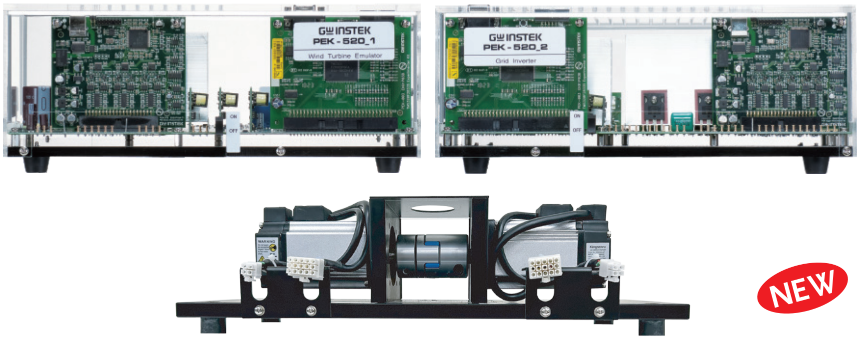
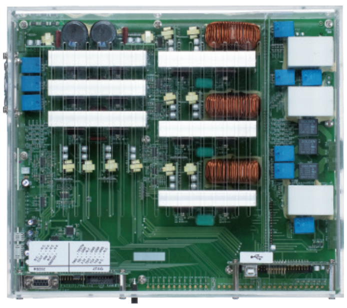
PEK-520 PERMANENT MAGNET SYNCHRONOUS GENERATOR WIND INVERTER DEVELOPER'S KIT

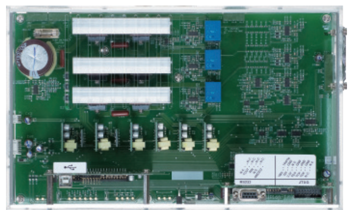


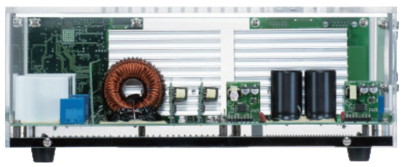
PEK-520

FEATURES

- Provide Analysis, Design, Simulation and Implementation Verification for ower Electronics
- Allow Students With no DSP Firmware Programming Capability to Easily Complete Programming so as to Swiftly Proceed to Digital Control Domain
- Provide Comprehensive After-sales Maintenance Services
- Provide a Complete Experiment Kit List
- Provide Circuit Diagram Files for Each Course Kit
- Provide DSP Hardware Planning, Setting and Program Burning Method
- Provide Detailed Principle and Design of Experiment Circuits





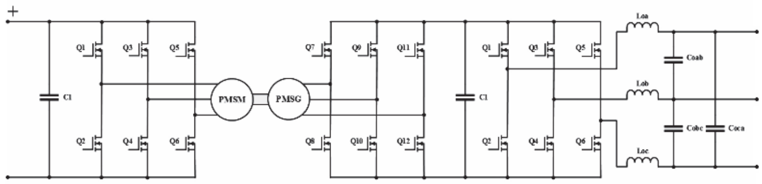


Power converter utilizing digital control is the development trend of the present industrial products. Digital control can elevate the function and performance of power converter to increase product's added value. More and more power converters are using the digital control technology. The objective of this course kit is to provide a learning platform for power converter using digital control. Users, via PSIM software and simulation, learn the principle, analysis and design of power converter.

Furthermore, the SimCoder tool of PSIM can be used to convert control circuit to digital control program as well as to operate a second simulation for circuit, which will be replaced by DSP. Finally, control program, via simulation verification, can be burned into DSP chip. DSP, via control and communications, verifies the correctness of designed circuit and controller.

PEK-520 is the development module of PMSG Wind Inverter, aiming at the training of circuit analysis, design, simulation and experiment for researchers to conduct problem-oriented learning. The quantitative design of power circuit and controller is based upon converter's specifications. Users can further understand the related technology of PMSG Wind Inverter through PSIM simulation verification and SimCoder programming processes.

With the comprehensive capabilities of realizing simulation, design, hardware circuit, PSIM is simulated software specifically designed for systems such as power electronics, motor driver and power conversion. PSIM features comprehensive functions, complete components, fast simulation, accurate simulation results and easy to use, and this software is often used by the international academics and industries for education and research.



Schematic of a Wind Turbine **Schematic of a Wind Power Inverter**

THE SPECIFICATIONS OF PERMANENT MAGNET SYNCHRONOUS GENERATOR WIND INVERTER DEVELOPMENT MODULE

PEK-520 PMSG Wind Inverter							
PMSM Inverter (PEK-520_1)							
Description		Symbol	Min	Typ	Max	Units	Comment
DC Input	Voltage	V_{IN}	130	140	150	V	
	Current	I_{IN}			2.6	A	
AC Output (Inverter Output)	Voltage	V_{L-L}	45		65	V	
	Current	I_{OUT}			3	A	
	Power	P_{OUT}			300	W	
Dimensions (L × W × H)			310 (mm) × 190 (mm) × 110 (mm)				
Weight			Approx. 2kg				
PMSG Converter + Grid Connected Inverter (PEK-520_2)							
Description		Symbol	Min	Typ	Max	Units	Comment
AC Input	Voltage	V_{L-L}	45		65	V	
	Current	I_{OUT}	0		3	A	
DC Output	Voltage	V_{OUT}	90	100	110	V	
	Current	I_{OUT}			3	A	
	Power	P_{OUT}			270	W	
AC Output	Voltage	V_{L-L}		50		V	
	Current	I_{OUT}	0		2.9	A	
	Power	P_{OUT}			250	W	
Dimensions (L × W × H)			310 (mm) × 270 (mm) × 110 (mm)				
Weight			Approx. 4kg				
Motor Specifications		Delta (EMCAC30604PS)(3 Phase AC, 0.4KW)					

EXPERIMENTS

Experiment 1: Three Phase Stand-alone Inverter

To get to know the principle of three phase SPWM and SVPWM. Realize the measurements of voltage and current via PEK-520-2 module, and learn the TI F28335 DSP IC pins, PWM and A/D hardware setting. Also understand how to proceed to DSP internal signal control and measurement via RS-232. (Refer to the fig. 1 for wiring)

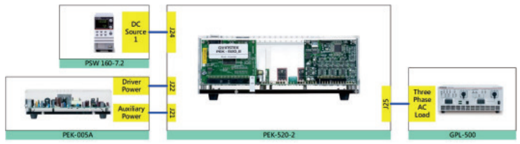


Fig1

Experiment 2: Three Phase Grid-connected Inverter

To get to know the fundamental with structure of three phase grid-connected inverter, and learn not only the design method of phase-lock loop for three phase grid-connected inverter, but the design of both voltage loop and current loop controllers as well, further proceeding to the code programming via SimCoder, after well mapping out the grid-connected inverter. (Refer to the fig. 2 for wiring)

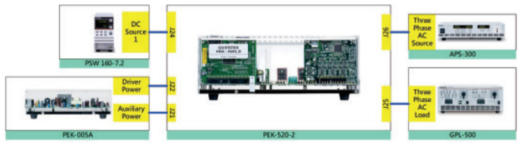


Fig2

Experiment 3: Speed and Torque Control of PMSM

To get to know the fundamental of PMSM, encoder, calculation of speed, vector control theory as well as controller design for current and speed. To learn the way to establish circuit in simulation and proceed to the code programming via SimCoder, after well mapping out the DSP digital control circuit. (Refer to the fig. 3 for wiring)

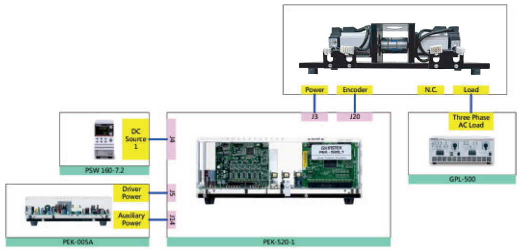


Fig3

Experiment 4: Speed Control of PMSG

To get to know the fundamental of PMSG, vector control theory as well as controller design for current and speed. To learn the way to establish circuit in simulation and proceed to the code programming via SimCoder, after well mapping out the DSP digital control circuit. (Refer to the fig. 4 for wiring)

Experiment 5: Wind Turbine Generator (WTG) Emulation

To get to know the fundamental of WTG and establish WTG model, further learning the way to simulate fundamental of WTG via motor and not only setting up the circuit in simulation of WTG simulation system, but proceeding to simulation as well. Finally, to map out the WTG simulation system via DSP digital control circuit. (Refer to the fig. 4 for wiring)

Experiment 6: Maximum Power Point Tracking of WTG

WTG generates differed power curves in accordance with different wind speeds. In order to better take advantage of wind power, work point, in accord with wind speeds, is supposed to be altered for keeping it at the highest level of power curve, which is known as Maximum Power Point Tracking (MPPT). This experiment locates MPP curve, based on the attributes of wind turbine, and further design MPPT controller on the basis of MPP curve, fulfilling it through DSP digital control circuit. (Refer to the fig. 4 for wiring)

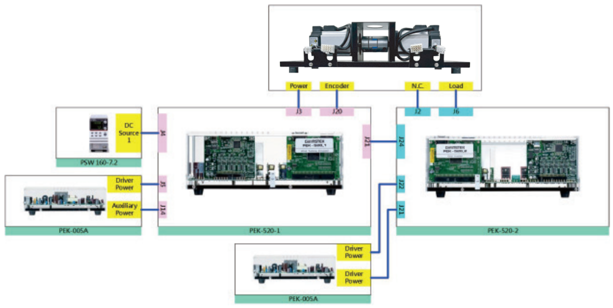


Fig4

Experiment 7: Grid-connected PMSG Wind Power Generation System

Integrate MPPT generator actuator, grid-connected inverter with wind turbine simulator to establish circuit in simulation of integrated system and to proceed to full system verification in simulation. (Refer to the fig. 5 for wiring)

Experiment 8: Low Voltage Ride Through (LVRT) of PMSG WTG System

To learn the requirements of both frequency operation and reactive power by grid-connected power to WTG and to understand the requirement of adaptation by WTG to grid-connected voltage. To learn the Low Voltage Ride Through (LVRT) method of PMSG WTG and establish DSP digital control programming of LVRT and to verify LVRT function via experiment. (Refer to the fig. 5 for wiring)

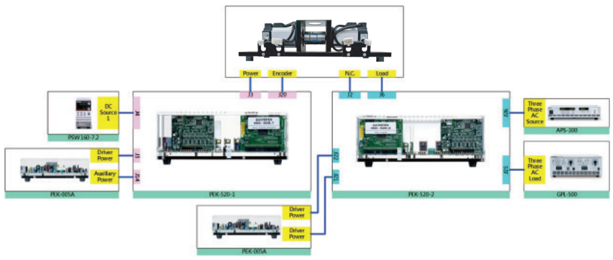


Fig5

ORDERING INFORMATION

PEK-520 Permanent Magnet Synchronous Generator Wind Inverter Developer's Kit

STANDARD ACCESSORIES

CD ROM (Including PSIM Example Files and User Manual), Terminal, RS-232 Communications Cable

OPTIONAL ACCESSORIES

PEK-003	TMS320F28335 experiment board that isolates RS-232 interface
PEK-005A	Multi-output auxiliary power supply
PEK-006	Isolated JTAG emulated adapter

* The required accessories for PEK-520 digital control module: PEK-005A x2 and PEK-006 x1

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