FOUR QUADRANT CHOPPER TRAINER (Model : XPO-4Q)

**SALIENT FEATURES**
- Facilitates easy & safe wiring by students due to 4mm sturdy shrouded banana patch cords and shrouded socket arrangement to try out different topologies for high voltage circuits.
- Each panel has ABS molded plastic sturdy enclosure, and colorful screw less overlays showing circuit diagram & its connection tag numbers for easy understanding, connections & servicing by swapping at site.
- Study of different types of choppers i.e. Type-A, Type-B, Type-C, Type-D and Type-E (first quadrant to fourth quadrant).
- Set of Instructor Guide & Student Workbook.
- Inbuilt IC based PWM control with variable duty cycle & variable frequency (1-20KHz).
- 4 independent IGBTs with built in driver & 2KV isolation provided for TTL level driver. Thus easy for site servicing, Optionally 2 hall current sensors one for load & one for source supplied.

**TECHNICAL SPECIFICATIONS**

A) Aluminum profile modular flat demo panel rack (4X2) system, carrying various high voltage components housed in plastic enclosures (panel) to minimise shock possibility.

- Instrumentation Power supply cum Multichannel DPM panel (EMT 8) (6 Shrouded Banana)
- DC Multi Output power supply.
- Supplies DC power to neighboring signal conditioning circuit panels like EMT9, CIP1, CIP2, MIT12, CE7 etc. through 20 pin FRC cable.
- Provides 1 Ph. AC supply through 3 MCB’s, 4A each to power up other panels in the rack.
- Optionally Multichannel 4 position DPM for Speed, Torque etc.
- Green SBSS5 socket is provided for extend earth.
- 4 IGBT/MOSFET power & sensing panel (PE7) (37 Shrouded Banana)
- 1200V/40A IGBT with isolated (LV) TTL compatible isolated drive circuit & individual heat sink 4 nos.
- DC current measurement using 0.5E/5W series resistor or optionally hall sensors (Max I/P up to 10A, 50/60Hz), isolation up to 2KV, O/P = 0-3V for controller feedback.
- DC voltage measurement using DC meter panel.
- IC3525 based PWM control with variable duty cycle (5%-90%) & variable frequency (1-20KHz).
- Diode Bridge & LC filter panel (PE8B)
- Power supplies isolated 2 nos. 24V@3A & 12V@750mA with loading resistors provided to prevent voltage built up.
- 2.5mH@5A inductor as load supplied.
- RC components : Capacitors : 0.1uF/63V, 25uF/63V.
- Resistors : 0.5E/5W - 2 Nos, 5E/SW.
- Diode bridge : 1000V/35A.
- DC Voltmeter & Ammeter panel (EMT6D) (8 Shrouded Banana)
- Voltmeter (300V-0-300V) & Ammeter (2A-0-2A)
- DC Voltmeter & Ammeter panel (EMT6E) (8 Shrouded Banana)
- Voltmeter (30V-0-30V) & Ammeter (2A-0-2A)
- PMDC Motor Specifications:
  - 200V/200W/2000RPM Chassis mounted table top with optionally spring balance loading arrangement [10kg]
  - 0V/1000RPM. Weight : 12 Kg.
- Variable AC & DC Supply Panel (EMT23) (8 Shrouded Banana)
  - Variable O/P: AC 0-270V/3A
  - Variable O/P: DC 0-250V/3A
- Resistive Load (EMT14B)
  - DC Resistors : 750E/600E/300E/212E/162E/125E/112E/100E/400W/8 taps +OFF+separate 60E tap for DC series
- 400W/8 taps +OFF+separate 60E tap for DC series Gen.

**List of Experiment:**
1. Study of first quadrant chopper or Type-A chopper.
2. Study of second quadrant chopper or Type-B chopper.
3. Study of two quadrant type-A chopper or Type-C chopper.
4. Study of two quadrant type-B chopper or Type-D chopper.
5. Study of fourth quadrant chopper or Type-E chopper.
6. Four quadrant 200V/200W PMDC motor chopper drive.
7. Resonant converter

**Accessories (optional)** -
1) Single IGBT module mounted on 140x40mm heat sink.
2) Single phase rectifier pack mounted on heat sink.

**Mechanical Dimension(mm):** 960(L) x 545(H) x 300(W)

**IGBT/MOSFET Module (MOQ=Multiple of 15)**

**Technical Specifications**

1) IGBT/MOSFET module mounted on 140x40mm finned heat sink with drain & source outputs brought out on 2 solder pads connected to 100mm x 1.5 Sq.mm flying leads terminated on screw less press fit HV WAGO connectors. Forced air cooling (CFM=85) needed else derate by approximately (~50%).

2) Power device : IGBT (Package-TO 247) 1200V/40A with built in short circuit sustainability upto 4 μsec. OR optionally MOSFET 800V/17A (or your choice).

3) Protection:
   i) Over temperature using NTC @ 85°C
   ii) Over current using ferrite CT (1:100) III) Transient high voltage Snubber using RC with 800V clamping voltage transient suppressor.

4) Drive supply : External 12V/100mA supply needed through 4-pin relimate connector while built in transformer (2KV) isolated DC-DC converter inside.

5) Drive input : Opto isolated O/C TTL @10mA, Max switching frequency DC to 25 KHz, propagation delay opto isolated trip feedback signal provided using 5-pin relimate connector.

6) Indication : Power ON green LED & red trip LED provided on module.

400W/8 taps +OFF+separate 60E tap for DC series Gen.