Algorithm for work and structure of an electronic system for control of converter for transformation of energy from photovoltaic panel

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Algorithm for work and structure of an electronic system for control of converter for transformation of energy from photovoltaic panel *The paper presents algorithm for work of an inverter to convert of the energy of single PV panel into alternating current. The main task is to providing maximum energy yield that will be used in a household. Developed is a structural scheme of an electronic system for control of converter for transformation of energy from photovoltaic panel. This system improves the quality of supplied electricity to consumers of alternating current.*

Key words: *Electronic system for control, Autonomous photovoltaic systems*

INTRODUCTION

In recent years, alternative energy sources are particularly relevant. Specific about them is the variety of design solutions for the transformation of energy from photovoltaic systems.

Projects for the production of renewable energy made redundant production of electricity and heat from fossil fuels and reducing emissions (carbon) from fossil fuel sources as renewable energy technologies are sources with zero greenhouse gas emissions [5, 6].

In the present stage of the development of the invention stands the need for cheap inverters, which converted energy from a PV panel to meet the needs of a household.

Aim of the study is to develop an inverter to convert the energy of a single PV panel into alternating current providing maximum energy yield.

Specifics of the studied object

Management of autonomous photovoltaic systems has to provide maximum energy yield of photovoltaic panel (PV panel), taking into account the influence of factors [1, 2], as a movement of the sun, heat of PV panel, volt-ampere and power-voltage characteristics of PV panels [7] etc.

Another important task is to ensure the necessary quality of supplied power to the AC loads [3].

ALGORITHM FOR WORK OF AN ELECTRONIC SYSTEM FOR CONTROL OF CONVERTER FOR TRANSFORMATION OF ENERGY FROM PHOTOVOLTAIC PANEL

The algorithm for work of an electronic system is shown at fig. 1.

In block 1 is done initialization of ports of Single-chip microcontroller 1 and Single-chip microcontroller 2, i.e. which one will work as inputs and which one as outputs.

By the block 2 "Measurement of controlled parameters U_{OC}" is intended for unification of the parameters of the electronic system with those of the electricity grid. To ensure the maximum yield of energy from PV panel must be evaluated the output voltage of the DC/DC converter. Thus, take into account the power-voltage characteristics of PV panels with a maximum voltage value. It is represent about 80% of the open circuit voltage U_{OC}. Thus by block 3 assessing the nominal weight of the PV panel in order to obtain maximum yield of energy [1, 4].

Block 5 "Calculating of the current power $P_{DD} = U_{DD}.I_{DD}$" is designed to calculate the output power P_{DD} of the DC/DC converter The main task of this block is to set a load, which corresponds with output current I_{DD} and voltage U_{DD} of the DC/DC converter - block 4.

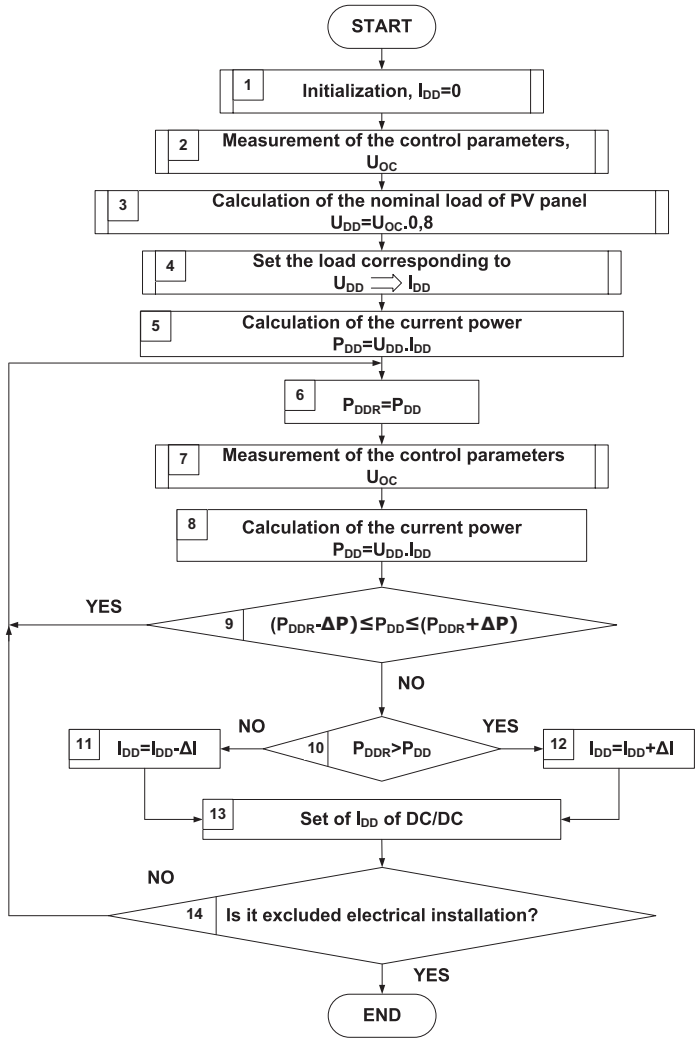

Fig.1. Algorithm for work of an electronic system for control of converter for transformation of energy from photovoltaic panel

In block 6 the output power P_{DD} of the DC/DC converter is compared with a reference power P_{DDR}, then by blocks 7 and 8 the measurement is repeated for the control parameters and re-calculate the current power P_{DD}.

Block 9 checks the calculated power is in the range $P_{DDR} \le |P_{DDR} \pm \Delta P|$. If calculated power is not in this range is used block 10 to compare P_{DD} and P_{DDR}. If P_{DD} is smaller the P_{DDR} it is used block 11 "$I_{DD}=I_{DD}-\Delta I$", if it is larger then P_{DDR} it is used block 12 "$I_{DD}=I_{DD}+\Delta I$".

In both cases, the algorithm proceeds to block 13 "Set of I_{DD} of DC/DC converter". In block 14 "Is it excluded electrical installation?" if the installation is off the work of algorithm proceed to end. If installation is not off it is returned to block 6 for comparing the received power P_{DD} with a reference power P_{DDR}.

STRUCTURE OF AN ELECTRONIC SYSTEM FOR CONTROL OF CONVERTER FOR TRANSFORMATION OF ENERGY FROM PHOTOVOLTAIC PANEL

The structural scheme of the electronic system is shown at fig. 2.

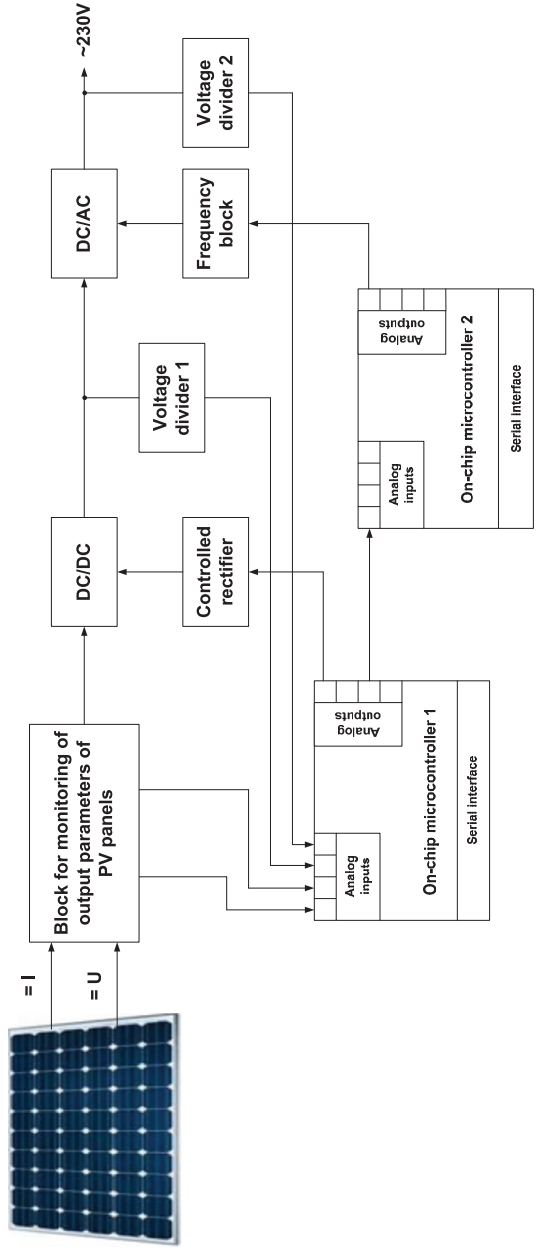

Fig.2. Structural scheme of an electronic system for control of converter for transformation of energy from photovoltaic panel

The constant current and voltage produced by an output of the photovoltaic panel (PV) in a block for monitoring of output parameters of PV panel enter in DC/DC converter for amplification the voltage. To convert DC voltage from the DC/DC converter in a variable frequency 50Hz is use DC/AC inverter.

Signals from the block for monitoring of output parameters of PV panel enter in the initialized as analogue input ports of on-chip microcontroller 1. The output voltage of DC/DC converter is monitored by a voltage divider 1, which transmits a signal to the analogue inputs of the on-chip microcontroller 1.

The ports of the on-chip microcontroller 1 initialized as analogue output signal is supplied to the control rectifier, which aims to regulate the output voltage of DC/DC converter. AC voltage from the DC/AC inverter is monitored by a voltage divider 2, which transmits a signal to the analogue inputs of the on-chip microcontroller 1, and the AC voltage is adjusted by the output voltage of DC/DC converter by the controlled rectifier.

From the analogue outputs of on-chip microcontroller 1 signal is supplied to the on-chip microcontroller 2, which plays the role of controlled generator of rectangular pulses for the formation of a sine wave. Signals from on-chip microcontroller 2 enter the frequency block, which main task is to form positive and negative quantized pulses corresponding network input frequency of DC/AC.

CONCLUSION

Developed is algorithm for work of an inverter to convert of the energy of single PV panel into alternating current.

The main task is to providing maximum energy yield that will be used in a household.

Developed is a structural scheme of an electronic system for control of converter for transformation of energy from photovoltaic panel. This system improves the quality of supplied electricity to consumers of alternating current.

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Докладът е рецензиран.