Project Name	Name of Package	Location
Project:193186-Introduction of Additional Technologies in Polytechnic Institutes of FATA	1. Electrical Technology (DAE)	GPI Wana South Waziristan

Project:193186-Introduction of Additional Technologies in Polytechnic Institutes of FATA

LIST OF EQUIPMENT FOR ELECTRICAL TECHNOLOGY GPI Wana

S.No	Description of Items	QTY
1.	**BASIC ELECTRONIC TRAINER KIT** Universal training and instruction system 1018 for the principles of electrical engineering / electronics / analog technology. With integrated DC, AC and three - phase current sources as well as a function generator. Function generator, DC and three-phase current sources short-circuit proof and LED-monitored. The out signals of the voltage generator can be adjusted with a PC via built in USB-connection and the operators software. These signals can be simultaneously projected with a beamer offers a universal training and instruction system perfectly suitable for conducting following experiments: DC, AC and three-phase current technology Characteristics of diodes and transistors Characteristics of thyristors and triacs Amplifier circuits Oscillator circuits Modulators and demodulators Multivibrators Power supply circuits Switched power supplies and DC voltage converters Power electronic circuits With measuring interface incl. measuring Software the measured data are easily shown on a PC-monitor. With the USB-Oscilloscope student can view all signals time or frequency based. **Technical Features:** **AC and DC voltages** - DC voltage: +15 V (± 5 %); 800 mA - 15 V (± 5 %); 800 mA + 5 V; 100 mA 0 ... 25 V; 300 mA - AC voltage: 24 V AC; max. 100 mA **Function generator** - Sinewave / Squarewave / Triangle: V = 0 ~ 20 V; 100 mA F = 1 Hz ... 250 kHz - Squarewave, positive: V = 5 V / TTL - PWM 10 kHz; Pulse width 0 ... 100 % - DC Offset +12 V ... -12 V **Three-phase current generator** - Phase voltage: 7 VAC - Line voltage: 12 VAC - Line current: max. 50 mA - Frequency: approx. 50 Hz The outputs of the function generator, DC and three-phase current sources are short-circuit-proof and LED-monitored.	**01 Nos.**

	Digital 2-channel storage oscilloscope with USB interface, max. sampling rate: 1 GS/s, spectrum analyzer, transient recorder, incl. 2 test probes, USB interface cable, software, manual for operating systems: Windows 98 SE or higher Set of connections: 70 connecting plugs, 2 mm/5 mm 6 connecting leads, 2 mm, 30 cm 2 connecting leads, 2 mm, 50 cm Experiment manual with CD: Direct Current Technology Alternating Current Technology Semiconductor Components Basic Electronic Circuits UK, Germany or Equivalent	
2.	**BASIC ELECTRICITY TRAINING KIT** Universal training and instruction system 1019 for non-electrical professions. With integrated DC and AC sources. All functions are short-circuit-proof and monitored by LEDs. Clear arrangement of accessories directly on the basic unit. Detailed instructions for experiments with solutions. Components protected against incorrect connection It contains numerous experiments with problems and solutions for the following subjects (excerpt): The electrical circuit - Ohm's law - Electric measuring equipment - Electric power - Electric resistors - Resistors in series - Resistors in parallel - Voltage dividers - Mixed electric circuits - Electric fuse - Lamp circuits - Relay circuits - Voltage sources in series Voltage sources in parallel - Capacitor - Diode - LED - Transistor as a switch - Half-wave rectifier - Logic circuits **Technical Data:** **DC and AC voltages available on the Board** - DC voltage and current: 1.25 ... 15 V; 0.2 A - Sinewave voltage and current: 14 V (rms); 0.1 A The outputs of both voltage sources are short-circuit-proof and monitored by LEDs. **Relay**	**01 Nos.**

	- Contacts: 2 changeovers - Contact power: max. 1 A - Operating voltage: 15 V DC The individual electric components are connected by 4 mm safety jacks with 4 mm plugs or leads. Digital 2-channel storage oscilloscope with USB interface, max. sampling rate: 1 GS/s, spectrum analyzer, transient recorder, incl. 2 test probes, USB interface cable, software, manual for operating systems: Windows 98 SE or higher Experiment manual: Fundamentals of Electrical Engineering UK, Germany or Equivalent	
3.	**DIGITAL ELECTRONICS TRAINER** Universal training and exercise unit 3910 for fundamental digital technology/ microcomputer technology. The DIGI BOARD 2 contains all function groups and the power supply for fast experiment setup .Can be used as a desktop, demonstration or portable training unit. Individual expansion possibilities. With an adapter for connection to a computer **Features:** 2 input keys with 4 pairs of keys (L/H) each - Clock generator with divider, TTL level, crystal-controlled - DC signal source 0...5 V/10 mA - Hexadecimal/dual coding switch (double) - LED display, divided into 3 groups with the colours red, yellow, green - HIGH/LOW, for tapping HIGH, LOW states - 7-segment display (2-digit), with decoder - Adapter (2 mm jacks/ SUB-D socket), for adapting 2 mm jacks to SUB-D connector (25-pin), pins 1...13 and 18 assigned - 8 AND gates, with pull-up resistors, one of which is disconnectable - 6 OR gates, with pull-down resistors, one of which is disconnectable - 3 AND/OR combi-gates - 1-bit comparator 4-bit comparator - 4 JK-flip flops, can also be used as RS flip flops - 4 D-type flip flops - 2 adders (4-bit), with input and output carry - Mono flop, settable times: 0.1 s; 1 s; 5 s - Multiplexer, 4 channels - Demultiplexer, 4 channels - Shift register (4-bit), parallel and serial operation possible, bidirectional - ALU, for conducting 16 arithmetic and 16 logical computing operations with 4-bit dual numbers - Binary counter (4-bit), up/down counter - 2 inverters with open collector (pull-up resistors can be connected) - 2 Schmitt triggers, inverting	**01 Nos.**

	- Units complements for negating a 4-bit binary number - Antivalence and equivalence gates - RAM 8x4, static RAM, 8 addresses, 4 bits data Width **Basic logical circuits** - Schmitt triggers - Bistableflipflops - Monostableflipflops - Code converters, coders - Computing circuits - Counting circuits - Register circuits - Multiplex mode - ALU - Memory circuits - Analog-digital converter, - Digital-analog converter **Technical Data:** **Integrated power supply for additional plug-in modules** 5 V DC/max. 1 A; the power is supplied via the plugs in the base of the modules. **DC voltage source +5 V/0.5 A** For connecting external equipment **IC components** All IC components are inserted in sockets. Connection Leads: 22 connecting leads, 2 mm, 7.5 cm 12 connecting leads, 2 mm, 20 cm 12 connecting leads, 2 mm, 30 cm 14 connecting leads, 2 mm, 50 cm 8 connecting plugs, 2 mm Experiment manual with CD Experiments in Digital Technology UK, Germany or Equivalent	
4.	**AM TRANSMITTER AND RECEIVER TRAINER and FM TRANSMITTER AND RECEIVER TRAINER** Complete radio trainer in one Board 4070. All the important signals trappable at measuring points. With built-in AM and FM tuner. With stereo decoder and integrated loudspeakers. With built-in sinewave generator **Experiment with the Tone Control** _ **Experiments with the AM** - Generation of an AM Signal with the FM/AM Transmitter - Measuring the AM Antenna Signal - Determination of the Oscillator Frequency - Measurements at the AM Mixer - Measurements at the IF Stage and at the Demodulator - Automatic Gain Control AGC	**01 Nos.**

	The FM/AM Transmitter is a module for generation of a FM and AM signal. **Technical data** - Modulation input: 700 mV - Modulation output: AM signal: carrier 1 MHz FM signal: carrier 100 MHz - Supply voltage:9 V DC **AM unit** - Ferrite antenna at the input circuit - Frequency range: 540 ... 1600 kHz, tuneable by LC input circuit, consisting of capacitance diodes - HF amplifier - Oscillator for generating the IF frequency by means of a mixer, oscillator frequency: approx. 900 Hz ... 2 MHz - IF circuit with filter (455 kHz), IF amplifier and AGC **Sound adjuster** - 2 inputs: right channel / left channel - Adjustable: volume, treble, bass and balance **2 AF amplifiers** - Output power: 3 W **Sinewave generator** - 5 frequency ranges: 300 Hz ... 34 kHz, adjustable - Output voltage: Vpp = 400 mV Complete radio trainer in one Board. All the important signals tappable at measuring points. With built-in AM and FM tuner. With stereo decoder and integrated loudspeakers. With built-in sinewave generator **Experiments with the FM** - Measuring the Adjustable Oscillator Frequency - Measurements in the IF Stage - Measuring at the Demodulator Output with Mono Reception - Measuring at the Demodulator Output at Stereo Reception - Measurements in the Stereo Decoder - Behaviour with and without DE-Emphasis The FM/AM Transmitter is a module for generation of a FM and AM signal. **Technical data** - Modulation input: 700 mV - Modulation output: AM signal: carrier 1 MHz FM signal: carrier 100 MHz - Supply voltage:9 V DC **FM unit** - Antenna input for throw antenna - Input circuit with LC element, tunable with capacitance diodes - Frequency range: 88 ...108 MHz	

	- HF amplifier - Oscillator for generating the IF frequency by means of a mixer - IF amplifier with level detector output - Demodulator for generating the MPX signal - PLL demodulator with mono/stereo switching and deemphasis inputs **Sound adjuster** - 2 inputs: right channel / left channel - Adjustable: volume, treble, bass and balance **2 AF amplifiers** - Output power: 3 W **Sinewave generator** - 5 frequency ranges: 300 Hz ... 34 kHz, adjustable - Output voltage: Upp = 400 mV **PC Based Interface Unit:** Digital 2-channel oscilloscope with USB interface, max. sampling rate: 1 GS/s, spectrum analyzer, transient recorder, incl. 2 test probes, USB interface cable, software, manual for operating systems: Windows 98 SE or higher UK, Germany or Equivalent	
5.	**TRAINER FIBER OPTICS TRANSMISSION SYSTEM** For plastic and glass fibres 4290. With built-in transmit diodes in different wavelengths of the light. Characteristic recording and attenuation measurement also possible with DC voltages. Coupling attenuations can be simulated directly on the Receiver Board. All necessary power supplies and generators on Board Experiments on fibre optics with plastic fibre - Characteristics of transmit diodes - Attenuation of plastic fibres and connectors - Transmission of TTL signals - Immunity to interference of the optical fibre - Experiments on optic fibre with glass fibre - Measurement of propagation time **Optical Transmitter** **Inputs** (2 mm jacks) - 1 analog / 1 digital **Optical outputs** - 660 nm / 850 nm (plastic fibre) - 850 nm (glass fibre, ST-standard) **Electrical output** (via 2 mm jacks) - With preceding driver circuit for connecting a two-wire line or coaxial cable for comparative measurements on a fibre optic transmission path - Output impedance: 50 Ω; 75 Ω **Function groups** - Sinewave generator: F = 1 kHz; Vpp = 3 V - Squarewave generator: F = 10 kHz (TTL) - Pulse generator: impulse duration 400 ns - Patch field and power supply for plug-in transformer to simulate Interferences **Optical Receiver** **Optical input**	**01 No.**

	- Plastic fibre / Glass fibre **Electrical input** (2 mm jacks) - For connecting a two-wire line or coaxial cable for comparative measurements - Input impedance: 50 Ω; 75 Ω **Output amplifier** - Voltage gain: 1 ... 6 (adjustable) - DC offset: +0,5 V... -5,5 V (adjustable) **Outputs** (2 mm jacks) - DC: Vout = 0 ... +/-8 V - AC: Vout pp = 0 ... 16 V - TTL: with Schmitt trigger; fan-out = 10; **Set of accessories:** Plastic fibre, 0.5 m, without plug Plastic fibre, 5 m, without plug Plastic fibre, 20 m, without plug Glass fibre, 1 m, with ST plug Glass fibre, 20 m, with ST plug Optical coupling for glass fibre Connecting plug, 2 mm, spacing: 5 mm Coil, N = 100 Coil, N = 900 Tape-wound core (1 pair) Connecting lead, 2 mm, 30 cm, yellow Connecting lead, 2 mm, 100 cm, yellow Experiment manual with CD Fibre optics **UK, Germany or Equivalent**	
6.	**BASIC POWER ELECTRONICS MODULE** The whole power electronics on one Board 5125 With built-in three-phase source Connection field for Temperature and Brightness Controlled System All experiments with protective low voltage (12 V) Four-quadrant operation with H-circuit (MOS-FET) or anti parallel thyristor bridges Can be combined with PID BOARD, MOTOR BOARD and STEPPING BOARD Experiments on the single-phase AC supply - The uncontrolled half-wave rectifier - The uncontrolled bridge rectifier - The half-controlled bridge Rectifier - The fully controlled bridge rectifier - The line-commutated inverter - Two fully controlled bridge rectifiers, anti parallel with circulating current-free wiring and optical indication by 2 LEDs - Pulse group control Experiments on the three-phase supply: - The uncontrolled rectifier (M3) - The uncontrolled rectifier (B6) - The controlled rectifier (M3) - The controlled rectifier (B6)	**One Unit**

	Experiments on the DC supply: - Basic pulse width modulation (PWM) circuits - PWM with H-circuit, DC-evaluated - PWM with H-circuit, sine-evaluated Contains resistive, inductive and capacitive loads for conducting the experiments mentioned above. Bridgeable shunts are integrated in all the important load current branches for measuring the currents. The basic frequency of the PWM control can be varied for investigation of the smoothing with uniform inductance. Module connected to the single-phase mains, the required three phase voltage is generated internally. **Technical Data:** Integrated power supplies - DC voltage: +/-15 VDC / 2.5 A - AC voltage (L1): 12 V AC / 1 A - Three-phase source: switchable for M3 or B6 circuit; Vrms = 12 V DC All power supplies are electrically isolated from each other. Controls - Phase gate control I, II and III - Pulse group control - Pulse width modulation - Block-up logic for circulating current-free four-quadrant drive - GTO pulse shaper - Signal generator: f = 2 ... 100 Hz (for sine-evaluated PWM) Rectifiers - Uncontrolled rectifiers - Controlled rectifiers (thyristors) - H-circuit (Power MOS-FET) Additional semiconductor components - 1 diode, transistor, GTO thyristor, TRIAC Load components - Resistive load (27 Ω) - Inductive load (20 mH) - Capacitive load (47 µF) **PC Based Interface Unit:** Digital 2-channel oscilloscope with USB interface, max. sampling rate: 1 GS/s, spectrum analyser, transient recorder, incl. 2 test probes, USB interface cable, software, manual for operating systems: Windows 98 SE or higher UK, Germany or Equivalent	
7.	**CONTROL OF INDUSTRIAL MOTORS TRAINING SYSTEM MODULE** Universal speed control system 5130. Extendable with plug-in module for temperature and brightness control .With integrated four-quadrant display .With variable centrifugal mass .Dual-channel encoder .Built-in four-quadrant Amplifier The module contains a machine set comprising: - DC motor with current actual value acquisition	**One Unit**

	- DC generator with connectable load - Tacho generator with decoupling amplifier - Connectable mechanical centrifugal mass, realized electronically - Dual-channel encoder for direct acquisition of speed and direction of rotation - Built-in sight window for optical recognition of speed and direction of rotation and stroboscopic scanning a four-quadrant indicator is integrated which links the current and direction of rotation via a logical circuit and then indicates them on 4 LEDs. The following disturbance variables can be applied: - Variation of the mechanical centrifugal mass and the related time constant fluctuation - Connectable load on the Generator / Motor - Rated voltage: 12 V - Rated speed: 5900 / min - Speed: max. 8000 / min - Current: max. 0.5 A Generator - Rated voltage: 12 V - Maximum current: 0.5 A Tach generator - Output voltage: 2 V@ 1000 / min decoupled by amplifier RI = 200 Encoder - Resolution: 100 lines / rev. - Output channels: 2 - Output voltage: TTL (decoupled by TTL module) Load - Connectable load resistance: 33 / 5 W ; with parallel-circuited lamp Current actual value acquisition - Measuring resistance Series-connected amplifier - Gain factor: 10 - Internal resistance: 200 DC amplifier - Input I: 0 ... +/-10 V - Gain factor: V = 1.2 - Input II: 0 ... +/-5 V - Gain factor: V = 2.4 - Output voltage in four-quadrant operation: 0 ... +/-12 V - Output current: max. 0.5 A Four-quadrant indicator 4 LEDs in two colours, to distinguish between motor and generator quadrants UK, Germany or Equivalent	
8.	**MOTOR WINDING KIT MODULE** Kit for instructions in design and assembly of three phase asynchronous induction motor	**One Unit**

	SE2670 in four versions depending upon the kind of statoric winding that has been used. It includes magnetic circuits, insulating material, mechanical parts, to realise the motors 3PH 2 poles motor 0,5kVA - 230/400V, 50Hz; 3PH 4 poles motor 0,5kVA - 230/400V, 50Hz; 3PH 6 poles motor 0,75kVA - 230/400V, 50Hz; 3PH 8 poles motor 0,75kVA - 230/400V, 50Hz; 4 stator casing 4 squirrel cage rotor with shaft and bearings 8 shields 4 fan with housing 4 terminal block with terminal, related cover and fixtures 4 set of statoric winding of four different kind. NOTE: Should be provided all the accessories including books etc. UK, Italy, Germany	
9.	**EXPERIMENTER UNIT:** Experimenter SO4203-2B for coupling to the Experimenter modules. Connects to the UniTrain-I Interface and additional Experimenters via UniTrain-I bus UniTrain-I bus connection for experiment cards Direct connection to the standard UniTrain-I power supply for use without an UniTrain-I Interface Fixed and variable voltages available via 9 2-mm sockets Accommodates UniTrain-I experiment cards Accommodates a breadboard for experimenting with discrete components and integrated circuits Accommodates a multimeter using IrDa interface Dimensions: 28 x 19 x 9 cm **UK, Germany or Equivalent**	**2**
10.	**EXTENDED POWER SUPPLY** SO4203-2D Supplementary power supply unit for UniTrain-I system. This power supply unit is used in addition to the basic power supply unit where variable higher-power alternating voltages, adjustable higher-power direct voltages or a three-phase current system with variable frequencies and amplitudes are required for experiments. The UniTrain-I Interface is required for the power supply generation functions. Adjustment is carried out with virtual instruments. Mains input: 100 - 250 V AC, 50 - 60 Hz via IEC socket (non-heated devices) and included mains cable Output: 2 x 24 V / 2 A via cable approx. 2 m long with 6-pin DIN socket Shunt resistors on a PCB SO4203-2J, for current measurement using the analog inputs of the UniTrain-I system. 6 Shunt resistors: 2 x 1 ohm, 2 x 10 ohm, 2 x 100 ohm Screen print of symbols for identifying resistors, the voltage taps and current inputs 24 x 2-mm sockets Dimensions: 100 x 40 mm Set of connection cables 2mm (22 pcs) for UniTrain-I consisting of: 8 x connection leads 2mm, 15cm, blue	**1**

	4 x connection leads 2mm, 15cm, yellow 2 x connection leads 2mm, 45cm, black 2 x connection leads 2mm, 45cm, yellow 2 x connection leads 2mm, 45cm, red 2 x connection leads 2mm, 45cm, blue 2 x adapter connection leads 4mm to 2mm, 50cm, white Connection plugs 2mm/5mm (10 pcs) 2-mm connector plugs Plug spacing 5 mm **UK, Germany or Equivalent**	
11.	**MOTOR-GENERATOR SET MODULE** **Shunt-Wound DC Machine** Power: 0.3 kW speed: 2000 rpm armature voltage and current: 205 V/2 A; field voltage and current: 205 V/0.33 A; NOTE: Should be provided all the accessories including books etc. UK, Germany or Equivalent	**One Unit**
12.	**THREE PHASE TRANSFORMER** Three phase transformer realised in didactic version. Each primary and secondary windings are divided in two sections to allow many possibilities of connection including zig-zag. Primary:400V (3x2x115V) Secondary: 230V (3x2x66,5V) Power: 300VA; Frequency 50/60Hz UK, Italy, Germany	**One No.**
13.	**SINGLE PHASE TRANSFORMER** Primary and secondary windings are divided in several sections to allow many possibilities of connections. 220/110V primary/secondary. Primary: 2x110V ac; Secondary: 2x55V ac; Power: 300VA; Frequency: 50-60Hz UK, Italy, Germany	**One No.**
14.	**SQUIRREL CAGE (3-PHASE) INDUCTION MOTOR 2707** Power: 0.37 kW speed: 1400 rpm at 50 Hz; cos : 0.72 star connection: 400 V/0.85A delta connection: 230 V/1.47A Terminal boards: imprinted with the respective symbols Connections: 4 mm safety jacks (thermal contact: 2 mm jacks) Provided with four machine feet and a coupling half. For protection against thermal overload all machines are equipped with thermal contact UK, Germany or Equivalent	**One No.**
15.	**SLIP RING INDUCTION MOTOR 2708** Power: 0.25 kW	**One No.**

	speed: 1340 rpm at 50 Hz; cos : 0.74 star connection: 400 V/1.15A delta connection: 230 V/2 A Terminal boards: imprinted with the respective symbols Connections: 4 mm safety jacks (thermal contact: 2 mm jacks) Provided with four machine feet and a coupling half. For protection against thermal overload all machines are equipped with thermal contact UK, Germany or Equivalent	
16.	**AUTOMATIC STARTER FOR 3-PHASE INDUCTION MOTOR**	**One No.**
17.	**STAR / DELTA STARTER (MANUAL) FOR INDUCTION MOTOR** . Power: 350 VA . Voltage: 230/400 V-50 Hz . Rpm: 3000 2 poles . Excitation voltage: 220 Vdc . Operation also as synchronous motor with induction starting . Delta/star connection . Constructive form: 1M 83 . Protection: I P 22 . Integrated thermal protector	**One No.**
18.	CONTROL UNIT The Control Unit 2730 controls the three-phase induction motor of the Brake Unit It comprises: **-** Frequency converter **-** Control unit **-** RPM display **-** Torque display **Technical data** **-** Mains connection: 220 ... 230 V AC; 50 ... 60 Hz **-** Working range of the Control Unit: 0.5 ... 120 Hz in both directions **Accessories included** **-** Connecting Lead, 4-pin **-** Connecting Lead, 8-pin **-** 2 Connecting Leads **UK, Germany or Equivalent**	**One No.**
19.	**CAPACITOR MOTOR 2715** Power: 0.3 kW speed: 1425 rpm at 50 Hz; cos : 0.93; AC voltage 230 V current: 2.1 A;	**One No.**

	phase-shift and starting capacitor: 10uF/14uF UK, Germany or Equivalent	
20.	**UNIVERSAL MOTOR 2705** Power: 0.3 kW speed: 2250 rpm AC voltage and current: 230 V/3.4 A; DC voltage and current: 130 V/3.4 A; UK, Germany or Equivalent	**One No.**
21.	**REPULSION MOTOR 2706** Power: 0.25 kW speed: 2100 rpm at 50 Hz; cos : 0.69; AC voltage and current: 230 V/2.9 A; UK, Germany or Equivalent	**One No.**
22.	**Split-Pole Motor 2716** Power: 0.12 kW speed: 2700 rpm at 50 Hz; cos : 0.6; AC voltage and current: 230 V/3.2 A; UK, Germany or Equivalent	**One No.**
23.	**THREE-PHASE SYNCHRONOUS GENERATOR/ MOTOR WITH ASYNCHRONOUS STARTING 2707** **Three-Phase Induction Motor** Power: 0.37 kW speed: 1400 rpm at 50 Hz; cos : 0.72 star connection: 400 V/0.85 A delta connection: 230 V/1.47 A **Synchronous Machine** Power: 0.3 kW speed: 1500 rpm at 50 Hz; cos : 0.97 excitation current: 0,95 A star connection: 400 V/0.66 A delta connection: 230 V/1.44 A; UK, Germany or Equivalent	**One No.**
24.	**SPEED SLIP INDICATOR**	**One No.**
25.	**CONTACT TECHOMETER**	**One No.**
26.	**DIGITAL TACHOMETER** . Table-top metal container, treated chemically with silk screen printed steel front panel . Reflection optical probe and reflection strip . Microprocessor measurement instrument with CPU Z 80 . Digital display (4 digits) . Measurement range: 0+9999 rpm 0+9999 ms (period) 0+9999 pulses 0+99.99 seconds (timer) . 4-digit selector for maximum measurement value	**One No.**
27.	**STROBOSCOPE type 4203** **Germany/UK or Equivalent**	**One No.**

28.	**AUTO-TRANSFORMER**	**One No.**
29.	THREE PHASE SUPLY UNIT This power supply unit 2740.1 guarantees a clear experimental set-up and a short set-up time. **Technical data** - Mains connection, three phase: 380 ... 415 V AC - Outputs, three-phase: with phase pilot lamp and safety switch, 3-pole (6 A) - Fixed DC: 200 V / 4 A (at 230 V mains) for field current supply of DC machines, with pilot lamp - DC, continuously adjustable: 0 ... 250 V/4 A **UK, Germany or Equivalent**	**One Unit**
30.	MOTOR STARTER The Universal Resistor 2750 carries out the following functions in conjunction with the electric machines: - Starters and field rheostats for DC motors - Field rheostats for DC generators - Load resistors for DC generators - Starting resistors for slip ring motors - Load resistors for synchronous machines **Technical Data** **Ring rheostat, 500 W** - With protection series resistor: 1.8 /150 W - With 5-step winding: 1.8 ... 11 /4.6 A 11 ... 32 /3.5 A 32 ... 56 /2.4 A 56 ... 140 /1.7 A 140 ... 1 k /0.6 A - Additional series resistor, for expanding the resistance range: 1 k /180 W; Imax = 0.43 A - Bridge rectifier: 3-phase, B6 Vmax = 500 V AC Imax= 9 A **Ring rheostat, 100 W** (field rheostat) - 0 ... 1.5 k , with 2-step winding and q-contact - Steps: 0 ... 450 /0.5 A 450 ... 1.5 k /0.25 A The Universal Resistor is equipped with a bridge rectifier for loading of synchronous generators with the Ring rheostat (500 W). The slip ring voltage of the Slip ring motor can also be rectified by means of the bridge rectifier. Thus all possible steps of the slip ring starter can be examined.	**01 No. (Each)**

	UK, Germany or Equivalent	
31.	**COUPLING 1.0** Rubber coupling sleeve for mechanical connection of two electrical machine of the 1.0 KW series.	**1**
32.	**COUPLING GUARD 1.0** Attachable guard for protection against contact with electrical machine rotating parts of the 1.0 KW series.	**1**
33.	**SHAFT EXD GUARD 1.0** Attachable guard for protection against contact with electrical machine rotating parts of the 1.0 KW series	**1**
34.	**TACHO GENERATOR 1.0** For registering the speed of electrical machine of the 1.0 kw series, out put voltage +/- V/100 min-l	**1**
35.	**PANEL FRAME-T 150, TWO LEVEL**. 2 level frame for training panels in DIN A4 equivalent height, free standing design:3 aluminum profile reils with 2 brush strip, 2-T-base of rectangular steel buging, width 1450 mm, Height: 730mm, depth:300mm.	**1**
36.	**RMS METER** Demonstration meter for measuring the true RMS voltage and current types of measurment:RMS-AC+DC total true RMS, RMS-AC Alternating true RMS, AV-AC+DC arithmetic average value switchover is possible for all ranges and types of measurement at any time measurement ranges for all types of measurements: Voltage:3/10/.30/100/300/1000 V, R=10 mohm, Current:0.1/0.3/1/3/10/30A, AV-Polarity indicators:2 LEDS, instrument: moving coil, class 1.5, 192x96mm(WxH), Scale division;0……10 A and o……3, scale length" 119mm, continuous overload protection in all measurement ranges up to 1000 V and 30 A, mains supply:110/130/220/.210V, 50Hz.	**1**
37.	**ZERO VOLTMETER**, for measurement differences of mains and generator voltage in a synchronizing circuit full scale deflection at double operating voltage. The initial range of the scale is largly expanded. Measurement range:0…..400/800 V, Instrument: Moving iron meter class: 1.5 front frame 144xz 144mm	**1**
38.	**ON/OFF SWITCH THREE POLE**, Switch load 20 A/500V AC, switch position:0-1	**1**
39.	**10 SAFETY BRIDGING PLUGS BLK**.,Tan4, mm safety bridging plugs with 119 mm spacing colour black, max. current rating 32A.	**1**
40.	**SET 32 SAFETY CONN. LEADS**. 4mm safety connecting leads with 2.5 mm cable, current rating 322?A.m consisting of: 2 each safety connecting lead red 100cm 2 each safety connecting lead, Blue 100 cm 2each safety connecting lead red 50 cm 2each safety connecting lead blue 50 cm 2each safety connecting lead red 25 cm 2each safety connecting lead blue 25 cm 4each safety connecting lead black 100 cm 6each safety connecting lead black 50cm 6each safety connecting lead black 25 cm 6each safety connecting lead black 15cm.	**1**
41.	**DOUBLE FREQUENCY METER**, "Two independent meter movements for frequency comparison of two voltages measurement rang: 2x47… 50…..53 Hz, Rated voltage: 380V, Instruments: vibration meter with tuned steel rod class 1.5 front frame 1'44x 144mm.	**1**
42.	**SYNCHRONOSCOPE,** With rotational indicator for phase comparison in synchronizing circuits with three phase of single phase AC Rated voltage: 380V, Instruments: air cero, electro dynamic quotient movement from frame: 144x144mm.	**1**
43.	**SHUNT 0.1 OHM,** Plug-in element for current measurement in conjunction with the isolation amplifier and no 735 26. Resister:0.1 ohm, 8A, 1%	**1**
44.	**PAIR CABLES 50 CM, RED/BLUE** Plug: 2= 4mm, with axial sockets: continuous current:10 A max; conductor cross section: 1.0 max.	**1**

45.	**3-PHASE IOSOLATING TRANSFORMER** suitable for all circuit configurations. Al connections via 4mm safety sockets Power:300VA, Primary: 3x280/220V, 80Hz, Secondary 3x2x100 V.	**1**
46.	**1-PHASE ISOLATING TRANSFORMER** All connections via 4mm safety sockets Power: 300 VA, Primary 220V, 80Hz, Secondary: 2 x 110V.	**1**
47.	**1-PHASE AUTO TRANSFORMER 0.3** All connections via 4mm safety sockets. Power 300 VA, Primary 220 V, 50 Hz, Secondary: 110/220/244 V.	**1**
48.	**RESISTIVE LOADS** Three synchronously adjustable circular rheostats (step winding) with scale 100-0% each with a series resister and fuse in the sliding contact connection, suitable for parallel, series, star and delta circuits, Resistance:3x47—ohm, Series Resistance: 3x220 ohm, 3x 0.6 A.	**1**
49.	**CAPACITIVE LOAD** Three groups of MP capacitors each consisting of three capacitors, suitable for parallel series, star and delta circuits" capacitance:3x1/2/4pF, 450V.	**1**
50.	**INDUCTIVE LOEAD** Three inductances with taps at 0.2/0.4/0.6 H(0.65A), 0.3/1.0/1.2 H (0.5 A) and 2.4/4.8/6.0H(0.25A) suitable for parallel, series, star and delta circuits.	**1**
51.	**BEARING PULLER 3,4,6" CAPACITY** three jaws	**6**
52.	**OIL CIRCUIT BREAKER**for demonstration purpose, 220/240 (volt, 10-15 amp. 50 hz).	**2**
53.	**AIR CIRCUIT BREAKER: FOR DEMONSTARATION PURPOSE, 220/240 VOLT, 10-15 AMP 50HZ.**	**1**
54.	**ARMATURE TEST GROWLER**.	**2**
55.	**INDUCTION RELAY**, demonstration type.	**1**
56.	**OVER CURRENT/OVER VOLTAGE RELAY**.	**1**
57.	**CELL TESTER 1.5V**	**3**
58.	**BEARING PULLER, 4,8,12"**	**2 Set**
59.	**STAR DELTA STARTER,** 30A, 400V	**2**
60.	**DIRECT ON LINE STARTER, 220V, 50A, 50 CYCLE**	**2**
61.	**BATTERY CHARGER**, input 230 V, 50 cycle, AC output3,6,12,V DC	**2**
62.	**TELEPHONE EXCHANGE**, Telephone exchange incoming lines 2 Nos., outgoing lines, 10Nos. along with telephone sets 10 Nos.	**1**
63.	**AUTO TRANSFORMER STARTER** , power 2HP, voltage 220 single phase.	**1**
64.	**CURRENT TRANSFORMER**, Primary 100 amp. Secondary 5 amp, maximum 600 volt.	**2**
65.	PETENTIAL TRANSFORMER, Primary 110 volt, secondary 11 KV	**1**
66.	AMPERE METER WITH MOVING COIL, range 15μ to 6A, 3 version, Demonstration type.	**2**
67.	**VOLTMETER(AC)BENCH TYPE FOR DEMONSTRATION**, range 0 to 300 V, 0 to 500V,	**2**
68.	**INSULATOR,** ➢ Disc type 15 KV ➢ Pin type: 15 KV, ➢ Post type 15 KV Low voltage capacitance 750 V	**2 Each**
69.	**12 LINE INTERCOM:** With Digital Dialling and Provision for Secrecy Analog-with Connecting Accessories.	**1 Set**
70.	**INDUCTION MOTOR.** Capacitor type 5HP AC 3 phase	**1**
71.	**INDUCTION MOTOR**, Capacitor 2 HP, AC Single phase.	**2**
72.	**COIL WINDING MACHINE:** Hand operated, with counter, small size, mounted type. (PAK OR GOOD QUALITY).	**5**
73.	**ELECTRIC IRON 220v, 1000w**	**4**
74.	**PEDESTAL FAN 24"**	**4**
75.	**VACUUM CLEANER 220V, 1300w**	**1**
76	**WASHING MANCHINE WITH DRYER**	**1**
77	**MICROWAVE OVERN**	**1**
78	**EXHAUST FAN**	**4**