit MLX242 manufactured by Melexis and measuring system DAQ-6009 manufactured by National Instruments has been created. The magnetosensitive integrated circuit is investigated. Its conversion characteristic is obtained. A mathematical equation describing this characteristic is drawn.

By means of a virtual system instruments panel is possible to measure as applied to sensor magnetic field so a generated by him output voltage.

It is foreseen to keep results of measurements in generated by programm product LabView special file.

A created virtual system for magnetic field measurement can find a wide application in electronics, instrumentation and automatics. Its possibility to collect and treat measuring information makes it accessible for anyone research laboratory. Thanks to the small gauges of used components (sensor and DAQ-module) and their operation without external power supply a function of measuring system is increased. This system can be used out of laboratories in field conditions.

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