Multi-Function Converter Digital-control implemented by dSPACE and Arduino boards: Application to arc welding power source

Saad CHAOUCH, Amar BOUTAGHANE, Omar Fethi BENAOUDA, Hanene AISSAOUI, Chahra ABERDACHE, Abderahmane BOUCHALOUI

Abstract: A digital control of a multi-function converter implemented by dSPACE DS1103 Workstation and Arduino board based on PWM (Pulsed Width Modulation) techniques is presented. The generation of PWM signals is realised by Matlab/Simulink RTI blocks or by IDE Arduino code based on C programming language. The two boards are optically isolated and their TTL signals are amplified for allowing a good control of IGBT and MOSFET switches. For this purpose, an isolation-amplifier board is designed. These innovative technologies are of key importance in designing digital welding power source as well as robotic arc welding. The control technique was successfully implemented to the multi-function IGBT converter. The output signals (both current and voltage) are of high quality. By using our control model, the output signals could be either continuous, alternative or pulsed with variable frequency as well could be used as reference to control arc welding. Both implementation methods show very good results when compared and discussed with the experimental data.

Keywords: dSPACE, Arduino, Digital control, PWM generation, Power electronics, Arc welding power sources.