

#### **SALIENT FEATURES :**

- 01 Facilitates easy and safe wiring by students due to use of 4mm sturdy Shrouded banana patch cords & shrouded socket arrangements.
- 02 All machines are mounted on finely painted sturdy base frame with easy machine interchangeability. Use of gear coupling facilitates screwless coupling. interchangeability. Use of gear coupling facilitates screwless coupling.
- 03 With due emphasis on student safety machines operate upto 300W power levels and upto 1500 RPM, without compromising on didactic use. Able to draw all graphs. Contact factory for 3 HP EMT Trainer.
- 04 Trunnion mounted DC Integrated machine is used as Dynamometer for loading other machines (Motors/ generators both); unlike magnetic powder brake or eddy current brake which can load only coupled Motors and not generators, with facility to measure shaft power using electronic torque / speed Measurement

Note: Specifications are subject to change.

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### Panels Provided

- 01 Aluminum Machine trainer Rack
- 02 Input 3 phase DOL Starter panel
- 03 Multifunction Meter (Single Phase/Three Phase AC 50Hz) - Qty.2
- 04 FWD/REV, Star-Delta starter panel
- 05 Rotor Resistor Cum 3Phase Synchronous Motor Control
- 06 1 Phase Motor, Alternator & Sync. Motor
- 07 DC voltmeter & Ammeter and Torque Measurement Meter - Qty.2
- 08 Variable DC Power Supply - Qty.2
- 09 Input Single Phase DOL Starter Panel AC DC Fix / Variable Supply - Qty.2
- 10 AC Load Resistor
- 11 DC Load Resistor
- 12 AC Load Inductor
- 13 Capacitive © Load
- 14 Lamp Load
- 15 Synchroscope / 3 Phase Alternator Synchronizer
- 16 Extension Board

### Motors Provided

- 01 DC Integrated (Trunion Mounted) Motor - Qty.2
- 02 3 Phase AC Integrated Motor - Qty.2
- 03 3 Phase Salient Pole Alternator
- 04 1 Phase. Synchronous Motor
- 05 1 Phase AC Integrated Motor
- 06 Universal Motor
- 07 DC Integrated (Foot mounted) Motor
- 08 1 Phase AC Integrated Motor with loading arrangement
- 09 3 Phase AC Integrated Motor with loading arrangement
- 10 3 Phase Squirrel Cage Induction Motor with loading arrangement
- 11 Repulsion Motor with loading arrangement

### Accessories Provided

- |    |  |    |
|----|--|----|
| 01 | Hand held digital Tachometer.....              | 01 |
| 02 | Shrouded connecting leads 4mm 50cm Red.....    | 20 |
| 03 | Shrouded connecting leads 4mm 50cm Black.....  | 20 |
| 04 | Shrouded connecting leads 4mm 100cm Red.....   | 20 |
| 05 | Shrouded connecting leads 4mm 100cm Black..... | 20 |

### DC MOTOR COUPLED 3PH. AC MOTOR TRAINER (46801)

- |                 |  |
|-----------------|--|
| Experiment – 01 | speed torque curve of DC shunt motor with 3 phase AC integrated motor                                    |
| Experiment – 02 | speed torque curve of DC series motor with 3 phase AC integrated motor                                   |
| Experiment – 03 | speed torque curve of separately excited DC motor with 3 phase AC integrated motor                       |
| Experiment – 04 | speed torque curve of DC compound motor with 3 phase AC integrated motor                                 |
| Experiment – 05 | v-i efficiency curve of DC shunt generator with 3 phase AC integrated motor                              |
| Experiment – 06 | v-i efficiency curve of DC series generator with 3 phase AC integrated motor                             |
| Experiment – 07 | v-i efficiency curve of separately excited DC generator with 3 phase AC integrated motor                 |
| Experiment – 08 | v-i efficiency curve of DC compound generator with 3 phase AC integrated motor                           |
| Experiment – 09 | v-i efficiency curve of occ of shunt generator with 3 phase AC integrated motor                          |
| Experiment – 10 | speed torque curve of would rotor induction motor with rotor shorted and with Different rotor resistance |
| Experiment – 11 | DOL starter  |
| Experiment – 12 | Star delta starter   |
| Experiment – 13 | Rotor resistance starter   |
| Experiment – 14 | Application of synchronous motor as pf improvement device-v curves                                       |
| Experiment – 15 | Synchronous generator v-I curves   |

### DC MOTOR COUPLED 3PH. SALIENT MOTOR TRAINER (46802)

- |                 |  |
|-----------------|--|
| Experiment – 16 | speed torque curve of DC shunt motor with 3 phase salient motor  |
| Experiment – 17 | speed torque curve of DC series motor with 3 phase salient motor |

Note: Specifications are subject to change.

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Experiment – 18	Speed torque curve of separately excited DC motor with 3 phase salient motor
Experiment – 19	Speed torque of DC compound motor with 3 phase salient motor
Experiment – 20	v-i efficiency curve of DC shunt generator with 3 phase salient motor
Experiment – 21	v-i efficiency curve of DC series generator with 3 phase salient motor
Experiment – 22	v-i efficiency curve of DC separately excited generator with 3 phase salient motor
Experiment – 23	v-i efficiency curve of DC compound generator with 3 phase salient motor
Experiment – 24	v-i efficiency curve of occ of shunt generator with 3 phase salient motor
Experiment – 25	Speed torque of 3ph. synchronous motor
Experiment – 26	Efficiency and input power factor measurement 3ph. synch. motor
Experiment – 27	Study of 'v' curve and inverted 'v' curve
Experiment – 28	output volt -amp charACteristics of synchronous generator
Experiment – 29	Efficiency of synchronous generator
Experiment – 30	Performance of R, L, and C load

#### **DC MOTOR COUPLED 1PH. AC MOTOR TRAINER (46803)**

Experiment – 31	speed torque curve of DC shunt motor with 1 phase AC integrated motor
Experiment – 32	speed torque curve of DC series motor with 1 phase AC integrated motor
Experiment – 33	Speed torque curve of separately excited DC motor with 1 phase AC integrated motor
Experiment – 34	Speed torque of DC compound motor with 1 phase AC integrated motor
Experiment – 35	v-i efficiency curve of DC shunt generator with 1 phase AC integrated motor
Experiment – 36	v-i efficiency curve of DC series generator with 1 phase AC integrated motor
Experiment – 37	v-i efficiency curve of DC separately excited generator with 1 phase AC integrated motor
Experiment – 38	v-i efficiency curve of DC compound generator with 1 phase AC integrated motor
Experiment – 39	v-i efficiency curve of occ of shunt generator with 1 phase AC integrated motor
Experiment – 40	speed torque curve of split phase induction motor
Experiment – 41	speed torque curve for CSIR
Experiment – 42	Speed torque curve of CSCR

#### **DC MOTOR COUPLED 1PH. SYNCH. MOTOR TRAINER (46804)**

Experiment – 43	speed torque curve of DC shunt motor with 1 phase synchronous motor
Experiment – 44	speed torque curve of DC series motor with 1 phase synchronous motor
Experiment – 45	Speed torque curve of separately excited DC motor with 1 phase synchronous motor
Experiment – 46	Speed torque of DC compound motor with 1 phase synchronous motor
Experiment – 47	v-i efficiency curve for DC shunt generator with 1 phase synchronous motor
Experiment – 48	v-i efficiency curve for DC series generator with 1 phase synchronous motor
Experiment – 49	v-i efficiency curve for DC separately excited generator with 1 phase synchronous motor
Experiment – 50	v-i efficiency curve for DC compound generator with 1 phase synchronous motor
Experiment – 51	v-i efficiency curve for occ of shunt generator with 1 phase synchronous motor
Experiment – 52	Speed torque curve of synchronous motor
Experiment – 53	Efficiency and input power factor measurement of 1ph. synch. Motor.
Experiment – 54	Study of 'V' curve of 1ph. synch. Motor.
Experiment – 55	Out volt-amp charACteristics of synchronous motor
Experiment – 56	Efficiency of synchronous generator.
Experiment – 57	Performance with R, L and C load.

#### **DC MOTOR COUPLED WITH UNIVERSAL MOTOR TRAINER (46805)**

Experiment – 58	speed torque curve of DC shunt motor with universal motor
Experiment – 59	speed torque curve of DC series motor with universal motor
Experiment – 60	Speed torque curve of separately excited DC motor with universal motor
Experiment – 61	Speed torque of DC compound motor with universal motor
Experiment – 62	v-i efficiency curve for DC shunt generator with universal motor
Experiment – 63	v-i efficiency curve for DC series generator with universal motor
Experiment – 64	v-i efficiency curve for DC separately excited generator with universal motor
Experiment – 65	v-i efficiency curve for DC compound generator with universal motor
Experiment – 66	v-i efficiency curve for occ of shunt generator with universal motor
Experiment – 67	Speed torque curve of universal motor when operated with 180VDC
Experiment – 68	Study of efficiency of universal motor for various loading condition.

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**DC MOTOR COUPLED WITH DC MOTOR TRAINER (46806)**

- Experiment – 69 Speed torque curve and efficiency of DC shunt motor with DC motor
- Experiment – 70 Speed torque curve and efficiency of DC series motor with DC motor
- Experiment – 71 Speed torque curve and efficiency of separately excited DC motor with DC motor
- Experiment – 72 Speed torque curve and efficiency of DC compound motor with DC motor
- Experiment – 73 Output volt-amp characteristics of DC shunt generator with DC motor
- Experiment – 74 Efficiency of DC shunt generator with DC motor
- Experiment – 75 Output volt-amp characteristics of DC separately excited generator with DC motor
- Experiment – 76 Efficiency of DC separately excited generator with DC motor
- Experiment – 77 Output volt-amp characteristics of DC series generator with DC motor

**SYNCHRONIZATION / PARALLELING OF 2 THREE PHASE ALTERNATOR TRAINER (46807)**

- Experiment – 78 speed torque curve of DC shunt motor with 3 phase AC integrated motor
- Experiment – 79 speed torque curve of DC series motor with 3 phase AC integrated motor
- Experiment – 80 Speed torque curve of separately excited DC motor with 3 phase AC integrated motor
- Experiment – 81 Speed torque of DC compound motor with 3 phase AC integrated motor
- Experiment – 82 v-i efficiency curve for DC shunt generator with 3 phase AC integrated motor
- Experiment – 83 v-i efficiency curve for DC series generator with 3 phase AC integrated motor
- Experiment – 84 v-i efficiency curve for DC separately excited generator with 3 phase AC integrated motor
- Experiment – 85 v-i efficiency curve for DC compound generator with 3 phase AC integrated motor
- Experiment – 86 v-i efficiency curve for occ of shunt generator with 3 phase AC integrated motor
- Experiment – 87 Speed torque curve of wound rotor induction motor with rotor shorted and with different Rotor resistance.
- Experiment – 88 DOL/Star-delta starter, rotor resistance starter.
- Experiment – 89 Application of sync. Motor as pf improvement device-V curve.
- Experiment – 90 Synchronous generator V-I curves.
- Experiment – 91 Dark lamp method[all lamps are dark]
- Experiment – 92 Bright lamp method[all lamps are bright]
- Experiment – 93 1 Dark 2 Bright lamp method.

**1 PHASE AC INDUCTION MOTOR TRAINER (46808)**

- Experiment – 94 Study of speed-torque characteristics of single phase induction motor (split phase type).
- Experiment – 95 Study of efficiency and input power factor of 1phase induction motor (split phase type) for various loading conditions.
- Experiment – 96 Study of speed-torque characteristics of single phase induction motor (capacitor start type).
- Experiment – 97 Study of efficiency and input power factor of 1phase induction motor (capacitor start type) for various loading conditions.
- Experiment – 98 Study of speed-torque characteristics of single phase induction motor (capacitor start-run Type).
- Experiment – 99 Study of efficiency and input power factor of 1phase induction motor (capacitor start-run type ) for various loading conditions.
- Experiment – 100 Study of "No Load Test" and "Blocked Rotor Test ". on 1 phase Induction Motor.

**3 PHASE AC SLIP RING INDUCTION MOTOR TRAINER (46809)**

- Experiment – 101 Speed torque characteristics of 3 ph. wound rotor induction motor with variable rotor Resistance.
- Experiment – 102 Efficiency of input power factor measurement of 3 ph. wound rotor induction motor.
- Experiment – 103 Speed torque characteristics of 3 ph. short-circuited rotor induction motor.
- Experiment – 104 Efficiency of input power factor measurement of 3 ph. short-circuited rotor Inductions motor.
- Experiment – 105 Speed torque charACteristics of 3 ph. synchronous motor.
- Experiment – 106 Efficiency of input power factor measurement of 3 ph. synchronous motor.
- Experiment – 107 Use of synchronous motor as power factor improvement device. study of 'v' curves
- Experiment – 108 Study of Direct On Line (DOL) starter for three phase induction motor.
- Experiment – 109 Study of star delta-starter for 3 ph. induction motor.
- Experiment – 110 Study of rotor resistance starter for three phase wound rotor induction motor.

Note: Specifications are subject to change.

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Experiment – 111 Study of direction of reversal for 3 phase induction motor.

**3 PHASE SQUIRREL CAGE INDUCTION MOTOR TRAINER (46810)**

Experiment – 112 Speed torque charACteristics of 3 phase squirrel cage induction motor.

Experiment – 113 Efficiency, % slip and input power factor measurement of 3 phase squirrel cage induction motor.

Experiment – 114 Speed control of squirrel cage induction motor by pole changing method.

Experiment – 115 'No Load Test' & 'Blocked Rotor Test' on 3 ph. squirrel cage induction motor.

**REPLUTION MOTOR TRAINER (46811)**

Experiment – 116 Study of speed torque characteristics of Repulsion motor.

Experiment – 117 Study of efficiency and input power factor measurement of single phase Repulsion motor.

Experiment – 118 Speed control and reversal of direction of rotation of repulsion motor.

Note: Specifications are subject to change.

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### Technical Specification of Panels

#### INPUT 3 PHASE DOL STARTER PANEL



- 1 MCB 4 pole 4Amp.
- 2 DOL 9A Contactor with 415V / 50 Hz / 11VA COIL .
- 3 RYB Indicator
- 4 Emergency Switch
- 5 Shrouded socket 8Nos.
- 6 Push button switch for Stop/Start

#### DC VOLTMETER & AMMETER WITH TORQUE MEASUREMENT METER



- 1 TWO DPM DC voltmeter (0-1000V)
- 2 TWO DPM DC Ammeter (0-20A)
- 3 Torque Measurement Meter
- 4 Shrouded socket 16Nos.

#### MULTIFUNCTION METER (Single Phase/ Three Phase AC 50Hz)



- 1 Bidirectional Multifunction Meter
- 2 3 Phase 4 wire, 440V, Current 5A
- 3 LED display,
- 4 Aux supply 230V, 45-65Hz, 5W
- 5 To measure parameters ie Voltage Current., KVA, Frequency, Power factor, Active Power (W), Reactive Power (vary) etc.
- 6 Shrouded socket 08Nos. etc.

#### VARIABLE DC POWER SUPPLY



- 1 Half bridge SCR based 0V-200V / 3 Amp cosine firing with linear characteristics, 3 Nos. Switch SPDT to On/Off with indication
- 2 Three Nos. of these supplies required for DC Armature, DC motor field and AC generator field.
- 3 Shrouded socket 8Nos.

#### FWD/REV AND STAR-DELTA STARTER PANEL



- 1 FWD/REV, 3 pole 3 way Switch with centre OFF, 10A/ 440V.
- 2 Star/Delta switch 3 pole, 3 way with centre OFF, 10A/ 440V.
- 3 Shrouded socket 12Nos.

#### INPUT SINGLE PHASE DOL STARTER PANEL AC DC FIX / VARIABLE SUPPLY



- 1 MCB 2 pole 10A with indicator
  - 2 Emergency Switch
  - 3 Push button switch for Stop/Start
  - 4 DOL 9A Contactor with 230V / 50 Hz / 11VA Coil .
  - 5 Shrouded socket 4Nos.
- Variable AC Supply (0-200V)**
- 1 Shrouded socket 6Nos.
- Fix/Variable DC Supply (0-200V)**
- 1 Shrouded socket 4Nos.

#### ROTOR RESISTOR CUM 3PHASE SYNCHRONOUS MOTOR CONTROL



- 1 Rotor resistors of 30E/5A with 3 taps of 15E, 21E, 30E each - 3 Nos.
- 2 Rotor resistor selector switch, 3 pole. 6 Way 10A/440V.
- 3 DC Rotor excitation with circuit breaker (3Amp)
- 4 Shrouded socket 7Nos.

#### AC LOAD RESISTOR



- 1 AC Resistors 10K/5K/3.5K/2.5K/2K/1.5K/OF
- 2 200W x 3 phases/ 6 taps
- 3 Load Resistance switch 3 POL 7 Way/10Amp.
- 4 Cooling Fan size 4" 230V Operated
- 5 Shrouded socket 12Nos.

#### 1 PH. MOTOR, ALTERNATOR & SYNC. MOTOR



- 1 1 ph. MCBs of 4A/1.6A 1 each.
- 2 2 no. 2P2W selector switches to run as 1ph. Alternator then as synchronous motor.
- 3 2A push button switch to simulate as centrifugal switch.
- 4 1 Lamp load holder with lamp
- 5 Shrouded socket 14Nos.

#### DC LOAD RESISTOR



- 1 750E/600E/300E/212E/162E/125E/112E/100E/400W /8 taps + OFF + separate 60E tap For DC series Gen.
- 2 Load Resistance switch 3 POL 7 Way/10Amp.
- 3 Cooling Fan size 4" 230V Operated
- 4 Shrouded socket 6Nos.

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### Technical Specification of Panels

#### AC LOAD INDUCTOR



- 1 Inductive load  
=0.15H/0.3H/  
0.45H/0.6H/0.75H/1.5H/3H/  
400mA X 3Nos.
- 2 Load inductor switch 3 Pole  
7 Way/10Amp.
- 3 Shrouded socket 12Nos.

#### AC VOLTMETER & AC AMMETER AND REVERSING SWITCH

- 1 Two Digital AC Voltmeter 3½ Digit  
Having Dual range of 0-200V /600V
- 2 Two Digital AC Ammeter 3½ Digit  
having Dual range of 0-2A / 20A
- 3 Four DPDT Switches for Dual DPM
- 4 Reversing Switch
- 5 Power socket for AC I/P
- 6 Power on off Switch
- 7 Shrouded socket 20Nos

#### CAPACITIVE (C) LOAD



- 1 Capacitive load =1.25mF  
/2.5mF/5mF/440VX 3Nos
- 2 Shrouded socket 18Nos.

#### DIGITAL WATTMETER

- 1 Two Digital Wattmeter having range  
of 0-250V, 0-5Amp. = 1250W  
Aux. supply 230V.
- 2 Power socket for AC I/P
- 3 Power on off Switch
- 4 Shrouded socket 12Nos

#### LAMP LOAD



- 1 3 Nos. Lamp 100W  
with Holder  
& switch
- 2 Shrouded socket  
12Nos.

#### PHASE SEQUENCE & VIF / PF METER

- 1 Phase Sequence meter  
Operating Voltage 110v ± 20%
- 2 Digital Power factor meter (VIF / PF)  
230V 5Amp.
- 3 Power socket for AC I/P
- 3 Power on off Switch
- 4 Shrouded socket 9 Nos

#### SYNCHROSCOPE / 3 PH. ALTERNATORS SYNCHRONIZING



- 01 Synchroscope:- Rotating light  
meter with 28 LED on a circular  
scale and a zero voltage differential  
Indication with 2 LED
- 02 3 Phase Alternator Synchronizing
- 03 Synchronization indication for  
qualitative indication of the phase  
relationship between mains and  
voltage of the generator

#### ALUMINUM FRAME - MODULAR PANELS



Electrical motor trainer rack made up  
aluminium profile size 40×40mm,  
foldable and light in weight 10 panel  
setup can be interchange conveniently to  
perform experiments. Dimension  
Length 1100×Height 1000×Depth  
350mm.

#### EXTENSION BOARD

- 1 Operating Voltage 230VAC ± 10% at 50Hz
- 2 ON OFF Switch with indicator
- 3 Eight Nos. five pin 5 Amp Electrical Sockets

Note: Specifications are subject to change.

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## Technical Specification of Motors



### **DC INTEGRATED (TRUNION MOUNTED) MOTOR**

**Voltage :**  $V_{arm} = 180V$   $V_{field} = 180V$

**Capacity** - 300W/2 Pole m/c, **RPM** - 1500, **Shrouded Socket** - 12

**Rotor Construction:** Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals

**Stator construction :** Separately excited field winding with laminated solid yoke 2 pole and series winding brought out on 4 terminals.

**Toque characteristic:** Provision of load cells 6 Kg. 2 No. assembly to measure the torque .



### **3 PHASE AC INTEGRATED MOTOR**

**Voltage :** 415VAC, 50Hz

**Capacity** - 300W/4 Pole m/c, **RPM** - 1500, **Shrouded Socket** - 18

**Rotor Construction :** Star connected, four terminals including star point brought out on 4 slip rings mounted on shaft.

**Stator construction :** Six terminals to be brought out to start the motor using STAR-DELTA starter.



### **3 PHASE SALIENT POLE ALTERNATOR**

**Voltage :** 415VAC, 50Hz

**Capacity** - 300W/4 Pole m/c, **RPM** - 1500, **Shrouded Socket** - 12

**Rotor Construction :** Star connected, four terminals including star point brought out on 4 slip rings mounted on shaft.

**Stator construction :** Separately excited field winding with laminated solid yoke, 4 pole brought out on 2 terminals



### **1 PHASE. SYNCHRONOUS MOTOR**

**Voltage :** 230 VAC, 50Hz

**Capacity** - 300W/4 Pole m/c, **RPM** - 1500, **Shrouded Socket** - 8

**Rotor Construction :** Single phase wound rotor with terminals brought out on two slip rings mounted on shaft.

**Stator construction :** One winding will be used to configure synchronous motor & Alternator output when used as single phase generators.



### **1 PHASE AC INTEGRATED MOTOR**

**Voltage :** 230 VAC, 50Hz

**Capacity** - 300W/4 Pole m/c, **RPM** - 1500 **Shrouded Socket** - 18

**Rotor Construction :** Diecast Squirrel cage motor

**Stator construction :** Two windings brought out on 4 terminals for main and auxilliary. These will be used to configure different motors Split phase, CSCR, CSIR.

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#### **UNIVERSAL MOTOR**

**Voltage :** 230 VAC, 50Hz / 150VDC

**Capacity -** 300W/4 Pole m/c, **RPM -** 1500, **Shrouded Socket -** 8

**Rotor Construction :** Standard commutator brush arrangement brought out on 4 terminals

**Stator construction :** Stator brought out on 4 terminals to facilitate AC/DC operation and direction change. Built in compensating winding to minimize AR and sparking.



#### **REPULSION MOTOR**

**Voltage :** 230 VAC, 50Hz

**Capacity -** 300W/4 Pole m/c, **RPM -** 1500, **Shrouded Socket -** 4

**Rotor Construction :** Standard commutator brush but short circuited.

**Stator construction :** Stator brought out on 4 terminals. Settable handle to rotate brush position w.r.t. Neutral axis.



#### **3 PHASE SQUIRREL CAGE INDUCTION MOTOR**

**Voltage :** 415 VAC, 50Hz

**Capacity -** 300W/4 Pole m/c, **RPM -** 1500, **Shrouded Socket -** 12

**Rotor Construction :** Diecast Squirrel cage motor

**Stator construction :** 6x2 terminals brought out to run machine at two speeds using pole changing method (Dahellander Winding)



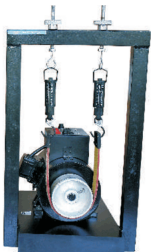
#### **DC INTEGRATED (FOOT MOUNTED) MACHINE**

**Voltage :**  $V_{arm} = 180V$   $V_{field} = 180V$

**Capacity -** 300W/4 Pole m/c, **RPM -** 1500, **Shrouded Socket -** 12

**Rotor Construction:** Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals

**Stator construction :** Separately excited field winding with laminated solid yoke 2 pole and series winding brought out on 2 terminals.



- 1 PHASE AC INTEGRATED MOTOR with loading arrangement
- 3 PHASE AC INTEGRATED MOTOR with loading arrangement
- 3 PHASE SQUIRREL CAGE INDUCTION MOTOR with loading arrangement
- REPULSION MOTOR with loading arrangement
- UNIVERSAL MOTOR with loading arrangement

Note: Specifications are subject to change.

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