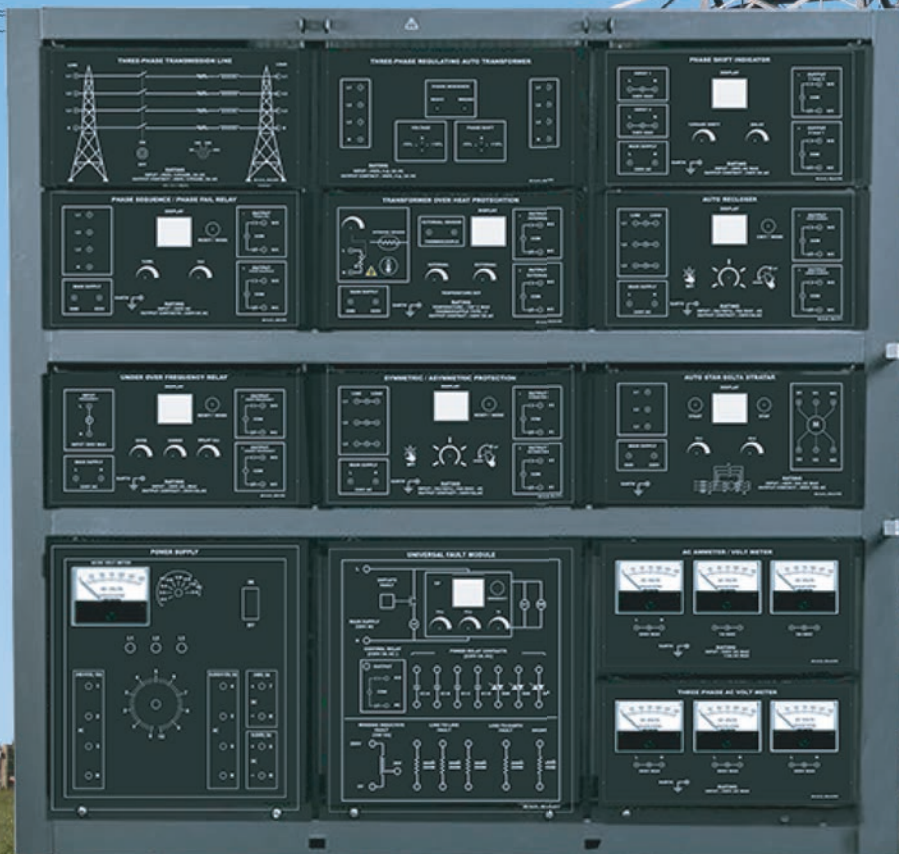


# AC Power Transmission Training System



db-tech, DB-309tr

# THREE PHASE TRANSMISSION LINE



db-tech, DB-309tn

db-tech, DB-309tn

THREE PHASE TRANSMISSION LINE

## DESCRIPTION

### General Description:

The Three-Phase Transmission Line consists of three iron-core inductors enclosed in a half-size EMS module. The inductors are specifically designed to simulate a high-voltage ac transmission line. The line impedance can be adjusted to four different values using a selector switch mounted on the front panel. A three-pole switch is used to induce transients by momentarily interrupting the power flow. Both sides (sender and receiver) of the Three-Phase Transmission Line are terminated on the front panel by 2 mm color-coded safety banana jacks

### Specifications:

S/L	Parameter	Value
01	Line Voltage	220/380 V AC
02	Line Reactance	10Ω, 20Ω, 40Ω
03	Line Current	2 A
Physical Characteristics		
04	Dimensions	154 x 287 x 440 mm
05	Net Weight	6.5 kg
06	Shipping Weight	7.1 kg

THREE PHASE REGULATION AUTO TRANSFORMER



db-tech, DB-309at

db-tech, DB-309at

THREE PHASE REGULATION AUTO TRANSFORMER

DESCRIPTION

General Description:

The Three-Phase Regulating Auto transformer consists of a three-phase autotransformer enclosed in a half-size EMS module. Eight safety banana jacks on the module front panel provide access to both sides of the regulating autotransformer. A buck-boost selector switch can be used to increase or decrease the autotransformer output voltage by 15%. A phase-shift selector switch can be used to set the phase shift produced by the autotransformer output voltage to  $\pm 15^\circ$ . A phase sequence indicator on the module front panel indicates the phase sequence of the voltages across the autotransformer.

Specifications:

S/L	Parameter	Value
01	Line Voltage	220/380 V AC
02	Power	400 VA
03	Line Current	0.6 A
04	Buck-Boost Voltage	-15, 0, -15%
05	Phase Shift	-15, 0, -15°
06	Phase Sequence	1-2-3
Physical Characteristics		
07	Dimensions	154 x 287 x 440 mm
08	Net Weight	7.6 kg
09	Shipping Weight	9.2 kg





db-tech, DB-309pfr

db-tech, DB-309pfr

DESCRIPTION

General Description:

The Motor Power-Factor Relay is a protective relay that is sensitive to power factor. Because the phase angle between the motor current and voltage, and thus, the power factor, is dependent on the mechanical load applied to the motor, this relay can be used to detect either underload or overload conditions for a three-phase induction motor. Power factor setpoint and start delay adjustments, and an underload/overload selection switch are provided along with a single set of contacts. The adjustable start delay is a useful feature which prevents the relay from tripping while the motor is starting.

Specifications:

S/L	Parameter	Value
01	Nominal Input Current	5 A AC
02	Nominal Input Voltage	220 V/400 VAC
03	Maximum Input Voltage	20% of nominal input voltage
04	Cosφ Setpoint Range	0 to ±180°
05	Range	0.1 to 3.0 Hz
06	Output Contacts	SPDT: 0.5 A at 120 V dc; 5 A at 240 V ac
07	HMI	2 x Variable + Graphics Display 84x48
Physical Characteristics		
08	Dimensions	154 x 287 x 440 mm
09	Net Weight	3.5 kg
10	Shipping Weight	4.2 kg

PHASE METER / POWER FACTOR METER (DIGITAL)

PHASE SHIFT INDICATOR (DIGITAL)



db-tech, DB-109psi

db-tech, DB-109psi

DESCRIPTION

General Description:

The Phase-Shift Indicator is designed to measure the phase shifting between two phase. It consists of a digital display. That show the phase shifting 180° to 0 to 180° electrical degrees, It have two knob to set % phase shift and delay for switching relay.

Specifications:

S/L	Parameter	Value
01	Nominal Frequency	50Hz
02	Nominal Input Voltage	220 V
03	Maximum Input Voltage	20% of nominal input voltage
04	Shifting Setpoint Range	0 to ±180°
05	Delay Range	0 to 7 sec
06	Output Contacts	2 x SPDT: 2 A at 120 V dc; 5 A at 240 V ac
07	HMI	2 x Variable + Graphics Display 84x48
Physical Characteristics		
08	Dimensions	154 x 287 x 440 mm
09	Net Weight	3.5 kg
10	Shipping Weight	4.2 kg

PHASE SHIFT INDICATOR (DIGITAL)



db-tech, DB-311ar

db-tech, DB-311ar

AUTO RECLOSER (DIGITAL)

DESCRIPTION

General Description:

In electric power distribution, a recloser or autorecloser is a circuit breaker equipped with a mechanism that can automatically close the breaker after it has been opened due to a fault. Reclosers are used on overhead distribution systems to detect and interrupt momentary faults. Since many short-circuit on overhead lines clear themselves, a recloser improves service continuity by automatically restoring power to the line after a momentary fault.

Specifications:

S/L	Parameter	Value
01	Line Voltage	220/380 V AC
02	Line Current	0-5A
03	Frequency	45-65 Hz
04	Main Input	220V, 45mA, 50/60Hz
05	Phase Sequence	1-2-3, 2-1-3
06	Rated operating sequence (for auto reclosing)	0 -0.3 Sec- CO-3 min-CO
07	Maximum break time	3 cycles
08	Rated out of phase breaking current	25% of the symmetrical short circuit breaking current
09	HMI	Rotary Encoder Switch+ Graphics Display 84x48
Physical Characteristics		
10	Dimensions	154 x 287 x 440 mm
11	Net Weight	5.6 kg
12	Shipping Weight	6.2 kg



db-tech, DB-309psr

db-tech, DB-309psr

DESCRIPTION

General Description:

The Phase Balance/Sequence Relay or Reverse phase sequence relay is sensitive to phase unbalance, phase reversal and phase loss in three phase power systems. It can be used to initiate an action should any one of the hazards mentioned above occur. For instance, the sensitivity to phase unbalance allows protection of a three-phase induction motor against excessive temperature rise due to unbalanced supply voltages. Unbalance set point and time delay adjustments as well as two sets of contacts are provided. The adjustable time delay is a useful feature which can prevent premature relay operation on short duration supply fluctuations

Specifications:

S/L	Parameter	Value
01	Operation Voltage	240V AC
02	Nominal Input Voltage	220/380V Three Phase
03	Maximum Input Voltage	20% of nominal input voltage
04	Unbalance Setpoint Range	5% to 15% of nominal input voltage
05	Time Delay Range	0.1 to 10 s
06	Output Contacts	2 x SPDT DC 120V 1A, 220V AC 5A
07	HMI	2 x Variable + Graphics Display 84x48
Physical Characteristics		
08	Dimensions	154 x 287 x 440 mm
09	Net Weight	3.5 kg
10	Shipping Weight	4.2 kg

REVERSE PHASE SEQUENCE PROTECTION (DIGITAL)

TRANSFORMER OVER HEAT PROTECTION (DIGITAL)



db-tech, DB-109toh

db-tech, DB-109toh

DESCRIPTION

General Description:

Thermal overload protector has been specifically developed for over temperature and burn-out protection of transformers, There are two thermometers in a power transformer. One monitors the top oil temperature while the other monitors the winding temperature. thermostat is very sensitive to temperature rise and ampere load and can be fitted inside the winding. As soon as the windings start heating up, this thermal cut-out senses the temperature rise and switches off at the pre-determined cutoff temperature, thereby, protecting the transformer from overheating or burning out. Here is two knob for setting value of temperature. Display shows setting temperature and current temperature. Two temperature sensor one is internal and another is external. Internal sensor is attached with a variable dummy transformer that can heat up.

Specifications:

S/L	Parameter	Value
01	Sensor type	Thermocouple/Thermostat
02	Temperature range	10 <sup>0</sup> to 600 <sup>0</sup> C
03	Setting range	10 <sup>0</sup> to 150 <sup>0</sup> C
04	Output Contacts	2 x SPDT DC 120V 1A, 220V AC 5A
05	HMI	2 x Variable + Graphics Display 84x48
Physical Characteristics		
06	Dimensions	154 x 287 x 440 mm
07	Net Weight	7.6 kg
08	Shipping Weight	9.2 kg

TRANSFORMER OVER HEAT PROTECTION (DIGITAL)





db-tech, DB-311cr

db-tech, DB-311cr

DESCRIPTION

General Description:

Symmetrical (RMS) Current This term is widely used to identify the short circuit rating of breakers in low voltage systems. This is because the low voltage breakers take 8 to 10 cycles to break a circuit. In 8 or more cycles (typically 15), the fault current will decay to a symmetrical waveform which, of course, would have no DC offset. Low voltage panels too are rated by their symmetrical current rating. Most modern circuit breakers implicitly list their ratings in symmetrical amps.

Asymmetrical (RMS) Current During the first half of a cycle, the fault current is at its largest magnitude occurring at a moment when the voltage wave is passing the reference axis. This asymmetry is brought on by the DC offset current (see Figure 1 below.) At the half cycle mark, the peak RMS value of the asymmetrical current is about ~1.6 times the symmetrical current.

Specifications:

S/L	Parameter	Value
01	Line Voltage	220/380 V AC
02	Line Current	0-5A
03	Frequency	45-65 Hz
04	Main Input	220V, 45mA, 50/60Hz
05	Phase Sequence	1-2-3, 2-1-3
06	Output Contacts	2 x SPDT DC 120V 1A, 220V AC 5A
07	HMI	Rotary Encoder Switch+ Graphics Display 84x48
Physical Characteristics		
08	Dimensions	154 x 287 x 440 mm
09	Net Weight	7.6 kg
10	Shipping Weight	9.2 kg

UNDER OVER FREQUENCY RELAY (DIGITAL)



db-tech, DB-109fr

db-tech, DB-109fr

DESCRIPTION

General Description:

The Under/Over Frequency Relay is sensitive to both under frequency and over frequency conditions. For instance, in an ac power plant, it can be used to protect a generator against underspeed and or overspeed, because frequency is proportional to speed. Frequency setpoint and hysteresis adjustments are provided for under frequency and over frequency, along with two independent sets of contacts: one for underfrequency and one for overfrequency. There is three setting knob. Those are for under frequency set, over frequency set, time delay. The digital display show all setting value and current value. Also a reset/mode push switch. The switch can change tripping reset condition auto reset or manual reset.

Specifications:

S/L	Parameter	Value
01	Nominal Frequency	50Hz
02	Nominal Input Voltage	120 V
03	Maximum Input Voltage	120% of nominal input voltage
04	Frequency Setpoint Range	40 to 70 Hz
05	Hysteresis Range	0.1 to 3.0 Hz
06	Output Contacts	2 x SPDT: 0.5 A at 120 V dc; 5 A at 240 V ac
07	HMI	3 x Variable + Graphics Display 84x48
Physical Characteristics		
08	Dimensions	154 x 287 x 440 mm
09	Net Weight	3.5 kg
10	Shipping Weight	4.2 kg

UNDER OVER FREQUENCY RELAY (DIGITAL)

# AUTO STAR-DELTA STARTER (DIGITAL)



db-tech, DB-309asd

db-tech, DB-309asd

## DESCRIPTION

### General Description:

To limit the starting current surge, large induction motors are started at reduced voltage and then have full supply voltage reconnected when they run up to near rotated speed. Most induction motors are started directly on line, but when very large motors are started that way, they cause a disturbance of voltage on the supply lines due to large starting current surges. This is the reduced voltage starting method. Voltage reduction during star-delta starting is achieved by physically reconfiguring the motor windings.

### Specifications:

S/L	Parameter	Value
01	Nominal frequency	50-60 Hz
02	Nominal Input Voltage	400V AC ,3 Phase
03	Nominal Current	10A
04	Thermal overload	1- 10A
05	Delay Range	0 to 60 sec
06	Output Contacts	10 5 A at 400 V ac
07	HMI	2 x Variable + Graphics Display 84x48
Physical Characteristics		
08	Dimensions	154 x 287 x 440 mm
09	Net Weight	6.5 kg
10	Shipping Weight	7.2 kg

AUTO STAR DELTA STARTER (DIGITAL)

## THREE PHASE AC VOLT METER



db-tech, DB-309vm

## DESCRIPTION

### General Description:

The AC Voltmeter module is fitted with three separate multi-range ac voltmeters for simultaneous measurement of three-phase voltages. Meter ranges and scalar values of each instrument have been carefully selected for compatibility and are appropriate for the electrical values to be measured. All meter readings are direct indications and do not require the indicated value to be mentally multiplied by a constant.

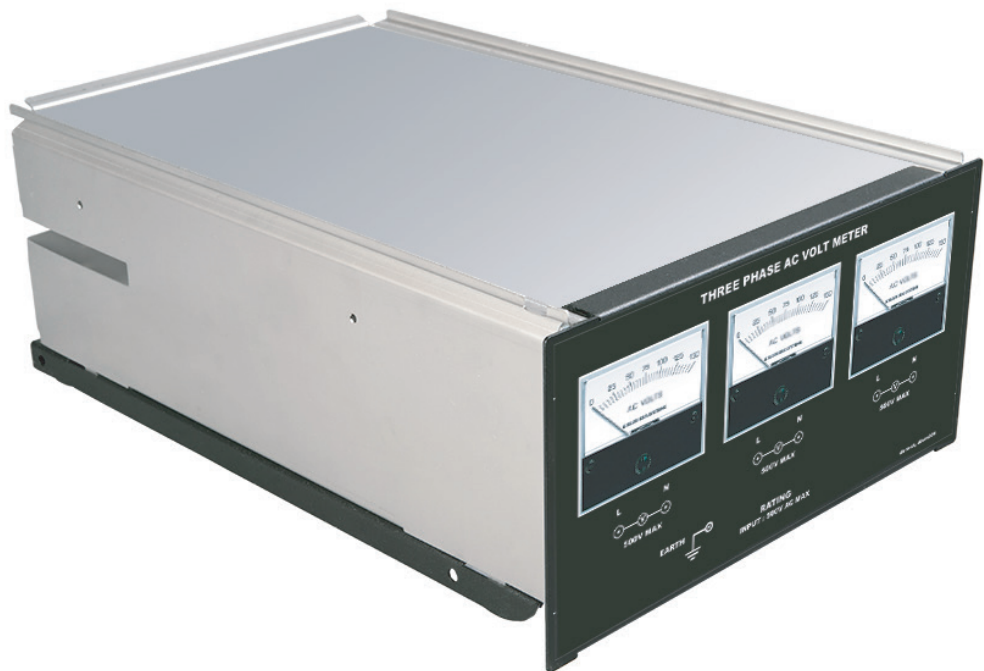
All meters are diode-protected against burnout, should the students miswire a meter by range or function. This permits the greatest latitude of student involvement without fear of damaging equipment. All meters are terminated by 2 mm color-coded safety sockets.

### Specifications:

S/L	Parameter	Value
01	Voltage	0-500V AC
02	Accuracy	2%
03	Type of Instrument	Panel meter - 65 mm
04	Type of Movement	d'Arsonval, 1000 $\Omega$ /V, and rectifier current
<b>Physical Characteristics</b>		
05	Dimensions	154 x 287 x 440 mm
06	Net Weight	3.6 kg
07	Shipping Weight	4.8 kg



# THREE PHASE AC AMMETER / VOLT METER



db-tech, DB-309cvm

db-tech, DB-309cvm

## DESCRIPTION

### General Description:

The AC Ammeter module is fitted with three separate multi-range ac ammeters for simultaneous measurement of three-phase currents. Two of the three meters have identical ranges while the third instrument has one additional higher range for measurement of the starting current of single-phase motors. Meter ranges and scalar values of each instrument have been carefully selected for compatibility and are appropriate for the electrical values to be measured.

All meters are diode-protected against burnout, should the students miswire a meter by range or function. This permits the greatest latitude of student involvement without fear of damaging equipment. All meters are terminated by 2 mm color-coded safety sockets.

### Specifications:

S/L	Parameter	Value
01	Voltage	0-500V AC
02	Current	1A, 5A AC
03	Accuracy	2%
04	Type of Instrument	Panel meter - 65 mm
05	Type of Movement	d'Arsonval, 1000 Ω/V, and rectifier current
Physical Characteristics		
06	Dimensions	154 x 287 x 440 mm
07	Net Weight	3.6 kg
08	Shipping Weight	4.8 kg

THREE PHASE AC AMMETER / VOLT METER



DESCRIPTION

General Description:

The Workstation is a fully assembled workstation that serves the same purpose as the Mobile Workstation, but has no storage cabinet or pull-out work surface. This workstation is intended for use on a bench (not supplied) and is fitted with rubber feet to protect the bench top. Alternatively, this workstation can be mounted on either a Mobile Storage Cabinet, to make a Mobile Workstation, or on a Mobile Base, to make a mobile workstation without storage cabinet. In that case, it is possible to mount and lock a second Workstation, on top of the first Workstation to double the space available for EMS modules. The Workstation consists of three rows of compartments designed to house EMS modules.

Two of these rows have full-height compartments while the other row has half-height compartments. Each row of full-height compartments can accommodate up to three full-size EMS modules or six half-size EMS modules whereas the row of half-height compartments can accommodate up to three half-size EMS modules.

Specifications:

S/N	PARAMETER	VALUE
01	Physical Characteristics	
02	Intended Location	On a table able to support the weight of the workstation and installed equipment
03	Dimensions (H x W x D)	890 x 935 x 465 mm
04	Net Weight	31.8 kg
05	Shipping Weight	33.2 kg

## MOBILE STORAGE CABINET

### Optional:



## DESCRIPTION

### General Description:

The Mobile Storage Cabinet, is a fully assembled storage cabinet with two hinged panels and a lock handle. Immediately above the storage cabinet is a pull-out work surface with a scuff- and burnresistant laminate finish. Four rubbertire swivel casters allow easy movement of the cabinet in the laboratory classroom. The Mobile Storage Cabinet is specifically designed so that a Workstation, can be mounted and locked on top of the cabinet. This converts the Mobile Storage Cabinet and the Workstation into the equivalent of a Mobile Workstation.

### Specifications:

S/N	PARAMETER	VALUE
01	Physical Characteristics	
02	Intended Location	On a table able to support the weight of the workstation and installed equipment
03	Dimensions ( H x W x D)	750 x 935 x 465 mm
04	Net Weight	20.8 kg
05	Shipping Weight	22.2 kg