



Educational set up for measurement of photovoltaic modul electrical parameters

Marko Šućurović¹, Miloš Božić¹ and Snežana Dragičević¹

¹Faculty of Technical Sciences Čačak, University of Kragujevac, Čačak, Serbia

e-mail marko.sucurovic@ftn.kg.ac.rs

Abstract: This paper presents educational set up for practical teaching about photovoltaic systems. The paper gives theoretical aspects of photovoltaic panels with description of the current-voltage characteristic. Measuring of electrical parameters using conventional measurement instruments and data acquisition system are shown. Usage of the measuring data acquisition systems speeds up obtaining important characteristics of photovoltaic panel. The main focus is on the processing and analysing of results, not on reading the data from conventional measurement instruments. The LabVIEW software automatically generates a report after completing the measurement. Ideas for further development of set up and enhance the teaching of photovoltaic modules are also given.

Keywords: photovoltaic cells; photovoltaic module, I-V characteristics, LabVIEW

1. INTRODUCTION

Besides other technologies of renewable sources, photovoltaic (PV) systems have a significant part in the electricity production. Total global installed capacity of photovoltaic systems at the end of 2014 was 177 GW [1]. The increasing usage of PV sources require a greater number of teaching units at secondary schools and faculties for teaching this technical field. Students on courses about renewable energy sources should equally have theoretical classes and practical exercises. In this way, students better understand working principles of generate electricity using renewable energy sources. Secondary schools and faculties should improve their teaching with practical work as much as possible. This primarily refers to work in the laboratory and practical work in industry, if possible. Because the use of real system in the laboratory improves the quality of teaching.

2. ELECTRICAL CHARACTERISTICS OF PHOTOVOLTAIC CELL

The most important characteristic of photovoltaic cells and panels is current-voltage (*I-V*) characteristic. This characteristic give information of some important PV cell/panel parameters. PV panel is modelled by electric equivalent circuit, and *I-V* characteristic is described by a mathematical function. The dependence of certain values can be confirmed by measuring witch also gives the mathematical model of the system [2]. Electrical values measured using data acquisition equipment can be easily processed. So, these example can be further developed through the concept of distance learning [3].

Photovoltaic cell can be modelled with a current source, anti-parallel diode, a shunt resistance and a series resistance (Fig. 1b). Current source I_{ph} represents photo current and it is

