3 Ph. Variac

SALIENT FEATURES

- Facilitates study of transformer operation, determine its equivalent circuit, use of tertiary winding to suppress harmonics etc.
- 2 models: 300VA & 1KVA/3KVA.
- Facilitates easy and safe wiring by students due to 4mm sturdy shrouded banana patch cords and shrouded socket arrangement for high voltage circuits.
- Each of following standalone Electrical trainers may need a set of associated panels which are mounted in a light weight sturdy aluminium flat demo panel system.
- Each panel has ABS molded plastic sturdy enclosure, and colorful screwless overlays showing circuit diagram & its connection tag numbers for easy understanding and connections.
- Set of Instructor Guide & Student Workbook.

Technical Specifications

Aluminum profile Sturdy (4x3 or 5x2) Modular Flat Panel system, carrying various high voltage components housed in plastic enclosures (panel) to minimize shock possibility.

- **Input 3 phase DOL Starter panel (EMT1) X 1no.** [10 Shrouded Banana]
- 4 pole MCB of 415 V/4A.
- DOL 9A Contactor with 230V / 50 Hz / 11VA COIL.
- Bimetallic thermal O/L relay with range 1.4A - 2.3A for 300VA or 3A-5A for 1KVA/3kVA.
- Green SBS5 socket is provided to extend earth.
- **3 Ph. Bidirectional power cum Energy meter panel (EMT 20) X 3nos.** [8 shrouded Banana]
- Bidirectional Multifunction Meter
- 3 Phase 3/4 wire, 415V CT Input 5A
- LCD/LED display, Aux supply 230V, 45-65 Hz, 5W
- V.I., Hz, Pf, KVA, KW, KWH
- Modbus RTU RS 485 (optional)
- Green SBS5 socket is provided to extend earth.
- **FWD-OFF-REV switch panel (EMT 4A) X 1no.** [6 Shrouded Banana]
- FWD/REV, 3 pole 3 way switch with centre OFF, 6A/440V.
- **1 phase AC Input supply panel (EMT16A) X 1no.** [10 Shrouded Banana]
- 1ph. MCBs of 4A/1.6A - 2nos.
- Bulb Load.
- **AC voltmeter panel (EMT2) X 1no. (Only for 300VA)** [12 Shrouded Banana]
- Voltage range : 500V.
- 1 pole 4 way switch to select line voltage for three phase
- **Dual range AC ammeter panel (EMT3) X 1no. (Only for 300VA)** [12 Shrouded Banana]
- Current range:2A/6A selectable.
- 1 pole 7 way switch to select phase current for three phase
- **Milliohm (V-I method) / Rect/ CAP Load Panel – EMT6C X 1no. (Only for 300VA)** [9 Shrouded Banana)
- Transformer : 230V/14V/3A.
- DC Voltmeter : (0 – 10Vdc).
- DC Ammeter : (0 – 2A).
- Diode bridge rectifier with Rectifying capacitor
- **Resistive Load (EMT14A/B) X 1no. (Only for 300VA)**
- **AC Resistors** **[18** Shrouded Banana]
  10K/5K/3.5K/2.5K/2K/1.5K/OFF (6 taps+1 OFF) 200W x 3 phase
- **DC Resistors**
  750E/600E/300E/212E/162E/ 125E/112E/100E/400W /8 taps + OFF + separate 60E tap for DC series Gen.
- **Lamp Load (EMT7)** [12 Shrouded Banana]
- 230V/100W X3 bulbs with individual ON/OFF using 6A toggle.
- **Variable AC / DC current & voltage supply Panel (EMT23E) X 1no. (Only for 3KVA)** [15 Shrouded Banana]
- Current injecting transformer Primary 230Vac/1A, Secondary 8V/12A, Diode bridge rectifier 1000V/35A, Rectifying capacitor : 1000uF/230VDC
- **DC voltmeter & DC Ammeter panel (EMT68) X 1no. (Only for 3KVA)** [14 Shrouded Banana]
- DC voltmeter (0-50V)
- DC ammeter (0-5A) with polarity protection diode.

Note: Specifications are subject to change.

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Table top panels: (Only for 3KVA model)

- **3 phase Dimmer panel (EMT20D) X1No**
  [24 Shrouded Banana]
- Consisting of 3 numbers of 1 phase dimmers connected in star.
- Input 415VAC, 50 Hz, Output 0-470VAC, 6A, 3 phase.
- **Resistive load Panel (3 Ph.) (EMT79A)**
  [12 Shrouded Banana]
- 3 nos of 1KW resistors with switch selectable 6 nos of taps at 125, 150, 200, 225, 250, 262 ohm.
- **Resistive load Panel (1 Ph.) (EMT79B)**
  [4 Shrouded Banana]
- 1 no. of 1KW resistors with switch selectable 8 nos of taps at 40, 50,65,100,125 150, 200, 250 ohm.

Choice of Transformer : 300VA/1KVA/3KVA

Sr. No.	Parameters	Model I (Default)		Model II	
1	VA rating	300VA (2No) + 50VA in EMT6C	300VA	1 KVA	3 KVA
2	X'mer Type	1 phase (2 Nos + 1No)	3 phase (1 No.)	1 phase (3 Nos.)	3 phase (1 No.)
3	Construction	Double wound iron core EI step down Transformer	Iron core strip lamination type step down Delta primary / Star secondary design.	Double wound iron core EI step down Transformer	Iron core strip lamination type step down Delta primary / Star secondary design.
4	Primary	0-115-200-230VAC/1.3A,50Hz brought out on 8 x 2 sockets for 2 primaries.	3 Nos. Isolated primaries 0-415/0.24A at 50Hz brought out on 3 x 4 sockets	1KVA [2 Nos.] 0-115-200-230Vac / 4.5A,50Hz brought out on 8x2 sockets for 2 primaries. 300VA (1 No.) 0-115-200-230VAC /1.3A,50Hz brought out on 8 x 2 sockets for 1 primary.	3 Nos. Isolated primaries 0-415/4A at 50Hz brought out on 3 x 4 sockets
5	Secondary	200 Vac / 1.5 Amp. brought out on 4 x 2 sockets	3 Nos. Isolated windings groups main 110V/0.5A, zigzag 110V/0.5A, Tertiary 220V/0.25A brought out on 4 x 3 x 3 sockets.	1KVA [2 Nos.] 200Vac / 5Amp. brought out on 4x2 sockets for 2 Secondaries 300VA (1 No.) 200Vac / 1.5Amp brought out on 2 x 2 sockets x 1 secondary	3 Nos. Isolated windings groups main 110V/5A, zigzag 110V/5A Tertiary 220V/1A brought out on 4 x 3 x 3 sockets.
7.	Rack / Panels /Table top	4 x 3 / 12 Nos. / 3 Nos table top units		5 x 2 / 9 Nos. / 3 Nos table top unit	
8.	Mechanical Dimensions/Wt.	960 (L) x 300 (W) x 720 (H) mm		1165 (L) x 300 (W) x 720 (H) mm	
9.	Accessories : Variac	3 Phase / 3 Amp. Variac (table top)		1 phase 3 nos. / 6A each.	Star connected for 3 phase

10. More than 25 experiments :

1. Study of Manufacturing Quality Tests.
   a) Insulation Test
   b) Turns ratio
   c) Polarity Test
2. Study of Performance tests.
   a) Study of Open circuit test
   b) Study of Short circuit test
   c) Study of Load regulation test.
   d) Study of Back to back test (sumpner test)
   e) Study of Winding temperature rise test.
   f) Measurement of winding resistance by DC V–I method.
   g) Study of effect of type of load on transformer O/P waveform
3. Study of Parallel operation of single-phase transformers
4. Study of Scott connection for 3phase to 2 phase conversion
5. Self & mutual inductance measurement of 1 phase transformer
6. Three phase transformers - basic configurations – their effect on capacity utilization egulation.
7. Study of Phasor Groups in 3 Phase Transformer connections
8. Study of Phasor Group1 connections in 3 ph. Transformer.
9. Study of Phasor Group2 connections in 3 ph. Transformer.
10. Study of Phasor Group3 connections in 3 ph. Transformer.
11. Study of Phasor Group4 connections in 3 ph. Transformer.
12. Study of using Tertiary winding on 3 ph. transformers for suppressing harmonics.
13. Study of Load regulation, efficiency & Temp. rise test on 3 ph. Transformers
14. Study of Manufacturing Quality Tests on 3 phase transformers
15. Determination of zero sequence reactance of 3 ph. transformer
16. Determination of equivalent circuit of 3 ph. transformer
17. Parallel operation of two 3 phase transformers (optional) [needs one more extra 3 ph. transformer)

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