

EV TEST BED

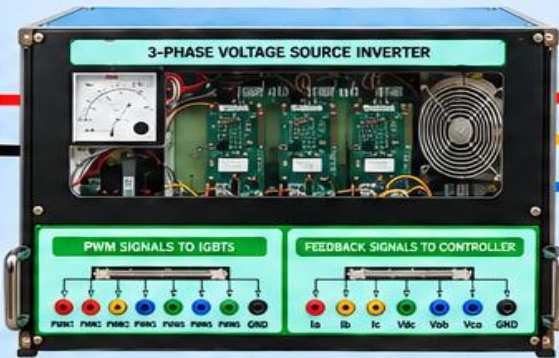
BLDC/PMSM MOTOR REGENERATIVE LOAD

BATTERY PACK (DC SOURCE)



- Li-ion Battery Pack
- 200 – 800 V DC
- BMS (Voltage, Current, Temp)
- Pre-charge & Contactor
- CAN Communication

3-PHASE VOLTAGE SOURCE INVERTER



- 3-Phase Voltage Source Inverter
- IGBT / SiC Based
- DC Link Voltage: 200 – 800 V
- PWM Input from FPGA
- Protection (Over Current, Over Temp)

PWM
Gate Signals

Current, Voltage,
Temp Feedback

BLDC / PMSM MOTOR – TORQUE SENSOR – AC GENERATOR (REGENERATIVE LOAD)



BLDC / PMSM MOTOR

- 3-Phase BLDC / PMSM
- Rated Power: e.g. 10–100 kW
- Rated Speed: e.g. 0–6000 rpm
- Position Sensor (Resolver/Encoder)
- Temperature Sensor

TORQUE SENSOR

- Torque Measurement
- Speed Measurement
- Bi-directional
- Analog / CAN Output
- Accuracy: $\pm 0.1\%$ (typ)

AC GENERATOR (REGENERATIVE LOAD)

- 3-Phase Synchronous / Induction Generator
- Rated Power: e.g. 10–100 kW
- Rated Speed: 0–6000 rpm
- Used as Regenerative Load

Position / Speed
(Resolver / Encoder)

Torque & Speed
(Analog / CAN)

Voltage, Current,
Power, Frequency

GRID / RLC LOAD



- Grid Tied Converter (Optional)
- Dynamic Load Bank (R/L/C)
- Regenerative Load
- AC Grid / RLC Load

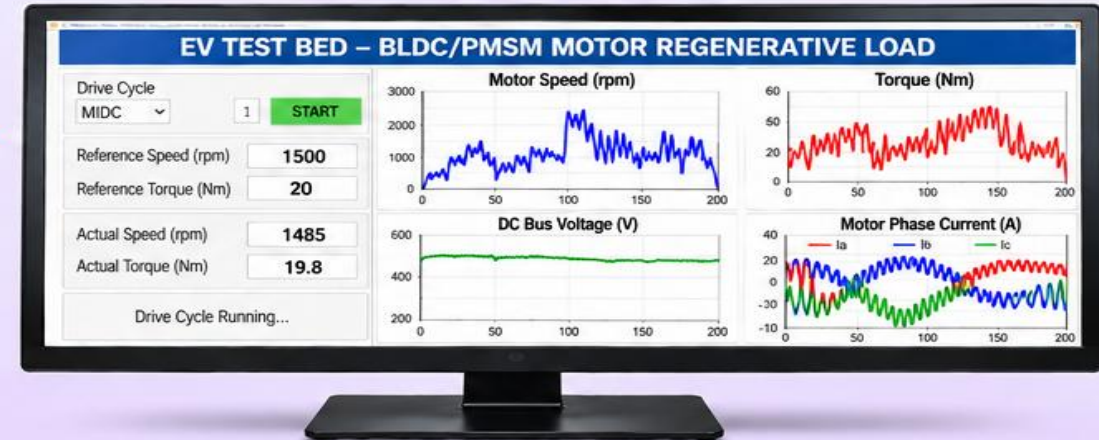
FPGA / DAQ CONTROLLER



- FPGA / MCU Based Control
- ADC (16 Channels)
- DAC Outputs
- PWM Outputs (to Inverter)
- Encoder / Resolver Interface
- Current, Voltage, Temperature Measurement
- CAN / RS485 / Ethernet
- MATLAB / Simulink Interface
- High Speed Data Acquisition
- Real-time Control Execution

USB /
Ethernet

HIL & SUPERVISORY PC



TEST CAPABILITIES

- Motor Control (Speed / Torque)
- Drive Cycle Testing (MIDC, WLTP, Custom)
- Efficiency Measurement (Motor + Inverter)
- Regenerative Braking Test
- HIL (Hardware-in-the-Loop)
- Data Logging & Analysis

KEY SIGNALS



DC Power (Battery)
3-Phase AC (Motor / Generator)
Mechanical Shaft
Control Signals (PWM, Command)



Feedback Signals (Current, Voltage, Temp)
Position / Speed Feedback (Encoder / Resolver)
Torque / Speed Feedback (Analog / CAN)
Measurement Signals (Power, Frequency)

APPLICATIONS

- EV Powertrain Testing & Validation
- Motor & Inverter Algorithm Development
- Drive Cycle Emulation
- Academic Research & Training

EV TEST BED

BLDC/PMSM MOTOR REGENERATIVE LOAD

FPGA / DAQ CONTROLLER



- FPGA / MCU Based Control
- ADC / DAC (16 Channels)
- PWM Outputs (to Inverter)
- Encoder / Resolver Interface
- CAN / RS485 / Ethernet
- MATLAB / Simulink Interface
- Real-time Control Execution

MOTOR INVERTER (3-PHASE VSI)



- IGBT / SiC Based 3-Phase Inverter
- PWM from FPGA
- DC Link: 200 – 800 V
- Motor Control (BLDC / PMSM)
- Current, Voltage, Temp. Measurement

BATTERY BIDIRECTIONAL DC-DC CONVERTER

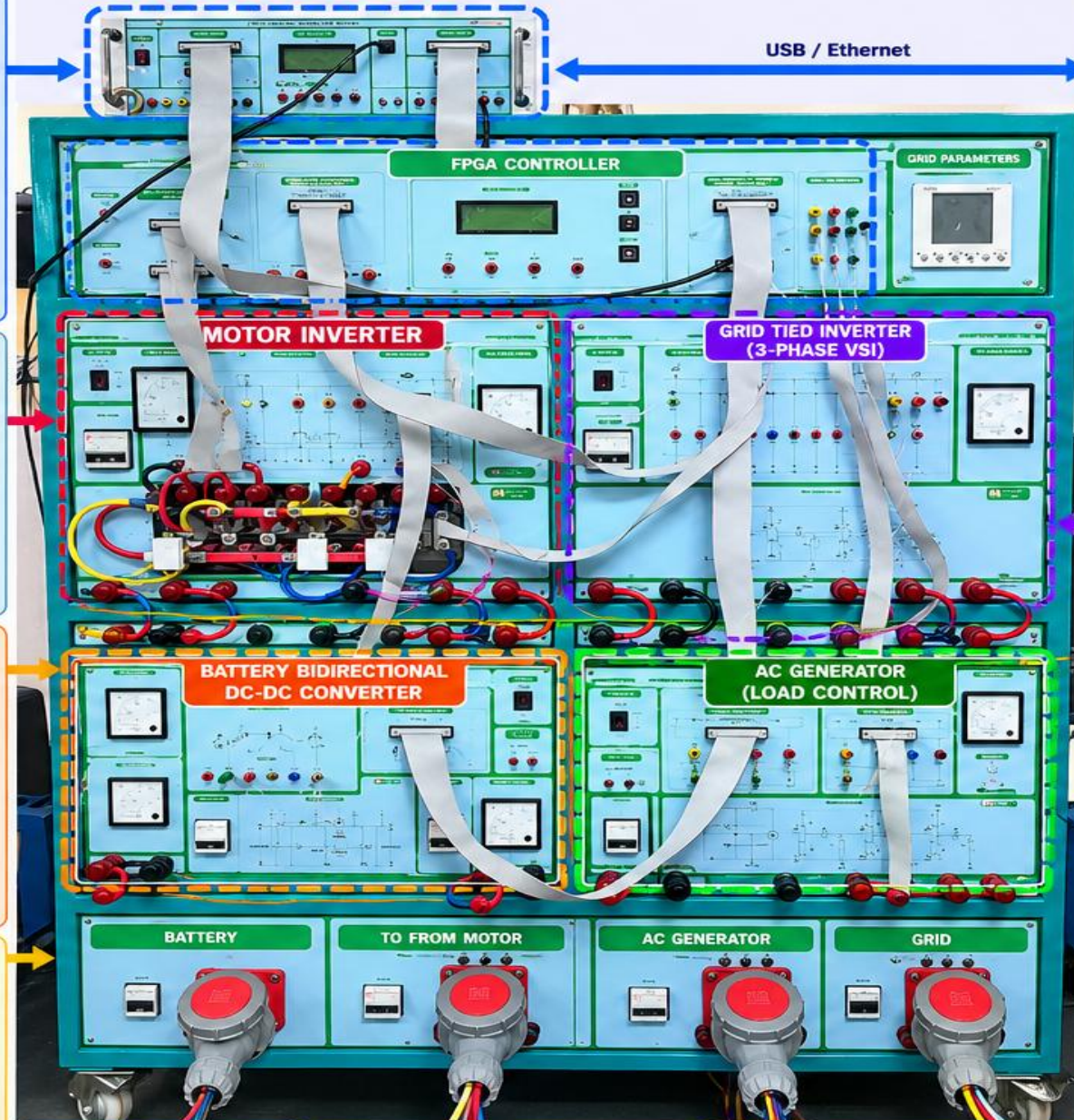


- Bi-directional DC-DC Converter
- Battery Charge / Discharge
- DC Bus Regulation
- Voltage, Current, Temp. Measurement
- Pre-charge & Contactors
- CAN Communication

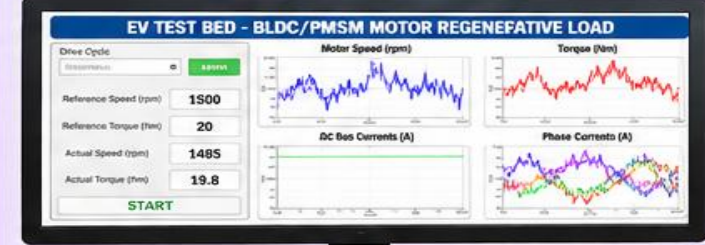
AC GENERATOR (LOAD MACHINE)



- 3-Phase Synchronous / Induction Generator
- Regenerative Load Control
- Speed / Torque Control
- Grid / RLC / Dynamic Load Bank
- Power Measurement
- Used as Load (Energy Recovery)



HIL & SUPERVISORY PC



- MATLAB / Simulink Based HIL
- Drive Cycle Control
- Real-time Monitoring (Speed, Torque, Current, Voltage, Power)
- Data Logging & Analysis

GRID TIED INVERTER (3-PHASE VSI)



- Grid Tied Inverter Power Module
- Synchronisation with Grid
- Active / Reactive Power Control
- Grid Parameters Measurement
- Power Quality Analysis
- RLC Load (Optional)

KEY SIGNALS / CONNECTIONS

- DC Power (Battery)
- DC Link (Bidirectional Converter)
- 3-Phase AC (Motor / Generator)
- Grid Connection (Grid Tied Inverter)
- Control Signals (PWM, Command)
- Feedback Signals (Current, Voltage, Temp.)
- Position / Speed Feedback (Encoder / Resolver)
- Measurement Signals (Power, Frequency)

APPLICATIONS

- EV Powertrain Testing & Validation
- Motor & Inverter Algorithm Development
- Drive Cycle Emulation
- Academic Research & Training
- Industry R&D and Product Development

TEST CAPABILITIES

- Motor Control (Speed / Torque)
- Drive Cycle Testing (MIDC, WLTP, Custom)
- Efficiency Measurement (Motor + Inverter)

- Regenerative Braking Test
- Data Logging & Post Analysis