The American Journal of Engineering and Technology
ISSN 2689-0984 Volume 07 - 2025

Working Principle and Advantages of The Fsm-230 Solar Panel With Tempered Glass And Anodized Aluminum Frame

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Received: 23th Oct 2025 | Received Revised Version: 28th Oct 2025 | Accepted: 30th Nov 2025 | Published: 11th Dec 2025

Volume 07 Issue 12 2025 | Crossref DOI: 10.37547/tajet/Volume07Issue12-02

Abstract

This article describes the main design features, technical characteristics and scope of application of the FSM-230 polycrystalline solar photovoltaic module (230 W). The module consists of an anodized aluminum frame and tempered glass, and has high mechanical strength. Silicon photocells are protected from external environmental influences and mechanical damage due to the fact that they are placed between protective layers based on lamination technology. The FSM-230 module is used in autonomous and backup power supply systems, and together with a charge regulator, battery and inverter, it forms an independent power supply complex. The voltage at the open contacts of the module is 36.6 V, the operating current is 7.8 A, the short-circuit current is 8.42 A, and the efficiency is 16–18%. A plastic waterproof contact box (IP65) and bypass diodes ensure reliable operation of the module. The manufacturer guarantees a 25-year service life of the module and long-term maintenance of power at 80–90%.

Keywords: Polycrystalline photovoltaic module, Photoelectric energy conversion, Tempered glass, Anodized aluminum frame, Charge controller, Autonomous power supply, Bypass diode.

Cite This Article: Karimov Abdusamat Ismonovich, & Ismanov Mukhammadziyo Abdusamat ugli. (2025). Working Principle and Advantages of The Fsm-230 Solar Panel With Tempered Glass And Anodized Aluminum Frame. The American Journal of Engineering and Technology, 7(12), 29–31. https://doi.org/10.37547/tajet/Volume07Issue12-02

1. Introduction

Solar battery, photovoltaic module 230 watts, is made in the form of a glass plate enclosed in a durable frame made of polycrystalline anodized aluminum. Losses of light energy in a special tempered glass are minimized due to its technology,production. Silicon photocells are located between layers of laminating film and are glued to the back of the plate. The lower layer of the film is protected from the external environment by an additional protective film. Inside the housing there is a block of contacts designed to connect the modules in series with each other or to a charge controller. reliability. The strength of the structure is ensured by the use of tempered glass and a frame made of anodized aluminum profile (with drainage holes). The rigid design prevents module deformation in extreme weather conditions.

Table 1 - Characteristics of the solar battery

Power	230 W
Average energy production per month	9-36 kWh/month
Nominal voltage	24.0V
Operating voltage	29.5 V
Open circuit voltage	36.6V
Operating current	7.80 A
Short circuit current	8.42 A
Elements	60 pieces (156*156 mm)
Efficiency	16-18%
Dimensions L * W * D; area	1195*990*50mm;
Weight	19.5 kg
Operating temperature -40...+85 °C	-40...+85 °C
MC4 connectors	MS4
Cable length and cross-section	900 mm, 4 sq.
Estimated service life / warranty	25 years / 10 years

2. Research results and discussion

Description of the solar photovoltaic battery (module) FSM-230: Polycrystalline solar photovoltaic panel (module) with a nominal power of 230 W. It is used as an integral part in autonomous and backup power supply systems. Together with a charge regulator, a deep-discharged battery and a voltage converter, it forms the minimum configuration of an autonomous power supply system.

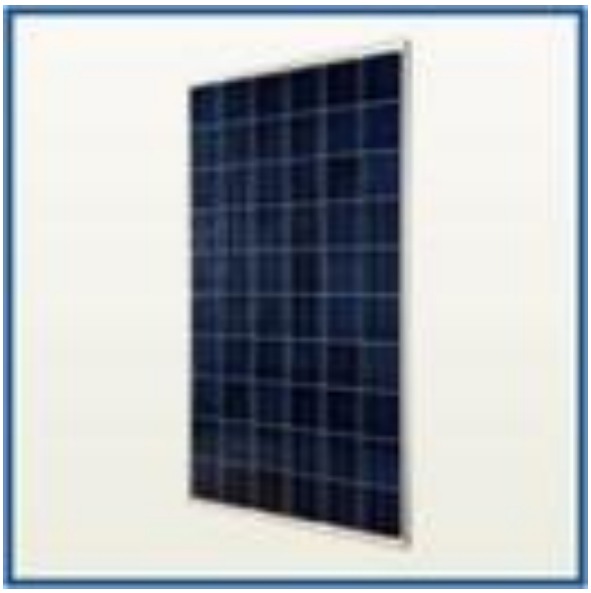

Figure 1 - Solar battery FSM 230

This solar module is made of high-efficiency polycrystalline solar cells (JA Solar), which guarantees

high performance and reliability. The strength of the structure is ensured by the use of a frame made of tempered glass and anodized aluminum profile (with drainage holes). The rigid design prevents module deformation in extreme weather conditions.

Each module undergoes individual quality control and has its own serial number and passport. As a rule, the solar cell has a positive power deviation (+ up to 3%), which guarantees the declared performance after the start of operation.

On the back there is a plastic waterproof contact box that ensures stable operation and long service life. Protection class IP65. Two diodes reduce power losses when the module is in partial shade and protect it from damage. Standard female-male connectors allow you to simplify the connection of modules into a single array - series-parallel connections, which reduces installation time, and also increases reliability and safety during operation. The manufacturer guarantees that the capacity will be maintained at more than 90% of the nominal value for 10 years, and at more than 80% of the nominal value for 25 years.

3. Conclusion

The FSM-230 photovoltaic module is based on high-efficiency polycrystalline solar cells and is characterized by a robust design and reliable electrical protection. The mechanical stability of the module, high voltage and current ratings, and a long-term warranty allow it to be used in autonomous energy systems. Tempered glass, anodized aluminum frame, and a waterproof junction box help the module to operate stably even in extreme weather conditions. With its 230 W power and 16–18% efficiency, the FSM-230 module is one of the optimal solutions for ensuring high reliability in energy production.

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