MAKING POWER SYSTEMS WORLDWIDE STABLE, RELIABLE, SECURE, AND SUSTAINABLE

# SYNDEM Smart Grid Research and Education Kit

# SDEDU-120-500


The SYNDEM Smart Grid Research and Education Kit is for startups, university professors, researchers and graduate students to explore different topologies and control algorithms of power electronic converters. It is quickly reconfigurable to obtain 10+ different converter topologies, covering DC/DC converters and single-phase/three-phase DC/AC, AC/DC, and AC/DC/AC converters. It can be used to facilitate research and education in different applications, such as motor drives, grid integration of solar power, wind power, energy storage, and flexible loads. The controller is the widely-used Texas Instrument (TI) C2000 ControlCARD and is equipped to use the automatic code generation tools of MATLAB®, Simulink®, and TI Code Composer Studio™ (CCS), making it possible to obtain experimental results suitable for IEEE Transactions papers within hours of simulations. The kit comes with complete interface details and sample implementations, based on which users can easily test their own control algorithms. It is a MathWorks-approved third-party product.

**Key Features**

- Reconfigurable to obtain 10+ different power electronic converter topologies
- Capable of directly downloading control codes from MATLAB/Simulink
- Ideal for research in smart grid, microgrid, renewable energy, EV, storage etc.
- Compatible with utilities around the world with 120 V or 230 V voltage, 5A current
- Versatile communication interfaces, such as RS485 and CAN, for SCADA
- Multiple DAC channels for easy debugging and monitoring of internal signals
- Suitable for parallel, grid-tied or islanded operation
- Designed by a globally well recognized professor in control and power engineering

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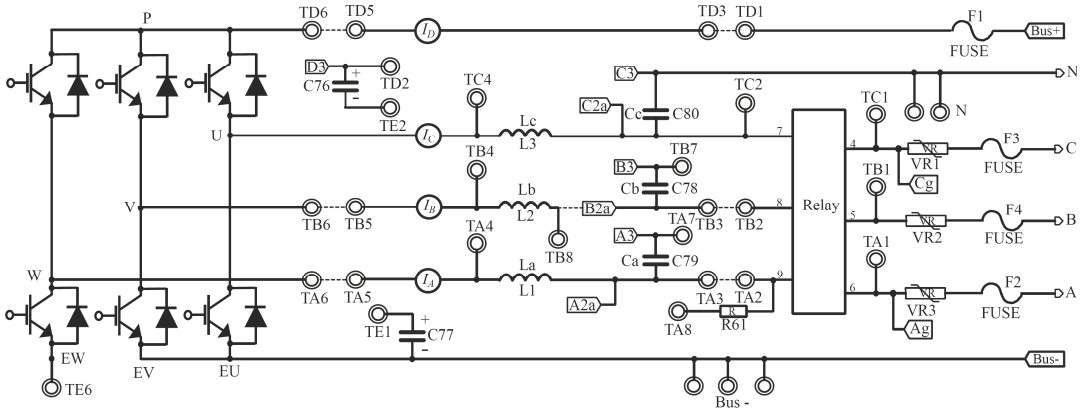
## Technical Details

The kit consists of one control board, up to two power boards, Simulink blocksets, Simulink demo models, and one Texas Instrument C2000 ControlCARD TMDSCNCD28335. As illustrated below, each power board contains one three-phase converter, five voltage sensors (three phase voltages, one grid voltage, and one DC-bus voltage), four current sensors (three phase currents and one DC-bus current), one junction temperature sensor, one three-phase relay, and three-phase LC filters. Wires are provided to configure the board into desired circuit.




The kit comes with Simulink blocksets that cover all the hardware interfaces, including

- Analog inputs: 18 channels 12-bit at -10V~10V and 4 channels 12-bit at 0V~10V
- DAC: 4 channels 12 bit for sending out real-time MCU states analog signals
- PWM generation: two sets of three-phase PWM signals with low-level voltage driven logic and reconfigurable deadbands
- PWM enable/disable: PWM signals can be enabled or disabled by a control command
- Protection: over-current/over-voltage/thermal protection with error codes available
- RS485 and CAN communication for SCADA
- Typical controllers: proportional-integral (PI), proportional-resonant (PR), and sinusoidal signal generation functions
- Switches: 4 channels for different commands
- LED: 4 LED outputs to indicate different MCU states.
- Relay control for two power boards
- SPI: Capable of communicating with different peripherals, such as the AD2S1210 10-Bit to 16-Bit Resolver-to-Digital Converter
- Other interfaces: QEP with absolute position, $I^2C$

A sample Simulink model is supplied, which demonstrates a DC-DC-AC converter. It includes a buck/boost converter connected to a PV/DC input and an H-bridge DC/AC converter connected to a load, with both converters sharing a DC bus. A PI controller is adopted to regulate the DC bus voltage, Vdc, and another controller is adopted to regulate the amplitude and the frequency of the AC output voltage. Almost all Simulink blocksets are included in the Simulink model to demonstrate how to use them. Some internal signals, such as PV/DC voltage, PV/DC current, PV/DC power, DC bus voltage, AC output RMS voltage, AC output RMS current, AC output real power, AC output reactive power, and error codes, are sent out through RS485 or CAN communication. A host Simulink model with RS485 and CAN interfaces for data monitoring and logging is also provided.

**Where To Buy**: Please email admin@syndem.com.
**Further Details**: http://www.syndem.com/Products.html

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