



BENN ELECTRICALS

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Electrical Machine Trainer - DRONACHARYA

'**BENN**' has introduced an Electrical Machine Trainer '**DRONACHARYA**', a comprehensive and cost effective solution for electrical laboratories.

The Electrical Machine Trainer system is provided with specially designed integrated machines of nominal 300 W / 0.5 HP rating. Control Panels containing power supplies, drives, loading arrangements, electronic and digital instruments are provided along with Machines.

The training system is suitable to study a wide range of electrical machine syllabi starting from the basic principle and operation to the detailed study of characteristics of different types of AC and DC Machines.

This Machine Trainer consists of the following Machine and Control Panel Sets: -

Machine Set - 1

0.5 HP / 180 V / 1500 RPM / DC Integrated Machine, Coupled with 350 VA / 3 Phase / 415 V / 1500 RPM / Star connected / Rotor Wound / Stator Excited / 220 V DC Separate excitation / Manually regulated / 3 Phase Synchronous Machine with Damper winding. Provided with base and couplings.

DC Machine will be Trunnion Mounted Dynamometer type with Linear scales (2 nos.) for torque measurement. DC Machine can run as DC Shunt, Series & Compound Motor as well as Generator.

3 Phase Synchronous machine can run as 3 Phase Synchronous Alternator & 3 Phase Auto Synchronous Motor.

Machine Set – 2

0.5 HP / 415 V Stator / 200 V Star connected Rotor / 1440 RPM / 3 Phase / Slip Ring Induction Motor complete with Mechanical Loading Arrangement having Aluminum Drum Mounted on Motor Shaft, Linear spring balances (2 nos.), Friction belt & necessary frame-work for Torque Measurement.

Machine Set - 3

0.5 HP / 415 V / 1440 – 2880 RPM / 3 Phase / SQ. Cage Induction Motor with Dhalandar Winding for 2 speed operation. Complete with Mechanical Loading Arrangement having Aluminum Drum Mounted on Motor Shaft, Linear spring balances (2 nos.), Friction belt & necessary frame-work for Torque Measurement.

Machine Set – 4

0.5 HP / 230 V / 1 Phase / 1440 RPM / SQ. cage Induction Integrated Motor. Complete with Mechanical Loading Arrangement having Aluminum Drum Mounted on Motor Shaft, Linear spring balances (2 nos.), Friction belt & necessary frame-work for Torque Measurement.

This Motor can run as Capacitor Start Capacitor Run (CSCR), Capacitor Start Induction Run (CSIR) and Split Phase Single Phase Sq. Cage Induction Motor.

Machine Set – 5

0.5 HP / 160 V DC – 220 V AC / 1500 – 2000 RPM / Universal (AC Series) Motor. Complete with Mechanical Loading Arrangement having Aluminum Drum Mounted on Motor Shaft, Linear spring balances (2 nos.), Friction belt & necessary frame-work for Torque Measurement.

Machine Set – 6

0.5 HP / 230 V AC / 1500 RPM / Repulsion Motor Complete with Mechanical Loading Arrangement having Aluminum Drum Mounted on Motor Shaft, Linear spring balances (2 nos.), Friction belt & necessary frame-work for Torque Measurement.

Control Panel (Common for all Machine sets)

Control Panel is made of 16 SWG SS Sheet metal with Poly Carbonate Facia displaying Mimic diagrams. The Control Panel will consist of the following components:-

1	Digital DC Ammeters – 3 Nos.	2	Digital AC Ammeter
3	Digital DC Voltmeters – 3 Nos.	4	Digital AC Voltmeter
5	3 Phase / 1E AC Combimeter	6	Digital RPM Indicator with sensor
7	Single Phase DC Thyristor Power Supply – 3 Nos.	8	1 Phase Resistive Load Bank
9	3 Phase Resistive Load Bank	10	DOL cum Star Delta starter
11	DC Starter	12	Field Regulator
13	Fix resistance as Field Diverter	14	3 Phase Variac (External)
and all other required Indicators, switches, MCB & Educational Type terminals			

Note : Individual Control panels for each machine set can be provided at an extra cost to facilitate multiple student batches to perform experiments simultaneously.

SALIENT FEATURES

- ❖ Control Panel contains all safety and tripping measures.
- ❖ Panel has Polycarbonate Facia with mimic diagrams of components with all terminals brought outside for easy and shock free connections.
- ❖ The trainer unit covers a wide range of machine syllabus. More than 45 experiments can be conducted.
- ❖ Easy and safe wiring due to use of colour coded & Electrically insulated terminals (binding posts) on Top.
- ❖ Dynamically balanced rotors to minimise vibration / noise.
- ❖ Acrylic viewing window is provided to observe internal structure of machine and to make students familiar with parts of the machines like commutator, slip ring, brush holder, carbon brush, stator, rotor, centrifugal switch etc.
- ❖ Digital indication of electrical parameters like Voltage, Current, RPM, etc. giving a broad introduction of measuring instruments.
- ❖ Separate Machines with Common Control Panel or option for individual Control Panels which enables multiple batches of students to conduct experiments Simultaneously.
- ❖ Performance conforming to IS/IES Standards.
- ❖ Complete Hard and Soft copy of Manual.

List of Practicals that can be covered by Electrical Trainer Unit – At a glance

DC Integrated Machine.

- ❖ Speed torque characteristic for self/separately excited Shunt Motor.
- ❖ Speed torque characteristic for over/under/level excited compound Motor.
- ❖ Speed torque characteristic for Series Motor.
- ❖ Study of cumulative and differential compounded motor.
- ❖ Swinburne's test on DC Machine.
- ❖ Starting methods of DC Machine using 2P/3P/4P Starters.
- ❖ Speed control of Shunt Motor using armature/field control.
- ❖ Speed control of Compound Motor using armature/field control.
- ❖ Speed control of Series Motor using armature control.
- ❖ O.C.C on DC Generator.
- ❖ V/I characteristic for separately/self excited DC shunt Generator.
- ❖ V/I characteristic for over/under/level excited Compound Generator.
- ❖ V/I characteristic for Series Generator.

- ❖ Study of cumulative and differential compounded Generator.
- ❖ Efficiency curve for DC integrated Machine.
- ❖ Study of a Dynamometer.

3 Phase AC Synchronous Machine.

- ❖ Load characteristic of 3 phase Synchronous Motor
- ❖ V curve/inverse V curve for 3 phase synchronous machine.
- ❖ Current Locus for Synchronous Motor.
- ❖ Voltage regulation of Three Phase Alternator by EMF, MMF & Direct Loading(UPF)
- ❖ Load characteristic of 3 phase Alternator.
- ❖ O.C.C./S.C.C. test for 3 phase Alternator.
- ❖ Slip test for 3 Phase Synchronous machine.
- ❖ Efficiency curve 3 Phase Alternator and synchronous Motor

Universal Motor.

- ❖ Load test of Universal Motor with AC supply.
- ❖ Load test of Universal Motor with DC supply.
- ❖ Speed control of Universal Motor.
- ❖ Efficiency curve for Universal Motor.

1 Phase AC Integrated Machine.

- ❖ Load characteristic of 1 Phase AC Motor as capacitor start-induction run.
- ❖ Load characteristic of 1 Phase AC Motor as capacitor start-capacitor run.
- ❖ Load characteristic of 1 Phase AC Motor as split phase.
- ❖ Blocked rotor Test.
- ❖ Efficiency curve for 1 phase AC Induction Motor.

3 Phase AC Integrated Machine.

- ❖ Load characteristic of 3 Phase Slip Ring Induction Motor.
- ❖ Star/Delta starting of 3 Phase Slip Ring Induction Motor.
- ❖ DOL starting of 3 Phase Slip Ring Induction Motor.
- ❖ Load characteristic of 3 Phase self start Synchronous Induction Motor.
- ❖ Blocked rotor test.
- ❖ Efficiency curve for 3 phase Slip Ring Induction Motor.

Repulsion Motor.

- ❖ Load test of Repulsion Motor.
- ❖ Speed control of Repulsion Motor. (with Brush Adjustment)
- ❖ Efficiency curve for Repulsion Motor.

3 Phase SQ. Cage Induction Motor.

- ❖ Load characteristic of 3 phase SQIM @ 2 Pole & 4 Pole.
- ❖ DOL starting of 3 phase SQIM.
- ❖ Blocked rotor test.
- ❖ Efficiency curve for 3 phase SQIM.
- ❖ To study Dhalandar Winding. (2 Pole – 4 Pole connection).

MG Set.

- ❖ 3 phase AC to DC converter & vice versa

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TECHNICAL DATA SHEET

Common Specifications:

Frame : 90 /100 Watts : 300/375 RPM : 1500
Insulation Class : B Enclosure : SPDP /IP22 Duty : S1 (Continuous)
Cooling : IC01 Mounting : B3 (Foot) Hz. : 50 (if AC)

DC INTEGRATED MACHINE

FIELD V : 180 FIELD A : 0.45
ARMATURE V/A FOR MOTOR : 180 V / 2 A
SHUNT GENERATOR : 170 V / 1.75 A
SERIES GENERATOR : 120 V / 2.5 A
COMPOUND GENERATOR : 190 V / 1.6 A

3 PHASE SYNCHRONOUS MACHINE

ROTOR : 415 V / 0.6 A / 3 PHASE – 4 W AC
STAR CONNECTION
STATOR : 220 V / 0.5 A DC

SINGLE PHASE AC INTEGRATED MACHINE:

VOLTS : 230 Hz : 50
AMPS : CSCR : 2.6 A CSIR : 4.7 A
SPLIT PHASE : 4.7 A

THREE PHASE AC SQIM (2 SPEED):

WITH DHALANDAR WINDING

Hz : 50 VOLTS : 415
0.5 HP AMPS : 1.0 RPM : 1500
1.0 HP AMPS : 2.0 RPM : 3000

REPULSION MOTOR:

AC
VOLTS 230
AMPS 4.5

THREE PHASE AC SLIPRING MACHINE:

Hz : 50 CONN : DELTA

	SLIM	SYN. INDUCTION MOTOR
V (STATOR)	415 V AC	415 V AC
A (STATOR)	1.4 A AC	0.8 A AC
EX. V (ROTOR)	50 V DC	50 V DC
EX. A (ROTOR)	2.0 A DC	2.0 A DC

UNIVERSAL MOTOR:

	AC	DC
VOLTS	230	150
AMPS	4.5	3.5
RPM	2000	1500