**Tender Specifications of Automation Laboratory**

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| S. No. | **Brief Description and Specifications** |
| 1. | BASIC + ADVANCED PNEUMATIC + ELECTRO PNEUMATICTRAINING KIT (5Nos) consisting of  **Pneumatic Trainer work bench: Qty - 5 Nos.**  Work benched should be designed in such a way that allows two groups of students to work at the same time of the panel. The pneumatic and the electro-pneumatic components with which the students will work should be able to fit the panel. This should be further facilitated by the drawer units in order to ensure quick and easy access of the components to the students.  It will be designed for electrical power supply and compressed air connections.  -4 wheel support, with brake and high loading output |
|  | **Components for basic and advanced pneumatics ad electro-pneumatics Trainer Qty.- 5 sets**  All of the components must be industrial. Each component must be mounted on a mild steel plate, which will include holding clips to be able to insert the components in the work panel. The mild steel plates should bear a label identifying the component in question, including its reference number and ISO symbols.  All of the components will include silencers and one-touch fittings for 4mm tubing. The electric and/or electro pneumatic components will include all of the necessary cables with instant connections for 2mm-diameter power jacks.  All of the pneumatic components must be lubricated, which must last throughout their service life without the need for lubricators.   The basic & advanced pneumatic trainer should be capable to demonstrate the design, construction and application of pneumatics components and circuits.   The kit shall be capable of being used to demonstrate:  •       Design and function of a pneumatic system  •       Function and identification of pneumatic components and their symbols  •       Design of controls (logic, Memory, time & pressure dependent, intermediate position etc  •       Logic AND / OR function to start signals  •       Application and fault findings of pneumatic controls  •       Functional diagrams  •       Reading complex circuit with step diagram  •       Signal overlapping and methods of signal cut-off  •       Sequential design and supplementary conditions  •       Systematic fault finding in complex pneumatic control systems and correction  •       Pneumatic safety.  **Pneumatic Trainer Kit Equipment Set:**  Each set shall comprise of the following components / systems  **Storage drawer block for rolling table with lock: Qty - 2 Nos**  Compact drawer block with slide guides to house the trays of components  Lockable with key  **Power Supply: Qty - 2 Nos.**  Input Voltage: 220V/110V  Output: 24V/2,5A  Protection against short circuits  Input switch and LED display  Supply cable included  **Air Cleaning unit with distribution valve: Qty - 2 Nos.**  Port size 1/4 inch  Maximum Flow rate: 800 l/min  Maximum operating pressure: 10 bar  Filtration – 05 microns  Connection for tube 6 dia input and 4 dia output  it will include Filter, a Regulator with 1 Mpa Pressure Gauge, 3/2 discharge valve with silencer for connection and disconnection of the rest of the circuit.  Possibility of vertical and horizontal positioning  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **Distribution block with distribution valve: Qty - 2 Nos.**  It will include 8-outlet distribution block, one touch fittings and non-return system.  Direct coupling to the air cleaning unit  4mm Dia od for input and output  Maximum pressure - 10 bar  **Double 3/2 NC valve, operated by push button: Qty - 6 Nos.**  Type – 3/2 Normally closed position spring return  Push button colour Red and Black  Push button – Flush head type  Design – Spool type  Size – 04mm outer diatube connection  Working pressure range: 7 bar  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **3/2 NC valve, operated by roller lever: Qty - 12 Nos.**  Type – Mechanical roller action, spring return  Size – 04mm outer diatube connection  Maximum pressure – 7 bar  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob  **3/2 NC switch-operated double valve: Qty - 2 Nos.**  Type – 3/2port valve with locking system  Size – 04mm outer diatube connection  Maximum pressure – 7 bar  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob  **5/2 valve with 2-position selector: Qty - 2 Nos.**  Power-assisted valve driven by a locking switch with silencer  Size – 04mm outer diatube connection  Maximum pressure – 7 bar  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob  **3/2 NC/NO, air operated single valve: Qty - 3 Nos.**  It will include 3/2 valve which convert NO to NC as required.  Spring return, manually action facility  Size – 04mm outer dia tube connection  Maximum pressure – 7 bar  Mounting – Push to lock /Unlock mechanism  **3/2 NC convertible valve: Qty - 1 No.**  It will include Basic timer, convertible from NC to NO  Timing range 0 – 5s  Spring return  It will include silencer & speed controller  Size – 4mm outer dia tube connection  Minimum & Maximum pressure – 2 6 bar  Mounting – Push to lock /Unlock mechanism  **Air operated 5/2 single valve: Qty - 3 Nos.**  Spring return pneumatic pilot  Manual operation facility  It will include with cylinder  Size – 04mm outer dia tube connection  Design – Spool type spring return  Pressure range – 0.15 – 7 bar  Mounting – Push to lock /Unlock mechanism  **Air operated 5/2 double valve double piloting with memory function & possibility of manual operation: Qty - 10 Nos.**  Size – 04mm outer dia tube connection  Design – Spool type spring return  Pressure range – 0.15 – 7 bar  It will include silencer  Mounting – Push to lock /Unlock mechanism  **Double "OR" valve: Qty - 5 Nos.**  It will include double circuit selector with logic function "OR"  Mounting – Push to lock /Unlock mechanism  **AND function : Qty - 5 Nos.**  It will Includes a double simultaneous valve with a logic function "AND"  Mounting – Push to lock /Unlock mechanism  **Single direction speed controller (double): Qty - 10 Nos.**  It will Include two single direction speed controllers, operate manually  Size – 4mm dia tube  Type – Inline  Pressure range – 1 to 10 bar  **Quick exhaust valve: Qty - 2 Nos.**  It will Includes a free exhaust valve with silencer  Size – 4mm dia tube  Pressure range – 1 to 10 bar  Mounting – Push to lock /Unlock mechanism  **Single acting cylinder: Qty - 1 No.**  Rod normally retracted  Material – stainless steel construction  End cushioning: Rubber cushioning  Bore –20 dia (min)  Stroke – 50 mm (min)  Type – Miniature cylinder  Maximum pressure – 10 bar  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **Double acting cylinder: Qty - 7 Nos.**  Material – Stainless steel construction  Bore– 20 dia (min) Stroke – 100 mm (min)  Size - 4 mm dia tube  Type – Miniature cylinder (Magnetic with Reed Switch)  Maximum pressure – 10 bar  End cushioning: Rubber cushioning  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **Polyurethane tube 10 metre. each colour set of 4 mm exterior diameter for connections on pneumatic circuits: Qty - 3 Sets.**  Maximum pressure – 10 bar  Colour: Blue, Black. Red. Green  **TEE fittings: Qty - 3 Sets.**  Union T fitting: – Set of 10 one-touch fittings  Size – 4mm outer dia. tube  Material – Plastic body  Maximum pressure – 10 bar  **Set of 10 x 4mm plastic plugs: Qty - 2 Sets.**  Tool for plugging pressure outlets in 4mm tube  Material – Plastic body  Maximum pressure – 10 bar  **Pressure Indicator**  It will include a green optical gauge with a display angle of 180deg  Size: 4mm dia tube  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **Tube Cutte tool: Qty - 1 No.** |
|  | **Electro Pneumatic trainer kit - Quantity - 5Nos.**  Add on basic & advanced electro pneumatic trainer should be capable to demonstrate the design, construction and application of pneumatics components and circuits.    The kit shall be capable of being used to demonstrate:  •       Application and function of 3/2 and 5/2 valves  •       latching circuits  •       Relay Logic operations: AND /OR /NOT  •       Combining logic operations  •       Function and application of electrical limit switches  •       End position monitoring  •       Realising oscillating movement  •       Electrical safety requirements  •       Economic and technical aspects of using electro pneumatic components  •       Trouble shooting of simple electro pneumatic circuits  •       Sequence Controls with opposing signal  •       Special circuit for industrial applications  Add on components for basic & advanced electro pneumatic trainer:  **Quick exhaust valve: Qty - 2 Nos.**  It will Includes a free exhaust valve with silencer  Size – 4mm dia tube  Pressure range – 1 to 10 bar  Mounting – push to lock / Unlock mechanism  **Single direction speed controller (double): Qty - 10 Nos.**  It will include two single direction speed controllers, operated manually.  Size – 4mm dia tube  Type – Inline  Pressure range – 1 to 10 bar  **Single acting cylinder: Qty - 1 No.**  Rod normally retracted  Material – Stainless steel construction  End cushioning: Rubber cushioning  Bore –20 dia (min)  Stroke – 50 mm (min)  Type – Miniature cylinder  Maximum pressure – 10 bar  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **Double acting cylinder adjustable air cushion with built-in rail for magnetic detection: Qty - 7 Nos.**  Material – Stainless steel construction  Bore – 20 dia (min)  Stroke – 100 mm (min)  Size - 4mm dia tube  Type – Miniature cylinder (Magnetic with Reed Switch)  Maximum pressure – 10 bar  End cushioning: Rubber cushioning  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **5/2 Single solenoid valve: Qty - 2 Nos.**  Low consumption 0, 55 W  LED display and surge absorber  Design – Spring and air reset  Power-assisted system  Includes silencer & fittings 4mm od  4mm banana plugs for electric connections  **5/2 Double solenoid valve Low consumption, LED display and surge absorber: Qty - 6 Nos.**  Low consumption 0, 55 W  LED display and surge absorber  Design – Spring and air reset  Power-assisted system  Includes silencer & fittings 4mm od  4mm banana plugs for electric connections  **Button pad with three push buttons: Qty - 4 Sets.**  4mm safety terminals for use with connections wiring  Two pushbuttons and a locking pushbutton.  Independent light indicator.  Two push-button switch contacts  Push button colour – Red, Green, Blue.  Mounting - Push to lock/unlock mechanism  **Set of 3 relays with active LED: Qty - 5 Sets.**  It will include three relays with 24V coil and 4 switchable contacts  Relay-active LED  4mm safety terminals for use with connections wiring  Mounting - Push to lock/unlock mechanism  **Indicator (Pilots, buzzer) 8 pilot lights and a buzzer: Qty - 2 Nos.**  Supplementary Terminals for power distribution  4mm safety terminals for use with connections wiring  Mounting - Push to lock/unlock mechanism  **Electrical end of stroke: Qty - 8 Nos.**  It will include Roller-driven end of stroke with switchable electric contact.  4mm safety terminals for use with connections wiring.  Mounting – Turn to lock / Unlock mechanism with slot stone indicator knob.  **Set of connection cables: Qty - 2 Sets.**  It will include 50x 2mm (diameter) snap connection cables with different colours and lengths.  Cable colours – Red, black & Blue  Connector type – 4mm banana plug  **Set of 2-Timer: Qty - 1 No.**  It will include two timer relays, one for connection and the other for disconnection  24V Coil, with switch contact  LED display of timer status  Time programmable between 0.1 s and 1 h  Connection type 4mm banana plug  Mounting - Push to lock/unlock mechanism  4mm safety terminal for use with connections wiring  **Electric counter: Qty - 1 No.**  It will include inputs for counting and discounting  Power supply: 24VDC  Electromechanical preselection  Manual or electrical reset  Switch contact  Connection type 4mm banana plug  Display: 6 digits LCD display  Mounting – Push to Lock/ Unlock mechanism  4mm safety terminals for use with connections wiring  **Photoelectric Detector: Qty - 2 Nos.**  It will M18 reflection photoelectric detector  Detection Distance: 100 mm  Sensor Display–LED  Operating Voltage: 24V.  Connector Type: quick connection cable QD connector  Mounting – Push to Lock/ Unlock mechanism  **Programmable digital vacuum pressure switch. Analog / digital outputs: Qty - 1 No.**  Operating Voltage: 24V.  Consumption: 45mA  Pr. Range: 1 to 0.1 mpa  3 numerical digits  PNP output with snap connection cables  Size – 4mm dia tube.  **Polyurethane tube 10 mtr. each colour set of 4 mm exterior diameter for connections on pneumatic circuits: Qty - 3 Sets.**  Maximum pressure – 10 bar  Colour: Blue, Black. Red. Green  **TEE fittings: Qty - 2 Sets.**  Union T fitting: – Set of 10 one-touch fittings  Size – 4mm outer dia tube  Material – Plastic body  Maximum pressure – 10 bar  **Set of 10 x 4mm plastic plugs: Qty - 2 Sets.**  Tool for plugging pressure outlets in 4mm tube.  Material – Plastic body  Maximum pressure – 10 bar |
| 2. | **Training Kit PLC- Module: Qty-2 sets**  Add on Supplementary equipment set to perform experiments related to automation with PLC. This module will help to cover following activities    •       Benefits of PLC compared to conventional solutions  •       Functions of systems components of PLC  •       Commissioning of PLC  •       Sequence control and parallel logic  •       Systematic programming of a PLC  Each unit will consist of following components  Brand: Mitsubishi PLC, Ac 100240V  12 Inputs & 8 outputs  With programming cable and software  Should be able to mount on profile plate of basic pneumatics kit  Operating voltage – 24V DC  PLC Type – PLC with 12DI, 8DO  Connection type – 4mm banana plug, Mounting - Push to Lock / Unlock |
| 3. | **PICK AND PLACE DEMO KIT: Qty - 1 Set.**  The equipment should be capable to demonstrate concept of automation in pick and place of components in industry. All of the components used to build the Pick and Place demo kit must be industrial.   The equipment should include:  **Control Panel:**  - Power on OFF button  - Selector switch to select auto or manual operation  - Green start button  - Red stop button  - Reset button  - Emergency stop button  **Air treatment unit:**  - The equipment should include an air treatment unit comprising a 5 µm filter with a pressure  regulator, 10 bar pressure gauge, manual 3/2 stop valve, drain valve and silencer.  **Documentation:**  The equipment will come with a set of hardcopy documentation, consisting of:  - Technical system description.  - Pneumatic drawings.  - Electrical drawings.  - Mechanical assembly drawings.  - Specifications for all of the industrial components.  Pick and Place Demo Kit will be provided fully assembled, programmed and tested.  **Operation:**  **In auto mode:** Complete cycle will be repeated until barrel is unloaded.  **In manual mode:** Only one cycle will be run by pressing the start button.  The function of the equipment will consist of:  Manual loading a part in barrel.  Use of proximity sensor to sense the work piece  Pushing work piece to demonstrate movement with linear cylinder, sensing final position of linear cylinder by proximity sensor and retraction of linear cylinder.  Movement of vertical guide cylinder and gripping the work piece with gripper for demonstration of pick up operation.  Retraction of guide cylinder to lift the work piece.  Rotate the work piece with gripper and rotary actuator at 90deg to place the work piece in required location.  Release the work piece from gripper fingers to place at required location.  The equipment will be mounted on a anodized aluminium desktop base. The following modules will be fitted on this base:  **Barrel & pusher module:**  This module will have a gravity feeder in which the anodised aluminium parts will be stored on top of each other, so that when the part at the bottom of the pile is feed the rest fall down due to gravity. The part at the bottom of the pile will be removed using a pneumatic cylinder.The components in this module will have the following characteristics:  - Barrel block storage capacity: minimum 08 parts.  **Actuators:**  - 1 double acting pneumatic pusher cylinder, Ø16 and 100mm stroke, with speed controllers  and initial and final position switches and controlled by a double 5/2 solenoid valve.  **Sensors:**  - 2 auto switches, PNP Reed type  **Pick and place module**  **Actuators:**  - 1 Pneumatic guide cylinder, Ø12and 30mm stroke, with speed controllers and final position switches and controlled by a double 5/2 solenoid valve.  - 1 Pneumatic gripper, Ø16mm, with speed controllers and final position switches and controlled by a double 5/2 solenoid valve.  - 1 Rotary actuator, Ø10mm, with speed controllers and final position switches and controlled by a double 5/2 solenoid valve.  **Sensors:**  - 2 auto switches, PNP Reed type.  - 2 Proximity Sensor  **Electrical control panel:**  **PLC**  Wired and programmed control PLC for automatic/manual operation. This PLC will have at least 16 digital inputs including push buttons, and 10 digital outputs, 24VDC implemented, i.e. connected to the hardware.  All of the pneumatic tubing and wiring must be properly identified and labelled at both ends |
| 4. | **SORTING DEMO KIT: Qty - 1 Set.**  The equipment should be capable to demonstrate concept of automation in sorting of components in industry. All of the components used to build the Sorting demo kit must be industrial.  The equipment should include:  **Control panel:**  - Power On off button  - Selector switch to select auto or manual operation  - Green start button  - Red stop button  - Reset button  - Emergency stop button  **Air treatment unit:**  The equipment should include an air treatment unit comprising a 5 µm filter with a pressure regulator, 10 bar pressure gauge, manual 3/2 stop valve, drain valve and silencer.  **Documentation:**  The equipment will come with a set of hardcopy documentation, consisting of:  - Technical system description.  - Pneumatic drawings.  - Electrical drawings.  - Mechanical assembly drawings.  - Specifications for all of the industrial components.  Sorting Demo Kit will be provided fully assembled, programmed and tested.  **Operation:**  **In auto mode:** Complete cycle will be repeated until barrel is unloaded.  **In manual mode:** Only one cycle will be run by pressing the start button.  The function of the equipment will consist of:  Manual loading a part in barrel.  Use of proximity sensor to sense the work piece  Pushing work piece to demonstrate movement with linear cylinder, sensing final position of linear cylinder by reed switch and retraction of linear cylinder.  Another proximity sensor will sense part is metallic or non-metallic.  If part is metallic linear cylinders will push the metallic part for collection in bin 2.  If part is non-metallic linear cylinder will not extend and let the non-metallic part pass for collection in another bin 1.  The equipment will be mounted on anodized aluminium desktop base. The following modules will be fitted on this base:  **Barrel module:**  This module will have a gravity feeder in which the anodised aluminium parts will be filled on top of each other, so that when the part at the bottom of the pile is fed the rest fall down due to gravity. The part at the bottom of the pile will be removed using a pneumatic cylinder. The components in this module will have the following characteristics:  - Storage capacity: minimum 08 parts.  **Actuators:**  - 1 double acting pneumatic pusher cylinder, Ø16 and 50mm stroke, with speed controllers and initial and final position switches and controlled by a double 5/2 solenoid valve.  **Sensors:**  - 2 auto switches, PNP Reed type.  **Sorting module**  **Actuators:**  - 1 double acting pneumatic cylinder, Ø16 and 75mm stroke, with speed controllers and final  position switches and controlled by a double 5/2 solenoid valve.  **Sensors:**  - 2 auto switch, PNP Reed type.  - 2 Proximity sensor – one to sense the component & second to sense the metal part.  Separate bins to store sorted components.  **Electrical control panel:**  Wired and programmed control PLC for automatic/manual operation. This PLC will have at least 16 digital inputs including push buttons, and 10 digital outputs implemented, i.e. connected to the hardware.  All of the pneumatic tubing and wiring must be properly identified and labelled at both ends. |
| 5. | **STAMPING DEMO KIT: Qty - 1 Set.**  The equipment should be capable to demonstrate concept of automation in stamping of components in industry. All of the components used to build the stamping demo kit must be industrial.  The equipment should include:  **Control panel:**  - Power on off button  - Selector switch to select auto or manual operation  - Green start button  - Red stop button  - Reset button  - Emergency stop button  **Air treatment unit:**  The equipment should include an air treatment unit comprising a 5 µm filter with a pressure regulator, 10 bar pressure gauge, manual 3/2 stop valve, drain valve and silencer.  **Documentation:**  The equipment will come with a set of hardcopy documentation, consisting of:  - Technical system description.  - Pneumatic drawings.  - Electrical drawings.  - Mechanical assembly drawings.  - Practice activities.  - Specifications for all of the industrial components.  Stamping Demo Kit will be provided fully assembled, programmed and tested.  **Operation:**  **In auto mode:** Complete cycle will be repeated until barrel is unloaded.  **In manual mode:** Only one cycle will be run by pressing the start button.  The function of the equipment will consist of :  Manual loading a part in barrel.  Use of proximity sensor to sense the work piece on barrel.  Pushing work piece to demonstrate movement with linear cylinder, sensing final position of linear cylinder by reed switch and retraction of linear cylinder.  Movement of vertical linear cylinder for demonstration of stamping operation and retract and position sensing by reed switch.  Pushing the work piece with linear cylinder after stamping and cylinder position will be confirmed by reed switch & PLC get signal.  Proximity sensor – sense the component at stamping position.  The equipment will be mounted on an anodized aluminium desktop base. The following modules will be fitted on this base:  **Barrel module:**  This module will have a gravity feeder in which the anodised aluminium parts will be filled on top of each other, so that when the part at the bottom of the pile is fed the rest fall down due to gravity. The part at the bottom of the pile will be removed using a pneumatic cylinder. The components in this module will have the following characteristics:  - Storage capacity: minimum 08 parts.  **Actuators:**  - 1 double acting pneumatic pusher cylinder, Ø16 and 100mm stroke, with speed controllers and initial and final position switches and controlled by a double 5/2 solenoid valve.  **Sensors:**  - 2 auto switches, PNP Reed type.  - 1 Proximity sensor – Sense the component  **Stamping module**  **Actuators:**  - 1 double acting pneumatic cylinder, Ø32 and 50mm stroke, with speed controllers and final position switches and controlled by a double 5/2 solenoid valve.  **Sensors:**  - 2 auto switch, PNP Reed type.  - 1 Proximity sensor – before stamping confirm the component  **Displacement module**  Once the stamping operation has been carried out, this module will displace the part to an unloading area. The part will be displaced by a pneumatic cylinder that will push stamped anodised aluminium part. The components in this module will have the following characteristics:  **Actuators:**  - 1 rectangular pneumatic pusher cylinder, Ø16 and 50mm stroke, with speed controllers and final position switches and controlled by a double 5/2 solenoid valve.  **Sensors:** - 2 auto switch, PNP Reed type.  **Electrical control panel:**  Wired and programmed control PLC for automatic/manual operation. This PLC will have at least 16 digital inputs including push buttons, and 10 digital outputs implemented, i.e. connected to the hardware.  All of the pneumatic tubing and wiring must be properly identified and labelled at both ends. |
| 6. | **VACUUM TECHNOLOGY: Qty - 1 Set.**  All of the components must be industrial.  All of the components will include silencers and fittings with instant connections for 6mm tubing.  This kit shall be capable to demonstrate the following:  •       Development of skills related to vacuum technology  •       Sizing and setting up of vacuum system  •       Function and use of vacuum ejectors  •       Selection of vacuum pad  •       Understanding different pad material suitable for different applications  •       Selection of vacuum ejectors  •       Sizing ejectors to work in systems where leakage is present between vacuum pad and work piece.  •       Using vacuum switch to monitor vacuum level  •       Designing, analysis of circuits using vacuum and trouble shooting.  **SYSTEM COMPONENT SPECIFICATIONS**  The system will consist of two stratified panels, panels A and B, and a set of vacuum pads and components. The components included on panels A and B will be held in place on the work panel by clips and will bear ISO symbols identifying them.  The panel fixing system for the panels described below must be compatible with an extruded aluminium panel with 8.5mm slots.  **PANEL A: QUANTITY: 1.**  It will include:  · Foot mounted reservoir with non-return fittings - Quantity 1 No.  · Solid state compact vacuum pressure switches -Quantity 2 Nos.  · Digital vacuum pressure switch with fault prediction function- Quantity 1 No.  · 24 VDC timer - Quantity 1 No.  · Programmable digital vacuum pressure switches Quantity 2 Nos.  · Pressure gauge with electrical contact switch for vacuum1 Quantity 1 No.    **PANEL B: QUANTITY: 1.**  It will include:  · Multiphase vacuum ejector Quantity 1 No.  · Vacuum unit with ejector, valves, vacuum pressure switch and filter Quantity 1 No.  · Compact vacuum ejector Quantity 1 No.  · 3/2 elastic runner solenoid valve Quantity 1 No.  · Vacuum module with ejector, valves, vacuum pressure switch and filter Quantity 1 No.  · Vacuum unit with ejector, timed valves, vacuum pressure switch and filter Quantity 1 No.  · Vacuum Regulator with pressure gauge Quantity 1 No.  · Air suction filter for vacuum Quantity 1 No.    **SET OF VACUUM PADS: QUANTITY: 1. COMPRISING:**  · Flat NBR vacuum pad with ridges. Quantity 1 No.  · Silicone vacuum pad with gaiter. Quantity 1 No.  · Urethane rubber vacuum pad with gaiter. Quantity 1 No.  · Fluorine rubber vacuum pad with gaiter. Quantity 1 No.  · Flat NBR vacuum pad with joint. Quantity 1 No.  · Flat NBR vacuum pad with telescope. Quantity 1 No.  · Deep/concave NBR vacuum pad with telescope.Quantity 1 No  **Other Elements:**  Tube cutter tool Quantity 1 No |
| 7. | **TRANSPARENT HYDRAULICS / ELECTROHYDRAULICS TRAINER: Qty - 2 Set.**  Work benches should be designed in such a way that allows two groups of students to work at the same time on either side of the panel. The system will consist of an extruded aluminium panel with slots on both sides, which will allow two groups of students to work at the same time on either side of the panel. The hydraulic and electrohydraulic components with which the students will work will be fitted on the panel.  This should be further facilitated by two drawer units in order to ensure quick and easy access of components to students.  It will be designed for electrical power supply and compressed air connections.  4-wheel support, with brake and high loading output.  All of the components will be formed by a prismatic body made of transparent methacrylate with metal industrial parts on the inside. Each component must be mounted on a plate, which will include holding clips to be able to insert the components in the work panel. The plates will bear a metal label identifying the component in question, including its reference number and ISO symbols.  **Hydraulic trainer should be capable to demonstrate following:**  Design and function of a Hydraulic System, Electrohydraulic system  Design and Function of manual operated valves and solenoid valve  Symbols according to international standards.  Basic Circuit Diagrams on practical applications  Basic Circuit Diagrams on practical applications, Hydraulic energy, Electrical logics AND/OR  Reading and understanding technical data  Interpretation of measurement results  Trouble shooting  Interpretation of measurement results  Analytical fault finding  Control technology with position, sequence and pressure control  Hydraulic controls with pilot operated valves  Hydraulic reservoirs, flow distributors  Basic principles of analogue processing  **SYSTEM COMPONENT SPECIFICATIONS**  **Work bench with twin-post: Qty - 1 No.**  - The system will consist of an extruded aluminium panel with slots to fix the  components.  - The entire rolling frame may be disassembled for transportation.  - It will be designed for electrical power supply and compressed air connections.  - 4-wheel support, with brake and high loading output.  **Storage drawer block for rolling table with lock: Qty - 1 No.**  - Compact 4-drawer block with slide guides to house the trays of components.  - Post formed material with ergonomically designed pull devices  - Lockable with key.  **Portable hydraulic pump for transparent hydraulic: Qty - 1 No.**  - Transparent tank holding 6 litres.  - Single-phase motor 0.12 Kw, 220v, 50Hz.  - Gear pump. Q= 1 l/min.  - Start - stop switch.  - Filling lid and filter.  - Pressure relief valve, Pmax: 10 bar.  - Pressure gauge with diameter 40 mm, with scale from 0 to 16 bar.  - 3 quick connector couplings (P + 2T)  - Power supply cable, length of 3 metres, with single-phase plug.  - Air bubble insertion system in the circulation oil.  - Does not include oil drum  **Oil with special red colouring: Qty - 1 No.**  - Specially coloured oil for using with transparent elements.  - Quantity required for portable hydraulic pump  **BATCH OF COMPONENTS AND ACCESSORIES:**  **TRANSPARENT HYDRAULICS COMPOSITION – LEVEL I: Qty - 1 No.**  **General features:**  - All the hydraulic components will use anti-leakage quick NW4 plugs self-sealing 1/8”.  - All the components that should have, will be mounted on a base plate.  - Each of these components will include a fixing system to the assembly panel, with a specific design based on POM material (state-of-the-art polymer with self-lubricating properties, resistant to deformation, wear and ageing).  - All of the components will be formed by a prismatic body made of transparent methacrylate with metal industrial parts on the inside.    **COMPRISING THE FOLLOWING COMPONENTS AND QUANTITIES:**  **Double acting cylinder: Qty - 1 No.**  - Double acting cylinder D20/D10 x 58mm of stroke.  - Pmax: 10 bar  - In a prismatic body made of transparent methacrylate and with metal industrial parts on the inside.  - On a base plate with two NW4 plugs self-sealing 1/8".  **4/2 Directional control valve, manually operated: Qty - 1 No.**  - Manually-operated and spring return.  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with four NW4 plugs self-sealing 1/8".  **Pressure relief valve, direct control: Qty - 1 No.**  - Pressure relief valve (ball), direct control.  - Manual adjustment using the twist handle.  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with two NW4 plugs self-sealing 1/8".  **One way restrictor: Qty - 1 No.**  - Pmax: 10 bar.  - It enables the oil to flow on one direction only.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with three NW4 plugs self-sealing 1/8".  **Two-way flow control valve: Qty - 1 No.**  - Two-way flow control valve, with two ports, needle.  - Manual adjustment by rotary knob.  - Pmax: 10 bar.  - It enables the oil flow in both directions to be adjusted.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with two NW4 plugs self-sealing 1/8".  **Set of 10 hoses: Qty - 1 Set.**  - Set of 10 transparent polyurethane tubes.  - Pmax: 10 bar.  - 520 mm length: 6 units  - 350 mm length: 4 units  - With two NW4 socket 1/8".  **6 connection distributors on manifold: Qty - 1 No.**  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate.  - On a base plate with six NW4 plugs self-sealing 1/8".  **Cross distributor with pressure gauge: Qty - 1 No.**  - Distributor with 3 connections with 2-self-sealing plugs and 1 socket.  - Pressure gauge from 0 to 16 bar.  - In a prismatic body made of transparent methacrylate.  - On a base plate with two self-sealing NW4 plugs and 1 NW4 socket 1/8".  User’s and exercise manual. English.  - It will include dossiers with hydraulics - electrohydraulic activities proposed and solutions  **TRANSPARENT HYDRAULICS COMPOSITION – LEVEL II: Qty - 1 No.**  **General features:**  - All the hydraulic components will use anti-leakage quick NW4 plugs self-sealing 1/8”.  - All the components that should have, will be mounted on a base plate.  - Each of these components will include a fixing system to the assembly panel, with a specific design based on POM material (state-of-the-art polymer with self-lubricating properties, resistant to deformation, wear and ageing).  - All of the components will be formed by a prismatic body made of transparent methacrylate with metal industrial parts on the inside.    **COMPRISING THE FOLLOWING COMPONENTS AND QUANTITIES:**  **Single acting cylinder: Qty - 1 No.**  - Single acting cylinder D20/D10 x 40mm of stroke. Spring return.  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with one NW4 plug self-sealing 1/8".  **3 way pressure relief valve with damping: Qty - 1 No.**  - Spool-type pressure relief valve, direct control.  - Manual adjustment by rotary knob.  - Pmax: 10 bar.  - Opens the oil flow when the pre-set Pr. Value is reached at the input.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with three NW4 plugs self-sealing 1/8".  **Pressure reducing valve, 3 way. Direct control: Qty - 1 No.**  - Manual adjustment by rotary knob.  - Pmax: 10 bar.  - It enables the pr. Value at the output, at A to be adjusted.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with three NW4 plugs self-sealing 1/8".  **Manual shut-off valve, 2 way: Qty - 1 No.**  - 2-port shut-off valve.  - Manual rotary actuation.  - Pmax: 10 bar.  - Open/close the oil flow with an activation lever.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with two NW4 plugs self-sealing 1/8".  **Piloted check valve: Qty - 1 No.**  - Pmax: 10 bar.  - Normally it allows the oil to pass in one direction only, but it does it in both directions  when there is pressure in the pilot connection.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with three NW4 plugs self-sealing 1/8".  **One-way flow control valve: Qty - 1 No.**  - Flow control valve with non-return, one-way.  - Manual adjustment by rotary knob.  - Pmax: 10 bar.  - It enables the oil flow in one direction to be adjusted and flow to be unrestricted in the opposite direction.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with two NW4 plugs self-sealing 1/8".  **Flow control valve with Pr. compensation: Qty - 1 No.**  - Flow control valve with hydrostatic compensation.  - Manual regulation by rotary knob.  - Pmax: 10 bar.  -  It enables the flow to be adjusted regardless of the pressure values at the input and output.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with two NW4 plugs self-sealing 1/8".  **Set of 5 hoses: Qty - 1 Set.**  - Set of 5 transparent polyurethane tubes.  - Pmax: 10 bar.  - 520 mm length.  - With two NW4 socket 1/8".  **4 connection dividers: Qty - 1 No.**  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate.  - On a base plate with three self-sealing NW4 plugs and 1 NW4 socket 1/8".  **User’s and exercise manual. English: Qty - 1 No.**  - It will include dossiers with hydraulics - electrohydraulic activities proposed and solutions.  **TRANSPARENT ELECTROHYDRAULICS COMPOSITION: Qty - 1 No.**  **General features:**  - All the hydraulic components will use anti-leakage quick NW4 plugs self-sealing 1/8”.  - All the electrical connectors will include 4 mm security terminals.  - All the components that should have, will be mounted on a base plate.  - Each of these components will include a fixing system to the assembly panel, with a specific design based on POM material (state-of-the-art polymer with self-lubricating properties, resistant to deformation, wear and ageing).  - All of the components will be formed by a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  **COMPRISING THE FOLLOWING COMPONENTS AND QUANTITIES:**  **4/2 Solenoid valve, spring return: Qty - 1 No.**  - Coil-operated with low consumption of 24Vcc 12w and spring return.  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with four NW4 plugs self-sealing 1/8".  **4/3 Solenoid valve with closed mid-position: Qty - 1 No.**  - Coil-operated with low consumption of 24Vcc 12w on both sides and spring cantered.  - Pmax: 10 bar.  - In a prismatic body made of transparent methacrylate with metal industrial parts on the inside.  - On a base plate with four NW4 plugs self-sealing 1/8".  **Power supply: Qty - 1 No.**  - Input: 110 - 240 VAC  - Output: 24 VDC/5A.  - Protection against short circuit and overload. Input switch and LED display.  - Supply cable included.  - 4 mm female electrical safety connectors.  - Insulating box with screen printed lid  **Set of push-buttons: Qty - 1 No.**  - 2 Push buttons: 1 green, 1 red, with 2 open contacts +2 closed contacts  - 1 Selector with 2 open contacts + 2 closed contacts.  - 4 mm female electrical safety connectors.  - Insulating box with screen printed lid  **Set of three relays: Qty - 1 No.**  - 3 relays with 24VDC coil and 4 switchable contacts.  - Relay-active LED.  - 4 mm terminals for snap connection cables.  - Insulating box with screen printed lid  **Electric end of stroke (right): Qty - 1 No.**  - 1 contact NC and 1 contact NO.  - 4 mm female safety connectors.  - Transparent body and roller with reversible position.  - Mounted on base plate and fixing system to the assembly panel.  **Electrical end of stroke (left): Qty - 1 No.**  - 1 contact NC and 1 contact NO.  - With cables and 4 mm security terminals.  - Mounted on base plate and fixing system to the assembly panel.  **Set of connectors for solenoids. 2 grey + 1 black: Qty - 1 No.**  - Connector (2 grey and 1 black colour) + LED + cable 1.5m + 4 mm terminals (1 red and 1 blue colour).  - Ready to connect in solenoid valve coils.  **Set of electrical connectors: Qty - 1 No.**  - Comprising 25 cables of different colours with 4 mm electrical connectors.  - 5 Red cable – length: 1.5m  - 5 Black cable – length: 1m  - 10 Yellow cable – length: 0.5m  - 5 Blue cable – length: 0.25m  **User’s and exercise manual. English: Qty - 1 No.**  - It will include dossiers with hydraulics - electrohydraulic activities proposed and solutions. |
| 8. | **SENSOR TRAINING KIT (it should not be add on kit, it should be aseparate kit): Qty - 1 No**  Compact and user-friendly trainer to provide a modern, portable, comprehensive and practical way to learn Technology of sensors. Trainer should be provided with detailed learning material which covers objectives, step by step procedure to conduct the experiment and other useful information on Fibre optic, inductive, capacitive, optical and magnetic sensors.  **Equipment should be supplied with:**  Equipment user manual.  Theoretical-practical activities proposal for the student.  Solutions to the proposed activities for the instructor.  **Integral parts:**  Working table: mechanical part and electrical modules. It includes:  Linear guide with spindle and wheel.  Graduated support for sensors.  Materials for detection and positioning.  Power supply: 24 VDC.  Emergency push button.  On/off switch.  LED indicators for detection of sensor activation.  Buzzer for audio indication of sensor activation.  Auxiliary relay.  Sensor trainer kit should be capable of helpful in study following practical activities:  **PRACTICAL ACTIVITIES**    **P1**: **Characteristics of the inductive switch**  **.** To analyse the characteristics of the inductive switch.  ·To describe the concepts: connection point, disconnection point and hysteresis of a proximity switch.  · To identify the influence of the diameter of the sensor on the switching distance.    Description of the element required to complete activity.  - Omron M12 inductive switch  - Omron M18 inductive switch  - Switch mount.  - Test piece  - Connecting plate 1: Power supply source & displays -  **P2**: **Use of the inductive switch to detect different materials**  To determine the influence that the material of the part which is to be detected has on the switching distance.  Description of the element required to complete activity.  - M18 inductive switch  - Piece of mild steel  - Piece of stainless steel  - piece of aluminium  - Piece of brass  - Switch mount  - Connecting plate 1: Power supply source & displays.  **P3: Influence of the object’s dimensions on the inductive switch**  · To determine the influence that the dimensions of the object which is to be detected have on the switching distance.    Description of the element required to complete activity.  - Omron M18 inductive switch  - 3 Pieces of stainless steel of different size  - Switch mount  - Connecting plate 1: Power supply source & displays-  **P4: Characteristics of capacitive switches**  · To analyse the switching characteristics of a capacitive proximity switch.    Description of the element required to complete activity.  - Omron M18 capacitive switch  - Piece of Cardboard  - Piece of Methacrylate  - Piece of Mild steel  - Switch mount  - Connecting plate 1: Power supply source & displays  **P5: Use of the capacitive switch to detect different thicknesses**  · To identify the influence that the thickness of the object which is to be detected has on the switching distance of a capacitive proximity switch.  · To detect plastic objects with a capacitive proximity switch.    Description of the element required to complete activity.  - Omron M18 capacitive switch  - Piece of Cardboard  - Piece of Methacrylate  - Piece of Mild steel  - Switch mount  - Connecting plate 1: Power supply source & displays  **P6: Lateral approach with capacitive proximity switches**  · To analyse and plot the switching characteristics of a capacitive proximity switch with a lateral approach.    Description of the element required to complete activity.  - Omron M18 capacitive switch  - Test object Mild steel  - Switch mount  - Connecting plate 1: Power supply source & displays    **P7**: **Object reflex photo electric switch**  · To identify desirable and undesirable objects using a direct reflection sensor.  · To analyse the technical and switching features of a direct reflection sensor.  Description of the element required to complete activity.  - Omron M18 Photo electric switch Reflex on object.  - Piece of Stainless steel  - Piece of Aluminium  - Piece of Methacrylate  - Piece of Black plastic  - Switch mount.  - Connecting plate 1: Power supply source & displays.  **P8**: **Retroreflective photo electric switch**  · To analyse the features of a retroreflective switch.  · To assemble the switch and the reflector correctly.    Description of the element required to complete activity.  - Omron M18 Photo electric switch Reflex on object.  - Piece of Red plastic  - Piece of Brass  - Piece of Methacrylate  - Piece of Aluminium  - Switch mount  - Connecting plate 1: Power supply source & displays    **P9**: **Fibre optic object reflex sensor**  · To identify the changes in the detection distance according to the sensitivity to which the sensor is adjusted.  · To determine the characteristics of a photo electric reflex object sensor with fibre optics.    Description of the element required to complete activity.  - Omron Photo electric sensor with digital adjustment  - Object reflex fibre optic cable  - Piece of black plastic  - Switch mount  - Connecting plate 1: Power supply source & displays  **P10: Using fibre optic to detect different colours**  • To determine the characteristics of an object reflex sensor with fibre optic cables according to the materials to be detected.  • To detect objects of different colours by playing with the sensitivity.  • To assemble a sensor with fibre optic cables.    Description of the element required to complete activity.  - Photo electric sensor with digital adjustment  - Object reflex fibre optic cable  - Piece of black plastic  - Piece of red plastic  - Switch mount  - Connecting plate 1: Power supply source & displays    **P11**: **Use of a fibre optic barrier sensor**  · To determine the characteristics of a photo electric barrier sensor with fibre optic cables.  · To detect a transparent object with an optical barrier sensor with fibre optic.    Description of the element required to complete activity.  - Photo electric sensor with digital adjustment  - Fibre optic transmitter cable  - Fibre optic receiver cable  Piece of methacrylate  - Switch mount  - Connecting plate 1: Power supply source & displays  **P12**: **Magnetic proximity switches**  · To identify the characteristics of a reed-type magnetic proximity switch according to the position and alignment of the magnet.    Description of the element required to complete activity.  - Magnetic switch  - Test pieces with permanent magnets  - Switch mount  - Connecting plate 1: Power supply source & displays |
| 9. | **Necessary Software: Qty - 1 No.**  **Basic Pneumatics Training Software with animation covering below mentioned study material.**  ·         Properties of compressed air and its area of application.  ·         Basic pneumatic system and compressed air theory.  ·         Description of different types of pneumatic compressor  Compressed air production, purification and distribution.  ·         Explanation of different air filtering, regulation, and lubrication techniques.  ·         Construction, principle of operation, sizing and mounting of actuators and Directional Control Valves.  ·         Familiarization with pneumatic symbols-ISO 1219/5599.  ·         Ancillary pneumatic equipment  ·         Reading/designing of control schematics  ·         Practical exercises with troubleshooting  **Basic Electro - Pneumatics Training Software with animation covering below mentioned study material.**           Basic Electric Theory.           Construction and principle of operation of basic electrical components           Theory of Electromagnetism           Construction and principle of operation of Electro Pneumatic Components.           Construction and principle of operation of electrical logic components           Symbols – ISO 1219/5599.           Construction of Ladder diagram.           Reading/Design of control Schematics.           EP1 Practical exercises with troubleshooting. |
| 10. | **Set of Training cut sections – consisting of Qty 1 each**  Cut section (dissection view) of various pneumatics product as below for study purpose to understand the working & construction of the product in a more refined way:  - Cut section for air filter  - Cut section for air regulator  - Cut section for air filter regulator  - Cut section for double acting air cylinder  - Cut section for single acting air cylinder  - Cut section for solenoid valve  - Cut section for rotary actuator |
| 11. | **Pneumatic magnetic board symbols for training purpose – QTY 02 each**  Magnetic symbols of various pneumatics product for study purpose to understand the circuit designing in pneumatic system. |
| 12. | **Poster set (set of 10 posters) on pneumatic products which should include:**  - Heavy duty auto drain  - Single acting cylinder  - Rack and pinion type rotary actuator  - Membrane Air dryer  - Air Gripper  - Rodless cylinder  - Solenoid valve  - Vacuum pad  - Check valve and shuttle valve  - Air filter regulator |
| 13. | NECESSARY TRANING TEXTBOOKS**-QTY 5 Nos**  **Basic & Advanced pneumatics, Covering following:**  - Introduction of Pneumatics  - Basic Pneumatic system  - Compressed air theory  - Details on Air compression, preparation and distribution  - Air treatment  - Piping  - Air line equipment  - Directional control valves  - Actuators  - Symbols  **Basic Pneumatic Circuits**  - Servicing and safety notes  **Basic & Advanced Electro Pneumatics Basic Electric theory**  - Electro pneumatic Components  - Sensors timers and counters  - Compressed air basics  - Control Systems  - Various Control Circuits  - Introduction to sequence control  - Sequence control with opposing Signal  - Sequence control with supplementary conditions  - Circuit design for industrial applications  - Electrical Safety  **PLC, Covering following**  - Introduction of PLC  - PLC Hardware components  - Types of PLCs  - Number, codes and little logic  - Concept of PLC programming  - Basic Programming instructions  - PLC specifications  - Simple ladder logic diagrams  - PLC program case studies  - PLC installation commissioning and trouble shooting  **Vacuum, Covering following**  - Industrial vacuum technology  - Units of measure  - Vacuum generation  - Vacuum Systems  - Glossary of low and high vacuum terms  - Vacuum pad selection  - Vacuum ejector selection  - Vacuum pump Systems  - Peripheral vacuum components |
| 14. | **E-Learning License for 1 User for 1Year** |
| 15. | **AUTOSIM-200 Educational License for 1User for1 Year** |
| 16. | **Booklets on Problems of industrial circuit design with solutions on Pneumatics & Electropneumatics-Qty-5** |