# *Section VI. Schedule of Requirements*

*The delivery schedule expressed as weeks/months stipulates hereafter a delivery date which is the date of delivery to the project site.*

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| **LOT 3- 39,717,835.00** | | | | | |
| **3.1 Eelctrical and Electronics Circuits Laboratory** | | | | | |
| **1** | **11** | **set** | **Development Module with Power Supply**<br>POWER SUPPLY<br>A- TECHNICAL DATA<br>1) Metallic box.<br>2) Fixed outputs: + 5 V, ± 12 V, 1 A.<br>3) Variable outputs: ± 12 V, 0.5 A.<br>4) AC output: 12V. or 24 V.<br>5) Outputs through either 2 mm. contact terminals, or through 25 pin CENTRONICS connectors (2 outputs).<br>6) LED's voltage indicators.<br>7) Robust construction.<br>8) Supply: 110/220V.A.C.<br>9) Frequency: 50/60 Hz.<br>10) Includes all the requirements for full working with any kit.<br>11) Dimensions: 225 x 205 x 100 mm. approx. Weight: 2 Kg. approx.<br>DEVELOPMENT MODULE<br>A- TECHNICAL DATA:<br>1) This is a module to build and implement student's own circuits, it consists on:<br>- Development board.<br>- Power supply connector.<br>- Digital visual display unit<br>- Logical source.<br>- Set of potentiometers.<br>- Pulse generator and inverters.<br>- Interrupter.<br>- Clock.<br>2) Development Module<br>3) Dimensions: 300 x 210 x 45 mm. approx. Weight: 300 gr. approx. | | |
| **2** | **8** | **set** | **Direct Current Circuits Kit**<br>A- TECHNICAL DATA:<br>The purpose of Electronics and Electricity Assembly Kits is to provide the students with the necessary elements for creating their own circuits.<br>1) DC Circuits kit contains:<br>- Assembly and practice manuals (1 manual supplied).<br>- Set of components and wires necessary for mounting the corresponding practice.<br>- After the first assembly, all the elements are recoverable.<br>2) KIT Contents :<br>• Manuals.<br>• Set of practice wires.<br>• 1 switch, 2 positions.<br>• 5 switches, 3 positions.<br>• 1 red lamp12V.<br>• 1 button potentiometer 10K.<br>• 1 button potentiometer 500 ohms.<br>• 1 resistance 0 (bridge).<br>• 2 resistances 1.5K<br>• 1 resistance 100 ohms. | | |

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| | | | • 5 resistances 10K<br>• 1 resistance 12K.<br>• 5 resistances 1K.<br>• 5 resistances 2.2K.<br>• 3 resistances 2.7K<br>• 1 resistance 33 ohms.<br>• 2 resistances 330 ohms.<br>• 4 resistances 4.7K<br>• 1 resistance 470K.<br>• 2 resistances 680 ohms<br>3) Direct Current Assembly Kit: Dimensions: 300 x 300 x 200 mm. approx.<br>• Measurement managing and checking instruments:<br>• Electronic instrumentation operation. Use of multimeter.<br>• Study of faults in the Resistance circuit.<br>• Ohm's Law:<br>• Ohm´s Law verification.<br>• Power calculation<br>• Resistors: characteristics and types:<br>• Resistors measurement. Color code. Ohmmeter.<br>• Study of Faults in Resistors circuit<br>• Resistors association and the Wheatstone Bridge:<br>• Voltage and current measurement in a circuit with resistors connected in series.<br>• Series/Parallel configuration study.<br>• The Wheatstone Bridge.<br>• Study of Fault in Series Resistors circuit.<br>• Study of Fault in Parallel Resistors circuit.<br>• Study of Fault in Wheatstone Bridge circuit.<br>• Kirchoff's laws:<br>• Kirchoff's first law.<br>• Kirchoff's second law.<br>• Fault study using Kirchoff's law. | | |
| **3** | **8** | **set** | **Alternating Current Circuits Kit**<br>A- TECHNICAL DATA:<br>The purpose of Electronics and Electricity Assembly Kits is to provide the students with the necessary elements for creating their own circuits.<br>1.Each kit contains:<br>- Assembly and practice manuals (1 manual supplied)<br>- Set of components and wires necessary for mounting the corresponding practice.<br>- After the first assembly, all the elements are recoverable.<br>2.AC Circuit Kit Contents :<br>• Manuals.<br>• Set of practice wires.<br>• 3 coils 100 mH.<br>• 4 coils 10 mH.<br>• 3 coils 68 mH.<br>• 1 ceramic capacitor 220 pF.<br>• 1 ceramic capacitor 470 pF.<br>• 3 capacitors POLY 100 nF.<br>• 1 capacitor POLY 10 nF.<br>• 1 capacitor POLY 1 nF.<br>• 1 capacitor POLY 220 nF.<br>• 2 capacitors POLY 22 nF.<br>• 1 capacitor POLY 470 nF.<br>• 1 capacitor POLY 47 nF.<br>• 1 variable capacitor 5.5 - 65 pF.<br>• 9 switches, 2 positions. | | |

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| | | | • 8 switches, 3 positions.<br>• 1 resistance 10 ohms.<br>• 3 resistances 100 ohms.<br>• 1 resistance 100K.<br>• 9 resistances 10K.<br>• 13 resistances 1K.<br>• 7 resistances 2.2K.<br>• 1 resistance 270 ohms.<br>• 1 resistance 3.3K.<br>• 4 resistances 330 ohms.<br>• 5 resistance 4.7K.<br>• 3 resistances 470 ohms.<br>• 4 resistances 680 ohms.<br>• 1 transformer 2.8 VA.<br>• 1 red lamp 12V. direct current.<br>• 1 button potentiometer 10K.<br>• 1 button potentiometer 500 ohms.<br>• 1 resistance 0 (bridge).<br>• 2 resistances 1.5K.<br>• 1 resistance 12K.<br>• 3 resistances 2.7K.<br>• 1 resistance 33 ohms.<br>3) Dimensions: 300 x 300 x 200 mm. approx.<br>This kit is designed to be able to do the following practices:<br>Alternating signal characteristics instruments:<br>• Waveforms study in A.C.<br>• Introduction of anomalies in the Wave form circuit.<br>• Study of Faults in the Wave form circuit.<br>• Relation between peak values and RMS for sinusoidal waves.<br>• Resistance in a sinusoidal alternating current.<br>• Measurements using the oscilloscope.<br>• Voltage and current phase angles for resistors in sinusoidal alternating current.<br>• Sinusoidal A.C. resistors in series.<br>• Sinusoidal A.C. resistors in parallel.<br>Behaviour of A.C. capacitors and inductors:<br>• Capacitance with square waveform and sinusoidal input current.<br>• Inductance with square waveform and a sinusoidal input voltage.<br>• Reactive reactance, Xc, variations with the frequency.<br>• Study of faults in capacitors.<br>• Reactive capacitance variations with capacitance.<br>• A.C. capacitors in parallel.<br>• A.C. capacitors in series.<br>• A.C. capacitors as voltage dividers.<br>• Inductance in an A.C circuit.<br>• Inductive reactance variations with the inductance.<br>• Inductors in series in an A.C. circuit.<br>Basic theorems and capacitance and inductance circuits:<br>• A.C. Resistor-Capacitor circuits in series.<br>• A.C. Resistor-Capacitor circuits in parallel.<br>• A.C. Resistor-Inductor circuits in series.<br>• Study of Faults in the Circuit.<br>• A.C. Resistor-Inductor circuits in parallel.<br>RLC Circuits:<br>• Resistance-Capacitance Filters.<br>• Filters inductive resistance. Low-Pass and High-Pass filters.<br>Resonance: | | |

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| | | | • A.C. L-C Circuits in parallel with low impedance source.<br>• Study of Faults in the resonance circuit.<br>• A.C. L-C Circuits in parallel with high impedance source.<br>• Circuit frequency response and bandwidth.<br>• A.C. R-L-C Circuits in series.<br>• Study of Faults in the resonance circuit.<br>The transformer:<br>• The transformer.<br>• The transformer with load.<br>Current measurement in the secondary transformer with charge. | | |
| **4** | **8** | **pckg** | **Semiconductors I Kit**<br>A- TECHNICAL DATA:<br>The purpose of Electronics and Electricity Assembly Kits is to provide the students with the necessary elements for creating their own circuits.<br>Each kit contains:<br>- Assembly and practice manuals (1 manual supplied).<br>- Set of components and wires necessary for mounting the corresponding practice.<br>- After the first assembly, all the elements are<br>recoverable.<br>KIT Contents of the following:<br>• Manuals.<br>• Set of practice wires.<br>• 3 ceramic capacitors 1µF.<br>• 1 ceramic capacitor 100 pF.<br>• 1 bypass ceramic capacitor 100 nF.<br>• 3 capacitors ELCO. 100µF.<br>• 5 switches, 2 positions.<br>• 5 diodes.<br>• 1 button potentiometer 10K.<br>• 2 button potentiometers 1K.<br>• 1 button potentiometer 5K<br>• 1 resistance 1.5K.<br>• 4 resistances 100 ohms.<br>• 2 resistances 100K.<br>• 8 resistances 10K.<br>• 1 resistance 11K.<br>• 2 resistances 12K.<br>• 6 resistances 1K.<br>• 1 resistance 1M.<br>• 2 resistances 4.7K.<br>• 3 resistances 47K.<br>• 1 resistance 560 ohms.<br>• 7 transistors.<br>• 1 transistor BC557.<br>• 2 transistors BF256A.<br>Experiments Possibilities:<br>This kit is designed to be able to do the following practices:<br>Complementary transistors pair:<br>Transistors pair with alternating signal<br>Fault study of the complementary<br>Transistor pair.<br>Darlington configuration:<br>Darlington configuration.<br>Fault study of the Darlington configuration.<br>Differential amplifier:<br>Differential amplifier. | | |

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| | | | Fault study in the differential amplifier.<br>Study and characteristics of the JFET transistor:<br>JFET characteristics.<br>Fault study with the JFET transistor<br>Analog switch:<br>Analog switch<br>Multistage Amplifier.<br>Direct coupling:<br>Amplifier coupled directly.<br>Fault study of an amplifier coupled directly. | | |
| **5** | **8** | **set** | **Semiconductors II kit**<br>A- TECHNICAL DATA:<br>The purpose of Electronics and Electricity Assembly Kits is to provide the students with the necessary elements for creating their own circuits.<br><br>Kit Contents of the following :<br>• Manuals.<br>• Set of practice wires.<br>• 3 ceramic capacitors 1µF.<br>• 1 ceramic capacitor 100 pF.<br>• 1 bypass ceramic capacitor 100 nF.<br>• 3 capacitors ELCO. 100µF.<br>• 5 switches, 2 positions.<br>• 5 diodes.<br>• 1 button potentiometer 10K.<br>• 2 button potentiometers 1K.<br>• 1 button potentiometer 5K.<br>• 1 resistance 1.5K.<br>• 4 resistances 100 ohms.<br>• 2 resistances 100K.<br>• 8 resistances 10K.<br>• 1 resistance 11K.<br>• 2 resistances 12K.<br>• 6 resistances 1K.<br>• 1 resistance 1M.<br>• 2 resistances 4.7K.<br>• 3 resistances 47K.<br>• 1 resistance 560 ohms.<br>• 7 transistors.<br>• 1 transistor BC557.<br>• 2 transistors BF256A.<br>Dimensions : 300 x 300 x 200 mm. approx.<br>EXPERIMENTS POSSIBILITIES:<br>This kit is designed to be able to do the following practices:<br>Complementary transistors pair.<br>Transistors pair with alternating signal.<br>Fault study of the complementary<br>Transistor pair.<br>Darlington configuration:<br>Fault study of the Darlington configuration.<br>Differential amplifier:<br>Fault study in the differential amplifier.<br>Study and characteristics of the JFET transistor:<br>JFET characteristics.<br>Fault study with the JFET transistor.<br>Analog switch:<br>Multistage Amplifier.<br>Direct coupling: | | |

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| | | | Amplifier coupled directly.<br>Fault study of an amplifier coupled directly | | |
| 6 | 8 | set | **Oscillators Kit**<br>TENDER SPECIFICATIONS<br>A- TECHNICAL DATA:<br>The purpose of Electronics and Electricity Assembly Kits is to provide the students with the necessary elements for creating their own circuits.<br><br>Kit contents the following:<br>• Manuals.<br>• Set of practice wires.<br>• 2 coils 10mH.<br>• 1 coil 1mH 5MM.<br>• 1 I.C. NE555.<br>• 1 I.C. TL072.<br>• 3 bypass ceramic capacitors 100 nF.<br>• 4 capacitors POLY 1µF.<br>• 8 capacitors POLY 100 nF.<br>• 5 capacitors POLY 10 nF. •<br>1 capacitor POLY 2.2 nF.<br>• 2 capacitors POLY 4.7 nF.<br>• 2 diodes.<br>• 2 button potentiometers 1K.<br>• 1 button potentiometer 500K.<br>• 1 button potentiometer 5K.<br>• 2 resistances 0.<br>• 2 resistances 100K.<br>• 4 resistances 10K.<br>• 2 resistances 15K.<br>• 2 resistances 1K.<br>• 1 resistance 1M.<br>• 6 resistances 2.2K.<br>• 1 resistance 220K.<br>• 2 resistances 22K.<br>• 2 resistances 470 ohms.<br>• 3 transistors Dimensions:<br>300 x 300 x 200 mm. approx.<br>Experiment Possibilities:<br>This kit is designed to be able to do the following practices:<br>Oscillators.<br>RC and LC Nets:.<br>RC net oscillator.<br>LC net oscillator.<br>Faults study with RC and LC Net oscillators.<br>Wien bridge oscillator:<br>Wien Bridge.<br>Fault study in the Wien bridge oscillator.<br>Colpitts oscillator.<br>Hartley oscillator:<br>Colpitts oscillator.<br>Hartley oscillator.<br>Faults study with the Colpitts oscillator.<br>Astable multivibrator:<br>Astable multivibrator.<br>Fault study with an Astable multivibrator.<br>555 TIMER:<br>555 timer.<br>555 timer fault study. | | |
| 7 | 8 | set | **Operational Amplifiers kit** | | |

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| | | | TENDER SPECIFICATIONS<br>A- TECHNICAL DATA:<br>Each kit contains:<br>- Assembly and practice manuals (1 manual supplied).<br>- Set of components and wires necessary for mounting<br>the corresponding practice.<br>- After the first assembly, all the elements are<br>recoverable.<br>KIT contents of the following:<br>• Manuals.<br>• Set of practice wires.<br>• 1 I.C. LM318.<br>• 1 I.C. OP07.<br>• 6 I.C. UA741 operational amplifier.<br>• 16 bypass ceramic capacitors 100nF.<br>• 6 switches, 2 positions.<br>• 2 button potentiometers 100K.<br>• 1 button potentiometer 50K.<br>• 2 button potentiometers 5K.<br>• 1 vertical multi-turn potentiometer 10K.<br>• 1 resistance 100 ohms.<br>• 6 resistances 100K<br>• 3 resistances 10K.<br>• 2 resistances 15K.<br>• 2 resistances 1K.<br>• 2 resistances 200K.<br>• 1 resistance 300K.<br>• 3 resistances 30K.<br>• 2 resistances 50K.<br>Dimensions: 300 x 300 x 200 mm. approx.<br>EXPERIMENTS POSSIBILITIES:<br>This kit is designed to be able to do the following practices:<br>Operational amplifier characteristics:<br>Operational amplifier study.<br>Closed-loop output compensation voltage.<br>Operational amplifier fault study.<br>The inverting amplifier:<br>Inverting amplifier study.<br>Inverting amplifier fault study.<br>The non-inverting amplifier:<br>Study of the non-inverting amplifier.<br>Voltage follower.<br>Fault study in the non- inverting amplifier.<br>The adder amplifier:<br>Adding amplifier study.<br>Fault study in the adding amplifier.<br>The differential amplifier:<br>Differential amplifier study.<br>Differential amplifier fault study.<br>Comparators:<br>Comparator study.<br>Comparators fault study. | | |
| **8** | **8** | **set** | **Filters kit**<br>TECHNICAL DATA:<br>The purpose of Electronics and Electricity Assembly Kits is to provide the students with the necessary elements for creating their own circuits.<br>KIT contents the following : | | |

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| | | | • Manuals.<br>• Set of practice wires.<br>• 1 I.C. TL071.<br>• 1 I.C. TL072.<br>• 1 I.C. TL084.<br>• 1 capacitor POLY 1µF.<br>• 10 capacitors POLY 100nF.<br>• 4 capacitors POLY 10nF.<br>• 5 capacitors POLY 1nF.<br>• 5 capacitors POLY 2.2nF.<br>• 1 capacitor POLY 4.7nF.<br>• 4 switches, 2 positions.<br>• 4 diodes 1N4148.<br>• 1 button potentiometer 1K.<br>• 3 resistances 100K.<br>• 9 resistances 10K.<br>• 1 resistance 12K.<br>• 9 resistances 15K.<br>• 1 resistance 1K.<br>• 1 resistance 1M.<br>• 4 resistances 2.2K .<br>• 1 resistance 2.7K.<br>• 1 resistance 220K.<br>• 1 resistance 22K.<br>• 4 resistances 27K.<br>• 13 resistances 3.3K.<br>• 2 resistances 3.9K.<br>• 3 resistances 4.7K.<br>• 2 transistor.<br>Dimensions : 300 x 300 x 200 mm. approx.<br>EXPERIMENTS POSSIBILITIES:<br>This kit is designed to be able to do the following practices:<br>RC and LC filter responses:<br>Frequency response.<br>Low-pass filter<br>High-pass filter.<br>LC Circuit.<br>Study of Error in Low-pass filter.<br>Study of Error in High-pass filter.<br>T-shaped Filter:<br>Filter with double T link.<br>Generator circuit of the signal S1.<br>Study of Error in RC filter with double T.<br>Active filters:<br>Low-pass filter.<br>Low-pass filter with load and operational amplifier.<br>High-pass filter.<br>High-pass filter with load and operational amplifier.<br>The attenuattion is cumulative.<br>Use of Operational Amplifier.<br>Study of Faults in filter.<br>Association of filters:<br>Behaviour of the filter.<br>Filter a distorted signal. Filter in cascade; low pass filter and high pass filter.<br>Filter in parallel.<br>Study of Error in filters. | | |
| **9** | **8** | **set** | **Power Electronics kit** | | |

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| | | | A- TECHNICAL DATA:<br>Each kit contains:<br>- Assembly and practice manuals (1 manual supplied).<br>- Set of components and wires necessary for mounting<br>the corresponding practice.<br>- After the first assembly, all the elements are<br>recoverable.<br>KIT contents the following :<br>• Manuals.<br>• Set of practice wires.<br>• 1 I.C. 4N33.<br>• 1 I.C. LM311.<br>• 1 I.C. NE555.<br>• 3 bypass ceramic capacitors 100nF 50V.<br>• 2 multi-layer capacitors 1mF 25V.<br>• 3 switches 2 positions.<br>• 2 DIAC.<br>• 4 diodes 1N4001.<br>• 1 diode 1N4148.<br>• 4 diodes ZENER 15V.<br>• 1 diode ZENER 8.2V.<br>• 1 photo-resistance.<br>• 1 red lamp 12V. direct current.<br>• 4 button potentiometers 100K.<br>• 1 button potentiometer 10K.<br>• 1 button potentiometer 5K<br>• 2 resistances 1ohm.<br>• 1 resistance 1.8K.<br>• 2 resistances 100 ohms.<br>• 1 resistance 100K.<br>• 1 resistance 10K.<br>• 1 resistance 120 ohms.<br>• 1 resistance 15K.<br>• 6 resistances 1K.<br>• 1 resistance 2.2K.<br>• 1 resistance 220 ohms.<br>• 3 resistances 390 ohms.<br>• 3 resistances 4.7K.<br>• 1 resistance 47ohms.<br>• 2 thyristors.<br>• 1 pulse transformer.<br>• 1 transistor Bc327.<br>• 1 MOSFET transistor.<br>• 2 transistor.<br>• 1 transistor VN10LM.<br>• 2 TRIAC.<br>Dimensions: 300 x 300 x 200 mm. approx.<br>EXPERIMENTS POSSIBILITIES:<br>This kit is designed to be able to do the following practices:<br>The bipolar power transistor:<br>Study of the power transistor.<br>Study of faults in the power transistor.<br>The MOSFET transistor:<br>Study of the MOSFET transistor.<br>Study of faults in the MOSFET transistor.<br>The thyristor:<br>Study of the thyristor<br>Study of error of the thyristor. | | |

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| | | | The UJT transistor and trigger circuits of the thyristor:<br>Study of the trigger circuits of the thyristor.<br>Study of insulation circuits.<br>The TRIAC:<br>Study of the TRIAC.<br>Practical assembly of the TRIAC. | | |
| **10** | **8** | **set** | **100 MHz Digital Oscilloscope**<br>Bandwidth: 100 Mhz<br>1GSa/s Sampling Rate<br>2 Channels<br>7" Widescreen LCD Color Display<br>Equivalent Sampling Rate: 50GSa/S<br>Memory Depth: Single Channel: 2 Mpts; Double Channels: 1 Mpts<br>Rise Time: <3.5ns<br>Input Impedance: 1MΩ‖14pF<br>Sec/Div range: 2.5ns/div-50s/div<br>Scan: 100ms-50s/div<br>Display: 7" LCD Color (480*234)<br>USB Host/Device: Support USB Printer and USB Flash Drive<br>PictBridge Function<br>Easyscope Software | | |
| **11** | **8** | **set** | **40 MHz Analogue Oscilloscope**<br>40MHz Dual Channel<br>High Sensitivity 1Mv/DIV<br>5mV/div Sensitivity on Both Channels<br>CH1 & CH2 Independent Channels<br>CH1 Signal Output<br>Unique Digital Filter function and Waveform recorder function<br>Two waveforms in different frequency can be observed via alternative trigger function<br>High-speed sweep<br>Algebraic Addition and Subtraction<br>X-Y Operation<br>0.2µs/div to 0.5s/div Time Base(Uncal up to 20ns)<br>Z Modulation TTL Level<br>8 x 10 cm Display Internal Graticule<br>TV signal synchronous function, TV Triggering Frame (V) & Line (H)<br>Line Trigger<br>ALT Triggering | | |
| **12** | **8** | **set** | **DC Power Supply, 0-30V, 3A**<br>Technical Specification:<br>AC Input Voltage: AC 220V±10%, 60Hz<br>Rated Output Voltage: CH1 0~30V, CH2 0~30V,<br>CH3 2.5V/3.3V/5V<br>Rated Output Current: CH1 0-3A, CH2 0~3A,<br>CH3- 3A<br>Rated Output Power: 195W/315W<br>Voltage Display Precision: 0.1V±2bit<br>Current Display Precision: 0.01A±2bit<br>Ripple and Noise: ≤ 1mVrms<br>Voltage Stability: ≤0.01%+2mV<br>Load Stability: ≤0.01% +5mV<br>Protection Method: current-limited lower voltage protection<br>Environment parameters: Relative humidity <80%,<br>Temperature range 32- 104 F. (0-40 | | |
| **13** | **8** | **set** | **Function Generator, 5 Mhz** | | |

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| | | | Specification:<br>Frequency Sine wave: 5MHz<br>Square wave 0.1Hz ~ 2MHz (Valid Range)<br>Triangle wave 0.1Hz ~ 1MHz (Valid Range)<br>Resolution 100mHz<br>Frequency stability ± 1 ×10-6<br>Frequency error ±5×10-6<br>Square Wave Distortion <0.6% (Foundation frequency: 1kHz)<br>Triangle Wave Linearity _98%,100mHz~100kHz; _95%,100kHz~1MHz<br>Square Wave R ising & falling time <30ns<br>TTL/CMOS Amplitude _3 Vp-p<br>Fan Out 20TTL Load<br>CMOS level 3.5~13.5 Vp-p<br>Options Power Output Output Power _10W (4_Load)<br>Output Wave: sine wave<br>Frequency range: 20Hz~40kHz<br>Counter Measure frequency range: 1Hz~40MHz<br>Measure Voltage range _ 0.2V<br>Error range: ±1×10-4<br>Others Supply voltage A C 2 2 0 V ±10%,50Hz ±5% (Line voltage setting is factory installed)<br>Dimensions 265(W)×110(H)×300(D)<br>Weight About 1.5kg | | |
| **14** | **8** | **set** | **Spectrum Analyzer 1Ghz with Tracking Generator**<br>Specification:<br>150kHz to 1.05GHz (1050MHz)<br>Dynamic Range 80dB (113dB with attenuation)<br>AM & FM demodulator included<br>20 and 400 kHz resolution bandwidth<br>150kHz/hour stability<br>Built-in tracking generator | | |
| **15** | **8** | **set** | **Frequency Counter, 10Hz – 2700Mhz**<br>**Features:**<br>8-Digit LED display<br>Few switches, for easy operation<br>Quickness, high resolution<br>Gate time: 0.01S/0.1S//1S<br>Accuracy: ±1Hz, ±1 Count Figure, ±Time Base<br>**Accuracy:**<br>Input Sensitivity:<br>10Hz~8MHz:75mV (Channel 1)<br>8MHz~10MHz: 30mV (Channel 1)<br>10MHz~100MHz: 30mV (Channel 1)<br>F1000C 100MHz~1000MHz: 30mV (Channel 2)<br>F2700C 100MHz~2400MHz: 30mV (Channel 2)<br>2.4Hz~2.7Hz: 30mV (Channel 2)<br>Input Impedance: 1MΩ at Channel 1, 50Ω at Channel 2<br>Max. Input Voltage: 250Vrms Channel 1, 5Vrms Channel 2<br>Max. Aging Rate: ±5ppm/year<br>Power Input: AC 220±10% (50/60Hz)<br>Power Consumption: approx. 5W<br>Dimension: 230(W) x 210(H) x 76 (D) mm<br>Weight: 1.8kg | | |
| **16** | **8** | **set** | **Digital Multimeter**<br>3 1/2 LCD display with maximum reading of 1999<br>Overload protection<br>Auto power off function | | |

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| | | | Data hold function<br>Capacitance measurements<br>Shock Case<br>Mechanical protection<br>2000uF test function<br>Diode Testing : YES<br>Audio Testing : YES<br>Continuity Buzzer : YES<br>Auto power Off : YES<br>Data hold : YES<br>Low battery indication: YES<br>Technical Specification:<br>Voltage DC : 200mV/2V/20V/200V/1000V<br>Voltage AC: 200mV/2V/20V/200V/700V<br>Direct Current: 2mA/20 mA/200 mA/10A<br>Alternating Current: 2mA/20 mA/200 mA/10A<br>Resistance: 200Ω/2kΩ/20kΩ/200kΩ/2MΩ/20MΩ/200MΩ | | |
| **17** | **8** | **set** | **Analog Multimeter**<br>Easy to assemble<br>-Break-proof body cover<br>-Solded test leads providing better safety<br>-Portable analog multitester<br>Technical Specification:<br>DCV: 0.3/3/12/30/120/300/600V (20kΩ/V)<br>ACV: 12/30/120/300/600V (9kΩ/V)<br>DCA: 60μ/3m/30m/0.3A<br>Resistance: 20/200/20kΩ<br>Battery check: 1.5<br>Bandwidth: 50 or 60Hz (sine wave)<br>Battery: UM-3(1.5V) x 2<br>Fuse: Ø5.2x20mm (250V/0.5A)<br>Size/Mass: H159.5 x W129 x D41.5mm/.320g<br>Standard Accessories included: Instruction Manual | | |
| **18** | **8** | **set** | **RF Signal Generator**<br>Specifications:<br>Frequency range: (up to 450MHz on 3'th harmonics)<br>A: 100KHz ~ 320KHz.<br>B: 300KHz ~ 1,100KHz.<br>C: 1MHz ~ 3.3MHz.<br>D: 3.0MHz ~ 11MHz.<br>E: 10MHz ~ 35MHz.<br>F: 32MHz ~ 150MHz.<br>Frequency accuracy: ±5%.<br>RF output: 100mVrms, approx (up to 35MHz unloaded).<br>Output control: HIGH-LOW switch and fine adjuster.<br>Modulation:<br>INT. 1KHz (AM) 30% approx.<br>EXT. 50Hz ~ 20KHz, at less than 1Vrms input.<br>Audio output: 1KHz, Min. 2 Vrms.<br>Crystal oscillator: For 1 ~ 15MHz crystal in type HC-6u holder (not included).<br>Power requirement: AC 115 / 230V, 50 / 60Hz Approx 3VA.<br>Dimensions & weight:<br>150 (H) x 250 (W) x 130 (D) mm.<br>Approx 2.5kgs.<br>Accessories: BNC-clips x 1.<br>Features:<br>Wide frequency range: 100KHz ~ 150MHz. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | With 1KHz oscillator in inner part for the purpose of modulation.<br>Of portable type, high stability. | | |
| **19** | **8** | **set** | **Reworking & Soldering Station**<br>Technical Specifications:<br>Input Voltage: 220V AC<br>Power consumption: 550W(max)<br>Air pump: Diaphragm<br>Volume: 23L/min(max)<br>Leakage voltage of Iron Tip: <0.5mV<br>Temperature range of the nozzle: 100~480°C<br>Temperature range of the iron tip: 200~480°C<br>The standard iron tip: AT -900M<br>Outer Dimensions:245×187×150 (L×W×H)mm | | |
| **20** | **8** | **set** | **Soldering Iron & Station**<br>Specification:<br>Power Consumption: 90W<br>Input Voltage: 220VAC 50Hz or 110V 60Hz<br>Output Voltage: 24VAC<br>Temperature Range: 100 – 500°C （212 – 932°F）<br>Temperature Calibration Range: -50 ~ +50°F (-58 ~ +122°F)<br>Password Setting: 001 – 999<br>Automatic dormant temperature: 200°C<br>Dormant setting: 1 – 99 min<br>Temperature accuracy: ±10°C<br>Temperature stability: ±2°C(static working mode)<br>Tip to Ground Impedance: <= 2 Ohm<br>Tip to Ground Voltage: <= 2 mV<br>Size: 168(L) x 110(W) x 95(H)<br>Weight: 2.5KG | | |
| **21** | **16** | **set** | **Set of Tools (set of pliers, wire stripper, screw driver set.)** | | |
| **22** | **6** | **set** | **Electronics Engineering Board,**<br>Features:<br>compatible with NI-ELVIS<br>• 26 hands-on projects in Electronics Engineering<br>• Menu-driven navigation through the labs<br>• Student registration<br>• Interactive representation of circuits in each hands-on project<br>• Step-by-step instructions for students<br>• Interactive study guide for each experiment<br>• Preassembled board with 26 circuits<br>• Representation of experimental results on the screen (graphs, scope signals, numeric indicators). Export of results in MS Excel format<br><br>I. DC circuits<br>1. Voltage source in electric circuits<br>2. Light sensitive resistors (photoresistors)<br>3. Kirchhoff's circuit laws<br>4. Electric power, performance factor, source and load matching<br>5. Ohm's law<br>6. Series connection of resistors<br>7. Parallel connection of resistors<br>8. Resistive voltage dividers<br>9. Temperature sensitive resistors (thermistors)<br>10. Voltage dependent resistors (varistors)<br>11. Charging and discharging of capacitors<br>II. AC circuits<br>1. Parallel connection of capacitors<br>2. Series connection of capacitors | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | 3. AC circuits with capacitors. Voltage, current and reactive impedance. Reactive power<br>4. Parallel connection of inductors<br>5. Series connection of inductors<br>6. Voltage and current over inductors. Reactive impedance. Reactive power<br>7. Series connection of a resistor and an inductor<br>8. Series connection of a resistor and a capacitor<br>9. Parameters of AC voltage and current. Active power<br>10. Operation of transformers in open-circuit mode<br>11. Operation of transformers in short circuit mode<br>12. Operation of transformers with resistive load<br>13. Transitory processes in RC networks<br>14. Transitory processes in RL networks<br>15. Transitory processes in RLC networks | | |
| **23** | **2** | **set** | **Power Electronics Board**<br>Features<br>• 17 experiments in Power Electronics<br>• Menu-driven navigation through the labs<br>• Student registration<br>• Step-by-step instructions for students<br>• Interactive study guide for each experiment<br>• Graphical representation of experimental results<br>• Export of results in MS Excel format<br>List of labs<br>1. Operational characteristics of DC voltage generators<br>2. Operational characteristics of AC voltage generators<br>3. Operational characteristics of DC current generators<br>4. Operational characteristics of linear voltage regulators (current instability)<br>5. Operational characteristics of linear voltage regulators (voltage instability)<br>6. Operational characteristics of switching voltage regulators<br>7. Operational characteristics of switching voltage regulators with filter<br>8. Operational characteristics of SCRs<br>9. Operational characteristics of Zener diodes<br>10. Operational characteristics of single-phase transformers in idle running and short-circuit modes<br>11. Operational characteristics of single-phase transformers with active loads<br>12. Operational characteristics of single-phase rectifiers without a filter<br>13. Operational characteristics of single-phase rectifiers with a filter<br>14. Characteristics of three-phase networks and transformers (star/delta connection)<br>15. Characteristics of three-phase networks and transformers (star/star connection)<br>16. Operational characteristics of single-phase controlled rectifiers with active load<br>17. Operational characteristics of three-phase controlled rectifiers with active load | | |
| **24** | **2** | **set** | **Desktop Computer, all in one model**<br>Desktop Computer, all-in-one, 21.5 " LED monitor(or higher), CPU: I3; RAM: 4G; HDD: 1T; DVD RW; OS: Windows 8; mouse & keyboard; with UPS | | |
| **25** | **1** | **lot** | **(Laboratory Tables, Teacher & Student Chairs, Hanging storage Cabinet, Interactive Whiteboard & Multimedia projector)**<br>**Laboratory Table (4 pcs)**<br>2440 x 800mm, 30mm laminated board table top, with PVC edging. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | 18mm laminated board with PVC edging, electrical outlets with removable front plate. Includes wiring provisions for four 2-gang universal outlet. Powder-coated Tubular steel metal framing.<br><br>Detachable with joining pins.<br>**Teacher's table (1)**<br>1000x950x780mm Table<br>18mm Laminated Board with PVC edging<br>**Teacher's chair (1)**<br>Executive type<br>Non Folded<br>Finished Materials: PU + Steel + PP<br>Back: PU or better<br>Seat: Cutting sponge with PU or better ;<br>Armrest: steel, powder coated or of similar quality<br>Foam: High Density Foam or better<br>Steel leg, powder coated steel structure<br>Color: preferably Navy blue<br>**Laboratory Bench Stools (40 pcs)**<br>12" round wooden seat, at least 1" thick<br>Tubular 4-legged base<br>Steel tubing heavy duty frame<br>18" Seat Height<br>Powder-coated frame<br>Color: preferably Navy blue/ dark blue<br>**Storage Cabinet (2pcs)**<br>1.20m x 1.90m<br>Sliding Glass doors on powdercoated aluminum frame with lock<br><br>18mm laminated boards with PVC edging<br>**Interactive Whiteboard (1)**<br>78" diagonal surface, 4 pens, 1wand, wall-mount, USB Interface computer connection, Workspace software; Infrared Technology-pen & finger touch with Windows, Mac or Linux; Multi-touch with Windows 7; aspect ratio; 4:3; 8000x8000 resolution; Android & IOS tablet compatible.<br>**Multimedia Projector (1)**<br>USB 3LCD Projector, 2800 ( or better)Lumens White and Colour Light Output , Computer Cable, USB A/USB B Cables, Remote Control, Soft Carry Case & Manual | | |
| **3.2 Communications and Digital Laboratory** | | | | | |
| **26** | **4** | **set** | **Educational Laboratory Virtual Instrumentation Suite**<br>Platform Features:<br>• Open architecture for third-party plug-in boards<br>• Hi-Speed USB plug-and-play connectivity<br>• 1.25 MS/s oscilloscope<br>• 51⁄2-digit isolated digital multimeter<br>• ±15 and +5 V power supply<br>• Manual control – function generator and variable power supply<br>• Circuit protection with resettable fuse.<br>Integrated Suite of 12 Virtual Instruments<br>• Oscilloscope<br>• Function generator (manual control)<br>• Digital Multimeter (DMM)<br>• Arbitrary waveform generator<br>• Bode analyzer<br>• 2-wire current voltage analyzer<br>• 3-wire current voltage analyzer<br>• Dynamic signal analyzer (DSA)<br>• Impedance analyzer<br>• Digital reader<br>• Digital writer<br>• Variable power supply (manual control) | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | Driver Software (included)<br>• NI-ELVISmx<br>• LabVIEW SignalExpress | | |
| **27** | **8** | **unit** | **Fiber Optics Communication Board**<br>Compatible with ELVIS platform<br>Specifications:<br>- 20 patching leads<br>- 7 optical fibers<br>- headphones<br>- user and experimenter manuals<br>- BNC copes leads<br>- easy to use and highly student resistant<br>- allows the student to do over 12 experiments in digital and fiber optic communications in the one,<br>- self contained portable unit<br>- only requires the additional use of a PC<br>- topics covered in Experiment Manual<br>- introduction to the experimental module<br>- PCM encoding<br>- PCM decoding<br>- Sampling and Nyquist in PCM<br>- Time Division multiplexing (TDM)<br>- Line coding and bit-clock regeneration<br>- Fiber optic transmission<br>- PCM-TDM 'T1' implementation<br>- Optical digital filtering, splitting and combining<br>- Fiber optic bi-directional communication<br>- Wave division multiplexing (WDM)<br>- Optical losses | | |
| **28** | **8** | **unit** | **Signal Processing Experimenter**<br>Compatible with ELVIS platform<br>Includes:<br>- 16 experiment Lab Manual covers<br>- easily be integrated or adapted to suit your current signals and systems courses and text books<br>Lab 1: Introduction to the SIGEx board<br>Lab 2: Special signals – characteristics and applications<br>Lab 3: Systems: Linear and non-linear<br>Lab 4: Unraveling convolution<br>Lab 5: Integration, convolution, correlation & matched filters<br>Lab 6: Exploring complex numbers and exponentials<br>Lab 7: Build a Fourier series analyzer<br>Lab 8: Spectrum analysis of various signals<br>Lab 9: Time domain analysis of RC networks<br>Lab 10: Poles and zeros in Laplace domain<br>Lab 11: Sampling and Aliasing<br>Lab 12: Getting started with analog-to-digital conversion<br>Lab 13: Discrete-time filters – FIR<br>Lab 14: Poles and zeros in the z-plane: IIR forms<br>Lab 15: Discrete-time filters – practical applications<br>App A: SIGEx Lab to Textbook chapter table SIGEx | | |
| **29** | **8** | **unit** | **Telecommunication Board**<br>Compatible with ELVIS platform<br>- Board accessories kit includes:<br>- 20 x stackable patch cords<br>- User Manual<br>- Digital and Analog Basic Telecommunications Experiments Manual Volume-1<br>- DATEX SFP CD-ROM<br>Telecommunication Topics:<br>Basic Analog Communications AM, FM, DSB, SSB, PM, PAM, TDM, PWM, Superheterodyne, Speech in Comms, PLL, QAM, SNR Concepts and more<br>Digital Communications PCM, PCM-TDM, ASK, BPSK, FSK, GFSK, Eye Patterns, DPSK, QPSK, Spread Spectrum, Line Coding, Noise Generation, SNR Concepts and more. | | |
| **30** | **8** | **unit** | **Digital Trainer**<br>Components:<br>-standard PB-501 breadboard<br>-8 Data Switches<br>- The data switch circuits provides eight DATA OUTPUT pins D1 to D8 whose output level is adjusted using slide switches. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • 8 Data Status Monitor - Has eight buffered inputs with LED indicators that show the current state of the inputs.<br>• 555-Based Clock Generator - The circuit is based on a 555 IC configured as an astable multivibrator. The signal is accessible through the OUT pin. An overlapping LOW (10 Hz to 500 Hz) and<br><br>control as well as VR1 for fine tuning control.<br>• Pulse Generator - A monostable signal generator based on the 74HC221 IC. These are two outputs, pressing a switch generates a pulse across the corresponding output pin.<br>• Logic Probe - The probe displays the status of the signal fed across its input pins using three LED status indicators, one each for HIGH, LOW and PULSE.<br><br>• 5-Volt Power Supply - This supply is the same power source used for the rest of the modules such that the user need not worry about compatibility problems when using the built-in modules in the trainer. | | |
| **31** | **8** | **unit** | **Transmission Line Trainer**<br>All elements are mounted in a metallic box, with power supply and block diagrams.<br>• Generator blocks:<br>Square signal generator.<br>Sine signal generator.<br>Triangle signal generator.<br>Each generator block has a Radio-Frequency Tuning and four BNC connectors with different line impedances (25Ω, 50Ω, 75Ω and 100Ω).<br>• Transmission line block:<br>Two transmission lines made of 40 m. length coaxial cable (total length joining the two transmission lines is 80 m.).<br><br>Different test points along the lines (each 10 m.).<br>• Load block:<br>Fully configurable termination load, through switches on each load branch.<br>Short circuit termination.<br>Capacitive load.<br>Resistive load (fixed electric resistances and potentiometers).<br>Inductive load.<br>Cables and Accessories, for normal operation.<br>• Manuals:<br>Required Services<br>Assembly and Installation<br>Starting-up<br>Safety, Maintenance & Practices Manuals.<br>• Dimensions:<br>490 x 330 x 310 mm. approx. (19.29 x 12.99 x 12.20 inches approx.)<br>• Weight:<br>20 Kg. approx. (44 pounds approx.). | | |
| **32** | **3** | **unit** | **Antenna Trainer**<br>Includes:<br>• Control Interface Box:<br>- Radio-Frequency generator<br>- Spectrum analyzer<br>- Stepper motor controller<br>• Low power for safety operation (under 10dBm transmission power).<br>• Radio-Frequency tuning, computer controlled.<br>• Frequency control and measurement from the computer (PC).<br>• Wide range of frequencies in UHF band.<br>• BNC connector to transmitter antenna.<br>• Operate in UHF band.<br>• BNC connector to receptor antenna.<br>• SWR- meter (included in the Control Interface Box):<br>• Measurement of SWR from the computer (PC).<br>• BNC connector to transmitter antenna.<br>• BNC connector to radio-frequency generator.<br>• Two towers antennas:<br>• Tower for the receptor antenna.<br>• Tower for the transmitter antenna. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Stepper motor coordinate with an encoder, all of these components are computer controlled.<br>• allows the full-automatic 360° rotation of the transmitter antenna<br>• EANC-1. Antennas Kit:<br>• High sensibility Log-periodic antenna for the receptor.<br>• Monopole antenna with Ground plane.<br>• Drooping monopole antenna.<br>• Straight dipole antennas (λ/2 and λ).<br>• Folded dipole antenna (λ/2).<br>• Helical antenna (right-hand circular polarization).<br>• Helical antenna (left-hand circular polarization).<br>• Circular loop antenna.<br>• Square loop antenna.<br>• Diamond loop antenna.<br>• Microstrip patch antenna.<br>• Yagi-Uda antenna.<br>• Antenna expositor<br>• RF transformer<br>• Space required between antennas: 2-3 m.<br>Complete unit includes as well:<br>• Advanced Real-Time SCADA.<br>• Open Control + Multicontrol + Real-Time Control.<br>• Specialized Control Software based on Labview.<br>• National Instruments Data Acquisition board (250 KS/s , kilo samples per second).<br>• Projector and/or electronic whiteboard compatibility | | |
| **33** | **4** | **unit** | **Microwave Trainer**<br>Specifications:<br>• Microwaves signal generator:<br>o Solid state dielectric resonance oscillator (DRO).<br>o Radio-Frequency tuning.<br>o X-band range of frequencies from 8.8GHz to 12GHz.<br>• Power meter.<br>• SWR meter.<br>• Crystal probe.<br>• Thermistor probe.<br>• Slotted line waveguide.<br>• Slide-Screw Tuner.<br>• Crossguide waveguide.<br>• Directional coupler.<br>• MagicorHybrid Tee.<br>• Variable attenuators waveguides.<br>• Fixed attenuators waveguides.<br>• Short circuit terminations.<br>• Adjustable termination.<br>• Dummy loads.<br>• Two towers antennas, one of them with azimuth indicator.<br>• Horn Antennas.<br>• All the waveguide have the standard size WR90.<br>• Cables and accessories, for normal operation.<br>Exercise and practical possibilities:<br>1. Familiarization with a microwaves test bench.<br>2. Power emissions measurement.<br>3. Study of different Attenuation measurement.<br>4. Wavelength and frequency measurement through a probe mounted on a slotted line waveguide.<br>5. Wavelength and frequency measurement through a frequency meter.<br>6. Stationary wave (SWR) measurements.<br>7. Basic principles of Smith chart.<br>8. Impedance and admittance.<br>9. Complex impedance, reflection coefficient.<br>10. Stationary wave diagram for different loads.<br>11. Comparison of matched and mismatched loads.<br>12. Study of the Tees and crossguide.<br>13. Measure of wavelength in free space.<br>14. Measure of power emission in free space.<br>15. Study of gain and directivity of a horn antenna (dBi).<br>16. Radiation pattern of a horn antenna.<br>17. Reflection of a dielectric plate and metallic plate.<br>Dimensions&Weight | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Dimensions: 700x700x1100mm. approx.<br>• Weight: 25 Kg. approx.<br>Required Services<br>• Electrical supply: single-phase, 220V./50Hz | | |
| **34** | **8** | **unit** | **Milliampmeter**<br>•Bright large screen VFD display<br>•Digital display : 4 1/2 digits<br>•Frequency range 5 Hz to 5 MHz<br>•AC voltage 50 µV to 300 V<br>•ACV test resolution is up to 0.1µV<br>•Two independent input channels<br>•Auto or manual ranging can be selected •Standard accessory interface is RS-232 | | |
| **35** | **8** | **unit** | **Digital Multitesters**<br>• 3 1/2 LCD display with maximum reading of 1999<br>• Overload protection<br>• Auto power off function<br>• Data hold function<br>• Capacitance measurements<br>• Shock Case<br>• Mechanical protection<br>• 2000uF test function<br>• Diode Testing : YES<br>• Audio Testing : YES<br>• Continuity Buzzer : YES<br>• Auto power Off : YES<br>• Data hold : YES<br>• Low battery indication: YES<br>Technical Specification:<br>• Voltage DC : 200mV/2V/20V/200V/1000V<br>• Voltage AC: 200mV/2V/20V/200V/700V<br>• Direct Current: 2mA/20 mA/200 mA/10A<br>• Alternating Current: 2mA/20 mA/200 mA/10A<br>• Resistance: 200Ω/2kΩ/20kΩ/200kΩ/2MΩ/20MΩ/200MΩ | | |
| **36** | **1** | **lot** | **(Laboratory Tables, Interactive Whiteboard, Storage Cabinets & Multimedia Devices) 1 Lot**<br>**LABORATORY TABLE (8pcs)**<br>2440 x 800mm, 30mm laminated board table top with PVC edging, provided with grommet caps for computer monitor wire access.<br>Powder-coated steel casing for table top electrical outlets with removable front plate, powder-coat finish. Includes wiring provisions for eight 2 gang universal outlet and LAN provision for two (2) computers.<br>Plastic keyboard tray<br>Powder-coated Tubular metal framing with perforated plate cover for table legs support and adjustable metal glides.<br>18mm laminated board with PVC Edgeband CPU shelving<br>**MULTIMEDIA PROJECTOR (1)**<br>USB 3LCD Projector, 2800 ( or better)Lumens White and Colour Light Output , Computer Cable, USB A/USB B Cables, Remote Control, Soft Carry Case & Manual<br>**INTERACTIVE WHITEBOARD (1)**<br>78" diagonal surface, 4 pens, 1wand, wall-mount, USB Interface computer connection, Workspace software; Infrared Technology-pen & finger touch with Windows, Mac or Linux; Multi-touch with Windows 7; aspect ratio; 4:3; 8000x8000 resolution; Android & IOS tablet compatible.<br>**STORAGE CABINET (1)**<br>1.20m x 1.90m<br>Sliding Glass doors on powder-coated aluminum frame with lock<br>18mm laminated boards with PVC edging | | |
| **3.3 Electrical Machines, Installation and Motor Controls** | | | | | |
| **37** | **8** | **unit** | **Analog Multimeter**<br>Easy to assemble<br>-Break-proof body cover<br>-Solded test leads providing better safety<br>-Portable analog multitester | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | Technical Specification:<br>• DCV: 0.3/3/12/30/120/300/600V (20kΩ/V)<br>• ACV: 12/30/120/300/600V (9kΩ/V)<br>• DCA: 60μ/3m/30m/0.3A<br>• Resistance: 20/200/20kΩ<br>• Battery check: 1.5<br>• Bandwidth: 50 or 60Hz (sine wave)<br>• Battery: UM-3(1.5V) x 2<br>• Fuse: Ø5.2x20mm (250V/0.5A)<br>• Size/Mass: H159.5 x W129 x D41.5mm/.320g<br>• Standard Accessories included: Instruction Manual | | |
| **38** | **8** | **unit** | **Digital Multimeter**<br>• 3 1/2 LCD display with maximum reading of 1999<br>• Overload protection<br>• Auto power off function<br>• Data hold function<br>• Capacitance measurements<br>• Shock Case<br>• Mechanical protection<br>• 2000uF test function<br>• Diode Testing : YES<br>• Audio Testing : YES<br>• Continuity Buzzer : YES<br>• Auto power Off : YES<br>• Data hold : YES<br>• Low battery indication: YES<br>Technical Specification:<br>• Voltage DC : 200mV/2V/20V/200V/1000V<br>• Voltage AC: 200mV/2V/20V/200V/700V<br>• Direct Current: 2mA/20 mA/200 mA/10A<br>• Alternating Current: 2mA/20 mA/200 mA/10A<br>• Resistance: 200Ω/2kΩ/20kΩ/200kΩ/2MΩ/20MΩ/200MΩ | | |
| **39** | **1** | **set** | **Integrated Laboratory for Electrical Machines**<br>A. Consisting of the following:<br>**1. Electrical Machines Unit (Power Supply)**<br>- Metallic box.<br>- Diagram in the front panel.<br>- Thermal Magnetic Circuit Breaker.<br>- Two double switches (1 NO + 1 NC in each one)<br>- Push Button (1 NC + 1 NO).<br>- Three contactors with 2 NO and 1 NC.<br>- DC supply 200 V dc with fuses.<br>- Connection Key<br>- Emergency stop Push button.<br>**2. Electric Power Data Acquisition System**<br>A.1)Hardware :<br>A.1.1.1) EPIB. Electric power interface box ( dimensions: 300 x 120 x 180 mm. approx.):<br>Interface that carries out the conditioning of the diverse signals that can be acquired in a process, for their later treatment and visualisation.<br><br>Front panel separated in two: left-hand part for VOLTAGE sensors, and right-hand part for CURRENT sensors.<br>- 8 analog input channels. - Sampling range: 250 KSPS (Kilo samples per second).<br>- 4 Tension sensors AC/DC, 400V. - 4 Current sensors.<br>A.1.1.2) DAB. Data acquisition board :<br>PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.<br>Analog input:<br>- Number of channels= 16 single-ended or 8 differential.<br>- Resolution=16 bits, 1 in 65536.<br>- Sampling rate up to: 250 KSPS (Kilo samples per second).<br>- Input range (V)=± 10V.<br>- Data transfers=DMA, interrupts, programmed I/0. Number of DMA channels=6.<br>Analog output:<br>- Number of channels=2. Resolution=16 bits, 1 in 65536.<br>- Maximum output rate up to: 833 KSPS.<br>- Output range(V)=± 10.<br>- Data transfers=DMA, interrupts, programmed I/0<br>Digital Input/Output:<br>- Number of channels=24 inputs/outputs. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | - D0 or DI Sample Clock frequency: 0 to 1 MHz.<br>- Timing: Counter/timers=2. Resolution: Counter/timers: 32 bits.<br><br>A.2) Data Acquisition Software :<br>- Data Acquisition Software with Graphic Representation: Amicable graphical frame.<br>- Compatible with actual Windows operating systems.<br>- Configurable Software allowing the Representation of temporal evolution of different signals. Visualization of Circuit tensions on the computer screen.<br>- Sampling rate up to 250 KS/s (Kilo samples per second) guaranteed.<br>**3. Three Phase transformer**<br>- input and output connectors.<br>- Three phase transformer, 400 V a.c - 230 V a.c., 1000 VA.<br>- input and output connectors.<br>**4. Single phase transformer,** 400 V a.c. - 230 V a.c., 400 VA.<br>- Ground connector.<br>**5. Variable autotransformer**<br>- input and output connectors.<br>- Three phase transformer, 400 V a.c - 230 V a.c., 1000 VA.<br>- input and output connectors.<br>**6. Resistive, Inducive and Capacitance Load Module**<br>- Metallic box.<br>- Diagram in the front panel.<br>- Variable resistive loads: 3 x [ 150(500 W)<br>- Fixed resistive loads:<br>3 x [ 150(500 W) + 150 (500 W) ].<br>- Inductive loads:<br>3 x [ 0, 33, 78, 140, 193, 236 mH ].(230V /2 A)<br>- Capacitive loads:<br>3 x [ 4 x 7 µF ]. (400V)<br>**7. DC Series Excitation Motor Generator**<br>Power: 250-300W.<br>Speed: 3000 r.p.m.<br>V.excitation: 220 V.D.C.<br>I.Excitation nominal: 0.3A.<br>V.Armature.: 200V D.C.<br>I.Armature nominal: 1.5A.<br>**8. DC Shunt Excitation Motor generator**<br>Power: 250-300W.<br>Speed: 3000 r.p.m.<br>V.excitation: 190 V.D.C.<br>I.Excitation nominal: 0.3A.<br>V.Armature.: 200V D.C.<br>I.Armature nominal: 1.5A.<br>**9. AC Synchronous Alternator Motor**<br>Power: 250-300W.<br>Speed: 3000 r.p.m.<br>Frequency: 50Hz.<br>Connections: Star/triangle.<br>V.excitation nominal: 220V D.C.<br>I.Excitation nominal: 0.59A.<br>V.Armature.: 3x220/380V.<br>**10. Three Phase Asynchronous Motor Squirrel Cage (750rpm,8poles,550w)**<br><br>Power: 250-300W.<br>Speed: 2769 r.p.m. (50Hz), 3330 r.p.m. (60Hz).<br>Connections: Star/triangle.<br>Frequency: 50/60 Hz.<br>V.Armature:230/400V (50Hz), 250/440V. (60Hz).<br>I.Armature nominal: 1A-0.7A.<br>**11. Three Phase Reluctance Motor**<br>Three-phase. 380 V.<br>Power: 200W.<br>Speed: 3000 r.p.m.<br>Frequency: 50 Hz.<br>**12. Three Phase Asynchronous Motor with wound Rotor**<br>Power: 300W.<br>Speed: 1413 r.p.m.<br>Frequency: 50Hz.<br>V.Armature.: 230/400V.<br>I.Armature nominal: 1A-0.7A.<br>**13. Single Phase Asynchronous Motor with Starting Capacitor** | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | Power: 370W.<br>Speed: 2800 r.p.m.<br>Frequency: 50Hz.<br>V.Armature.: 230V.<br>I.Armature nominal: 1.5A.<br>**14. Single Phase Universal Motor**<br>Power: 4-8W.<br>Speed: 480/14000 r.p.m.<br>Frequency: 50Hz.<br>V.Armature.: 230/240V.<br>Power: 250W.<br>Speed: 2800 r.p.m.<br>Frequency: 50 Hz.<br>V.Armature: 230V.<br>**15. Single Phase Asynchronous Motor with Starting and Running Capacitor**<br><br>Power: 370W.<br>Speed: 2800 r.p.m.<br>Frequency: 50Hz.<br>V.Armature.: 230V.<br>I.Armature nominal: 1.5A.<br>**16. DC Motor Speed Controller**<br>- Metallic box.<br>- Regulated voltage output up to 320 Vdc. Maximum current output 2 A.<br>- Front panel including: Connections:<br>- Positive, negative and Ground connections. on/OFF switch.<br>- The top side of the unit include a wheel to adjust the DC output voltage up to 320 Vdc.<br>**17. AC Motor Speed Controller**<br>- Metallic box.<br>- Output: 3 PH, 3.0 KVA, 220 V, 1-50 Hz., 8.0 A.<br>- Overload current Thermal protection.<br>- on/OFF switch.<br>- It has two blocks in the front panel:<br>- Speed control:<br>- Start/stop switch.<br>- Speed control potenciometer.<br>- Connections to motor:<br>- Three-phase Connection to AC motor.<br>- Ground connection.<br>**B.Personal Computers (2 units)**<br>Desktop Computer, all-in-one, 21.5 " LED monitor(or higher), CPU: I3; RAM: 4G; HDD: 1T; DVD RW; OS: Windows 8; mouse & keyboard; with UPS | | |
| **40** | **1** | **assy** | **Disassembly Machine Kit:**<br>Disassembly Machines Kit allows the student to construct, operate and make more than 50 assemblies and practices of different<br><br>electrical machines.<br>Specifications:<br>base plate<br>frame ring<br>fixed and removable bearing housings<br>shaft, squirrel cage rotor<br>wound stator<br>couplings<br>armature poles and hub<br>brushes<br>brush holders<br>commutator/slip rings<br>interpoles<br>armature field and interpole coils<br>compound field coils<br>field coils<br>centrifugal switch<br>robust case for the elements<br>necessary tools and elements for norml working operation<br>all machies that may be assembled used low voltage, protected rotating part, operating at low power levels,<br>- Panel for connections and protections:<br>- Anodized aluminium structure with Panel in painted steel. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | - Diagrams for each practice, which explains the different connection configurations.<br>- connections box, that allows to make different connections for each practice.<br>- Protection circuit that is used to protect each module short circuits.<br><br>- Drive motor: Asynchronous Three-phase motor of squirrel cage:<br><br>Power: 370W.<br>Speed: 2730 r.p.m.<br>Frequency: 50/60 Hz.<br>V.Armature:230/400V.<br>I.Armature nominal: 1.67/0.97A.<br>Connections: Star/triangle.<br>- AC motor speed controller.<br>Metallic box.<br>Power: 3kVA.<br>Frequency: 1-50 Hz.<br>Phase voltage: 230 Vac.<br>Maximum current: 8A.<br>Overcurrent thermal protection.<br>ON/OFF switch.<br>It has two blocks in the front panel:<br>Speed control: Start/Stop switch and speed control potenciometer.<br><br>Connections to motor:<br>Three-phase connection to AC motor and ground connection.<br><br>- DC motor speed Controller<br>Metallic box.<br>Adjustable voltage: up to 320 Vdc.<br>Maximum current: 2 A.<br>At the top of the unit there is a knob to adjust the DC voltage.<br><br>Front panel including: Positive, negative and ground connections.<br>ON/OFF switch.<br>**- Velocity Control for stepper motor:**<br>This unit is used for controlling the stepper motor assembly.<br><br>Metallic box.<br>Cables and accessories, for normal operation. | | |
| **41** | **2** | **set** | **Integrated Electrical Installation Laboratory a. Modular Trainer (AC Motors) b. Modular Trainer for Electronics (Complete Option) c. Star Delta Starter**<br><br>**a. Modular Trainer (AC Motors)**<br>Industrial Main Power<br>Supply<br>- Magneto-thermal protection.<br>- Differential protection.<br>- Double plug and terminals (three phase+singlephase).<br>- 2 lamps.<br>- 8 terminals.<br>- Mushroom security button.<br>- Removable key.<br>AC Auxiliary Power<br>Supply (24Vac)<br>- 230 / 24 Vac transformer.<br>- 4 terminals.<br>3 Double Chamber<br>Push-buttons. (2 units)<br>- 3 d o uble chamber push buttons<br>(one closed and one open)<br>- for actions of start/stop of motors.<br>3-pole Contactor (24Vac)<br>(4 units)<br>- 3 pole contactor, 9 A.<br>- Control coil 24 Vac.<br>- Auxiliary contacts 3NO + 2NC.<br>Frequency variator<br>- Frequency, voltage and currect<br>control and programming.<br>- motor specification required for<br>programming. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | Thermal relay (GV protector) module<br>(2 units)<br>- Three-phase of 10A.<br>Synchronization Relay (variable delay)<br>- 2 regulation relays.<br>- Work and rest activation time control.<br>- Digital display.<br>- Adjustable delay.<br>Motor (squirrel cage)<br>-squirrel cage.<br>-Three phase Asynchronous motor.<br>-270 W.<br>-3000 rpm.<br>Motor (Dahlander motor)<br>-2 speeds.<br>-Three phase Asynchronous motor.<br>-250 W.<br>-2800/1400 rpm.<br>**b. Modular Trainer for Electronics**<br>- AC and DC Power supply module that allows the following output<br>voltages:<br>Alternating:<br>15 + 25 V, 0.5 A<br>24 V, 2 A<br>Direct:<br>24 V, 2 A<br>0-20 V, 2 A<br>Inductances Module<br>- 9 inductances from 1 mH to 45 mH for assemblies in alternating of<br><br>R, L, C components<br>Capacitors Module<br>- 7 independent not polarised ones, from 56 nF 470 nF.<br>- 2 polarised of 220 mF and 470 mF V.<br>Rectifier Diodes Module<br>- Rectifier diodes of 40 A (6 units).<br>- Some assemblies:<br>Positive/negative simple rectification.<br>Single-phase and three-phase bridge rectification.<br>Double rectification.<br>Filtrate of voltage of the assembies can be made<br>Resistive Components Module<br>- Fixed resistances, with values from 47 to 159 K ohms. (14 units).<br><br>- Linear potentiometers , one of them coiled of 5 W.<br>- Logarithmic potentiometers.(2 units).<br>Three Phase Transformer<br>- Transformer of three branches:<br>Primary ones: 220 and 380 V.<br>Secondary ones: 3x73 V by branch.<br>Power: 500 W.<br>- Possible practices:<br>The transformer as a booster (single-phase).<br>The transformer as a reducer Autotransformer<br>Star connection (three-phase).<br>Delta connection<br>Transformers in series and in parallel (single-phase).<br>Electromagnetism Kits with group of motor/generator<br>- It is based on A printed circuit with the components that can be easily seen.<br>- Set of two coils.<br>- Longitudinal magnet.<br>- Group motor/generator with its axis united<br>Dismantled transformer kit<br>- A nucleus in "U".<br>- A coil with 1000 turns.<br>- A coil with 2000 turns.<br>- Nucleus close in "I".<br>- Case.<br>Electrostatic kit<br>- Ebinita bar.<br>- Plexiglas bar.<br>- Vertical base and hook. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | - Balls.<br>- Cat skin.<br>- Case for the components storage.<br>- Acetate sheets.<br>- aluminium sheets.<br>- Electrometer<br>Open Universal Motor<br>- Universal motor open by its sides to see inside, specially the brushes.<br><br>**c. Star-Delta Starter**<br>Industrial Main Power Supply<br>- Magneto-thermal protection.<br>- Differential protection.<br>- Double plug and terminals (three phase+singlephase).<br>- 2 lamps.<br>- 8 terminals.<br>- Mushroom security button.<br>- Removable key.<br>Push-Buttons with Light (24Vac)<br>-3 push buttons with light.<br>-24 Vac.-NO and NC contacts.<br>3-pole Contactor (24Vac (3 units)<br>- 3 pole contactor, 9 A.<br>- Control coil 24 Vac.<br>- Auxiliary contacts 3NO + 2NC. | | |
| **42** | **1** | **set** | **Electric motors with speed control and loads**<br>**1. Electrical Machines Unit ( Basic)**<br>Metallic box.<br>Diagram in the front panel.<br>Thermal Magnetic Circuit Breaker.<br>DC supply 200 V dc with fuses.<br>Connection Key.<br>Emergency stop push button.<br>Two push buttons (1NO + 1NC).<br>**2. Network Analyzer**<br>Metallic box.<br>Diagram in the front panel.<br>3 current inputs, for series intensity.<br>3 voltage terminals, for each phase measure (R,S,T) and another one for the neutral connection.<br>Control and visualization digital display.<br>Voltage: Range 20 - 500 Vrms. Prec.: 0.5%. Phase to phase - Phase to neutral.<br>Current: Range 0.02 - 5 Arms. Prec.: 0.5%.<br>Frequency: Range 48 to 62 Hz. 0.1Hz.<br>Power: Active, Reactive and Apparent. Range 0.01 to 9900 kW. Prec.: 1%.<br>Power Factor: Power Factor for each phase and average. Range -0.1 to + 0.1. Prec.: 1%.<br>Operating temperature 0 to +50°C.<br>**3. Resistive, Inducive and Capacitance Load Module**<br>- Metallic box.<br>- Diagram in the front panel.<br>- Variable resistive loads: 3 x [ 150(500 W)<br>- Fixed resistive loads:<br>3 x [ 150(500 W) + 150 (500 W) ].<br>- Inductive loads:<br>3 x [ 0, 33, 78, 140, 193, 236 mH ].(230V /2 A)<br>- Capacitive loads:<br>3 x [ 4 x 7 µF ]. (400V)<br>**4. DC Shunt- Series Compound Excitation Motor**<br>Power: 250-300W.<br>Speed: 3000 r.p.m.<br>V.excitation: 220 V.D.C.<br>I.Excitation nominal: 0.3A.<br>V.Armature.: 200V D.C.<br>I.Armature nominal: 1.5A.<br>**5. AC Synchronous Alternator Motor**<br>Power: 250-300W.<br>Speed: 3000 r.p.m.<br>Frequency: 50Hz.<br>Connections: Star/triangle.<br>V.excitation nominal: 220V D.C. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | I.Excitation nominal: 0.59A.<br>V.Armature.: 3x220/380V.<br>**6. Three Phase Asynchronous Motor Squirrel Cage**<br>(750rpm,8poles,550w)<br>Power: 250-300W.<br>Speed: 2769 r.p.m. (50Hz), 3330 r.p.m. (60Hz).<br>Connections: Star/triangle.<br>Frequency: 50/60 Hz.<br>V.Armature:230/400V (50Hz), 250/440V. (60Hz).<br>I.Armature nominal: 1A-0.7A.<br>**7. Three Phase Asynchronous Motor with wound Rotor**<br>Power: 300W.<br>Speed: 1413 r.p.m.<br>Frequency: 50Hz.<br>V.Armature.: 230/400V.<br>I.Armature nominal: 1A-0.7A.<br>**8. Single Phase Asynchronous Motor with Starting Capacitor**<br>Power: 370W.<br>Speed: 2800 r.p.m.<br>Frequency: 50Hz.<br>V.Armature.: 230V.<br>I.Armature nominal: 1.5A.<br>**9. Single Phase Universal Motor**<br>Power: 4-8W.<br>Speed: 480/14000 r.p.m.<br>Frequency: 50Hz.<br>**10. Single Phase Asynchronous Motor with Starting and Running Capacitor**<br>V.Armature.: 230/240V.<br>Power: 250W.<br>Speed: 2800 r.p.m.<br>Frequency: 50 Hz.<br>V.Armature: 230V.<br>**11. DC Motor Speed Controller**<br>- Metallic box.<br>- Regulated voltage output up to 320 Vdc. Maximum current output 2 A.<br>- Front panel including: Connections:<br>- Positive, negative and Ground connections. on/OFF switch.<br>- The top side of the unit include a wheel to adjust the DC output voltage up to 320 Vdc.<br>**12. AC Motor Speed Controller**<br>- Metallic box.<br>- Output: 3 PH, 3.0 KVA, 220 V, 1-50 Hz., 8.0 A.<br>- Overload current thermal protection.<br>- on/OFF switch.<br>- It has two blocks in the front panel:<br>- Speed control:<br>- start/stop switch.<br>- speed Control potenciometer.<br>- Connections to motor:<br>- Three-phase connection to AC motor.<br>- Ground connection.<br>**13. Tachogenerator:**<br>- Tachodynamo, 60V, 1000 rpm<br>**14. Electronic Brake**<br>This unit is based in two elements:<br>1. Module -metallic box:<br>Power supply:1 phase, 200-240V.<br>Rated output capacity:0.75 KW.<br>Output frequency range: 0.2 to 400 Hz.<br>Display to visualize voltage (V), Current (A), and Frequency (Hz).<br>Brake resistance included.<br>Torquemeter.<br>R.p.m. Meter.<br>Connectors.<br>2. Braking motor mounted on a bench-support.<br>Connection wire between elements “1” and “2”.<br>**15. Computer Aided Instruction Software System**<br>- complementary to the Modules, formed by:<br>Classroom Management Software Package(Instructor Software) only one is required and common for all software packages(student/module/software) | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | **16. Demonstration Software(Student/Module Software) for a DC Shunt-series compound excitation motor, Single licence** | | |
| **43** | **1** | **lot** | **(Tables, Teacher's and Students' Chairs, Storage Cabinets) 1 Lot**<br>**Laboratory Table (6units)**<br>2440 x 800mm, 30mm laminated board table top with PVC edging, with two cabinets below (with locks)<br>Powder-coated steel casing for table top electrical outlets with removable front plate, powder-coat finish. Includes wiring provisions for eight 2 gang universal outlet<br>Powder-coated Tubular metal framing with perforated plate cover for table legs support and adjustable metal glides.<br>**Teacher's table (1)**<br>1000x950x780mm Table<br>18mm Laminated Board with PVC edging<br>Clear glass view panel for rocessed monitor (approx 24" diagonal)<br>**Teacher's chair (1)**<br>Executive type<br>Non Folded<br>Finished Materials: PU + Steel + PP (or better)<br>Back: PU or better<br>Seat: Cutting sponge with PU or better ;<br>Armrest: steel, powder coated or of similar quality<br>Foam: High Density Foam (or equiv/)<br>Steel leg, powder coated steel structure<br>Color: preferably Navy blue<br>**Polypropylene Stacking Chair (45 pcs)**<br>Chair seat & back: high-quality polypropylene,<br>Chair frame: Round steel tube (heavy duty) , high quality electro-static powder coated (or equivalent)<br>Stacks 10 high from the floor<br>Color: Navy blue/ dark blue<br>**Storage Cabinet (1)**<br>1.20m x 1.90m<br>Sliding Glass doors on powder-coated aluminum frame with lock<br>18mm laminated boards with PVC edging | | |
| **44** | **1** | **lot** | Laboratory Repairs Renovation<br>*(pls see details in approved EDP)* | | |
| **LOT 8- P 8,165,000.00** | | | | | |
| **8.1 CISCO Networking** | | | | | |
| **45** | **15** | **unit** | **CISCO 2911 w/ 3 GE, 4 EHWIC, 2 DSP, 1 SM, 256MB CF, 512MB DRAM, IPB**<br>- AC Power Cord (North America), C13, NEMA 5-15P, 2.1 m<br>- CISCO 2901-2921 IOS UNIVERSAL<br>- CISCO 2911 AC Power Supply<br>- CISCO Config Pro Express on Router Flash<br>- 512MB DRAM for CISCO 2901-2921 ISR (Default)<br>- 256MB Computer Flash for CISCO 1900, 2900, 3900 ISR<br>- IP Base License for CICSO 2901-2951 | | |
| **46** | **15** | **unit** | **SMARTNET 8X5XNBD for CISCO 2911 Routers** | | |
| **47** | **15** | **unit** | **2-Port Serial WAN Interface Card (HWIC-2T)** | | |
| **48** | **15** | **unit** | **CISCO CATALYST 2960-24PC-L**<br>Device Type: Switch - 24 ports - Managed<br>Enclosure Type: Rack-mountable - 1U<br>Interfaces: Fast Ethernet<br>Ports: 24 x 10/100 (PoE) + 2 x combo Gigabit SFP<br>Power Over Ethernet (PoE): PoE<br>Performance Switching capacity: 32 Gbps<br>Forwarding performance (64-byte packet size): 6.5 Mpps<br>MAC Address Table Size: 8K entries<br>Remote Management Protocol: SNMP 1, SNMP 2, RMON 1, RMON 2, RMON 3, RMON 9, Telnet, SNMP 3, SNMP 2c, HTTP, HTTPS, TFTP, SSH | | |
| **49** | **15** | **unit** | **SMARTNET 8X5XNBD Catalyst 2960-24PC-L** | | |
| **50** | **15** | **unit** | **Linksys EA Series (2700, 3500, 4500) or equivalent (Wireless N-Router (b/g/n))** | | |
| **51** | **30** | **unit** | **Branded All-in-one Computer Units**<br>- OPERATING SYSTEM: Windows 8 | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | - DISPLAY: 23.0"(58.4cm), 16:9, Full HD 1920x1080, LED-backlight, 178° wide viewing angle, Touch Screen - Multi Touch(10 Fingers Touch)<br><br>- PROCESSOR: Intel® Core™ i5-3330 (6M Cache, 3.0 GHz, Turbo Boost up to 3.2GHz)<br>- CHIPSET: Intel® B75<br>- MEMORY: 8 GB, DDR3 at 1600MHz<br>- STORAGE: 1TB SATA Hard Drive (7200RPM)<br>- WIRELESS DATA NETWORK: 802.11 b/g/n or 802.11 b/g/n + WiDi (Optional)<br><br>- LAN: 10/100/1000 Mbps<br>- CAMERA: 2 MP<br>- CARD READER: 3-in-1: SD/SDHC/MMC | | |
| **52** | **5** | **unit** | **45U 2 Welded 4 Por Steel Frame Rack, 35.5" Base deep, 28.75" Post Deep** | | |
| **53** | **10** | **set** | **High Performance Wire Stripper**<br>Electrician Tool Type: Wire strippers<br>Application: Cable cutting/stripping<br>Type of Wire: Stranded<br>Handle Length (Inches): 3.0<br>Lockable: Yes<br>Material: Stainless steel<br>Stripping Capacity: From#18 to #10 | | |
| **54** | **10** | **set** | **High Performance Phone & Data Crimping Tool**<br>Electrician Tool Type: Data crimper<br>Application: Cuts, strips and crimps phone and data wire<br>Type of Wire: Solid and stranded<br>Crimping Capacity: Phone and data wire<br>Wire Cutting Capacity (Inches): 1.0<br>Handle Length (Inches): 5.0<br>Lockable: Yes<br>Material: Metal and plastic<br>Stripping Capacity: Phone and data | | |
| **55** | **45** | **unit** | **Heavyduty RS232 to USB Adaptor/Converter** | | |
| **56** | **15** | **unit** | **3ft. CISCO Smart Serial Cable (CAB-SS26X26-3)** | | |
| **57** | **5** | **unit** | **Digital Network Cable Tester**<br>Power supply: 4 x 1.5 V DC AA batteries (not included)<br>Power consumption: up to 16 mA<br>Display: 4 x 16 character LCD screen, 61.6 x 25.2 mm<br>Designed for: STP/UTP twin twisted, coaxial & telephone cable<br>Working ambient temperature: -10 ... + 60°C<br>Tester port: tester RJ45 master port (M), tester LOOPBACK RJ45 port (L), far-end recognizer RJ45 port (R)<br>Max cable length: up to 1350 m<br>Calibration accuracy: 3% (+/- 0.5 m)<br>Calibration cable length: > 5 m<br>Cable problems detected: open circuit, short circuit, reverse connection, crossover or cross-talk interference | | |
| **58** | **1** | **set** | **INTERACTIVE PROJECTOR**<br>Projection Technology: RGB liquid crystal shutter projection system (3LCD)<br><br>LCD: Size (0.59" with MLA (D8)), Native Resolution (WXGA)<br>Projection Lens:<br>Type: No Optical Zoom / Focus (Manual)<br>F-Number: 1.80<br>Focal Length: 3.71mm<br>Zoom Ratio: 1 - 1.35 (Digital Zoom)<br>Throw Ratio: 0.27 - 0.37 (Wide - Tele)<br>Lamp:<br>Type: EB-1400Wi: 190W UHE, EB-1410Wi: 215W UHE<br>Life*1 (Normal/Eco): 3,500 hours / 5,000 hours<br>Screen Size (Projected Distance):<br>74.3" screen 0.438m , 60" to 100" [0.348 to 0.597m]<br>Network:<br>Wired LAN: RJ45 x 1 (10/100Mbps)<br>Wireless: Yes (ELPAP07)<br>BASIC SPECIFICATIONS:<br>Technology: Infrared<br>Input Devices: Digital Pen (Easy Interactive Pen 1 and 2)<br>Connection to PC: USB, Network<br>Calibration: Auto / Manual (25points)<br>Functions: Hover, Right click, Auto Adjust Pen Area | | |
| **59** | **45** | **pcs** | **Stacking chairs for students (45 pcs)** | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Chair seat & back: high-quality polypropylene,<br>• Chair frame: Round steel tube (heavy duty) , high quality electro-static powder coated<br>• Stacks 10 high from the floor<br>• Color: Navy blue/ dark blue | | |
| **60** | **10** | **pcs** | **Computer Table**<br>- High-pressure laminate top that is 1-1/4" thick with radius corners and vinyl edge banding.<br>- Scratch-resistant, environmentally-friendly, powder-coat paint finish on welded leg assemblies and modesty panel.<br>- Modesty panel features center grommet for wire pass-through.<br>- Adjustable leveling glides.<br>- 24"D table with 30" W; 26" fixed height | | |
| **61** | **2** | **pcs** | **Display Cabinet**<br>- Made with tempered glass panels<br>- 4 tempered glass shelves<br>- Twin lockable tempered glass doors<br>- Chrome plated fittings<br>- 4 Wheels & feet<br>- Twin cupboard doors at bottom<br>- Frameless design<br>- Black Laminate finish<br>- Dimensions: 1016mm (w) x 457mm (d) x 1850mm (h) | | |
| **LOT 11- P 38,061,839.00** | | | | | |
| **11.1 Advanced Mechatronics Laboratory** | | | | | |
| **62** | **1** | **assy** | **Modular Production System Mechatronics Station with Mechatonics Assistant**<br>**1. Distribution Station**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>- PLC Board<br>- Control Panel<br>- Work pieces<br>- Power Supply<br>-PLC software<br>-Programming cable<br>- Low noise compressor<br>- Semi-rotary actuators<br>• swivel arm can be set to various angles between 90° and 270°<br>• end positions are sensed by means of micro switches.<br>• double-acting linear cylinder pushes workpieces out of the stacking magazine<br>- Special grippers: Suction gripper<br>• Operating pressure 600 kPa (6 bar)<br>• Power supply 24 V DC<br>• 7 digital inputs<br>• 5 digital outputs<br>- Trolley<br>• Height (incl. castors, to bottom edge of profile plate): 750 mm<br>• Width: 350 mm<br>• Depth: 700 mm<br>- Control console<br>• Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector<br>• Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel<br>• fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br>- Programmable Logic Controller-EduTrainer Universal Preferred versions MPS®/MPS® PA A4 rack with built-in power supply 24 V DC power supply integrated<br>• 32 bit MIPS processor, 400 MH<br>• Data memory 32 MB flash/32 MB<br>• 20 MB flash/8 MB RAM user memory<br>• 32 KB non-volatile memory<br>• Communication network Ethernet 10/100 Base-T | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Integrated web server<br>• Master CANopen<br>• Diagnostic handheld for CPX terminal can be connected<br>Desktop Computer (1 set)<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br>- Aluminium profile plate<br>• 350 x 700 mm<br>• Grid Dimension: 50mm<br>- Cable holder<br>- Changer module CP<br>• Cylinder rotation angle (rotary cylinder): 180° (freely selectable)<br>• Height: 130 mm ,Width: 130 mm , Length: 250 mm<br>- CP Valve terminals<br>- Electrical mounting system<br>• Comprising: 2 cable ducts 340 mm and DIN rail 340mm, with mounting accessories for securing to profile plate.<br>- Minor accessories<br>- On-off valve with filter regulating valve<br>• Filter regulator with pressure gauge, on-off valve, quick push-in connections and quick couplings, mounted on a swivel support<br>- Profile plate connector<br>- Stacking magazine module<br>• Consisting of double-acting cylinder with inductive sensors and cables, magazine separator and magazine tube. The speed with which The cylinder extends and retracts can be set via one-way flow control valves.<br>• Height: 280 mm<br>• Width: 60 mm<br>• Length: 290 mm<br>- Station link receiver<br>- Through beam sensor<br>• Nominal switching distance: 80 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open/normally closed contact<br>• Connection cable: 4-pin<br>- Vacuum switch<br>• Mechanical vacuum switch (pneumatic-electric pressure transduction) with adjustable switching point and switching status display (LED)<br>•Mechanical vacuum switch with adjustable switching point and switching status display (LED)<br>- Compressor : Silent type, 1 unit<br>Oil-lubricated, Extremely quiet (45 dB (A)) compressor.<br>With pressure regulator and water separator.Pressure: 800 kPa (8 bar) Pmax, Performance: 50 l/min, Reservoir capacity: 24 l, Compressed air outlet: ¼" or KD4, Noise level: 45 dB (A)/1 m, Duty cycle: max. 50 %, Pressure regulator valve with gauge, Design: 230 V/50 Hz<br>**2. Testing Station**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>- PLC Board<br>- Control Panel<br>- Work pieces<br>- Power Supply<br>- PLC software<br>- Programming cable<br>- Sensors:<br>The Testing station employs all basic types of industrial sensors in typical applications:<br>optical<br>capacitive proximity sensors and<br>optical retro-reflective sensors.<br>supplemented by various cylinder limit switches (inductive, magnetic).<br>-Technical data<br>• Operating pressure 600 kPa (6 bar)<br>• Power supply 24 V DC<br>• 8 digital inputs<br>• 5 digital outputs<br>- Trolley | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Height (incl. castors, to bottom edge of profile plate): 750 mm<br>• Width: 350 mm<br>• Depth: 700 mm<br>- Control console<br>• Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector<br><br>• Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel<br>• fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br><br>-Programmable Logic Controller-EduTrainer Universal Preferred versions MPS®/MPS® PA A4 rack with built-in power supply 24 V DC power supply integrated<br>• 32 bit MIPS processor, 400 MH<br>• Data memory 32 MB flash/32 MB<br>• 20 MB flash/8 MB RAM user memory<br>• 32 KB non-volatile memory<br>• Communication network Ethernet 10/100 Base-T<br>• Integrated web server<br>• Master CANopen<br>• Diagnostic handheld for CPX terminal can be connected<br>• 1 set Desktop computer<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br>- Cable guide<br>- Cable holder<br>- CP valve terminals<br>- Electrical mounting system<br>- Lifting module<br>- Measuring module<br>• Linear displacement sensor (conductive plastic potentiometer):<br>Measuring range: 25 mm<br>Resistance: 1 k.<br>• Comparator:<br>Nominal switching distance: up to max. 400 mm (adjustable)<br>Power supply: 24 V DC<br>Switch outputs: 3, PNP, normally open contact<br>Analogue input: 0 – 10 V<br>- On-off valve with filter regulating valve<br>• Filter regulator with pressure gauge, on-off valve, quick push-in connections and quick couplings, mounted on a swivel support.<br><br>- Pneumatic slide module<br>- Profile plate connector<br>- Recognition module<br>• comprises two different sensors and a mounting bracket<br>• Power supply: 24 V DC<br>• Switch outputs: PNP, normally open contact<br>• Connection cable: 3-pin<br>• Capacitive sensor: 2 – 8 mm (adjustable)<br>• Optical sensor: up to max. 400 mm (adjustable)<br>- Retro-reflective sensor<br>- Station link receiver<br>- Slide module<br>• universally mounted on a profile.<br>• can be adjusted by means of the flow control valve on the underside of the slide<br>• Length: 220 mm<br>• Operating pressure: 600 kPa (6 bar)<br>- Workpiece set “Cylinder bodies”<br>**3. Processing Station**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>- PLC Board | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | - Control Panel<br>- Work pieces<br>- Power Supply<br>- PLC software<br>- Programming cable<br>- Drilling operation<br>• Power supply 24 V DC<br>• 8 digital inputs<br>• 8 digital outputs<br>- Trolley<br>• Height (incl. castors, to bottom edge of profile plate): 750 mm<br>• Width: 350 mm<br>• Depth: 700 mm<br>- Control console<br>• Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector<br><br>• Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel<br>• fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br><br>- Programmable Logic Controller-EduTrainer Universal Preferred versions MPS®/MPS® PA A4 rack with built-in power supply 24 V DC power supply integrated<br>• 32 bit MIPS processor, 400 MH<br>• Data memory 32 MB flash/32 MB<br>• 20 MB flash/8 MB RAM user memory<br>• 32 KB non-volatile memory<br>• Communication network Ethernet 10/100 Base-T<br>• Integrated web server<br>• Master CANopen<br><br>• Diagnostic handheld for CPX terminal can be connected<br><br>1 set Desktop computer<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br>- Aluminium profile plate<br>• 350 x 700 mm<br>• Grid Dimension: 50mm<br>- Cable holder<br>- Clamping/ejecting module<br>- For mounting on a profile plate.<br>- An electrical solenoid is used for the drive<br>- Drive, with working stroke of 9 mm.<br>- For mounting directly on the conveyor.<br>• Working stroke: 9 mm<br>• Voltage: 24 V DC<br>• Output: 7 W<br>- Drilling module<br>• Height: 360 mm<br>• Working stroke: 100 mm<br>• Power supply: 24 V DC<br>• Nominal current DC motor: 0.3 A<br>• Nominal current drill: 0.5 A<br>- Electrical mounting system<br>- Profile plate connector<br>- Relay<br>- Rotary indexing table module<br><br>• Rotary indexing table with 6 workpiece positions. The table is driven by a DC-geared motor with a series resistor.<br><br>• Workpiece positions: 6<br>• Diameter: 350 mm<br>• Height: 125 mm<br>• Nominal voltage: 24 V<br>• Nominal rotational speed: 6 r.p.m. (with series resistor 47.)<br>• Nominal current: 0.15 A (with series resistor 47.)<br>• Nominal current: 0.5 A | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • The end positions (6 x 60°) can be sensed by means of an optional inductive sensor. An optional capacitive sensor for workpiece sensing can also be mounted under each workpiece position.<br>- Sensor, inductive<br>• Inductive sensor for end-position interrogation on the rotary indexing table Nominal switching distance: 2.5 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open contact<br>• Connection cable: 3-pin<br>- Sorting gate module, electrical C34<br>- Branch module, electrical: For mounting on a profile plate. Voltage 24 V DC Rating 7 WFor mounting on a profile plate. An electrical solenoid is used for the drive<br>• Voltage: 24 V DC<br>• Output: 7 W<br>- Station link receiver<br>- Testing module<br>• consists of a solenoid probe with an inductive sensor for sensing.<br>• used for the testing of workpieces: simple drill-hole checking, simple height checking, workpiece position checking.<br>- Solenoid actuator:<br>• Working stroke: 10 mm<br>• Voltage: 24 V DC<br>• Output: 7 W<br>- Inductive sensor:<br>• Nominal switching distance: 2.5 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open contact<br>• Connection cable: 3-pin<br>**4. Handling Station**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>- PLC Board<br>- Control Panel<br>-Work pieces<br>-Power Supply<br>- PLC software<br>- Programming cable<br>-Technical data<br>• Operating pressure 400 kPa (4 bar)<br>• Power supply 24 V DC<br>• 8 digital inputs<br>• 5 digital outputs<br>- Control console<br>• Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector<br>• Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel<br>• fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br>- Programmable Logic Controller-EduTrainer Universal Preferred versions MPS®/MPS® PA A4 rack with built-in power supply 24 V DC power supply integrated<br>• 32 bit MIPS processor, 400 MH<br>• Data memory 32 MB flash/32 MB<br>• 20 MB flash/8 MB RAM user memory<br>• 32 KB non-volatile memory<br>• Communication network Ethernet 10/100 Base-T<br>• Integrated web server<br>• Master CANopen<br>• Diagnostic handheld for CPX terminal can be connected<br>1 set Desktop computer | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br>- Compressor: Silent type, 1 unit<br>Oil-lubricated, Extremely quiet (45 dB (A)) compressor.<br>With pressure regulator and water separator.Pressure: 800 kPa (8 bar) Pmax, Performance: 50 l/min, Reservoir capacity: 24 l, Compressed air outlet: ¼" or KD4, Noise level: 45 dB (A)/1 m, Duty cycle: max. 50 %, Pressure regulator valve with gauge, Design: 230 V/50 Hz<br><br>- Aluminium profile plate<br>• 350 x 700 mm<br>• Grid Dimension: 50mm<br>- PicAlfa module, pneumatic<br>• Universal 2-axis handling device for "Pick & Place" tasks. Stroke length, inclination of the axes and arrangement of the end-position sensors and mounting position can be adjusted.<br><br>• Linear drive: 600 mm stroke length, 3 end-position sensors<br><br>• Flat cylinder: 80 mm stroke length, 2 end-position sensors<br><br>• Pneumatic gripper<br>• Height: 700 mm<br>• Width: 220 mm<br>• Length: 730 mm<br>• gripper<br>- Holder module<br>-Diffuse sensor<br>• diffuse sensor can be mounted directly in the pickup module, at the end of a slide or on a gripper<br><br>- complete with bracket for mounting on a profile or profile plate<br><br>- diffuse sensor includes a holder for mounting on the conveyor guide rail profile or a slide.<br>• Nominal switching distance: 30 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open/normally closed contact<br>• Connection cable: 4-pin<br>- Slide module<br>• with a retainer for mounting on a profile plate<br>• Application: As end slide or segregating slide<br>• Length: 250 mm<br>• Standard height: 117 – 20 mm (adjustable)<br>- CP valve terminals<br>- On-off valve with filter regulating valve<br><br>• Filter regulator with pressure gauge, on-off valve, quick push-in connections and quick couplings, mounted on a swivel support.<br><br>- Profile plate connector<br>- Station link receiver<br>- Electrical mounting system<br>- Cable holder<br>**5. Sorting Station**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>- PLC Board<br>- Control Panel<br>- Work pieces<br>- Power Supply<br>- PLC Software<br>- Programming cable<br>Sorting gates with short-stroke cylinder<br>Sensors<br>Guide rails<br>Conveyor motor<br>- **Technical data**<br>• Operating pressure 600 kPa (6 bar)<br>• Power supply 24 V DC<br>• 8 digital inputs<br>• 4 digital outputs<br>- Trolley<br>• Height (incl. castors, to bottom edge of profile plate): 750 mm<br>• Width: 350 mm | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Depth: 700 mm<br>- Control console<br>• Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector<br><br>• Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel<br>• fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br><br>- Programmable Logic Controller-EduTrainer Universal Preferred versions MPS®/MPS® PA A4 rack with built-in power supply 24 V DC power supply integrated<br>• 32 bit MIPS processor, 400 MH<br>• Data memory 32 MB flash/32 MB<br>• 20 MB flash/8 MB RAM user memory<br>• 32 KB non-volatile memory<br>• Communication network Ethernet 10/100 Base-T<br>• Integrated web server<br>• Master CANopen<br><br>• Diagnostic handheld for CPX terminal can be connected<br><br>1 set Desktop computer<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br>- Aluminium profile plate<br>• 350 x 700 mm<br>• Grid Dimension: 50mm<br>- Cable holder<br>- Conveyor module 350 with DC motor<br>• complete with DC motor<br>• For the transport of workpieces of 40 mm diameter (or for the transport of workpiece carriers)<br>• Transport distance: 350 mm<br>• DC motor: 24 V DC/1.5 A<br>- CP valve terminals<br>- Diffuse sensor<br>- Electrical mounting system<br>- Inductive sensor<br>- On-off valve with filter regulating valve<br><br>• quick push-in connections and quick couplings, mounted on a swivel support<br><br>- Profile plate connector<br>- Retro-reflective sensor<br><br>• complete with brackets for mounting on a profile or profile plate.<br><br>• Operating distance: 10 – 700 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open/normally closed contact<br>• Connection cable: 4-pin<br>- Set of guide rails, Sorting<br>• Operating distance: 10 – 700 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open/normally closed contact<br>• Connection cable: 4-pin<br>- Slide module<br>- Sorting gate module, pneumatic<br>- Starting current limiter<br>• can be mounted on a DIN rail. Electrical connection is by means of screw terminals<br>• Control voltage: 24 V DC<br>• Current: 1 A<br>• Current limitation at switching torque: to 2 A<br>- Stopper module<br>• Complete with double-acting short-stroke cylinder, sensors and cable with mounting accessories for conveyor profile | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • For mounting on a conveyor. Complete with one double-acting short-stroke cylinder, two sensors for end-position sensing and mounting accessories.<br>**6. Mechatronic assistant software**<br>•Design and Simulation program<br>•Project details for each Mechatronics station including robot, Risk minimization and Analysis, communication via ProfiBus-DP and communication via process Input/Output<br>•Includes Technical documentation such as Assembly Instructions, construction drawing, Data sheets for individual components, Manuals, Operating Instructions, Parts List and programming and exercise.<br>•Fundamentals and Introduction for each Mechatronics Module such as PLC programming, production, robotics, sensors in automated system, solenoid and vacuum technology<br>•Multi-Media presentation:<br>a. Animation, Assembly and sequence<br>b. Autocad<br>c. Fault list<br>d. Combinations of each mechatronics stations equipment with photo such as:<br>1. Distribution and Testing Stations<br>2. Distribution and Sorting Stations<br>3. Process and Handling Stations<br>4. Robot and Assembly Stations<br>Complete system: Integration of different mechatronics stations, SCADA with virtual, Converyor system, camera, monitoring and vision inspection<br>•Mechatronics outline and training syllabus,Presentations, Video and word template for commissioning, terminal allocation, project plan, sequence description, set up and testing<br>**7. Coloured Laser Printer** : Docuprint, 5ppm colour and 25ppm monochrome print speed (or better)<br>8. Package should come with complete training program, laboratory manuals/workbooks, and after sales support. | | |
| **63** | **1** | **assy** | **Complete Robotic System and Assembly Station**<br>**A. Robotic System**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>High-precision<br>6-axis articulated arm robot with extended mobility for minimal cycle times.<br>Complete with :<br>controller,<br>programming cable,<br>1 set of batteries and<br>the Teachbox<br>The Robot station transports workpieces that are fed via a slide and place them in an assembly retainer.<br>The sensor in the gripper to enable the robot to differentiate workpieces by colour (black/non-black).<br>The sensor in the assembly retainer to monitor the orientation of the workpiece.<br>From the assembly retainer the robot sorts the workpieces into various magazines or passes them on to the downstream station.<br>Combination with the assembly station facilitates the assembly of workpieces.<br>The new drive unit is small, powerful and lightweight and fits into the MODULAR PRODUCTION SYSTEM (MPS).<br>**Technical data:**<br>• Operating pressure 6 bar (600 kPa)<br>• Power supply 24 V DC<br>• 4 digital inputs<br>• 2 digital outputs<br>> Training aims for project work<br>Mechanical: | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Mechanical set-up of a station<br>Sensors: Correct application of limit switches<br>PLC: • Programming and application of a PLC<br>Robotics:<br>• Applications of robots<br>• Fundamentals of robotics<br>• Robot terminology<br>• Robot programming<br>Assembly technology:<br>• Introduction to and application of automated assembly technologies<br>• Planning an assembly station<br>Commissioning: Commissioning of the entire sequence<br>*Accessories/Components:*<br>Silent type Compressor<br>Oil-lubricated, Extremely quiet (45 dB (A)) compressor.<br>With pressure regulator and water separator.Pressure: 800 kPa (8 bar) Pmax, Performance: 50 l/min, Reservoir capacity: 24 l, Compressed air outlet: ¼" or KD4, Noise level: 45 dB (A)/1 m, Duty cycle: max. 50 %, Pressure regulator valve with gauge, Design: 230 V/50 Hz<br>1 set desktop computer<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br>1. Trolley •<br>Height (incl. castors, to bottom edge of profile plate): 750 mm, Width: 350 mm, Depth: 700 mm<br>2. Workpiece set "For cylinder assembly"<br>The workpiece set consisting of cylinder components for full assembly (body, piston, spring, cover). The cylinders can be assembled and dismantled many times.<br>• External diameter: 40 mm<br>• Height (black): 22.5 mm<br>• Height (red and aluminium): 25 mm<br>3. Tabletop power supply unit<br>• Input voltage: 85 – 265 V AC (47 – 63 Hz)<br>• Output voltage: 24 V DC, short-circuit-proof<br>• Output current: max. 4.5 A<br>• Dimensions: 75 x 155 x 235 mm<br>4. Programming instructions for robot<br>5. Technical manual for robot<br>6. Robotics Simulation software<br>- technical documentation including instructions on processing.<br>- 3D real-time simulation<br>- Programming environment for IRL (Industrial Robot Language), programming languages Movemaster Command and robot systems.<br>- Library with pick & place tasks<br>7. Aluminium profile plate<br>• Sizes: 350 x 700 mm<br>• Grid Dimension: 50mm<br>8. Cable holder<br>9. Angle Slide module<br>The slide comes complete with a retainer for mounting on a profile plate.<br>•Application: As angled end slide or segregating slide<br>•Length: 170 mm<br>•Standard height: 170 - 100 mm (adjustable)<br>The slide comes complete with a retainer for mounting on a profile plate.<br>• Application: As angled end slide or segregating slide<br>• Length: 170 mm<br>• Standard height: 170 – 100 mm (adjustable)<br>10. CP valve standalone<br>11. Electrical mounting system<br>12. Diffuse sensor<br>• Nominal switching distance: 30 mm<br>• Power supply: 24 V DC<br>• Switch output: PNP, normally open/normally closed contact<br>• Connection cable: 4-pin<br>13. On-off valve with filter regulating valve | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | - Filter regulator with pressure gauge, on-off valve, quick push-in connections and quick couplings, mounted on a swivel support.<br>14. Piston pallet<br>– Pallet for the storage of 4 pistons (“Cylinder for assembly” workpiece set). (10 mm diameter and 16 mm diameter from workpiece set "For cylinder assembly").<br>- Pallet size: 2 x 4 locations<br>- Height: 20 mm<br>- Width: 90 mm<br>- Length: 140 mm<br>15. Gripper, pneumatic<br>16. Profile plate connector<br>- Length: 45 mm<br>- Mounting method: Bolt with rotating head and M6 hammer-head nut<br>17. Separating module (springs)<br>- Height: 260 mm<br>- Width: 70 mm<br>- Length: 220 mm<br>18. Slide module<br>- Height: 260 mm<br>- Width: 70 mm<br>- Length: 220 mm<br>19. Stacking magazine module (end caps)<br>- Height: 190 mm<br>- Width: 60 mm<br>- Length: 290 mm<br>20. Station link receiver<br>21. Through beam sensor<br>- Nominal switching distance: 80 mm<br>- Power supply: 24 V DC<br>- Switch output: PNP, normally open/normally closed contact<br>- Connection cable: 4-pin<br>22. Holder module<br>The Holder module comes complete with a holder for mounting on a profile plate.<br>- Application: As horizontal workpiece holder at the end of an inclined slide<br>- Standard height: 40 – 60 mm (adjustable)<br>23. • Retaining module<br>• The retaining module has two setdown positions. The upper setdown position allows workpieces to be set down independent of their orientation. The lower setdown position has a locking pin. Workpieces (cylinder bodies) have to be inserted in the correct orientation.<br>• The holding pin ensures that the cylinder body does not turn during assembly of the cap.<br>• Inclusive Teachdorn for robot<br>24. Terminals and series resistors<br>25. Robot Teachbox<br>**B. Assembly station**<br>The assembly station works in conjunction with the robot station and can be program using Automation Suite or Automation Suite Mechatronics<br>It supplies cylinder components for the assembly process: A double-acting cylinder pushes the cylinder caps out of the stacking magazine.<br>The pistons are stored on a pallet.<br>A double-acting cylinder pushes the springs out of a slim magazine.<br><u>Technical data:</u><br>- Operating pressure 6 bar (600 kPa)<br>- Power supply 24 V DC<br>- 8 digital inputs<br>- 3 digital outputs<br><u>Accessories/Components:</u><br>1. Trolley<br>- Height (incl. castors, to bottom edge of profile plate): 750 mm<br>- Width: 350 mm<br>- Depth: 700 mm | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | 2. Control console - Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector.<br>- Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel.<br>- fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br>3. Programmable Logic Controller-EduTrainer Universal Preferred versions<br>- A4 rack with built-in power supply 24 V DC power supply integrated<br>- 32 bit MIPS processor, 400 MH<br>- Data memory 32 MB flash/32 MB<br>- 20 MB flash/8 MB RAM user memory<br>- 32 KB non-volatile memory<br>- Communication network Ethernet 10/100 Base-T<br>- Integrated web server<br>- Master CANopen<br>- Diagnostic handheld for CPX terminal can be connected<br>- All FEDs can be connected via Ethernet<br>- Visualisation OPC server for connection to any SCADA packages<br>4. Aluminium profile plate<br>- 350 x 700 mm<br>- Grid Dimension: 50mm<br>5. Cable holder<br>6. CP valve terminals<br>7. Electrical mounting system<br>8. On-off valve with filter regulating valve<br>- Filter regulator with pressure gauge, on-off valve, quick push-in connections and quick couplings, mounted on a swivel support.<br>9. Piston pallet<br>- Pallet for the storage of 4 pistons (“Cylinder for assembly” workpiece set). (10 mm diameter and 16 mm diameter from workpiece set "For cylinder assembly").<br>- Pallet size: 2 x 4 locations<br>- Height: 20 mm<br>- Width: 90 mm<br>- Length: 140 mm<br>10. Profile plate connector<br>11. Separating module (springs)<br>- Height: 260 mm<br>- Width: 70 mm<br>- Length: 220 mm<br>The module separates springs (“Cylinder for assembly” workpiece set) from a gravity-fed magazine and makes them available to the assembly process.<br>A double-acting cylinder moves the springs to the transfer point.<br>A micro switch detects whether there is a spring in the transfer point.<br>12. Slide module<br>The slide comes complete with a retainer for mounting on a profile plate.<br>13. Stacking magazine module (end caps)<br>- Height: 190 mm<br>- Width: 60 mm<br>- Length: 290 mm<br>14. Station link receiver<br>Through beam sensor<br>- Nominal switching distance: 80 mm<br>- Power supply: 24 V DC<br>- Switch output: PNP, normally open/normally closed contact<br>- Connection cable: 4-pin<br>15. Desktop computer (1set) | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better | | |
| 64 | 1 | assy | **SCADA system and visualization with control and monitoring system**<br>Can be integrated to any Mechatronics module<br>System visualization and operation on basis of industrial SCADA software. communication between SCADA and controllers takes place via Profibus DP. PC-based control and monitoring system designed for the visualization and control of processes, sequences and<br><br>machines.The package consists of a configuration (development) system and a runtime system for 1024 variables (PowerTags). Coupling with S5, S7, Profibus (DP) is integrated into the system. Coupling with other systems on request. Supplied on CD-ROM.<br>The SCADA system includes a Personal computer with TFT monitor (Specs: Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better) | | |
| 65 | 1 | assy | **Conveyor system:**<br>**MPS 500**<br>MPS with Interface to Stations<br>- Dimensions main loop: 3000 X 500 mm<br>- Base: aluminum profiles<br>- Track with: 40mm<br>- Identifications System: 6 inductive sensors for identification of pallets<br>- Interface to stations: 6X8 inputs / 8 outputs Syslink terminal IEEE488 24 pin<br>- Pneumatic valves: 6 valves (5/2 way)<br>- Number of stop gates: 6<br>- Stopper: short stroke cylinder type AEVUZ, stroke 10mm<br>- Motor data: 4 motors, 3 phase 220 V<br>- Workpiece carriers: 8 carriers, dimensions: 9x8 cm with pallet (11x16.4 cm)<br>- Transportation speed: p to 9m/min<br>- Total number of sensors: 24 (18X inductive, 6x light barrier)<br>- Total number of pn actuators: 6 short stroke cylinders<br>- Control cabinet: PLC board with frequency controller for speed variations<br>- Motor control: frequency converter<br>- Communication to I/O: AS interface<br>- Emergency stop system: emergency stop boards with two buttons on the system<br>- Operation panel: ON/OFF/ERROR/CONTROLLER<br>- Pneumatic maintenance unit: pressure gauge, water separator, 3/2 way valve manually actuated<br>- Operation pressure: 6 bar<br>- Power supply: 220 V VDC with PLC 16 DI/DO, 4 Analog Input, 2 Analog Output | | |
| 66 | 1 | assy | **Vision Inspection Station**<br>Sensor: 1/3" CMOS colour global shutter progressive scan<br>Resolution: 752 x 480 Pixel<br>Optics CS-Mount, C-Mount<br>Digital I/O 2 Inputs, 3 Outputs<br>Light Integrated ring LED light<br>External Port, for 10/100 Mbps Ethernet connection<br>PLC 16 DI/DO, 4 Analog Input, 2 Analog Output | | |
| 67 | 1 | assy | **Automation Suite for Robot and Mechatronics System and Handling station**<br><br>**The Automation Suite simulation software:**<br>Is a software used in training centers and in industry . It consists of five individual simulation software in a single system, carefully matched program packages with a very realistic 3D simulation of simple to very complex automation systems. The numerous learning scenarios can be adapted and extended individually.<br><br>**INCLUDES THE FOLLOWING:**<br>**1. Automation Suite Robotics**<br>Function:<br>•Programming, comission and simulating different Industrial robots system such as (KUKA, ABB, Adept-Compiler and Mitsubishi robots). | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • 3D Display (with rendering)<br>• Simulation (multi-robot)<br>• Simulation (multi-PLC)<br>• Configurable work cell window<br><br>**2. Automation Suite Mechatronics**<br>• Is a virtual learning Environment for Mechatronics focus on PLC programming and control<br><br>• 3D Display (with rendering)<br>• Mechatronics learning module + user interface<br>• Configurable work cell window<br>• Permanently configured OPC interface<br>• Manual control environment<br>**3. Automation Suite Advanced Mechatronics**<br>• Is a virtual learning Environment for Advance Mechatronics enables<br>flexiby set up individual Mechatronics stations for Mechatronic plant system with a distributed control architecture, commission and control<br><br>• 3D Display (with rendering)<br>• Mechatronics learning module + user interface<br>• Simulation of ( 1 PLC + Download to the mechatronics station)<br><br>• Simulation of ( Multi-PLC + Download to the mechatronics station )<br><br>• Simulation of ( Multi-PLC )<br>• Simulation of learning environment for trouble shooting<br>• Modelling (CAD+ import, mechanism)<br>• Modelling ( Layout editor + ICM library)<br>• Permanently configured OPC interface<br>• Manual control environment<br>• Configurable work cell window<br>**4. Automation Suite Production**<br>• 3D Display (with rendering)<br>• Simulation (multi-robot)<br>• Simulation of ( Multi-PLC + Download to the mechatronics station )<br><br>• Modelling (CAD+ import, mechanism)<br>• Control station (without Hardware driver)<br>• Production Management<br>**5. Automation Suite Studio**<br>Function:<br>•Programming, comission and simulating different Industrial robots system such as (KUKA, ABB, Adept-Compiler and Mitsubishi robots).<br><br>• 3D Display (with rendering)<br>• Simulation (multi-robot)<br>• Simulation (multi-PLC)<br>• Simulation of ( 1 PLC + Download to the mechatronics station)<br><br>• Simulation of ( Multi-PLC + Download to the mechatronics station )<br><br>• Simulation of ( Multi-PLC )<br>• Modelling (CAD+ import, mechanism)<br>• OPC interface (Freely configurable)<br>• Permanently configured OPC interface<br>• Manual control environment<br>• Production Management<br>**Handling station, pneumatic: All-rounder with pneumatic linear drive:**<br>( capable for different combinations and can be Integrated to Automations Suite Mechatronics)<br>**Technical data**<br>Operating pressure 400 kPa (4 bar)<br>Power supply 24 V DC<br>8 digital inputs<br>5 digital outputs<br>**Training aims for project work**<br>Mechanical:<br>Mechanical set-up of a station<br>Pneumatics: | | |

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| | | | Installation of tubing for pneumatic components<br>Pneumatic grippers<br>Pneumatic linear drives<br>Electrical:<br>Correct wiring of electrical components<br>Sensors:<br>Correct application of limit switches<br>PLC:<br>Programming and application of a PLC<br>Control of a handling device<br>Commissioning:<br>Commissioning of the entire sequence<br>Optimisation of cycle time<br>Safety in the event of loss of pneumatic or electrical power<br>**Accessories/Components:**<br>Desktop Computer (1 unit)<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better<br><br>1. Trolley<br>The trolley makes an MPS® station a compact and mobile unit. The station is easy to mount on the trolley. An EMERGENCY-STOP board can also be fitted. Appropriate through-holes in the side and rear panels enable orderly routing of cables. The front side is equipped with mountings for the control panel. The trolley is supplied complete with castors.<br><br>Height (incl. castors, to bottom edge of profile plate): 750 mm<br>Width: 350 mm<br>Depth: 700 mm<br>2. Control console<br>- allows simpler operation of the MPS® station. SysLink or AS-interface – various interfaces ensure versatility of use. Fully assembled with operating panel, communication panels, spare panel and mounting frame with SysLink connector.<br><br>- Membrane keyboard: Start pushbutton with LED, Stop pushbutton, Reset pushbutton with LED, 2 flexibly assignable control lamps, 4 mm safety sockets with LED status display for simple I/O connection. Syslink and Sub-D sockets for connection to PLC of choice are available on the rear panel.<br><br>- fully assembled with AS-interface control console, communication panels, spare panel and mounting frame with AS-interface connector.<br>3. Programmable Logic Controller-EduTrainer Universal Preferred versions<br><br>- rack with built-in power supply 24 V DC power supply integrated<br><br>-32 bit MIPS processor, 400 MH+D1209:D1228<br>- Data memory 32 MB flash/32 MB<br>- 20 MB flash/8 MB RAM user memory<br>- 32 KB non-volatile memory<br>- Communication network Ethernet 10/100 Base-T<br>- Integrated web server<br>- Master CANopen<br>- Diagnostic handheld for CPX terminal can be connected<br>- All FEDs can be connected via Ethernet<br>- Visualisation OPC server for connection to any SCADA packages<br>4. Aluminium profile plate<br>- 350 x 700 mm<br>- Grid Dimension: 50mm<br>5. PicAlfa module, pneumatic<br>Universal 2-axis handling device for “Pick & Place” tasks. Stroke length, inclination of the axes and arrangement of the end-position sensors and mounting position can be adjusted.<br>- Linear drive: 600 mm stroke length, 3 end-position sensors<br><br>- Flat cylinder: 80 mm stroke length, 2 end-position sensors<br>- Pneumatic gripper<br>- Height: 700 mm<br>- Width: 220 mm<br>- Length: 730 mm<br>- gripper<br>6. Holder module | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | 7. Diffuse sensor<br>The fibre optic diffuse sensor can be mounted directly in the pickup module, at the end of a slide or on a gripper.The diffuse optical sensor comes complete with bracket for mounting on a profile or profile plate. The fibre-optic diffuse sensor includes a holder for mounting on the conveyor guide rail profile or a slide.<br><br>- Nominal switching distance: 30 mm<br>- Power supply: 24 V DC<br>- Switch output: PNP, normally open/normally closed contact<br>- Connection cable: 4-pin<br>8. Slide module<br>The slide comes complete with a retainer for mounting on a profile plate.<br><br>- Application: As end slide or segregating slide<br>- Length: 250 mm<br>- Standard height: 117 – 20 mm (adjustable)<br>9. CP valve terminals<br>10. On-off valve with filter regulating valve<br>Filter regulator with pressure gauge, on-off valve, quick push-in connections and quick couplings, mounted on a swivel support.<br>11. Profile plate connector<br>12. Station link receiver<br>13. Electrical mounting system<br>14. Cable holder<br>15. Silent type Compressor<br>Oil-lubricated, Extremely quiet (45 dB (A)) compressor.<br>With pressure regulator and water separator.Pressure: 800 kPa (8 bar) Pmax, Performance: 50 l/min, Reservoir capacity: 24 l, Compressed air outlet: ¼“ or KD4, Noise level: 45 dB (A)/1 m, Duty cycle: max. 50 %, Pressure regulator valve with gauge, Design: 230 V/50 Hz | | |
| **68** | **4** | **set** | **Robotics Starter Kit**<br>Compatible with LABView<br>Specifications:<br>1. Ultrasonic Sensor<br>Supply voltage: 5VDC<br>Supply Current: 30 mA, typ; 35 mA max<br>- Range: 2cm to 3cm<br>Input trigger: positive TTL pulse, 2microS min, 5microS typ<br>- Echo pulse: positive pulse, 115 microS to 18.5 ms<br>- Echo holdoff: 750 micros from fall of trigger pulse<br>2. Burst frequency: 40 kHz for 200 microS<br>- Burst indicator: LED shows sensor activity<br>Delay before next measurement: 200 microS<br>- Size(HxWxD): 2mmx46mmx16mm<br>3. DC Motors<br>Supply voltage: 12V<br>Torque: 300 oz-in.<br>RPM: 152<br>-Encoders<br>Supply voltage: 5V<br>- Cycles per revo: 100 CPR<br>Pulses per revo: 400 PPR<br>4. NI sbRIO-9632<br>Network<br>Network interface: 10 BaseT and 100BaseTX<br>- Ethernet<br>Compatibility: IEEE 802.3<br>Communication rates: 10 Mbps, 100 Mbps, auto-negotiated<br>- Max cabling distance: 100 m/segment<br>5. RS-232 DTE Serial Port<br>Baud rate support: Arbitrary<br>Max baud rate: 115,200 bps<br>Data bits: 5, 6, 7,8<br>Stop bits: 1, 2<br>Parity: Odd, Even, Mark, Space, None<br>Flow control: RTS/CTS, XON/XOFF, DTR/DSR, None<br>6. Processor Speed<br>NI sbRIO-9611/9631/9641: 266 MHz<br>NI-sbRIO-9612,9632/9642 and NI sbRIO-96x2XT: 400MHz<br>7. Memory<br>Non-volatile Memory: | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | NI sbRIO-9611/9631/9641:128 MB<br>NI-sbRIO-9612,9632/9642 and NI sbRIO-96x2XT: 256 MB<br>System memory<br>NI sbRIO-9611/9631/9641:64 MB<br>NI-sbRIO-9612,9632/9642 and NI sbRIO-96x2XT: 128 MB<br>8. Xilinx Spartan-3<br>Reconfigurable FPGA<br>Number of logic cells<br>NI sbRIO-9611/9631/9641:17,280<br>NI-sbRIO-9612,9632/9642 and NI sbRIO-96x2XT: 46,080<br>Available embedded RAM<br>NI sbRIO-9611/9631/9641: 432 kbits<br>NI-sbRIO-9612,9632/9642 and NI sbRIO-96x2XT: 720 kbits<br>9. 3.3 V Digital I/O<br>Number of DIO channels: 110<br>Max tested current per channel: 3 mA<br>Max total current, all lines: 330 mA<br>Max tested DIO frequency: 10 mHz<br>Input logic levels<br>Input high voltage, VIH: 2.0 V min; 5.25 V max<br>Input low voltage, VIL: 0 V min; 0.8 V max<br>Output logic levels<br>Output high voltage, VOH, sourcing 3mA: 2.7 V min; 3.3 V max<br>Output low voltage, VOL, sinking 3 mA: 0.07 V min; 0.54 V max<br>Overvoltage protection (max 2 pins in overvoltage)<br>NI sbRIO-961x/963x/964x (-20 to 550C): ±20 V<br>NI sbRIO-96x2XT (-20 to 85oC): ±20 V<br>(-24 to -20oC): ±7 V<br>Posistor (PR18BB330MS1RB from Murata)<br>Max peak abnormal-condition current: 760 mA<br>Max hold current at 25oC: 36 mA<br>Max hold current at 70oC: 20 mA<br>Max hold current at 85oC (NI sbRIO-96x2XT only): 3 mA<br>Trip current at 25oC: 71 mA<br>Resistance at 25oC: 33Ω ±20%<br>10. Analog input<br>Number of channels: 32 single-ended or 16 differential analog input channels<br>ADC resolution: 16 bits<br>Differential nonlinearity: no missing codes guaranteed<br>Integrated nonlinearity: refer to Al Absolute Accuracy tables and formulas<br>Conversion time: 4.00 microS(250 kS/s)<br>Input coupling: DC<br>Nominal input ranges: ±10 V, ±5 V, ±1 V, ±0.2 V<br>Minimum overrange (10 V range): 4%<br>Max working voltage for analog inputs (signal + common mode): within ±10.4 V each channel<br>Input impedance (Al-to-Al GND)<br>Powered on: >10 GΩ in parallel with 100 pF<br>Powered off/overload: 1.2 kΩ miN<br>Crosstalk (at 100 kHz)<br>Adjacent channels: -65 dB<br>Non adjacent channels: -70 dB<br>Small signal bandwith: 700 kHz<br>Over voltage protection<br>Al channel: ±24 V (one channel only)<br>AISENSE: ±24 V<br>CMRR (DC to 60 Hz): 62 dB<br>±120 ppm of full-scale step (±8 LSB): 4 µS convert interval, 5.5 µS (from 50 to 85oC)<br>±30 ppm of full-scale step (±2 LSB): 8 µS convert interval<br>Analog triggers<br>Number of triggers: 1<br>Resolution: 10 bits, 1 in 1,024<br>Bandwidth (-3 dB): 700 kHz<br>Accuracy: ±1% of full size<br>11. Analog Output (NI sbRIO-963x/9632XT and NI sbRIO-964x/9642XT Only)<br>Analog input channels: 4<br>DAC resolution: 16 bits<br>Type of DAC: string<br>Output range: ±10V | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | Operating Voltage<br>Nominal: ±10.7 V<br>Minimum: ±10.3 V<br>Maximum: ±11 V<br>Current drive: ±3 mA per channel<br>Output impedance: ±10 V<br>Stability<br>Offset drift: 80 µV/oC<br>Gain drift: 6 ppm/oC<br>Protection<br>Overvoltage: ±25 V at 25 oC<br>Short-circuit: indefinitely<br>Power on voltage: 0 V<br>Update time<br>One channel in use: 3 µs<br>Two channels in use: 5µs<br>Three channels in use: 7.5 µs<br>Four channels in use: 9.5 µs<br>Noise<br>Updating at 100 kS/s: 600 µVrms<br>Not updating: 260 µVrms<br>Slew rate: 4 V/µs<br>Crosstalk: 76dB<br>Setting time (100 pF load to 1 LSB)<br>FS step: 20 µs<br>3 V step: 10 µs<br>0.1 V step: 8 µs<br>Glitch energy (256 steps, worst case): 2 mV for 2 µs<br>Capacitive drive: 1,500 pF min<br>Monotonicity: 16 bits<br>Differential nonlinearity: -1 to 2 LSBs max<br>Integrated nonlinearity (endpoint): 16 LSBs max<br>12. Power Limits<br>5 V pins (P2, P3, P4, P5): +5 V ±5%, 2 A max (shared with C series modules)<br>13. Power Requirements<br>Power supply voltage range: 19-30 VDC<br>Power supply current limit: 1.8 A<br>Power connector internal fuse: 2 A (non-replaceable)<br>Max Pint<br>NI sbRIO-961x/9612XT: 7.50 W<br>NI sbRIO-963x/9632XT: 7.75 W<br>NI sbRIO-964x9642XT: 8.00 W<br>Max PDIO:1.28 W<br>PDIO = Total DIO Current x 3.3 V/0.85<br>Max P5V<br>P5V = Total 5 V Output Current x 5 V/0.9<br>Max PCSer: 3.3 W; each installed C series module consumes up to 1.1 W<br>Back-up battery: 3 V lithium coin cell, BR2032 (-40 to 85 oC)<br>14. Safety Voltages<br>V terminal to C terminal: 35 VDC max, measurement category 1)<br>15. Environmental<br>NI sbRIO-96xx//96x2XT: intended for indoor use only<br>Ambient temperature in enclosure (IEC 60068-2-1, IEC 60068-2-2)<br>NI-sbRIO-96x/963x/964x: -20 to 55 oC<br>NI-sbRIO-96x/2XT: 40 to 85 oC<br>Storage temperature (IEC 60068-2-1, IEC 60068-2-2): 40 to 85 oC<br>Operating humidity (IEC 60068-2-56): 10 to 90% RH, noncondensing<br>Storage humidity (IEC 60068-2-56): 5-95% RH, noncondensing<br>Maximum altitude: 2,000 m<br>Pollution degree (IEC 60664): 2<br>16. Physical characteristics<br>Torque for screw terminals on J3: 0.5 to 0.6N, m (4.4 to 5.3 lb.in)<br>Weight: 269.3 g. (9.5 oz) | | |
| **69** | **1** | **set** | **Sensors for Object Detection and Vacuum Technology**<br>1. Advanced level: Vacuum technology(2units)<br>Each unit consists of the ff. Accessories/Components: | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | - Air pressure reservoir, 0.4 l - for generating static pressure with the aid of a one-way flow control valve, for the generation of long time delays in conjunction with time-delay and flow control valves, for compensation of pressure fluctuations, as reservoir for sudden pressure drop, and for generation of a control system with a delay of the 1st order.<br><br>• Design: Brazed tank<br>• Capacity: 400 ml<br>• Pressure range: 0 – 1600 kPa (0 – 16 bar)<br>- Pressure switch, 0 – -1 bar<br>• Pressure switch (piezo-resistive relative pressure transducer) with built-in amplifier and temperature compensator on Quick-Fixsafety and quick mounting plate for profile platesRotatable, 90° detenting<br><br>• Switching function N/O or N/C contact (PNP)<br>• Operating voltage range 15 – 30 V DC<br>• Idle current max. 30 mA<br>• M8x1 connector, 4-pin<br>• Cable with M8 socket and 4 mm safety plug<br>• Switching output positive switching (PNP)<br>• Output current max. 100 mA<br>• Reverse-polarity<br>• Short circuit/overload protection (clocking)<br>• Nominal pressure range 0 – -1 bar<br>• Overload pressure (short-time) max. 5 bar -<br>Vacuum gauge<br>Adjustable red/green range<br>Indicating range/operating pressure -1 – 0 bar<br>Quick action mounting system Quick-Fix<br>- Flow control valve<br>Standard nominal flow rate 85 l/min<br>QS-4 connection<br>- Vacuum generator, type H<br>Operating pressure 1 – 8 bar<br>Nominal operating pressure 4.5 bar<br>Nominal diameter of laval nozzle 0.45 mm<br>QS-4 connections<br>Max. suction rate with respect to atmosphere 6.2 l/min<br>Maximum vacuum 88%<br>With silencer, plug-in<br>Quick action mounting system Quick-Fix<br>- Vacuum generator, type L<br>Operating pressure 1 – 8 bar<br>Nominal operating pressure 6 bar<br>Nominal diameter of laval nozzle 0.45 mm<br>QS-4 connections<br>Max. suction rate with respect to atmosphere 15.7 l/min<br>With silencer, plug-in<br>Quick action mounting system Quick-Fix<br>- Non-return valve<br>Standard nominal flow rate 136 l/min<br>QS-4 connection<br>- Non-return valve, delockable<br><br>As long as a pilot signal is applied to the non-return valve, compressed air flows to and from the cylinder. When the pilot signal is reset, the non-return valve shuts off the cylinder exhaust air, and cylinder motion is stopped.<br><br>- Suction gripper 30 SN<br>With suction cup holder and handle<br>Connection QS-4 or QS-6<br>Diameter 30 mm<br>Suction cup material: NBR<br>- Suction gripper 20 SS<br>With suction cup holder and handle<br>Connection QS-4 or QS-6<br>Diameter 20 mm<br>Suction cup material: VMQ<br>- Suction gripper 30 SS<br>With suction cup holder and handle<br>Connection QS-4 or QS-6<br>Diameter 30 mm<br>Suction cup material: VMQ<br>- Suction gripper 20 CS with vacuum security valve | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | With suction cup holder and handle<br>Connection QS-4 or QS-6<br>Diameter 20 mm<br>Bellows structure, 3.5 x<br>Suction cup material: VMQ<br>- Suction gripper 4x20 Oval<br>With suction cup holder and handle<br>Connection QS-4 or QS-6<br>Oval suction cup design, 4 x 20 mm<br>Suction cup material: NBR<br>- Tabletop power supply unit<br>Input voltage: 85 – 265 V AC (47 – 63 Hz)<br>Output voltage: 24 V DC, short-circuit-proof<br>Output current: max. 4.5 A<br>Dimensions: 170 x 240 x 92 mm<br>- 4 mm Safety laboratory cables, 106 pieces, red, blue and black<br>Complete set, consisting of 106 safety laboratory cables with 4 mm safety plugs in the colours red, blue and black:<br>• 10x red 50 mm<br>• 10x blue 50 mm<br>• 8x black 50 mm<br>• 8x red 300 mm<br>• 8x blue 300 mm<br>• 18x black 300 mm<br>• 18x black 300 mm<br>• 18x black 300 mm<br>• 18x black 500 mm<br>• 2x red 1000 mm<br>• 3x blue 1000 mm<br>• 2x black 1000 mm<br>• 1x red 1500 mm<br>• 1x blue 1500 mm<br>• 1x black 1500 mm<br>• Plugs with rigid protective sleeve and axial socket<br>• Conductor cross section: 1 mm2<br>• 1000 V CAT II<br>• Rated current: 16 A<br>**2. Sensors for object detection (2units)**<br>Each unit consists of the ff. Accessories/Components:<br>Proximity sensor, magneto-resistive<br>• Magneto-resistive proximity sensor on Quick-Fix safety and quick mounting system for profile plates<br>• 360° rotatable, detenting every 15°<br>• Operating voltage 10 – 30 V DC<br>• Starting function N/O contact (PNP)<br>• Output current 200 mA<br>• Protection against short-circuit, overload and reverse polarity<br>• Block design<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix quick mounting system<br>- Proximity sensor, inductive, M12<br>Proximity sensor with protection against polarity reversal, overload and short circuit.<br>• M12 design<br>• 360° rotatable, detenting every 15°<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix® quick connector system<br>• Power supply 10 – 30 V DC<br>• N/O contact (PNP) starting function<br>• Quick-Fix® quick connector system<br>• Sensing distance of 0 – 4 mm<br>- Proximity sensor, inductive, M18<br>Inductive proximity sensor on the Quick-Fix secure and quick action mounting system for profile plates and cable with safety plug<br><br>• 360° rotatable, detenting every 15°<br>• Size M18<br>• Non-flush fitting<br>• Operating voltage 15 – 34 V DC<br>• Sensing distance 8 mm<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix® quick mounting system | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Starting function N/O (PNP) - Analog sensor, inductive, M12<br>Inductive distance sensor on the Quick-Fix secure and quick action mounting system for profile plates and cable with safety plug<br><br>• 360° rotatable, detenting every 15°<br>• size M12<br>• flush fitting<br>• operating voltage 15 – 30 V DC<br>• measuring range 0 – 6 mm<br>• connection via the 4 mm safety connectors integrated in the Quick-Fix quick mounting system<br>• analogue output, 0 – 10 V DC or 0 – 20 mA<br>- One-way light barrier, receiver<br>One-way light barrier receiver (optical proximity sensor) on the Quick-Fix secure and quick action mounting system for profile plates and cable with safety plug<br><br>• 360° rotatable, detenting every 15°<br>• size Q30<br>• operating voltage 10 – 30 V DC<br>• light method: infrared<br>• range up to 6,000 mm<br>• adjustable by potentiometer<br>• connection via the 4 mm safety connectors integrated in the Quick-Fix quick mounting system<br>• starting function N/O (PNP)<br>-One-way light barrier, transmitter<br><br>One-way light barrier, transmitter (optical proximity switch) on Quick-Fix safety and quick mounting system for profile plates and cables with safety plug.<br><br>• 360° rotatable, detenting every 15°<br>• Size Q30<br>• Operating voltage 10 – 30 V DC<br>• Type of light: infrared<br>• Range up to 6000 mm<br>• Adjustable by potentiometer<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix quick mounting system<br>• Test input<br>- Fibre-optic unit<br>Fibre-optic unit (optical proximity switch) on Quick-Fix safety and quick mounting system for profile plates and cables with safety plug.<br><br>• 360° rotatable, detenting every 15°<br>• Size Q30<br>• Operating voltage 10 – 30 V DC<br>• Type of light: red<br>• Range up to 400 mm<br>• Adjustable by potentiometer<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix® quick mounting system<br>• Starting function N/O and N/C contact (PNP)<br>- Fibre-optic cable<br>Fibre-optic cable (through-beam sensor with polymer fibre-optic cable) on Quick-Fix safety and quick mounting system for profile plates and cables with safety plug.<br>• 360° rotatable, detenting every 15°<br>• Maximum range 400 mm<br>• Minimum bending radius 25 mm<br>• Fibre-optic cable length 2000 mm - Retro-reflective sensor<br>Retro-reflective sensor (optical proximity switch) on Quick-Fix safety and quick mounting system for profile plates and cables with safety plug.<br><br>• 360° rotatable, detenting every 15°<br>• Size Q30<br>• Operating voltage 10 – 30 V DC<br>• Type of light: red<br>• Polarised<br>• Range up to 2000 mm<br>• Adjustable by potentiometer<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix quick mounting system | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Starting function N/O contact (PNP)<br>- Reflector (triple mirror), 20 mm<br>Reflector on the Quick-Fix secure and quick action mounting system for profile plates<br>• 360° rotatable, detenting every 15°<br>• principle: triple mirror<br>• diameter 20 mm<br>- Diffuse sensor with background suppression<br>Diffuse sensor with background suppression (optical proximity switch) on Quick-Fix safety and quick mounting system for profile plates and cables with safety plug.<br>• 360° rotatable, detenting every 15°<br>• Size Q20<br>• Operating voltage 10 – 30 V DC<br>• Type of light: red<br>• Range up to 100 mm<br>• Adjustable using teach-In<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix quick mounting system<br>• Starting function N/O and N/C contact (PNP) - Proximity sensor, capacitive, M12<br>Proximity sensor with protection against polarity reversal, overload and short circuit.<br>• M12 design<br>• 360° rotatable, detenting every 15°<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix quick connector system<br>• Power supply 10 – 36 V DC<br>• N/O contact (PNP) starting function<br>• Quick-Fix® quick connector system<br>• Sensing distance of 0 – 4 mm<br>Indicator unit and distributor, electrical<br>The device contains an acoustic indicator and four lamps with terminals and three buses for power supply. Through-contact socket pairs per lamp allow the element to also be used as a distributor.<br><br>• Power consumption acoustic indicator: 0.04 W<br>• Power consumption indicator lamps: 1.2 W<br>Frequency acoustic indicator: 420 Hz<br>Consisting of: Bus bar, mass flow rail, contact for 4 mm security plugs, mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate<br>- Slide unit<br>- Set of test objects<br>Set of test objects for determining the response characteristics of sensors consisting of sample materials in different designs and material strength.<br><br>• Magnets<br>• Transparent and coloured plastics<br>• Various metals<br>• Magnets<br>• Rubber<br>• Cardboard<br>• Kodak grey card<br>• Wood<br>• Size 50 x 50 mm<br>• Tabletop power supply unit<br>• Input voltage: 85 – 265 V AC (47 – 63 Hz)<br>• Output voltage: 24 V DC, short-circuit-proof<br>• Output current: max. 4.5 A<br>• Dimensions: 170 x 240 x 92 mm<br>- Workbook<br>Fifteen projects based on industrial examples, each including problem descriptions, parameters and project tasks, deal in detail with the specific subject of sensors for object detection. The main topics are configuration, function and the influence of material properties on behavior, possible applications and how to select a sensor based on the application conditions. The content topics are covered by exercises using magnetic, inductive, optical and capacitive proximity sensors.<br><br>The workbook includes:<br>• Sample solutions | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Training notes<br>• Multimedia CD-ROM with graphics, photos of industrial applications<br>• Exercise sheets for trainees<br>• Digital training programme, sensor technology 2:<br>Sensors for object detection<br>• 4 mm Safety laboratory cables, 106 pieces, red, blue and black<br>Complete set, consisting of 106 safety laboratory cables with 4 mm safety plugs in the colours red, blue and black:<br>• 10x red 50 mm<br>• 10x blue 50 mm<br>• 8x black 50 mm<br>• 8x red 300 mm<br>• 8x blue 300 mm<br>• 18x black 300 mm<br>• 8x red 500 mm<br>• 8x blue 500 mm<br>• 18x black 500 mm<br>• 2x red 1000 mm<br>• 3x blue 1000 mm<br>• 2x black 1000 mm<br>• 1x red 1500 mm<br>• 1x blue 1500 mm<br>• 1x black 1500 mm<br>• Plugs with rigid protective sleeve and axial socket<br>• Conductor cross section: 1 mm2<br>• 1000 V CAT II<br>• Rated current: 16 A | | |
| **70** | **1** | **lot** | **(Working Tables, Teacher & Student Chairs, Storage Cabinet, Multimedia devices) (1 lot)**<br>**Working Tables (15 pcs)**<br>Working Table : (18" x 48") and standard height.<br>Table top using 2 face laminated light gray particle board<br>with powder coated steel framing on wheels with all four (4) lockable rollers.<br><br>**Polypropylene Stacking Chair (45 pcs)**<br>Chair seat & back: high-quality polypropylene,<br>Chair frame: Round steel tube (heavy duty) , high quality electro-static powder coated<br>Stacks 10 high from the floor<br>Color: Navy blue/ dark blue<br>**Storage Cabinet (1)**<br>1.20m x 1.90m<br>Sliding Glass doors on powder-coated aluminum frame with lock<br><br>18mm laminated boards with PVC edging<br>**Interactive Whiteboard (1)**<br>78" diagonal surface, 4 pens, 1wand, wall-mount, USB Interface computer connection, Workspace software; Infrared Technology-pen & finger touch with Windows, Mac or Linux; Multi-touch with Windows 7; aspect ratio; 4:3; 8000x8000 resolution; Android & IOS tablet compatible.<br><br>**Multimedia Projector (1)**<br>USB 3LCD Projector, 2800 ( or better)Lumens White and Colour Light Output , Computer Cable, USB A/USB B Cables, Remote Control, Soft Carry Case & Manual | | |
| 71 | 1 | lot | Laboratory Repairs Renovation<br>*(pls see details in approved EDP)* | | |

*Note:All MPS modules must be official equipment for WorldSkills Mechatronics.*

*All packages should come with complete training program, laboratory manuals/workbooks and after sales support.*

*Training Details:*

*A. Pre-delivery training (at Supplier's Venue) for:*

*One (1) potential expert in Mechatronics*

*One(1) in-charge of Mechatronics curriculum*

*Duration: 7 days*

*Expenses relative to training (transportation and accommodation) will be shouldered by the* supplier

*B. After delivery - trainlng to be conducted at MUST.*

*No limit of the number of participants.*

*Duration of training: 6 days during the contract period.*

## 11.2 Automation, Instrumentation and Process Control

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| 72 | 1 | pkg | **Basic Pneumatic Package**<br>3/2-way valve with pushbutton actuator, normally closed (2pcs)<br>3/2-way valve with pushbutton actuator, normally open<br>5/2-way valve with selector switch<br>3/2-way valve with selector switch, normally closed<br>3/2-way roller lever valve, normally closed (2pcs)<br>Proximity switch, pneumatic, with cylinder attachment (2pcs)<br>Pneumatic timer, normally closed<br>Pressure sequence valve<br>3/2-way pneumatic valve, pneumatically actuated, one side<br>5/2-way valve, pneumatically actuated, one side<br>5/2-way double pilot valve, pneumatically actuated, both sides (3pcs)<br>Shuttle valve (OR)<br>Dual-pressure valve (AND) (2pcs)<br>Quick-exhaust valve<br>One-way flow control valve (2pcs)<br>Single-acting cylinder<br>Double-acting cylinder<br>Start-up valve with filter control valve<br>Pressure regulator valve with<br>Pressure gauge (2pcs)<br>Manifold<br>Plastic tubing 4 x 0.75 Silver 10 m<br>Silent type Compressor<br>Oil-lubricated, Extremely quiet (45 dB (A)) compressor. With pressure regulator and water separator.Pressure: 800 kPa (8 bar) Pmax, Performance: 50 l/min, Reservoir capacity: 24 l, Compressed air outlet: ¼" or KD4, Noise level: 45 dB (A)/1 m, Duty cycle: max. 50 %,<br><br>Pressure regulator valve with gauge, Design: 230 V/50 Hz<br>1 roll, pneumatic hose, 3 mm dia | | |
| 73 | 1 | unit | **Basic Electro-Pneumatics with Aluminum Profile**<br>Composition:<br>1.Signal input, electric (1)<br>(Contact set: 1 makes, 1 breaks)<br>Contact load: Maximum 2 A,<br>Power consumption (Miniature bulb): 0.48 W<br>Consisting of: 3 illuminated push buttons, 1 illuminated pressure, switch,each with a mini bulb, bus bar, mass flow rail, 1 N/O, contacts and 1 NC contacts for 4 mm security plugs, Mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate.) 2. Relay, Three fold (2) ( Contact set: 1 makes, 1 breaks<br><br>Contact load: Maximum 2 A, Power consumption (Miniature bulb): 0.48 W<br><br>Consisting of: 3 illuminated push buttons, 1 illuminated pressure switch,each with a mini bulb, bus bar, mass flow rail, 1 N/O contacts and 1 NC contacts for 4 mm security plugs. Mounting with protection against accidental contact<br>with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate.<br><br>3.Limit switch, electrical, left-actuated (1) -The micro switch can be wired as a N/O contact, N/C contact or a changeover switch, using the 4 mm safety sockets integrated in the quick action mounting system Quick-Fix.<br>Possible contact load: maximum 5 A<br>4.Limit switch, electrical, right-actuated (1) - The micro switch can be wired as a N/O contact, N/C contact or a changeover switch, using the 4 mm safety sockets integrated in the quick action mounting system Quick-Fix.<br>Possible contact load: maximum 5 A<br>5.Proximity sensor, optical, M12 (1) - Proximity sensor with protection against polarity reversal, overload and short circuit.<br>• M12 design<br>• 360° rotatable, detenting every 15°<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix quick connector system<br>• Power supply 10 – 30 V DC<br>• N/O contact (PNP) starting function<br>• Quick-Fix quick connector system<br>• Adjustable sensing distance of 70 – 300 mm, with LED | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | 6.Electronic proximity sensor with cylinder attachment (2) - Magneto-resistive proximity sensor, magnetically operated<br>• Connection via 4 mm safety sockets<br>• Switching output N/O contact (PNP) with switching status indication<br>• Overload and short-circuit proof, with reverse polarity protection<br>• Operating voltage 5 – 30 V DC<br>• Output current: max. 100 mA<br>• Switching time (on/off) max. 1 ms<br>• Mounting system for cylinder diameter 20 mm, 2x T-slot for simultaneous mounting of one pneumatic and one electronic proximity sensor<br>7. 2 x 3/2-way solenoid valve with LED, normally closed (1) - Pilot actuated, single solenoid piston spool valve with pneumatic spring return, non-detenting and detenting manual override, and LED.<br>• Electrical connection via integrated 4 mm safety sockets<br>• 24 V DC power supply<br>• Switching time on/off 6/16 ms<br>• Pneumatic connection via QS-4 push-in fitting<br>• Operating pressure 150 – 800 kPa (1.5 – 8 bar)<br>• Quick-Fix® safety and quick action mounting system for slotted profile plates<br>8.5/2-way solenoid valve with LED (2) -Pilot actuated, single solenoid piston spool valve with pneumatic spring return, non-detenting and detenting manual override, and LED.<br>• Electrical connection via integrated 4 mm safety sockets<br>• 24 V DC power supply<br>• Switching time on/off 7/19 ms<br>• Pneumatic connection via QS-4 push-in fitting<br>• Operating pressure 250 – 800 kPa (2.5 – 8 bar)<br>• Quick-Fix® safety and quick action mounting system for slotted profile plates<br>9.5/2-way double solenoid valve with LED (1) - Pilot actuated, double solenoid piston spool valve with non-detenting and detenting manual override, and LED.<br>• Electrical connection via integrated 4 mm safety sockets<br>• 24 V DC power supply<br>• Response time 7 ms<br>• Pneumatic connection via QS-4 push-in fitting<br>• Operating pressure 150 – 800 kPa (1.5 – 8 bar)<br>• Quick-Fix® safety and quick action mounting system for slotted profile plates<br>10.Pressure sensor with display (1) - Piezoresistive relative pressure sensor with LCD display, freely programmable switching function, adjustable hysteresis and analogue output for direct measured data acquisition.<br>• 360° rotatable, detenting every 15°<br>• Connection via the 4 mm safety connectors integrated in the Quick-Fix® quick connector system<br>• Power supply 15 – 30 V DC<br>• Switching output PNP<br>• Analogue output 0 – 10 V DC<br>• Pneumatic connection via QS-4 push-in fitting<br>• Pressure measuring range 0 – 1000 kPa (0 – 10 bar)<br>• Quick-Fix® safety and quick connector system for slotted profile plates<br>11. One-way flow control valve (4) - • Design: One-way flow control valve<br>• Pressure range: 20 – 1000 kPa (0.2 – 10 bar)<br>• Nominal flow rate<br>in flow control direction: 0 – 85 l/min<br>in open direction: 100 – 110 l/min<br>12. Single-acting cylinder (1) - Single-acting cylinder with control cams.<br>• Design: Piston cylinder<br>• Operating pressure: Maximum 1000 kPa (10 bar)<br>• Stroke length: Maximum 50 mm | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Thrust at 600 kPa (6 bar): 150 N<br>• Spring return force minimal: 13.5 N<br>13. Double-acting cylinder (2) - Double-acting cylinder with control cams. End-position cushioning with two adjusting screws. A permanent magnet is mounted on the cylinder piston. Its magnetic field can trigger a proximity switch.<br>• Design: Piston cylinder<br>• Operating pressure: Maximum 1000 kPa (10 bar)<br>• Stroke length: Maximum 100 mm<br>• Thrust at 600 kPa (6 bar): 165 N<br>• Return thrust at 600 kPa (6 bar): 140 N<br>14. Start-up valve with filter control valve(1) - Filter control valve with Pressure gauge and Start-up valve mounted on<br>adapter with ajustable angle. The Start-up valve pressures/exhausts the connected pressure zone.<br>• Design: sintered filter with water separator and piston regulator<br>• Standard flow: 120 l/min<br>• Pressure regulation range: 50-700 kPa (0,5-7 bar)<br>• Grade of filtration: 40 µm<br>• Fitting: G 1/8, QS-6, for Plastic tubing PUN 6 x 1<br>15. Manifold (1) - Manifold with eight self-closing non-return valves. A common manifold (QS-6 for plastic tubing PUN 6 x 1) allows supply of compressed air to the control via eight individual ports (QS-4 for plastic tubing PUN 4 x 0.75).<br>• Connector: G 1/8<br>16. Plastic tubing, 4 x 0.75 silver 10 m (1) - Very flexible and pressure secure.<br>PUN 4 x 0.75,Silver<br>• Exterior diameter: 4 mm<br>PUN 6 x 1,Silver<br>• Exterior diameter: 6 mm<br>• Interior diameter: 4 mm<br>17. 4 mm Safety laboratory cables (1) - • 10x red 50 mm<br>• 10x blue 50 mm • 26x red 300 mm • 11x blue 300 mm • 21x red 500 mm<br>• 12x blue 500 mm • 3x red 1000 mm • 3x blue 1000 mm • 1x red 1500 mm<br>• 1x blue 1500 mm • Plugs with rigid protective sleeve and axial socket<br>• Conductor cross section: 1 mm2 • 1000 V CAT II • Rated current: 16 A<br>18. Power supply (1) - • Input voltage: 85 – 265 V AC (47 – 63 Hz)<br>• Output voltage: 24 V DC, short-circuit-proof<br>• Output current: max. 4.5 A • Dimensions: 170 x 240 x 92 mm<br>19.Preset counter, electronic (1) - Electronic preset counter with terminals for count pulse, contact set and reset pulse, as well as bus bars for supply power.<br>• Contact set: 1 changeover contact • Contact rating: max. 5 A<br>• Power consumption: 3 W • Maximum counting rate: 30 Hz<br>• Preset value display: 4-place, red (counter reading) and yellow (preselection) illuminated<br>• Preset value programmable at each digit with up/down keys<br>• Reset key for manual resetting<br>• Lock key for locking the preset value<br>Consisting of:<br>• Electronic counter with EEPROM for retaining the preset value and the current counter value in case of power failure<br>• 4-place preset value display<br>• Electronic or manual reset<br>• One changeover contact<br>• Supply contact rail<br>• Earth contact rail<br>• Connection for 4 mm safety plug | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Attachment via protection against accidental contact with integrated locking strip in the mounting frame for electrical connection and control units or via plug adapter on the slotted assembly board<br><br>20.Time relay, two-fold (1) - The element contains a release-delay and a pickup-delay time relay. Both relays are infinitely variable, using the rotary knob of the potentiometer.<br><br>• Contact set: 2 makes, 2 breaks • Contact load: Maximum 5 A<br>• Cut-off load: Maximum 100 W • Delay: 0.5 – 10 s adjustable<br>Consisting of: 1 relay for switch-on delay, 1 relay for switch-off delay, 2 normally open contacts and 2 normally closed contacts per relay, connection for 4 mm safety plug mounting via contact protection with integrated locking strip in the mounting frame for electrical terminal and control units or via plug-in adapter on slotted profile plate, supply contact rail, earth contact rail.<br><br>21.Systainer/Container with components trays (1) - Stackable and interlocking case system, made of light grey plastic with light blue T-LOC rotary locks, one-hand operation, for opening and interlocking the Systainers®. With four slots for credit-card-sized labels or markings.<br><br>TEACHWARE:<br>1. Workbook: (1)<br>Twelve project-orientated exercises, increasing in complexity and suitable for equipment set TP 201, are the ideal introduction to electropneumatics. Real problem descriptions with positional sketch, concrete project tasks and detailed aids for professional implementation provide the ideal preparation for ta real-life industrial environment.<br><br>The workbook includes:<br>• Sample solutions<br>• Training notes<br>• Multimedia CD-ROM with graphics, photos of industrial applications, animations and circuit diagrams<br>• Exercise sheets for trainees<br>2.Pneumatics and Electro-Pneumatics, Simulation software, License (1)<br><br>•Digital or Analogue simulation<br>•Circuit diagram creation<br>•Documentation of hydraulics components<br>•Didactic material<br>•Must be integrated to Easy port USB and Universal connection unit<br><br>• Mini-control system with 16 I/O's that can access the Easyport via OPC or directly<br><br>• Can be use for controlling, monitoring, analysis, commissioning and testing of the following:<br>1. Electro-Pneumatics<br>2. Electro-Hydraulics<br>3. Process control (optimization for 2 point controller, P, PI, and PID)<br>4. Servo/stepper motor<br>5. Mechatronics stations (different modules)<br>6. Different PLC's (Programmable logic controller)<br>7. Sensors<br><br>3. WBT (web-based Training) Electropneumatics (1)<br>4. Textbook; Basic Principles of pneumatics and Electropneumatics (1)<br><br>5. DVD Electropneumatics (1)<br>6. Easy port USB for and interface for measuring,<br>open-loop control, closed loop control (Simulation between hardware and software without using PLC) (1) | | |
| **74** | **1** | **unit** | **Basic Electro-hydraulic Trainer with Aluminum Profile, power pack and Accesories** | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | Components: 1. Pressure relief valve - The valve limits the pressure at port P relative to the pressure at T to the set value.<br>• Adjustment: manual<br>• Includes non-return valve<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Low-leakage, self-sealing coupling nipples<br>• Quick action mounting system Quick-Fix<br>2. 2-way flow control valve - The valve ensures a constant volumetric flow rate in the flow direction from A to B, regardless of the load pressure on B. The oil can flow from B to A via the non-return valve which opens.<br>• Actuation: manual<br>• Differential pressure of the pressure balance 0.55 MPa (5.5 bar)<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Low-leakage, self-sealing coupling nipples<br>• Quick action mounting system Quick-Fix<br>3. One-way flow control valve - The valve is used to influence the volumetric flow rate through an adjustable throttle point, in one direction. In the opposite direction, the throttle is bypassed using the non-return valve.<br>• Actuation: manual<br>• Integrated non-return valve<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Low-leakage, self-sealing coupling nipples/quick coupling socket<br>4. • Non-return valve - The valve is closed by a locking cone which is pressed against the seat by a spring. When the opening pressure on the seat side is exceeded, the valve opens and fluid can flow through it. When the pressure on the spring side is greater, the valve remains closed.<br>• Actuation: hydraulic<br>• Tube length 1000 mm<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Low-leakage, self-sealing quick coupling sockets<br>• 4/2-way solenoid valve, spring return<br>• Actuation: switching solenoid<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Valve port pattern, hydraulic ISO/DIN 4401 size 02<br>• Low-leakage, self-sealing coupling nipples<br>• 24 V DC power<br>• 6.5 W output<br>• Electrical connection: 4 mm safety socket<br>• Quick action mounting system Quick-Fix<br>5. • 4/3-way solenoid valve, closed mid-position<br>• Actuation: switching solenoid<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Valve port pattern, hydraulic ISO/DIN 4401 size 02<br>• Low-leakage, self-sealing coupling nipples<br>• 24 V DC power<br>• 6.5 W output<br>• Electrical connection: 4 mm safety socket<br>• Quick action mounting system Quick-Fix<br>6. 4/2-way double solenoid valve, detenting<br>• Actuation: switching solenoid<br>• Operating pressure 6 MPa (60 bar) | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Maximum permissible pressure 12 MPa (120 bar)<br>• Valve port pattern, hydraulic ISO/DIN 4401 size 02<br>• Low-leakage, self-sealing coupling nipples<br>• 24 V DC power<br>• 6.5 W output<br>• Electrical connection: 4 mm safety socket<br>• Quick action mounting system Quick-Fix<br><br>7. Shut-off valve - The valve can be closed by turning the lever. This presses a ball onto the seal on the non-pressurized side, sealing off the flow without any leakage.<br><br>• Actuation: manual<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Low-leakage, self-sealing coupling nipples/quick coupling socket<br><br>8. Weight, 9 kg, for cylinder - Weight for mounting on a Learnline profile column. Can be used as the driving or tractive load of a hydraulic cylinder. With clevis and plain-bearing guide.<br>9. Differential cylinder 16/10/200 with cover<br>• Operating pressure 6 MPa (60 bar)<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Double-acting<br>• Low-leakage, self-sealing coupling nipples<br>• Quick action mounting system Quick-Fix<br>• Piston Ø: 16 mm<br>• Piston rod Ø: 10 mm<br>• Stroke: 200 mm<br>• Surface area ratio 1 : 1.6<br>10. Mounting kit for cylinders - Fitting a mounting kit on a cylinder makes the following possible:<br>• Actuation of the stem actuated valve by the guide bar<br>• Actuation of proximity sensors by the permanent magnet of the guide bar<br>• Use of a displacement encoder<br>• Mounting kit for cylinders<br>Suitable for cylinders<br>11. T-distributor - The distributor can be inserted at any point.<br>• Ports: 2x coupling nipples and 1x quick coupling socket<br>• Maximum permissible pressure 12 MPa (120 bar)<br>• Low-leakage, self-sealing coupling<br>12. 4-way distributor with pressure gauge<br>Commissioning<br>All quick connection couplings are connected via holes in the distributor block. The coupling nipple on the side can be swapped with the blanking plug on the opposite side. The pressure in the distributor can be read off on the pressure gauge.<br><br>13. Pressure gauge -The pressure gauge can be inserted at any point for pressure measurement.<br>• Effective range and maximum permissible pressure 10 MPa (100 bar)<br>• Quality class 1.6% of the full scale value<br>• Operating pressure, static: 3/4 of full scale value<br>• Operating pressure, dynamic: 2/3 of full scale value<br>• Cushioning: glycerine<br>• Low-leakage, self-sealing couplings<br>14. Pressure switch, electronic -The pressure switch can be inserted at any point for pressure measurement and has two switching outputs and an analogue output.<br>• Operating voltage 18 – 35 V DC<br>• Switching outputs 2 x PNP, maximum 1.2 A | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
|---|---|---|---|---|---|
| | | | • Effective range and maximum permissible pressure 10 MPa (100 bar)<br><br>• Analogue output 0 – 10 V<br>• 4-digit digital display, can be rotated along 2 axes<br>• Electrical connection M12, 5-pin on 4 mm safety plug<br>• Low-leakage, self-sealing couplings<br>15. Relay, three-fold - The device has three relays with terminals and two buses for power supply.<br>• Contact load: max. 5 A • Cut-off load: max. 90 W<br>• Pick-up time: 10 ms • Drop-off time: 8 ms<br>Consisting of: 4 changeover switches, electricity supply rail, mass flow rail, ports for 4 mm safety plugs. Mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate.<br><br>16.Signal input, electrical -The device contains an illuminated pushbutton switch (control switch) and three illuminated pushbuttons (momentary contact switches) with terminals and two buses for power supply.<br>• Contact set: 1 makes, 1 breaks<br>• Contact load: Maximum 2 A<br>• Power consumption (Miniature bulb): 0.48 W<br>Consisting of: 3 illuminated push buttons, 1 illuminated pressure switch, each with a mini bulb, bus bar, mass flow rail, 1 N/O contacts and 1 NC contacts for 4 mm security plugs. Mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate.<br><br>17. Limit switch, electrical, left-actuated -The micro switch is actuated mechanically when the roller lever is pressed, for example by the trip cam of a cylinder. The micro switch can be wired as a N/O contact, N/C contact or a changeover switch, using the 4 mm safety sockets integrated in the quick action mounting system Quick-Fix®.<br><br>Possible contact load: maximum 5 A<br>• Limit switch, electrical, right-actuated<br>The micro switch is actuated mechanically when the roller lever is pressed, for example by the trip cam of a cylinder. The micro switch can be wired as a N/O contact, N/C contact or a changeover switch, using the 4 mm safety sockets integrated in the quick action mounting system<br><br>• Possible contact load: maximum 5 A<br>18. Proximity sensor, electronic - Magneto-resistive proximity sensor, magnetically operated<br>• Connection via 4 mm safety connectors<br>• Switching output N/O contact (PNP) with switching status indication<br>• Overload and short-circuit proof, with reverse polarity protection<br>• Operating voltage 5 – 30 V DC<br>• Output current: max. 100 mA<br>• Switching time (on/off) max. 1 ms<br>• Mounting system for T-slot<br>19. Hose line with quick release couplings - The high-pressure hose consists of three layers: The innermost layer is synthetic rubber, followed by a wire mesh and sheath of abrasion-resistant synthetic rubber. The quick coupling sockets are self-sealing when decoupled. Used with a coupling nipple, the coupling sockets form a tightly sealed connection. Only the face of the coupling is coated with oil during the coupling process. Coupling and decoupling are only permissible when the hose is de-pressurised.<br><br>• Operating pressure 6 MPa (60 bar)<br>• Max. permissible pressure 12 MPa (120 bar)<br>• Temperature range -40 – + 125 °C<br>• Min. bending radius 100 mm<br>• DN 06 (Ø 6,3 mm) | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | 20. 4 mm Safety laboratory cables, 106 pieces, red, blue and black<br>Complete set, consisting of 106 safety laboratory cables with 4 mm safety plugs in the colours red, blue and black:<br>• 10x red 50 mm • 10x blue 50 mm • 8x black 50 mm • 8x red 300 mm<br>• 8x blue 300 mm • 18x black 300 mm • 8x red 500 mm • 8x blue 500 mm<br>• 18x black 500 mm • 2x red 1000 mm • 3x blue 1000 mm • 2x black 1000 mm<br>• 1x red 1500 mm • 1x blue 1500 mm, 1x black 1500 mm<br>• Plugs with rigid protective sleeve and axial socket<br>• Conductor cross section: 1 mm2<br>• 1000 V CAT II • Rated current: 16 A<br>21. Laboratory Workstation with Aluminium profile plate 700x1100mm and ER frame -The anodised aluminium profile plate forms the basis for all training packages. All of the components fit securely and safely into the grooves on the profile plate. There are grooves on each side and, if required, both sides can be fitted with components. The grooves are compatible with the ITEM profile system. Grid dimensions: 50 mm.<br>Sizes 350 x 1100 mm and 350 x 250 mm supplied without side caps (H x W).<br>22. Hydraulic power pack with a constant-displacement pump, 230 V - Ideal for individual hydraulic workstations for all experiments using standard equipment sets TP 500,<br>600 and the MPS® punching station.<br>• Mounting on Learnline with universal bracket<br>• Mounting on Learntop-S: direct<br>• Pump design: external gear motor with pressure relief valve adjustable from 0 – 6 MPa (0 – 60 bar)<br>• Operating pressure 6 MPa (60 bar)<br>• Motor: AC, single-phase with overload protection, start capacitor and ON/OFF switch<br>• Tank: 5 l volume, sight glass, temperature display, drain screw<br>• Air filter and return filter<br>• Low-leakage, self-sealing coupling nipples for P and T<br>• Plug socket for unpressurised return<br>• Connecting flange for measuring container return<br>• Dimensions: 580 x 300 x 180 mm (W x D x H)<br>• Weight: 19 kg<br>• Nominal voltage: 230 V AC<br>• Rated output: 0.65 kW<br>• Frequency: 50 to 60 Hz<br>• Delivery rate (rated speed): 2.2 – 2.7 l/min at 1320 – 1680 m-1<br>• Protective cover for weight, 9 kg<br>23. Power supply unit for mounting frame<br>24.Hydraulics Simulation software, license<br>•Digital or Analogue simulation<br>•Circuit diagram creation<br>•Documentation of hydraulics components<br>•Didactic material<br>•Must be integrated to Easy port USB and Universal connection unit<br>• Mini-control system with 16 I/O's that can access the Easyport via OPC or directly<br>25. Electrohydraulics: WBT (Web-Based training)<br>•Documentation<br>1. Structure and function Hydraulics and Electro-Hydraulics<br>2. Application of Hydraulics and Electro-Hydraulics<br>•Multimedia presentation | | |
| **75** | **1** | **set** | **Closed-loop Pneumatic Trainer/ Advanced Electro-Pneumatics, Equipment Set** | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | Accessories/Components:<br>1. Signal input, electrical<br>2. 3/2-way valve with pushbutton actuator, normally closed -<br>Pilot actuated, single solenoid piston spool valve with<br>pneumatic spring return, non-detenting and detenting manual<br>override, and LED.<br>• Electrical connection via integrated 4 mm safety sockets<br>• 24 V DC power supply • Switching time on/off 6/16 ms<br>• Pneumatic connection via QS-4 push-in fitting<br>• Operating pressure 150 – 800 kPa (1.5 – 8 bar)<br>• Quick-Fix® safety and quick action mounting system for slotted profile plates<br>3. 2 x 3/2-way solenoid valve with LED, normally closed -<br>Pilot actuated, single solenoid piston spool valve with pneumatic spring return, non-detenting and detenting manual<br>override, and LED.<br>• Electrical connection via integrated 4 mm safety sockets<br>• 24 V DC power supply<br>• Switching time on/off 6/16 ms<br>• Pneumatic connection via QS-4 push-in fitting<br>• Operating pressure 150 – 800 kPa (1.5 – 8 bar)<br>• Quick-Fix® safety and quick action mounting system for slotted profile plates<br>Pressure gauge - The pressure gauge shows the pressure in pneumatic control circuits.<br>• Design: Bourdon tube pressure gauge<br>• Display range: 0 – 1000 kPa (0 – 10 bar)<br>• Quality class: 1.6<br>4. One-way flow control valve<br>5. On-off valve with filter/regulator, 5 µm - Filter regulator<br>valve with pressure gauge, on-off valve, quick push-in<br>connectors and quick coupling plug, mounted on a swivel<br>support. The filter with water separator removes dirt, pipe<br>sinter, rust and condensed water. The pressure regulator<br>maintains the supply air pressure at the set operating pressure<br>and compensates pressure fluctuations. The filter bowl has a<br>condensate drain valve.<br>The on-off valve pressurises and vents the entire control system. The 3/2-way valve is actuated by a rotary button.<br>• Design: Piston regulator valve with sintered filter and water trap<br>• Standard nominal flow rate*: 1600 l/min<br>• Input pressure: max. 1600 kPa (16 bar)<br>• Working pressure: max. 1200 kPa (12 bar)<br>• Grade of filtration: 5 µm • Condensate quantity: 43 cm3<br>• Connector: G 1/8, QS-6 for plastic tubing PUN 6 x 1<br>* Input pressure: 1000 kPa (10 bar)<br>Operating pressure: 600 kPa (6 bar)<br>Differential pressure: 100 kPa (1 bar)<br>6. Manifold - Manifold with eight self-closing non-return valves. A common manifold (QS-6 for plastic tubing PUN 6 x 1) allows supply of compressed air to the control via eight individual ports (QS-4 for plastic tubing PUN 4 x 0.75).<br>• Connector: G 1/8<br>7. Plastic tubing - Very flexible and pressure secure.<br>PUN 4 x 0.75<br>• Exterior diameter: 4 mm<br>• Interior diameter: 2.6 mm<br>PUN 3 x 0.5<br>• Exterior diameter: 3 mm<br>• Interior diameter: 2.1 mm<br>PUN 6 x 1 | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Exterior diameter: 6 mm<br>• Interior diameter: 4 mm<br>8. PID controller - PID controller for pneumatic and hydraulic control circuits.<br>Consisting of: Bus bar, mass flow rail, contact for 4 mm security plugs, mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate.<br>The controller comprises the following: • Voltage supply<br>• Differential inputs<br>• Comparators<br>• Final control elements: positional control elements, speed control elements, acceleration controlelements (status controller), proportional control elements, integralcontrol elements, differential control elements (PID controller)<br>• Overall gain (Status controller)<br>• Correcting variable offset<br>• Summing junction • Limiter • Output<br>Technical data:<br>• Overmodulation indicator: -10 > Ue > +10 V<br>• Input voltage range: -13 – +13 V<br>• Output voltage limitation: [0 – +10 V] [-10 – +10 V]<br>• Correcting variable offset: 5 ±3.5 V at [0 – +10 V] 0 ±7 V at [-10 – +10 V]<br>• Proportional coefficient KP: 0 – 1000<br>• Integral coefficient KI: 0 – 1000 s-1<br>9. Comparator - Positive switching comparator with hysteresis. The inputs are short-circuit-proof or surge-proof to 24 V. 2 separate inputs (IN A, IN B) each acting on two independent comparators. Each comparator can be set to:<br>• Reference voltage (-10 – +10 V), Hysteresis (0 – +5 V).<br>• Input voltage (inputs A and B): -10 – +10 V<br>• Input resistance (inputs A and B): > 10 kΩ<br>• Display accuracy: ± 30 mV<br>• Outputs A and B: Floating relay contacts, changeover contacts<br>• Contact load: 24 V DC/2 A and 120 V AC/1 A<br>Consisting of: Bus bar, mass flow rail, contact for 4 mm security plugs, mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate.<br>10. Pressure sensor, analog<br>• Pressure measuring range*: 0 – 1000 kPa (0 – 10 bar)<br>• Maximum permissible pressure: 1400 kPa (14 bar)<br>• Power supply: 12 – 30 V DC<br>• Output signals: Voltage output 0 – 10 V<br>• Frequency, maximum: 100 Hz<br>• Electrical protection: Short-circuit proof, polarity reversal protected<br>*The sensor will also supply a signal at pressures of < 0 bar. Linearity and proportionality cannot be guaranteed in this case.<br>11. 5/3-way solenoid valve, mid position closed - Pilot actuated, spring centred piston spool valve with non-detenting and detenting manual override, and LED.<br>• Electrical connection via integrated 4 mm safety sockets<br>• 24 V DC power supply • Switching time on/off/changeover 10/30/16 ms<br>• Pneumatic connection via QS-4 push-in fitting<br>• Operating pressure 300 – 800 kPa (3 – 8 bar)<br>• Quick-Fix® safety and quick action mounting system for slotted profile plates<br>• 5/3-way proportional valve - The integrated electronic control of the slide path allows favorable static and dynamic characteristics, as reflected by low hysteresis (<0.3 %), short switching time (typically 5 ms) and higher upper critical frequency (approx. 100 Hz). For this reason the valve is particularly suitable as an actuator for position control of a pneumatic cylinder, particularly in conjunction with a higher-level position controller. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | 5/3-way proportional valve mid position closed actuated on both sides spring centered, manual override mounting system<br>• Medium: Compressed air, microfiltered (unlubricated)<br>• Pressure range: 600 – 1000 kPa (6 – 10 bar)<br>• Flow rate at nominal pressure: Maximum 700 l/min<br>• Power consumption: 2 – 20 W • Analog setpoint voltage: 0 – 10 V DC<br>• Nominal value at pneumatic mid-position: 5 V DC<br>• Duty cycle in accordance with VDE 0580: 100 %<br>12. Air pressure reservoir, 0.4 l - Air pressure reservoir for generating static pressure with the aid of a one-way flow control valve, for the generation of long time delays in conjunction with time-delay and flow control valves, for compensation of pressure fluctuations, as reservoir for sudden pressure drop, and for generation of a control system with a delay of the 1st order.<br>• Design: Brazed tank • Capacity: 400 ml<br>• Pressure range: 0 – 1600 kPa (0 – 16 bar)<br>13. Status controller - The status controller is used as a regulator in pneumatic and hydraulic position control circuits. Consisting of: Bus bar, mass flow rail, contact for 4 mm security plugs, mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate. The controller comprises the following:<br>• Voltage supply• Differential inputs • Comparators<br>• Final control elements: positional control elements, speed control elements, acceleration controlelements (status controller), proportional control elements, integralcontrol elements, differential control elements (PID controller)<br>• Overall gain (Status controller) • Correcting variable offset<br>• Summing junction • Limiter • Output<br>Technical Data:<br>• Overmodulation indicator: -10 > Ue > +10 V<br>• Input voltage range: -13 – +13 V<br>• Output voltage limitation: [0 – +10 V] [-10 – +10 V]<br>• Correcting variable offset: 5 ±3.5 V at [0 – +10 V] 0 ±7 V at [-10 – +10 V]<br>• Position coefficient Kx: – 10<br>• Speed coefficient Kx: 0 – 100 ms<br>• Acceleration coefficient Kx: 0 – 10 s2<br>• Overall gain P: 0 – 1000<br>14. Status controller - The status controller is used as a regulator in pneumatic and hydraulic position control circuits. Consisting of: Bus bar, mass flow rail, contact for 4 mm security plugs, mounting with protection against accidental contact with a built-in lock grid ledge in the fixture for electrical port and control unit or else with plug-in adaptors for the profile plate. The controller comprises the following:<br>• Voltage supply • Differential inputs • Comparators<br>• Final control elements: positional control elements, speed control elements, acceleration controlelements (status controller), proportional control elements, integralcontrol elements, differential control elements (PID controller)<br>• Overall gain (Status controller) • Correcting variable offset<br>• Summing junction • Limited • Output<br>Technical Data:<br>• Overmodulation indicator: -10 > Ue > +10 V<br>• Input voltage range: -13 – +13 V<br>• Output voltage limitation: [0 – +10 V] [-10 – +10 V]<br>• Correcting variable offset: 5 ±3.5 V at [0 – +10 V] 0 ±7 V at [-10 – +10 V]<br>• Position coefficient Kx: – 10 • Speed coefficient Kx: 0 – 100 ms<br>• Acceleration coefficient Kx: 0 – 10 s2 • Overall gain P: 0 – 1000<br>15. Linear drive, pneumatic, with guide and accessories - For proximity sensing, with positive-locking between piston and carrier, and adjustable end-position cushioning.<br>• Space-saving rodless linear drive. | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Double-acting cylinder; compressedair for forward and return strokes.<br>• Power application point is protectedagainst rotation around the longitudinal axis.<br>• Adjustable end-position cushioning inboth end positions.<br>• Permanent magnet mounted on piston toallow position sensing by a suitable proximity switch. This allows proximitysensing of end positions and intermediate positions. • More compact than conventionalcylinders through rodless design.<br><br>• Type of damping: Pneumatic, adjustable<br>• Buffering length: 18 mm<br>• Rotation protection: Guide<br>• Stroke length: 450 mm<br>• Overall length: 650 mm<br>• Pressure range: 200 – 800 kPa (2 – 8 bar)<br>• Type of port/diameter: Thread G 1/8 "<br>• Usable power (theoretical) at 600 kPa (6 bar): 295 N<br>• Air consumption at 6 bar: 0.03 l/ stroke<br>Including connection and mounting material<br>16. Position encoder - Analog displacement encoder for pneumatic linear drive unit for determining the current actual position. When ordering single units, please also order mounting accessories<br>The connection cable is required for use in TP 111.<br>• Measuring stroke: 450 mm<br>• Mass: 1.2 kg<br>• Output signal at cable output of Connection cable (Order no. 376177): 0 – 10 V<br><br>17. Ruler - Ruler, with millimeter scale printed on both sides, with two knurled screws. Used to measure position of the guides of the linear drive (Order no. 192501).<br><br>• Total length: 500 mm • Scale length: 450 mm • Unit of measurement: mm<br>18. Weight, 5 kg, for linear drive - Weight for mounting on a linear drive to be used as additional load. Self-setting hydraulic shock absorber for smooth deceleration. Suitable for the pneumatic linear drives<br><br>When ordering separately, please also order shock-absorber bracket<br>• Stroke:12 mm<br>• Impact speed: Maximum 3 m/s<br>• Connecting cable for linear potentiometer<br>• Adapter for Y-axis or weight<br>• Adapter for mounting the applied load on the pneumatic linear drive unit.<br>• Mounting accessories for position encoder | | |
| **76** | **3** | **unit** | **16 Digital/Analogue Inputs/Outputs Compact PLC Educational Trainer**<br>Technical Data for the CPU:<br>• Supply power: 24 V DC • Maximum input power: 40 VA<br>Inputs/outputs:<br>• Input current, IN 0 – 3: 7.3 mA, 0 – 20 kHz at 24 V<br>• Input current, IN 4 – 16: 8.9 mA, 0 – 1 kHz at 24 V<br>• 8 relay outputs: 1.2 A at 24 V DC • 8 FET outputs: 1 A<br>The mounting system:<br>• 19" module with SysLink system connector.<br>• Suitable for ER mounting frame or unfastened on the table<br>• Lightweight injection moulded housing • The unit is supplied fully assembled.<br>• Other combinations are possible via the online configurator.<br>Recommended training media:<br>Digital training programme training in PLC programming in accordance with IEC 61131.<br>Contents:<br>• Programmable logic controllers • Project organisation | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | • Programming languages in accordance with IEC 61131<br>• Link-orientated programming languages<br>• Sequential function chart • Structured text<br>• Sequence programming project<br>• The training program provides beginners with an ideal introduction to IEC-compliant programming.<br>• In addition to trainees, pupils and students, it also appeals to skilled workers, technicians and engineers who have previously only programmed in IL, LDR or FCH. The higher, IEC-compliant languages provide a range of benefits to be discovered and used.<br><br>Accessories:<br>• I/O data cable with connectors (IEEE 488) at both ends, 2.5 m<br>• Universal connection unit, digital. • Programming cable<br>• Programming software • Workbook | | |
| **77** | **1** | **set** | **Instrumentation and Process Control Compact Workstation**<br><br>The Compact Workstation Energy is equipped with current and power meters, and includes the measuring and training monitoring software Energy.<br>**Power supply unit:**<br>Input voltage: 85 – 265 V AC (47 – 63 Hz)<br>Output voltage: 24 V DC, short-circuit-proof<br>Output current: max. 4.5 A<br>**Monitoring/Visualization software:**<br>Operation, open- and closed-loop control with the Easy<br>Port communication module (Interfacing unit between the computer to Process Control or PLC to Hardware or software to software Visualization)<br><br>Control-technology operations and continuous and discontinuous controllers are presented. Subsequent analyses bring a valuable, basic realization, which can be transferred to the general technology. Especially general training aims, such as the concentrated observation and analysis of systems.<br><br>Virtual PLC – actuating with simulation using the basics of PLC programming and the logical processing of binary and analogue signals. Test the program on a virtual or real model.<br>Filling with Excel<br><br>Transmitted order data from MS Excel via the DDE interface, e.g. the number and volume of the bottles. Conversely, the current status of the plant, for example the level of the storage tanks, is reported.<br><br>MPS PA Compact Workstation: Workbook<br>Process automation: Web based training, License<br>Open- and closed-loop control: Web based training, License<br>Easy port USB interface for measuring, Open-loop control, Closed loop control<br><br>Mechanical Components:<br>Two (2) Transparent Reservoirs,<br>Air Pressure Reservoir with Pressure Gauge,<br>Plug-in tubing system<br>Mounting Frame for Electrical Devices and Controls<br>Aluminium Profile Plate on a Portable Trolley<br>**Sensors:**<br>Two (2) Capacitive Sensors<br>Two (2) Mechanical Contact Float Switches<br>Ultrasonic Level Transmitter 345 mm Range<br>Opto-electronic Vane Flow Transmitter 0-7.5l/min Range<br>Piezoelectric Ceramic Pressure Sensor 0-0.4 bar Range<br>PT100 Temperature Transmitter 0-100 deg. C Range<br>**Actuators:**<br>Centrifugal Pump 0-10 V Control Voltage<br>Proportional Solenoid Process Valve 0-10V Control Voltage<br>Process Ball Valve with On/Off Pneumatic Quarter-Turn Actuator | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | Heater, 1 KW<br>**Electrical Components:**<br>Signal Converters or Transducers: I/V, f/V, R/V<br>Motor Controller and Current Limiter for Centrifugal Pump's Motor<br>Digital and Analogue I/O terminal strip: 8DI/8O and 4AI/2AO<br>Syslink Plug Connection of Digital and Analogue I/O to Controllers such as PC or PLC<br>Signal conversion with parameterisable measured-value transducers, includes parameterization software and programming cable<br>**Controller:**<br>**Programmable Logic Controller**<br>16 Digital Inputs + 16 Digital Outputs<br>4 Analogue Inputs (4-20 mA, 0-10V, RTD) + 2 Analogue Outputs (4-20 mA and 0-10V)<br>24 Vdc Power<br>Ethernet Interface for Fieldbus, HMI and Programming Connections<br>CANOpen fieldbus interface<br>2 Digital I/O Syslink Cable<br>1 Analogue I/O Syslink Cable<br>1 Ethernet Cable, Crossed<br>PLC Development Software<br>Built-in Software Simulator or Virtual PLC with Runtime and Graphics<br>**Monitoring/Visualization Software Controller in a PC**<br>using PLC and Easyport<br>Measuring and Control (with Real-Time Graph and Measurement Data)<br>Charateristic Curves of Sensors and Actuators<br>Closed Loop Control of Level, Flow, Pressure and Temperature using PID Continuous Control or ON/OFF Two-Point Control<br>Manual Open Loop Control of Level, Flow, Pressure and Temperature<br>Filtering of Measurement Signals from Sensors<br>Offset and Re-ranging of Measurement Signals from Sensors<br>Simulation with P&ID and PID Model of Process Control without the Actual Hardware using Easyport USB module<br>Testing and Commissioning of Process Control Hardware<br>**Fault Simulation Module:**<br>Four (4) Fault Simulation for Level Control Loop<br>Six (6) Fault Simulation for Flow Control Loop<br>Five (5) Fault Simulation for Pressure Control Loop<br>Four (4) Fault Simulation for Temperature Control Loop<br>Two (2) Fault Simulation for Pneumatic Systems<br>Multiple Parametric or Software Fault Simulations with<br>Hand-outs (Book)<br>Primary controller, Intel Core i5-2450M processor 3 MB L3<br>cache, 2.5 GHz with turbo boast up to 3.2/3.3 GHz, 4GB<br>DDRIII, 500GB<br>Training media including Easy port, web-based training program for Process control, fundamentals of open and closed loop control | | |
| **78** | **1** | **unit** | **Advance Motor Control Workstation**<br>Automation Controller Workstation consist of the following:<br>1. Variable Frequency Drive<br>2. Push Buttons, Indicators, Analog Input, Analog Meter<br>3. Power Supply, compact Controller with integrated USB, Ethernet/IP Port and SD memory. Certified under Ethernet/IP<br>4. Digital I/O modules and analog output modules<br>5. Remote I/O Ethernet Adapter<br>6. Touch Screen Interface 6" | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | 7. Primary controllers for wireless communications<br>8. With Control Software for multiple user. | | |
| **79** | **2** | **set** | **Data Acquisition Device, NI myRIO University Bundle incl. Starter Kit and Mechatronics Kit (1 set: 10 units)**<br>With built-in LABView Software<br>**Specifications:** (Typical between 0 to 40 degrees)<br>Processor: type(Xilinx Z-7010), speed(667 MHz), cores(2)<br>Memory:<br>Nonvolatile memory(256 MB), DDR3 memory(512 MB),<br>DDR3 clock frequency(533 MHz), DDR3 data bus width(16<br>bits), FPGA type:Xilinx Z-7010<br>Radio mode:IEEE 802.11 b,g,n, Frequency band:ISM 2.4 GHz, Channel width:20 MHz, Channels:USA 1-11, International 1-13, TX power: +10 dBm max (10 mW), Outdoor range : Up to 150 m (line of sight), Antenna directivity : Omnidirectional, Security:WPA, WPA2, WPA2-Enterprise, USB host port:USB 2.0 Hi-Speed, USB device port: USB 2.0 Hi-Speed<br><br>Analog Input:<br>Aggregate sample rate: 500 kS/s, Resolution: 12 bits,<br>Overvoltage protection: ±16 V MXP connectors:<br>Configuration: Four single-ended channels per connector<br>Input impedance: >500 kΩ acquiring at 500 kS/s, 1 MΩ powered on and idle<br>4.7 kΩ powered off, Recommended source impedance:3 kΩ or less<br><br>Nominal range : 0 V to +5 V, Absolute accuracy: ±50 mV<br>Bandwidth:>300 kHz, MSP connector<br>Configuration:Two differential channels<br>Input impedance:Up to 100 nA leakage powered on; 4.7 kΩ powered off<br><br>Nominal range: ±10 V, Working voltage, (signal + common mode):±10 V of AGND, Absolute accuracy: ±200 mV, Bandwidth: 20 kHz minimum, >50 kHz typical<br>Audio input:<br>Configuration:One stereo input consisting of two AC-coupled, single-ended channels, Input impedance :10 kΩ at DC ,Nominal range: ±2.5 V<br><br>Bandwidth:2 Hz to >20 kHz<br>Analog Output:<br>All AO channels on MXP connectors:345 kS/s<br>All AO channels on MSP connector and audio output channels:345 kS/s<br><br>Resolution :12 bits, Overload protection:±16 V, Startup voltage:0 V after FPGA initialization MXP connectors<br>Configuration:Two single-ended channels per connector<br>Range:.0 V to +5 V, Absolute accurac:50 mV, Current drive:.3 mA<br>Slew rate :0.3 V/µs<br>MSP connector:<br>Configuration:Two single-ended channels<br>Range:.±10 V, Absolute accuracy:±200 mV, Current drive :2 mA<br>Slew rate :2 V/µs<br>Audio output:<br><br>Configuration :One stereo output consisting of two AC-coupled, single-ended channels, Output impedance :100 Ω in series with 22 µF<br>Bandwidth:70 Hz to >50 kHz into 32 Ω load;<br>2 Hz to >50 kHz into high-impedance load<br>Power Output:<br>+5 V power output, Output voltage :4.75 V to 5.25 V<br>Maximum current on each connector: 100 mA<br>+3.3 V power output: Output voltage: 3.0 V to 3.6 V<br>Maximum current on each connector : 150 mA | | |

| ITEM NO. | QTY. | UNIT | DESCRIPTION AND SPECIFICATION | TOTAL | DELIVERED WEEKS/MONTH |
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| | | | +15, power output: Output voltage:+15 V to +16 V, Maximum current :32 mA (16 mA during startup), -15 V power output: Output voltage:-15 V to -16 V<br>Maximum current:32 mA (16 mA during startup)<br>Maximum combined power from +15 V and -15 V power output :500 mW<br>Power Requirements:<br>NI myRIO-1900 requires a power supply connected to the power connector.<br>Caution You must use either the power supply provided in the shipping kit, or<br>another UL Listed ITE power supply marked LPS, with the NI myRIO-1900.<br>Power supply voltage range:6-16 VDC, Maximum power consumption:14 W<br>Typical idle power consumption:2.6 W<br>Environmental:<br>Ambient temperature near device<br>(IEC 60068-2-1, IEC 600682-2):.0 to 40 °C<br>Storage temperature:<br>(IEC 60068-2-1, IEC 600682-2):.-20 to 70 °C<br>Operating humidity (IEC 60068-2-56) :10 to 90% RH, noncondensing<br>Storage humidity (IEC 60068-2-56) :10 to 90% RH, noncondensing<br>Maximum altitude:2,000 m<br>Pollution Degree (IEC 60664) :2, Indoor use only. | | |
| **80** | **9** | **set** | **Personal Computer with Complete Accessories, with UPS**<br>Core i3-3240/4GB/1TB/Windows 7 with 19.5-inch LED monitor or better | | |
| **81** | **1** | **lot** | **(Students' Chairs, Storage Cabinets & Multimedia Devices) 1 Lot**<br>**Polypropylene Stacking Chair (45pcs)**<br>Chair seat & back: high-quality polypropylene,<br>Chair frame: Round steel tube (heavy duty) , high quality electro-static powder coated<br>Stacks 10 high from the floor<br>Color: Navy blue/ dark blue<br>**Storage Cabinet(2pcs)**<br>1.20m x 1.90m<br>Sliding Glass doors on powder-coated aluminum frame with lock<br>18mm laminated boards with PVC edging<br>**Storage Cabinet (1)**<br>1.20m x 1.90m<br>Sliding Glass doors on powder-coated aluminum frame with lock<br>18mm laminated boards with PVC edging<br>**Interactive Whiteboard (1)**<br>78" diagonal surface, 4 pens, 1wand, wall-mount, USB Interface computer connection, Workspace software; Infrared Technology-pen & finger touch with Windows, Mac or Linux; Multi-touch with Windows 7; aspect ratio; 4:3; 8000x8000 resolution; Android & IOS tablet compatible.<br>**Multimedia Projector (1)**<br>USB 3LCD Projector, 2800 ( or better)Lumens White and Colour Light Output , Computer Cable, USB A/USB B Cables, Remote Control, Soft Carry Case & Manual | | |
| **82** | **1** | **lot** | Laboratory Repairs Renovation (pls see details in approved EDP) | | |

*Note:All packages should come with complete training program, laboratory manuals/workbooks and after sales support.*

*Training Details:*

*After delivery - training to be conducted at the University.*

*No limit of the number of participants.*

*Duration of training: 5 days during the contract period.*