



LIST OF EXPERIMENTS:

1. Basic Measurement and Characteristic of SCR and TRIAC

- 1-1: Three-Phase source voltage measurement
- 1-2: Digital storage oscilloscope and differential amplifier
- 1-3: SCR Characteristic and measurement
- 1-4: TRIAC Characteristic and measurement

2. Single-Phase Rectifiers and AC Voltage Controller (AC→DC, AC→AC)

- 2-0: Trigger pulse measurement
- 2-1: Single-Phase Half-Wave uncontrolled rectifier
- 2-2: Single-Phase Full-Wave uncontrolled rectifier
- 2-3: Single-Phase Half-Wave controlled rectifier
- 2-4: Single-Phase Full-Wave controlled rectifier
- 2-5: Symmetrical Single-Phase Full-Wave Semi-Controlled rectifier
- 2-6: Asymmetrical Single-Phase Full-Wave Semi-Controlled rectifier
- 2-7: Single-Phase Semi-Controlled AC voltage controller
- 2-8: Single-Phase Full-Controlled AC voltage controller

3. Three-Phase Rectifiers and AC Voltage Controller (AC→DC, AC→AC)

- 3-1: Three-Phase Half-Wave uncontrolled rectifier
- 3-2: Three-Phase Full-Wave uncontrolled rectifier
- 3-3: Three-Phase Half-Wave controlled rectifier
- 3-4: Three-Phase Full-Wave Semi-Controlled rectifier
- 3-5: Three-Phase Full-Wave Full-Controlled rectifier
- 3-6: Three-Phase Full-Wave Semi-Controlled AC voltage controller
- 3-7: Three-Phase Full-Wave Full-Controlled AC voltage Controller

4. DC Choppers (DC→DC)

- 4-0: IGBT Characteristic measurement
- 4-1: DC PWM Controller
- 4-2: Single-Quadrant DC chopper
- 4-3: Two-Quadrant DC chopper
- 4-4: Four-Quadrant DC chopper
- 4-5: SCR DC chopper

5. Inverters (AC→DC→AC)

- 5-1: Single-Phase PWM controller
- 5-2: Single-Phase inverter
- 5-3: Three-Phase PWM controller
- 5-4: Three-Phase inverter

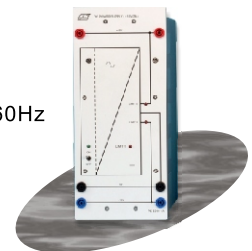
6. Applications of Power Electronics

- 6-0: Power MOSFET characteristic measurement
- 6-1: Buck switching power supply
- 6-2: Boost switching power supply
- 6-3: Buck-Boost switching power supply
- 6-4: Flyback switching power supply
- 6-5: Electronic ballast

LIST OF MODULES:

1. DC Power Supply ($\pm 15V/2A$) (PE-5310-1A)

- (1) Short circuit & over temperature protection
- (2) Overcurrent indicator: LED
- (3) Over temperature indicator: LED
- (4) Rated output: $\pm 15V/2A$
- (5) Power indicator: LED
- (6) Power supply: 1 ϕ , AC 220V, 50/60Hz



2. DC Power Supply (0-40V/3A 0-20V/6A) (PE-5310-1B)

- (1) Input voltage: 220V, AC
- (2) 2 Output voltage: 0~20V, 0~40V DC
- (3) Rated current: 0~20V/6A, 0~40V/6A
- (4) Overload protection



3. Reference Variable Generator (PE-5310-2A)

- (1) Internal reference voltage output(VREF): +10V
- (2) External reference voltage input(VREF): -10V~+10V
- (3) Output:
 - a. 0~+ VREF
 - b. -VREF~0~+ VREF
- (4) Adjustment scale: Linear 0~100%
- (5) Working voltage: ±15V



7. R.M.S. Meter (PE-5310-3A)

- (1) Measuring range:
 - a. Current: 0.1/0.3/1/3/10/30 A
 - b. Voltage: 3/10/30/100/300/1000V
- (2) 3 Measuring type:
 - a. RMS AC+DC: Total RMS value
 - b. RMS AC : Ripple RMS value
 - c. AV AC+DC: Arithmetic mean value
- (3) Overload protection
- (4) +- Value indicator: LED
- (5) Accuracy: 2%. Full scale
- (6) Operation power supply:
 - 1 Phase, AC 220V, 50/60Hz



4. Differential Amplifier (PE-5310-2B)

- (1) 4 Channels output and input
- (2) Measuring voltage (Max.):700Vp
- (3) Output voltage (Max.): 10Vp
- (4) Measuring frequency (Max.): 200kHz
- (5) Input voltage range: 500V, 100V, 10V
- (6) Output voltage range: 10V
- (7) Output terminal: common ground, 3 types:
 - a. 2 BNC Sockets for oscilloscope, the switching switches to selected measuring channel(A/B, C/D)
 - b. 4 mm Terminal for module connection
- (8) Power supply: AC 220V, 50/60 Hz



8. Power Meter (0.3W-30KW) (PE-5310-3B)

- (1) Active power & reactive power can be selected
- (2) Measuring range: 0.3W(Var)~30KW(KVar)
 - a. Current: 0.1/0.3/1/3/10/30 A r.m.s.
 - b. Voltage: 3/10/30/100/300/1000V r.m.s.
- (3) Frequency range: 0~20KHz
- (4) Overload protection
- (5) Overcurrent & overvoltage LED indicator
- (6) Reactive power +- value indicator (QL & QC)
- (7) Accuracy: 2% Full scale
- (8) Output terminal:
 - Measuring full scale 100%=1V
- (9) Operation power supply:
 - 1 Phase, AC 220V, 50/60 Hz



5. Current Transducer (PE-5310-2C)

- (1) Hall current sensor
- (2) Measuring frequency (Max.): 200KHz
- (3) Current measuring:
 - a. Input :20Ap, Output 10V
 - b. Input :5Ap, Output 10V
 - c. Input :1Ap, Output 10V
- (4) Overcurrent indicator



9. Resistor Load Unit (PE-5310-3C)

- (1) Bench top type
- (2) 3 Load resistors, each one 100Ω
- (3) Rated current: 2.5A



6. Three Phase Angle Controller (PE-5310-2D)

- (1) Pulse output: Electric isolation, can directly drives up to 6 thyristors
- (2) Trigger angle: 0~180°
- (3) Control input signal: 0~10V
- (4) Rectification angle : 0~90° adjustment
- (5) Convert angle: 0~180° adjustment
- (6) Working voltage:±15V, single pulse & continuous pulse



10. Resistor Load (PE-5310-3D)

- (1) 2 Resistors load:
 - a. 5~50Ω/120W
 - b. 10~100Ω/120W
- (2) Overcurrent protection



11. Inductive Load Unit (PE-5310-3E)

- (1) Bench top type
- (2) Load indicator: 50m H x 2/200m H
- (3) Rated current: 5A



12. Flyback Switching Power Supply (PE-5310-4A)

- (1) Test point:
 - a. Switching control IC output signal
 - b. Current feedback signal
 - c. Voltage feedback signal
 - d. Switching power component terminal
- (2) Switching frequency up to 40KHz
- (3) Converter control: Isolation feedback converter
- (4) Input voltage: 95~250V AC
- (5) Output: 45W, up to 80% efficiency
- (6) Output voltage ripple: $\leq 5\%$
- (7) Output voltage regulation: $\leq 5\%$
- (8) Output voltage: DC 12V ~ 15V, adjustment
- (9) Rated current: 2A Max.
Overload & short circuit protection
- (10) Switching power component: MOSFET



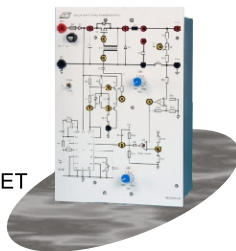
13. Boost Switching Power Supply Unit (PE-5310-4B)

- (1) Test point:
 - a. Switching control IC output signal
 - b. Current feedback signal
 - c. Voltage feedback signal
 - d. Switching power component terminal
- (2) Switching frequency: $\geq 40\text{KHz}$
- (3) Converter control: Isolation feedback converter
- (4) Input voltage: DC 10 ~ 16V
- (5) Output: 60W, up to 85% efficiency
- (6) Output voltage ripple: $\leq 5\%$
- (7) Output voltage regulation: $\leq 5\%$
- (8) Output voltage: DC 18V ~ 30V, adjustment
- (9) Rated current: 2A Max.
Overload & short circuit protection
- (10) Switching power component: MOSFET



14. Buck Switching Power Supply (PE-5310-4C)

- (1) Test point:
 - a. Switching control IC output signal
 - b. Current feedback signal
 - c. Voltage feedback signal
 - d. Switching power component terminal
- (2) Switching frequency: $\geq 40\text{KHz}$
- (3) Converter control: Isolation feedback converter
- (4) Input voltage: DC 17~ 30V
- (5) Output: 45W, up to 85% efficiency
- (6) Output voltage ripple: $\leq 5\%$
- (7) Output voltage regulation: $\leq 5\%$
- (8) Output voltage: DC 10V ~ 15V, Adjustment
- (9) Rated current: 2A Max.
Overload & short circuit protection
- (10) Switching power component: MOSFET



15. Buck-Boost Switching Power Supply Unit (PE-5310-4D)

- (1) Test point:
 - a. Switching control IC output signal
 - b. Current feedback signal
 - c. Voltage feedback signal
 - d. Switching power component terminal
- (2) Switching frequency: $\geq 40\text{KHz}$
- (3) Converter control: Isolation feedback converter
- (4) Input voltage: DC 20 ~ 30V
- (5) Output: 60W, up to 85% efficiency
- (6) Output voltage ripple: $\leq 5\%$
- (7) Output voltage regulation: $\leq 5\%$
- (8) Output voltage: DC 25V ~ 30V, adjustment
- (9) Rated current: 2A Max.
Overload & short circuit protection
- (10) Switching power component: MOSFET



16. Electronic Ballast Fluorescent Lamp Unit (PE-5310-4E)

- (1) Switching frequency: 10KHz
- (2) Input voltage range: 70V~130V AC
- (3) Type of lamp: 35cm long tube 10W
- (4) Control mode: half-bridge self-excitation feedback multivibrator
- (5) Output current: 2A max. with overflow and short circuit protection
- (6) Switching power element: BJT



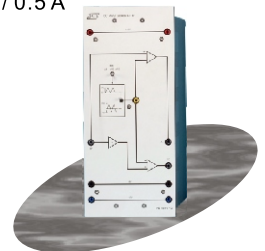
17. IGBT Drive Set (PE-5310-4F)

- (1) Input voltage: DC 20~300V
- (2) Output voltage: 0~300VP
- (3) Drive circuit: Photo couple and drive circuit
- (4) Output device: IGBT, 60A/800V
- (5) Current protector



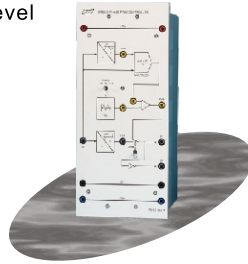
18. DC PWM Generator (PE-5310-4G)

- (1) Triangular wave(carrier) generator:
 - a. Amplitude: $\pm 10\text{Vp}$ or 0~10Vp
 - b. Frequency: 1k, 10k, 15kHz
- (2) PWM Signal generator: 2 x PWM control signal
- (3) Working power supply: DC $\pm 15\text{V} / 0.5\text{A}$



19. Single Phase PWM Controller (PE-5310-4H)

- (1) Triangular wave(carrier) generator:
 - a. Amplitude: $\pm 10Vp$
 - b. Frequency: 1k, 5k, 15kHz
- (2) Sine wave signal generator
- (3) Multiplex
- (4) PWM Signal generator: 2 x TTL level
- (5) Square wave signal generator
- (6) Working power supply: DC $\pm 15V$



23. Power Diode Set (PE-5310-5A)

- (1) Rated voltage: 1200V
- (2) Rated current: 40A



20. Three Phase PWM Controller (PE-5310-4I)

- (1) Triangular wave(carrier) generator:
 - a. Amplitude: $\pm 10Vp$
 - b. Frequency: 5k, 10k, 20kHz
- (2) Sine wave signal generator
- (3) Multiplex
- (4) PWM Signal generator: 2 x TTL level
- (5) Square wave signal generator
- (6) Working power supply: DC $\pm 15V$



24. Fuse Set (PE-5310-5B)

- (1) Module design
- (2) 3 x D-Type fuses, 6A/ 500V



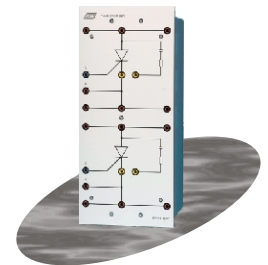
21. Three Phase Rectifier & Filter (PE-5310-4J)

- (1) Power input: 1 \emptyset or 3 \emptyset , 0~220V AC
- (2) With Inductor & capacitor filter circuit
- (3) Surge voltage protection circuit
- (4) Output voltage: 0~300Vdc (max.)/10A(max.)



25. Thyristor (800V/10A) (PE-5310-5C)

- (1) Rated voltage: 800V
- (2) Rated current: 10A
- (3) With RC surge buffer protection circuit



22. Universal Inverter 3x230V (PE-5310-4K)

- (1) 6 X TTL level signal input: $> 2.5\mu S$, for interlock & dead time control
- (2) Power input: 1 \emptyset or 3 \emptyset AC 20~220V
- (3) With photo-couple, isolation and main circuit
- (4) Output power component: IGBT 60A/800V
- (5) With adjustment overcurrent protection circuit
- (6) Output capacity: 220V/ 1.5KV
- (7) Operation voltage: DC $\pm 15V$, 1 \emptyset , 220V, AC



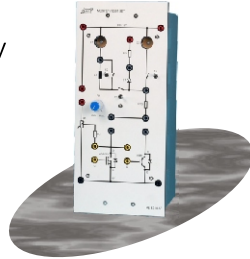
26. SCR/TRIAC Set (PE-5310-5D)

- (1) SCR: 800V/16A
- (2) TRIAC: 600V/12A
- (3) Load lamp: 2, 12V/10W (with switch)
- (4) Load inductor: 1, 50m H/1A(with switch)
- (5) With current/voltage transfer measurement
- (6) With trigger control adjustment
- (7) Operation power supply: 1 \emptyset AC 220V, 50/60Hz



27. MOSFET/IGBT Set (PE-5310-5E)

- (1) IGBT: 800V/50A
- (2) MOSFET: 100V/48A
- (3) Load lamp: 2, 12V/10W (with switch)
- (4) Load inductor: 1, 50mH/1A(with switch)
- (5) With current/voltage transfer measurement
- (6) With trigger control adjustment
- (7) With external signal input
- (8) Operation power supply: DC+15V



28. SCR DC Chopper Set (PE-5310-5F)

- (1) IGBT: 800V/50A
- (2) MOSFET: 100V/48A
- (3) Load lamp: 2, 12V/10W (with switch)
- (4) Load inductor: 1, 50mH/1A(with switch)
- (5) With current/voltage transfer measurement
- (6) With trigger control adjustment
- (7) With external signal input
- (8) Operation power supply: DC+15V



29. Isolating Transformer (PE-5340-3A)

- (1) Benchtop type
- (2) Output voltage: 3 \emptyset , 4W, Y type connected, 110/164/190/220V line-to-line voltage output
- (3) Rated capacity: 1.5KVA
- (4) Input: AC, 3 \emptyset , 220V, 50/60Hz



30. System Transformer (EM-3340-3B)

- (1) Rated power: 1.5KVA
- (2) Primary: Depend on the local line voltage
- (3) Secondary: AC, 3 \emptyset , 220V
- (4) Frequency: 50/60Hz



31. Magnetic Powder Brake Unit (EM-3320-1A)

- (1) Power supply: 110/220V AC
- (2) Type: forced air-cooling magnetic powder brake
- (3) Braking Torque: 0.999 kg-m (9.999 N-m), max.
- (4) Speed sensing: photoelectric type, 60 pluse /rev.
- (5) Torque Sensing: Strain-gage torque transducer, torsion bar
- (6) Temperature sensing: thermal switch
- (7) Base unit: integral, aluminum alloy
- (8) Connecting to controller via the dedicated cable
- (9) Cooling fan: 12V DC, / 0.29A
- (10) Analog DC output:
 - a. Torque output (1V / 1 kg-m)
 - b. Speed output (1V / 1000 rpm)
 - c. Power output (1V / 1 KW)



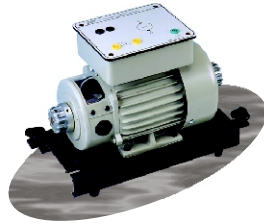
32. Powder Brake Controller Unit (EM-3320-1N)

- (1) Power supply: 110/220 VAC
- (2) Connecting to magnetic powder brake unit via dedicated cable
- (3) 2 x 4-digit 7 segment LED display
 - a. Display speed(S), torque(T), power(P), for the motor under test
 - b. Display control voltage(V) and current (I), applied to magnetic powder brake
- (4) LCD Character display(20 x 2), & buttons for control of command entry and display
- (5) LCD Graphic display (128 X 64)
 - a. Graphically display characteristics for brake and motor
 - b. Display, record, and save various values presenting on LED display
- (6) Display range:
 - a. Torque: 0~0.999 kg-m or 0~9.999 N-m
 - b. Speed: 0~9999 rpm
 - c. Power: 0~9.999KW
 - d. Voltage: 0~24V
 - e. Current: 0~0.999A
- (7) Control mode:
 - a. Open-loop control mode: Manual loading and unloading power to brake, automatic loading and unloading power to brake, selectable initial power (Wi) and max. Power (Wm): 0~0.99 kg-m, selectable loading time: 1~15 sec.
 - b. Closed- loop control mode: constant-torque mode, constant-speed mode
- (8) Fault detection and indication:
 - a. MAIN indicator for controller fault
 - b. BRAKE indicator for brake fault
 - c. MOTOR indicator for motor fault
- (9) Communicating with PC through RS-232 (Standard) or RS-485 (option) port
- (10) Dedicated hardware and software allow processing and displaying data on PC, such as full-screen displaying, tracing, recording, printing motor speed, motor torque, motor power, brake voltage and brake current



33. DC Permanent-Magnet Machine (EM-3330-1A)

- (1) The machine is functioning as motor and generator operation
- (2) For motor operation:
 - a. Rated voltage/current: 180 VDC / 2.7 A
 - b. Rated speed: 2500 rpm
 - c. Rated power: 0.4 KW



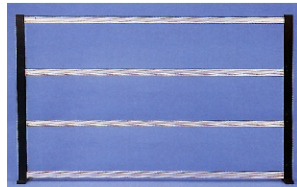
34. Three-Phase Squirrel Cage Machine (EM-3330-3C)

- (1) Rated voltage: Delta 220 VAC, 50/60 Hz
- (2) Rated current: 1.4A
- (3) Rated speed: 1670 rpm(60 Hz), 1420 rpm(50Hz)
- (4) Rated power: 0.3KW
- (5) Power factor: 0.82



35. Experimental Frame (EM-3380-2B)

- (1) Suitable for setting up of test circuits and for demonstration purpose with A4 297 mm high experiment panels.
- (2) Can be secured to benches or back upright and removed to any time
- (3) The side pieces consist of rectangular tube steel, 60 x 30 x 2 mm, protected against corrosion, horizontal sections consist of anodized-aluminum profiles
- (4) Frame dimension: 1800(W) X 1060(H) X 250(D)mm, ±5%



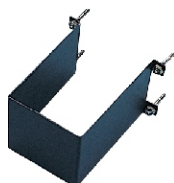
36. Coupling (EM-3390-2A)

- (1) Material: Rubber
- (2) Coupling sleeve for mechanical connection of two electrical machine



37. Coupling Guard (EM-3390-2B)

- (1) Material: Plate coating
- (2) Attachable guard for protecting against contact with electrical machines rotating parts



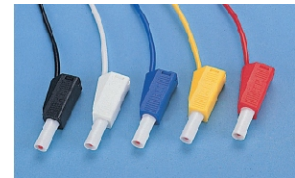
38. Shaft End Guard (EM-3390-2C)

- (1) Material: Plate coating
- (2) Attachable guard for protecting against contact with electrical machines rotating parts



39. Connecting Leads (EM-3390-3A)

- (1) 4mm Safety plugs with leads
- (2) Rated current: 19A max.
- (3) 25 cm: Red/Black/Yellow/Blue/White
- (4) 50 cm: Red/Black/Yellow/Blue/White/Green
- (5) 100 cm: Red/Yellow/Blue/White/Green
- (6) 150 cm: Red/Yellow/Blue/White/Black



40. Safety Bridging Plugs Set (EM-3390-4A)

- (1) 4mm Safety bridging plugs 19 mm spacing
- (2) Rated current: 19A max.



KCN-419A



KCN-419B

41. Laboratory Table (Option) (EM-3380-1A)

- (1) Dimension: 1800(W) X 900(D) X 780(H) mm, ±5%



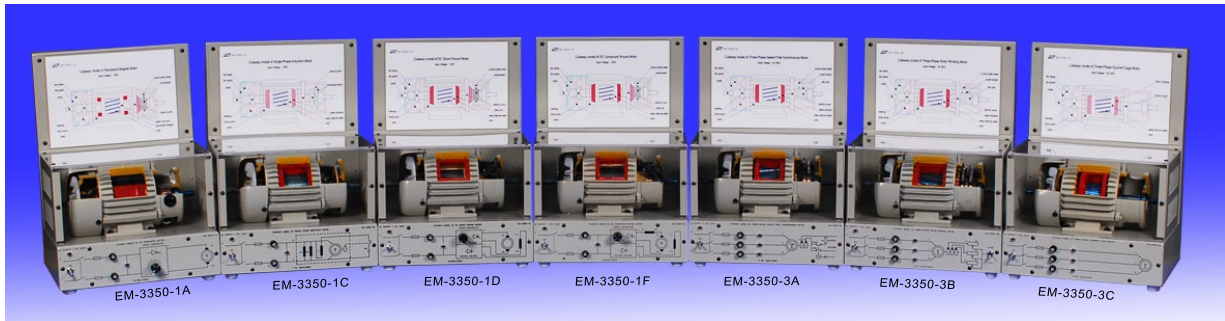
42. Holder For Connecting Leads (Option) (EM-3390-1A)

- (1) Mobile type, with 5-foot tubular, steel base, with 5 casters
- (2) Height: 1400 mm, chipboard with 20 connecting leads slots



Power Electronics Training System

CUTAWAY MODEL OF ELECTRICAL MACHINE:



Cutaway models are made from normal electrical machines. The stator is cut away by 1/4 over the entire length to enable an optimum view of the internal construction of the machine and it is operational. The cutaway surfaces are protected against corrosion.

- DC Permanent-magnet motor (EM-3350-1A)
- Single-Phase induction motor (EM-3350-1C)
- DC Shunt wound motor (EM-3350-1D)
- DC Compound wound motor (EM-3350-1F)
- Three-Phase salient pole synchronous motor (EM-3350-3A)
- Three-Phase rotor winding motor (EM-3350-3B)
- Three-Phase squirrel cage motor (EM-3350-3C)

OVERVIEW OF EQUIPMENT REQUIRED:

Chapter 1 : Basic Measurement and Characteristic of SCR and TRIAC	(PE-5310-3A)	(PE-5310-2B)	(PE-5310-5D)	(PE-5340-3A)							
	R.M.S. Meter	Differential Amplifier	SCR / TRIAC Set	Isolating Transformer						Analog Multimeter	D.S.O. (Digital Storage Oscilloscope)
Exp 1-1: Three-phase Source Voltage Measurement	1			1							
Exp 1-2: Digital Storage Oscilloscope and Differential Amplifier		1		1							1
Exp 1-3: SCR Characteristic and Measurement		1	1							1	1
Exp 1-4: TRIAC Characteristic and Measurement		1	1							1	1

※System Transformer (EM-3340-3B), Experimental Frame(EM-3380-2B), Connecting Leads(EM-3390-3A) and Safety Bridging Plugs Set (EM-3390-4A) are required

Chapter 2: Single-Phase Rectifiers and AC Voltage Controller (AC→DC、AC→AC)	(PE-5310-1A)	(PE-5310-2A)	(PE-5310-2B)	(PE-5310-2C)	(PE-5310-2D)	(PE-5310-3A)	(PE-5310-3B)	(PE-5310-3C)	(PE-5310-3E)	(PE-5310-5A)	(PE-5340-5B)	(PE-5310-5C)	(PE-5340-3A)	
	DC Power Supply	Reference Variable Generator	Differential Amplifier	Current Transducer	3∅ Phase Angle Controller	R.M.S. Meter	Power Meter	Resistor Load Set	Inductive Load Set	Power Diode Set	Fuse Set	Thyristor	Isolating Transformer	D.S.O. (Digital Storage Oscilloscope)
Exp 2-0: Triggering Pulse Measurement	1	1	1		1						1		1	1
Exp 2-1: Single-Phase Half-Wave Uncontrolled Rectifier			1	1		1	1	1	1	1	1		1	1
Exp 2-2: Single-Phase Full-Wave Uncontrolled Rectifier			1	1		1	1	1	1	2	1		1	1
Exp 2-3: Single-Phase Half-Wave Controlled Rectifier	1	1	1	1	1	1		1	1		1	1	1	1
Exp 2-4: Single-Phase Full-Wave Controlled Rectifier	1	1	1	1	1	1		1	1		1	2	1	1
Exp 2-5: Symmetrical Single-Phase Full-Wave Semi-Controlled Rectifier	1	1	1	1	1	1		1	1	1	1	1	1	1
Exp 2-6: Asymmetrical Single-Phase Full-Wave Semi-Controlled Rectifier	1	1	1	1	1	1		1	1	1	1	1	1	1
Exp 2-7: Single-Phase Semi-Controlled AC Voltage Controller	1	1	1	1	1	1		1	1	1	1	1	1	1
Exp 2-8: Single-Phase Full-Controlled AC Voltage Controller	1	1	1	1	1	1		1	1		1	1	1	1

※ System Transformer (EM-3340-3B), Experimental Frame(EM-3380-2B), Connecting Leads(EM-3390-3A) and Safety Bridging Plugs Set (EM-3390-4A) are required

Chapter 3: Three-Phase Rectifiers and AC Voltage Controller (AC→DC、AC→AC)	(PE-5310-1A)	(PE-5310-2A)	(PE-5310-2B)	(PE-5310-2C)	(PE-5310-2D)	(PE-5310-3A)	(PE-5310-3B)	(PE-5310-3C)	(PE-5310-3E)	(PE-5310-5A)	(PE-5310-5B)	(PE-5310-5C)	(PE-5340-3A)	
	DC Power Supply	Reference Variable Generator	DIFFERENTIAL AMPLIFIER	CURRENT TRANSDUCER	3∅ Phase Angle Controller	R.M.S. Meter	Power Meter	Resistor Load Set	Inductive Load Set	Power Diode Set	Fuse Set	Thyristor	Isolating Transformer	D.S.O. (Digital Storage Oscilloscope)
Exp 3-1: Three-Phase Half-Wave Uncontrolled Rectifier			1	1		1		1	1	2	1		1	1
Exp 3-2: Three-Phase Full-Wave Uncontrolled Rectifier			1	1		1		1	1	3	1		1	1
Exp 3-3: Three-Phase Half-Wave Controlled Rectifier	1	1	1	1	1	1		1	1		1	2	1	1
Exp 3-4: Three-Phase Full-Wave Semi-Controlled Rectifier	1	1	1	1	1	1		1	1	2	1	2	1	1
Exp 3-5: Three-Phase Full-Wave Full-Controlled Rectifier	1	1	1	1	1			1	1		1	3	1	1
Exp 3-5: Three-Phase Full-Wave Semi-Controlled AC Voltage Controller	1	1	1	1	1			1		2	1	2	1	1
Exp 3-5: Three-Phase Full-Wave Full-Controlled AC Voltage Controller	1	1	1	1	1			1			1	3	1	1

※ System Transformer (EM-3340-3B), Experimental Frame(EM-3380-2B), Connecting Leads(EM-3390-3A) and Safety Bridging Plugs Set (EM-3390-4A) are required

Power Electronics Training System

Chapter 4: DC Chopper (DC→DC)																					
	(PE-5310-1A)	(PE-5310-2A)	(PE-5310-2B)	(PE-5310-2C)	(PE-5310-3A)	(PE-5310-3C)	(PE-5310-3E)	(PE-5310-4F)	(PE-5310-4G)	(PE-5310-4J)	(PE-5310-5B)	(PE-5310-5E)	(PE-5310-5F)	(PE-5310-3A)	(EM-3320-1A)	(EM-3320-1N)	(EM-3330-1A)	(EM-3390-2A/2B)	(EM-3390-2C)		
	DC power supply	Reference Variable Generator	Differential Amplifier	Current Transducer	R.M.S. Meter	Resistor Load Set	Inductive Load Set	IGBT Drive Set	DC PWM Generator	Three Phase Rectifier & Filter	Fuse Set	MOSFET / IGBT Set	SCR DC Chopper Set	Isolating Transformer	Magnetic Powder Brake Unit	Powder Brake Controller Unit	DC Permanent-magnet Machine	Coupling & Coupling Guard	Shaft And Guard	D. S.O. (Digital Storage Oscilloscope)	
Exp 4-0: IGBT Characteristic Measurement	1		1								1										1
Exp 4-1: DC PWM Controller	1	1	1						1												1
Exp 4-2: Single-Quadrant DC Chopper	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1
Exp 4-3: Two-Quadrant DC Chopper	1	1	1	1		1	1	1	1	1	1			1	1	1	1	1	1	1	1
Exp 4-4: Four-Quadrant DC Chopper	1	1	1	1		1	1	1	1	1	1			1	1	1	1	1	1	1	1
Exp 4-5: SCR DC Chopper	1		1	1		1	1			1	1		1	1							1

※System Transformer (EM-3340-3B), Experimental Frame(EM-3380-2B), Connecting Leads(EM-3390-3A) and Safety Bridging Plugs Set (EM-3390-4A) are required

Chapter 5: Inverters(AC→DC→AC)																					
	(PE-5310-1A)	(PE-5310-2A)	(PE-5310-2B)	(PE-5310-2C)	(PE-5310-3A)	(PE-5310-3C)	(PE-5310-3E)	(PE-5310-4F)	(PE-5310-4H)	(PE-5310-4I)	(PE-5310-4J)	(PE-5310-4K)	(PE-5310-5B)	(PE-5340-3A)	(EM-3320-1A)	(EM-3320-1N)	(EM-3330-3C)	(EM-3390-2A/2B)	(EM-3390-2C)		
	DC power supply	Reference Variable Generator	Differential Amplifier	Current Transducer	R.M.S. Meter	Resistor Load Set	Inductive Load Set	IGBT Drive Set	Single Phase PWM Controller	Three Phase PWM Controller	Three Phase Rectifier & Filter	Universal Inverter	Fuse Set	Isolating Transformer	Magnetic Powder Brake Unit	Powder Brake Controller Unit	Three Phase Squirrel Cage Machine	Coupling & Coupling Guard	Shaft And Guard	D. S.O. (Digital Storage Oscilloscope)	
Exp 5-1: Single-Phase PWM Controller	1	1	1						1					1							1
Exp 5-2: Single-Phase Inverter	1	1	1	1		1	1	1	1		1		1	1							1
Exp 5-3: Three-Phase PWM Controller	1	1	1		1					1											1
Exp 5-4: Three-Phase Inverter	1	1	1	1		1				1	1	1	1	1	1	1	1	1	1		1

※System Transformer (EM-3340-3B), Experimental Frame(EM-3380-2B), Connecting Leads(EM-3390-3A) and Safety Bridging Plugs Set (EM-3390-4A) are required

Chapter 6: Applications of Power Electronics	(PE-5310-1A)	(PE-5310-1B)	(PE-5310-2B)	(PE-5310-3A)	(PE-5310-3B)	(PE-5310-3D)	(PE-5310-4A)	(PE-5310-4B)	(PE-5310-4C)	(PE-5310-4D)	(PE-5310-4E)	(PE-5310-5E)	(PE-5340-3A)	
	DC Power Supply	DC Power Supply	Differential Amplifier	R.M.S. Meter	Power Meter	Resistor Load	Flyback Switching Power Supply	Boost Switching Power Supply	Buck Switching Power Supply	Buck-boost Switching Power Supply	Electronic Ballast Fluorescent	MOSFET / IGBT Set	Isolating Transformer	D.S.O. (Digital Storage Oscilloscope)
Exp 6-0: Power MOSFET Characteristic Measurement	1		1									1		1
Exp 6-1: Buck Switching Power Supply		1	1	1		1			1					1
Exp 6-2: Boost Switching Power Supply		1	1	1		1		1						1
Exp 6-3: BuckBoost Switching Power Supply		1	1	1		1				1				1
Exp 6-4: Fly-back Switching Power Supply			1	1	1	1	1						1	1
Exp 6-5: Electronic Ballast			1	1	1						1		1	1

※ System Transformer (EM-3340-3B), Experimental Frame(EM-3380-2B), Connecting Leads(EM-3390-3A) and Safety Bridging Plugs Set (EM-3390-4A) are required

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K&H PRODUCTS® **K&H MFG. CO., LTD.**

5F, No. 8, Sec. 4 Tzu-Chiang Rd., San Chung City 241,
 Taipei Hsien, Taiwan R.O.C.
 http://www.kandh.com.tw E-Mail:education@kandh.com.tw
 Tel : 886-2-2286-0700 (Rep.) 886-2-2286-7786
 Fax : 886-2-2287-3066, 886-2-2287-9704

