

The Device for Conversion and Displaying Ecological Information Using Sensors on the Base of ZnO Films.

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Abstract - Gas-sensors based on ZnO films give an opportunity to measure some parameters of gase-medium in a large band of temperature and pressure. In this article is described the device which allows measuring and imaging on display information about concentrations of diversity of gases. The device has a reduced weight and dimensions: this fact allows us to use it as a mobile analyzer of concentration of gases.

Index Terms – ZnO films, concentration, microcontroller.

I. INTRODUCTION

While executing ecological monitoring as a rule following parameters are measured:

- Temperature
- Pressure
- Relative humidity
- Concentration of different gases
- Transparency of air and water
- PH- level of water
- Level of Electromagnetical field and radiation
- Level of noise and vibration
- Chemical and bacteriological characteristics, e.t.c

For measuring this parameters are using a variety of non-electrical to electrical transducers. They transform the external influence into electrical voltage or current, which value depends proportionally on influence intensity. For example, pressure is measured, using piezosensors, transparency of some kind of medium is measured with optoelectronic couples, noise or vibration is measured with microphones.

For measuring the concentration of gases it is perspective to use sensors, based on different nano-films, in particular on ZnO, which has a relatively low price, a high sensitivity and stable parameters.

II. DEVICE DESCRIPTION

The device allows analyzing of some of the given parameters. Received values can be converted with the help of different sensors in proportional electrical signals. Device has following functions and abilities:

- Measurement of parameters on one of eight channels
- Reflecting data graphically
- Comfortable interactive interface
- Transmitting data to the PC
- Memory for saving data
- Operation as a part of a measuring complex together with PC or in a standalone mode
- The device possesses small power consuming that ensures continuous functioning in a

standalone mode without charging of the accumulator plant.

- By operation as a part of a measuring complex together with PC charging of the accumulator plant happens automatically from PC.

Scheme of the device is given on the Figure.1.

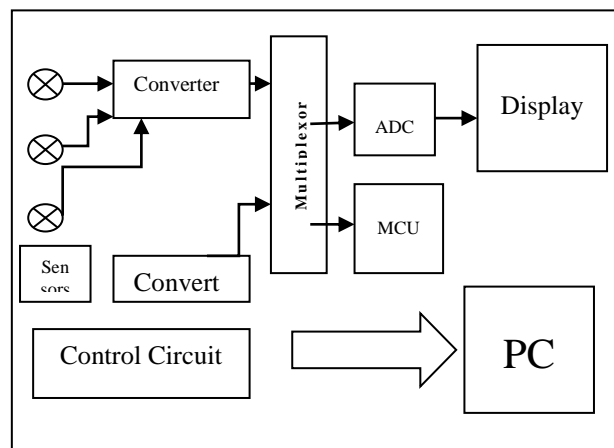


Fig.1. Bloc-scheme of the device.

The base of the block-scheme is the microcontroller ATmega 128 [1], which organizes logical functionality of the device and connection with PC. Sensors convert non-electrical signals to electrical ones, which are filtered, amplified, and if needed normalized before coming to MCU through ADC and multiplexor [2].

From MCU the signal is directed to display and PC, where they can be received by users.

AVR family microcontrollers has a built-in Analog-to-Digital converter, which provides a Analog-to-Digital conversion, without using an extra hardware resources, and gives an opportunity to process incoming data.

For imaging and controlling the device is using LCD display LCD-V320P24282WS17TB-DU3, with resolution 40 on 320 pixels, and a built-in T.S. panel, which allows executing commands, setting up and controlling the device.

As an example on pic.2. it is shown wiring diagram between device and PC, using FT232 controller.

Control system allows choosing channel of measuring, turning off/on the process of measuring and indication, turning on/off the device.

Connection with computer can be accomplished through USB- interface or Bluetooth devices. Choice of connection options is also made by control system.

As an example, in Fig. 2. the diagram of connection of the device to PC using a chip FT232 [4] is shown

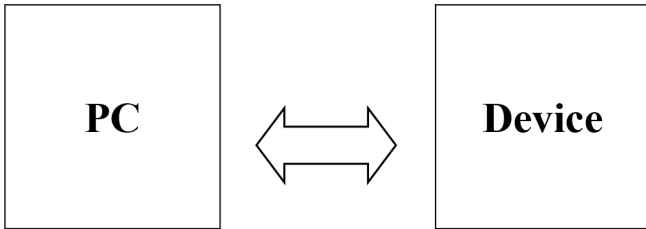


Fig.2. Receive/transmit line

Outward of the device is shown on the figure 3; on the figure 2 the example of displaying on the PC the data from the sensor on the base of ZnO films.

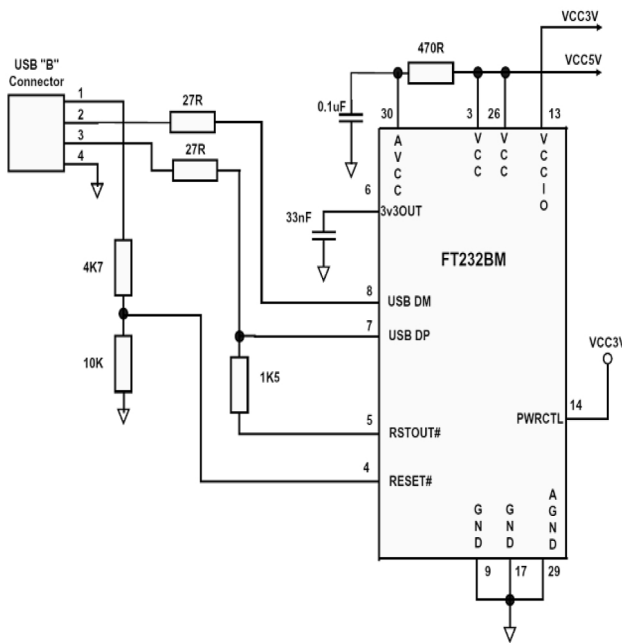


Fig.3. The diagram of connection of the device to PC

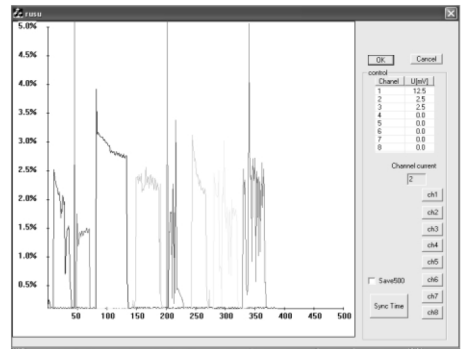


Fig. 4 The example of displaying on the PC the data from the sensor on the base of ZnO films.



Fig. 5 Outward of the device .

CONCLUSIONS

The described device can be applied in following areas:

- Ecology, ecological measuring
- Transportation, control of CO₂ level
- Chemistry
- Agriculture

The device is tested by testing and calibration sensors-SPC PolyCard Gas Control[3].

REFERENCES

- [1] Atmega128 datasheet
- [2] 74HC573 datasheet.
- [3] <http://moreprom.ru/product.php>
- [4] Система мониторинга "ГИС-АТМОСФЕРА"