TESCA™

EV TECHNOLOGY LAB

CATALOG
2024

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BATTERY CHARGER DISCHARGER (LI- ION)-1.8KW

Order Code - EV46001

This unit can be used for Charging test and discharge test of lead-acid batteries, lithium batteries and other types of batteries.

The maximum charge & discharge cycle index is 16 times, which can also be used as the aging equipment in the battery production.

The device provides two operation modes: Panel and Software. After installing the specified software, the device can be managed and operated through the computer: charge-discharge setting, data sampling, test report imports and export, test data analysis, charge-discharge curves drawing. One computer can manage multiple devices simultaneously through a switch.

Specifications

Power Supply	:	AC 220V±10% 50/60HZ
Basic Function	:	Charge ,Discharge ,Auto-cycle, Test data analysis, Test data import & export
Applicable Batteries	:	Lead-acid battery pack, Li-ion battery pack
Battery Rated Voltage	:	12V-84V
Charging Functions		
Charge Methods	:	CV & CC
Charge Current	:	0.5-10A adjustable, 0.1A stepping
Charge Cut-Off Current	:	0.1-5A adjustable, 0.1A stepping
Charge Voltage Range	:	9V-99V, 0.1V stepping
Charge Current Accuracy	:	±0.03A
Charge Voltage Accuracy	:	±0.1V
Discharging Functions		
Discharge Methods	:	CC
Discharge Current	:	9V-21V - 0.5-10A adjustable 21V-99V- 0.5-20A adjustable
Discharge Cut-Off Voltage	:	9V-99V, 0.1V stepping
Discharge Current Accuracy	:	±0.03A
Discharge Voltage Accuracy	:	±0.1V
Max. Cycle Index	:	16 times
Operation Methods	:	Software/Panel
Battery Connection Methods	:	Testing cable with clamp
Communication Port	:	LAN

Note : Computer to be purchased /Provided by Customer

Note: Specifications are subject to change.

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28.10.2024

60V , 1.2KW LITHIUM ION BATTERY WITH BMS (LFP)

Order Code - EV46001ACC01

Battery Electro Chemistry : LFP
Voltage : 60V
Battery Capacity : 1.2KW

- With Smart BMS & Blutooth and RS485 Output
- PC based BMS Software

60V , 1.2KW Lithium ion battery with BMS
Battery Electro Chemistry ; NMC
Voltage ; 60V
Battery Capacity ; 1.2KW
With Smart BMS & Blutooth and RS485 Output
PC based BMS Software

60V , 1.2KW LITHIUM ION BATTERY WITH BMS (NMC)

Order Code - EV46001ACC02

Battery Electro Chemistry : NMC
Voltage : 60V
Battery Capacity : 1.2KW

- With Smart BMS & Blutooth and RS485 Output
- PC based BMS Software

Note: Specifications are subject to change.

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ENVIRONMENTAL CHAMBER (CLIMATE CHAMBER)

For Lithium Battery Testing

Order Code - EV46002

Specifications

Type	:	Vertical, floor model
Inner	:	Size in mm 1000 x 1000 x 700mm
Capacity	:	700 Liters
Temperature Range	:	+20°C to +80°C (- Degree will be optional cost)
Controller	:	GIC make microprocessor based digital PID temperature controller cum indicator will be provided.
Resolution	:	0.1°C
Sensor	:	RTD, PT100, class-A sensor will be provided to monitor the temperature.
Controlling Accuracy	:	±1°C
Load	:	100 Kg's maximum
Interior	:	1.2mm (18 SWG) thick SS304 with matt finishing will be the inner layer.
Exterior	:	1.2mm (18 SWG) thick MS with powder coated will be the outer layer.
Insulation	:	100mm thickness high density glass wool insulation will be provided.
Door	:	Single door, double walled insulated & interior lined with SS304,silicon gaskets for leak proof, lock, handle & heavy-duty hinges for door.
Uniformity	:	Heavy duty axial fans will be provided for forced air circulation to maintain uniform conditions inside the chamber within permissible limit.
Air Heaters	:	SS tubular heaters with fins will be provided
Compressor	:	Hermetically sealed single stage refrigeration system with Emerson make compressor will be provided for Cooling
Condenser & Evaporator	:	Air cooled type copper tubes & fins will be provided

Refrigeration Features

- Refrigerant-CFC Free (ECO friendly) will be used.
- Drier for compressor safety will be given.
- Overload cut off relay for compressor safety.
- Efficient oil return managing system for protection of compressor
- The additional isolation suspension channel with antivibration pads are provided to reduce the vibration & noise level
- High speed axial fan will be provided for better condensation.

Electrical Features

- Schneider make MCB's & contactors will be provided for motor & other loads
- L&T make main switch will be provided.
- Emergency cut-off switch will be provided
- SSR will be using for Heater efficiency
- Door interlocking switch will be provided
- Door open alarm will be provided
- Fire and temperature retardant wires will be using
- Ceramic cables will be provided for heaters.
- High temperature safety cut off through thermostat.
- Air circulating fan will control by door locking switch.
- Power supply:230v, single phase,50Hz

Note: Specifications are subject to change.

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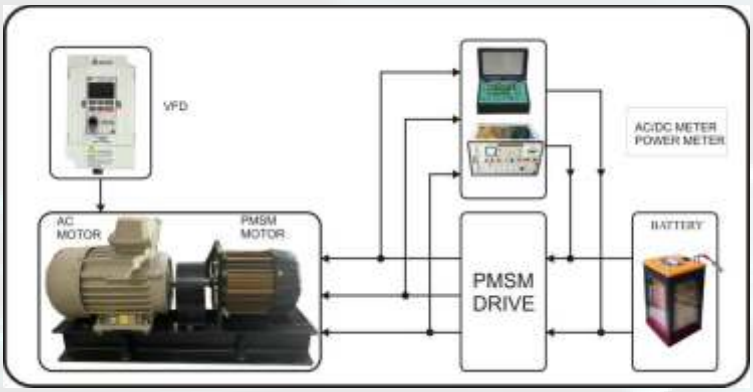
REGENERATIVE BRAKING AND BATTERY CHARGING STUDY SET UP-PC BASED

Order Code - EV46003

This set up is designed to study the working principle of Regenerative braking and charging system used in Electric vehicle , set up consists of



- 1 kw , 3 Phase PMSM Motor with Prime mover set up
- 1KW PMSM Drive with battery set
- IGBT Power Module +PWM Controller for Regenerative braking study

3 Phase PMSM Motor

Type	:	3 Phase PMSM
Voltage	:	48V
Power	:	1KW
Speed	:	3500RPM
Feedback	:	3 numbers of Hall sensor

- Coupled with 3 phase AC Motor (1.5KW) /3000RPM @ act as a prime mover
- Variable Frequency drive (2hp) is provided to adjust prime mover speed

PMSM Drive

- Digital meters for drive input dc voltage measurement
- Digital meters for motor speed Measurement
- Potentiometer for speed adjustments

Note: Specifications are subject to change.

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REGENERATIVE BRAKING AND BATTERY CHARGING STUDY SET UP-PC BASED

Order Code - EV46003

- SPDT switches for Forward /Reverse selection
- MCB for input DC ON/OFF, Fuse for output side
- DC Source (Battery, 48v, 25ah, lfp lithium battrey+charger)is provided for drive input
- All are mounted on a nice powder coated cabinet with front panel sticker

Specification

Input	:	48V VDC from battery
Output	:	Suitable for PMSM Motor
Power	:	1KW

ALTERNATE - LOW COST MODEL

Order Code - EV46003.1

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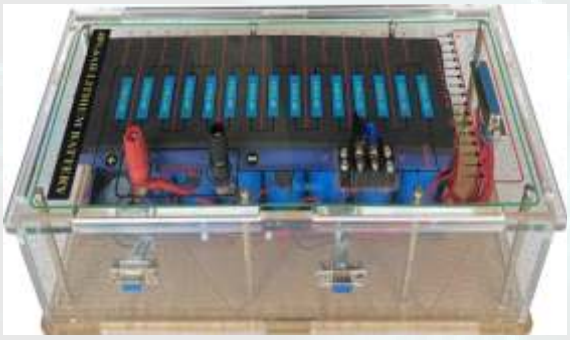
BATTERY MANAGEMENT SYSTEM (BMS) STUDY / TEST SET UP

Order Code - EV46004

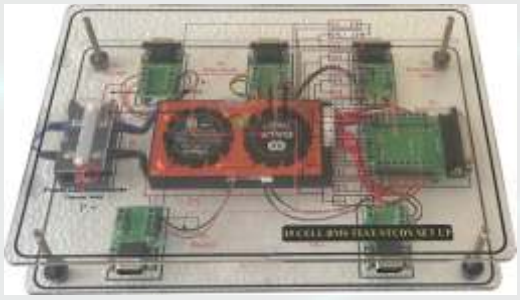
In order to use the highly efficient lithium-ion batteries safely and effectively, a battery management system (BMS) is needed , This set up can be used to study and test the BMS board which is commonly used in Lithium battery pack for various protections like cell unbalance , Temp , OL, etc . This set up consists of

- BMS board with PC based Software & Blue tooth App
- BMS Accessories (Temp sensor , Buzzer, Indicator etc)
- Lithium Battery Emulator Board with individual cell voltage adjustment
- 48V Lithium Battery (LFP)-Actual
- Battery discharger (Or) Battery charger & discharger
- Accessories : Hot air Gun with Temp probe

BMS Software's



Lithium Battery



BMS Board

Battery Cell simulator

Lithium Battery Emulator Board with individual cell voltage adjustment

Battery Management Systems [BMS] development & characterization phases require an emulator for battery cells voltage / Current & Temperatures System functions can be tested with emulator at better software function & FW locks can be built to make your BMS optimised.

Voltage Emulator Specifications:

- No of Cell model- 15 Channels [48V]
- Supply Voltage & Current- 12V , 6A
- Variable Voltage per Cell- 1.2V to 4.9V
- Cell output current -1000mA/Per Channel
- Voltage Accuracy- 2mV
- Voltage Isolation -1.5KVA
- Voltage Adjustment / control – Digital INC/DEC Key

Note: Specifications are subject to change.

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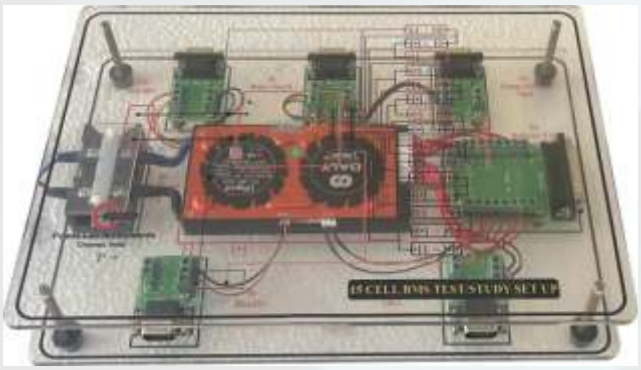
BATTERY MANAGEMENT SYSTEM (BMS) STUDY / TEST SET UP

Order Code - EV46004

BMS board with PC based Software

- One number of BMS board-15 cell with PC based Software & Mobile Blue Tooth App
- Provision to connect Battery emulator or Real Lithium Battery (any one at a time for testing
- Necessary Terminations for cell terminal connections
- PC should be provided by institutions



Lithium Battery

- 48V , 6AH Battery / Lithium / LPF type (15 cell)
- with suitable charger
- All cell connections terminated for BMS Interface
- Four Number of Temperature sensor and terminations for BMS interface

Accessories : Hot air Gun with Temp probe

- Can be used to test Temp sensor in BMS
- Adjustable blower speeds
- Digitally set-able temperature and fan speed
- Temperature range: 100 to 480 Degrees Centigrade
- Advanced 7 Segment Display

Battery Discharger (Li- Ion)-1kw

This unit can be mainly used for discharge test of lead-acid batteries, lithium batteries and other types of batteries. Main performance of test equipment: Discharge function Have Constant current discharge function.

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BATTERY MANAGEMENT SYSTEM (BMS) STUDY / TEST SET UP

Order Code - EV46004

Input power		AC 220V +10% / 50Hz
Voltage	**Measuring range**	0~100V
	Precision	± (0.2% of reading + 0.2% of range)
Current	**Discharge range**	0~20000mA
	Precision	± (0.2% of reading + 0.2% of range)
Capacity	**Precision**	± 1%
Power	**Discharge power**	£1000W
Time	**Inspection time**	Receive in real time £ 1S
	Timing range	0~999 hours/step
Data logging interval		³ 2S
Mid-range version		1.1 series
Discharge	**Discharge mode**	Constant current discharge
	Cut-off condition	Voltage, relative time, over-discharge protection
Voltage and current detection sampling		Four-wire sampling
Chassis size		W*D*H:430*210*210(mm)

Lithium Battery Protection Board Test Equipment

Scope of application: mainly used to detect whether the functional indicators of the power battery protection board are in the parameter range in order to provide staff with a set of testing standards. It is mainly used to test the power battery protection board of the protection board manufacturer and the power battery manufacturer.

Function introduction: PBTS protection board test system, divided into two types: Quick test and precise test.

Accurate testing: It can accurately detect the precise value of each functional parameter of the power battery protection board (the error is 5mv), which is convenient for the debugging and development of samples, and provides a set of standards for rapid testing to R&D personnel. Quick test: According to the design parameters of the protection board, set the test parameters for quick test, which is convenient for the protection board manufacturers and power battery manufacturers to quickly test and ship on a large scale. At the same time, it is suitable for various hardware schemes and part of the software scheme protection board test

Features

- Over Charging and over discharging protection test.
- Over Charging delay time and over Discharging delay time protection test.
- Short circuit protection test.
- Over voltage/under voltage protection tests.
- Over voltage delay time /under voltage delay time protection test.
- Over voltage/under voltage release protection test.
- Single cell self-consumption test.
- Total self-consumption test of protection board.
- Equalization current & Equalization voltage.
- Precise testing and quick test.IR Testing.

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BATTERY MANAGEMENT SYSTEM (BMS) STUDY / TEST SET UP

Order Code - EV46004

- Type BMS test support -B+ , P+ , C+ , B-, P-, C-
- High current module: the current level is 120A, current accuracy 0.1A.
- Voltage module: voltage range 0.5-5V, programmable output 0.5-5V, voltage accuracy 5mV.
- Short circuit module: super capacitor, fully analog pack the battery voltage instantly short-circuits the protection board to accurately capture the short-circuit time and current

• Number of test strings	:	1-16 string	
• The reference voltage	:	Ternary lithium battery lithium iron phosphate	(3.8V), (3.0V)
• Overcharge protection voltage	:	0.5-5V with Accuracy of	±5mV
• Over discharge protection voltage	:	0.5-5V with Accuracy of	±5mV
• Overcharge recovery voltage (Self-recovery)	:	0.5-5V with Accuracy of	±5mV
• Over discharge recovery voltage (Self-recovery)	:	0.5-5V with Accuracy of	±5mV
• Overcharge protection current	:	1-40A with Accuracy of	±0.1A
• Over discharge protection current	:	1-120A with Accuracy of	±0.1A
• Balanced opening voltage	:	0.5-5V with Accuracy of	±5mV
• Balance real-time current	:	0-1000mA with Accuracy of	±1mA
• Over current protection delay	:	0-15S with Accuracy	±1mS
• Overcharge protection delay	:	0-20S with Accuracy	±1mS
• Over-discharge protection delay	:	0-20S with Accuracy	±1mS
• Single cell self- consumption	:	0-500uA with Accuracy	±1uA
• Loop resistance	:	0-500mΩ with Accuracy	±1mΩ
• Short circuit protection (6 strings or more)	:	0-9999us with Accuracy	±1uS

- Scope of application
- All hardware solution protection boards and some software boards in the market (Special test items need to be communicated)

Battery Charger Discharger (Li- Ion)-1.8kw Order Code - EV46001

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BATTERY FABRICATION LAB SET UP

Order Code - EV46005

Lithium battery packs are the heart of the electric vehicle systems, the below offered equipments can be used to understand the fabrication process and Testing procedure of Lithium battery pack in various power ratings

- 8 Channel Cell tester - 6A
- Cell - IR tester
- Spot welding Machine -(Manual)
- Nickel removal Machine with compressor
- Battery Pack tester-99V/20A (Charger +Discharger)
- Cell Balancer-24 string /5A
- Adjustable Cell Fixing Clamp
- Soldring station
- Consumable Accessories like Lithium Cell (NMC & LFP Each 100 qty) , Cell Holder , Nickel welding strip, BMS(Various Ratings)

Note: Specifications are subject to change.

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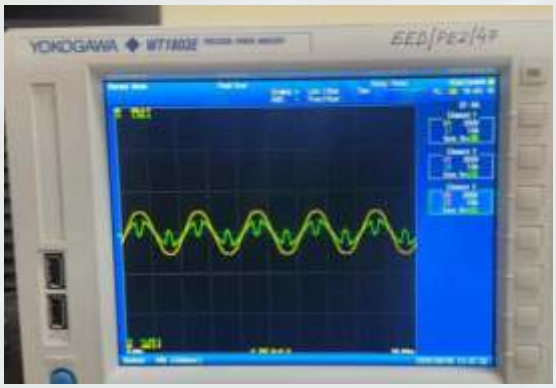
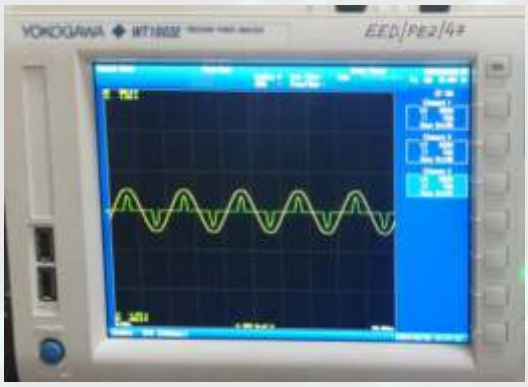
STATCOM CONTROLLER FOR BATTERY CHARGER

Order Code - EV46006

This STATCOM controller can be used study the harmonics level reduction in non linear load like battery charger . This set up consists of

- 60V , 18AH Lithium Battery with 3A charger
- STATCOM Controller with digital Harmonics meter
- 230VA C Input and 230VAC Output to non linear load (ie Battery charger)
- 1KW Capacity (230V , 4.5A)
- Current Harmonics improvement from 120% to 20% (3rd, 5th & 7th etc)
- Facility to study with different harmonics implementation through PC software
- SIC MOSFET based H bridge with STM 32 Microcontroller based PWM Controller
- Test points for PWM and Feed back signals (V, I etc)
- Digital meter is provided to indicate V, I , PF & Harmonics
- MCB provided to study with & without Harmonics compensation effect
- All are Mounted on a nice cabinet with Stickered front panel





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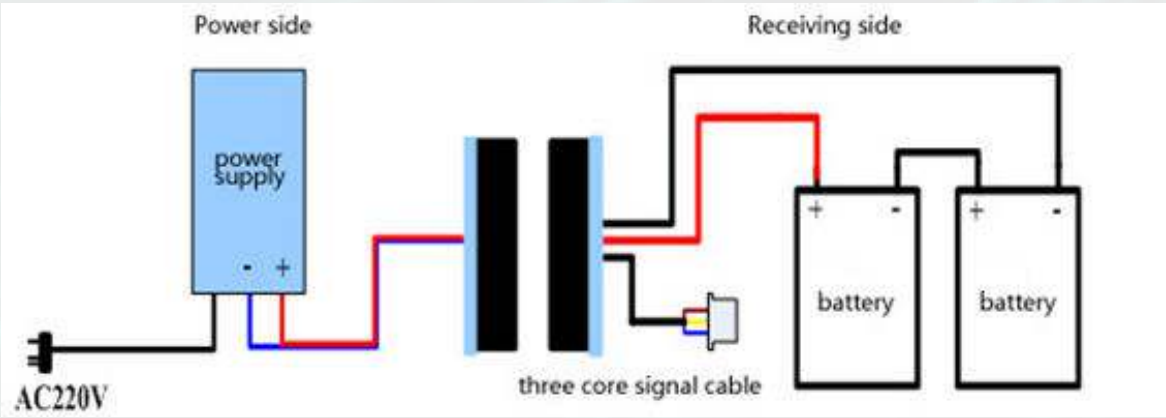
WIRELESS CHARGING STUDY SET UP -1KW , 60/48V

Order Code - EV46007

It is a high performance battery charger and suitable for providing non-contact charging for various mobile robots or devices such as AGV, AGC, RGV, electric forklift, golf cart , adaptive control technology to overcome the charging distance and load changes on the system performance, high control accuracy, for lithium batteries, lead-acid batteries, Ni-MH batteries and super capacitors to provide accurate and reliable charging, to protect and extend battery life.

Specifications

- Input voltage : AC220V ± 15%, single phase 50Hz
- Input current : 6A (max)
- Output voltage : 48.0V ~ 60.0V (adjustable, factory setting 54.4V)
- Output current : 8 ~ 16A (adjustable, factory setting 10A)
- Regulating accuracy : ± 0.3%
- Steady flow accuracy : ± 1.0%
- Voltage ripple : ≤0.3%
- Power efficiency : ≥85%
- Charging distance : air gap length: 0-30mm , X axis & Y axis deviation : ± 20mm
- Charging frequency : 30 ~ 60kHz (self-tuning)
- Ambient temperature : -20 ~ + 50 ℃
- Insulation resistance : ≥ 100MΩ
- Impact resistance : 10G (all directions)
- Vibration resistance : 19.6m / sec2 (10 ~ 55Hz)
- Dimension : 170 (W) * 150 (H) * 52 (D) mm
- Weight : 6.0kg/set



Note: Specifications are subject to change.

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FUEL CELL CHARGING SET UP -200W , 60/48V

Order Code - EV46008

Fuel cell-200W

- FUELCELL SINGLE CELL or Dual Cell ASSEMBLY
- Each Cell VOLT: 0.50 V - 0.9 VOLTS DC
- WATTS: 200 WATTS (Max) & 180W Continuous
- TYPE: PEM & SIZE: 25 SQ CM (Approx)

Fuel cell test station

- H2 Flow :Thro Rotameter 0-10slpm
- O2 Flow : Thro Rotameter 0-10slpm
- Cell Heater: 0- 100 deg.C
- H2 Humidification - 0 - 150 deg . C with humidification 1
- O2 Humidification - 0 - 150 deg . C with humidification1
- Electronic DC Load with volt and ammeter
- Range : 0 - 1V - 10V DC, 0.1 A - 25 A

Gas with Cylinder

- One number of Hydrogen Cylinder filled with Hydrogen Gas with regulator
- One number of Nitrogen Cylinder filled with Nitrogen Gas with regulator
- One number of Oxygen Cylinder filled with Oxygen Gas with regulator

Alternate Model

This set up consists of

1. 200W PEM Fuel Cell (PEMFC) with necessary Hydrogen control panel
2. Meter set up

Note: Specifications are subject to change.

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FUEL CELL CHARGING SET UP -200W , 60/48V

Order Code - EV46008

200W PEM Fuel Cell (PEMFC) with necessary Hydrogen control panel

The Horizon H-200 PEM Fuel Cell is a 200 Watt, air fed / air cooled, self-humidified hydrogen fuel cell suitable for many medium projects and uses. Because this fuel cell is air cooled there is no need for large, complicated, and expensive water cooling systems.

Horizon H-Series PEM fuel cells are semi-integrated, efficient, reliable systems that minimize the use of peripherals. As such, they are the most compact and lightweight fuel cells around the world.

Includes:

- Connections/Tubing
- Electronic valves
- Electronic control box
- 200W stack with blower
- Fuel cell ON/OFF switch
- SCU ON/OFF switch

Fuel Cell Properties	
Number of Cells	20/40
Rated Power	100 / 200W
Rated Performance	12V @ 8.3A or 12V@16A
Hydrogen Supply Valve Voltage 12V	
Purging Valve Voltage	12V
Blower Voltage	12V
Reactants	Hydrogen and Air
Ambient Temperature	5 - 30 C; (41 - 86 F;)
Max Stack Temperature	65 C (149 F)
Hydrogen Pressure	0.45 - 0.55 Bar
Humidification Cooling Air	Self-humidified (integrated cooling fan)
Controller Weight	400g
Stack Weight (with Fan & Casing)	1290g ± 30g
Hydrogen Flow Rate at Max Output	1.3 L/min
Stack Size	118 x 104 x 94mm (4.6" x 4.1" x 3.7")
Hydrogen Purity Requirement	≥ 99.995% (dry H2)
Start up time	≤ 30s (ambient temperature)
Efficiency of System	40% at 12V
Low Voltage Protection	20V
Over Current Protection	12A
Over Temperature Protection	65 C
External Power Supply	13V (±1V), 5A

Meter set up with

- Necessary MS frame to Fix the above Unit with terminations
- Necessary Digital meters is provided to indicate Fuel cell voltage , current etc
- DC DC Converter & with battery 48V, 60V

Gas with Cylinder : One number of Hydrogen Cylinder filled with Hydrogen Gas with regulator

Note: Specifications are subject to change.

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BATTERY SIMULATOR-2KW (& DISCHARGER)

Order Code - EV46009

- IT6514C can be used as a power supply and an electronic load.
- As a power supply, CV, CC, CP modes are available.
- As an electronic load, CC and CP mode are available.
- It supports independent adjustable rise/fall time setting in different modes.
- In battery charging and discharging test, the changes of internal resistance should be taken into account.
- For enhancing test precision, IT6500C series power supply provides built-in internal resistance setting function which can simulate battery operation status in real-case BSS2000 Battery Simulation Test Software
- Battery simulation range: 2250V / 1152kW
- Support multi-channel battery module status simulation
- Bidirectional regenerative battery simulator, regenerative efficiency up to 95%
- Seamless switching between battery charging and discharging mode
- Support user-defined battery characteristic curve import
- Support quick set up of battery characteristic curves by input common parameters
- Support .mat file import function *2
- Built-in various battery types (include LAB,Li-on,LMO, LNMCO, LNMCO&LMO,LFP,LTO and NiMH .) *
- Battery protection parameter setting function
- Battery output initial state of charge setting function
- Ideal data report function
- Battery curve preview and real-time curve display function
- Flexible expansion by parallel for larger current/power simulation request
- Support up to 20 channels battery simulation *3
- BSS2000 basic version software is used to simulate lead-acid and lithium-ion batteries.
- BSS2000 Pro version and BSS2000M Multi-channel version(optional)

Note: Specifications are subject to change.

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BLDC MOTOR (HUB)

Order Code - EV46010

Type	:	3 Phase BLDC
Voltage	:	60V or 48V
Power	:	360W / 1KW
Speed	:	350RPM
Feedback	:	3 numbers of Hall sensor
Load set up	:	Spring balance Load set up with brake Drum

E vehicle Motor Controller(BLDC Drive)

This controller used to study & testing of Ev-BLDC motor (hub Type). Commercial motor drive used in this system to understand the working concept of the BLDC machines by user. it consists of

Features

- Meters for drive input dc voltage measurement
- Digital meters for motor speed Measurement
- Potentiometer for speed adjustments
- SPDT switches for Forward /Reverse selection
- MCB for input DC ON/OFF, Fuse for output side
- DC Source (Or Battery Lithium)is provided for drive input
- All are mounted on a nice powder coated cabinet with front panel sticker

Specification

Input : 0-48/60 VDC from battery
Output : Suitable for BLDC Motor
Power : 360W or 1KW

Note: Specifications are subject to change.

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MID DRIVE MOTORS , DRIVE AND CONTROL PANEL

Order Code - EV46011-EV46016

Set up designed to study the connection procedure and testing procedure of electric 3 or 4 wheeler set up using various components of electric vehicle like battery , EV.Motors , drive etc , Set up consists of

Control Panel (with Drive, battery, charger etc)

Controller

• Type	:	MOSFET based Controller
• Input Voltage	:	48-60VDC
• Maximum Current	:	30A

Battery

• Type	:	lithium ion battery -LPF
• Voltage	:	60v
• Power/Current	:	18Ah
• Features	:	in built Smart BMS with PC interface Software and
	:	Bluetooth-Mobile App software -optional features

Charger

• Type	:	MOSFET based Charger
• Input Voltage	:	170-250VAC
• Output Voltage	:	62V
• Charging Current	:	5A

Note: Specifications are subject to change.

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MID DRIVE MOTORS , DRIVE AND CONTROL PANEL

Order Code - EV46011-EV46016

- Charging Time : 4-5 Hour
- Features : Led's for status indicator

Panel

- Powder coated M.S Panel with diagram Stickered front panel to fix the Above Motor, controller and Battery and also to fix the below mentioned components
  - Steering with Pedal Accelerator for speed control
  - F/R selection switch, Left /Right indicator switch with Lamp
  - Head light switch with Lamp, Horn switch with buzzer
  - Brake control lever(optional)
  - Digital LCD-indicator ,To indicate
    - Speed in KM/H
    - Motor Speed in Rpm
    - Left indicator status
    - Right indicator status
    - Head light Indicator status
  - ON/OFF Switch with Key
  - DC-DC Converter for Light (48V TO 12V, 10A)
- Necessary Banana terminals provided for motor , Battery , Controller input and outputs terminations for external patching.
- Panel Meter for Battery voltage and Current
- Necessary terminations for controller control signal (like hall sensor , indicator, throttle) output and inputs for external patching.
- Necessary Fuse and MCB provided for battery, Motor

Features

- Provision / Facility to Interface with External IGBT Power Module and Controller set up (FPGA /MATLAB/DSPIC etc)- for Motor control and testing

Optional Features

1. PC Software for BMS -Smart Battery (OP2)
2. Blue tooth Mobile app- connectivity for BMS -Smart Battery(OP3)

Possible Experiments

1. Study and testing of speed control of Hub Motor used in two wheelers
2. Study and testing of 3/4 wheeler control components functions (pedal Acce function, F/R switch function , Left /Right indicator switch function, Head light switch function, Horn switch function, Brake control lever function, Digital LCD-indicator function etc)
3. Study and Testing of battery charging and discharging - BMS system using PCSoftware and Mobile blue-tooth App (Computer /Mobile will be provided by user)- optional features

The performance of this model could even better than the performance of bench top oscilloscope. It has 4 analog channels, 1GSa/s real-time sampling rate, 2mV-10V/DIV input sensitivity, and 250MHz bandwidth. It is powered by USB2.0 Interface, plug and play device with small size which is easy for carrying. High cost performance, pass/fail test, resourceful trigger function, dynamic cursor tracking, waveform record and replay function

Note: Specifications are subject to change.

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MID DRIVE MOTORS , DRIVE AND CONTROL PANEL

Order Code - EV46011-EV46016

MOTORS SPECIFICATION

1. THREE PHASE BLDC MID DRIVE MOTOR - ORDER COD - EV46011M

- Voltage : 60V
- Motor Power : 1000W
- Maximum speed : 25-35KMPH
- Sensor : 3 Numbers of Hall sensor
- Load : Differential gear , Drum & tyre
- Tire : Brand New

2. THREE PHASE SWITCHED RELUCTANCE MOTOR ORDER CODE - EV46012M

- Voltage : 48V
- Power : 1KW or 3KW (Optional)
- Speed : 2500 RPM
- Feedback : 3 numbers of Hall sensor
- Differential set up : 10:1 Gear Ratio Fitted with stand and Tire , drum

3. THREE PHASE PERMANENT MAGNET SYNCHRONOUS MOTORS - ORDER CODE - EV46013M

- Voltage : 48V
- Power : 1KW
- Speed : 2500 RPM
- Feedback : 3 numbers of Hall sensor
- Differential set up : 10:1 Gear Ratio Fitted with stand and Tire , drum

4. SIX PHASE PERMANENT MAGNET SYNCHRONOUS MOTORS - ORDER CODE - EV46014M

- Voltage : 60V
- Power : 1KW or 3KW (Optional)
- Speed : 2500 RPM
- Feedback : 3 numbers of Hall sensor
- Differential set up : 10:1 Gear Ratio Fitted with stand and Tire , drum

5. THREE PHASE AC INDUCTION MOTOR - ORDER CODE - EV46015M

- Voltage : 48V
- Power : 1KW or 3KW (Optional)
- Speed : 2500 RPM
- Feedback : Encoder
- Differential set up : 10:1 Gear Ratio Fitted with stand and Tire , drum

6. THREE PHASE AXIAL PERMANENT MAGNET SYNCHRONOUS MOTORS - ORDER CODE - EV46016M

- Voltage : 48V
- Power : 1KW or 3KW (Optional)
- Speed : 2500 RPM
- Feedback : 3 numbers of Hall sensor
- Differential set up : 10:1 Gear Ratio Fitted with stand and Tire , drum

Note: Specifications are subject to change.

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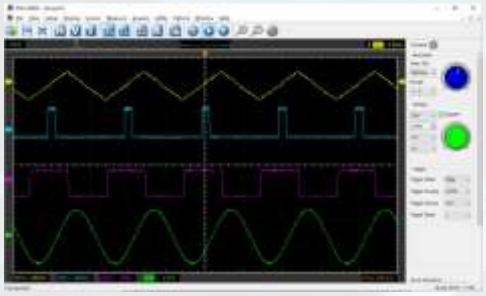
PC BASED MEASUREMENT AND ACQUISITION SYSTEM FOR MOTOR VOLTAGE AND CURRENT (OPTIONAL)

Order Code - EV-DAQ

The performance of this model could even better than the performance of bench top oscilloscope. It has 4 analog channels, 1GSa/s real-time sampling rate, 2mV-10V/DIV input sensitivity, and 250MHz bandwidth. It is powered by USB2.0 Interface, plug and play device with small size which is easy for carrying. High cost performance, pass/fail test, resourceful trigger function, dynamic cursor tracking, waveform record and replay function.



A. Data acquisition unit with software- Specifications

Bandwidth	:	70MHz
Channel	:	4 CH
Real-time Sampling Rate	:	1GSa/s
Memory Depth	:	64K
Time Base Precision	:	±50ppm
Time Base Range	:	2ns/div-1000s/div (1-2-4 sequences)
Input Impedance	:	1MΩ 25pF
Input Sensitivity	:	2mV/div ~ 10V/div
Vertical Resolution	:	8Bit
Vertical Displacement Range	:	2mV ~ 10V/div @ x1 probe; 20mV ~ 100V/div @ x10 probe ; 200mV ~ 1000V/div @ x100 probe; 2V ~ 10000V/div @ x1000 probe
DC Gain Accuracy	:	±3%
Bandwidth Limit	:	20MHz
Trigger Mode	:	Edge, Pulse, Video, Alternative
Trigger Source	:	CH1, CH2, CH3,CH4
Waveform Signal Process	:	+,-,x,÷,FFT, Invert
Cursors Measurement	:	Cross, Trace, Horizontal, Vertical
Auto Measurement	:	Vpp, Vamp, Vmax, Vmin, Vtop, Vmid, Vbase, Vavg, Vrms, Vcrms, Preshoot, Overshoot, Frequency, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle
Volume	:	175mm * 105mm * 25mm
Weight		0.9KG

B. AC/DC Current Probe - 3 Numbers

- AC/DC frequency range: Up to 20KHz
- Effective Measurement Range: 20mA to 65A DC
- Its current transducer is composed of permalloy and hall elements, which linearly transform the AC or DC current to AC or DC current voltage
- And if connect to an oscilloscope by BNC type connector, you are able to observe the current waveforms;

Note: Specifications are subject to change.

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PC BASED MEASUREMENT AND ACQUISITION SYSTEM FOR MOTOR VOLTAGE AND CURRENT (OPTIONAL)

Order Code - EV46011-DAQ

C. Accessory-2 passive probes (10:1 Voltage probes), 2 gator clip lines is provided

D. Computer -To be provided / to be Purchased

- Assembled computer -18 months warrantee
- Windows -10 Software
- Intel Core i5 processor with Fan
- 310 Asrock NVME Motherboard
- 8GB Ddr4 samsung Ram
- 512gb NVME SSD Harddisk
- Fingers Brand Turbo mini cabinet (3.0)
- Logitech multimedia keyboard& mouse
- 5Ghz wireless option
- Computer Backup ups(15mins) - Make- FOXIN
- 24" Acer IPS full HD Monitor (HDMI)-(2 Yrs Wrty)

Note: Specifications are subject to change.

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THREE PHASE SYNCHRONOUS RELUCTANCE MOTOR

Order Code - EV46017

Features

- Digital meters for motor speed Measurement
- Digital meters for drive input (Battery) dc voltage , current measurement
- Potentiometer for speed adjustments
- switches for Forward /Reverse selection
- switches for Brake selection
- MCB for input dc on/off, Fuse for output side
- All are mounted on a nice powder coated cabinet with front panel sticker

Specification

Voltage	:	3 phase 400VAC
Power	:	1KW
Speed	:	1500 RPM
Feedback	:	Encoder /Proximity sensor
Load	:	Spring balance load set up

Motor Controller

Input	:	3 phase ac 415v
Output	:	suitable for 3 Phase Syn.Reluct. Motor
Power	:	1KW

Features :

- Speed control through throttle /pedal
- F/R selection
- Brake selection
- Interlock selection

Note: Specifications are subject to change.

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ELECTRIC VEHICLE (TWO WHEELER) STUDY TRAINER

Order Code - EV46018

Set up designed to study the connection procedure and testing procedure of electric 2 wheeler set up using various components of electric vehicle like battery , BLDC Hub Motor , drive etc , Set up consists of

BMS PC Based Software

BMS Blue tooth Mobile app

Motor

- Motor Type : BLDC Hub Motor
- RIM/HUB Size : 10Inch
- Voltage : 60V
- Motor Power : 1000W
- Maximum speed : 25-35KMPH
- Sensor : 3 Numbers of Hall sensor
- Brake : Disc brake
- Tire : Brand New

Controller

- Type : MOSFET based Controller
- Input Voltage : 48-60VDC
- Maximum Current : 30A

Battery

- Type : lithium ion battery -LPF
- Voltage : 60v
- Power/Current : 18Ah

Note: Specifications are subject to change.

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ELECTRIC VEHICLE (TWO WHEELER) STUDY TRAINER

Order Code - EV46018

- Features : in built Smart BMS with **PC interface Software and**
  : **Bluetooth-Mobile App software -optional features**

Charger

- Type : MOSFET based Charger
- Input Voltage : 170-250VAC
- Output Voltage : 62V
- Charging Current : 5A
- Charging Time : 4-5 Hour
- Features : Led's for status indicator

Panel

- Powder coated M.S Panel with diagram Stickered front panel to fix the Above Motor, controller and Battery and also to fix the below mentioned components
  - Handle with throttle for speed control
  - F/R selection switch, Left /Right indicator switch with Lamp
  - Head light switch with Lamp, Horn switch with buzzer
  - Brake control lever(optional)
  - Digital LCD-indicator ,To indicate
    - Speed in KM/H
    - Motor Speed in Rpm
    - Left indicator status
    - Right indicator status
    - Head light Indicator status
  - ON/OFF Switch with Key
  - DC-DC Converter for Light (48V TO 12V, 10A)
- Necessary Banana terminals provided for motor , Battery , Controller input and outputs terminations for external patching.
- Panel Meter for Battery voltage and Current
- Necessary terminations for controller control signal (like hall sensor , indicator, throttle) output and inputs for external patching.
- Necessary Fuse and MCB provided for battery, Motor

Features

- Provision / Facility to Interface with External IGBT Power Module and Controller set up (FPGA /MATLAB/DSPIC etc)- for Motor control and testing

Optional Features

1. Spring balance load set up with dial indication facility for HUB Motor (OP1)
2. PC Software for BMS -Smart Battery (OP2)
3. Blue tooth Mobile app- connectivity for BMS -Smart Battery(OP3)

Possible Experiments

1. Study and testing of speed control of Hub Motor used in two wheelers
2. Study and testing of Two wheeler control components functions (throttle function, F/R switch function , Left /Right indicator switch function, Head light switch function, Horn switch function, Brake control lever function, Digital LCD-indicator function etc)
3. Study and Testing of battery charging and discharging - BMS system using PC Software and Mobile blue-tooth App (Computer /Mobile will be provided by user)-optional features
4. Load test of HUB Motor -optional.

Note: Specifications are subject to change.

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ELECTRIC VEHICLE (4 WHEELER) TRAINER WITH BLDC/PMSM/SR MOTOR

Order Code - EV46019

FOUR WHEELER ELECTRIC VEHICLE SYSTEM CONSISTS OF

Mid drive Motor & Drive

- One number of 60V/1.2KW, 3Ø PMSM Motor with controller
- BLDC Motor **(Optional -1)**
- Switched Reluctance Motor **(Optional -2)**
- any one motor from above optional-1 & 2 can be interchange with 3Ø PMSM Motor.
- Suitable differential gear arrangements (10:1) to fix the above motors- any one at a time

Battery & Charger

- One number of 60V/2.5KW Lithium ion battery with smart BMS
- Bluetooth connectivity with mobile app for BMS
- RS485/CAN Communications for BMS Output
- Suitable charger for battery charging purpose
- Charging time 4-5Hours

Vehicle Dimensions

- 4 feet (W) , 7 feet (L) +/-10% Variations
- Ground Clearance -375MM
- Curve Weight-200kg

General Features

- Speed 30-35KMPH
- Millage range -30km Per charge

Digital indicator with RS485 Output (Optional-3)

- PLC/Other type controller with 7 inch HMI provided to indicate -Motor speed in RPM , Vehicle KMPH , Battery current, Voltage & Energy etc
- Battery BMS o/p with RS485, Blue tooth output
- Tire pressure sensor with Display only
- Speed sensor with RS485

Note: Specifications are subject to change.

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ELECTRIC VEHICLE (4 WHEELER) TRAINER WITH BLDC/PMSM/SR MOTOR

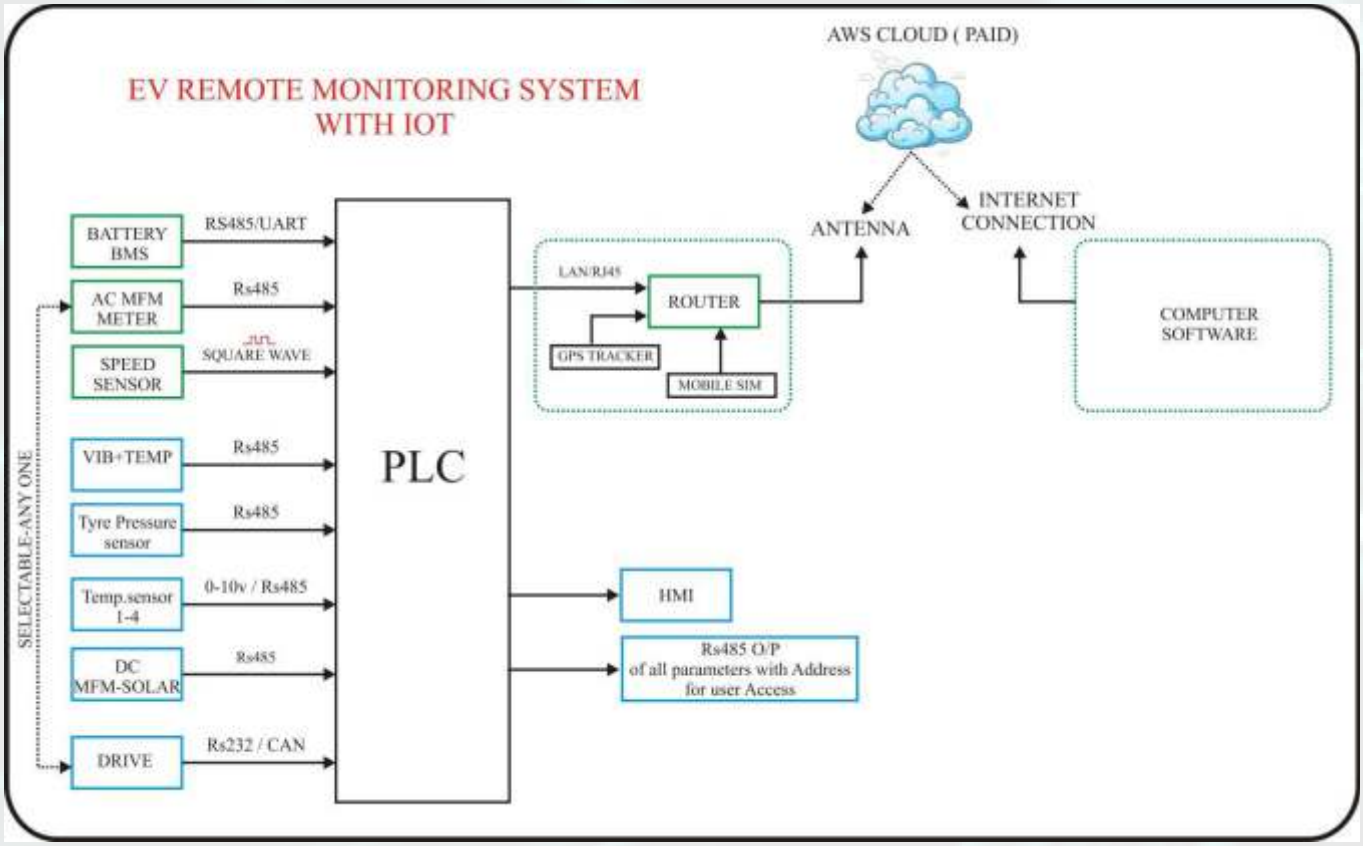
Order Code - EV46019

- Vibration sensor interface with RS485
- Temperature sensor for battery charger
- Temperature sensor for Motor
- Temperature sensor for Drive
- Temperature sensor for solar panel

Special Features

- Provision to interface external PWM Controller (dpsace /opal rt/RTGUI FPGA) & IGBT module for Motor control

Iot -Remote Monitoring Software (Optional-4)



Battery Parameters

Motors Parameters

Note: Specifications are subject to change.

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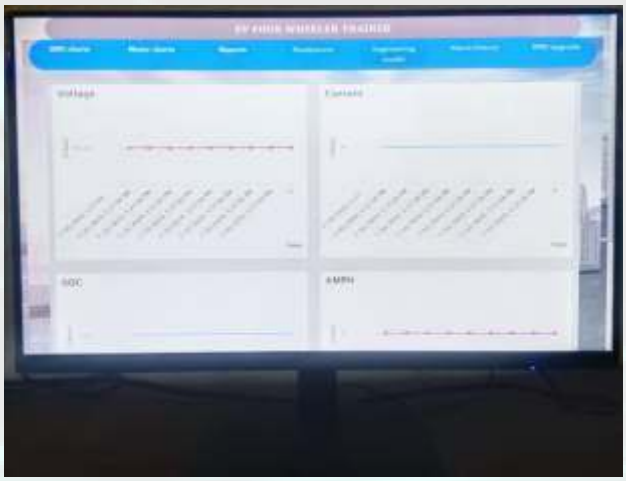
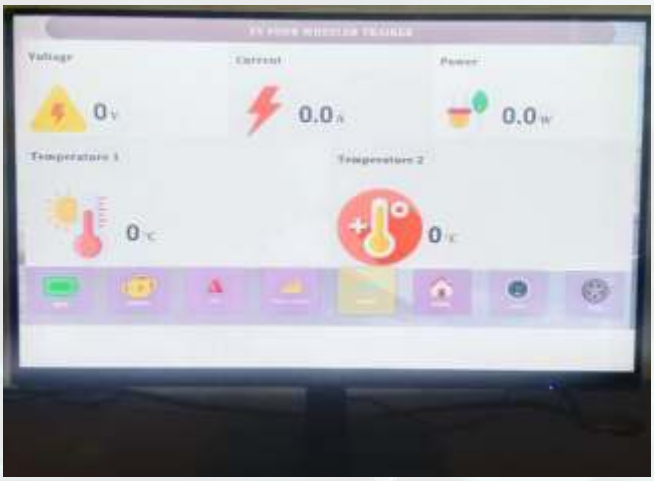
ELECTRIC VEHICLE (4 WHEELER) TRAINER WITH BLDC/PMSM/SR MOTOR

Order Code - EV46019



Data Logging & GPS Tracking



Temp ,Vibration sensors, Charger Parameter

Solar Roof for Hybrid Energy System for Charging (Optional-5)

Solar Panel fixed on the roof of Vehicle

Solar Panel Specifications

- Type : Mono crystalline solar PV
- Each Panel Power : 75W
- Total Number of Panel : 4
- Connection ; All 4 panel connected in series
- Per panel Voltage (Voc) : 24V
- Per panel Voltage (Vmp) : 18V
- Type of Cell : Polycrystalline Solar Panel
- Total power of Roof top panel : 72V ,300W
- Make ; Kaumo solar - (Made in India)

Solar Battery Charger

- Solar Battery charger for lithium Battery
- Input from solar panel 72V , 300W
- Output - suitable for 48 or 60v lithium battery
- MOSFET based Charger (PWM/MPPT) circuit
- All are mounted on a nice powder coated cabinet with MCB & ON/OFF switch

EV Jeep -Open & Roof type (Optional-6-Other Model)

EV Car - Non Brand

EV Car - MG

Note: Specifications are subject to change.

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ELECTRIC VEHICLE (3 WHEELER) TRAINER WITH BLDC/PMSM/SR MOTOR

Order Code - EV46020

THREE WHEELER ELECTRIC VEHICLE SYSTEM CONSISTS OF

Mid drive Motor & Drive

- One number of 60V/1.2KW, 6 Phase PMSM Motor with controller
- One number of 60V/1KW, 3 Phase BLDC Motor with controller - **(optional -1)**
- One number of 60V/1KW, 3 Phase SR Motor with controller - **(optional -2)**
- Suitable differential gear arrangements (10:1) to fix the above motors- any one at a time

Battery & Charger

- One number of 60V/2KW Lithium ion battery with smart BMS
- Bluetooth connectivity with mobile app for BMS
- RS485/CAN Communications for BMS Output
- Suitable charger for battery charging purpose
- Charging time 4-5Hours

Vehicle Dimensions

- 3 feet (W) , 4.5 feet (L) +/-10% Variations
- Ground Clearance -375MM
- Curve Weight-200kg

General Features

- Speed 30-35KMPH
- Millage range -30km Per charge

Digital indicator with RS485 Output

- PLC/Other type controller with 7 inch HMI provided to indicate -Motor speed in RPM , Vehicle KMPH , Battery current, Voltage & Energy etc **(Optional-3)**
- IOT interface with computer software (remote monitoring) **(Optional-4)**

Special Features

- Provision to interface external PWM Controller (dpsace /opal rt/RTGUI FPGA) & IGBT module for Motor control

Note: Specifications are subject to change.

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RT-GUI FPGA PWM CONTROLLER
(FOR STUDY THE CONTROL STRATEGIES OF DC/BLDC/PMSM/SR MOTOR)
Order Code - EV46021

RT-GUI (Real time Graphic User interface) FPGA PWM Controller

The FPGA-Real Time controller is a ready-to-use, high-performance, real-time testing platform with built-in analog and digital I/O channels. It includes all required cables, terminal boards, and adapters to enable easy connectivity from the target machine I/O to your hardware under test.

This controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be interfaced with Power Module through External cable connection.

FPGA Features

FPGA Device	:	Artix-7/Xilinx FPGA-XC7A200T
Number of Clock Sources	:	1
Primary Clock Frequency	:	100MHz - (150MHz converted inside FPGA using internal PLL)
Number Of GPIOs (Max)	:	More than 100
Configuration Options	:	USB 2.0 interface for On-board flash programming, JTAG
Configuration Memory	:	Flash memory-256 Mb SPI flash memory (S25FL256S)
Internal RAM	:	DDR3-512MB (MT41K256M16HA)
Power supply	:	On-board voltage regulators for single power rail operation

PWM Outputs & Digital I/O'S

- 12 numbers of PWM output @ 5V logic level (3.3v to 5V level converter is provided)
- 4 numbers of Digital input @ 5V logic level is provided for speed sensor interface / Motor feedback (hall sensor) interface
- 4 numbers of digital Inputs @ 3.3V logic level is terminated at separate connector

Note: Specifications are subject to change.

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RT-GUI FPGA PWM CONTROLLER
(FOR STUDY THE CONTROL STRATEGIES OF DC/BLDC/PMSM/SR MOTOR)
Order Code - EV46021

- Additional PWM output card -72 Channel PWM output (@Optional cost)-Depends on customer requirements

ADC/DAC

- 3 Channel SPI based ADC (12 Bit)
- 3 Channel SPI based DAC (12 Bit)

GUI Blocks

- Hardware Interface Blocks :
- PWM / Digital Output Blocks - 12 basic (Optional 72 at additional cost)
- Digital input Blocks - 12
- ADC Block - 3 Channel
- DAC Block - 3 Channel
- **Other Functional Blocks :** Knob - ON/OFF Switch - Gauge block -scope-display-etc, Frequency Counter-Speed estimator-Filter-PID Controller, Dead Time Controller, SCR Trigger Pulse controller, Sources : Constants-Sine wave generator (Multiphase)-Triangle wave-Square wave-saw tooth wavesvpwm- dc pwm-BLDC Look up table-user-configurable Lookup table etc, Others : Logic Gates- Comparator-Mux-Demux-Delay-Math Function-User Logic-Clarke/inverse clarke transformationpark- Inverse Park- etc,
- **Measuring Instruments / Control Blocks**, Built in 8 Channel DSO, Built in 14 Channel Logic Analyzer, Built in 04 Channel Plotter, Built in 08 Channel Digital Display, Built in 04 Channel Gauge (VI), Built in 04 Channel Knob (VI), Built in 08 Channel Toggle Switch(VI), All DSO, Plotter, analyser -Time & Amplitude adjustments, All Knob's & Gauge values are user configurable
- **Waveform Report** – Option to send waveform image to user (using mail or Bluetooth or USB-card). Option to send waveform sample data's as CSV file to user (using mail or Bluetooth or USB-card)

Power supply

- 5VDC@1A dc regulated power supply is provided for controller input
- 5V to 3.3V converter is provided for FPGA Controller
- FPGA board is mounted on nice powder coated cabinet.
- 230VAC Input with power ON/OFF Switch

Accessories

- 24inch LCD/LED Monitor-HDMI Port 01
- Mouse - wireless 01
- 15 Pin Connector Break out Board 01
- 9 pin Connector Break out Board 02

IGBT POWER MODULE-SEMIKRON - ORDER CODE - EV46021ACC01

This power module is designed by using SEMIKRON -IGBT for EV Motor control (AC/DC/BLDC/PMSM Motor) applications. This power module can be used by proper external PWM controller interfacing (From RTGUI FPGA or OPALRT). This Module consists of

Specifications

Power Circuit

Input	:	0-120VDC
Output	:	1 Ø /3Ø
Capacity	:	1KW / 3KW /5KW

Note: Specifications are subject to change.

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Website: www.tescaglobal.com

RT-GUI FPGA PWM CONTROLLER
(FOR STUDY THE CONTROL STRATEGIES OF DC/BLDC/PMSM/SR MOTOR)
Order Code - EV46021

PWM Section

Number of PWM Input	:	6
Maximum PWM Frequency	:	5 KHZ
PWM Level	:	0-3.3/5V (TTL)

IGBT

- Three Number of IGBT-IGBT Power Module Rating @ 1200V , 160A based three phase Voltage source inverter Power circuit
- Model : SKM 100 GB12T4 (REFER ATTACHED DATA SHEET)
- IGBT is fixed with suitable heat sink and snubber circuit for protection
- IGBT Power circuit input and outputs are terminated by suitable rating banana connectors in front panel with necessary indication

PWM Isolator

- Six Number of PWM Isolator IC (6N137) is used to isolate All the six PWM signals input PWM Driver
- IGBT Gate Driver is provided for IGBT Gate signal amplification.

Sensors

- 3 numbers of Hall effect current sensor @ 25A is provided for 3Ø output AC/DC Current measurement
- 1 numbers of Hall effect current sensor @ 25A is provided for Input DC bus Current measurement
- Op-Amp based Signal conditioner circuits are provided in all sensors for output current signals amplifications
- All current sensor signal conditioner circuit outputs are terminated in front panel by suitable connectors

Protection Circuit

- One number of automatic trip circuit is provided for O/C protection
- LED is provided for trip status indication
- Reset switch is provided for TRIP RESET

Connectors

- One number of 34 pin FRC Connector is provided for PWM input signal input and feed back
- Banana connectors are provided for 3 PHASE AC input
- Banana connectors are provided for 3 phase output
- Test points are provided for PWM signal and Current wave form measurements
- MCB is provided at input side for Input supply ON/OFF

Note: Specifications are subject to change.

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UNIVERSAL EDDY LOAD SET UP FOR EV MOTORS -UPTO 5KW/8000 RPM

Order Code - EV46022

Technical Specification

Type	:	Eddy Current Dynamometer Water Cooled
Maximum Power	:	5KW -Continuous
Direction of rotation	:	Bi-directional
Power transmission	:	Through High Precision strain gauge type load Cell.
Loading/ Unloading	:	By Microprocessor based controller. Foundation mounting : C.I. Base with water Inlet & Outlet Connection
Torque display	:	4 Digit Digital Indicator in Nm RPM display : 4 Digit Digital Indicator (Range 0-8000 RPM)
PC Communication	:	RS485 , Modbus RTU Protocol Calibration Set up : 2 Nos. Calibration Arms with dead weights.
Protection	:	Water flow switch for dry run protection and Temperature controller for over heat protection

PC Software (for drive cycle implementation)

- Computer front end software (developed by Lab view) is provided to display the below Motor & Source parameters
  - Motor -Speed in RPM
  - Motor -Torque in Nm
  - Output Mechanical Power in KW
  - Source- Battery current in AMP
  - Source- Battery Voltage IN Volt
  - Source- Battery Power in KW
- Provision for load control (load Torque (NM) , time setting) other mode of operation like Constant speed Variable Load , Constant Load Variable speed & Variable speed Variable Load
- Software Features Torque, Speed readings will be visible on Y-axis against time on X-axis. Torque, Speed, & Power will be stored into the file opening in MS Excel. Graph plotting against Torque & Speed, will be done manually in Excel/ Facility to save data for printout

Note: Specifications are subject to change.

PC Software (for drive cycle implementation)

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CUT SECTION/OPEN VIEW MODEL OF EV MOTORS

Order Code - EV46023, EV46024 & EV46025

BLDC/PMSM - EV46023

SR Motor - EV46024

Differential set - EV46025

Note: Specifications are subject to change.

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ELECTRICAL VEHICLE TRAINING SYSTEM

Order Code - 46990

46990 Electrical Vehicle Training System- Electric vehicles (EVs) are a promising technology for achieving a sustainable transport sector in the future, due to their very low to zero-carbon emission, low noise, high efficiency and flexibility in grid operation and integration.

Evs are vehicles that are either partially or fully powered on electric power. Electric vehicles have low running costs as they have less moving parts for maintaining and also very environmentally friendly as they use little or no fossil fuels (petrol or diesel).

Features

- Provided with all the sensors and its functionality
- Provided with meters for measurement analysis
- Throttle with 3 mode speed
- Testing -RPM, Torque, Input Power
- PWM Signal on Panel
- On Panel Charging Switch
- Real time and interactive training setup
- Motor Assembly Mechanical Arrangement for Experiments

Experiments

- Study the types of motors used in EV.
- Study the different Sensors of EV.
- Study of Motor Driver Controller in EV.
- Study of running, reversing & braking of HUB motor in two wheeler vehicle.
- Study of speed control of HUB motor using PWM method.
- Study of Hall Sensor.
- Study the N-T (Speed -Torque) characteristic of HUB Motor

Note: Specifications are subject to change.

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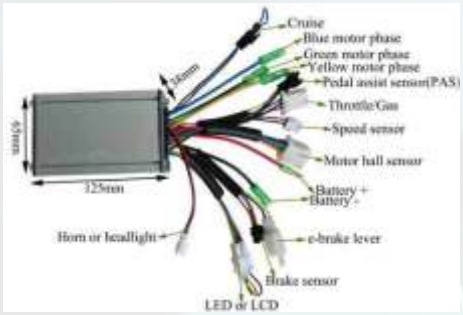
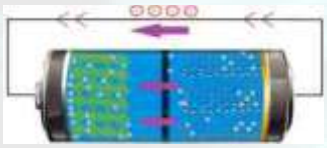
ELECTRICAL VEHICLE TRAINING SYSTEM

Order Code - 46990

Technical Specifications

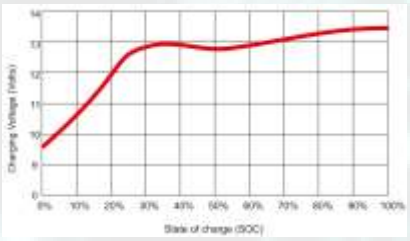
Type of Motor	:	Hub motor (12 inch)
Rated Voltage	:	48V
Power	:	1000W
Digital RPM Meter (0-9999 Count)	:	1 nos.
Battery LiFePo4 Cell (3.3V)	:	1 nos.
Battery with inbuilt BMS Protection	:	1nos .
Type of battery	:	Li-ion Phosphate
Capacity	:	12 AH
Voltage	:	48V
Battery Charger	:	1 nos.

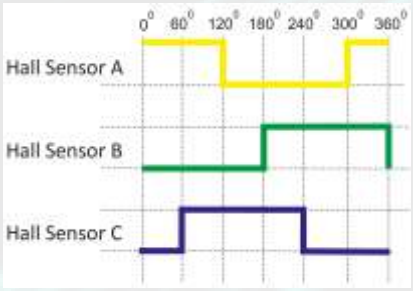




Digital Meters & Indication

AC Voltmeter (1 nos)	:	0-500V AC
AC Ammeter (1 nos)	:	0-30Amp AC
DC Voltmeter (1 nos)	:	0-500V DC
DC Ammeter (1 nos)	:	0-20Amp DC
Motor Controller	:	Inside of Trainer
Motor Speed Controlling	:	PWM
Spring Balance	:	2 nos.
Inter connection	:	4mm Patch cord
Digital Battery Level Indicator	:	1 nos.
Motor Assembly (mechanical)	:	1 nos.





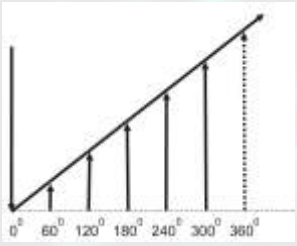
Additional Features

- Key switch for ON/OFF
- Head light & Tail light
- Brake System

Accessories

- Operating Manual-1nos.
- Patch Cord-15 nos.
- Wall poster with attractive study content - 2Qty.

Real Time signal Images of PWM in EV-11



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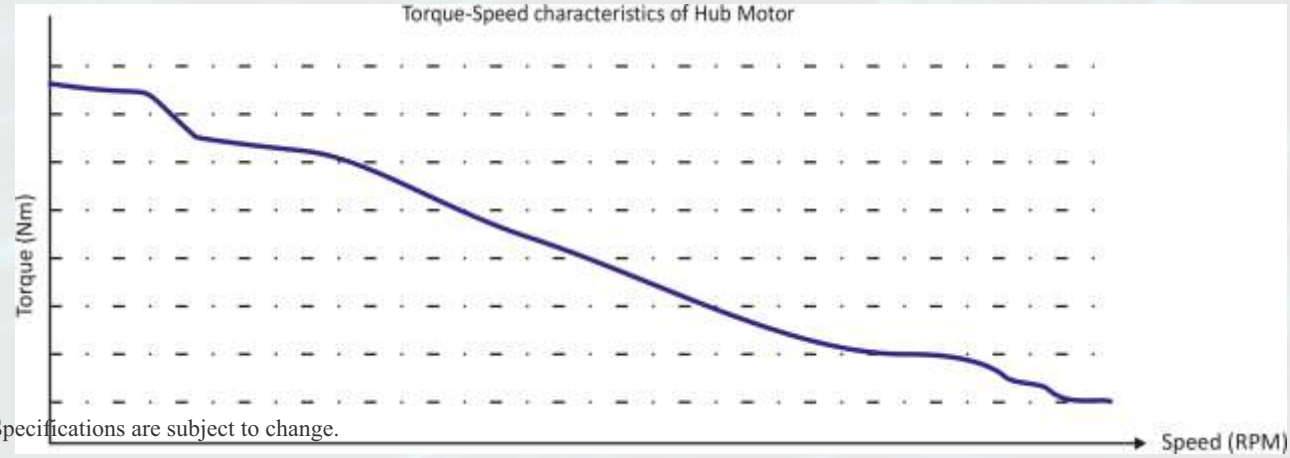
ELECTRICAL VEHICLE TRAINING SYSTEM

Order Code - 46990



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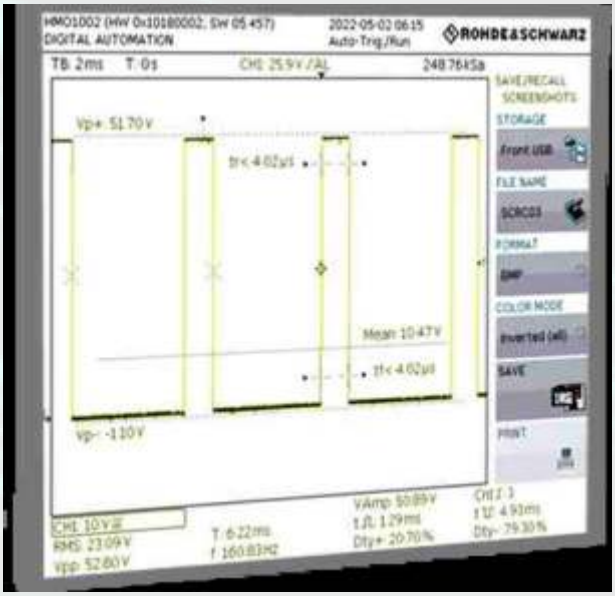
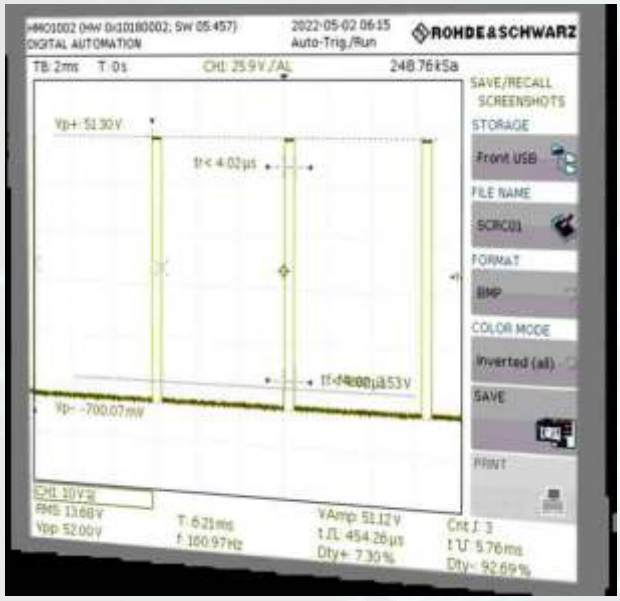
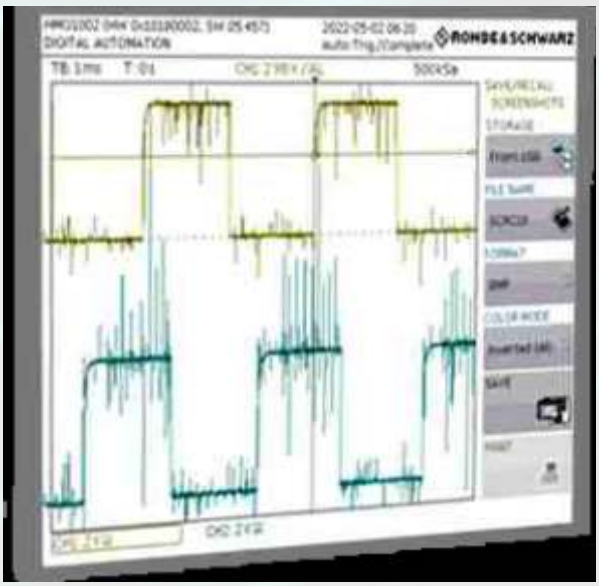
ELECTRICAL VEHICLE TRAINING SYSTEM

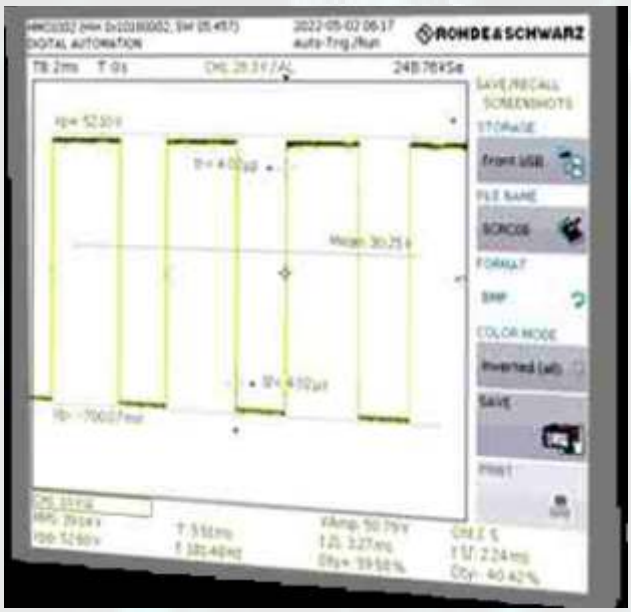
Order Code - 46990

Real Time signal Images of PWM









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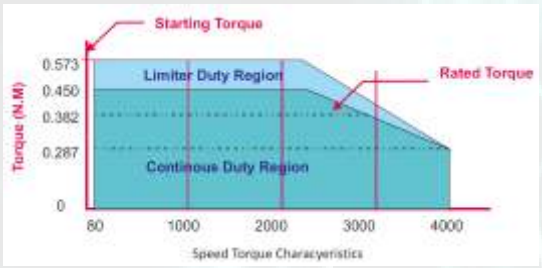
BLDC (BRUSHLESS DC) MOTOR TRAINER

Order Code - 46991

A motor converts supplied electrical energy into mechanical energy. Various types of motors are in common use. Among these, brushless DC motors (BLDC) feature high efficiency and excellent controllability, and are widely used in many applications. The BLDC motor has power-saving advantages relative to other motor types. Trainer kit consist a BLDC Motor with Controller help students to learn about operations and working of BLDC Motor.

Features

- Diagrammatic representation for the ease of connections.
- Designed by considering all the safety standard.
- Metallic Body.
- Machine with Mechanical Loading Arrangement.
- Exclusive and Compact Design.
- Motor Assembly Mechanical Arrangement for Experiments.



Experiments

- Explain working and Construction of a BLDC Motor.
- Explain working of Hall Sensor.
- Draw N-T (Speed-Torque) characteristic of BLDCMotor.
- Find out BLDC Motor efficiency at different type of load condition.
- Perform running, reversing operation in a BLDC motor.
- Observe PWM Signal using DSO during Speed Control.

Applications

Note: Specifications are subject to change.

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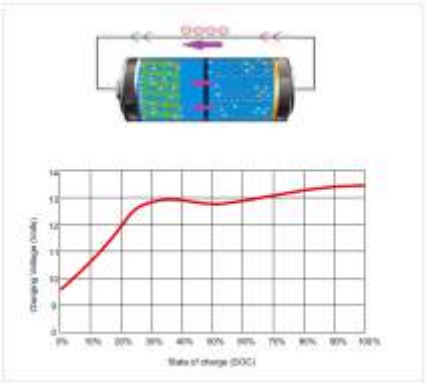
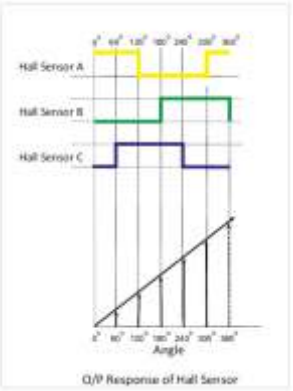
BLDC (BRUSHLESS DC) MOTOR TRAINER

Order Code - 46991

O/P Responses





O/P Response of Hall Sensor

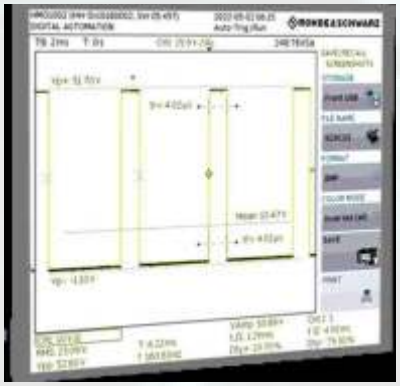
Technical Specifications

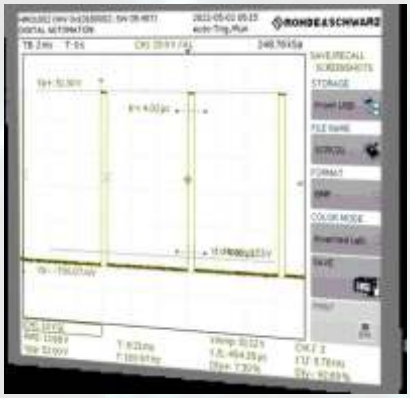
Machine Type	:	BLDC Motor
Rating	:	220W approx.
Voltage Rating	:	24V
Speed	:	3000 rpm ± 10%
Loading arrangement	:	Mechanical
Brake Drum/Pulley	:	Aluminum casted
DC power supply	:	24V, 10Amp.
On board Digital Panel Meters		
DC Voltmeter (1 nos)	:	0 - 300V
DC Ammeter (1 nos)	:	0 - 10A
Digital RPM Meter (0-9999 rpm)	:	1 nos.
Speed Controlling Method	:	PWM
Spring Balance	:	2 nos.
DC Supply 24V 10 Amp	:	1nos.
Inter connection	:	4mm Patch cord
Motor Assembly	:	1 nos.
Motor Controller	:	Inside of Trainer

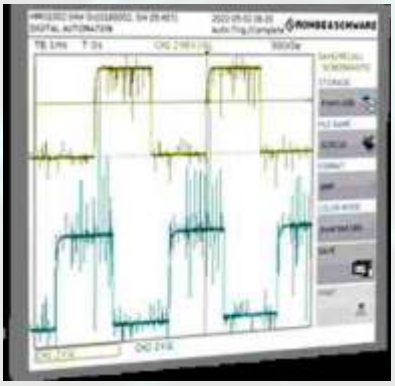
Accessories

- Operating Manual-1nos.
- Patch Cord-15 nos.
- Wall poster with attractive study content - 2Qty.

Real Time signal Images of PWM







Note: Specifications are subject to change.

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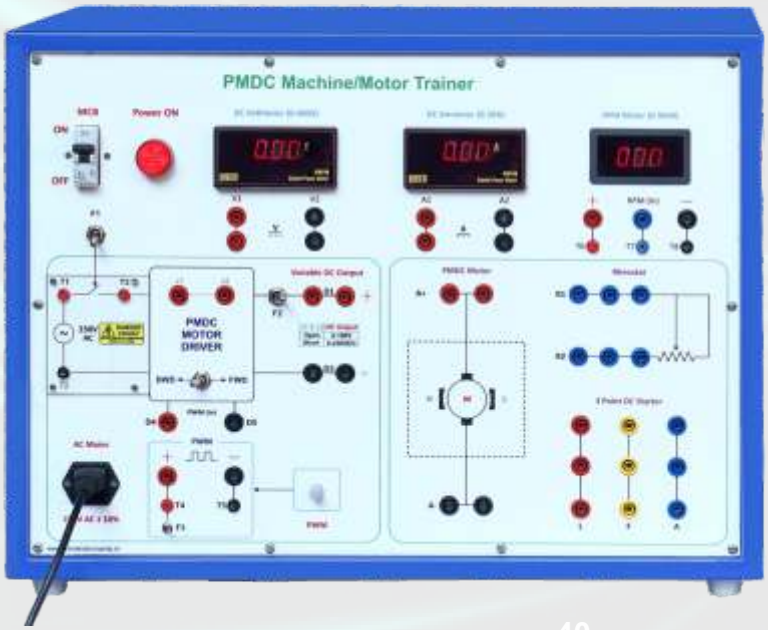
PMDC MACHINE TRAINER

Order Code - 46992



40

A PMDC (Permanent Magnet DC motor) is a kind of DC motor that includes a permanent magnet rather than field winding to form the magnetic field necessary for the DC motor operation. The PMDC motor is one of the most preferred motor for the electric vehicle application due to its traction characteristics such as high starting torque, high power density and good efficiency.

46692 PMDC Machine Trainer is an important and exclusively designed product for electrical laboratories. PMDC Machine is an important part of Electrical Engineering Syllabus considering upgraded technologies.

This product plays a vital role in letting the students have a basic knowledge about the operating principle of PMDC machine. It provides complete learning contents to enhance practical knowledge and explains students the fundamental concepts of PMDC Machine.

Applications

Note: Specifications are subject to change.

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PMDC MACHINE TRAINER
Order Code - 46992

Features
- Heavy Duty Base/Channel.
- Designed by considering all the safety standards.
- Diagrammatic representation for the ease of connections.
- Machine with Mechanical Loading Arrangement.
- Provided with Digital Tachometer.
- Motor Assembly Mechanical Arrangement for Experiments.

Experiments
- Explain working and Construction o f PMDC Motor.
- Describe Speed Control of a PMDC Motor by using PWM, also Measure PWM Signal on DSO.
- Draw N-T (Speed -Torque) characteristic of PMDC Motor.
- Perform running, reversing operation in a PMDC motor.

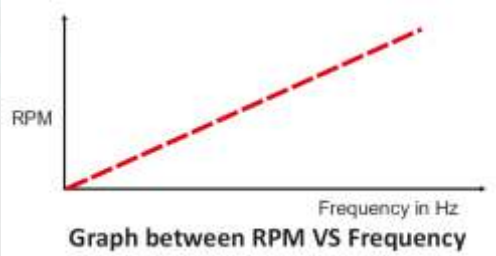
Technical Specifica

DC Machine

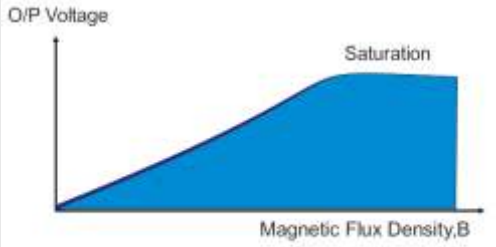
Type	:	PMDC Motor
Rating	:	1HP
Voltage Rating	:	180V ±10%
Speed	:	1500RPM ±10%
Loading Arrangement	:	Mechanical
Break Drum/Pulley	:	Aluminum Cast

On board Digital Panel Meters

DC Voltmeter (1 nos)	:	0-500V
DC Ammeter (1 nos)	:	0-20A
Digital RPM Meter (0-9999 rpm)	:	1 nos.
DC Drive	:	0-180V (variable),
	:	Inside of Trainer
Inter connection	:	4mm Patch cord
Spring Balance	:	2nos.

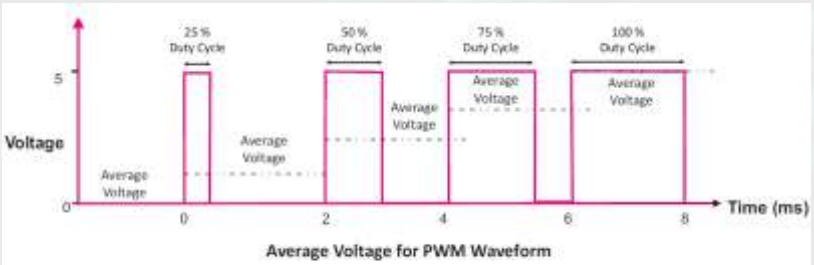


Graph between RPM VS Frequency

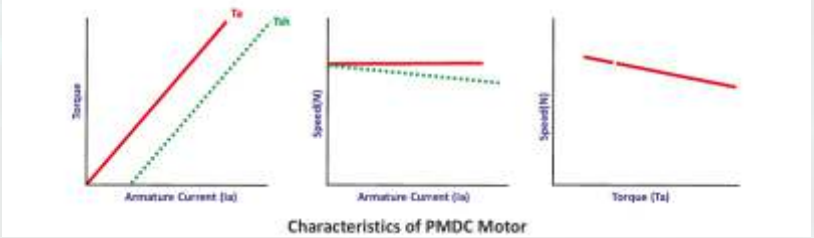


Hall Effect Sensors output response

Waveforms



Average Voltage for PWM Waveform



Characteristics of PMDC Motor

Note: Specifications are subject to change.

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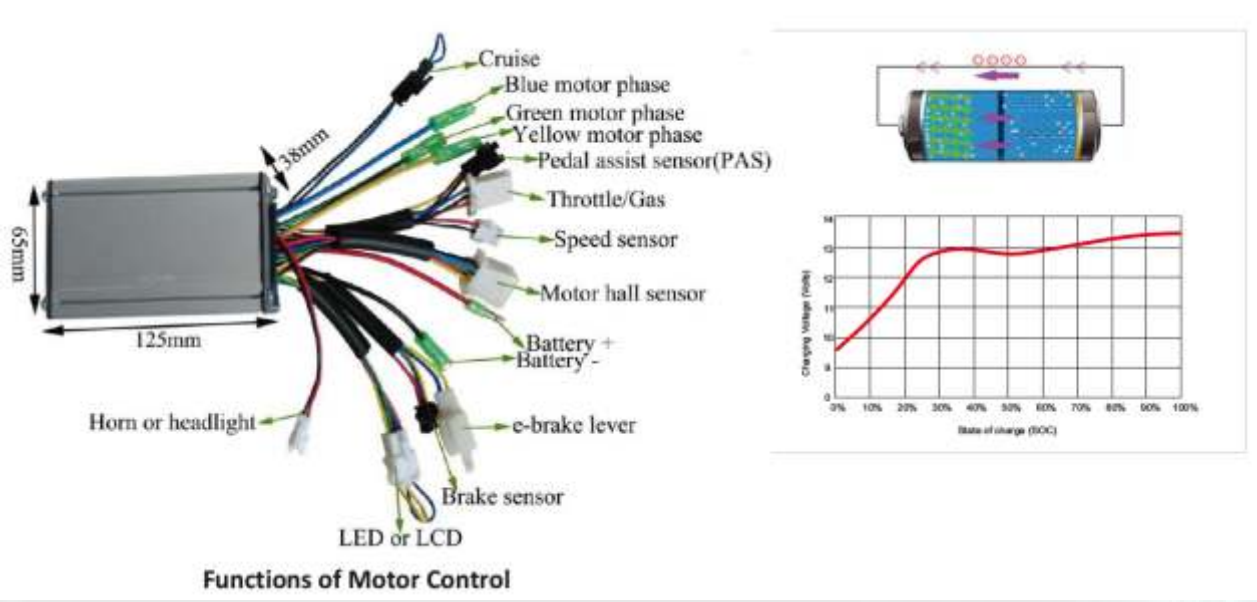
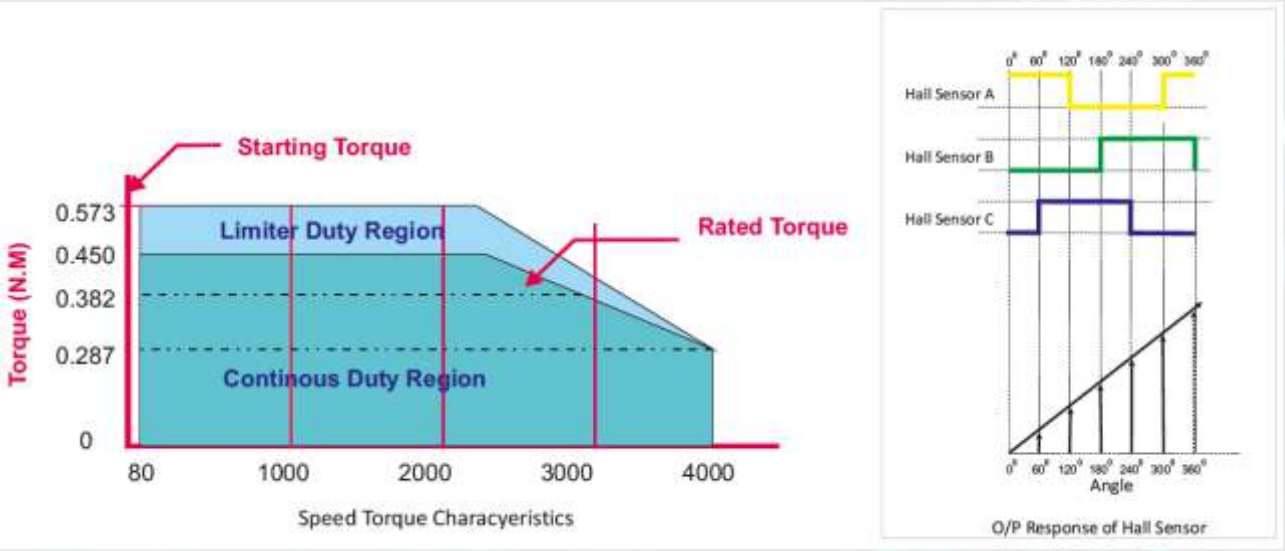
PMDC MACHINE TRAINER

Order Code - 46992





Accessories

- Operating Manual-1nos.
- Patch Cord-10 nos.
- Wall poster with attractive study content - 2Qty.
- Mains Cord-01 nos.

Note: Specifications are subject to change.

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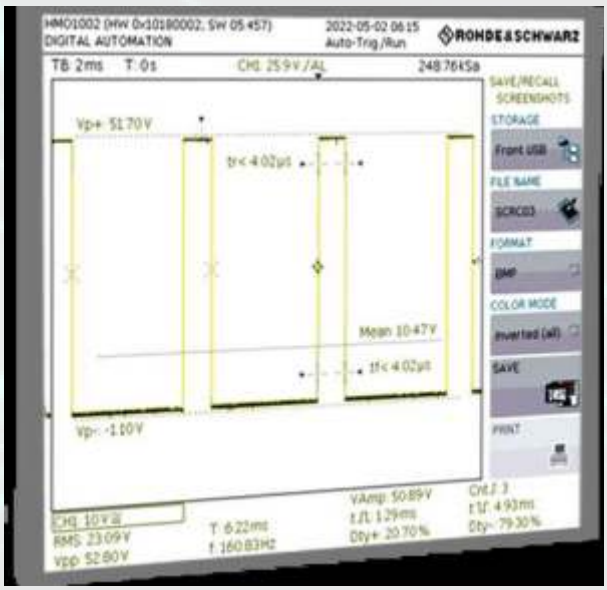
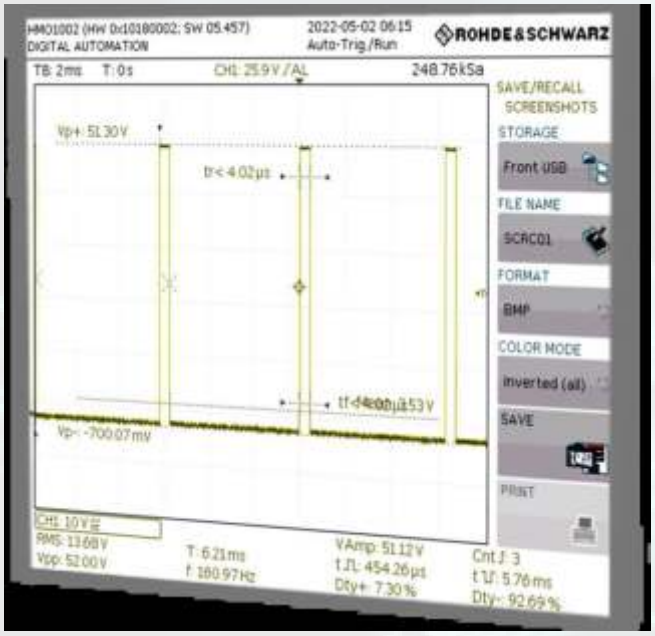
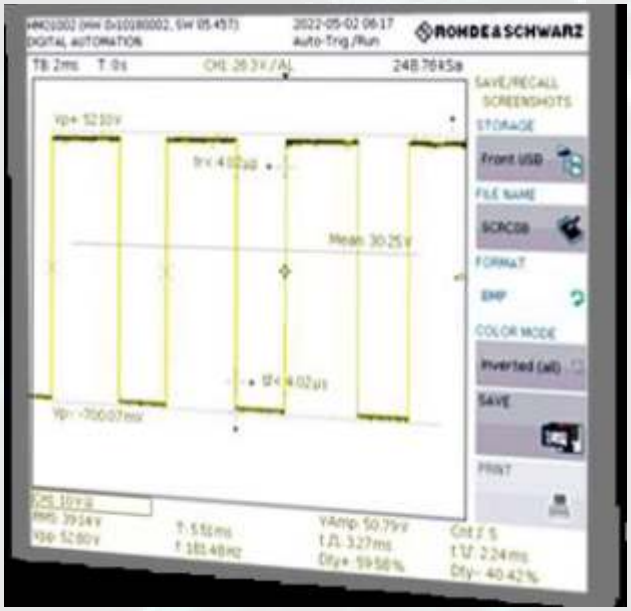
PMDC MACHINE TRAINER

Order Code - 46992

Real Time signal Images of PWM







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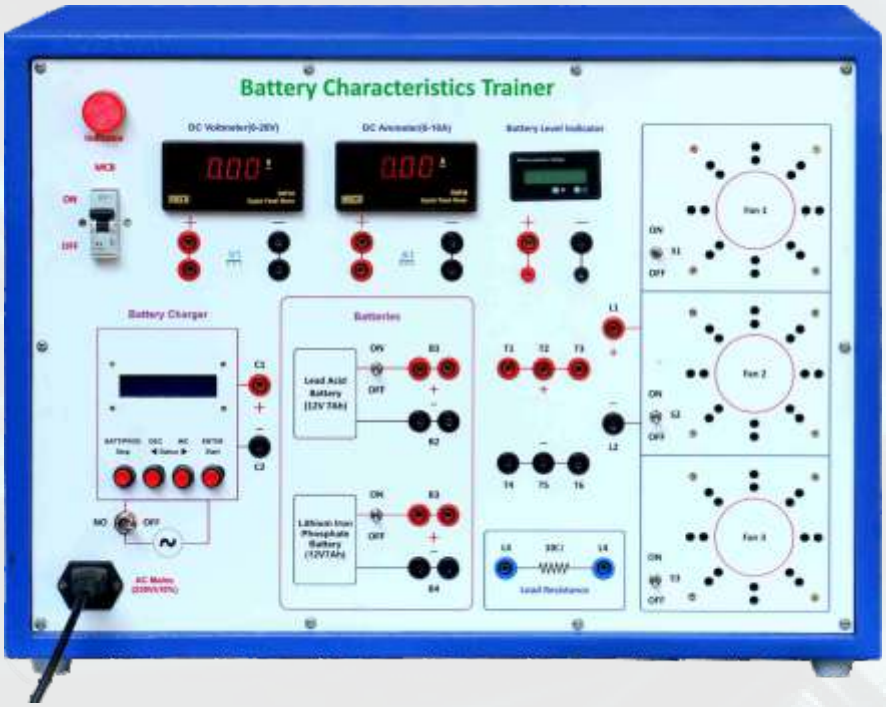
BATTERY CHARACTERISTICS TRAINER

Order Code - 46993



Energy storage is becoming increasingly important for improving the efficiency, reliability and price-competitiveness of power utilities and Electric Vehicles, and to achieve deeper integration with intermittent renewable energies.

Battery is an energy storage device consisting of two or more electrochemical cells that convert stored chemical energy into electrical energy and used as a source of power. As an energy storage device, the use of the battery is increasing day by day such as in automobiles, inverter , UPS, off- grid renewable energy sources.

46693 Battery Characteristics Trainer introduce students to the operation of Lead-Acid and Li-ion batteries. Hands-on experiments cover the charging and discharging characteristics of lead-acid and Li-ion batteries.

Applications

Note: Specifications are subject to change.

28.10.2024
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Features

- Models for study of battery characteristics of Lead-Acid and Li-iron Phosphate batteries.
- Real time and interactive training setup.
- DC Power source and charge controller.
- Meters and battery level indicator for analysis.
- Designed with all safety standards.

Experiments

- Study about Battery Construction.
- Study of about Different type of Battery.
- Evaluation of charging characteristics of Battery.
- Evaluation of discharging characteristics of Battery.

Technical Specifications

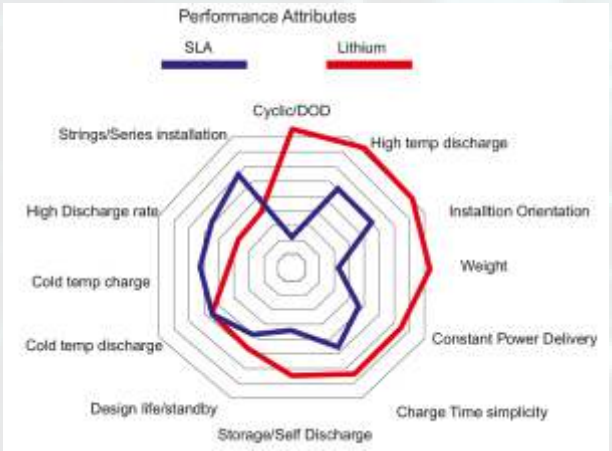
Battery 1

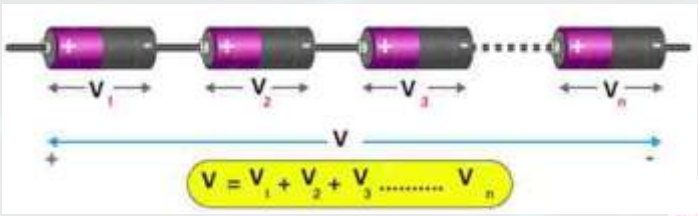
Type	:	Li-iron Phosphate (Inbuilt BMS)
Voltage : 12V		
Current Capacity	:	6-8 Ah

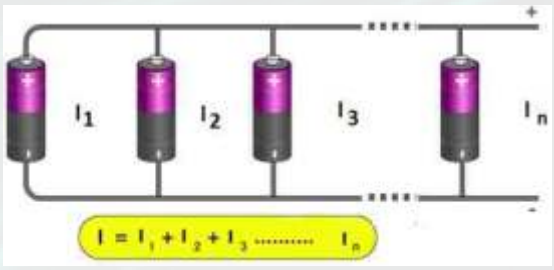
Battery 2

Type	:	Lead Acid
Voltage	:	12V
Current Capacity	:	6 Ah approx
Battery Charger	:	1 no. (Suitable for both)
DC Voltmeter	:	0-20V
DC Ammeter	:	0-10Amp
Interconnection	:	4mm Patch cord

Digital Battery Level Indicator 1 nos.







Accessories

- Operating Manual-1nos.
- Patch Cord-10 nos.
- Wall poster with attractive study content - 2Qty.

Note: Specifications are subject to change.

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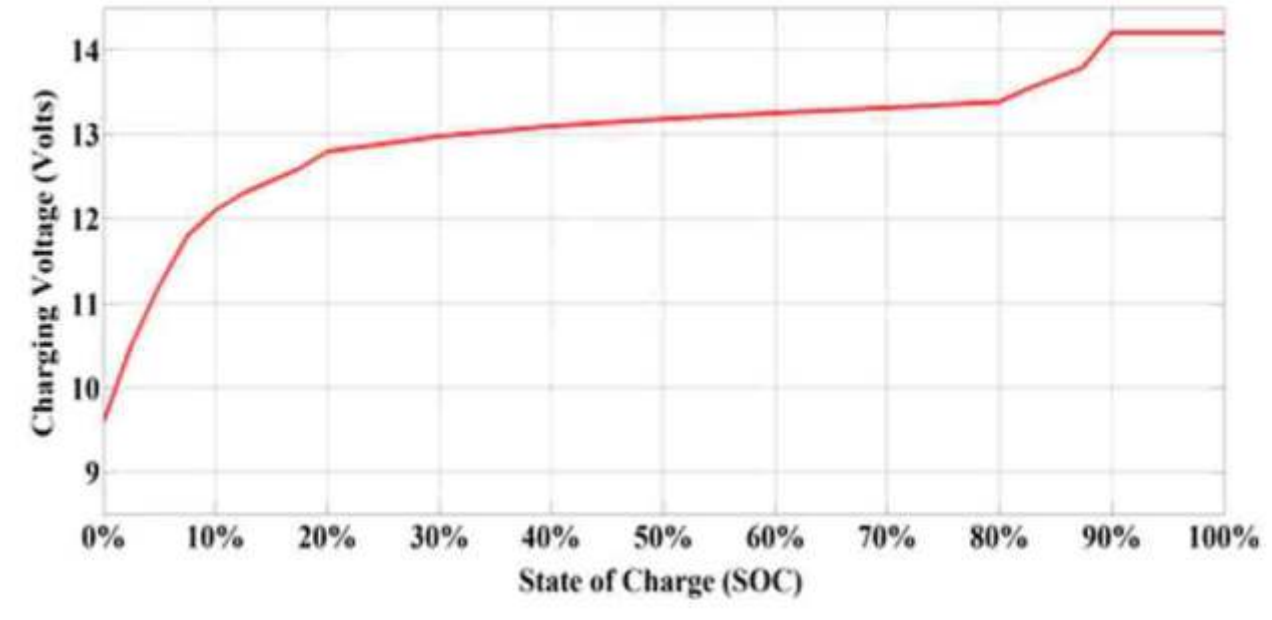
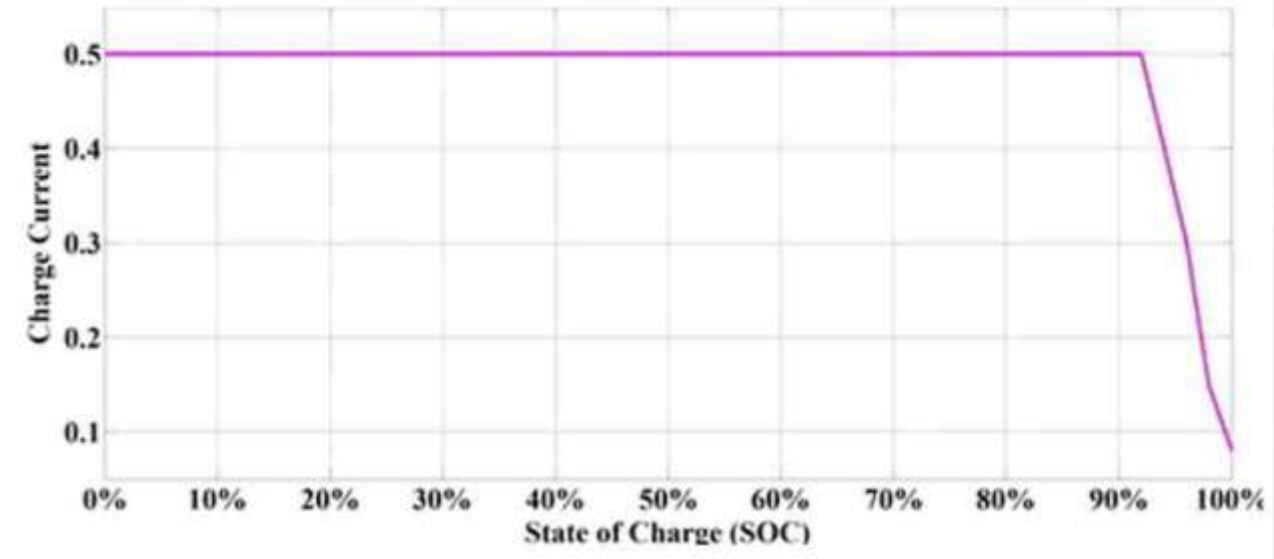
Charging curve of a LiFePO4 Battery (Charging voltage Vs SOC)



Charging curve of a LiFePO4 Battery (Charging current Vs SOC)



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BATTERY MANAGEMENT SYSTEM TRAINER

Order Code - 46994

Battery Management System Trainer is an electronic system which manages a battery or a pack of cells. It monitors and controls battery critical parameters, estimate its state, balancing and make sure that they operate in recommended safe conditions. A battery plays a key role in the fields of military, transportation, communication especially in portable devices like mobile phones, electric vehicles and appliances. The rechargeable electric battery is the most common and widespread device used to store electro-chemical energy for power systems. BMS is defined as which manages, control and monitor the conditions of battery.

Features

- Temperature measurement
- Cell balancing
- Voltage measurement
- Current measurement
- Motor Assembly Mechanical Arrangement for Experiments

Experiments

- Study of Battery Management System.
- Study of Battery Charging using Battery Management System.
- Study of Battery Discharging using Battery Management System.
- Study of Cell Balancing
- Study of Battery Management System including charging, discharging and cell balancing phenomenon.

Technical Specifications

Battery Cell (6nos)		
Type	:	LiFePo4
Cell Voltage	:	3.3V to 4V
Connection Type	:	Series
Machine Type	:	BLDC Motor
Voltage Rating	:	24V/110W Approx.
Speed	:	3000 rpm ± 10%
BLDC Motor Controller (inside of Trainer)	:	1nos.
Digital RPM Meter (0-9999 Count)	:	1nos.
Motor Speed Control	:	PWM
Loading arrangement	:	Mechanical
Brake Drum/Pulley	:	Aluminum casted
Power supply	:	24VDC.
Meters		
DC Voltmeter	:	0-300V
DC Ammeter	:	0-10A
Spring Balance	:	2nos.
Mains Supply	:	Single Phase, 230V ±10%, 50Hz
Interconnection	:	4mm Patch cord
Digital Battery Level Indicator	:	1 nos. (On LCD)

Accessories

- Operating Manual-1nos.
- Patch Cord-10 nos.
- Wall poster with attractive study content - 2Qty.

Note: Specifications are subject to change.

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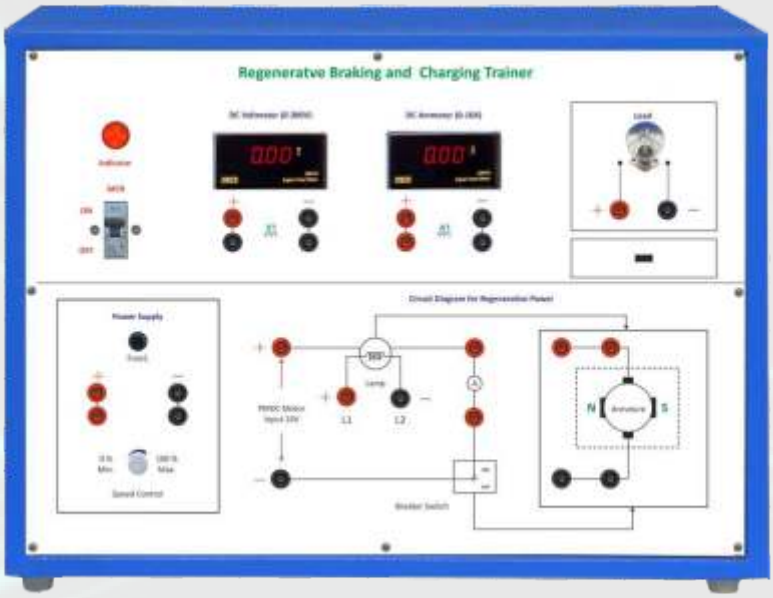
REGENERATIVE CHARGING AND BRAKING TRAINER

Order Code - 46995



Energy saving and extended mileage are very important for battery-operated electric vehicles (BEV). Regenerative braking performances are the key for saving energy in BEV's. Trainer introduces Permanent Magnet DC (PMDC) motor based regenerative braking to improve energy efficiency in BEV. The kinetic energy of the motor is returned to the battery system in regenerative charging.

46995 Trainer is an ideal platform to enhance vocational training, skills & development. This product clarifies the fundamentals of functioning of regenerative braking and also explains the regenerative charging technique used in Electric Vehicles.

Features

- Provided with digital tachometer for speed measurement.
- Provided with high quality meters.
- Provided with DC power supply.
- Diagrammatic representation for the ease of connections.
- Designed considering all safety standards.

Experiments

- Study of Regenerative braking of PMDC motor.
- Study of charging of battery by regenerative braking.
- Study of perform no load test of PMDC motor.

Technical Specifications

Machine Type	:	PMDC
Voltage Rating	:	100W watt approx.
Voltage	:	24V
Current	:	5 A (approx.)
Speed	:	2500 RPM ±10%
Power Supply	:	24V, 10A
Line Input Voltage	:	Single Phase, 230V±10%, 50Hz.
Digital Meters		
DC Voltmeter	:	300V
DC Ammeter	:	20A
Digital Tachometer	:	0-9,999 RPM

Accessories

- Operating Manual-1 nos
- Patch Cord-10 nos
- Power Cord-1 nos

Note: Specifications are subject to change.

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