



# Electrical WorkStation

## Nvis 7089A



All AC & DC Machines are optional

**Nvis 7089A Electrical Workstation** offers an excellent approach to the teaching of Electrical Machines principles by introducing a unique modular designed control unit. It provides flexibility for the students to carry out experiments over AC and DC Machines using a large selection of Industry standard inbuilt components.

Electrical Machines is one of the most important area of study as it helps users to understand the operational characteristics and working of AC and DC Machines. Nvis 7089A enables user to put their theory knowledge into practice with ease. There is an additional facility to make wireless connection on workstation with computer and to monitor real time electrical parameters using computer interfacing software. Users can also observe a real time graph between any of the AC and DC electrical parameters on computer.

Workstation comprises of separate AC and DC measuring sections equipped with all the necessary instruments such as digital meters, facility to connect AC and DC Supplies along with protection devices such as Fuses, MCB's, Supply Indicators, etc. There are multiple buses provided on the Workstation to make external connections while performing AC and DC Machines Experiments.

The design of the control unit ensures to get the highest quality practical experience to user. All the necessary protective measures are taken to avoid fault or danger.

**Note:** All AC & DC Machines along with supporting accessories are available optionally



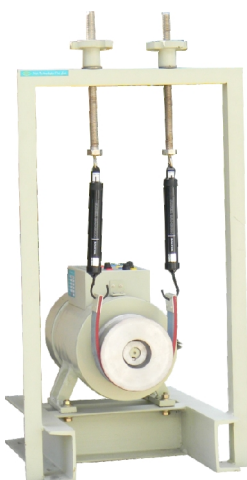
# Electrical WorkStation

## Nvis 7089A

### Features

- Compatible for Machines upto 2HP
- Equipped with Measurement Facilities for Experimentation on AC Machines, DC Machines and Transformers
- Separate AC and DC Measuring Sections
- Diagrammatic representation of AC and DC Machines for better understanding
- Rust Free Powder Coating Paint
- Standard BS-10 terminals, patch cords for safety purpose
- Terminals provided to obtain Three Phase Fixed as well as Variable AC and DC Supplies with suitable protection
- High Quality Digital Tachometer for RPM Measurement
- Motors provided with standard Mechanical Loading Arrangement Facility
- Motors with “aluminum” casted Brake-Drum/Pulley with heat suppression facility
- Machines with Class “B” Insulation
- Flexible shaft coupling arrangement (Lovejoy) for Motor Generator (MG) Sets
- Machines provided with Heavy Duty Base/Channel with suitable interconnection
- Machines provided with suitable protections such as MCB's, Fuses, Motor Generator (MG) Sets provided with coupling protective cover
- Generator with Electrical Loading Arrangement Facility
- Durable good quality spring balance
- Designed by considering all the safety measures

**Note:** All AC & DC Machines along with supporting accessories are available optionally



Motor with Mechanical loading arrangement

### Technical Specifications

#### Electrical Measuring Instruments

##### AC Ammeter (4 Nos.)

|       |   |         |
|-------|---|---------|
| Type  | : | Digital |
| Range | : | 10A     |

##### AC Voltmeter (4 Nos.)

|       |   |         |
|-------|---|---------|
| Type  | : | Digital |
| Range | : | 450Vrms |

##### DC Ammeter (4 Nos.)

|       |   |         |
|-------|---|---------|
| Type  | : | Digital |
| Range | : | 20A     |

##### DC Voltmeter (4 Nos.)

|       |   |         |
|-------|---|---------|
| Type  | : | Digital |
| Range | : | 300V    |

##### Single Phase Wattmeter (2 Nos.)

|       |   |         |
|-------|---|---------|
| Type  | : | Digital |
| Range | : | 4kW     |

##### DC Supply (for excitation purpose only)

|         |   |                |
|---------|---|----------------|
| Voltage | : | 300V $\pm$ 10% |
| Current | : | 2Amp           |

##### DC Power Supply

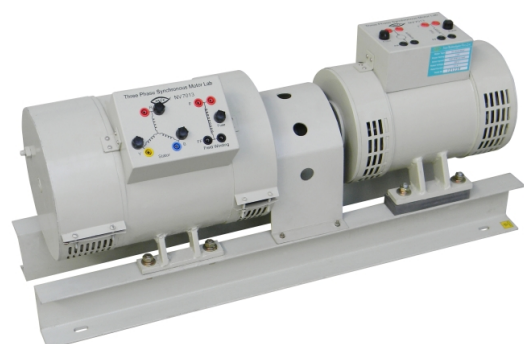
DC Output Voltage (Fixed) : 220V  $\pm$  10%, 2A

DC Output Voltage (Variable) : 220V  $\pm$  10%, 15A

##### Protective Devices

Three Phase MCB (TPN) : 2 Nos.

**Interconnections** : 4mm BS-10 Safety Terminals



Generator with Electrical loading arrangement



### Experiments with Nvis 7089A

#### DC Machines (optional)

##### DC Shunt Wound Motor

- Study of Operational Working and Principle of DC Shunt Motor
- Study of running and reversing phenomenon of DC Shunt Motor
- Study of No Load Characteristic of DC Shunt Motor
- Study of Load Characteristic of DC Shunt Motor
- Study of speed control of DC Shunt Motor using armature voltage control and flux field control method
- Study and Determine the losses of DC Machine and correspondingly calculate the efficiency of DC Machine by Swinburn's Test Method

##### DC Series Wound Motor

- Study of Operational Working and Principle of DC Series Motor
- Study of running and reversing phenomenon of DC Series Motor
- Study of Load Characteristic of DC Series Motor
- Study of speed control of DC Series Motor using armature voltage control and flux field control methods

##### DC Compound Wound Motor

- Study of Operational Working and Principle of DC Compound Motor
- Study of running and reversing phenomenon of DC Compound Motor
- Study of Load Characteristic of DC Cumulative-Compound Wound Motor
- Study of Load Characteristic of DC Differential-Compound Wound Motor

##### DC Shunt Wound Generator

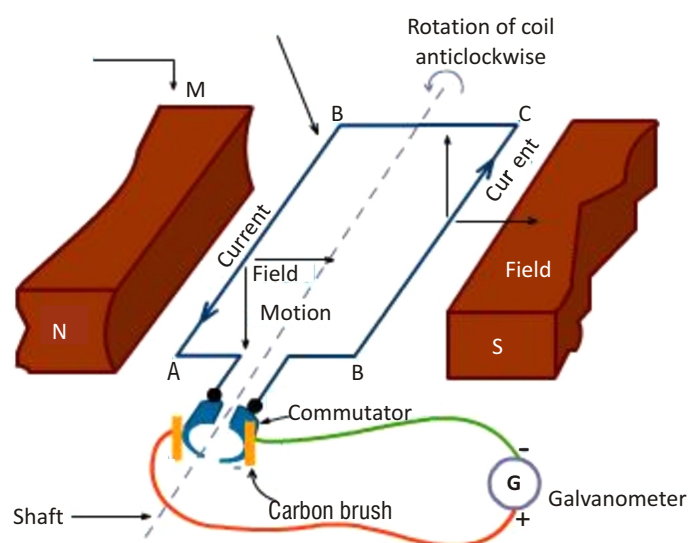
- Study of Operational Working and Principle of DC Shunt Generator
- Study and measurement of Open Circuit Characteristic of DC Shunt Generator
- Study and measurement of External Characteristic of DC Shunt Generator
- Study and measurement of Internal Characteristic of DC Shunt Generator

##### DC Series Wound Generator

- Study of Operational Working and Principle of DC Series Wound Generator
- Study and measurement of Open Circuit Characteristic of DC Series Generator
- Study and measurement of Load Characteristic of DC Series Generator
- Study and verify the Field Test of DC Series Machine and correspondingly determine the efficiency of DC Series Motor and Generator at any desire load

##### DC Compound Wound Generator

- Study of Operational Working and Principle of DC Compound Wound Generator
- Study and verify the Load Characteristics of Long Shunt Cumulatively Compound Generator
- Study and verify the Load Characteristics of Short Shunt Cumulatively Compound Generator
- Study and verify the Load Characteristics of Long Shunt Differentially Compound Generator
- Study and verify the Load Characteristics of Short Shunt Differentially Compound Generator



Working Principle of DC Generator

### AC Machines (optional)

#### Single Phase Capacitor Start Induction Motor

- Study of Operational Working and Principle of Single Phase Induction Motor
- Study of Running and Reversing of Single Phase Induction Motor
- Study of the No-Load Test in a Single Phase Induction Motor
- Study of the Blocked Rotor Test in a Single Phase Induction Motor
- Study of Load Test in a Single Phase Induction Motor

#### Three-phase Squirrel Cage Induction Motor

- Study of Operational Working and Principle of Three Phase Squirrel Cage Induction Motor
- Study of Running and Reversing of Three Phase Induction Motor
- Study of No Load Test performed in a Three Phase Induction Motor
- Study of Block Rotor Test performed in a Three Phase Induction Motor
- Measurement of Slip in a Three Phase Induction Motor
- Study of Speed-Torque characteristics in a Three Phase Induction Motor

#### Three Phase Salient Pole Synchronous Motor

- Study of Operational Working and Principle of Three Phase Synchronous Motor
- Study of V curve of Three Phase Synchronous Motor
- Study of Inverse V curve of the Three Phase Synchronous Motor

#### Three Phase Salient Pole Synchronous Generator

- Study of Operational Working Principle of Three Phase Synchronous Generator
- Study and Measurement of Positive Sequence Impedance of Three Phase Synchronous Generator
- Study and Measurement of Negative Sequence Impedance of Three Phase Synchronous Generator
- Study and Measurement of Zero Sequence Impedance of Three Phase Synchronous Generator
- Study of short circuit characteristics (SCC) of three Phase Synchronous Generator
- Study of open circuit characteristics (OCC) of three Phase Synchronous Generator
- Study and measure of voltage regulation of Three Phase Synchronous Generator using EMF Method

#### Single Phase Transformer:

- Study of Single-Phase Isolation Transformer
- Study of Single-Phase Step Up Transformer
- Study of Single-Phase Step Down Transformer
- Study of Subtractive Polarity of Single Phase Transformer
- Study of Additive Polarity of Single-Phase Transformer
- Study of Open Circuit test of Single-Phase Transformer
- Study of Short Circuit Test of Single-Phase Transformer

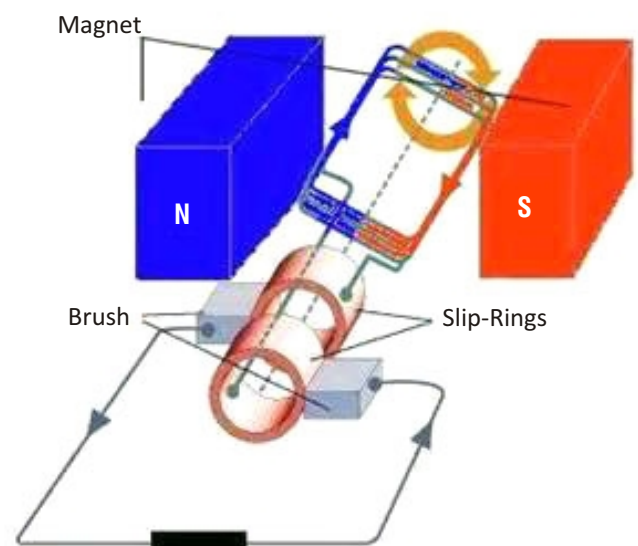
To determine the Efficiency and Voltage Regulation of a Single-Phase Transformer by direct loading at different loading condition.

#### Three Phase Transformer:

- Study of Open Circuit test of Three-Phase Transformer
- Study of Short Circuit Test of Three-Phase Transformer

**\*\*More than 70 Experiments can be performed in Nvis 7089A**

**\*\*Also suitable for performing experiments on basic Electrical Measurements**



Working Principle of AC Generator



# Electrical WorkStation

## Nvis 7089A

### Technical Specifications of Optional Machines

#### DC Motors (optional)

##### • Machine Specification

|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| Model No.                  | : Nvis SHM05, Nvis SHM10 & Nvis SHM20                 |
| Type                       | : Shunt                                               |
| Power Rating               | : Available with 1/2HP, 1HP & 2HP                     |
| Voltage Rating             | : 220V DC $\pm$ 5%                                    |
| Rated Speed                | : 1500RPM $\pm$ 7.5%                                  |
| Insulation                 | : Class 'B'                                           |
| <b>Loading arrangement</b> | : Mechanical                                          |
| <b>Spring Balance</b>      | : 2Nos.(Tubular Type)                                 |
| <b>Brake Drum/Pulley</b>   | : Aluminum casted with heat suppression facility      |
| <b>Machine Base</b>        | : "C" Channel                                         |
| <b>Protection</b>          | : Fuses (mounted at the terminal box of the Machines) |



DC Motors with standard Mechanical loading arrangement

##### • Machine Specification

|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| Model No.                  | : Nvis SM10 & Nvis SM20                               |
| Type                       | : Series                                              |
| Power Rating               | : Available with 1HP & 2HP                            |
| Voltage Rating             | : 220V DC $\pm$ 5%                                    |
| Rated Speed                | : 1500RPM $\pm$ 7.5%                                  |
| Insulation                 | : Class 'B'                                           |
| <b>Loading arrangement</b> | : Mechanical                                          |
| <b>Spring Balance</b>      | : 2Nos. (Tubular Type)                                |
| <b>Brake Drum/Pulley</b>   | : Aluminum casted with heat suppression facility      |
| <b>Machine Base</b>        | : "C" Channel                                         |
| <b>Protection</b>          | : Fuses (mounted at the terminal box of the Machines) |

##### • Machine Specification

|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| Model No.                  | : Nvis CM10 & Nvis CM20                               |
| Type                       | : Compound                                            |
| Power Rating               | : Available with 1HP & 2HP                            |
| Voltage Rating             | : 220V DC $\pm$ 5%                                    |
| Rated Speed                | : 1500RPM $\pm$ 7.5%                                  |
| Insulation                 | : Class 'B'                                           |
| <b>Loading arrangement</b> | : Mechanical                                          |
| <b>Spring Balance</b>      | : 2Nos.(Tubular Type)                                 |
| <b>Brake Drum/Pulley</b>   | : Aluminum casted with heat suppression facility      |
| <b>Machine Base</b>        | : "C" Channel                                         |
| <b>Protection</b>          | : Fuses (mounted at the terminal box of the Machines) |

### Selection Guide

| Machine Ratings | Shunt Motor | Series Motor | Compound Motor |
|-----------------|-------------|--------------|----------------|
| 0.5 HP          | Nvis SHM05  | --           | --             |
| 1 HP            | Nvis SHM10  | Nvis SM10    | Nvis CM10      |
| 2 HP            | Nvis SHM20  | --           | Nvis CM20      |



# Electrical WorkStation

## Nvis 7089A

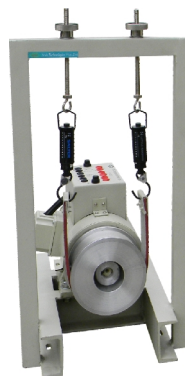
### AC Motors (optional)

#### • Machine Specification

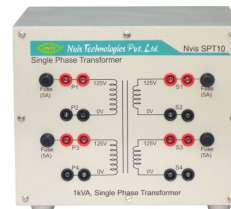
|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| Model No.                  | : Nvis SPM10                                          |
| Type                       | : Single phase Capacitor Start Induction Motor        |
| Power Rating               | : Available with 1HP                                  |
| Voltage Rating             | : 230V AC $\pm$ 5%, 50Hz                              |
| Rated Speed                | : 1440RPM $\pm$ 7.5%                                  |
| Insulation                 | : Class 'B'                                           |
| <b>Loading arrangement</b> | : Mechanical                                          |
| <b>Spring Balance</b>      | : 2 Nos. (Tubular Type)                               |
| <b>Brake Drum/Pulley</b>   | : Aluminum casted with heat suppression facility      |
| <b>Machine Base</b>        | : "C" Channel                                         |
| <b>Protection</b>          | : Fuses (mounted at the terminal box of the Machines) |

#### • Machine Specification

|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| Model No.                  | : Nvis SQM10 & Nvis SQM20                             |
| Type                       | : Three Phase Squirrel Cage Induction Motor           |
| Power Rating               | : Available with 1HP & 2HP                            |
| Voltage Rating             | : 415V AC $\pm$ 5%, 50Hz                              |
| Rated Speed                | : 1440RPM $\pm$ 7.5%                                  |
| Insulation                 | : Class 'B'                                           |
| <b>Loading arrangement</b> | : Mechanical                                          |
| <b>Spring Balance</b>      | : 2 Nos. (Tubular Type)                               |
| <b>Brake Drum/Pulley</b>   | : Aluminum casted with heat suppression Facility      |
| <b>Machine Base</b>        | : "C" Channel                                         |
| <b>Protection</b>          | : Fuses (mounted at the terminal box of the Machines) |



AC Motors with standard Mechanical loading arrangement



Transformer modules

### Single Phase Transformer (optional)

#### Transformer Specifications

|                   |                                         |
|-------------------|-----------------------------------------|
| Mains Supply      | : Single Phase, 230V AC $\pm$ 10%, 50Hz |
| Rating            | : 1kVA                                  |
| Primary Voltage   | : 0-125V, 0-125V                        |
| Secondary Voltage | : 0-125V, 0-125V                        |
| Rated Current     | : 5A                                    |

### Three Phase Transformer (optional)

#### Transformer Specifications

|                   |                        |
|-------------------|------------------------|
| Mains Supply      | : 415V $\pm$ 10%, 50Hz |
| Type              | : Three Phase          |
| Power Rating      | : 1kVA                 |
| Primary Voltage   | : 415V                 |
| Secondary Voltage | : 230V                 |
| Rated Current     | : 4A                   |

### Selection Guide

| Machine Ratings | Single Phase Capacitor Start Induction Motor | Three Phase Squirrel Cage Induction Motor |
|-----------------|----------------------------------------------|-------------------------------------------|
| 1 HP            | Nvis SPM10                                   | Nvis SQM10                                |
| 2 HP            | -----                                        | Nvis SQM20                                |

### Selection Guide

| Transformer Ratings | Single Phase Transformer | Three Phase Transformer |
|---------------------|--------------------------|-------------------------|
| 1 KVA               | Nvis SPT10               | Nvis TPT10              |



# Electrical WorkStation

Nvis 7089A

## DC Generators (optional)

### • Machine Specification

Model No. : Nvis SHG05, Nvis SHG10 & Nvis SHG20

Both the Machines are flexibly coupled and Mounted on a Single 'C' Channel Base DC Machine (acts as prime mover)

Type : Shunt  
Voltage Rating : 220V DC  $\pm$  5%  
Rated Speed : 1500RPM  $\pm$  7.5%  
Insulation : Class 'B'

### • DC Machine (acts as generator)

Type : Shunt  
Power Rating : Available with 0.5HP, 1HP & 2HP  
Rated Speed : 1500RPM  $\pm$  7.5%  
Insulation : Class 'B'  
Shaft extension : Single Sided  
**Loading Arrangement** : Electrical  
**Type of Coupling** : Flexible "Lovejoy" Coupling  
**Machine Base** : "C" Channel  
**Protection** : Fuses (mounted at the terminal box of the Machines)

### • Machine Specification

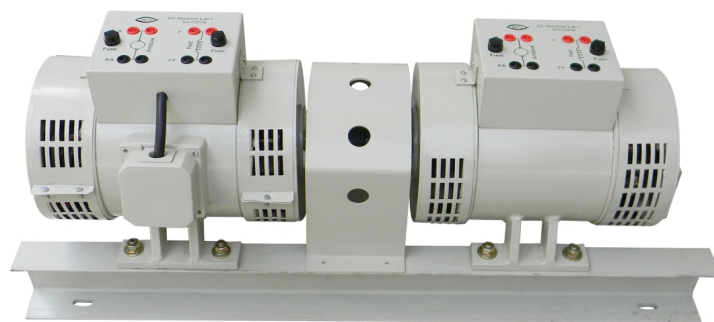
Model No. : Nvis SG10 & Nvis SG20

Both the Machines are flexibly coupled and Mounted on a Single 'C' Channel Base DC Machine (acts as prime mover)

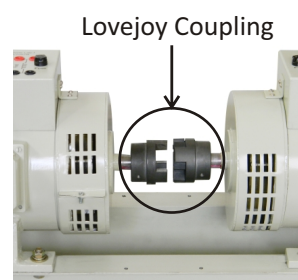
Type : Shunt  
Voltage Rating : 220V DC  $\pm$  5%  
Rated Speed : 1500RPM  $\pm$  7.5%  
Insulation : Class 'B'

### • DC Machine (acts as generator)

Type : Series  
Power Rating : Available with 1HP & 2HP  
Rated Speed : 1500RPM  $\pm$  7.5%  
Insulation : Class 'B'  
Shaft extension : Single Sided  
**Loading Arrangement** : Electrical  
**Type of Coupling** : Flexible "Lovejoy" Coupling  
**Machine Base** : "C" Channel  
**Protection** : Fuses (mounted at the terminal box of the Machines)



DC Motors -Generator Set Coupled with Flexible Lovejoy Coupling



### • Machine Specification

Model No. : Nvis CG10 & Nvis CG20

Both the Machines are flexibly coupled and Mounted on a Single 'C' Channel Base

### DC Machine (acts as prime mover)

Type : Compound  
Voltage Rating : 220V DC  $\pm$  5%  
Rated Speed : 1500RPM  $\pm$  7.5%  
Insulation : Class 'B'

### DC Machine (acts as generator)

Type : Compound  
Power Rating : Available with 1HP & 2HP  
Rated Speed : 1500RPM  $\pm$  7.5%  
Insulation : Class 'B'  
Shaft extension : Single Sided  
**Loading Arrangement** : Electrical  
**Type of Coupling** : Flexible "Lovejoy" Coupling  
**Machine Base** : "C" Channel  
**Protection** : Fuses (mounted at the terminal box of the Machines)

## Selection Guide

| Machine Ratings | Shunt Generator | Series Generator | Compound Generator |
|-----------------|-----------------|------------------|--------------------|
| 0.5 HP          | Nvis SHG05      | --               | --                 |
| 1 HP            | Nvis SHG10      | Nvis SG10        | Nvis CG10          |
| 2 HP            | Nvis SHG20      | Nvis SG20        | Nvis CG20          |



# Electrical WorkStation

## Nvis 7089A

### AC Generators (optional)

- Machine Specification**

Model No. : Nvis TPM30

Both the Machines are flexibly coupled and Mounted on a Single 'C' Channel Base

#### Three Phase Synchronous Machine

Type : Salient Type

Power Rating : 3 HP

Voltage Rating : 415V AC  $\pm$  10%, 50Hz

Configuration : "Delta" Connected

Rated Speed : 1500RPM  $\pm$  5%

Insulation : Class 'B'

Excitation Voltage : 180Vdc  $\pm$  10%

#### DC Machine (acts as generator)

Type : Shunt

Power Rating : 2HP

Rated Speed : 1500RPM  $\pm$  7.5%

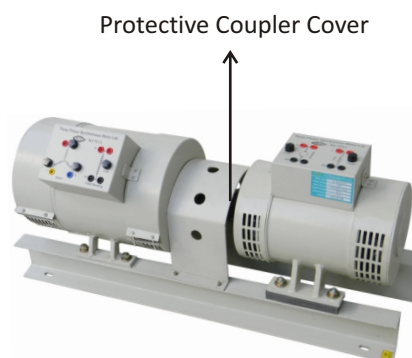
Insulation : Class 'B'

**Loading Arrangement** : Electrical

**Type of Coupling** : Flexible "Lovejoy" Coupling

**Machine Base** : "C" Channel

**Protection** : Fuses (mounted at the terminal box of the Machines)



AC Motors -Generator Set Coupled with Flexible Lovejoy Coupling

- Machine Specification**

Model No. : Nvis TP30

Both the Machines are flexibly coupled and Mounted on a Single 'C' Channel Base

#### DC Machine

Type : Shunt

Power Rating : 2HP

Voltage Rating : 220V DC  $\pm$  5%

Rated Speed : 1500RPM  $\pm$  5%

Insulation : Class 'B'

#### Three Phase Synchronous Machine

Type : Salient Type

Configuration : "Star" Connected

Power Rating : 3HP

Voltage Rating : 415V AC  $\pm$  5%, 50Hz

Rated Speed : 1500RPM  $\pm$  7.5%

Insulation : Class 'B'

Excitation Voltage : 180Vdc  $\pm$  10%

**Loading Arrangement** : Electrical

**Type of Coupling** : Flexible "Lovejoy" Coupling

**Machine Base** : "C" Channel

**Protection** : Fuses (mounted at the terminal box of the Machines)

### Selection Guide

| Machine Ratings | Three Phase Synchronous Motor | Three Phase Synchronous Machine |
|-----------------|-------------------------------|---------------------------------|
| 3 HP            | Nvis TPM30                    | Nvis TP30                       |

**\*\* We also offer customized Solutions for different Motor and Motor-Generator Set.**



# Electrical WorkStation

## Nvis 7089A

### Other Supporting Optional Items

- **Single and Three Phase Resistive Load**

#### Single Phase Operation

|               |                             |
|---------------|-----------------------------|
| Voltage       | : 240V AC $\pm 10\%$ , 50Hz |
| Current       | : 15A                       |
| Power         | : 3.5kW                     |
| Loading steps | : 15                        |

#### Three Phase Star Operation

|               |                             |
|---------------|-----------------------------|
| Voltage       | : 415V AC $\pm 10\%$ , 50Hz |
| Current       | : 5A (per Phase)            |
| Power         | : 3.5kW                     |
| Loading steps | : 5 (per Phase)             |

#### Three Phase Delta Operation

|           |                             |
|-----------|-----------------------------|
| Voltage   | : 415V AC $\pm 10\%$ , 50Hz |
| Current   | : 10A (per Phase)           |
| Mains MCB | : 16A (TPN)                 |

- **Three Phase Inductive Load**

#### Three Phase Star Operation

|         |                             |
|---------|-----------------------------|
| Voltage | : 415V AC $\pm 10\%$ , 50Hz |
| Current | : 10A (per Phase)           |

- **Single and Three Phase Capacitive Load**

#### Single Phase Operation

|               |                             |
|---------------|-----------------------------|
| Voltage       | : 230V AC $\pm 10\%$ , 50Hz |
| Current       | : 14A (Approx.)             |
| Loading steps | : 30                        |

#### Three Phase Star Operation

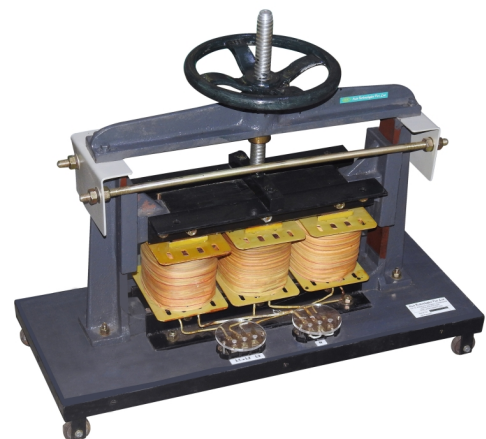
|               |                             |
|---------------|-----------------------------|
| Voltage       | : 415V AC $\pm 10\%$ , 50Hz |
| Current       | : 4.6A (per Phase)          |
| Loading steps | : 10 (per Phase)            |

#### Three Phase Delta Operation

|                     |                                    |
|---------------------|------------------------------------|
| Voltage             | : 415V AC $\pm 10\%$ , 50Hz        |
| Current             | : 13A (per Phase)                  |
| Loading steps       | : 10 (per Phase)                   |
| Switching Technique | : Star/Delta Switch, 415V, 25A     |
| Mains MCB           | : 16A (TPN) 10A (One Pole) 30 Nos. |



Single and Three Phase Resistive Load



Three Phase Inductive Load



Single and Three Phase Capacitive Load



# Electrical WorkStation

## Nvis 7089A

- **Thyristorized DC Regulated Power Supply**

Input Mains : 415VAC  $\pm$  10%, 50Hz  
Rated Output Voltage : 220VDC (Fixed)  $\pm$  5%,  
Rated Output Current : 50ADC  
Regulation : Less than 10% at full load condition.

- **Measuring Instruments**

AC Voltmeter : 1 No. (with voltage selector switch)  
DC Ammeter : 1 No.  
DC Voltmeter : 1 No.

- **Protection with its indicators**

Overload Protection  
Short Circuit Protection  
Phase Sequence Indicator

- **Single Phase Variac**

Type : Close Type  
Operating Rating : 230V AC  $\pm$ 10%, 50Hz  
Output Voltage : 0 - 270V AC  $\pm$ 10%, 50Hz  
Current : 10A (Also available in different Current Ratings)

- **Three Phase Variac**

Type : Close Type  
Operating Rating : 415V AC  $\pm$ 10%, 50Hz  
Output Voltage : 0 - 470V AC  $\pm$ 10%, 50Hz  
Current : 10A (Also available in different Current Ratings)

- **Rheostats**

- **AC Starters**

- **DC Starters**



Thyristorized DC Regulated Power Supply



Three Phase Variac



Single Phase Variac



DC Starters



AC Starters



Rheostats

Designed & Manufactured in India by

**Nvis Technologies Pvt. Ltd.**

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