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Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
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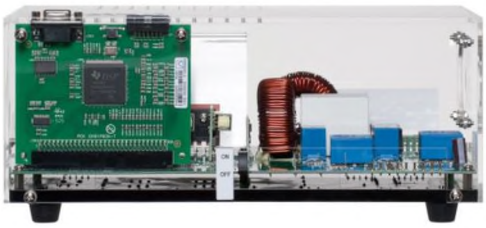
Технические характеристики на
модули силовой электроники

PEK-110 Single Phase Inverter



Features

- Using the TMS320F28335 floating point DSP of TI controller
- Provide five experimentations
- Provide PSIM simulation andexperimental files
- Provide PPT file for reference
- Provide hardware schematic and experimental guide book

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-110 is the development module of full digital controlled signal-phase 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 single-phase inverter through PSIM simulation verification and SimCoder programming processes.
With the comprehensive capabilities of realizing simulation, design, hardware circuit,
PSIM is a simulation 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.

The specifications of single-phase inverter development module

Experiments
Experiment 1: Unipolar SPWM Inverter
Experiment objective is to learn the principle of Unipolar SPWM Inverter. Via PEK-110 module, students learn the voltage and current measurement method and the settings of TI F28335 DSP IC pin locations, PWM and A/D hardware as well as to understand how to conduct the control and measurement of DSP's internal signal by RS-232.

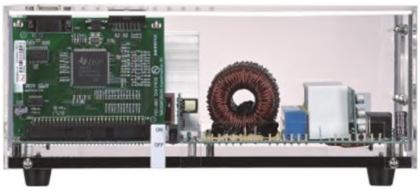
Experiment 2: Stand Alone Inverter with Dual Loop Inductor Current Control
Experiment objective is to learn the module establishment of single-phase inverter and the design of voltage and current loop controllers. After designing hardware SimCoder is utilized to conduct programming.

Experiment 3: Grid Connected Single Phase Inverter
Experiment objective is to understand the basic principle and structure of city grid paralleled with inverter; the design method of phase-locked loop of single-phase paralleled inverter, and the design of voltage and current loop controllers. After the designing city grid paralleled with inverter SimCoder is utilized to conduct programming.

Experiment 4: Bridgeless PFC AC/DC Converter
Experiment objective is to understand the principle of Bridgeless PFC; current loop design; voltage loop design and hardware planning. SimCoder is utilized to conduct programming.

Experiment 5: Full-bridge AC/DC Switching Rectifier
Experiment objective is to understand the principle of Full-bridge AC/DC Switching Rectifier; current loop design, voltage loop design and hardware planning. SimCoder is utilized to conduct programming.

PEK-120 Buck Converter



Features

- Using the TMS320F28335 floating point DSP of TI controller
- Provide five experimentations
- Provide PSIM simulation and experimental files
- Provide PPT file for reference
- Provide hardware schematic and experimental guide book

PEK-120 is the development module of full digital controlled Buck Converter, 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 Buck Converter through PSIM simulation verification and SimCoder programming processes.

The specifications of Buck Converter development module

Pulse Width Modulation Buck Converter
Experiment objective is to learn the principle of Pulse Width Modulation Buck Converter. Via PEK-120 module, students learn the voltage and current measurement method and the settings of TI F28335 DSP IC pin locations, PWM and A/D hardware as well as to understand how to conduct the control and measurement of DSP's internal signal by RS-232.

Voltage Mode Control Buck Converter
Experiment objective is to learn the small signal model derivation of Buck Converter and the design of voltage and current loop controllers. After designing hardware SimCoder is utilized to conduct programming.

Average Current Mode Control Buck Converter
Experiment objective is to understand the method of Buck Converter's Average Current Mode Control; small signal derivation of voltage and current loop, and the design of voltage and current loop controllers. After designing Buck Converter SimCoder is utilized to conduct programming.

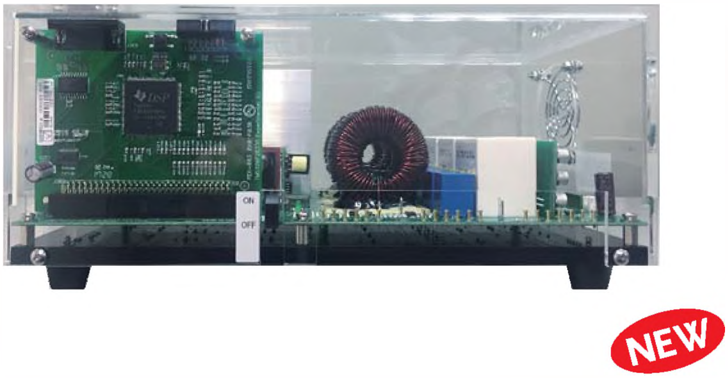
MPPT Converter for PV System
Experiment objective is to understand PV module characteristics and various MPPT methods; and to learn SimCoder programming for perturb and observe method and incremental conductance method. PEK-120 is utilized to verify experiment results.

PV Battery Charger
Experiment objective is to learn PV battery charger's control method for combining MPPT controller with battery's three-stage controller. After designing PEK-120's hardware SimCoder is utilized to conduct programming and to verify experiment results.

Specifications:

Description		Symbol	Min	Typ	Max	Units	Comment
DC Input	Voltage	V_{IN}	30	50	70	V	
	Current	I_{IN}		3		A	
DC Output	Voltage	V_{OUT}		24		V	
	Current	I_{OUT}	0		5	A	
	Power	P_{OUT}			120	W	
Protection Features			OCP				
Dimensions (L × W × H)			220 (mm) × 150 (mm) × 110 (mm)				
Weight			Approx. 1.5kg				

PEK-130



FEATURES

- Provide Analysis, Design, Simulation and Implementation Verification for Power Electronics
- Allow Students With no DSP Firmware Programming Capability to Easily Complete Programming so as to Swiftly Proceed To Digital Control Domain
- Provide Comprehensive Trainings and 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-130 is the development module of full digital controlled three-phase 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 three-phase inverter through PSIM simulation verification and SimCoder programming processes.

With the comprehensive capabilities of realizing simulation, design, hardware circuit, PSIM is a simulation 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.

THE SPECIFICATIONS OF THREE-PHASE INVERTER DEVELOPMENT MODULE

PEK-130 Three Phase Inverter							
Description		Symbol	Min	Typ	Max	Units	Comment
DC Input	Voltage	V_{IN}	90	100	110	V	
	Current	I_{IN}			3	A	
AC Output	Voltage	V_{L-L}		50		V	
	Current	I_{OUT}	0		2.9	A	
	Power	P_{OUT}			250	W	
Dimensions (L × W × H)			285 (mm) × 170 (mm) × 110 (mm)				
Weight			Approx. 2.5kg				

EXPERIMENTS

Experiment 1: Three Phase SPWM Inverter
Experiment objective is to learn the principles of three-phase SPWM, SVPWM and zero sequence injection. Via PEK-130 module, students learn the voltage and current measurement method and the settings of TI F28335 DSP IC pin locations, PWM and A/D hardware as well as to understand how to conduct the control and measurement of DSP' s internal signal by RS-232.

Experiment 2: Three Phase Stand-alone Inverter
Experiment objective is to learn the module establishment of three-phase inverter and the design of voltage and current loop controllers. After designing hardware SimCoder is utilized to conduct programming.

Experiment 3: Grid Connected Three Phase Inverter
Experiment objective is to understand the basic principle and structure of three-phase city grid paralleled with inverter; the design method of phase-locked loop of three-phase paralleled inverter, and the design of voltage and current loop controllers. After the designing city grid paralleled with inverter SimCoder is utilized to conduct programming.

Experiment 4: Three Phase Active Power Filter
Experiment objective is to understand the compensation method for harmonic current and virtual power; the circuit calculation from compensated current; and the control method for current controller. SimCoder is utilized to conduct programming.

Experiment 5: Single-phase Three-arm Rectifier-Inverter
Experiment objective is to understand the working mode of UPS and to learn the design of inverter' s voltage loop and current loop as well as the design of rectifier' s AC voltage control loop. SimCoder is utilized to conduct programming.

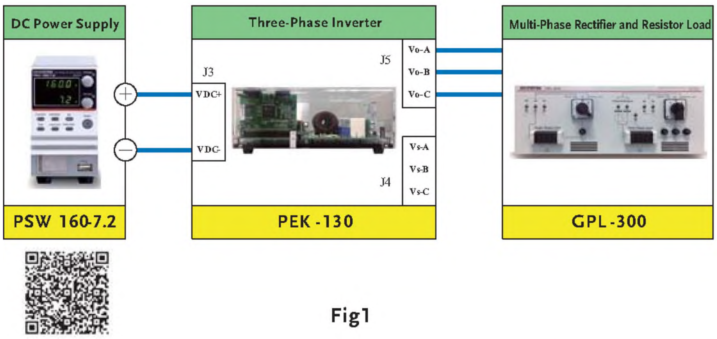


Fig1

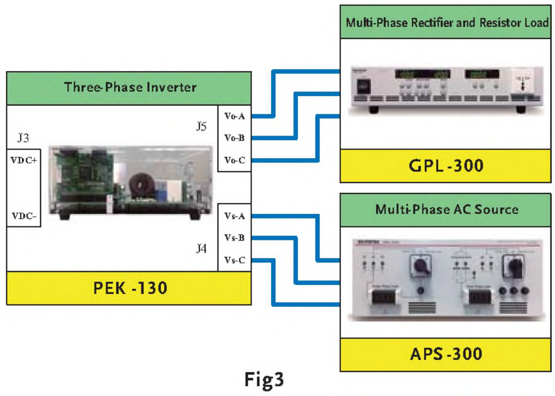


Fig3

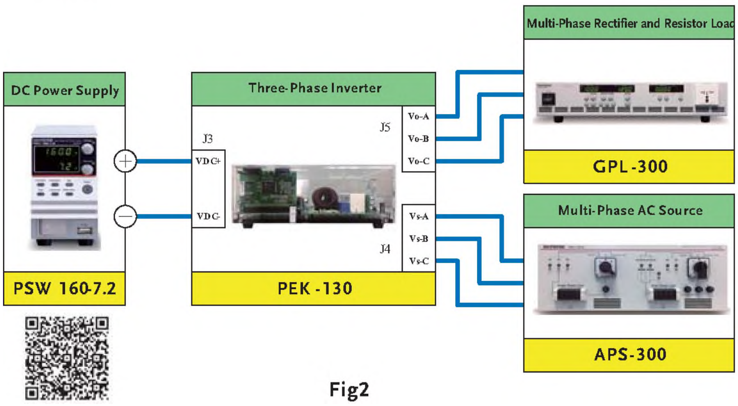


Fig2

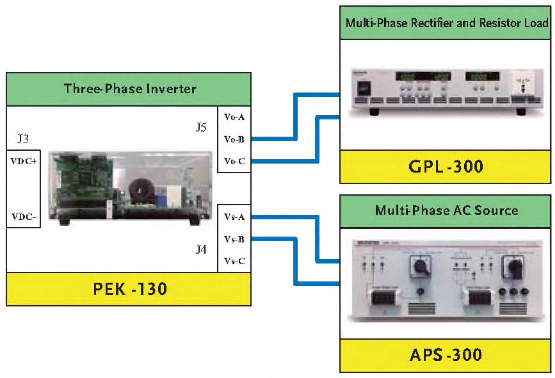
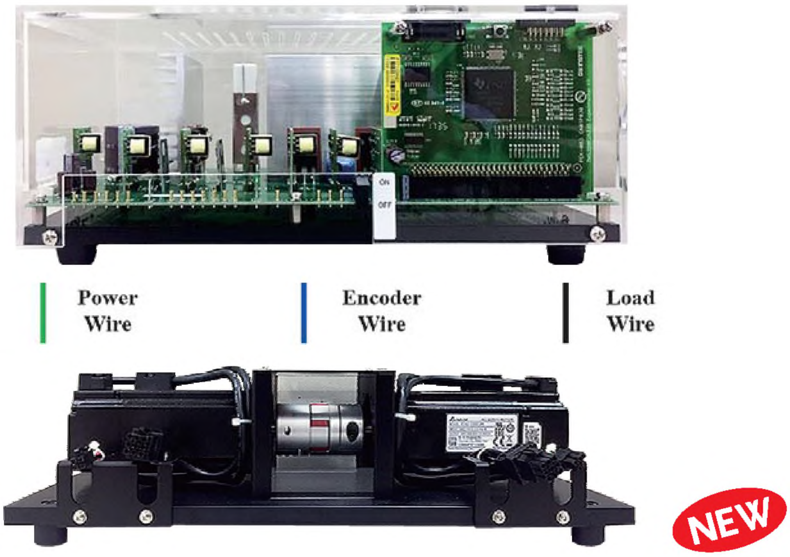


Fig4



PEK-190

FEATURES

- It Offers Analysis, Design, Simulation and Practical Verification for Power Electronics
- It Helps Trainee Unfamiliar With DSP Firmware Coding Promptly Access to Programming and Digital Control Realm With Ease
- It Provides Fully Educational Training and After-sales Warranty Service
- It Elaborates Circuit Diagram of Each Section of Module In Detail
- It Depicts DSP Hardware Layout, Setting and Way to Program Burning
- It Details Concept and Design of Experimental Circuit

Permanent-magnet synchronous motor, hereinafter referred to as PMSM, is widely utilized in the areas covering automatic production equipment, industry and business power supply, refrigerating air-conditioning ice maker and compressor motor, electric vehicle (EV), green energy related power generation, among others. PMSM, of which the drive and control that collectively dominate the expected performance and efficiency of system and play the key role in core technology leading to product development, has vast potentials in diverse markets.

PEK-190 module, not only providing motor-drive inverter, but offers PMSM (both electric motor and power generator) as well, which empowers user to profoundly realize the drive control technology of PMSM via the processes of analysis, design, simulation, circuit production, software coding, experimental verification, etc.

The experiments comprise motor vector control, measurement and estimation of motor parameter (both electrical and mechanical), initial rotor position detection and startup, position sensor less speed control including conventional sliding-mode observer, adaptive sliding-mode observer and model reference adaptive control, among others, all of which broadly cover the various significant control technologies relevant to this product genre.

PSIM, a simulating software specifically designed for power electronics as well as motor drive and power conversion system, is multi functional in its simulation, design and hardware circuit implementation with several features like all-dimensional, complete components, fast yet precise simulation, and user-friendly, just to name a few. Most importantly, it is currently the widely adopted teaching and researching software for academic and industrial fields.

PEK-190 PMSM Drive and Control

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)			285(mm)×170(mm)×110(mm)				
Weight			Approx. 2.5kg				
Motor Specifications		Delta (EMCAC30604PS) ; (3 Phase AC, 0.4KW)					
Experiment Items	1. Vector Control of PMSM						
	2. Parameter Identification of PMSM						
	3. Initial Angle Detection and Starting of PMSM						
	4. Position Sensor-less Control of PMSM with Sliding Mode Observer (SMO)						
	5. Position Sensor-less Control of PMSM with Self-adaptive Sliding Mode Observer						
	6. Position Sensor-less Control of PMSM with Model Reference Adaptive System (MRAS) Observer						

EXPERIMENTS

Experiment 1 : Vector Control of PMSM
To mainly educate the Space Vector Pulse Width Modulation (SVPWM) technology. To understand, via PEK-190 module, the measuring method of both voltage and current, and learn the pin of TI F28335 DSP IC, PWM and A/D hardware settings. Also, to realize the way how to utilize RS-232 for DSP internal signal control and measurement. (refer to the figure 1 for wiring)

Experiment 2 : Parameter Identification of PMSM
To mainly educate the way to retrieve the PMSM initial rotor position info precisely so that stable startup for motor can be achieved. To bring up a brand-new PMSM initial rotor position detection for both steady startup and credible operation of motor. In addition, it proceeds to, via SimCoder, program coding after mapping out the hardware appropriately. (refer to the figure 1 for wiring)

Experiment 3 : Initial Angle Detection and Starting of PMSM
To mainly educate how to estimate motor impedance, inductive reactance, counter emf, and mechanical parameters of motor including torque, rotor of inertia, mechanical constant. In addition, to learn, via SimCoder, program coding after mapping out the algorithm appropriately. (refer to the figure 1 for wiring)

Experiment 4 : Position Sensor-less Control of PMSM with Sliding Mode Observer (SMO)
To learn "conventional sliding-mode observer" and program coding via SimCoder. (refer to the figure 2 for wiring)

Experiment 5 : Position Sensor-less Control of PMSM with Self-adaptive Sliding Mode Observer
To learn "adaptive sliding-mode observer" and program coding via SimCoder. (refer to the figure 2 for wiring)

Experiment 6 : Position Sensor-less Control of PMSM with Model Reference Adaptive System (MRAS) Observe
To learn "model reference adaptive control" and program coding via SimCoder. (refer to the figure 2 for wiring)

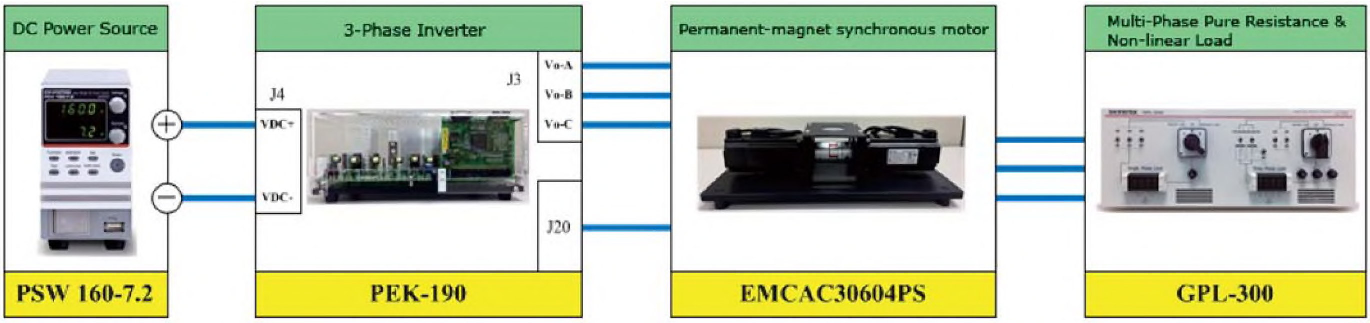


Fig1

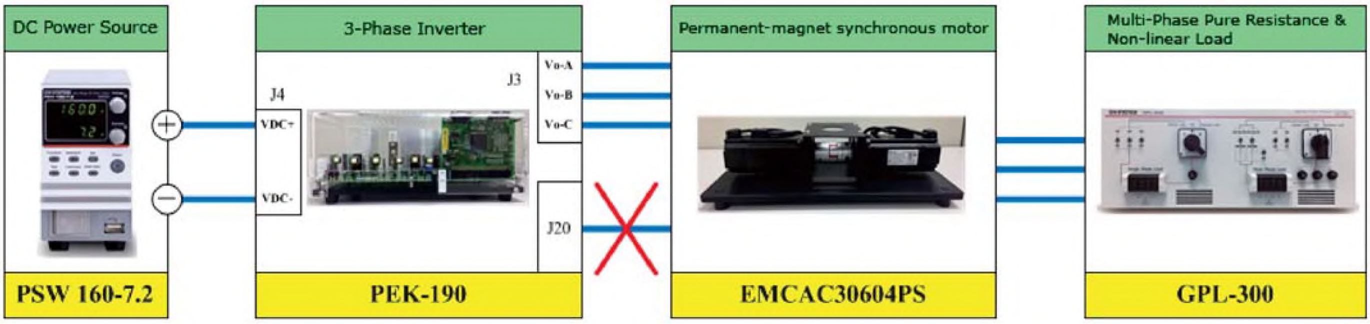


Fig2

PEK-510 SINGLE PHASE PV INVERTER DEVELOPER'S KIT

Features

- Provide Analysis, Design, Simulation and Implementation Verification for Power 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-510 is the development module of fully digital control single phase PV 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 single phase PV 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.

Experiment 1: Boost Converter
To get to know the principle and working mode of switching PWM boost converter. Realize the measurements of voltage and current via PEK-510 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.

Experiment 2: Input Voltage Control of Boost Converter
To get to know the small signal model derivation of boost converter, and learn the input voltage control, further proceeding to the code programming via SimCoder, after well mapping out the hardware.

Experiment 3: MPPT Control of Boost Converter
To get to know the characteristics of PV module and diversified MPPT method, and learn the code programming of Perturb and Observe method via SimCoder. Also, to validate experiment result via the PEK-510 boost converter.

Experiment 4: Single Phase Boost Stand-alone Inverter
To get to know the way for modeling of single phase inverter, and learn the design of both voltage loop and current loop controllers, further proceeding to the code programming via SimCoder, after well mapping out the hardware.

Experiment 5: Single Phase Grid-connected Inverter
To get to know the fundamental with structure of single phase grid-connected inverter, and learn not only the design method of phase-lock loop of single 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.

Experiment 6: Single Phase PV Grid-connected Inverter
To get to know the fundamental with structure of PV grid-connected inverter, and synthesize boost converter with single phase inverter to form the experiment of PV grid-connected inverter, further proceeding to the code programming via SimCoder, after well planning.

Experiment 7: PQ Control of Single-phase PV Grid-connected Inverter
To get to know the verification capability of real power management and reactive power injection of smart inverter, and proceed to the code programming via SimCoder, after well mapping out the hardware.
Experiment 8: Single Phase Islanding Protection Inverter
To get to know the purpose of islanding protection and the verification method of islanding test, and proceed to the code programming via SimCoder, after well mapping out the hardware.

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

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.

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.

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.

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.

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.

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.

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.

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.

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.

PEK-530 MICRO-GRID INVERTER DEVELOPER'S KIT

Features

- Provide Analysis, Design, Simulation and Implementation Verification for Power 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-530 is the development module of full digital controlled micro-grid 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 micro-grid 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.

Experiment 1: Three Phase SVPWM Inverter
To get to know the principle of three phase SPWM and SVPWM. Realize the measurements of voltage and current via PEK-530 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.

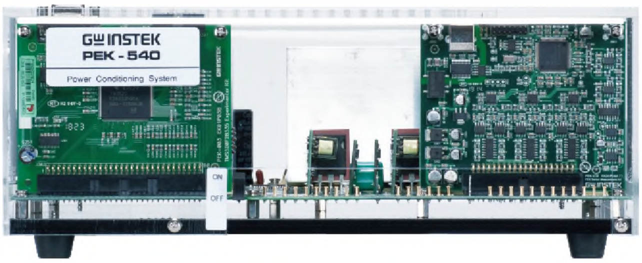
Experiment 2: Three Phase Stand-alone Inverter
To get to know the way for modeling of three phase stand-alone inverter, and learn the design of both voltage loop and current loop controllers, further proceeding to the code programming via SimCoder, after well mapping out the hardware.

Experiment 3: 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, 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.

Experiment 4: PQ Control of Three-phase Grid-connected Inverter
In essence, PQ control decouples real power and reactive power before controlling them respectively. PEK-530 is able to proceed to code programming via SimCoder, after well mapping out the PQ control.

Experiment 5: P-ω and Q-V Droop control of Three Phase Stand-alone Inverter
To learn the P-ω and Q-V droop control, and proceed to code programming via SimCoder, after well mapping out the PEK-530.

Experiment 6: Parallel Operation of Multiple Stand-alone Inverters with Virtual Impedance and Droop Control Method
To get to know the parallel operation of multiple stand-alone inverters, and implement parallel operation for 2 sets of inverters, further proceeding to code programming via SimCoder, after well mapping out the PEK-530.

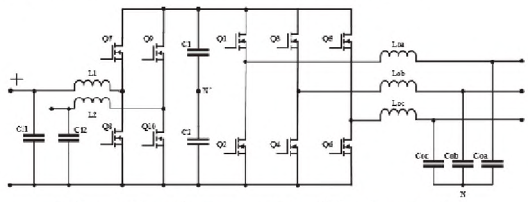


PEK-540

FEATURES

- Provide Analysis, Design, Simulation and Implementation Verification for Power 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

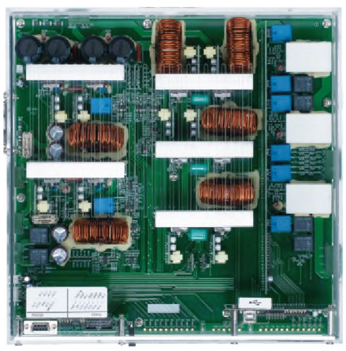
Power converter utilizing digital control is the development trend of the present industrial products. Digital control can elevate the function and performance of power converter to increase product's added value. More and more power converters are using the digital control technology. The objective 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-540 is the development module of full digital controlled power conditioning system, 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 power conditioning system 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.

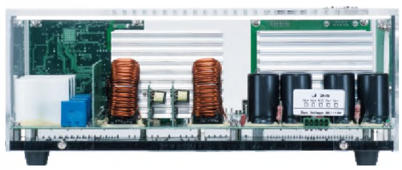


Schematic of a Power Conditioning System

THE SPECIFICATIONS OF POWER CONDITIONING SYSTEM

PEK-540 Power Conditioning System							
Bi-derection DC/DC Converter							
Description		Symbol	Min	Typ	Max	Units	Comment
DC Input	Voltage	V_{IN}	50		80	V	
	Current	I_{IN}			6	A	
DC Output	Voltage	V_{OUT}	90	100	110	V	
	Current	I_{OUT}			2.8	A	
	Power	P_{OUT}			250	W	
Three Phase Inverter							
Description		Symbol	Min	Typ	Max	Units	Comment
DC Input	Voltage	V_{IN}	90	100	110	V	
	Current	I_{IN}			3	A	
AC Output	Voltage	V_{L-L}		50		V	
	Current	I_{OUT}	0		2.9	A	
	Power	P_{OUT}			250	W	
Dimensions(L x W x H)			310 x 310 x 110 (mm)				
Weight			Approx. 5kg				
Experiment	1. Interleaved Buck Converter						
	2. Interleaved Boost Converter						
	3. Bi-directional DC-DC Converter						
	4. Three Phase Four Wire Boost Stand-alone Inverter						
	5. Three Phase Four Wire PV Grid-connected Inverter						
	6. Three Phase Four Wire Battery Energy Storage System						
	7. Three Phase Four Wire Hybrid System						





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Experiment 1 : Interleaved Buck Converter

To get to know the main circuit of interleaved buck converter, and learn the voltage and current dual-loop control method. To realize the DSP digital control circuit planning and learn the method of digital control programming via PEK-540 module. To well get familiar with the experiment devices and software manipulation. (Refer to the fig. 1 for wiring)

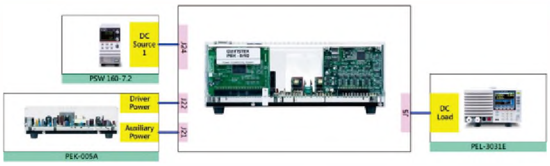


Fig1

Experiment 2 : Interleaved Boost Converter

To get to know the main circuit of interleaved boost converter, and learn the voltage and current dual-loop control method. To realize the DSP digital control circuit planning and learn the method of digital control programming via PEK-540 module. To well get familiar with the experiment devices and software manipulation. (Refer to the fig. 2 for wiring)

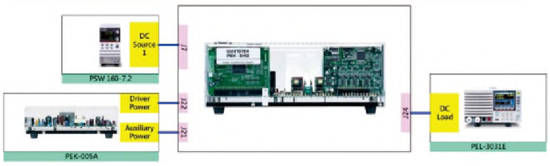


Fig2

Experiment 3 : Bi-directional DC-DC Converter

To get to know the main circuit of bi-directional DC-DC converter, and learn the control method. To realize the DSP digital control circuit planning and learn the method of digital control programming via PEK-540 module. To well get familiar with the experiment devices and software manipulation, further proceeding to the code programming via SimCoder, after well mapping out the bi-directional DC-DC converter. (Refer to the fig. 3 for wiring)

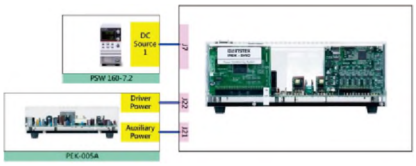


Fig3

Experiment 4 : Three phase Four Wire Boost Stand-alone Inverter

To get to know the three phase four wire boost stand-alone inverter integrated by the first-stage boost converter with the three-phase inverter, and learn the control method of inverter, further verifying the experiment result via PEK-540 module. (Refer to the fig. 4 for wiring)

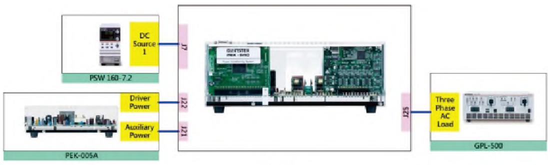


Fig4

Experiment 5 : Three phase Four Wire PV Grid-connected Inverter

To get to know the characteristics of PV module and diversified MPPT method, and learn the code programming of Perturb and Observe method via SimCoder. Also, to realize MPPT via the PEK-540 boost converter, further fulfilling the experiment of three phase PV grid-connected inverter through integration with the second-stage three phase grid-connected inverter. (Refer to the fig. 5 for wiring)

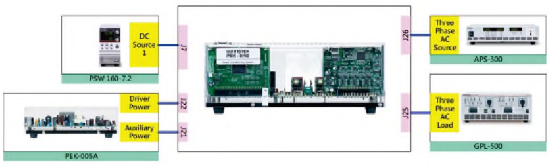


Fig5

Experiment 6 : Three phase Four Wire Battery Energy Storage System

To get to know the fundamental with structure of three phase four wire battery energy storage system, and synthesize the bi-directional DC-DC converter with three phase inverter, further proceeding to the code programming via SimCoder, after well planning. (Refer to the fig. 6 for wiring)

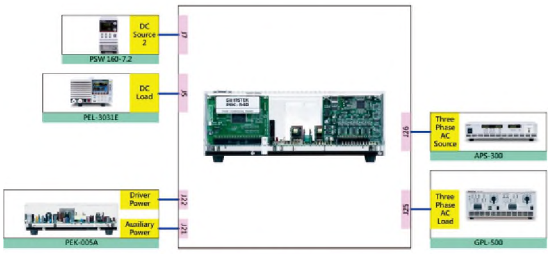


Fig6

Experiment 7 : Three phase Four Wire Hybrid System

Synthesize the PV power system with the battery energy storage system to form the hybrid micro-grid system, further proceeding to the code programming via SimCoder, after well mapping out the PEK-540. (Refer to the fig. 7 for wiring)

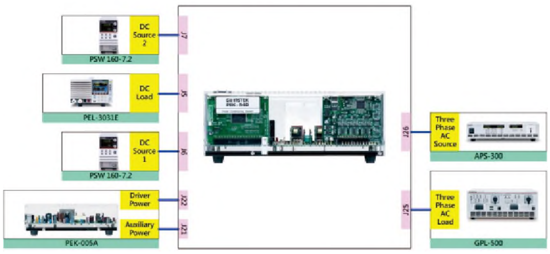
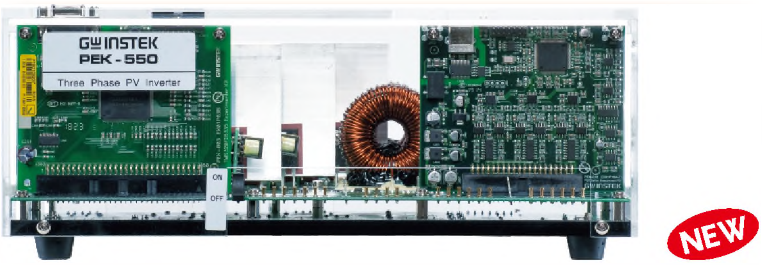


Fig7



PEK-550

FEATURES

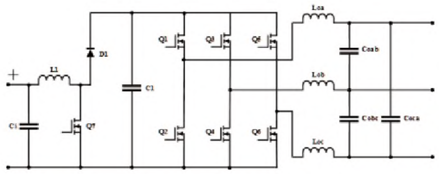
- Provide Analysis, Design, Simulation and Implementation Verification for Power Electronics
- Allow Students With no DSP Firmware Programming Capability to Easily Complete Programming so as to Swiftly Proceed to Digital Control Domain
- Provide Comprehensive After-sales Maintenance Services
- Provide 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.

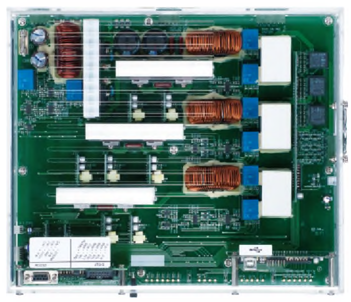
Furthermore, the SimCoder tool of PSIM can be used to convert control circuit to digital control program as well as to operate a second simulation for circuit, which will be replaced by DSP. Finally, control program, via simulation verification, can be burned into DSP chip. DSP, via control and communications,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

PEK-550 is the development module of full digital controlled three-phase PV 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 single-phase PV 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 Three Phase PV Inverter



THE SPECIFICATIONS OF THREE-PHASE PV INVERTER DEVELOPMENT MODULE

PEK-550 Three Phase PV Inverter							
Boost Converter							
Description		**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Comment**
DC Input	Voltage	V_{IN}	70	80	90	V	
	Current	I_{IN}			4	A	
DC Output	Voltage	V_{OUT}	90	100	110	V	
	Current	I_{OUT}			2.8	A	
	Power	P_{OUT}			250	W	
Three Phase Inverter							
Description		**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Comment**
DC Input	Voltage	V_{IN}	90	100	110	V	
	Current	I_{IN}			3	A	
AC Output	Voltage	V_{L-L}		50		V	
	Current	I_{OUT}	0		2.9	A	
	Power	P_{OUT}			250	W	
Dimensions (L x W x H)			310 (mm) x 265 (mm) x 110 (mm)				
Weight			Approx. 4kg				

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EXPERIMENTS

Experiment 1 : Three Phase SVPWM Inverter

To get to know the main circuit of three phase inverter, and learn three-phase SPWM, SVPWM as well as three phase axis transformation. To realize the DSP digital control circuit planning and learn the method of digital control programming via PEK-550 module. To well get familiar with the experiment devices and software manipulation. (Refer to the fig. 1 for wiring)

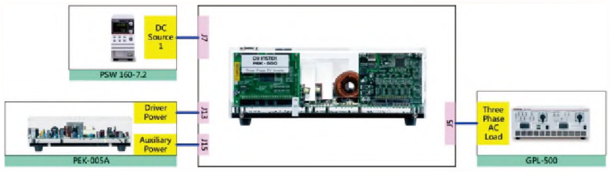

Fig1

Experiment 2 : Three Phase Boost Stand-alone Inverter

To get to know the way for modeling of three phase inverter, and learn the design of both voltage loop and current loop controllers, further proceeding to the code programming via SimCoder, after well mapping out the hardware. (Refer to the fig. 2 for wiring)

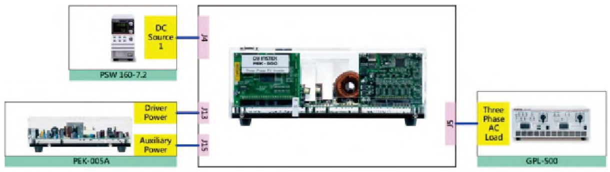

Fig2

Experiment 3 : 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 of 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 three phase grid connected inverter. (Refer to the fig. 3 for wiring)

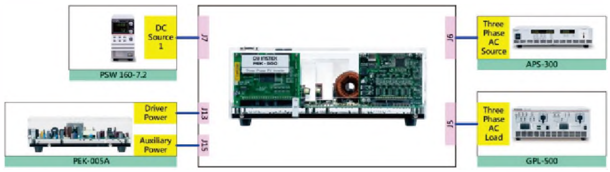

Fig3

Experiment 4 : PV Boost Converter

To get to know the characteristics of PV module and diversified MPPT method, and learn the code programming of Perturb and Observe method, further verifying the experiment result via step-up converter of PEK-550. (Refer to the fig. 4 for wiring)

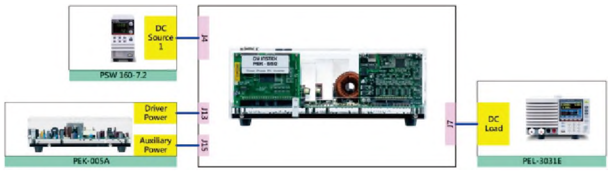

Fig4

Experiment 5 : Three Phase Islanding Protection Inverter

To get to know the purpose and way to test verification of PV islanding protection, further proceeding to the code programming via SimCoder, after well mapping out the hardware. (Refer to the fig. 5 for wiring)

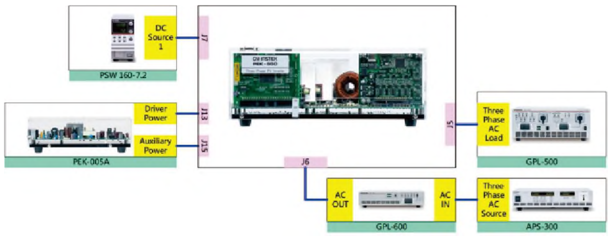

Fig5

Experiment 6 : Three Phase PV Grid-Connected Inverter

To get to know the fundamental with structure of three phase PV grid-connected inverter, and synthesize step-up converter with three-phase inverter to form the experiment of three phase PV grid-connected inverter, further proceeding to the code programming via SimCoder, after well planning. (Refer to the fig. 6 for wiring)

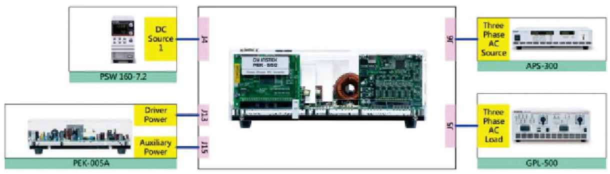

Fig6

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Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
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