Section VII. Technical Specifications

Technical Specifications

Lot 1 : **CNC Machining Equipment Upgrade**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	5-Axis Rotary Table Guide for Multi-Axes CNC Machine	Kindly refer to the technical specifications attached as **Annex D1.**	1	unit			

* Bidders must state here either "Comply" or "Not Comply" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Comply" or "Not Comply" must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.

All tools, equipment, gadgets and electrically operated instruments should have Standard Manufacturers Manual and/or Datasheet/Specification Sheet/Brochure as indicated in Annex D1.

Instruction Manual is an instructional book or booklet that is supplied with almost all technologically advanced products such as electrical products.

Datasheet/Specification Sheet/Brochure is a document that summarizes the performance and other characteristics of a product, machine, component that comes along with the product from its release from the manufacturer.

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

ANNEX D1

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
1	CNC Machining Equipment Upgrade	01-001	5-Axis Rotary Table Guide for Multi-Axes CNC Machine	CNC Rotary Table (trunnion) for 5 Axis CNC Milling Machine to upgrade the former 4 axis HAAS VF-2 CNC Milling Machines to become 5 Axis CNC Milling Machine - Make: HAAS - Model:TRT210 - No. of Spindle: 1 - Plater size: 230mm - Max Torque: 210 ft-lb - Max speed: 100 °/sec Additional requirements: - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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Technical Specifications

Lot 2 : **CNC Software and Simulation**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance *	Make Brand / Model	Reference
1	CADCAM Software	Kindly refer to the technical specifications attached as **Annex D2.**	18	set			
2	CNC Control Simulator (Full Function Control)		8	unit			

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ANNEX D2

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
2	CNC Software and Simulation	02-001	CADCAM Software	MasterCAM Educational Suite Includes: - Mill, Lathe, Wire, Router, Design, Art, ProDrill, and Mastercam for SOLIDWORKS® - Standard library of 2-, 3-, and 4-axis post processors. -Support and resources for the education community. Additional requirements: Certificate of authority to sell from the manufacturer or local distributor/reseller Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
2	CNC Software and Simulation	02-002	CNC Control Simulator (Full Function Control)	Refer to Technical Specification of Item Code 02-002	Learning System		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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TECHNICAL SPECIFICATION

Name of The Learning System	CNC Control Simulator (Full Function Control)
Item Code	02-002
Technology Area(s)	CNC Software and Simulation

Brief Description:

A computer-based CNC simulation software that allows configuration of different machining equipment using additive and deductive technologies.

NC Editor

File Management

1.1 File Manager:
- (1) File list: Enable the file comments browsing and picture preview
- (2) File control: New file, new folder, copy, cut, paste
  - (a) New file: Build and edit new CNC program
  - (b) New folder: Add and set the folder comment, set the default machine type in the folder
  - (c) Copy, cut, paste: control file and attachments
- (3) Recent files: Display latest edited files
- (4) Search: Search file with file name or comments
- (5) Refresh : Refresh file list
- (6) Recycle bin : Display removed files
- (7) Print folder: Print current browsing folder directory

Program Edit

2.1 Program edit:
- (1) Program edition
- (2) Nc Codes with different colors and font are easier to identify.
- (3) Comment text alignment is for the program code more readable
- (4) Searching
- (a) Search: quick search for target text
- (b) Replace: search the target text and replace with new text

2.2 Process Info:
- (1) Information:
  Edit the description and the image of the process
- (2) Tool:
- (a) Turret: Select the tool to be installed, adjust the tool in the turret
- (b) Edit the applied tool and comments of the tool comments.

2.3 Print: Print file, comments

2.4 Calculate:
- (1) Turning Counter:
  Outside Taper, Inside Taper, Thread, Outside Arc, Face Groove, Chamfer/Corner, V Groove, double taper, Arc circle, Gear Chamfer, Inner Arc, Trigonometric function, Gear (Worm gear), Arc Tangent, Line Arc, Arc, Three Taper, Rough/Finish (Inner/Outer)
- (2) Calculator: The result can be imported to Nc Editor after calculation

2.5 View:
- (1) Side-by-side: display file 1 and 2 side by side
- (2) Synch-Scrolling: simultaneously scroll file 1 and 2

(3) Switch Windows:
switch to the current opening CNC program window
(4) Cascade windows, Vertically display, Horizontally display:
CNC window display status switching

Program Simulation

3.1 Simulation: Machine type, turning simulation, machine turret.
(1) Machine type: select the machine type for simulation
(2) Turning simulation: cutting path and solid simulation
(3) Turret: set the applied tool of the CNC program
(a) Turret (Turning): Rhombus (80°, 55°, 35°), Trigon, Triangle, Round, Groove, Corner radius, Thread, Center Drill, Drill, Tap, End Mill

Transmission

4.1 Transmission:
(1) Send & Receive:
Connect to the machine to transmit CNC files

Virtual CNC Machine Controller Operation and Tool Offset Simulation Software for Turning

CNC Controller Function

1.01 CNC Controller Simulation Turning
1.02 The Operation Panel Function is the complete emulation based on the actual CNC machine operation panel
(1) Position Display [POS]: machine coordinate, absolute coordinate, relative coordinate
(2) Program function [PROG]:
(a) Automatic mode [AUTO]: Program content display, check, current block, next block
(b) Program Edit [EDIT]: [ALTER][INSERT][DELETE], program lock
(c) Background Edit
(d) Data Transfer, [F input] [F output]
(3) Tool compensation [OFS/SET]: work shift, coordinate system, tool geometry, tool wear, MACRO, Metric/Inch mode setting
(4) System parameters [SYSTEM]: transmission, machine, edit
(5) Alphabetic and Numeric keys, [INPUT], [RESET], [CANCEL]
1.03 Alarm display, the alarm codes show the same codes as in the machine
(1) E.g.: X axis is over travel, the alarm code indicates:
"500 OVER TRAVEL:+X", The way to clear the alarm , move X axis to the proper position and press [RESET] to clear the alarm
(2) E.g.:
1211 EMG ESTOP, pull up the emergency button to clear alarm
(3) System records the time and the error codes whenever the alarm message is displayed
1.04 To transmit the program by using RJ45 interface information transmission function.

CNC Machine Operation Panel

2.01 Mode Select Function
(1) [EDIT] Program edit mode – Edit program content
(2) [AUTO] Auto execution mode – Program executes automatically
(3) [MDI] Manual Data Input – For parameter settings and temporary input program
(4) [HANDLE] Handle mode – Using handwheel move and adjustment position
(5) [JOG] Cutting feed mode – Using axis key to feed
(6) [RAPID] Rapid mode – Using axis key to move rapidly
(7) [ZRN] Zero Point Return – X, Z axis return to Machine Home Position
2.02 Rapid Speed adjustment button, Feed speed adjustment button, Spindle speed adjustment button

2.03 Optional block skip [B.D.T], Single block execution [S.B.K], Optional stop [M01], Start [CYCLE START], Stop [FEED HOLD]
2.04 Spindle forward, Spindle stop, Spindle reversal.
2.05 Program lock, Emergency stop, Tool change button, Coolant
2.06 Axis movement buttons: X+, X-, Z+, Z- Reset button, axis return signal
2.07 manual handle rate button, manual handle axis button

CNC Machine Simulation for Turning

3.01 Based on 3D physical construction, the machine model of Horizontal Turning-Single spindle and turret including: chuck, jaw, turret, tool, tailstock, live center
Rapid: X axis 20 m/min, Z axis 24 m/min
Max Feedrate: X axis 6 m/min, Z axis 8 m/min
3.02 Simulate whole CNC machine with physical machine controlling panel and dynamic interactive simulation
3.03 Collision detection function: tool and material. If the tool isn't rotating, the contact between the tool and the material will be considered a collision
3.04 Simulation Speed Adjustment: 100%, 160%, 250%, 500%
3.05 Audio on/off, system volume adjustment
3.06 Work piece material setting, Diameter, Max Diameter= 250mm Length, Max Length=450mm
3.07 Turning tool setting: Diamond (80°, 55°, 35°), Triangle (60°), Thread, Groove, Round, Drill, Trigon, Radius corner groove, Center drill, Screw tap, End Mill
3.08 Turret setting: Tool install, modify, delete
3.09 Standard view: Top (XY), Front (ZX), Side, (YZ), 3-Dimension (ISO)
3.10 Common zoom view: Material view, Table view, Machine view

CNC Machine Programming Simulation for Turning

4.01 G Code function
(1) Interpolation: G00 G01 G02 G03
(2) Dwell: G04
(3) Plane Selection: G17 G18 G19
(4) Tool Radius Compensation: G40
(5) Work piece dimension: Input in inch/mm: G20 G21
(6) Return to reference position: G28 G30
(7) Feed per minute/ revolution: G98 G99, Constant surface speed control: G96 G97
(8) Work piece Coordinate: G54, G55, G56, G57, G58, G59

4.02 M Code auxiliary function
(M00) Program stop, (M03) Spindle forward,
(M01) Optional stop, (M04) Spindle reversal,
(M02) End of program, (M05) Spindle stop,
(M98) Calling of Subprogram
(M99) End of Subprogram
(M30) end of program

Virtual CNC Machine Controller Operation and Tool Offset Simulation Software for Milling

CNC Controller Function

1.01 CNC Operation Simulation Station: 3Axes
1.02 The Operation Panel Function is the complete emulation based on the actual CNC machine operation panel
(1) [POS]: machine coordinate, absolute coordinate, relative coordinate, Spindle load
(2) [PROG]
(a) [AUTO]: Program content display, check, current block, next block
(b) [EDIT]: [ALTER][INSERT][DELETE], program lock
(c) Program Transportation, [F input], [F output]
(3) [OFS/SET]: Work coordinate, Tool offset, MACRO variable, Metric/Imperial unit

settings
(4) [SYSTEM] parameters: transmission, machine, edit
(5) Alphabetic & Numeric keys, [INPUT], [RESET], [CANCEL]

1.03 Alarm display, the alarm codes share the same codes as in the actual machine
(1) E.g.: X axis is over traveled, the alarm code indicates: "500 OVER TRAVEK:+X", While X axis is over traveled , move X axis to the proper position and press [RESET] to clear the alarm
(2) E.g.: EMG ESTOP, pull up the emergency button to clear alarm
(3) System records the time and the error codes whenever the alarm message is displayed

1.04 RJ45 network transmission function

CNC Machine Operation Panel

2.01 Mode Select
(1) [EDIT] Program edit mode – program content modification
(2) [AUTO] Auto execution mode – program auto-run
(3) [MDI] Manual Data Input – for parameter settings and extra codes input
(4) [HANDLE] Manual Pulse Generator-adjustment with handwheel
(5) [JOG] Jog mode – Infeed control with axis buttons
(6) [RAPID] Rapid mode – Rapid Traverse with axis buttons
(7) [ZRN] Zero Point Return – for Axis Offset

2.02 Switches including:
Rapid override, Feedrate Override, Spindle revolution override

2.03 Block skip [B.D.T], Single block execution [S.B.K], Optional stop [M01], [CYCLE START], [FEED HOLD]

2.04 Spindle forward (CCW), Spindle stop, Spindle reversal (CW)

2.05 Program lock, Emergency stop, Index (Tool indexing), Coolant fluid

2.06 Axis Buttons: +X, -X, +Y, -Y, +Z, -Z
Collision Reset button, Axes return light

2.07 Handwheel feedrate override, Handwheel axis override

2.08 Work light button, Safety door open/close

CNC Machine Simulation for Milling

3.01 Based on 3D solid simulation, the machine model of Vertical Milling Machining Center including: Spindle head, Vice, Z axial gauge, Tool, Auto Tool Changer ATC

Travel: X axis 840 mm, Y axis 510 mm, Z axis 585 mm

Rapid: X axis 18 m/min, Y axis 18 m/min, Z axis 18 m/min

Max Feed: X axis 6 m/min, Y axis 6 m/min, Z axis 6 m/min

3.02 Simulate whole CNC machine with solid operation panel and dynamic interactive simulation

3.03 Collision detection: tool and material. If the tool hasn't been rotated, the contact between the tool and the material will be considered a collision

3.04 Simulation Speed Adjustment: 100%, 160%, 250%, 500%

3.05 Audio on/off, system volume adjustment

3.06 Material setting:

(1) Rectangle work piece dimension: Max Length= 500mm

Max Width= 310mm

Max Height= 300mm

3.07 Magazine setting:
FaceMill, EndMill, Ball-nose EndMill, Radius Corner EndMill, Chamfer EndMill, Edge finder, Tap, Drill, Spot Drill, Thread Mill, Rough Boring, Finish Boring

3.08 Magazine install: Tool installation, modification, deletion

3.09 Standard view: Top (XY), Front (ZX), Side, (YZ), 3D(ISO)

3.10 Universal view Setting: Material view, Table view, Machine view

3.11 Operator view: Shift, Rotate, Zoom in/out

3.12 Offset operation: Z axis setting, Photoelectric Length setter X, Y axis setting, Photoelectric Edge finder

CNC Machine Programming Simulation for Milling

4.01 The execution of program simulation including 3 axis synchro

4.02 G Code function

(1) Interpolation: G00 G01 G02 G03

(2) Dwell: G04

(3) Plane Selection: G17 G18 G19

(4) Tool Radius Compensation: G40 G41 G42 G43 G49

(5) Inch/Metric Conversion: G20 G21

(6) Work piece dimension, Absolute/Incremental positioning: G90 G91

(7) Reference Position Return: G28 G30

(8) Feed and Speed: G94 G95 G96 G97

(9) Work coordinate: G52, G53, G54, G55, G56, G57, G58, G59

(10) Canned cycle for drilling: G73, G81, G82, G83

(11) Canned cycle for tapping: G74, G84

(12) Canned cycle for boring: G76, G85, G86, G87, G88, G89

(13) Return to the initial plane after the canned cycle G98, Return to the R-plane after the canned cycle G99

4.03 M Code auxiliary function

(M00) Program stop, (M03) Spindle forward, (M98) Subprogram call

(M01) Optional stop, (M04) Spindle reversal, (M99) Subprogram end

(M02) Program end, (M05) Spindle stop,

(M30) program end & Rewind

CADCAM

CAD Drawing

1.1 Drawing Function
- (1) Point Function: coordinate, center, intersection, Polar, middle, on Arc
- (2) Line Function: two points line, Angle, Angle & Tangent Arc, through point & tangent Arc, two Arc tangent, Shift
- (3) Circle Function: center & radius, Two Points & radius, through point & tangent, through point & tangent circle, Tangent two lines,Tangent Line & Arc, Tangent two Arcs, Begin Middle End, two points on Diameter, center point & on circle, Center & tangent, Wizard for Drawing Circle

1.2 Cut and corner: auto section, section, break, cut, corner-chamfer

1.3 Modify Drawing: Work piece Coordinate Zero Point Shift, Absolute Shift, Incremental shift, rotate, mirror, Offset Contour, Scaling

1.4 Layer management: add, delete, rename, display

1.5 Import DXF file:
- (1) Import selection: point, line, circle, arc, input same layer

1.6 Dimension: radius, diameter (X axis), two line angle, point, distance to X-axis, diameter, distance to Y-axis, two point distance, two point horizontal distance, two point vertical distance

Cutting Machining

2.1 Material setting: length, width, height

2.2 Turning Tools: Diamond (80 °, 55 °, 35 °), Triangle (60 °), Thread, Groove, Corner Radius, Drill

2.3 Tool Library setting:
- (1) Tool selection: set tool used by machine

2.4 Cutting process: rough, pattern, finish, groove, straight groove, thread, drilling, tapping, cutting off
- (1) Tool change point setting: set tool change position to reduce collision
- (2) Middle safe point, approach safe point, retract safe point
- (3) Approach / retract extension line: can choose contour itself or next contour

2.5 Rough cutting process: External, Internal, End Face
- (1) According to requirement to choose axial or radial cutting
- (2) Support G71, G72 canned cycle function
- (3) Time and depth setting for cutting

2.6 Pattern process: external, internal, end face
- (1) According to requirement to choose axial or radial cutting
- (2) Time and depth setting for cutting
- (3) Approach/ retract absolute coordinate or relative coordinate setting

2.7 Finish cutting process: external, internal, end face
- (1) According to requirement to choose axial or radial cutting
- (2) Work piece contour directly calculate for tool nose offset
- (3) Can use G41, G42 to do compensation

2.8 Groove process: external, internal, end face
- (1) Support G74, G75 canned cycle function
- (2) Cutting style: cutting depth, peck cut
- (3) Working order: from Middle to side, from side to Middle

2.9 Drilling
- (1) Support G74 Drill

2.10 Tapping : G32 tapping, G84 tapping cycle

2.11 Cutting off: support cutting off setting, post cutting off program

2.12 Process setting: display all cutting path, redo, insert, edit, delete process

2.13 Contour
- (1) Contour start, Approach start point, Approach extension line, Retrace End point, Retract extension line etc. Drag function
- (2) Contour direction selection, auto connect function
- (3) Offer Sketch extension function, control Approach and Retract path without additional drawing

2.14 Tool setting:
- (1) Add, modify, delete
- (2) Self-setting key in limit tool cutting angle
- (3) Insert angle, cutting angle, auto overcut judgment, arc overcut judgment

2.15 Tool Library setting:
- (1) Common tool library: set common tool turret to choose for use
- (2) Import/Export tool library: Import and Export built tool library

2.16 Rough cutting process:
- (1) External rough increase re-approach clearance design to reduce insert breakage caused by chips stuck
- (2) G71 Canned Cycle II, multi Pockets in stock removal Turning (10 concaves)
- (3) Face cutting selection, divide into three parts to set cutting feedrate to protect tool from breakage

(4) Finish face cutting, support add user NC code

2.17 Pattern:
- (1) Support G73 forming process cycle function
- (2) Face cutting selection, divide into three parts to set cutting feedrate to protect tool from breakage
- (3) Finish face cutting, support add user setting

2.18 Finish process:
- (1) Can select Angle command, chamfer C, corner R
- (2) Auto corner R on Acute angle
- (4) Face cutting selection, divide into three parts to set cutting feedrate to protect tool from breakage
- (5) No drag function to protect groove from force in one direction
- (6) Finish face cutting, support add user setting

2.19 Straight: Single Straight Groove, Single Internal Straight, Single Face Straight
- (1) Height equal, higher right, higher left, pattern selection
- (2) Straight groove and internal straight multi groove function, support post subprogram selection
- (3) Groove approach selection of multi levels to satisfy each work piece figure cutting
- (4) Auto re-approach clearance function to reduce insert breakage from clips stuck while approach and extend tool life

2.20 Thread: taper type

2.21 Drilling:
- (1) Support G01 High Speed Drill, G83 Deep Hole Drill cycle

2.22 Cutting off: Can set chamfer parameter, and support user self-set auxiliary program

Cutting Simulation

3.1 Tool Bar
- (1) Simulation display: cutting path, solid, solid section, tool, axes, zoom in, zoom out, initial view, message switch, clean screen
- (2) Speed control: 50%, 100%, 250%, 500%
- (3) Process control: Search Sequence, Reset, Cycle Start Single Block, Option Block Skip, M01 Optional Stop

3.2 View control: move upward, downward, leftward, rightward, zoom in, zoom out

3.3 Process control: Search Sequence, Reset, Cycle Start, Single Block, Option Block Skip, M01 Optional Stop

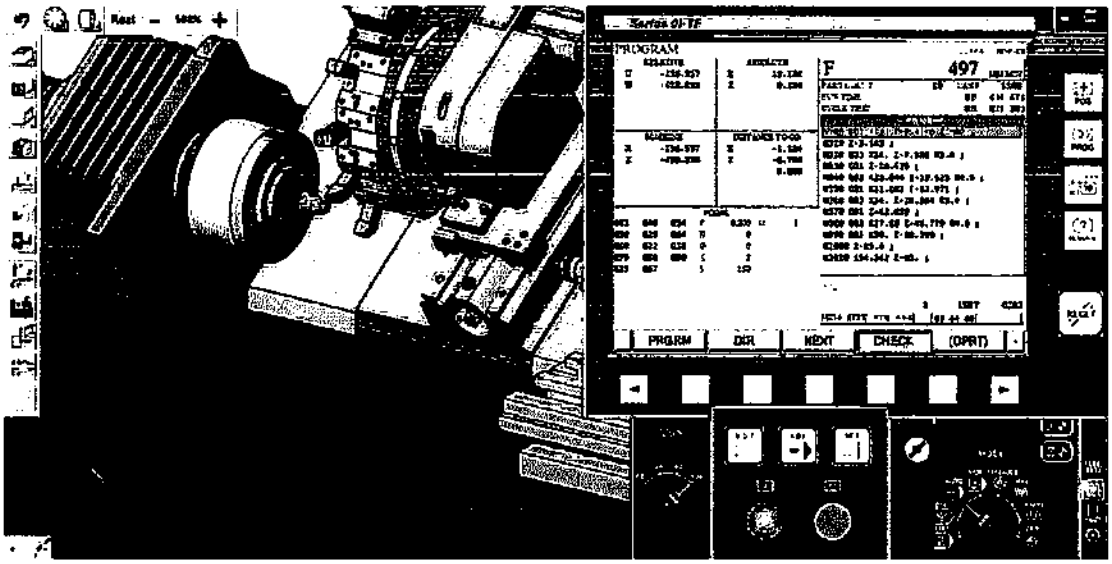
NC Code Generation

4.1 Post CNC Program
- (1) Sequence number: can choose simple sequence number, manually set start value and interval size
- (2) Transfer the process option: check the process to be transferred

Additional requirement:

- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



Picture for reference only

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Technical Specifications

Lot 3 : **CNC Machines**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	CNC Laser Cutting Machine	Kindly refer to the technical specifications attached as **Annex D3.**	1	unit			
2	CNC Lathe Performance Turning Center		1	unit			
3	CNC Lathe Machine		1	set			
4	CNC Milling Machine		1	set			

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ANNEX D3

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
3	CNC Machines	03-001	CNC Laser Cutting Machine	Refer to Technical Specification of Item Code 03-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
3	CNC Machines	03-002	CNC Lathe Performance Turning Center	Refer to Technical Specification of Item Code 03-002	Learning System		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
3	CNC Machines	03-003	CNC Lathe Machine	Refer to Technical Specification of Item Code 03-003	Learning System		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
3	CNC Machines	03-004	CNC Milling Machine	Refer to Technical Specification of Item Code 03-004	Learning System		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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TECHNICAL SPECIFICATION

Name of The Learning System	**CNC Laser Cutting Machine**
Item Code	03-001
Technology Area(s)	CNC Machines

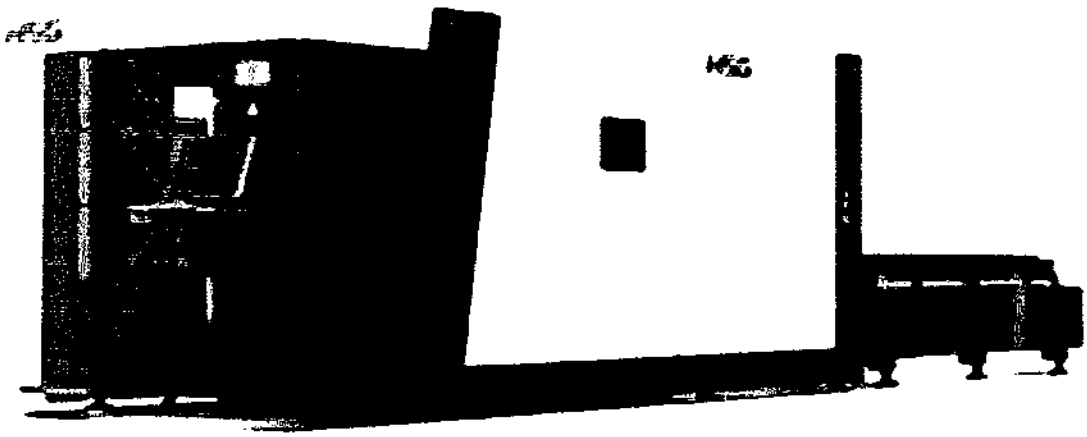
Specification

Control	G-Code/Conversational type, support remote monitoring, Wired **and/or** WiFi connection, 15" touch control display
*Cutting range	3,000 x 1,500 mm
*X-axis stroke	3,040 mm ±20%
*Y-axis stroke	1,520 mm ±20%
*Z-axis stroke	120 mm ±20%
*X/Y maximum trajectory speed	140m/min
*X/Y maximum acceleration	1.2 m/s^2
Positioning accuracy	±0.03 mm
Repositioning accuracy	±0.02 mm
Maximum load of worktable	700 kg ±20%
Machine layout dimension	4,550 x 4,500 x 2,000 mm or smaller
Laser generator	2 kW
Air-compressor	30HP or greater
Power	220VAC 60Hz Single phase/3 phase

Other requirements:

- Proof of extensive local service support (provide an organizational chart of the existing service staff, including certification from manufacturer)
- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate to conduct after-sales service and supply of spare parts from the manufacturer

Sample Image:



Picture for reference only

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	**CNC Lathe Performance Turning Center**
Item Code	03-002
Technology Area(s)	CNC Machines

Brief Description:

A CNC multi-axis machine equipment capable of high-performance multi-axis CNC Machining and Programming. Set-up for flexibility, extreme rigidity and high thermal stability.

Technical Specifications:

Control	G-Code/Conversational type, support remote monitoring, Wired **and/or** WiFi connection, 15" touch control display
Max swing	695 mm
Max machining diameter	340 mm
Max machining length	554 mm
Bar work capacity	Ø 52 mm
Travel X axis	215 mm
Travel Z axis	605 mm
C-axis indexing increment	0.0001 degree
Chuck size	6 inches
Spindle speed	6,000 rpm
Spindle bore	Ø 61 mm
Turret type	12 position drum turret (bolt-on)
Number of tools	12 tools
Tool shank height	25 mm
Boring bar shank diameter	Ø 40 mm
Rotary tool spindle speed	4,500 rpm
Milling Capacity: Drill	Ø 20 mm
Milling Capacity: Endmill	Ø 20 mm
Milling Capacity: Tap	M20 x 2.5

Rapid traverse rate: X-axis	30 m/min
Rapid traverse rate: Z-axis	30 m/min
Rapid traverse rate: C-axis	555 rpm
Tailstock stroke	565 mm
Tailstock center	MT No.5 dead center
Main spindle motor	11~15 kW
Rotary tool spindle motor	5.5 kW
Power Requirements:	Single/3 phase 220V 60Hz, with breaker and AVR system
Space requirement	Height should not be greater than 2.5m and width/length should not be greater than 4m (so that there will be no issue during ingress)
Others	Laptop with necessary application for design and control management
Consumable	2 Units Mild Steel 2 Units Stainless Steel
Learning Topics:	A. Industrial Safety 1. Practicing Safety 2. Personal Protective Equipment 3. Hazardous Materials Standards 4. Confined Spaces 5. Fire and Electrical Safety 6. Emergency Response 7. Equipment and Tool Safety 8. Work Station Safety B. Dimensional Measurement 1. Basic Measurement 2. Precision Measurement Tools 3. Dimensional Gauging C. Mechanical Print Reading 1. Multi-View Drawings 2. Sectional Drawings and Fasteners D. Geometric Dimensioning and Tolerancing 1. Introduction to Geometric Dimensioning and Tolerancing 2. Orientation Tolerances 3. Form Tolerances 4. Location Tolerances E. Machining Processes 1. Machining Processes 2. Drill Operation 3. Internal Machining Processes

	F. Turning 1. Turning Operation 2. Turning Production G. CNC Programming 1. CNC Program Operation H. CNC Turning 1. CNC Turning Operation I. Troubleshooting and Maintenance 1. CNC Machine Troubleshooting and Maintenance J. Statistical Process Control 1. Introduction to SPC 2. Control Charts

Other requirements:

- Compressor
- Machine Tooling
- Proof of extensive local service support (provide an organizational chart of the existing service staff, including certification from manufacturer)
- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate to conduct after-sales service and supply of spare parts from the manufacturer.

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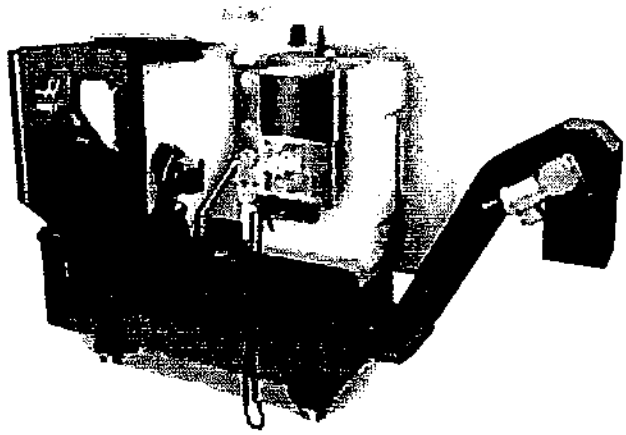

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TECHNICAL SPECIFICATION

Name of The Learning System	**CNC Lathe Machine**
Item Code	03-003
Technology Area(s)	CNC Machines

SPECIFICATIONS:

Control	G-Code/Conversational type, support remote monitoring, Wired **and/or** WiFi connection
Swing over bed	Φ550mm
Max turning diameter	Φ320mm or bigger
Max turning length	475mm or bigger
Spindle bore diameter	76mm or bigger
Bar capacity	Ø65 mm
Spindle Power	15kw (20.1 hp
Spindle Nose	A2-6
Spindle Speed	4000rpm
X Travel	235mm
Z Travel	475mm
Servo Motor Power X	1.8 kw (2.41 hp)
Servo Motor X Torque	7Nm
Servo Motor Power Z	1.8 kw (2.41 hp)
Servo Motor Z Torque	7Nm
Chuck	10" hollow hydraulic
Tool Capacity	12 position
Tool Indexing Time	0.5 sec/pos
Turning Tool Size:	25 x 25 mm
Max Boring Tool Diameter	Φ32 mm
Max.speed of Driven tools	6000 rpm

Max. drilling	Φ16x0.2 mm
Max. slotting	Φ20x12x40 mm
Rapid traverse X	24 m/min
Rapid traverse Z	30 m/min
Feeding speed	1-8000 mm/min
Machine Dimension (LxWxH)	4160 x 1825 x 1825 mm
Accessories	10" Hollow Hydraulic Chuck 1 Set Soft Jaw
	Hollow Hydraulic Cylinder
	Hydraulic Tailstock
	Auto Swing Tool Setter
	Automatic Parts Catcher
	Bar Feed Interface
	MPG
	Air Conditioner for Electrical Cabinet
	Auto Chip Conveyor & Chip Chart
	Auto Oil Lubrication System
	Tri-Color Light
	Air Gun
	Door Lock Switch
	Lighting Lamp
	Full Enclosure Splash Guard
	Telescopic Covers
Power Requirements:	Single-phase/3 phase 220V, with breaker and AVR system
Space requirement	Height should not be greater than 2.5m and width/length should not be greater than 4m (so that there will be no issue during ingress)
Others	Laptop with necessary application for design and control management
Consumables	2 Units Mild Steel

	2 Units Stainless Steel
Learning topics	I. Tooling Basics 1. Describe machining and turning tools 2. Describe different uses for cutting tools 3. Explain how cutting tools are classified 4. Describe how cutting tools are used in manufacturing 5. Describe how to select a cutting tool 6. Describe the machine operator's responsibility with cutting tools II. Tool Materials 1. Provide a brief history of materials used in cutting tools 2. Describe the five materials used in modern cutting tools 3. Describe coating materials used for cutting tools III. Tool Selection and Tool Life 1. Describe the variable that affects cutting tool life 2. Describe common defects found in worn cutting tools IV. Turning Tools and Tool Holders 1. Describe the turning process and lathes 2. Describe two types of turning tools 3. Describe two types of indexable tool holders 4. Describe tool holder components 5. Describe non-indexable turning tools V. Insert Tool holder and boring bar identification and selection 1. Describe two organizations responsible for maintaining turning tool standards 2. Describe how identification codes are used for turning tools 3. Describe how to determine the geometric features of an insert 4. Describe how to determine the physical features of an insert 5. Describe how to identify a tool holder 6. Describe how to identify a boring bar VI. Proper Care 1. Describe the importance of selecting the correct tool holder 2. Describe the importance of using the correct insert 3. Describe the proper maintenance of turning tools VII. Equipment Assembly 1. Describe how to install an indexable insert into a tool holder with a screw 2. Describe how to install an indexable insert into a tool holder with a clamp 3. Describe how to install a round shank tool holder into a

	mounting block 4. Describe how to install a square shank tool holder in a mounting block 5. Describe how to mount a square shank tool holder directly into a turret

Other requirements:

- Proof of extensive local service support (provide an organizational chart of the existing service staff, including certification from manufacturer)
- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate to conduct after-sales service and supply of spare parts from the manufacturer.

Sample Image:

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TECHNICAL SPECIFICATION

Name of The Learning System	**CNC Milling Machine**
Item Code	03-004
Technology Area(s)	CNC Machines

SPECIFICATIONS:

Control	G-Code/Conversational type, support remote monitoring, Wired **and/or** WiFi connection
Table size	1000 x 500 mm or bigger
T slot (width x number x distance)	18 × 5 × 100mm
Max load	650 kg
X Travel	900 mm
Y Travel	500 mm
Z Travel	650 mm
Spindle nose to table	80-680mm
Spindle center to column	585mm
Spindle taper and diameter	BT40
Spindle speed 10,000rpm	10,000 rpm
Rapid feed	36m/min.
Cutting speed	1-12000 mm/min.
Arm Tool changer	Standard
No. of tools	24
Max. tool length	300mm
Max. diameter	78mm/ 120mm
Pocket positioning time	1.6 sec.
Positioning accuracy	±0.003/300
Repeatability accuracy	±0.003

Coolant tank capacity	130 litres
Coolant flow rate	40 litres/min
Air pressure	0.6Mpa
Airflow rate	130 litres/min
Power Requirements:	Single-phase/3 phase 220V, with breaker and AVR system
Space requirement	Height should not be greater than 2.5m and width/length should not be greater than 4m (so that there will be no issue during ingress)
CNC Control eLearning Courseware	Covers vital CNC topics including CNC mill operation, CNC program operation, and CNC turning operation with the following objectives: a. how to use the HMI controls to navigate system screens b. how to jog a CNC machine axis c. how to set up and operate a CNC mill d. the operation of the canned drill cycle e. the axis movements of a CNC lathe f. how to locate and set workpiece zero on a CNC lathe
Accessories	CNC Control Module
	Z axis servo motor with brake
	Full enclosed machine, splash guard with top roof
	Telescopic guards for three axes
	Belt drive Spindle 10,000rpm, BT40
	Rigid tapping
	Ethernet, CF card and USB interface
	LCD Display
	Automatic lubrication unit
	Coolant system
	Oil separation
	Air-condition for electrical cabinet
	Spindle taper air blow
	Cutting air blast device

	LED Working lamp
	End of program light
	Electronic Hand wheel (MPG)
	Levelling bolts and blocks
	Handy coolant gun and Air gun
	Chip flushing device
	Tool Box
	Operation Manual
Air compressor	Air Tank Volume: 150 Litres Air Displacement: 14 cfm Max Working Pressure: 150/10 psi/bar Oil/Oil Free Oil Motor (HP): 3.0 Input Voltage: 230 V Watts: 2250 W Wheel Mounted: No Volts: 230 V
Tooling package	5 x BT40 ER32 collet chucks
	10 x Pull Studs
	15 pcs ER32 collet set
	1 x 100mm Face mill 45 deg, BT40 arbor & 20 inserts
	1 x set HSS End Mills
	1 x set HSS Drill bits
	1 x Clamp Kit
	1 x Machine vice
	1 x Keyless drill chuck with arbor
	1 x 5L coolant fluid
Learning topics	Modes of CNC Operation
	Tool Data and Offsets
	CNC Program Execution
	CNC Program Structure

	Linear and Circular Interpolation
	Machine Setup and Operation
	Canned Cycles
	Spindle and Tool Codes
	CNC Turning Machines

Other requirements:

- Proof of extensive local service support (provide an organizational chart of the existing service staff, including certification from manufacturer)
- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate to conduct after-sales service and supply of spare parts from the manufacturer.

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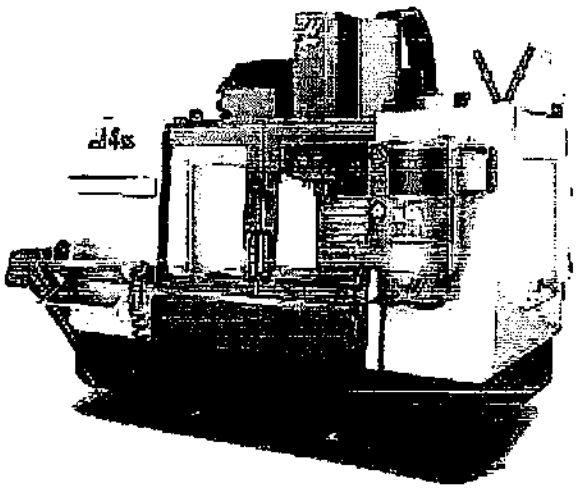

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Technical Specifications

Lot 4 : **Metal Fabrication Equipment**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Electric Box Furnace	Kindly refer to the technical specifications attached as **Annex D4**.	1	unit			
2	Hardness tester		1	unit			
3	Precision Centerless Grinding Machine		1	unit			
4	Pipe Beveling Machine		1	unit			
5	Plate Beveling Machine		1	unit			
6	Hydraulic Press Brake Machine		1	unit			
7	Hydraulic Shearing Machine		1	unit			
8	Lock Forming Machine		1	unit			
9	Hydraulic Plate Bending Roller Machine		1	unit			
10	Automatic Sheet and Plate Rolling Machine		1	unit			

No.	item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
11	Bench Mini Drill Press		1	unit			
12	Cut Off Machine		1	unit			
13	Metal Sheet Bending Machine		1	unit			
14	Hydraulic Press		1	unit			

* Bidders must state here either "Comply" or "Not Comply" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Comply" or "Not Comply" must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.

All tools, equipment, gadgets and electrically operated instruments should have Standard Manufacturers Manual and/or Datasheet/Specification Sheet/Brochure as indicated in Annex D4.

Instruction Manual is an instructional book or booklet that is supplied with almost all technologically advanced products such as electrical products.

Datasheet/Specification Sheet/Brochure is a document that summarizes the performance and other characteristics of a product, machine, component that comes along with the product from its release from the manufacturer.

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ANNEX D4

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	04-001	Electric Box Furnace	Refer to Technical Specification of Item Code 04-001	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
4	Metal Fabrication Equipment	04-002	Hardness tester	Testable Hardness: Rockwell *Hardness Display: Digital *Preliminary test force: 29.42 N, 98.07 N *Test force: Rockwell Superficial 147.1 N, 294.2 N, 441.3 N *Test force: Rockwell 588.4 N, 980.7 N, 1,471 N *Resolution: 0.1 HR indication *Preliminary test force switching: Dial switching *Total test force switching: Weight change *Total test force load operation: Motor drive, button start *Test force duration: Fixed 3-5.5 s or manual operation *Maximum specimen dimension: 180 mm (100mm if cover is attached), 165 mm (from indenter axis to frame) *Functions: OK/NG judgment function, Offset correction function, Hardness conversion function *Data output interface: Digimatic RS-232C *Power source: 220VAC, 60Hz Single phase/ 3 phase * Includes standard accessories: - Flat anvil, V-anvil, AC Adapter, Vinyl cover, Accessory box, Level *Overall machine size: should not be bigger than 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - English Manual - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	04-003	Precision Centerless Grinding Machine	*Standard processing range: 1-80 diameter *Grinding wheel sizes: (ODxWxID): 400-455x200-205x200-250 *Adjusting wheel sizes: (ODxWxID): 200-255x200-205x200-100-115 *Regulating wheel speed: 13-308 rpm *Grinding wheel speed: 1000-1500rpm *Regulating wheel tilt range:-3 to +5 degrees *Regulating wheel swivel angle:±5 degrees *Coolant pump drive motor: 1/4 HP x 2P *Power source: 220VAC, 60Hz Includes standard accessories *Overall machine size: 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - English Manual - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
4	Metal Fabrication Equipment	04-004	Pipe Beveling Machine	*Functions: External and Internal Beveling *Facing *Counter boring *Weld Removal *J-prepping and Compound bevels. *Materials: Any kind of steel & exotic alloy *Recommended working range: 3"-16" Diameter *Power: Pneumatic *Option of electric: 220VAC 50-60Hz *Overall machine size: 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - User's Manual (English) - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	04-005	Plate Beveling Machine	*Self-propelled *Max. bevel width: 40mm *Bevel angle:15-60 degree *Plate thickness: 6-60mm *Beveling speed: 0-1.6 m/min. *Motor power: 3000 w *Motor idle speed: 800 rpm *Voltage: 220V/60 Hz, 3-phase *Tooling: 9 changeable inserts; 80 mm diameter *Overall machine size: not more than 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - User's Manual (English) - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
4	Metal Fabrication Equipment	05-001	Hydraulic Press Brake Machine	Refer to Technical Specification of Item Code 05-001	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	05-002	Hydraulic Shearing Machine	*Max. shearing Thickness: 6mm *Max. shearing length: 1000-2500mm *Cutting angle:1.2 degrees * No. of Clamps: 11 *Power source: 220VAC, 60 Hz *with following accessories: Blade for stainless steel *Technology Transfer/Training *English Manual *Overall machine size: 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	05-003	Lock Forming Machine	*Double seam rolls: capacity= 20 to 26 gauge, approx material used: 25 mm, size=9.5 mm seam *Drive cleat rolls: capacity= 20 to 26 gauge, approx material used: 54 mm, size=28 mm width *Right angle flange rolls: capacity= 26 to 25 gauge, approx material used: 9.5 mm, size=9.5 mm high *Motor: 1HP *Speed: 25 per minute *Drive: V-belt *Stand: Arc welded steel heavy top plate *All steel forming head, hardened ground shafts, case hardened steel forming rolls, machine cut gears and needle type roller bearing throughout *Power source: 220VAC, 60 Hz *Overall machine size: should not be bigger than 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - English Manual - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	05-004	Hydraulic Plate Bending Roller Machine	*Double seam rolls: capacity= 20 to 26 gauge, approx material used: 25 mm, size=9.5 mm seam *Drive cleat rolls: capacity= 20 to 26 gauge, approx material used: 54 mm, size=28 mm width *Right angle flange rolls: capacity= 26 to 25 gauge, approx material used: 9.5 mm, size=9.5 mm high *Motor: 1HP *Speed: 25 per minute *Drive: V-belt *Stand: Arc welded steel heavy top plate *All steel forming head, hardened ground shafts, case hardened steel forming rolls, machine cut gears and needle type roller bearing throughout *Power source: 220VAC, 60 Hz *Overall machine size: should not be bigger than 2m (width) x 3m (height) to ensure that there will be no issue during ingress Additional Requirements: - English Manual - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
4	Metal Fabrication Equipment	05-005	Automatic Sheet and Plate Rolling Machine	*3 roller bending roll machine *Rolling services at up to 10mm thick x 2000mm width *Roll Diameter 200mm *Foot switch control *Power source: Voltage 220VAC, 60Hz *Overall machine size: 4.5m or less x 1.5m or less x 2m or less Additional Requirements: - English Manual - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	05-006	Bench Mini Drill Press	Drilling cap: 25mm (1") Motor power: 3/4 -1 1/4 hp Spindle travel: 75-100 mm Swing: 360 mm Table size: 290mmx290mm Base size: 460x272mm Column diameter: 70-80mm Height: 140-160mm Additional Requirements: - English Manual - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
4	Metal Fabrication Equipment	05-007	Cut Off Machine	Disc Diameter: 14" No load Speed: 3,800 RPM Power: 2000W Voltage: 220-240V, 60Hz	Equipment		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
4	Metal Fabrication Equipment	05-008	Metal Sheet Bending Machine	Box and pan brake Manual Bending angle: 0 - 135° Length: 48" Thickness: 16-20 gauge Beam lift max: 1.75" Box Depth: 4" With stand Includes 16 fingers with sizes 2" - 4" Power: 220V/60Hz/1Ph or 220V/60Hz/3Ph With english manual Additional Requirements: - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
4	Metal Fabrication Equipment	05-009	Hydraulic Press	H-Frame 15 ton capacity Piston travel: 160mm Bend angle: 0~135 degree Maximum capacity:16 gauge mild steel Dimension (from ground): 700 x 540 mm With Pressure Gauge Additional Requirements: - Certificate of authority to sell from the manufacturer or local distributor/reseller - Certificate of End of Life (EOL) Service from Manufacturer (5 years)	Equipment	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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TECHNICAL SPECIFICATION

Name of The Learning System	Electric Box Furnace
Item Code	04-001
Technology Area(s)	Metal Fabrication Equipment

Technical Specification

- Oven for heat treatment
- Volume (in litters): 15
- Inner dimension (w x d x h): 230 x 340 x 170 mm
- Temp uniformity pf +/- 5K in the empty workspace (w x d x h): 180 x 270 x 120 mm
- Max. Temperature: 1,300 °C
- Heating time: 70 min
- Connected load: 3,200 watts
- Power source: Voltage 220V, 50-60Hz, single phase
- Overall machine size: not more than 2m (width) x 3m (height) to ensure that there will be no issue during ingress

Features

- Heating from two sides
- Heating elements on support tubes ensure free heat radiation and a long service life
- Multi-layer insulation with robust lightweight refractory bricks in the furnace chamber
- Optional flap door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Adjustable air inlet in the furnace door
- Exhaust air outlet in rear wall of furnace

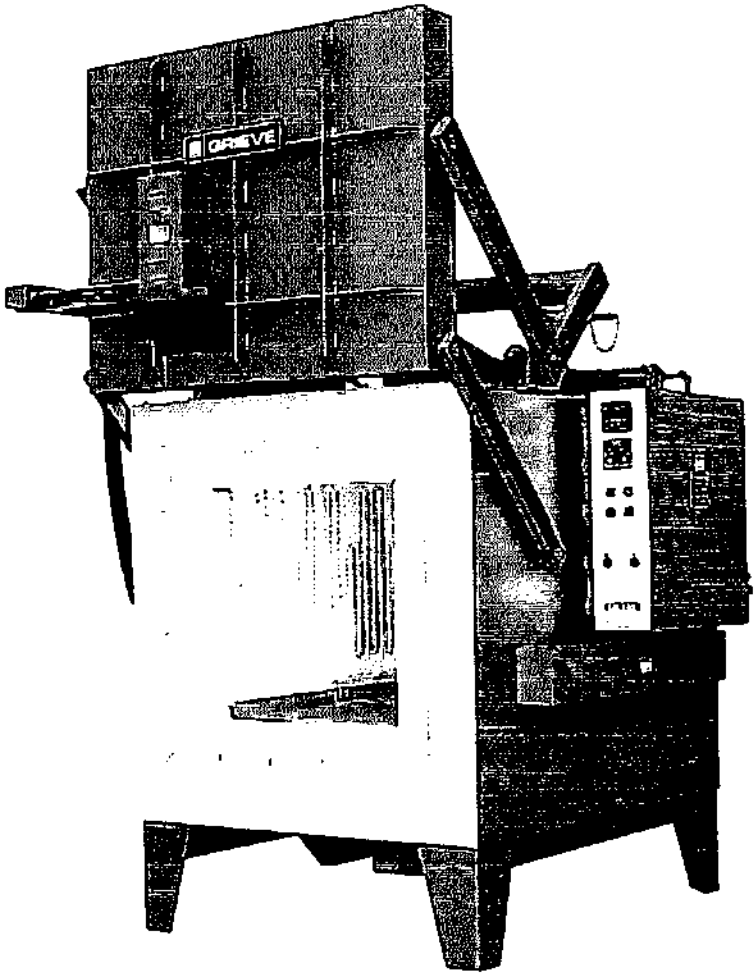
Principles of Heat Treatment Training

- Heat treatment eLearning course features an interactive eLearning curriculum that integrates various types of learning methods to create an engaging, effective learning experience
- The multimedia eLearning curriculum includes text with voice overs, videos, 3D animations, pictures, and interactive activities, quizzes, and self-reviews

Learning Topics

- Types of Heat Treating Processes
- Hardening, Quenching, & Annealing Processes
- Tempering, Normalizing, and Stress Relieving Chemical Changes of Ferrous & Non-Ferrous Metals
- Batch & Continuous Production Heat Treating
- Heat Treated Metal Testing
- Nomenclature System for Heat Treating Standards

Sample Image:



Picture for reference only

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Hydraulic Press Brake Machine
Item Code	05-001
Technology Area(s)	Metal Fabrication Equipment

Technical Specification

- Bending force: 1,100 kN
- Bending length: 3500mm
- Throat depth: 450mm
- Stoke adjustment range: 100mm/sec.
- Ram Stroke: 215 mm
- Ram speed: 160, 10, 130 mm/s
- Die Setting height: 520 mm
- Working Stroke Speed: 6-10mm/s
- Return stroke speed: 40-50 mm/s
- Input power: 220VAC 60Hz
- Main motor: 11 Kw
- Overall machine size: should not be bigger than 2m (width) x 3m (height) to ensure that there will be no issue during ingress

Additional Requirements

- User's Manual (English)
- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Features and accessories

- Mechanical Crowning
- Fast clamp for upper tool
- Finger stops along linear guide
- Standard punch
- Standard 2-V die
- Hydraulic oil
- Die holder
- 4-Vee Die

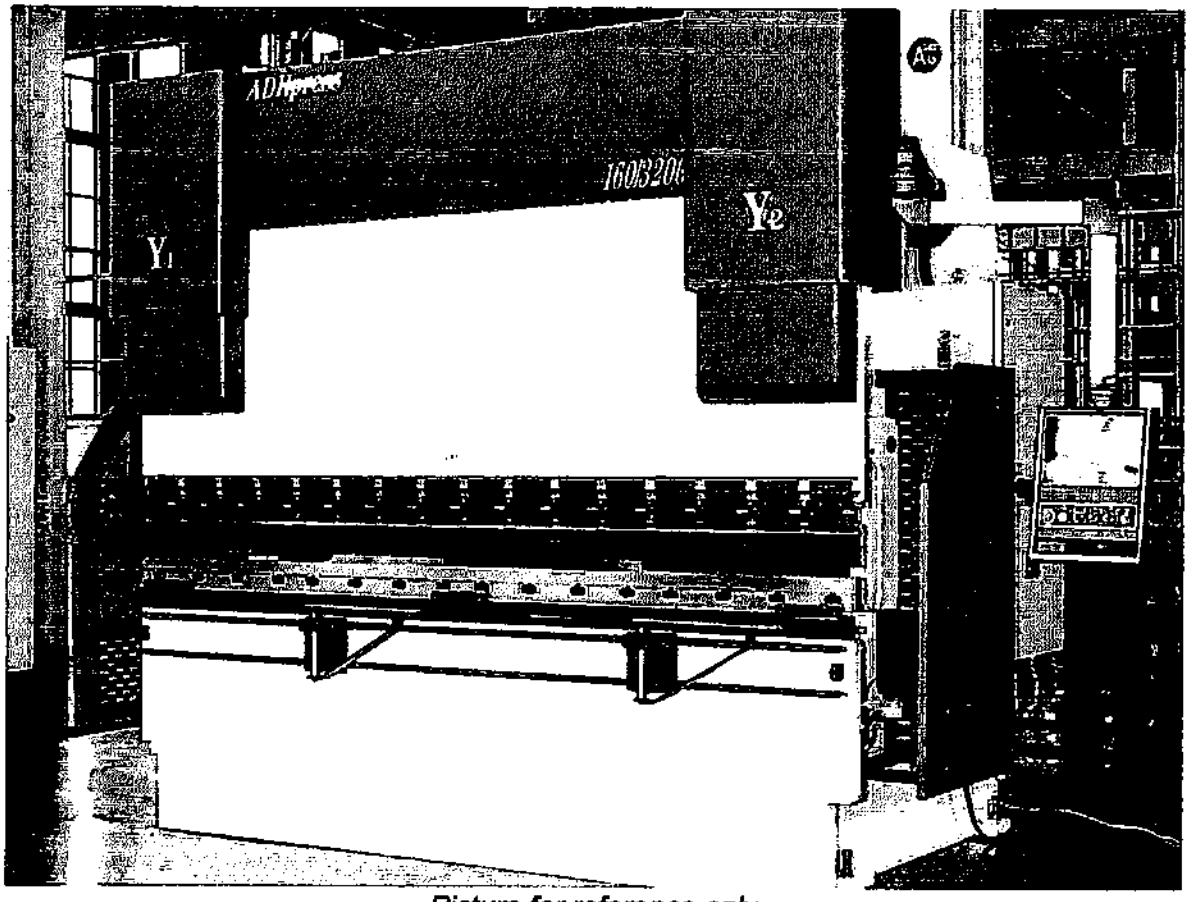
Principles of Measurement Training

- It introduces the fundamental principles of measurement including basic measurement, precision measurement, direct gauging, indirect gauging, and dimensional measurements using both the U.S. customary system as well as S.I. metric system
- Understanding how to perform accurate measurements is relevant to technical careers such as quality control inspector, machinist, manufacturing engineer, operations manager, and production technician.
- The measurement training system's compact size and durable case also provide for safe storage when available training space must be used to teach other topics.

Learning Topics

- Basic Measurement
- Tape Measurement
- Measurement Conversion
- Precision Measurement Tools
- Dial Caliper
- Digital Caliper
- Micrometers
- Dimensional Gauging
- Indicator Measurement
- Data Collection

Sample Image:



Picture for reference only

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

Technical Specifications

Lot 5 : **Modular Production Simulator**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Modular Production System	Kindly refer to the technical specifications attached as **Annex D5.**	1	set			

* Bidders must state here either "Comply" or "Not Comply" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Comply" or "Not Comply" must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.

All tools, equipment, gadgets and electrically operated instruments should have Standard Manufacturers Manual and/or Datasheet/Specification Sheet/Brochure as indicated in Annex D5.

Instruction Manual is an instructional book or booklet that is supplied with almost all technologically advanced products such as electrical products.

Datasheet/Specification Sheet/Brochure is a document that summarizes the performance and other characteristics of a product, machine, component that comes along with the product from its release from the manufacturer.

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

ANNEX D5

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
5	Modular Production Simulator	06-001	Modular Production System	Refer to Technical Specification of Item Code 06-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Modular Production System
Item Code	06-001
Technology Area(s)	Modular Production Simulator

MODULAR PRODUCTION SYSTEM *(2 sets, 6 modules per set)*

MPS DISTRIBUTING/CONVEYOR STATION

Description: The MPS distributing station tackles a number of topics, including the basic principles of PLC programming and sensor technology. In addition to this, the station provides an introduction to conveyor control using micro controllers and the associated transport of materials.

The station separates individual workpieces in a stacking magazine. A double-acting cylinder pushes the workpieces out one at a time. The conveyor module transports the workpiece to the right or left. The conveyor can be stopped in order to separate the workpiece. The simple setup process for the MPS Station makes it easy to create a workflow program for the handling process. Different workpieces can be used in the stacking magazine module.

Required Topics/Lessons:

The training system shall include, but not limited to the following topics/lessons:

- Familiarization with the stacking magazine and conveyor modules
- Gaining insight into common separation and distribution processes
- Introduction to pneumatic control systems
- Acquisition of basic PLC programming skills
- Introduction to how sensors and actuators work and are used
- Controlling a DC motor using a microcontroller
- Preparation and commissioning of a mechatronic system

Courseware:

- PLC Simulation Software
- Programming software portal
- Realization of networked solutions
- Software and documentation supplied on DVD
- Floating license supplied on USB stick

Hardware:

- **Conveyor Module**
  - Fiber-optic cable (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Coverage range max.: 120mm
    - Mounting thread: M6
    - Coating of housing: Nickel plated
    - Degree of protection: IP65
    - Switch triggering: Reflex
    - Function on actuation: Polymer fiber optic cable
  - Fiber-optic device (diffuse sensor)

    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / Interrupt
    - Function on actuation: Sender and receiver
    - Output potential: PNP
    - Coverage range max: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Short-circuit strength: Pulse
    - Type of mounting: Hole
    - Material of housing: PBT - reinforced
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- Fiber-optic cable (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: interrupt
    - Function on actuation: Polymer fiber optic cable
    - Coverage range max.: 400mm
    - Mounting thread: M4
    - Degree of protection: IP65
- Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering
    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm²) ft: 0.314x10^ (-6)

        - Time constant (ms): 6.5
    - DC Gear Motor
        - Nominal voltage: 24V
        - Nominal current: 1.5A
        - Nominal speed of drive shaft: 65rpm
        - Reduction stages: 1
        - Nominal torque: 1 N-m
        - Reversible: yes
        - Starting torque: 7 N-m
    - DC Motor Controller
        - Nominal voltage: 24 VDC ± 10%
        - Max. power consumption: 50 mA
        - Continuous motor current: 4 A DC
        - Control inputs, logic 1: 10 - 24V DC
        - Control inputs, logic 0: 0 - 4V DC
        - Analog input: 0...10V DC, 24V tolerant
        - Overvoltage protection: Yes
        - CE marking per: Class B interference emission
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Stack Magazine Module**
    - Proximity Sensor
        - Design: For T-slot
        - Measuring principle: Reed magnetic
        - Switch output: with contact, bipolar
        - Max. switching frequency: 800hz
        - Max. output current: 500mA
        - Electrical connection: Cable 3-core
        - Connector exit direction: axial
        - Cable length: 2.5m
        - Mounting type: Clamped in T-slot, insertable into slot lengthwise
        - Operating status display: Yellow LED
        - Protection class: IP65, IP67
        - Ambient temperature w/ flexible cable: -5 ... 60 °C
        - Tightening torque: 0.2 N-m
    - Fiber-optic cable (light barrier)
        - Signal processing (measuring principle): Red light
        - Switch triggering: interrupt
        - Function on actuation: Polymer fiber optic cable
        - Coverage range max.: 400mm
        - Mounting thread: M4

    - Degree of protection: IP65
- Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering
    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 hz
    - Degree of protection: IP65
- Standard cylinder
    - Stroke: 100mm
    - Piston diameter: 8mm
    - Piston rod thread: M4
    - Cushioning: P: Flexible cushioning rings/plates at both ends
    - Assembly position: Any
    - Piston-rod end: male thread
    - Design structure: Piston, Piston rod, Cylinder barrel
    - Variants: Single-ended piston rod
    - Working pressure: 1.5 ... 10 bar
    - Mode of operation: Double acting
    - Corrosion resistance classification CRC: 2 - Moderate corrosion stress
    - Impact energy in end positions: 0.03 J
    - Theoretical force at 6 bars, return stroke: 22.6 N
    - Moving mass with 0 mm stroke: 30.2 N
    - Mounting type: with accessories
    - Pneumatic connection: M5
    - Materials information for seals: NBR, TPE-U(PU)

- Solenoid valve
    - Valve function: 2x3/2 closed, monostable 2x3/2 open, monostable
    - Type of actuation: Electrical
    - Valve size: 10 mm, 14 mm, 18 mm
    - Standard nominal flow rate: 90 ... 1,380 l/min
    - Working pressure: -0.9 ... 10 bar
    - Design structure: Piston slide
    - Type of reset: mechanical spring Air spring
    - Protection class: IP40, IP65 with plug socket
    - Exhaust-air function: throttleable
    - Sealing principle: soft

        - Type of piloting: Piloted
        - Pilot air supply: external Internal
        - Operating medium: Compressed air in accordance with ISO8573-1:2010
        - Manual override: Detenting, Pushing, Covered
        - Medium temperature: -5 ... 60 °C
        - Ambient temperature: -5 ... 60 °C
        - Duty cycle: 100%
        - CE symbol: according to EU-EMV guideline
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)
    - One-way flow control valve
        - Valve function: One-way flow control function for exhaust air
        - Pneumatic connection, port 1: QS-4
        - Pneumatic connection, port 2: M5
        - Adjusting element: Slotted head screw
        - Mounting type: Threaded
        - Standard nominal flow rate in flow control direction: 40 l/min
        - Working pressure: 0.2 ... 10 bar
        - Ambient temperature: -10 ... 60 °C
        - Operating medium: Compressed air in accordance with ISO8573-1:2010
        - Materials information for seals: NBR
        - Release ring material data: POM

- **Sorting Gate/Separator Module**
    - DC Rotary Solenoid
        - Angle of rotation: 95°
        - Operating mode: S3 40%
        - Torque (NCM): 2.00
        - Rated power (W): 16.2
        - Mass inertia (kgm²) ft: 0.314x10^ (-6)
        - Time constant (ms): 6.5

- **Interface**
    - C Interface
        - Operating voltage: 24VDC
        - Digital inputs/outputs 8DI/8DO: Max. 24 V DC, Max. 2 A per output Max. 4 A total
        - Analogue inputs/outputs 4AI/2AO: 0 – 10 V DC or ± 10 V DC
        - Electrical connection: 2x 15-pin D-Sub HD (3 rows)
        - 1x 24 pin IEEE-488 socket (SysLink)
        - 1x 15-pin D-Sub (2 rows)
        - Indicators: Status LEDs: blue (power supply) green (input signals) orange (output signals)

- **Communication Cable**
  - D-Sub HD connecting cable crossed
    - Wires: 16
    - Cross section: 0.25 mm²
    - Plug type: D-Sub HD 15-pin (3 rows)
    - Socket type: D-Sub HD-15-pin (3 rows)
    - Power rating: Max. 2 A per wire

- **Supply Regulator Unit**
  - Start-up valve with filter control valve
    - Design: diaphragm control valve
    - Assembly position: Vertical ±5°
    - Standard nominal flow rate: 110 l/min
    - Upstream pressure: 100 to 1000 kPa (1 to 10 bar)
    - Operating pressure: 50 to 700 kPa (0.5 to 7 bar)
    - Connection: Coupling plug for coupling socket G1/8

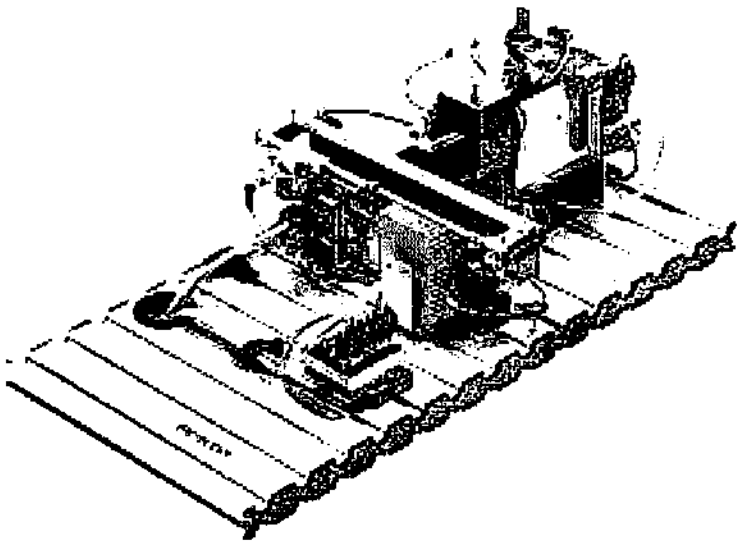
- **MPS Trolley/accessories**
  - Trolley
    - Dimensions: H incl. Rolls unit top edge of Trolley x W x L 750 x 350 x 700 mm
  - Accessories
    - Profile plate and control console
    - Height adjustment
    - A4 mounting frame
    - A4 mounting profile
    - Assembly board

- **Control Panel/Console**
  - Control console for Syslink
    - 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.

- **Programmable Logic Controller with built-in power supply**
  - Programmable Logic Controller
    - Main memory: 250 KB for programs and 1 MB for data Memory card included
    - Inputs/outputs: 32 digital inputs (24 V DC) 32 digital outputs (24 V DC/0.5A) 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution, 2x analog outputs, 2x U/I, 16-bit resolution
    - The mounting system: (W x H) 305 mm x 300 mm Can be placed on a desk or in an MPS station Stable, powder-coated, sheet-steel mounting system
    - Integrated power supply unit: AC 110/230 V/DC 24 V, 4 A
    - 19" module simulation plate with 2x SysLink plug connector for MPS station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
    - Programming language

- Statement list (STL)
- Function diagram (FUN)
- Ladder diagram (LDR)
- Structured text
- Function sequence diagram
- Software compatible with:
    - Windows 10 (64-bit) Professional or later
- Additional:
    - Programming cable (Ethernet cable)
    - Programming software portal
    - Realization of networked solutions
    - PLC simulation software
    - Software and documentation supplied on DVD
    - Floating license supplied on USB stick
    - Language: English"

Sample Image:



Picture for reference only

MPS MEASURING STATION

Description: The MPS measuring station tackles a number of topics, including how to record and process analog and digital signals. The station also provides insight into how pneumatic actuators work and are used, and how actuators are calibrated.

The station takes workpieces out of the ongoing process in order to place them on a measuring table and measure their height. The conveyor module transports the workpieces to the measurement point. The rotary lifting module moves a workpiece into the measuring position. The diffuse sensor measures the height of the workpiece. Depending on the result of the measurement, an electric quarter-turn actuator either moves the workpiece onto a material slide or places it on the conveyor.

Fiber-optic through-beam sensors and opto sensors monitor the material flow on both conveyors. The conveyors can be used in both directions.

The diffuse sensor supplies either an analog or a digital output signal, as required. The module can thus be used for various levels of training. The binary switching output can be adapted to the measurement requirement and the signal type by means of teach-in programming.

The rotary lifting module uses an electric quarter turn actuator and a pneumatic gripper to automate the measurement task and take random samples from the process.

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Familiarization with the various functions of the MPS measuring station D
- Gaining insight into common measurement and sorting processes
- Acquisition of basic PLC programming skills
- Introduction to pneumatic control systems
- Introduction to how sensors and actuators work and are used
- Executing processes based on measurements recorded by sensors
- Controlling a DC motor using a microcontroller
- Controlling a conveyor; programming and processing standardizations
- Calibration of actuators
- Preparation and commissioning of a mechatronic system

Courseware:
- PLC Simulation Software
- Programming software portal
- Realization of networked solutions
- Software and documentation supplied on DVD
- Floating license supplied on USB stick

Hardware:
- **Conveyor Module**
  - Fiber-optic cable (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Coverage range max.: 120mm
    - Mounting thread: M6
    - Coating of housing: Nickel plated
    - Degree of protection: IP65
    - Switch triggering: Reflex
    - Function on actuation: Polymer fiber optic cable
  - Fiber-optic device (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / Interrupt
    - Function on actuation: Sender and receiver
    - Output potential: PNP
    - Coverage range max: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED

    - Short-circuit strength: Pulse
    - Type of mounting: Hole
    - Material of housing: PBT - reinforced
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- Fiber-optic cable (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: interrupt
    - Function on actuation: Polymer fiber optic cable
    - Coverage range max.: 400mm
    - Mounting thread: M4
    - Degree of protection: IP65

- Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering
    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm²) ft: 0.314x10^ (-6)
    - Time constant (ms): 6.5
- DC Gear Motor
    - Nominal voltage: 24V
    - Nominal current: 1.5A
    - Nominal speed of drive shaft: 65rpm
    - Reduction stages: 1
    - Nominal torque: 1 N-m

        - Reversible: yes
        - Starting torque: 7 N-m
    - DC Motor Controller
        - Nominal voltage: 24 VDC ± 10%
        - Max. power consumption: 50 mA
        - Continuous motor current: 4 A DC
        - Control inputs, logic 1: 10 - 24V DC
        - Control inputs, logic 0: 0 - 4V DC
        - Analog input: 0...10V DC, 24V tolerant
        - Overvoltage protection: Yes
        - CE marking per: Class B interference emission
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Rotary/lifting module**
    - Proximity Sensor
        - Measured variable: Position
        - Measuring principle: Magneto resistive
        - Design: For round slot
        - Conforms to standard: EN 60947-5-2
        - CE symbol: EU-EMV guideline
        - Ambient temperature: -40 ... 70 °C
        - Switch output: NPN, PNP, Non-contacting 2-wire
        - Switching element function: Normally open contact
        - Max. switching frequency: 150 Hz
        - Max. output current: 100mA
        - Nominal operating voltage DC: 24V
        - Operating voltage range DC: 5 ... 30 V
        - Protection class: IP65, IP68
    - Proximity Sensor
        - Design: For T-slot
        - Conforms to standard: EN 60947-5-2
        - CE symbol: EU-EMV guideline
        - Measuring principle: Reed magnetic
        - Ambient temperature: 40 ... 60 °C
        - Switch output: with contact, bipolar
        - Switching element function: Normally open contact
        - Switch-on time: <= 0.5 ms
        - Electrical connection: Cable, 3-core
        - Connector exit direction: axial
    - Parallel Gripper
        - Size: 10

    - Stroke per gripper jaw: 3mm
    - Max. angular gripper jaw backlash: < 0.5 deg
    - Rotationally symmetrical: <= 0.2 mm
    - Repetition accuracy, gripper: < 0.02 mm
    - Number of gripper fingers: 2
    - Mode of operation: double-acting
    - Gripper function: Parallel
    - Design structure: Lever, guided motion sequence
    - Guide: Plain-bearing guide
    - Position detection: For proximity sensor
    - Total force at 6 bars, opening: 80 N
    - Pneumatic connection: M3
    - Materials information for gripper jaws: High alloy steel, non-corrosive
    - Working pressure: 2 ... 8 bar
- Semi rotary actuator
    - Size: 10
    - Cushioning angle: 0.5 deg
    - Swivel angle: 0 ... 180 deg
    - Cushioning: Flexible cushioning rings/plates at both ends
    - Mode of operation: double-acting
    - Design structure: Rotary vane
    - Position detection: For proximity sensor
    - Working pressure: 2.5 ... 8 bar
    - Max. swivel frequency at 6 bars: 3 Hz
    - Operating medium: Accordance with ISO8573-1:2010
    - Theoretical torque at 6 bars: 0.85 N-m
    - Mounting type: with internal (female) thread
    - Pneumatic connection: M3
    - Materials information for drive shaft: High alloy steel, non-corrosive
    - Materials information for seals: TPE-U(PU)
    - Materials information, housing: Aluminum, Anodized
- Compact cylinder
    - Stroke: 20 mm
    - Piston diameter: 12 mm
    - Based on the standard: ISO 21287
    - Cushioning: P: Flexible cushioning rings/plates at both ends
    - Design structure: Piston, Piston rod, Profile barrel
    - Position detection: For proximity sensor
    - Working pressure: 1.5 ... 10 bar
    - Mode of operation: double-acting
    - Pneumatic connection: M5
    - Moving mass with 0 mm stroke: 14 g
    - Materials information for cover: Aluminum, Anodized
- 5/2-way single solenoid valve
    - Valve function: 5/2 bistable, 5/2 monostable
    - Type of actuation: electrical

        - Valve size: 10 mm, 14 mm, 18 mm
        - Standard nominal flow rate: 90 ... 1,380 l/min
        - Working pressure: -0.9 ... 10 bar
        - Design structure: Piston slide
        - Type of reset: mechanical spring, Air spring
        - Protection class: IP40, IP65, with plug socket
        - Sealing principle: soft
        - Exhaust-air function: throttleable
        - Manual override: Detenting, Pushing, Covered
        - Type of piloting: Piloted
        - Pilot air supply: External, Internal
        - Duty cycle: 100%
        - Operating medium: Compressed air accordance with ISO8573-1:2010
        - CE symbol: according to EU-EMV guideline
        - Restriction ambient and medium temp.: -5 - 50 °C, without holding current reduction
        - Corrosion resistance classification CRC: 2 - Moderate corrosion stress
        - Medium temperature: -5 ... 60 °C
        - Ambient temperature: -5 ... 60 °C
    - One way flow-control valve
        - Valve function: One-way flow control function for exhaust air
        - Pneumatic connection, port 1: QS-3
        - Pneumatic connection, port 2: M3
        - Adjusting element: Slotted head screw
        - Working pressure: 0.2 ... 10 bar
        - Ambient temperature: -10 ... 60 °C
        - Operating medium: Compressed air in accordance with ISO8573-1:2010
        - Medium temperature: -10 ... 60 °C
        - Max. tightening torque: 0.3 Nm
        - Materials information for seals: NBR
        - Regulating screw material data: Brass
    - Multiple distributor
        - Size: Standard
        - Nominal size: 2.5mm
        - Design structure: Push/pull principle
        - Container size: 1
        - Operating pressure: -0.95 ... 6 bar
        - Corrosion resistance classification CRC: 1 - Low corrosion stress
        - Ambient temperature: -10 ... 80 °C
        - Number of outputs: 4
        - Number of supply lines: 1
        - Hose clamping segment material data: High alloy steel, non-corrosive

- **Measuring Table module**
    - Retro-reflective sensor
        - Design: Block design
        - Conforms to standard: EN 60947-5-2

        - CE symbol: according to EU-EMV guideline
        - Measured variable: Positioning
        - Measuring principle: Optoelectronic
        - Measurement method: Retro-reflective sensor For transparent objects
        - Type of light: Red, polarized
        - Working range: 5 ... 500 mm
        - Ambient temperature: -20 ... 60 °C
        - Reference material: Laser reflector, 51 x 51 mm
        - Switch output: PNP
        - Switching element function: Switchable
        - Max. switching frequency: 1,000 Hz
        - Max. output current: 100 mA
        - Voltage drops: <= 2.4 V
        - Operating voltage range DC: 10 ... 30 V
        - Idle current: 25 mA
        - Electrical connection: Plug, M8x1, 4-pin
        - Operating status display: Yellow LED
        - Protection class: IP67
        - Corrosion resistance classification CRC: 2 - Moderate corrosion stress
    - Reflector
        - Measurement method: Reflector
        - Ambient temperature: -40 ... 70 °C
        - Mounting type: with through hole
        - Materials information, housing: ABS, PMMA
        - Corrosion resistance classification CRC: 4 - Very high corrosion stress

- **Stopper Module**
    - Short stroke cylinder
        - Stroke: 10mm
        - Piston diameter: 12mm
        - Spring return force, retracted: 4N
        - Cushioning: P: Flexible cushioning rings/plates at both ends
        - Mode of operation: single-acting, pushing action

- **Stopper with valve**
    - Short stroke cylinder
        - Design structure: Piston, Piston rod
        - Working pressure: 1.5 ... 10 bar
        - Ambient temperature: -20 ... 80 °C
        - Theoretical force at 6 bar, advance stroke: 59 N
        - Mounting type: Optional, with through hole, with accessories
        - Pneumatic connection: M5
        - Materials information for piston rod: High alloy steel
    - Solenoid Valve
        - Valve function: 3/2 open, monostable
        - Type of actuation: electrical
        - Width: 10 mm

        - Standard nominal flow rate: 10 l/min
        - Working pressure: 0 ... 6 bar
        - Design structure: Poppet valve with spring return
        - Type of reset: mechanical spring
        - Protection class: IP40
        - Nominal size: 0.7 mm
        - Grid dimension: 10 mm
        - Exhaust-air function: throttleable
        - Sealing principle: soft
        - Manual override: Pushing
        - Type of piloting: direct
        - Flow direction: non-reversible
        - Valve position identification: Label
        - Maximum switching frequency: 20 Hz
        - Duty cycle: 100%
        - Ambient temperature: -5 ... 40 °C
        - Mounting type: On subbase
        - Characteristic coil data: 24 V DC: 1 W

- **Sorting Gate/Separator Module**
    - DC Rotary Solenoid
        - Angle of rotation: 95°
        - Operating mode: S3 40%
        - Torque (NCM): 2.00
        - Rated power (W): 16.2
        - Mass inertia (kgm²) ft: 0.314x10^ (-6)
        - Time constant (ms): 6.5

- **Interface**
    - C Interface
        - Operating voltage: 24VDC
        - Digital inputs/outputs 8DI/8DO: Max. 24 V DC, Max. 2 A per output Max. 4 A total
        - Analogue inputs/outputs 4AI/2AO: 0 – 10 V DC or ± 10 V DC
        - Electrical connection: 2x 15-pin D-Sub HD (3 rows)
        - 1x 24 pin IEEE-488 socket (SysLink)
        - 1x 15-pin D-Sub (2 rows)
        - Indicators: Status LEDs: blue (power supply) green (input signals) orange (output signals)

- **Communication Cable**
    - D-Sub HD connecting cable crossed
        - Wires: 16
        - Cross section: 0.25 mm²
        - Plug type: D-Sub HD 15-pin (3 rows)
        - Socket type: D-Sub HD-15-pin (3 rows)
        - Power rating: Max. 2 A per wire

- **Supply Regulator Unit**
  - Start-up valve with filter control valve
    - Design: diaphragm control valve
    - Assembly position: Vertical ±5°
    - Standard nominal flow rate: 110 l/min
    - Upstream pressure: 100 to 1000 kPa (1 to 10 bar)
    - Operating pressure: 50 to 700 kPa (0.5 to 7 bar)
    - Connection: Coupling plug for coupling socket G1/8

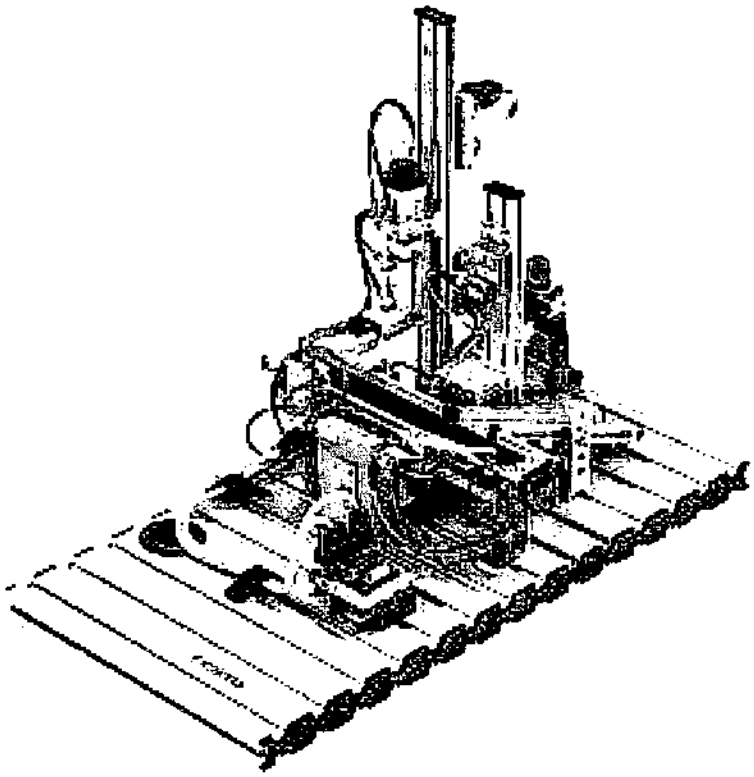
- **MPS Trolley/accessories**
    - Dimensions: H incl. Rolls unit top edge of Trolley x W x L 750 x 350 x 700 mm
  - Accessories
    - Profile plate and control console
    - Height adjustment
    - A4 mounting frame
    - A4 mounting profile
    - Assembly board

- **Control Panel/Console**
  - Control console for Syslink
    - 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.

- **Programmable Logic Controller with built-in power supply**
  - Programmable Logic Controller
    - Main memory: 250 KB for programs and 1 MB for data Memory card included
    - Inputs/outputs: 32 digital inputs (24 V DC) 32 digital outputs (24 V DC/0.5A) 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution, 2x analog outputs, 2x U/I, 16-bit resolution
    - The mounting system: (W x H) 305 mm x 300 mm Can be placed on a desk or in an MPS station Stable, powder-coated, sheet-steel mounting system
    - Integrated power supply unit: AC 110/230 V/DC 24 V, 4 A
    - 19" module simulation plate with 2x SysLink plug connector for MPS station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
    - Programming language
    - Statement list (STL)
    - Function diagram (FUN)
    - Ladder diagram (LDR)
    - Structured text
    - Function sequence diagram
    - Software compatible with:
      - Windows 10 (64-bit) Professional or later
    - Additional:
      - Programming cable (Ethernet cable)
      - Programming software portal

- Realization of networked solutions
- PLC simulation software
- Software and documentation supplied on DVD
- Floating license supplied on USB stick
- Language: English

Sample Image:



Picture for reference only

MPS PICK AND PLACE STATION

Description: The MPS Pick&Place station tackles a number of topics, including the basic principles of vacuum technology and how to use it in an automated process. A pneumatic gripper and the conveyor module are used to transport workpieces.

The station has a two-axis Pick&Place module and a conveyor module. Opto sensors, diffuse sensors or light barriers detect a workpiece housing when it is on the conveyor. The conveyor transports the workpiece to the electric feed separator. The Pick&Place module picks up a workpiece insert from the material supply slide and places it in the workpiece housing. The complete workpiece (housing and insert) is passed on by the feed separator. The conveyor module transports the workpiece to the end position.

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Familiarization with the various functions of the MPS Pick&Place station D
- Gaining insight into common handling processes

- Familiarization with the key components of a mechatronic system
- Acquisition of fundamental knowledge on vacuum technology and pneumatic grippers
- Acquisition of basic PLC programming skills
- Introduction to pneumatic control systems
- Introduction to how sensors and actuators work and are used
- Controlling a DC motor using a microcontroller
- Preparation and commissioning of a mechatronic system

Courseware:

- PLC Simulation Software
- Programming software portal
- Realization of networked solutions
- Software and documentation supplied on DVD
- Floating license supplied on USB stick

Hardware:

- **Conveyor Module**
  - Fiber-optic cable (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Coverage range max.: 120mm
    - Mounting thread: M6
    - Coating of housing: Nickel plated
    - Degree of protection: IP65
    - Switch triggering: Reflex
    - Function on actuation: Polymer fiber optic cable
  - Fiber-optic device (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / Interrupt
    - Function on actuation: Sender and receiver
    - Output potential: PNP
    - Coverage range max: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Short-circuit strength: Pulse
    - Type of mounting: Hole
    - Material of housing: PBT - reinforced
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
  - Fiber-optic cable (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: interrupt

    - Function on actuation: Polymer fiber optic cable
    - Coverage range max.: 400mm
    - Mounting thread: M4
    - Degree of protection: IP65
- Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering
    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm²) ft: 0.314x10^ (-6)
    - Time constant (ms): 6.5
- DC Gear Motor
    - Nominal voltage: 24V
    - Nominal current: 1.5A
    - Nominal speed of drive shaft: 65rpm
    - Reduction stages: 1
    - Nominal torque: 1 N-m
    - Reversible: yes
    - Starting torque: 7 N-m
- DC Motor Controller
    - Nominal voltage: 24 VDC ± 10%
    - Max. power consumption: 50 mA
    - Continuous motor current: 4 A DC
    - Control inputs, logic 1: 10 - 24V DC
    - Control inputs, logic 0: 0 - 4V DC
    - Analog input: 0...10V DC, 24V tolerant
    - Overvoltage protection: Yes
    - CE marking per: Class B interference emission
- Mini I/O terminal
    - Operating voltage: 24V DC
    - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output

- Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
- Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
- Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Pick & Place Module**
  - Proximity sensor
    - Design: for round slot
    - Conforms to standard: EN 60947-5-2
    - Measuring principle: Reed magnetic
    - Ambient temperature: -20 ... 70 °C
    - Switch output: with contact, bipolar
    - Switching element function: Normally open contact
    - Reproducibility of switching value: +/- 0,1 mm
    - Switch-on time: <= 0.6 ms
    - Switch-off time: <= 0.05 ms
    - Max. switching frequency: 500 Hz
    - Operating voltage range AC/DC: 12 ... 27 V
    - Electrical connection: Cable, 3-core
    - Mounting type: Clamped in T-slot Insertable into slot lengthwise
    - Materials information, cable sheaths: TPE-U(PUR)
  - Pressure Sensor
    - Switching element function: Normally open contact
    - Operating voltage range DC: 15 ... 30 V
    - Mounting type: with accessories
    - Pneumatic connection: QS-6
    - Protection class: IP40
    - Threshold value setting range 0-100 %: Threshold value setting range 0-100 %
  - Mini slide
    - Stroke: 50 mm
    - Adjustable end position range/front length: 35.5 mm"
    - Adjustable end position range/rear length: 18.5 mm"
    - Piston diameter: 10 mm
    - Operating mode of drive unit: Yoke
    - Cushioning: P: Flexible cushioning rings/plates at both ends
    - Guide: Ball bearing cage guide
    - Design structure: Yoke kinematics
    - Position detection: For proximity sensor
    - Working pressure: 1.5 ... 8 bar
    - Max. speed: 0.8 m/s
    - Repetition accuracy: 0,3 mm
    - Mode of operation: double-acting
    - Operating medium: accordance with ISO8573-1:2010
    - Cushioning length: 1.5 mm
    - Mounting type: with through hole
    - Pneumatic connection: M3

    - Materials information for seals: HNBR
- One-way flow control valve
    - Regulating screw material data: Brass
    - Swivel joint material data: Zinc die-casting
    - Valve function: One-way flow control function for exhaust air
    - Pneumatic connection, port 1: QS-3
    - Pneumatic connection, port 2: M3
    - Adjusting element: Slotted head screw
    - Mounting type: Threaded
    - Working pressure: 0.2 ... 10 bar
    - Medium temperature: -10 ... 60 °C
- Vacuum Generator
    - Nominal size, Laval nozzle: 0.45 mm
    - Grid dimension: 13 mm
    - Ejector characteristic: High vacuum, Inline
    - Design structure: Straight design
    - Working pressure for max. suction rate: 6.3 bar
    - Working pressure: 1 ... 8 bar
    - Working pressure for max. vacuum: 6 bar
    - Max. vacuum: 86 %
    - Nominal working pressure: 6 bar
    - Air supply time at nominal working pressure: 4.7 s
    - Medium temperature: accordance with ISO8573-1:2010
    - Mounting type: Line installation
    - Pneumatic connection, port 1: QS-6
    - Pneumatic connection, port 3: non-ducted
    - Vacuum connection: QS-6
    - Material information, collector nozzle: POM
- Suction cup holder
    - Volume: 0.719 cm3
    - Assembly position: Vertical
    - Design structure: Vacuum connection at top
    - Correlation to suction-cup holder: Size 4
    - Operating medium: Atmospheric air based on ISO 8573-1:2010
    - Ambient temperature: 0 ... 60 °C
    - Mounting type: with lock nut
    - Suction cup mounting: M6
    - Vacuum connection: QS-6
    - Materials information for seals: NBR
- Vacuum filter
    - Grade of filtration: 10 µm
    - Working pressure: 0.95 ... 4 bar
    - Flow rate at vacuum pressure of -0.75 bar: 260 l/min
    - Operating medium: Atmospheric air based on ISO 8573-1:2010
    - Ambient temperature: 0 ... 60 °C
    - Mounting type: with external (male) thread, Via vacuum port

        - Pneumatic connection: M6
        - Vacuum connection: M6
        - Materials information for seals: NBR
        - Materials information for filter: PVF
        - Materials information, housing: Aluminum, Nickel-plated brass
        - Corrosion resistance classification CRC: 1 - Low corrosion stress
        - Materials note: Free of copper and PTFE, Conforms to RoHS
    - Suction cup complete
        - Suction cup height compensator: 7 mm
        - Min. workpiece radius: 50 mm
        - Nominal size: 3 mm
        - suction cup diameter: 20 mm
        - suction cup volume: 2.75 cm3
        - Position of connection: on top
        - Correlation to suction-cup holder: Size 4
        - Suction cup shape: Round, bellows, 3.5 convolutions
        - Working pressure: 0 ... 0.95 bar
        - Nominal working pressure: -0.7 bar
        - Operating medium: Atmospheric air based on ISO 8573-1:2010
        - Corrosion resistance classification CRC: 1 - Low corrosion stress
        - Ambient temperature: -30 ... 180 °C
        - Mounting type: Via vacuum port
        - Vacuum connection: M6
        - Color: transparent
        - Shore hardness: 50 +/- 5
    - Push-in Connector
        - Size: Mini
        - Nominal size: 2.6 mm
        - Container size: 10
        - Design structure: Push/pull principle
        - Operating pressure complete temperature range: -0.95 ... 6 bar
        - Operating medium: accordance with ISO8573-1:2010
        - Pneumatic connection, port 1: Push-in sleeve QS-6
        - Pneumatic connection, port 2: For tubing outside diameter 4 mm
        - color of release ring: blue
        - Materials information, housing: PBT
        - Materials information for tubing seal: NBR
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Sorting Gate/Separator Module**
    - DC Rotary Solenoid

        - Angle of rotation: 95°
        - Operating mode: S3 40%
        - Torque (NCM): 2.00
        - Rated power (W): 16.2
        - Mass inertia (kgm²) ft: 0.314x10^ (-6)
        - Time constant (ms): 6.5

- **Interface**
    - C Interface
        - Operating voltage: 24VDC
        - Digital inputs/outputs 8DI/8DO: Max. 24 V DC, Max. 2 A per output Max. 4 A total
        - Analogue inputs/outputs 4AI/2AO: 0 – 10 V DC or ± 10 V DC
        - Electrical connection: 2x 15-pin D-Sub HD (3 rows)
        - 1x 24 pin IEEE-488 socket (SysLink)
        - 1x 15-pin D-Sub (2 rows)
        - Indicators: Status LEDs: blue (power supply) green (input signals) orange (output signals)

- **Communication Cable**
    - D-Sub HD connecting cable crossed
        - Wires: 16
        - Cross section: 0.25 mm²
        - Plug type: D-Sub HD 15-pin (3 rows)
        - Socket type: D-Sub HD-15-pin (3 rows)
        - Power rating: Max. 2 A per wire

- **Supply Regulator Unit**
    - Start-up valve with filter control valve
        - Design: diaphragm control valve
        - Assembly position: Vertical ±5°
        - Standard nominal flow rate: 110 l/min
        - Upstream pressure: 100 to 1000 kPa (1 to 10 bar)
        - Operating pressure: 50 to 700 kPa (0.5 to 7 bar)
        - Connection: Coupling plug for coupling socket G1/8

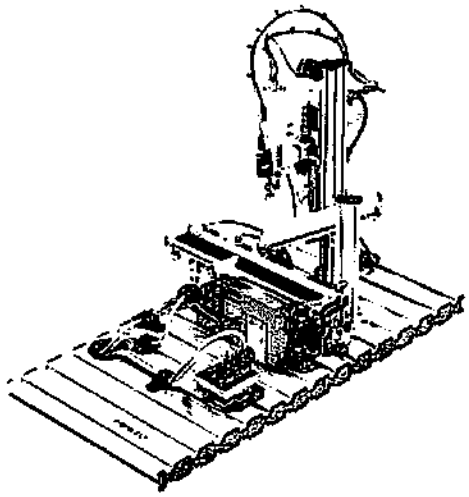
- **MPS Trolley/accessories**
    - Trolley
        - Dimensions: H incl. Rolls unit top edge of Trolley x W x L 750 x 350 x 700 mm
    - Accessories
        - Profile plate and control console
        - Height adjustment
        - A4 mounting frame
        - A4 mounting profile
        - Assembly board

- **Control Panel/Console**
    - Control console for Syslink

- 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 the PLC of choice are available on the rear panel.

- **Programmable Logic Controller with built-in power supply**
  - Programmable Logic Controller
    - Main memory: 250 KB for programs and 1 MB for data Memory card included
    - Inputs/outputs: 32 digital inputs (24 V DC) 32 digital outputs (24 V DC/0.5A) 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution, 2x analog outputs, 2x U/I, 16-bit resolution
    - The mounting system: (W x H) 305 mm x 300 mm Can be placed on a desk or in an MPS station Stable, powder-coated, sheet-steel mounting system
    - Integrated power supply unit: AC 110/230 V/DC 24 V, 4 A
    - 19" module simulation plate with 2x SysLink plug connector for MPS station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
    - Programming language
    - Statement list (STL)
    - Function diagram (FUN)
    - Ladder diagram (LDR)
    - Structured text
    - Function sequence diagram
    - Software compatible with:
      - Windows 10 (64-bit) Professional or later
    - Additional:
      - Programming cable (Ethernet cable)
      - Programming software portal
      - Realization of networked solutions
      - PLC simulation software
      - Software and documentation supplied on DVD
      - Floating license supplied on USB stick
      - Language: English

Sample Image:



Picture for reference only

MPS SEPARATING STATION

Description: The MPS separating station tackles a number of topics, including the use of digital sensors and actuators. The station controls a distribution process based on workpiece properties. The workpiece dimensions measured by the sensors are used to determine the subsequent process.

The workpieces on the conveyor are transported to the depth measurement point. An analog diffuse sensor checks the depth of a drilled hole. If the hole is deep enough, the conveyor carries the workpieces to the end position. An electric deflector with a quarter turn actuator guides workpieces that are skewed or do not have sufficient hole depth to a collection point via the second conveyor.

Fiber-optic through-beam sensors and opto sensors monitor the material flow on both conveyors. The workpieces on the conveyors can transport workpieces in both directions.

The diffuse sensor supplies either an analog or a digital output signal, as required. The module can thus be used for various levels of training. The binary switching output can be adapted to the measurement requirement and the signal type by means of teach-in programming.

The MPS separating station enables users to set up flexible assembly lines using a variety of stations. Downstream stations can be added to the station in two directions. Combined assembly processes such as cylinder assembly and installation of workpiece inserts in housings can be performed using the separating station.

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Familiarization with the various functions of the MPS separating station D
- Gaining insight into common distribution processes
- Familiarization with the key components of a mechatronic system
- Acquisition of basic PLC programming skills
- Introduction to pneumatic control systems
- Introduction to how sensors and actuators work and are used
- Controlling a DC motor using a micro controller

- Preparation and commissioning of a mechatronic system

Courseware:
- PLC Simulation Software
- Programming software portal
- Realization of networked solutions
- Software and documentation supplied on DVD
- Floating license supplied on USB stick

Hardware:
- **Conveyor Module**
  - Fiber-optic cable (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Coverage range max.: 120mm
    - Mounting thread: M6
    - Coating of housing: Nickel plated
    - Degree of protection: IP65
    - Switch triggering: Reflex
    - Function on actuation: Polymer fiber optic cable
  - Fiber-optic device (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / Interrupt
    - Function on actuation: Sender and receiver
    - Output potential: PNP
    - Coverage range max: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Short-circuit strength: Pulse
    - Type of mounting: Hole
    - Material of housing: PBT - reinforced
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
  - Fiber-optic cable (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: interrupt
    - Function on actuation: Polymer fiber optic cable
    - Coverage range max.: 400mm
    - Mounting thread: M4
    - Degree of protection: IP65
  - Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering

    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm²) ft: 0.314x10^ (-6)
    - Time constant (ms): 6.5
- DC Gear Motor
    - Nominal voltage: 24V
    - Nominal current: 1.5A
    - Nominal speed of drive shaft: 65rpm
    - Reduction stages: 1
    - Nominal torque: 1 N-m
    - Reversible: yes
    - Starting torque: 7 N-m
- DC Motor Controller
    - Nominal voltage: 24 VDC ± 10%
    - Max. power consumption: 50 mA
    - Continuous motor current: 4 A DC
    - Control inputs, logic 1: 10 - 24V DC
    - Control inputs, logic 0: 0 - 4V DC
    - Analog input: 0...10V DC, 24V tolerant
    - Overvoltage protection: Yes
    - CE marking per: Class B interference emission
- Mini I/O terminal
    - Operating voltage: 24V DC
    - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
    - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
    - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
    - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Reflexions-lichttaster analog module / Diffuse sensor analog**
    - Distance Sensor
        - Measured variable: Travel

- Measuring principle: Optoelectronic
- Measurement method: Distance sensor
- Type of light: Red
- Working range: 20 ... 80 mm
- Ambient temperature: 0 ... 60 °C
- Travel resolution: 0.5 mm
- Switch output: PNP
- Analog output: 0 - 10 V
- Operating voltage range DC: 15 ... 30 V
- Electrical connection: Plug, M8x1, 4-pin
- Size: 20x32x12 mm
- Operating status display: Yellow LED
- Operating reserve display: Green LED
- Setting range lower limit: 20 mm
- Upper limit of adjustment range: 80 mm

- **Stopper Module**
  - Short Stroke cylinder
    - Stroke: 10 mm
    - Piston diameter: 12 mm
    - Spring return force, retracted: 4 N
    - Cushioning: P: Flexible cushioning rings/plates at both ends
    - Mode of operation: single-acting, pushing action
    - Working pressure: 1.5 ... 10 bar
    - Operating medium: Compressed air with ISO8573-1:2010
    - Ambient temperature: -20 ... 80 °C
    - Moving mass: 6.9 g
    - Pneumatic connection: M5
    - Materials information for cover: Wrought Aluminum alloy, Anodized
    - Materials information for seals: NBR, TPE-U(PU)
    - Materials information, housing: Wrought Aluminum alloy, Anodized
    - Position detection: No

- **Sorting Gate/Separator Module**
  - DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm^2) ft: 0.314x10^ (-6)
    - Time constant (ms): 6.5

- **Interface**
  - C Interface
    - Operating voltage: 24VDC
    - Digital inputs/outputs 8DI/8DO: Max. 24 V DC, Max. 2 A per output Max. 4 A total
    - Analogue inputs/outputs 4AI/2AO: 0 – 10 V DC or ± 10 V DC

- Electrical connection: 2x 15-pin D-Sub HD (3 rows)
- 1x 24 pin IEEE-488 socket (SysLink)
- 1x 15-pin D-Sub (2 rows)
- Indicators: Status LEDs: blue (power supply) green (input signals) orange (output signals)

- **Communication Cable**
  - D-Sub HD connecting cable crossed
    - Wires: 16
    - Cross section: 0.25 mm²
    - Plug type: D-Sub HD 15-pin (3 rows)
    - Socket type: D-Sub HD-15-pin (3 rows)
    - Power rating: Max. 2 A per wire

- **Supply Regulator Unit**
  - Start-up valve with filter control valve
    - Design: diaphragm control valve
    - Assembly position: Vertical ±5°
    - Standard nominal flow rate: 110 l/min
    - Upstream pressure: 100 to 1000 kPa (1 to 10 bar)
    - Operating pressure: 50 to 700 kPa (0.5 to 7 bar)
    - Connection: Coupling plug for coupling socket G1/8

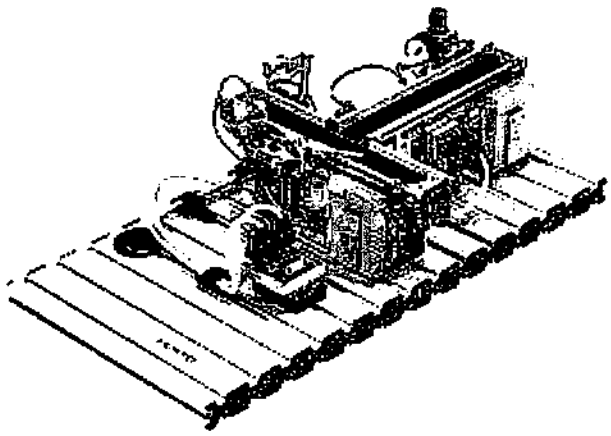
- **MPS Trolley/accessories**
  - Trolley
    - Dimensions: H incl. Rolls unit top edge of Trolley x W x L 750 x 350 x 700 mm
  - Accessories
    - Profile plate and control console
    - Height adjustment
    - A4 mounting frame
    - A4 mounting profile
    - Assembly board

- **Control Panel/Console**
  - Control console for Syslink
    - 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 the PLC of choice are available on the rear panel.

- **Programmable Logic Controller with built-in power supply**
  - Programmable Logic Controller
    - Main memory: 250 KB for programs and 1 MB for data Memory card included
    - Inputs/outputs: 32 digital inputs (24 V DC) 32 digital outputs (24 V DC/0.5A) 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution, 2x analog outputs, 2x U/I, 16-bit resolution
    - The mounting system: (W x H) 305 mm x 300 mm Can be placed on a desk or in an MPS station Stable, powder-coated, sheet-steel mounting system
    - Integrated power supply unit: AC 110/230 V/DC 24 V, 4 A

- 19" module simulation plate with 2x SysLink plug connector for MPS station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
- Programming language
- Statement list (STL)
- Function diagram (FUN)
- Ladder diagram (LDR)
- Structured text
- Function sequence diagram
- Software compatible with:
    - Windows 10 (64-bit) Professional or later
- Additional:
    - Programming cable (Ethernet cable)
    - Programming software portal
    - Realization of networked solutions
    - PLC simulation software
    - Software and documentation supplied on DVD
    - Floating license supplied on USB stick
    - Language: English

Sample Image:



Picture for reference only

MPS SORTING STATION

Description: The MPS sorting station tackles a number of topics, including combining different types of sensors to detect materials. The station controls a sorting process based on workpiece properties.

The station sorts workpieces onto three material slides. A diffuse sensor detects when a workpiece is placed in the station and triggers transportation of the workpiece to the sorting point: A pneumatic stopper (short-stroke cylinder) stops the workpiece while the conveyor keeps running, and passes it on for sorting onto one of three material slides. Opto and inductive sensors detect the workpiece properties and distinguish

between workpieces based on their color and material. An electric deflector sorts the workpiece onto the correct material slide. A retro-reflective sensor monitors the fill levels of the material slides.

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Familiarization with the various functions of the MPS sorting station D
- Gaining insight into handling technology and common sorting processes
- Acquisition of basic PLC programming skills
- Introduction to pneumatic control systems
- Introduction to how sensors and actuators work and are used, in particular diffuse sensors, fiber-optic through-beam sensors, fork light barriers and inductive proximity sensors
- Executing processes based on measurements recorded by sensors
- Controlling a DC motor using a microcontroller
- Preparation and commissioning of a mechatronic system

Courseware:
- PLC Simulation Software
- Programming software portal
- Realization of networked solutions
- Software and documentation supplied on DVD
- Floating license supplied on USB stick

Hardware:
- **Conveyor Module**
  - Fiber-optic cable (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Coverage range max.: 120mm
    - Mounting thread: M6
    - Coating of housing: Nickel plated
    - Degree of protection: IP65
    - Switch triggering: Reflex
    - Function on actuation: Polymer fiber optic cable
  - Fiber-optic device (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / Interrupt
    - Function on actuation: Sender and receiver
    - Output potential: PNP
    - Coverage range max: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Short-circuit strength: Pulse
    - Type of mounting: Hole
    - Material of housing: PBT - reinforced
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max (DC): 30V

    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- Fiber-optic cable (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: interrupt
    - Function on actuation: Polymer fiber optic cable
    - Coverage range max.: 400mm
    - Mounting thread: M4
    - Degree of protection: IP65
- Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering
    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm^2) ft: 0.314x10^ (-6)
    - Time constant (ms): 6.5

- DC Gear Motor
    - Nominal voltage: 24V
    - Nominal current: 1.5A
    - Nominal speed of drive shaft: 65rpm
    - Reduction stages: 1
    - Nominal torque: 1 N-m
    - Reversible: yes
    - Starting torque: 7 N-m
- DC Motor Controller
    - Nominal voltage: 24 VDC ± 10%
    - Max. power consumption: 50 mA
    - Continuous motor current: 4 A DC
    - Control inputs, logic 1: 10 - 24V DC

        - Control inputs, logic 0: 0 - 4V DC
        - Analog input: 0...10V DC, 24V tolerant
        - Overvoltage protection: Yes
        - CE marking per: Class B interference emission
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Detection Module**
    - Fiber Optic cable
        - Signal processing (measuring principle): red light
        - Switch triggering: Reflex
        - Function on actuation: Polymer fibre optic cable
        - Coverage range max.: 120 mm
        - Minimum ambient temperature: -40 °C
        - Maximum ambient temperature: 70 °C
        - Mounting thread: M 6
        - Material of housing: brass
        - Product weight: 0,02 kg
        - Coating of housing: Nickel-plated
        - Degree of protection: IP65
    - Fiber-optic Device
        - Signal processing (measuring principle): red light
        - Switch triggering: Reflex/Interrupt
        - Function on actuation: sender and receiver
        - Coverage range max.: 120 mm
        - Output potential (el. output): PNP
        - Minimum ambient temperature: -5 °C
        - Maximum ambient temperature: 55 °C
        - Air connection type elec.: Plug
        - Thread for connector: M 8x1
        - Number of pins, plug connection: 4
        - Operating status display: Yellow LED
        - Type of mounting: Hole
        - Voltage type: DC
        - Nominal operating voltage [DC]: 24 V
        - Operating voltage min. (DC): 10 V
        - Operating voltage max. (DC): 30 V
        - Degree of protection: IP65
    - Proximity Sensor
        - Materials note: Free of copper and PTFE
        - Nominal switching distance: 2.5 mm
        - Guaranteed switching distance: 2.03 mm

        - Switch output: PNP
        - Switching element function: Normally open contact
        - Max. switching frequency: 3,000 Hz
        - Inductive protective circuit: Integrated
        - Operating voltage range DC: 10 ... 30 V
        - Electrical connection: Plug, M8x1, 3-pin
        - Size: M8x1
        - Mounting type: with lock nut
        - Operating status display: Yellow LED
        - Protection class: IP65 IP67
    - Fork light barrier
        - Measured variable: Position
        - Measuring principle: Optoelectronic
        - Measurement method: Fork light barrier
        - Type of light: Red
        - Minimal object diameter: 0.3 mm
        - Ambient temperature: -10 ... 60 °C
        - Repetition accuracy: 0.03 mm
        - Switch output: PNP
        - Switching element function: Switchable
        - Operating voltage range DC: 10 ... 30 V
        - Polarity protected: For operating voltage connections
        - Operating status display: Yellow LED
        - Protection class: IP67
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)
    - Retro-reflective sensor
        - Measured variable: Position
        - Measuring principle: Optoelectronic
        - Measurement method: Retro-reflective sensor for transparent objects
        - Type of light: Red, polarized
        - Polarity protected: for all electrical connections
        - Reference material: Laser reflector, 51 x 51 mm
        - Switch output: PNP
        - Switching element function: Switchable
        - Operating voltage range DC: 10 ... 30 V
        - Residual ripple: 10 %
        - Electrical connection: Plug, M8x1, 4-pin

- **Stopper Module**
    - Short Stroke cylinder
        - Stroke: 10 mm

        - Piston diameter: 12 mm
        - Spring return force, retracted: 4 N
        - Cushioning: P: Flexible cushioning rings/plates at both ends
        - Mode of operation: single-acting, pushing action
        - Working pressure: 1.5 ... 10 bar
        - Operating medium: Compressed air with ISO8573-1:2010
        - Ambient temperature: -20 ... 80 °C
        - Moving mass: 6.9 g
        - Pneumatic connection: M5
        - Materials information for cover: Wrought Aluminum alloy, Anodized
        - Materials information for seals: NBR, TPE-U(PU)
        - Materials information, housing: Wrought Aluminum alloy, Anodized
        - Position detection: No

- **Sorting Gate/Separator Module**
    - DC Rotary Solenoid
        - Angle of rotation: 95°
        - Operating mode: S3 40%
        - Torque (NCM): 2.00
        - Rated power (W): 16.2
        - Mass inertia (kgm²) ft: 0.314x10^ (-6)
        - Time constant (ms): 6.5

- **Interface**
    - C Interface
        - Operating voltage: 24VDC
        - Digital inputs/outputs 8DI/8DO: Max. 24 V DC, Max. 2 A per output Max. 4 A total
        - Analogue inputs/outputs 4AI/2AO: 0 – 10 V DC or ± 10 V DC
        - Electrical connection: 2x 15-pin D-Sub HD (3 rows)
        - 1x 24 pin IEEE-488 socket (SysLink)
        - 1x 15-pin D-Sub (2 rows)
        - Indicators: Status LEDs: blue (power supply) green (input signals) orange (output signals)

- **Communication Cable**
    - D-Sub HD connecting cable crossed
        - Wires: 16
        - Cross section: 0.25 mm²
        - Plug type: D-Sub HD 15-pin (3 rows)
        - Socket type: D-Sub HD-15-pin (3 rows)
        - Power rating: Max. 2 A per wire

- **Supply Regulator Unit**
    - Start-up valve with filter control valve
        - Design: diaphragm control valve
        - Assembly position: Vertical ±5°
        - Standard nominal flow rate: 110 l/min

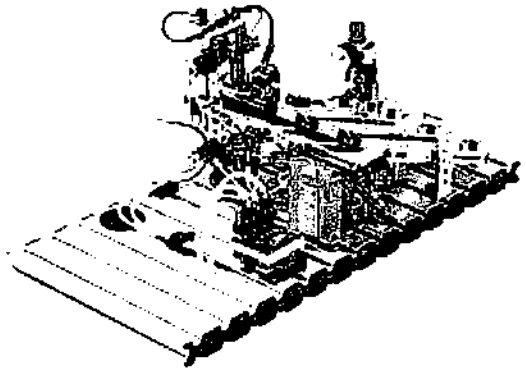
- Upstream pressure: 100 to 1000 kPa (1 to 10 bar)
- Operating pressure: 50 to 700 kPa (0.5 to 7 bar)
- Connection: Coupling plug for coupling socket G1/8

- **MPS Trolley/accessories**
  - Trolley
    - Dimensions: H incl. Rolls unit top edge of Trolley x W x L 750 x 350 x 700 mm
  - Accessories
    - Profile plate and control console
    - Height adjustment
    - A4 mounting frame
    - A4 mounting profile
    - Assembly board

- **Control Panel/Console**
  - Control console for Syslink
    - 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.

- **Programmable Logic Controller with built-in power supply**
  - Programmable Logic Controller
    - Main memory: 250 KB for programs and 1 MB for data Memory card included
    - Inputs/outputs: 32 digital inputs (24 V DC) 32 digital outputs (24 V DC/0.5A) 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution, 2x analog outputs, 2x U/I, 16-bit resolution
    - The mounting system: (W x H) 305 mm x 300 mm Can be placed on a desk or in an MPS station Stable, powder-coated, sheet-steel mounting system
    - Integrated power supply unit: AC 110/230 V/DC 24 V, 4 A
    - 19" module simulation plate with 2x SysLink plug connector for MPS station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
    - Programming language
    - Statement list (STL)
    - Function diagram (FUN)
    - Ladder diagram (LDR)
    - Structured text
    - Function sequence diagram
    - Software compatible with:
      - Windows 10 (64-bit) Professional or later
    - Additional:
      - Programming cable (Ethernet cable)
      - Programming software portal
      - Realization of networked solutions
      - PLC simulation software
      - Software and documentation supplied on DVD
      - Floating license supplied on USB stick
      - Language: English

Sample Image:



Picture for reference only

MPS STORAGE STATION

Description: The MPS storing station addresses, among other things, the topics of parameterization and commissioning of multi-axis controllers and advanced PLC programming. Workpieces can be stored on several high rack storage levels using a combination of sensors and actuators during the process sequence. A modern web interface serves as a state-of-the-art HMI.

The storing station can differentiate workpieces based on their color and store up to 48 workpieces on six levels. It is also possible to additionally store cardboard boxes by adjusting the tray and the actuator. The workpiece or the cardboard box is identified on the conveyor module by a combination of sensors and the parameterization of the multi-axis controller. A pneumatic gripper fastened to a stepper motor with gear rack picks the workpiece or the cardboard box from the conveyor and places it in the storage area. The storage area can be located either at the beginning (removal from storage) or at the end (placement into storage) of a production line, or as a buffer station within a production line, by means of appropriate programming. The position of the gripper can be registered by means of the encoder on the motor. Position teaching is possible by means of password-protected user management. 3D simulation software with integrated simulated PLC and error simulation is available for the station. The control panel and a PLC turn the station into an automated system. The station can process different workpieces with a diameter/edge length of 40 mm.

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Parameterization and commissioning of multi-axis controllers
- Acquisition of advanced PLC programming skills
- Learning about and configuring digital sensors and actuators
- Learning about and actuating stepper motors
- Using web interfaces to control and monitor the processes

Courseware:
- PLC Simulation Software
- Programming software portal
- Realization of networked solutions
- Software and documentation supplied on DVD
- Floating license supplied on USB stick

Hardware:

- **Conveyor Module**
  - Fiber-optic cable (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Coverage range max.: 120mm
    - Mounting thread: M6
    - Coating of housing: Nickel plated
    - Degree of protection: IP65
    - Switch triggering: Reflex
    - Function on actuation: Polymer fiber optic cable
  - Fiber-optic device (diffuse sensor)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / Interrupt
    - Function on actuation: Sender and receiver
    - Output potential: PNP
    - Coverage range max: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Short-circuit strength: Pulse
    - Type of mounting: Hole
    - Material of housing: PBT - reinforced
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V
    - Operating voltage min. (DC): 10V
    - Operating voltage max (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
  - Fiber-optic cable (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: interrupt
    - Function on actuation: Polymer fiber optic cable
    - Coverage range max.: 400mm
    - Mounting thread: M4
    - Degree of protection: IP65
  - Fiber-optic device (light barrier)
    - Signal processing (measuring principle): Red light
    - Switch triggering: Reflex / triggering
    - Output potential: PNP
    - Coverage range max.: 120mm
    - Thread for connector: M8x1
    - Number of pins, plug connection: 4
    - Operating status display: Yellow LED
    - Voltage type: DC
    - Nominal operating voltage (DC): 24V

    - Operating voltage min. (DC): 10V
    - Operating voltage max. (DC): 30V
    - Idle current max.: 25mA
    - Maximum switching frequency: 1000 Hz
    - Degree of protection: IP65
- DC Rotary Solenoid
    - Angle of rotation: 95°
    - Operating mode: S3 40%
    - Torque (NCM): 2.00
    - Rated power (W): 16.2
    - Mass inertia (kgm²) ft: 0.314x10^ (-6)
    - Time constant (ms): 6.5
- DC Gear Motor
    - Nominal voltage: 24V
    - Nominal current: 1.5A
    - Nominal speed of drive shaft: 65rpm
    - Reduction stages: 1
    - Nominal torque: 1 N-m
    - Reversible: yes
    - Starting torque: 7 N-m
- DC Motor Controller
    - Nominal voltage: 24 VDC ± 10%
    - Max. power consumption: 50 mA
    - Continuous motor current: 4 A DC
    - Control inputs, logic 1: 10 - 24V DC
    - Control inputs, logic 0: 0 - 4V DC
    - Analog input: 0...10V DC, 24V tolerant
    - Overvoltage protection: Yes
    - CE marking per: Class B interference emission
- Mini I/O terminal
    - Operating voltage: 24V DC
    - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
    - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
    - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
    - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)

- **Detection Module**
    - Fiber Optic cable
        - Signal processing (measuring principle): red light
        - Switch triggering: Reflex
        - Function on actuation: Polymer fibre optic cable
        - Coverage range max.: 120 mm
        - Minimum ambient temperature: -40 °C
        - Maximum ambient temperature: 70 °C
        - Mounting thread: M 6
        - Material of housing: brass

- Product weight: 0,02 kg
- Coating of housing: Nickel-plated
- Degree of protection: IP65

- Fiber-optic Device
  - Signal processing (measuring principle): red light
  - Switch triggering: Reflex/Interrupt
  - Function on actuation: sender and receiver
  - Coverage range max.: 120 mm
  - Output potential (el. output): PNP
  - Minimum ambient temperature: -5 °C
  - Maximum ambient temperature: 55 °C
  - Air connection type elec.: Plug
  - Thread for connector: M 8x1
  - Number of pins, plug connection: 4
  - Operating status display: Yellow LED
  - Type of mounting: Hole
  - Voltage type: DC
  - Nominal operating voltage [DC]: 24 V
  - Operating voltage min. (DC): 10 V
  - Operating voltage max. (DC): 30 V
  - Degree of protection: IP65
- Proximity Sensor
  - Materials note: Free of copper and PTFE
  - Nominal switching distance: 2.5 mm
  - Guaranteed switching distance: 2.03 mm
  - Switch output: PNP
  - Switching element function: Normally open contact
  - Max. switching frequency: 3,000 Hz
  - Inductive protective circuit: Integrated
  - Operating voltage range DC: 10 ... 30 V
  - Electrical connection: Plug, M8x1, 3-pin
  - Size: M8x1
  - Mounting type: with lock nut
  - Operating status display: Yellow LED
  - Protection class: IP65 IP67
- Fork light barrier
  - Measured variable: Position
  - Measuring principle: Optoelectronic
  - Measurement method: Fork light barrier
  - Type of light: Red
  - Minimal object diameter: 0.3 mm
  - Ambient temperature: -10 ... 60 °C
  - Repetition accuracy: 0.03 mm
  - Switch output: PNP

        - Switching element function: Switchable
        - Operating voltage range DC: 10 ... 30 V
        - Polarity protected: For operating voltage connections
        - Operating status display: Yellow LED
        - Protection class: IP67
    - Mini I/O terminal
        - Operating voltage: 24V DC
        - Digital I/O, 4DI, 4DO: Max. 24V DC, Max. 2A per output
        - Analog I/O, 2AI, 1AO: 0....10V DC and ± 10V DC
        - Electrical connection: D-Sub HD 15-pin (3-row) Spring clip: 0.14 ... 0.5 mm2
        - Indicators: Status LEDs: Blue (power supply) Green (input signals) Orange (output signals)
    - Retro-reflective sensor
        - Measured variable: Position
        - Measuring principle: Optoelectronic
        - Measurement method: Retro-reflective sensor for transparent objects
        - Type of light: Red, polarized
        - Polarity protected: for all electrical connections
        - Reference material: Laser reflector, 51 x 51 mm
        - Switch output: PNP
        - Switching element function: Switchable
        - Operating voltage range DC: 10 ... 30 V
        - Residual ripple: 10 %
        - Electrical connection: Plug, M8x1, 4-pin

- **Interface**
    - C Interface
        - Operating voltage: 24VDC
        - Digital inputs/outputs 8DI/8DO: Max. 24 V DC, Max. 2 A per output Max. 4 A total
        - Analogue inputs/outputs 4AI/2AO: 0 – 10 V DC or ± 10 V DC
        - Electrical connection: 2x 15-pin D-Sub HD (3 rows)
        - 1x 24 pin IEEE-488 socket (SysLink)
        - 1x 15-pin D-Sub (2 rows)
        - Indicators: Status LEDs: blue (power supply) green (input signals) orange (output signals)

- **Communication Cable**
    - D-Sub HD connecting cable crossed
        - Wires: 16
        - Cross section: 0.25 mm²
        - Plug type: D-Sub HD 15-pin (3 rows)
        - Socket type: D-Sub HD-15-pin (3 rows)
        - Power rating: Max. 2 A per wire

- **Supply Regulator Unit**
    - Start-up valve with filter control valve
        - Design: diaphragm control valve

        - Assembly position: Vertical ±5°
        - Standard nominal flow rate: 110 l/min
        - Upstream pressure: 100 to 1000 kPa (1 to 10 bar)
        - Operating pressure: 50 to 700 kPa (0.5 to 7 bar)
        - Connection: Coupling plug for coupling socket G1/8

- **MPS Trolley/accessories**
    - Trolley
        - Dimensions: H incl. Rolls unit top edge of Trolley x W x L 750 x 350 x 700 mm
    - Accessories
        - Profile plate and control console
        - Height adjustment
        - A4 mounting frame
        - A4 mounting profile
        - Assembly board

- **Control Panel/Console**
    - Control console for Syslink
        - 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.

- **Programmable Logic Controller with built-in power supply**
    - Programmable Logic Controller
        - Main memory: 250 KB for programs and 1 MB for data Memory card included
        - Inputs/outputs: 32 digital inputs (24 V DC) 32 digital outputs (24 V DC/0.5A) 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution, 2x analog outputs, 2x U/I, 16-bit resolution
        - The mounting system: (W x H) 305 mm x 300 mm Can be placed on a desk or in an MPS station Stable, powder-coated, sheet-steel mounting system
        - Integrated power supply unit: AC 110/230 V/DC 24 V, 4 A
        - 19" module simulation plate with 2x SysLink plug connector for MPS station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
        - Programming language
        - Statement list (STL)
        - Function diagram (FUN)
        - Ladder diagram (LDR)
        - Structured text
        - Function sequence diagram
        - Software compatible with:
            - Windows 10 (64-bit) Professional or later

- Additional:
  - Programming cable (Ethernet cable)
  - Programming software portal
  - Realization of networked solutions
  - PLC simulation software
  - Software and documentation supplied on DVD
  - Floating license supplied on USB stick
  - Language: English

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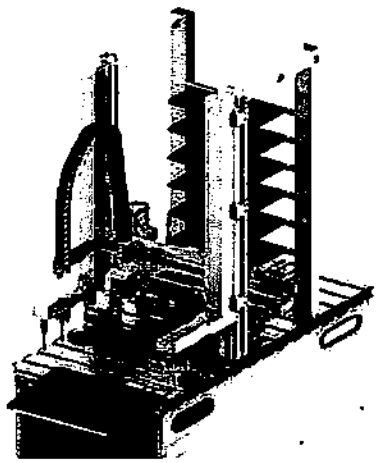


Picture for reference only

Human Machine Interface *(1 unit per station)*

System requirements: Windows XP/7/8/10 (32/64 bit)
Type code: CDPX
Real-time clock: Yes
Recipe memory: 32000 byte
Tags: 10000
Widgets: 2000
Simultaneous client access attempts: 4
Parameter sets per recipe: 32000
Event buffer: 4
Supported PLC protocols: CODESY 2.3 and 3.5, Modbus TCP client, TCP server, RTU client, RTU server
Alarms: 2000
Javascript file size per page: 8000 byte
Real-time clock deviation: 130 s/month
Display: Color TFT
Display properties: Touchscreen
Display size: 7"
Operating voltage: 18 - 30 V
Backup battery: Rechargeable lithium battery

Additional:
Open for web and multimedia applications
Incorporation of standard documents
Multiple interfaces for process communication
Integrated Ethernet switch
Programming with Designer Studio
HMI programming software downloadable

Additional Programmable Logic Controller *(5 units)*

CPU data: 400 MHz processor
Materials note: Conforms to RoHS
Safety class: III
Test for insensitivity to vibration: to EN61121-2
Test for insensitivity to shock: to EN61121-2
Protection class: IP20
Operating voltage: 19.2 - 30 VDC
Electrical connector technology I/O: Socket strip, grid 3.5 mm
Current consumption: 100 mA nominal at 24 VDC
Digital inputs, number: 12

Memory
Global memory and constraints (RAM): 16 MB
Available flash memory: 2 MB
Flag memory: 8,192 bytes
Input: 8,192 bytes
Output: 8,192 bytes
Protocol: CANopen
I-Port
IO-Link
Modbus TCP
IO-Link, protocol: Device V 1.0, Master V 1.1
IO-Link, protocol mode: Master SIO, COM1 (4.8 kBaud), COM2 (36.4 kBaud), COM3 (230.4 kBaud)

Other Equipment & Accessories:

- 6 Units of Digital Simulation box
  - Technical Data
    Operating voltage 24VDC
    Signal Voltage 24VDC
    Syslink interface, IEEE448
    Switches: 9, non-detenting, detenting
    LED's: 9

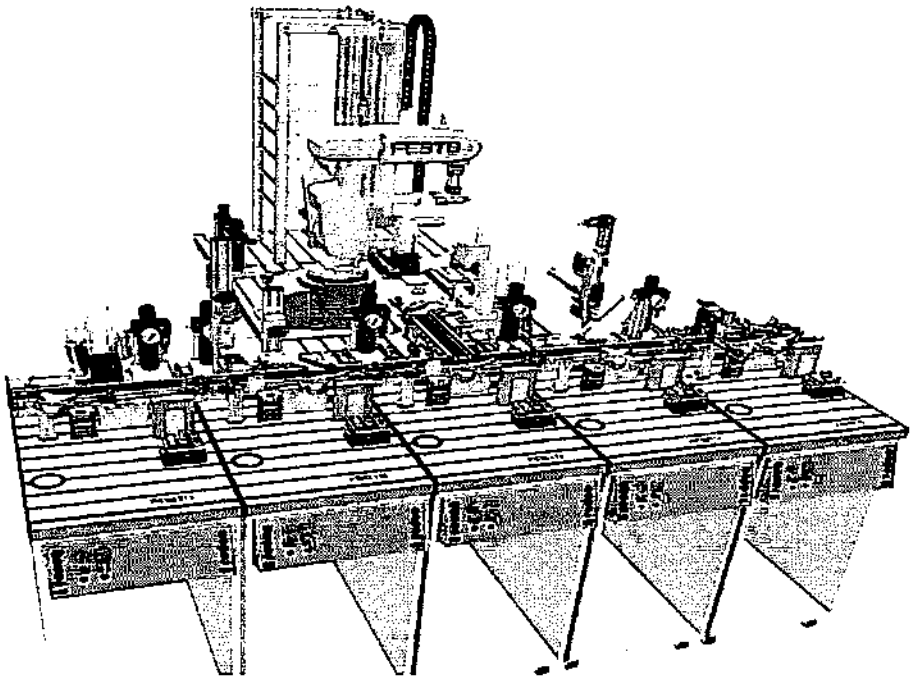
- 4 Units of Workpiece set "for cylinder assembly"
  - External diameter: 40mm
  - Height (black): 22.5mm
  - Height (red): 25mm

- 2 Units of Silent type compressor 230V/60Hz with accessories

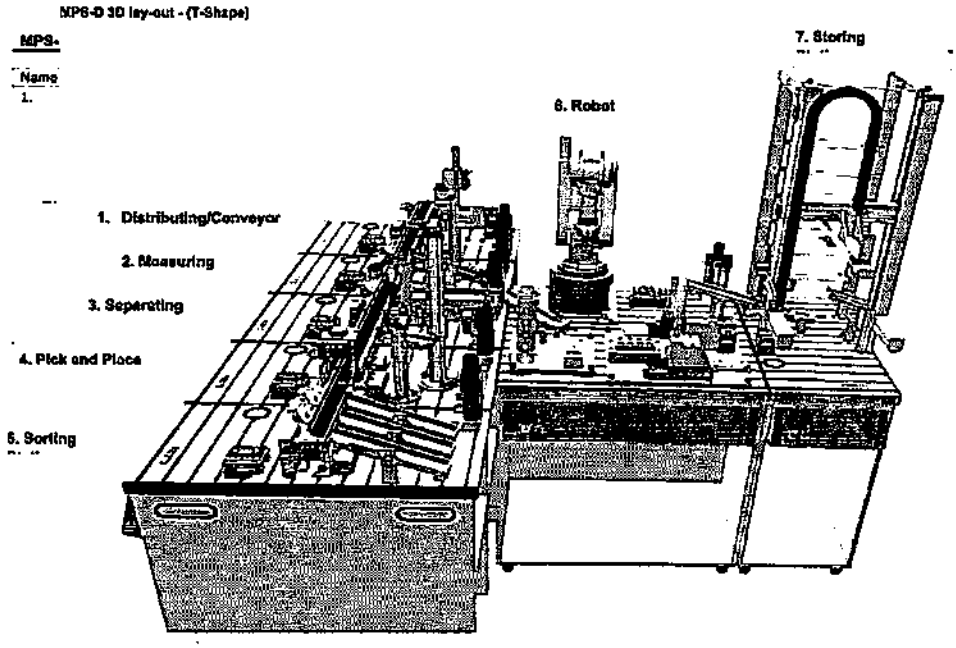
NOTE: Main voltage supply per station: 220-250VAC, 60hz

Sample Image:

MPS-D 3D lay-out - (T-Shape)



Picture for reference only



Picture for reference only

Additional requirements:

- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

Technical Specifications

Lot 6 : **Automatic Production Line Simulator**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Automatic Production Line Trainer	Kindly refer to the technical specifications attached as **Annex D6.**	2	set			

* Bidders must state here either "Comply" or "Not Comply" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Comply" or "Not Comply" must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.

All tools, equipment, gadgets and electrically operated instruments should have Standard Manufacturers Manual and/or Datasheet/Specification Sheet/Brochure as indicated in Annex D6.

Instruction Manual is an instructional book or booklet that is supplied with almost all technologically advanced products such as electrical products.

Datasheet/Specification Sheet/Brochure is a document that summarizes the performance and other characteristics of a product, machine, component that comes along with the product from its release from the manufacturer.

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

ANNEX D6

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
6	Automatic Production Line Simulator	07-001	Automatic Production Line Trainer	Refer to Technical Specification of Item Code 07-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Automatic Production Line Trainer
Item Code	07-001
Technology Area(s)	Automatic Production Line Simulator

Description: The equipment simulates an automated production process that requires stamping/boring holes on a workpiece based on material composition and/or workpiece size/height. The system also includes automatic sorting of materials based on set parameters.

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Mechanical structure disassembly and adjustment
- Automatic detection technology application training
- Pneumatic technology application training
- Programmable controller programming training
- Touch screen technology application training
- Frequency converter technology application training
- Control drive technology application training
- Mechanical system installation and commissioning training
- System maintenance and fault detection training
- System communication technology application training
- Understanding of fingerprint recognition
- Application of Fingerprint Recognition

Technical Description

A. Description of system operation

- Distribution station:
  This station holds the workpiece in que and releases it one-by-one into the system either manually or automatically.

- Handling station:
  This station is composed of a pick and place system and a guided rail synchronous belt transmission system which transfer the workpiece from distribution station to the succeeding stations. This system can be manual (push of a button) and automatic

- Assembly station:
  This is a rotary table which assembles the workpiece based on set instruction. This system can be manual (push of a button) and automatic

- Stamping station:
  This simulates a workpiece stamping process. There should be a clamping mechanism, and workpiece presence sensor for safety operation. This system can be manual (push of a button) and automatic (time-based setting)

- Sorting station:
  The sorting station will segregate the workpiece based on a given condition. A minimum of two kinds of workpiece can be sorted.

B. General parameters

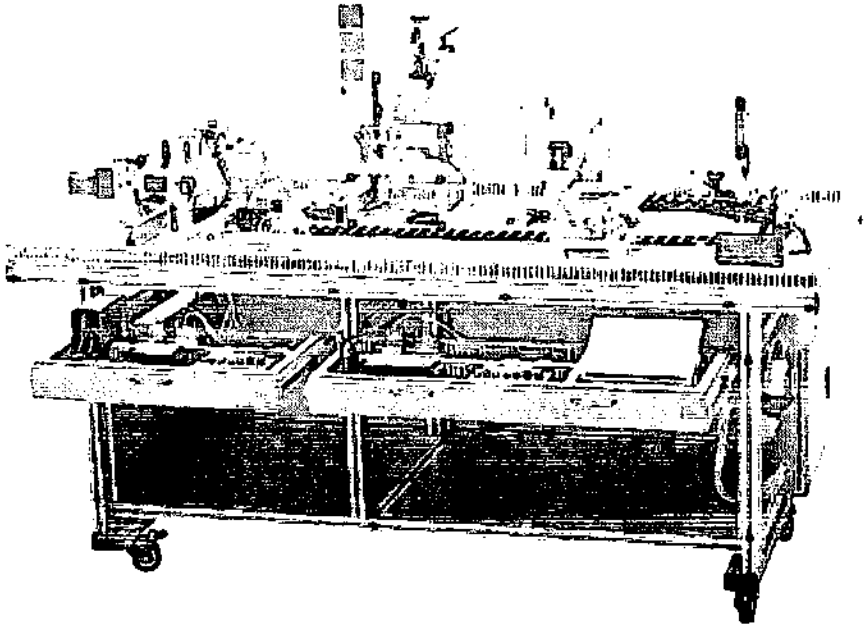
- Working power supply 220 ± 10% 60Hz single phase (a transformer should be provided if the system requires other power supply)
- Protection: short circuit, leakage, grounding, overcurrent, undervoltage, and emergency stop.
- Security: fingerprint for system power on.
- Web server and networking: stations should be interconnected via ethernet protocol which allows remote data collection, monitoring and control and accessible via web service.
- Overall size should not be greater than 2m (width) x 3m (height) to ensure that ingress of the machine will not be an issue.
- One (1) computer station for programming and visualization. with the following specs:
  - OS: Windows 11 or higher
  - No. of Cores: 20 cores
  - RAM: 32 GB RAM
  - Storage: 1TB SSD and 2TB HDD
  - Network: 2x 1Gbit LAN, WiFi and Bluetooth port
  - Dual 27~34 inches monitor with 2K resolution or higher and 12:9 or 16:9 image aspect ratio
  - Industry grade table and chair
- Programmable Logic Controller/s
  - Ethernet and other communication standards
  - Support cloud-based monitoring and control
  - With digital and analog I/Os
  - Expandable centrally and on distributed basis
- PLC Programming software (2 users), compatible to latest release of Windows
- Touch screen Human Machine Interface (HMI) 4~6 inches
- Silent type compressor

- Includes 3 set of workpiece
- This includes curriculum and instruction to exercises in print and digital format

Additional requirements:

- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



Picture for reference only

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

Technical Specifications

Lot 7 : **Smart Factory Simulator**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Smart Factory Enterprise	Kindly refer to the technical specifications attached as **Annex D7.**	1	lot			

* Bidders must state here either "Comply" or "Not Comply" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Comply" or "Not Comply" must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.

All tools, equipment, gadgets and electrically operated instruments should have Standard Manufacturers Manual and/or Datasheet/Specification Sheet/Brochure as indicated in Annex D7.

Instruction Manual is an instructional book or booklet that is supplied with almost all technologically advanced products such as electrical products.

Datasheet/Specification Sheet/Brochure is a document that summarizes the performance and other characteristics of a product, machine, component that comes along with the product from its release from the manufacturer.

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

ANNEX D7

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
7	Smart Factory Simulator	08-001	Smart Factory Enterprise	Refer to Technical Specification of Item Code 08-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Smart Factory Enterprise
Item Code	08-001
Technology Area(s)	Smart Factory Simulator

General Description

MECHATRONICS LEARNING SYSTEM (4 sets)
This system shall consist of a PLC, I/O connector kit, power supply, master control relay module, portable mounting console, student curriculum, and instructor's guide for use with a separately specified Mechatronics Workstation. The minimum specifications for each item are below.

The controller shall be an industrial grade type PLC.

Portable Mounting Console
The portable console shall consist of a sloped, painted, 11-gauge steel panel mounted on a steel base with rubber feet that make it free standing. The PLC, power supply, master control relay and other components shall be mounted to this console and wired together to form a functioning circuit that can be connected to a Mechatronics workstation or training module. The console shall contain raceways to neatly run all wiring in the system. It shall also be designed so that it can be removed without special tools from the Mechatronics workstation.

I/O Connector Kit
To consist of (3) wiring arms with plug-in DB25 connectors on one end and pre-wired to the PLC I/O on the other end. The cables shall carry a total of at least 24 inputs, 16 outputs.

24VDC Power Supply
This power supply shall be mounted on the training console using a DIN rail and wired to the I/O of PLC. It shall be powered by universal AC input, e.g., 220 VAC, 60 Hz, have total current output rating of 5.0 amps. It shall be regulated and have overload protection, an LED power on indicator, and voltage switch. It shall be totally enclosed and include protection for short circuit, overload, over voltage, and over temperature.

Master Control Relay Module
A master control relay shall be mounted to the training console and wired to the PLC so that only the power to the outputs of the PLC are de-energized when the master control relay is de-energized. The reversing motor starter shall use a 3-pole motor contactor with 24 VDC coil, manual override, IEC 60947 rated, and protected terminals. Terminal connections shall be wired to a DIN rail mounted terminal blocks.

Student Curriculum
The student curriculum supplied shall be designed in a skill-based format that focuses on teaching industry-relevant tasks. This curriculum shall be designed for use in a self-directed student-learning environment, which promotes a sense of rapid accomplishment and student motivation. The objectives shall be accomplished by organizing the learning material into a series of learning activity packets, which are further subdivided into three or more segments per packet. All learning materials needed shall be contained in the packets including text material, laboratory equipment activities, and multimedia directions. No external text sources shall be required. The specific cognitive skills taught by each text passage shall be identified next to the passage. Each lab activity shall be identified by the industrial task taught. All activities shall be highly detailed with step-by-step instructions to facilitate a self-directed learning environment. A combination of step-by-step enabling activities and creative, problem-solving activities shall be provided. A self-review of five to ten questions shall be provided after each segment.

The student curriculum shall consist of one (1) set of 12 Learning Activity Packets teaching industrial skills in mechatronics. The curriculum shall teach: machine setup, machine adjustment, machine operation, sequence programming, interfacing to IO devices, and program design and documentation of a wide variety of mechatronic applications including: Material Inventory Feed, Gauging and Testing, Orientation and Processing, Buffering and Sorting, Robotic Assembly, Assembly Torquing, and Programmable Storage. The curriculum shall also cover the operation, adjustment and control of a wide variety of industrial automation components including: pneumatic and electrical lockout/ tagout, master control relay operation, 8 types of electronic sensors, ultrasonic gauging, reversing motor starters, stepper motors, DC PWM motor control, precision ball screw axis drives, clutches, pneumatic screw feed systems, synchronous belt drives, electric motor slides, pneumatic rodless cylinders, rotary actuators, pneumatic brakes, and electrical overloads. The curriculum must be capable of completely self-directed and instructor directed study. All subject content as well as hands-on activities shall be included in the student curriculum. All activities must correlate directly to the hardware supplied, with detailed illustrations and diagrams.

Teacher's Assessment/ Portfolio Guide
The teacher's package shall contain student data sheets, data sheet solutions, self review answers, quizzes, quiz answers, student skill record sheets, and assessment directions. A quiz shall be provided for each packet. A question shall be provided in each quiz for each cognitive objective taught and correlated as such. All tasks listed in the packet shall be listed on personalized student record sheets. The Instructor's Package shall include methods for both cognitive objective assessment and authentic skill assessment, with all skill assessment criteria explained in detail. Detailed instructions and any supplemental material shall be provided for the teacher to perform live assessment of each student.

Hand Tool Package (1 set)
Include the following:

- 3-Drawer Tool Box
- Digital Multimeter
- Dial Caliper – 6-in.
- Hex Wrench Set – 13 pieces
- Metric Allen Wrench Set – 11 pieces
- Ultrasonic Meter Wrench
- Adjustable Wrench – 8-in. (2)
- Ignition Wrench Set – 20 pieces
- Metric Ignition Wrench Set
- Screwdriver Set – Straight and Phillips
- Flat Blade Screwdriver
- Combination Square – 6-in.
- Tap Handle and Tap
- Die Handle and Die

PLC Programming Software (4 sets)

- This product includes Programming Software for programmable controllers.
- The software shall use ladder logic programming and have all standard programming functions.
- It shall provide both online and offline programming, upload and download of programs, and hardcopy documentation. The software shall be supported with an operation and programming manual.

Pick and Place Feeding Station (1 set)
This station shall include
(1) Mobile Workstation,
(1) Operator Station,
(1) Powered Feed Module,
(1) Pick and Place Robot,

(1) Finished Parts Storage Module,
(1) Parts Set,
(1) Pneumatic Distribution Module,
(1) Electrical Distribution Module,
(1) Digital I/O Interface Module, and
(1) Electro-Pneumatic Valve Manifold.
These components shall be assembled, wired and tested to perform material feed sequences when interfaced to a separately-specified programmable controller. The components shall meet the below minimum specifications.

Mobile Workstation
This workstation shall be constructed of heavy-duty 18-gauge steel, braced, welded, and powder coat painted. It shall be enclosed on the sides and bottom, contain two shelves that extend the length of the workstation and feature two 2-inch rubber grommet holes on each side. The minimum dimensions shall be 32-in (81 cm) L x 53.25-in (135 cm) H x 14.5-in (37 cm) W. The overall length with operator station attached shall be 30-in (76 cm). The top worksurface shall be 1-inch (2.5 cm) extruded aluminum with slots for mounting. Also supplied shall be four casters, two of which shall be locking, and a quick release station connector set. This connector set shall consist of two connectors that join workstations to each other via a quick release method that requires no tools. All components shall be mounted to the workstation in a manner that permits students to easily reposition or replace them.

Operator Station
This station shall be constructed of heavy-duty 14-gauge steel, silkscreened and painted. The minimum dimensions shall be 4-in (10.0 cm) W x 4.63-in (11.8 cm) H x 13.25-in (33.7 cm) L. It shall be totally enclosed and mounted to the mobile workstation. The operator station shall contain manual electrical pilot devices with industrial quality contacts. These pilot devices shall be mounted to an angled console that is part of the operator station. All devices shall be wired to a compact 14-point digital IO interface module located on top of the operator station enclosure to allow students to take signal measurements. The following pilot devices shall be included: green, flush pushbutton with N.O. contacts and indicator lamp; red, extended pushbutton with N.C. contacts; 3-position selector switch, one position maintained and two sets of N.O. contacts; yellow, flush pushbutton with N.O. contacts and indicator lamp; and emergency stop pushbutton with red mushroom operator, illuminated, maintained actuation, and N.C. contacts. The emergency stop pushbutton shall be hardwired to an electrical circuit that connects via the operator station's digital IO interface module to the workstation's PLC master control relay. A 3-inch yellow decal shall surround the e-stop pushbutton. The operator station shall contain relay circuitry that causes the emergency stop pushbutton, when pressed, to also engage the emergency stop function on other linked workstations. The operator station shall link to other workstations upstream and downstream via two DB9 connector ports. Each port shall include at least 2 inputs and 2 outputs for control handshaking and additional IO for emergency stop functions. The operator station shall also include a main power switch with electrical lockout/ tagout with hasp, lock, and tagout. The main power switch shall include a hydraulic/magnetic circuit breaker with trip free function and 15 Amp rating. The operator station shall also include an inter-station communications link cable with female DB9 connectors on each end.

Electrical Power Module
This module shall consist of a 14-gauge steel enclosure mounted flush to the rear section of the workstation, power distribution cable, and (1) power supply cable. The module shall include two electrical power outlets that are interconnected to each other and the power distribution cable. The power distribution cable shall be wired to the main power switch on the operator station. The power supply cable shall be 6-ft (1.82 m) grounded power cord.

Pneumatic Distribution Module
This module shall provide connections for the compressed air supply to various control devices on the workstation. It shall consist of a relieving type pressure regulator; filter; pressure gauge; pneumatic, relieving lockout/ tagout valve with hasp, tagout, and lock; power air distribution unit with Tee fitting connected to female quick-connect fitting, 3 ft (0.91 m) of rubber air hose with male quick connect fitting,

and rubber air hose plumbed to pneumatic lockout/ tagout. The air preparation unit and lockout/tagout shall be mounted on top of the workstation at the front, and the power air distribution unit shall be mounted flush with the rear of the workstation.

Digital I/O Interface Module
This module shall be DIN rail mounted on the workstation. It shall have 72 input/output control terminals and 72 separate terminal sets for power to IO. All control and power terminals shall be internally connected to one of three DB25 connectors and connected to all IO devices on the workstation. The three DB connectors shall connect to plug-in cables.

Electro-Pneumatic Valve Manifold
The valve manifold shall include a 4-station manifold with (1) single-solenoid 24 VDC, 2-position, directional control valve and (3) double-solenoid, 24 VDC, 2-position, detent directional control valves. The manifold shall be connected via push-lock connectors and flexible, polyurethane tubing to all pneumatic devices and the main air preparation unit. The manifold shall be mounted to the top of the workstation and wired to the 72-point digital IO interface module. All valves shall have manual overrides.

Powered Feed Module
This module shall provide a powered material feed sequence that feeds components from an inventory storage unit to the manufacturing process. It shall consist of (1) double-acting pneumatic cylinder, (2) flow control valves, (1) 8-component gravity-fed storage unit, (2) cylinder-mounted Hall effect sensors, and (1) photo-electric sensor with PNP output, diffused mode, and adjustable position. The unit will consist of aluminum structural components that can be adjusted.

Pick and Place Robot
This pick and place robot shall consist of 2-axis electro-pneumatic manipulator plus gripper. The motion shall be Cartesian. The X axis shall use a rodless cylinder with dual rail linear bearing module, adjustable stroke, 10-inch (25.4 cm) travel, (2) magnetic sensors, (2) flow control valves, and adjustable shock absorber. The Z axis shall use a double-acting cylinder with dual rail linear bearing module, adjustable stroke, 4-inch (10.2 cm) travel, (2) magnetic sensors, and (2) flow control valves. The gripper shall be a vacuum type with vacuum cup, vacuum generator, vacuum switch, pressure regulator, and pressure gage. The robot shall be supported by an extruded aluminum structure that provides adjustment of manipulator horizontally and vertically.

Finished Parts Storage Module
This module shall consist of a molded plastic storage container that mounts to an extruded aluminum arm. The container shall be able to hold at least 10 completed components. The container shall be removable without use of tools when station is used in a multi-station application.

Parts Set
The parts set shall consist of directional control valve parts. When combined with parts from other stations, the parts shall be capable of being assembled by an automatic process and result in a working, industrial-quality pneumatic directional control valve that is rated for at least 100 psi/ 690 kPa. The parts set shall include: (8) acrylic valve bodies.

Gauging Station (1 set)
This station shall include
(1) Mobile Workstation,
(1) Operator Station,
(1) Traverse Shuttle,
(1) Ultrasonic Measurement Module,
(1) Proximity Gauging Module,
(1) Part Transfer Module,
(1) Part Reject Module,
(1) Finished Parts Storage Module,

(1) Pneumatic Distribution Module,
(1) Electrical Distribution Module,
(1) Digital I/O Interface Module and
(1) Electro-Pneumatic Valve Manifold.
These components shall be assembled, wired and tested to perform a material thickness inspection, part feature presence inspection, and material transfer sequence when interfaced to a separately-specified programmable controller. The components shall meet the below minimum specifications:

Mobile Workstation
This workstation shall be constructed of heavy-duty 18-gauge steel, braced, welded, and powder coat painted. It shall be enclosed on the sides and bottom, contain two shelves that extend the length of the workstation and feature two 2-inch rubber grommet holes on each side. The minimum dimensions shall be 32-in (81 cm) L x 53.25-in (135 cm) H x 14.5-in (37 cm) W. The overall length with operator station attached shall be 30-in (76 cm). The top worksurface shall be 1-inch (2.5 cm) extruded aluminum with slots for mounting. Also supplied shall be four casters, two of which shall be locking, and a quick release station connector set. This connector set shall consist of two connectors that join workstations to each other via a quick release method that requires no tools. All components shall be mounted to the workstation in a manner that permits students to easily reposition or replace them.

Operator Station
This station shall be constructed of heavy-duty 14-gauge steel, silkscreened and painted. The minimum dimensions shall be 4-in (10.0 cm) W x 4.63-in (11.8 cm) H x 13.25-in (33.7 cm) L. It shall be totally enclosed and mounted to the mobile workstation. The operator station shall contain manual electrical pilot devices with industry quality contacts. These pilot devices shall be mounted to an angled console that is part of the operator station. All devices shall be wired to a compact 14-point digital IO interface module located on top of the operator station enclosure to allow students to take signal measurements. The following pilot devices shall be included: green, flush pushbutton with N.O. contacts and indicator lamp; red, extended pushbutton with N.C. contacts; 3-position selector switch, one position maintained and two sets of N.O. contacts; yellow, flush pushbutton with N.O. contacts and indicator lamp; and emergency stop pushbutton with red mushroom operator, illuminated, maintained actuation, and N.C. contacts. The emergency stop pushbutton shall be hardwired to an electrical circuit that connects via the operator station's digital IO interface module to the workstation's PLC master control relay. A 3-inch yellow decal shall surround the e-stop pushbutton. The operator station shall contain relay circuitry that causes the emergency stop pushbutton, when pressed, to also engage the emergency stop function on other linked workstations. The operator station shall link to other workstations upstream and downstream via two DB9 connector ports. Each port shall include at least 2 inputs and 2 outputs for control handshaking and additional IO for emergency stop functions. The operator station shall also include a main power switch with electrical lockout/ tagout with hasp, lock, and tagout. The main power switch shall include a hydraulic/magnetic circuit breaker with trip free function and 15 Amp rating. The operator station shall also include an inter-station communications link cable with female DB9 connectors on each end.

Electrical Power Module
This module shall consist of a 14-gauge steel enclosure mounted flush to the rear section of the workstation, power distribution cable, and power supply cable. The module shall include two electrical power outlets that are interconnected to each other and the power distribution cable. The power distribution cable shall be wired to the main power switch on the operator station. The power supply cable shall be 6-ft (1.82 m) grounded power cord.

Pneumatic Distribution Module
This module shall provide connections for the compressed air supply to various control devices on the workstation. It shall consist of a relieving type pressure regulator; filter; pressure gauge; pneumatic, relieving lockout/ tagout valve with hasp, tagout, and lock; power air distribution unit with Tee fitting connected to female quick-connect fitting, 3 ft (0.91 m) of rubber air hose with male quick connect fitting, and rubber air hose plumbed to pneumatic lockout/ tagout. The air preparation unit and lockout/tagout shall

be mounted on top of the workstation at the front, and the power air distribution unit shall be mounted flush with the rear of the workstation.

Digital I/O Interface Module
This module shall be DIN rail mounted on the workstation. It shall have 72 input/output control terminals and 72 separate terminal sets for power to IO. All control and power terminals shall be internally connected to one of three DB25 connectors and connected to all IO devices on the workstation. The three DB connectors shall connect to plug-in cables.

Electro-Pneumatic Valve Manifold
The valve manifold shall include a 3-station manifold with (2) single-solenoid 24 VDC, 2-position, directional control valves and double-solenoid, 24 VDC, 2-position, detent directional control valve. The manifold shall be connected via push-lock connectors and flexible, polyurethane tubing to all pneumatic devices and the main air preparation unit. The manifold shall be mounted to the top of the workstation and wired to the digital IO interface module. All valves shall have manual overrides.

Traverse Shuttle
The traverse shuttle shall provide linear transport of parts across the width of the workstation. It shall be D.C. electric motor with precision gearbox reduction unit, powered using a reversing motor starter control. The reversing motor starter shall use (2) 3-pole motor contactors with 24 VDC coils, manual overrides, mechanical interlock, IEC 60947rated, and protected terminals. The traverse shall consist of two linear guide rods and two precision linear bearings that guide the carriage. The maximum travel shall be 11 inches (27.9 cm) with adjustable stops. Two adjustable position, over-travel limit switches shall be provided. The motor shall drive a precision ball screw through a parallel shaft arrangement that uses a synchronous belt and overrunning clutch. Industrial quality ball bearing modules shall precisely position the ball screw. The carriage shall be designed with fixtures to locate and transport components for the manufacturing process. A single-acting, non-rotating component lift cylinder shall be mounted to the axis. This cylinder shall use a quick exhaust valve.

Ultrasonic Measurement Module
This module shall consist of an ultrasonic sensor that provides a measurement of part thickness. It shall have an adjustable threshold window mode, 50-500 mm sensing range, with 24 VDC output, 3 LED's (for power, status, and error), 0.007-inch accuracy, 50 m.s. response, and 0.020-inch hysteresis. It shall also have a programming input and sync input. An inductive sensor shall trigger the ultrasonic read action. The inductive sensor shall have PNP output and adjustments for horizontal and vertical position.

Proximity Gauging Module
This module shall consist of a photo-electric sensor that performs a port presence inspection process. The sensor shall have PNP output, diffused mode operation with background suppression, visible red LED light source, 3 mm spot, 25 mm sensing distance, and adjustable vertical and horizontal position.

Powered Parts Transfer Module
This module shall provide a powered material transfer sequence that feeds components to either the finished parts storage module or another workstation. It shall consist of double-acting pneumatic cylinder, (2) flow control valves, 10-component, molded, plastic storage container, and (2) cylinder-mounted magnetic sensors.

Powered Parts Reject Module
This module shall provide a powered material reject sequence that feeds components to a rejected parts storage container. It shall consist of double-acting pneumatic cylinder, (2) flow control valves, 10-component, molded, plastic storage container, and (2) cylinder-mounted magnetic sensors. The reject container shall be mounted to an extruded aluminum arm.

Finished Parts Storage Module
This module shall consist of a molded plastic storage container that mounts to an extruded aluminum arm. The container shall be able to hold at least 10 completed components. The container shall be removable without use of tools when station is used in a multi-station application.

Parts Set
The parts set shall consist of (4) acrylic reject directional control valve bodies.

Orientation-Processing Station (1 set)
This station shall include
(1) Mobile Workstation,
(1) Operator Station,
(1) 8-Station Rotary Index Table,
(1) Pick and Place Pneumatic Robot,
(1) Fiber Optic Gauging Module,
(1) Part Transfer Module,
(1) Finished Part Storage Module,
(1) Pneumatic Distribution Module;
(1) Electrical Distribution Module,
(1) Digital I/O Interface Module and
(1) Electro-Pneumatic Valve Manifold.
These components shall be assembled, wired and tested to perform part orientation inspection, reorientation, and material processing (with separately-specified optional drill module) when interfaced to a separately-specified programmable controller. The components shall meet the below minimum specifications.

Mobile Workstation
This workstation shall be constructed of heavy-duty 18-gauge steel, braced, welded, and powder coat painted. It shall be enclosed on the sides and bottom, contain two shelves that extend the length of the workstation and feature two 2-inch rubber grommet holes on each side. The minimum dimensions shall be 32-in (81 cm) L x 53.25-in (135 cm) H x 14.5-in (37 cm) W. The overall length with operator station attached shall be 30-in (76 cm). The top worksurface shall be 1-inch (2.5 cm) extruded aluminum with slots for mounting. Also supplied shall be four casters, two of which shall be locking, and a quick release station connector set. This connector set shall consist of two connectors that join workstations to each other via a quick release method that requires no tools. All components shall be mounted to the workstation in a manner that permits students to easily reposition or replace them.

Operator Station
This station shall be constructed of heavy-duty 14-gauge steel, silkscreened and painted. The minimum dimensions shall be 4-in (10.0 cm) W x 4.63-in (11.8 cm) H x 13.25-in (33.7 cm) L. It shall be totally enclosed and mounted to the mobile workstation. The operator station shall contain manual electrical pilot devices with industry quality contacts. These pilot devices shall be mounted to an angled console that is part of the operator station. All devices shall be wired to a compact 14-point digital IO interface module located on top of the operator station enclosure to allow students to take signal measurements. The following pilot devices shall be included: green, flush pushbutton with N.O. contacts and indicator lamp; red, extended pushbutton with N.C. contacts; 3-position selector switch, one position maintained and two sets of N.O. contacts; yellow, flush pushbutton with N.O. contacts and indicator lamp; and emergency stop pushbutton with red mushroom operator, illuminated, maintained actuation, and N.C. contacts. The emergency stop pushbutton shall be hardwired to an electrical circuit that connects via the operator station's digital IO interface module to the workstation's PLC master control relay. A 3-inch yellow decal shall surround the e-stop pushbutton. The operator station shall contain relay circuitry that causes the emergency stop pushbutton, when pressed, to also engage the emergency stop function on other linked workstations. The operator station shall link to other workstations upstream and downstream via two DB9 connector ports. Each port shall include at least 2 inputs and 2 outputs for control handshaking and additional IO for emergency stop functions. The operator station shall also include a main power switch with electrical lockout/ tagout with hasp, lock, and tagout.

The main power switch shall include a hydraulic/magnetic circuit breaker with trip free function and 15 Amp rating. The operator station shall also include an inter-station communications link cable with female DB9 connectors on each end.

Electrical Power Module
This module shall consist of a 14-gauge steel enclosure mounted flush to the rear section of the workstation, power distribution cable, and power supply cable. The module shall include two electrical power outlets that are interconnected to each other and the power distribution cable. The power distribution cable shall be wired to the main power switch on the operator station. The power supply cable shall be 6-ft (1.82 m) grounded power cord.

Pneumatic Distribution Module
This module shall provide connections for the compressed air supply to various control devices on the workstation. It shall consist of a relieving type pressure regulator; filter; pressure gauge; pneumatic, relieving lockout/ tagout valve with hasp, tagout, and lock; power air distribution unit with Tee fitting connected to female quick-connect fitting, 3 ft (0.91 m) of rubber air hose with male quick connect fitting, and rubber air hose plumbed to pneumatic lockout/ tagout. The air preparation unit and lockout/tagout shall be mounted on top of the workstation at the front, and the power air distribution unit shall be mounted flush with the rear of the workstation.

Digital I/O Interface Module
This module shall be DIN rail mounted on the workstation. It shall have 72 input/output control terminals and 72 separate terminal sets for power to IO. All control and power terminals shall be internally connected to one of three DB25 connectors and connected to all IO devices on the workstation. The three DB connectors shall connect to plug-in cables.

Electro-Pneumatic Valve Manifold
The valve manifold shall include a 4-station manifold with single-solenoid 24 VDC, 2-position, directional control valve and (3) double-solenoid, 24 VDC, 2-position, detent directional control valves. The manifold shall be connected via push-lock connectors and flexible, polyurethane tubing to all pneumatic devices and the main air preparation unit. The manifold shall be mounted to the top of the workstation and wired to the digital IO interface module. All valves shall have manual overrides.

Rotary Index Table
The rotary index table shall provide positioning of parts at 8 software-programmable positions located 45 degrees apart from each other around the table. The table disk shall consist of painted 11-gauge steel on top of 16-gauge brushed stainless steel and have a minimum diameter of 15 inches (38.1 cm). The table shall be designed with fixtures to locate and transport parts for the manufacturing process. It shall be operated by a motion control system that uses a precision stepper-motor. The stepper motor shall have a resolution of 51,200 steps per revolution and operate in the 12-48 VDC range. The motion control system shall be integrated with the motor. It shall be PC software programmable via RS-485 communications and include the following programming functions: home, limit plus, limit minus, go, stop, pause, jog plus, jog minus, analog in, moving, fault, stall, velocity change, trip on input, trip on position, basic math functions, logical math expressions, and branch and call subroutines. The motion control system shall include (4) 24 VDC discrete I/O, and analog input (0-5 VDC or 4-20 ma). The system shall include Windows-compatible programming software and RS-485 to RS-232 communications cable with serial port. The motion control system shall be connected to the rotary table via a zero-backlash, flexible coupling, precision worm gear right-angle drive, and ball bearing guides. A homing sensor shall be mounted to the table structure. This sensor shall be an inductive type with (2) PNP outputs, cylindrical body, indicator light, and shall be position adjustable. A part present sensor shall be installed at position 1. This sensor shall be a capacitive type with cylindrical body, PNP output, indicator light, adjustable sensitivity, and adjustable horizontal and vertical position. A part present sensor shall also be installed at position 3. This sensor shall be a capacitive type with cylindrical body, PNP output, indicator light, adjustable sensitivity, and adjustable horizontal and vertical position.

Pick and Place Pneumatic Robot
This pick and place robot shall consist of a 2-axis electro-pneumatic manipulator plus gripper. The motion shall be Cartesian. The Z axis shall use a twin bore double-acting pneumatic cylinder module with adjustable stroke, 0.75-inch (1.9 cm) travel, (2) magnetic sensors, and (2) flow control valves. The rotary axis shall use a rack and pinion pneumatic actuator with adjustable stroke, 180-degree rotation with 45-degree adjustment on each end, (2) magnetic sensors, and (2) flow control valves. The gripper shall be a 2-point curvilinear type with double acting actuator, and (2) flow control valves.

Parts Transfer Module
This module shall provide a powered material transfer sequence that feeds components to either the finished parts storage module or another workstation. It shall consist of double-acting pneumatic cylinder, (2) flow control valves and (2) cylinder-mounted magnetic sensors.

Finished Parts Storage Module
This module shall consist of a molded plastic storage container that mounts to an extruded aluminum arm. The container shall be able to hold at least 10 completed components. The container shall be removable without use of tools when station is used in a multi-station application.

Servo Robot Assembly Station (1 set)

This station shall include:
(1) Mobile Workstation,
(1) Operator Station,
(1) Spool Insertion Module,
(1) Screw Feed Module,
(1) Spring/ Knob Feed Module,
(1) Screw/ Knob Engagement Module,
(1) Assembly Shuttle Module,
(1) Finished Parts Storage Module,
(1) Parts Presentation Module,
(1) Pneumatic Distribution Module,
(1) Electrical Distribution Module,
(1) Digital I/O Interface Module, and
(1) Electro-Pneumatic Valve Manifold.
These components shall be assembled, wired and tested to perform an assembly sequence when interfaced to a separately-specified programmable controller. The components shall meet the below minimum specifications.

Mobile Workstation
This workstation shall be constructed of heavy-duty 18-gauge steel, braced, welded, and powder coat painted. It shall be enclosed on the sides and bottom, contain two shelves that extend the length of the workstation and feature two 2-inch rubber grommet holes on each side. The minimum dimensions shall be 32" (81 cm) L x 53.25" (135 cm) H x 14.5" (37 cm) W. The overall length with operator station attached shall be 30" (76 cm). The top worksurface shall be 1-inch (2.5 cm) extruded aluminum with slots for mounting. Also supplied shall be four casters, two of which shall be locking, and a quick release station connector set. This connector set shall consist of two connectors that join workstations to each other via a quick release method that requires no tools. All components shall be mounted to the workstation in a manner that permits students to easily reposition or replace them.

Operator Station
This station shall be constructed of heavy-duty 14-gauge steel, silkscreened and painted. The minimum dimensions shall be 4" (10.0 cm) W x 4.63" (11.8 cm) H x 13.25" (33.7 cm) L. It shall be totally enclosed and mounted to the mobile workstation. The operator station shall contain manual electrical pilot devices with industrial quality contacts. These pilot devices shall be mounted to an angled console that is part of the operator station. All devices shall be wired to a compact 14-point digital IO interface module located on top

of the operator station enclosure to allow students to take signal measurements. The following pilot devices shall be included: green, flush pushbutton with N.O. contacts and indicator lamp; red, extended pushbutton with N.C. contacts; 3-position selector switch, one position maintained and two sets of N.O. contacts; yellow, flush pushbutton with N.O. contacts and indicator lamp; and emergency stop pushbutton with red mushroom operator, illuminated, maintained actuation, and N.C. contacts. The emergency stop pushbutton shall be hardwired to an electrical circuit that connects via the operator station's digital IO interface module to the workstation's PLC master control relay. A 3-inch yellow decal shall surround the e-stop pushbutton. The operator station shall contain relay circuitry that causes the emergency stop pushbutton, when pressed, to also engage the emergency stop function on other linked workstations. The operator station shall link to other workstations upstream and downstream via two DB9 connector ports. Each port shall include at least 2 inputs and 2 outputs for control handshaking and additional IO for emergency stop functions. The operator station shall also include a main power switch with electrical lockout/ tagout with hasp, lock, and tagout. The main power switch shall include a hydraulic/magnetic circuit breaker with trip free function and 15 Amp rating. The operator station shall also include an inter-station communications link cable with female DB9 connectors on each end.

Electrical Distribution Module
This module shall consist of a 14-gauge steel enclosure mounted flush to the rear section of the workstation, power distribution cable, and (1) power supply cable. The module shall include two electrical power outlets that are interconnected to each other and the power distribution cable. The power distribution cable shall be wired to the main power switch on the operator station. The power supply cable shall be 6-ft (1.82 m) grounded power cord.

Pneumatic Distribution Module
This module shall provide connections for the compressed air supply to various control devices on the workstation. It shall consist of a relieving type pressure regulator; filter; pressure gauge; pneumatic, relieving lockout/ tagout valve with hasp, tagout, and lock; power air distribution unit with Tee fitting connected to female quick-connect fitting, 3 ft (0.91 m) of rubber air hose with male quick connect fitting, and rubber air hose plumbed to pneumatic lockout/ tagout. The air preparation unit and lockout/tagout shall be mounted on top of the workstation at the front, and the power air distribution unit shall be mounted flush with the rear of the workstation.

Digital I/O Interface Module
This module shall be DIN rail mounted on the workstation. It shall have 72 input/output control terminals and 72 separate terminal sets for power to IO. All control and power terminals shall be internally connected to one of three DB25 connectors and connected to all IO devices on the workstation. The three DB connectors shall connect to plug-in cables.

Electro-Pneumatic Valve Manifold
The valve manifold shall include a 6-station manifold with (5) single-solenoid 24 VDC, 2-position, directional control valves and (1) double-solenoid, 24 VDC, 2-position, detent directional control valve. The manifold shall be connected via push-lock connectors and flexible, polyurethane tubing to all pneumatic devices and the main air preparation unit. The manifold shall be mounted to the top of the workstation and wired to the digital IO interface module. All valves shall have manual overrides.

Spool Insertion Module
This module shall provide a powered material feed sequence that can feed one of two types of spools from two inventory storage units to the manufacturing process. It shall consist of (1) single-acting pneumatic cylinder, double-acting pneumatic cylinder, (3) flow control valves, (2) 8-component storage units, (4) cylinder-mounted magnetic sensors, and (2) inductive parts-empty sensors with PNP output. The unit will consist of aluminum structural components that can be adjusted.

Screw Feed Module
This module shall provide pneumatic feeding of screws to the assembly process. It shall consist of (1) flexible, polyurethane, transparent screw feed tube, 36-inches (91.5 cm) long and 0.875-inches (22 mm)

diameter, and (1) pressure regulator valve. The module shall also include a screw escapement mechanism and screw queue mechanism that are pneumatic-powered. These mechanisms shall include: (3) single-acting pneumatic cylinders and (1) inductive sensor. This unit will include of aluminum structural components that can be adjusted.

Spring/ Knob Feed Module
This module shall provide a material feed device that feeds manual button-type operators and springs from an inventory storage unit to the manufacturing process via a servo robot. It shall consist of gravity feeder and fixtures to interact with the robot.

Screw/ Knob Engagement Module
This module shall perform final assembly of screw, operator, spring, spool and valve body. It shall consist of (1) double-acting pneumatic cylinder, (1) flow control valve, (2) cylinder-mounted magnetic sensors, and a screw engagement motor. This motor shall be a D.C. motor with foot mount, precision gearbox reduction unit, and friction engagement tool. The motor shall be powered using a motor starter control. The motor starter shall use 3-pole motor contactor with 24 VDC coil, manual override, IEC 60947rated, and protected terminals.

Assembly Shuttle Module
This module shall provide a powered material handling sequence that transports part assemblies between two assembly positions. It shall consist of (1) double-acting rodless pneumatic cylinder, (2) flow control valves, and (2) cylinder-mounted magnetic sensors. Two powered clamps shall also be provided. These clamps will include fixtures, (2) single-acting pneumatic cylinders, (2) flow control valves, and (2) cylinder-mounted magnetic sensors.

Finished Parts Storage Module
This module shall consist of a molded plastic storage container that mounts to an extruded aluminum arm. The container shall be able to hold at least 10 completed components. The container shall be removable without use of tools when station is used in a multi-station application.

Parts Presentation Module
This module shall consist of an extruded aluminum structure and fixture for part presentation to the system. The module shall be able to be adjustable vertically and horizontally.

Parts Set
The parts set shall consist of directional control valve parts. When combined with parts from other stations, the parts shall be capable of being assembled by an automatic process and result in a working, industrial-quality pneumatic directional control valve that is rated for at least 100 psi/ 690 kPa. The parts set shall include: (8) 3-way valve spools, (8) 4-way valve spools, (8) manual operators, (8) bolts and (8) spool return springs.

Smart Robot Workcell (1 set)
Components include:
- Robot with Advanced Software and Ethernet IP
- Area Laser Scanner
- Smart Robot Workstation with discrete I/O, pneumatic, Ethernet I/O Interface Panel
- Robot-to-PLC Interface
- Cabling Set
- Gripper Fixture Set
- Quick Connect System; System Configuration and Integration Prep

Fanuc 200iD/4S and 200iD Integration to Mechatronics (1 set)
(2) Custom Mounting Brackets with Actuators
(1) Compressed Air Piping

Single-Station Laser Scanner (1 set)
This product provides safety at the front of the Smart Robot Workcell. For Mechatronics systems with multiple Robot Workcells, customers must have (2) Laser Scanners and (1) Communication Kit.

- Laser Scanner System with one laser scanner
- Mounting Fixture Set
- Cable Set
- Integration Engineering and Programming

Mechatronics HMI Terminal Learning System (1 set)
This system teaches how to use human machine interface (HMI) to control and monitor an automated line.

HMI
•5.5-in. screen
•320x240 resolution

HMI Terminal Module

EtherNet Cable
•Cat 5E patch cable, 14', gray

Workstation Pedestal Mounting Module
•Rigid, adjustable mounting module allows the HMI to be situated in the optimal position

Student Curriculum
This system shall consist of three (3) Learning Activity Packets containing no less than thirteen (13) industry skills. Topics shall include: HMI construction; HMI configuration; HMI operation; application editing; component identification; The student curriculum supplied shall be designed in a skill-based format that focuses on teaching industry relevant tasks. The objectives shall be accomplished by organizing the learning material into a series of learning activity packets, which are further subdivided into three or more segments per packet. All learning materials needed shall be contained in the packets including text material and laboratory equipment activities. No external text sources shall be required. The specific cognitive skills taught by each text passage shall be identified next to the passage. Each lab activity shall be identified by the industrial task taught. All activities shall be highly detailed with step-by-step instructions to facilitate a self-directed learning environment. A combination of step-by-step enabling activities and creative, problem-solving activities shall be provided. A self-review of five to ten questions shall be provided after each segment. The curriculum must be capable of both self-directed and instructor directed study. All activities must correlate directly to the hardware supplied, with detailed illustrations and diagrams.

Teacher's Assessment Guide
A teacher's assessment guide shall be provided. It shall contain student data sheets, data sheet solutions, self-review answers, quizzes, quiz answers, student skill record sheets, and authentic assessment. A quiz shall be provided for each packet. A question shall be provided in each quiz for each cognitive objective taught. All tasks listed in the packet shall be listed on personalized student record sheets. The teacher's assessment guide shall include directions for authentic skill assessment.

Mechatronics Smart Device Learning (1 set)
This learning system shall be designed to teach communications between a stack light and other intelligent automation devices using EtherNet/IP in a Smart Factory environment. At minimum, the learning system shall consist of: EtherNet/IP communications I/O module, stack light module, cable set, student curriculum, student reference guide, and instructor's guide. The system shall be fully assembled and wired to mount to a mobile workstation or a table top surface.

Smart Factory Ethernet Learning System (1 set)
This learning system shall be designed to teach EtherNet/IP communications between various intelligent automation devices in various topologies in a Smart Factory environment to efficiently control and monitor

an automated manufacturing process. At minimum, the learning system shall consist of: (1) managed EtherNet/IP switch module, (1) unmanaged Ethernet switch module, (1) cable set, (1) student curriculum, student reference guide, and (1) instructor's guide. The system shall be fully assembled and wired to mount to mobile workstations or a table top.

Smart Factory Mechatronics Barcode (1 set)
This learning system teaches learners how barcode readers are used within an automated line to identify components, enter serial numbers in a database, and sort items into groups.

Multi-technology Interactive e-Learning solution with the use of different teaching tools such as text, 3D animation, video, audio and virtual simulation
(1 year subscription for 2 training centers)

Learning Management System (LMS) Included

- User-friendly Navigation with Skills on/Off Control
- SCORM to Other LMS Systems
- Custom LMS Branding Available. Put your school logo or organization's logo and colors on the LMS home screen.
- Pre-/Post-Course Quizzes. Create a valuable metric to track progress.
- Easy-to-Use Reporting Tools. Customizable reporting tools will help evaluate progress.

Custom Course Set-Up
Choose from thousands of eLearning modules to create an almost innumerable combination of courses that can exactly fit your training need.

Reduce Training Cost with eAssessment
Distance eLearning eAssessment to quickly reveal strengths and identify weaknesses. Utilize this program to assess individuals, departments, or the entire organizations.

eLearning Categories
I. AUTOMATION
1. Ethernet for Mechatronics
2. Mechatronics HMI
3. Mechatronics
4. Mechatronics Profibus
5. Mechatronics Troubleshooting
6. Mechatronics Troubleshooting with PLC
7. Mechatronics – PLC
8. Mechatronics - Ethernet/IP
9. Panelview Operator Interface
10. Mechatronics Simulation (Smart Factory)
11. Mechatronics Simulation
12. Pegasus Robotics Simulation
13. Robotics and Computer Programming
14. Robotics 1
15. Mechatronics CNC Mill
16. Machine Vision Inspection Systems
17. Machine Vision Inspection Systems
18. Mechatronics Troubleshooting System - PLC
19. Mechatronics RF Identification System
20. Mechatronics AB Micrologix
21. Mechatronics Barcode Identification
22. Mechatronics RF Identification System
23. Mechatronics RF Identification System- PLC

24. Tabletop Mechatronics
25. Mechatronics HMI
26. Mechatronics Barcode Identification – PLC
27. Mechatronics Barcode Identification – Barcode
28. Table-Top Mechatronics Servo Robot System
29. Table Top Smart Factory RFID/Sensors
30. Mechatronics Barcode Product Identification – PLC Controller
31. Tabletop Smart Factory Ethernet
32. Tabletop Smart Factory Manufacturing Execution System
33. Smart Factory Barcode System
34. Mechatronics RFID
35. Smart Factory Vision Inspection System
36. Smart Factory Visual Communication System
37. Mechatronics System
38. Mechatronics - Professional
39. Smart Factory Sensor System - Pneumatics/Vacuum
40. Smart Factory Sensor System - Ultrasonic
41. Smart Factory Sensor System - Photoeye
42. Smart Factory Device Learning System - Stack Light
43. Smart Factory Sensor System - Electrical Current
44. Smart Factory Sensor System - Analog Position
45. Smart Factory Sensor System - Analog Pressure
46. Tabletop Smart Factory Visual Communications
47. Smart Factory Barcode System – Basic
48. Mechatronics RFID AB L16
49. Smart Factory Ethernet
50. Smart Factory Network Security Learning System
51. Smart Factory Manufacturing Execution System
52. Smart Factory Visual Communications
53. Smart Factory Sensor System – Pneumatics/ Vacuum Advanced
54. Smart Factory Sensor System – Ultrasonic Advanced
55. Smart Factory Sensor System – Photoeye Advanced
56. Smart Factory Device Learning System Stack Light
57. Smart Factory Sensor System – Electrical Current
58. Smart Factory Sensor System – Analog Position
59. Smart Factory Sensor System – Analog Pressure
60. Mechatronics
61. Computer Control 2
62. Principles of Robotics
63. Principles of Factory Automation
64. Principles of Robotics

II. ELECTRONICS
1. DC Electronic Drives
2. Portable Plc
3. Portable Plc Troubleshooting
4. PLC Analog Application
5. PLC ControlNet
6. Mastering Programmable Controllers
7. PLC Statement List
8. PLC Analog
10. PLC Profibus
11. MPC
12. PLC Graph Programming -
13. MPC - i Bus

14. MPC
15. Mastering Programmable Controllers
16. PLC Troubleshooting
17. Programmable Controller
18. Mastering Programmable Controllers
19. Power and Control Electronics
20. AC Motor Drives
21. AC Motor Drive Troubleshooting
22. Electrical Control Systems
23. Variable Frequency AC Drive
24. AC Electronic Drives
25. PLC Motor Control
26. PLC Motor Control
27. Portable PLC Learning System
28. Portable PLC with Troubleshooting
29. PLC Troubleshooting- PLC
30. PLC Troubleshooting
31. Computer Control 1

III. ELECTRICAL
1. Electric Motor Control
2. AC/DC Electrical Systems
3. Electrical Control 1
4. Portable Electric Relay Control
Troubleshooting
5. Electric Relay Control
6. AC/DC Electrical Systems
7. Electric Motor Control
8. Electric Motor Control Troubleshooting
9. Electrical Fabrication 1
10. Motor Braking
11. Reduced Voltage Starting
12. Electronic Sensors
13. Electronic Counter
14. SCR Speed Control
15. Electric Wiring System
16. PLC/VFD Wiring System
17. Industrial Soldering
18. Ethernet and Analog Wiring
19. Electrical Power Distribution
20. Electric Motor Control
21. Motor Troubleshooting System
22. Rotating Electric Machines
23. DC Generators
24. Wound Rotor Motor
25. Rotating Electrical Machines

IV. GREEN ENERGY
1. Wind Concepts
2. Turbine Electric Hub Troubleshooting
3. Turbine Generator Control Troubleshooting
4. Turbine Nacelle Troubleshooting
5. Solar Concepts
6. Solar Site Analysis
7. Alternative Energy

8. Solar Thermal Troubleshooting - Open-Loop
9. Solar Thermal Troubleshooting - Closed-Loop
10. Solar Thermal Installation
11. Solar PV Troubleshooting
12. Solar Grid-Tie
13. Data Acquisition
14. Solar Photovoltaic Installation

V. LEAN MANUFACTURING
1. Lean Overview and Workplace Organization
2. Introduction to Lean
3. 5S
4. Total Productive Maintenance
5. Poka-Yoke
6. Lean Theory
7. Lean Process Flow
8. Visual Workplace
9. Standardized Work
10. Kaizen
11. Value Stream Mapping
12. Set-Up Reduction
13. Six Sigma

VI. MACHINING
1. Machine Tools 1
2. Machine Tools 2
3. Machine Tools 3
4. Manual Machine Tools
5. CNC Machine Tools 1
6. CNC Machine Tools 2
7. CNC Machine Tools 3
8. Principles of CNC
9. CNC Control
10. Principles of Turning
11. Principles of Machining Centers
12. Principles of Grinding
13. Principles of Workholding
14. Principles of Coolants and Oils
15. Principles of Gear Manufacturing
16. Principles of Tooling
17. Tooling for Turning
18. Tooling for Machining Centers
19. Tooling for Grinding
20. Tooling for Tapping

VII. MANUFACTURING PROCESS
1. Product Finishing
2. Production Assembly
3. Split Flange Coupling Assembly
4. Electric Torque Wrench Assembly
5. Print Reading 1
6. Welding Technology 1
7. Computer-Aided Design 1
8. Computer Aided Design 2
9. Wiring Harness Assembly

10. Contamination
11. Fasteners
12. Gaskets
13. Stall Bar Assembly
14. Instrumented DC-Electric Torque Wrench Assembly
15. Computer-Aided Manufacturing 1
16. Blueprint Reading
17. AWS Welding Symbols on Blueprints
18. General Dimensioning and Tolerances
19. Geometric Dimensioning and Tolerancing

VIII. MATERIALS
1. Plastic Mold Design
2. Manufacturing Processes 3
3. Structural Engineering 1
4. Structural Engineering 2
5. Surveying
6. Materials Engineering 1
7. Principles of Materials - Ferrous Metals
8. Principles of Materials - Non-Ferrous Metals
9. Principles of Heat Treating
10. Principles of Plastics
11. Principles of Composites
12. Principles of Ceramics

IX. MECHANICAL
1. Vibration Analysis
2. Pump Systems
3. Multiple Pump
4. Turbine Pump
5. Diaphragm Pump
6. Peristaltic Tubing Pump
7. Piston Pump
8. Gear Pump
9. Magnetic Pump
10. Centrifugal Pump
11. Rigging 3
12. Mechanical Drives 4
13. Floor Standing Belt Conveyor
14. Predictive Maintenance Vibration Analysis
15. Roller Pack Machine Tool Axis
16. Plain Bearing Machine Tool Axis
17. Mechatronics Simulation
18. Pipings
19. Central Lubrication
20. Mechanical Systems 1
21. Mechanical Fabrication 2
22. Rigging Systems 1
23. Rigging Systems 2
24. Mechanical Fabrication 1
25. Mechanical Drives 1
26. Portable Mechanical Drives 2
27. Mechanical Drives 2
28. Mechanical Drives 3
29. Laser Shaft Alignment

30. Portable Laser Shaft Alignment
31. Mechanical Systems 2

X. PROCESS CONTROL
1. Temperature Process Control
2. Data Acquisition
3. Analytical Process Control
4. Data Acquisition Systems
5. ControlLogix Process Control
6. Process Control Systems: Ultrasonic Level Measurement and Control
7. Process Control Systems: Differential Pressure Flow Measurement and Control
8. Process Visualization Control 1
9. Pressure Process Control Systems
10. Foundation Fieldbus Process Control 1
11. HART Process Control 1
12. Mastering Programmable Controllers
13. PLC Process Control
14. PLC Process Control 2
15. Process Control Systems

XI. QUALITY ASSURANCE
1. Metrology 1
2. Measurement Tools 1
3. Quality Assurance 1
4. Portable Precision Gauging 1
5. Portable Measurement Tools
6. Inspection Techniques 1
7. Surface Plates
8. Gauge Blocks
9. Test Indicators
10. Height Gauges
11. Bench Comparators
12. Optical Comparators
13. Bore Gauges
14. Air Gauges
15. Specialty Micrometers
16. Miscellaneous Inspection Instruments
17. ISO 9000 and TS 16949
18. Statistical Process Control 1
19. Statistical Process Control 2
20. Quality Control Concepts

XII.SAFETY
1. Safety Practices and Regulations
2. Personal Protective Equipment
3. Hazardous Communication
4. Confined Spaces
5. Lockout/Tagout
6. Accident Response
7. Overhead Crane Safety

XIII.THERMAL
1. Air Conditioning / Heat Pump
2. Steam Systems
3. Thermal Systems 1

4. Environmental Applications
5. Geothermal
6. Geothermal Troubleshooting
7. Geothermal Desuperheater
8. Geothermal Troubleshooting with Desuperheater
9. Geothermal Flush Cart Learning System
10. Thermal Technology 1
11. Thermal Technology 2

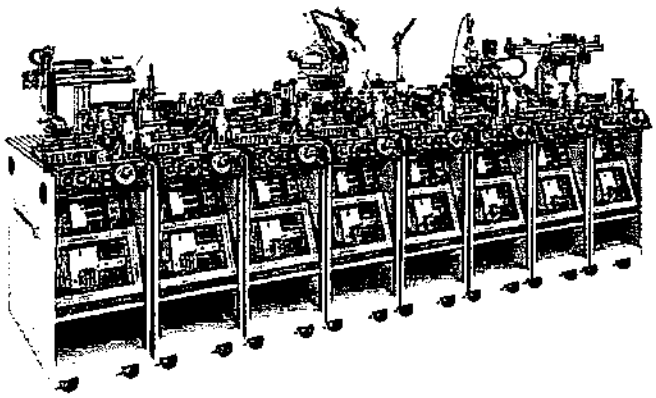
XV.WORKPLACE EFFECTIVENESS

1. Enterprise Systems 1
2. Principles of Advanced Manufacturing
3. Mathematics 1
4. Trigonometry 1
5. Communication Skills
6. Conflict Resolution
7. Working in Groups

Additional requirements:

- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



Picture for reference only

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

Technical Specifications

Lot 8 : **Industrial Process Control**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Liquid Mixing/Processing Simulator	Kindly refer to the technical specifications attached as **Annex D8.**	1	set			
2	Bottle Filling Production Line Trainer		2	set			

* Bidders must state here either "Comply" or "Not Comply" against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of "Comply" or "Not Comply" must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer's un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidder's statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the applicable laws and issuances.

All tools, equipment, gadgets and electrically operated instruments should have Standard Manufacturers Manual and/or Datasheet/Specification Sheet/Brochure as indicated in Annex D8.

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Datasheet/Specification Sheet/Brochure is a document that summarizes the performance and other characteristics of a product, machine, component that comes along with the product from its release from the manufacturer.

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ANNEX D8

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
8	Industrial Process Control	09-001	Liquid Mixing/Processing Simulator	Refer to Technical Specification of Item Code 09-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes
8	Industrial Process Control	09-001	Bottle Filling Production Line Trainer	Refer to Technical Specification of Item Code 09-002	Learning System		- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Liquid Mixing/Processing Simulator
Item Code	09-001
Technology Area(s)	Industrial Process Control

General Description

This training equipment is a simulation of an automated liquid mixing/processing plant using distributed control system and programmable control system PLC) technologies. With this equipment, one can learn to install sensors and monitoring devices, wiring of electrical circuits, configuration of instrumentation devices and controls, programming of PLC, debugging of programs and operation and monitoring of automated process control systems.

Required Topics/Lessons:

- Installation and application of PLC programming software
- Programming and Application of DCS Control System
- Application of DCS Communication System
- Installation and Application of Process Control Equipment Piping
- Installation and application of pressure transmitter
- Installation and Application of Temperature Transmitter
- Installation and application of flow sensor
- Installation and application of liquid level transmitter
- Installation and Application of Weight Sensor
- Application of Industrial Automation Network
- Installation and wiring application of digital network intelligent measurement and control system
- Application of Instrument Communication System
- Cognition and application of production process technology
- Safe and civilized production

Technical Description

- **Description of system operation**
  This training simulator will consists of the following sub-systems:

No	Training Platforms	Qty	Unit Measure
1	Mini-industrial process/System process *This training equipment is a simulation of a liquid mixing/processing plant wherein it feeds material to a reactor through two feedlines for batching. The batching system is composed of two (2) raw material tanks and product mixing tanks. The system can perform functions such as precise proportioning of materials, timing control, and material mixing according to process requirements. The system allows monitoring and control of process variables such as pressure, level, flow and temperature, weight and others.*	1	set

No	Training Platforms	Qty	Unit Measure
2	Intelligent measurement and control system *DCS system can support multi-domain control and operation, and has multi-programming language support in compliance with IEC international standards; including SFC, CFC, ST, LD and other languages, the system has fail-safe functions and complete project management functions, including multi-engineer collaborative work, configuration integrity management, online single-point configuration download, configuration and operation authority management, etc., and provide historical traceability of relevant operation records. The system is compatible with MODBUS, HART and other international standard field buses and the comprehensive integration of various heterogeneous systems. The system should allow real-time monitoring of subsystems over LAN and cloud.*	1	set
3	Energy management platform *This platform allows monitoring and control of all electrical parameters in the system in local and remote computers/devices*	1	set
4	Visualization platforms *This is composed of computer/s where the dashboard on process variable status and process simulation are displayed accessible in local and remote computers/devices*	1	set
5	Training platform • *This includes reference materials, exercises/activities (20+ activities), 1 set of tools needed to service the equipment, and 1 spool of electrical wires (per color used in the system).*	1	set

- **General parameters**
  - Working power supply 220 ± 10% 60Hz single phase (a transformer should be provided if the system requires other power supply)
  - Protection: Overpressure, over temperature, liquid level alarm and emergency stop.
  - Overall size should not be greater than 2m (width) x 3m (height) to ensure that ingress of the machine will not be an issue.
  - Two (2) computer/s for programming and visualization should be Windows 11 compatible, 20 cores, 32 GB RAM, 1TB SSD, 2TB HDD, 2x 1Gbit LAN port and dual 27~34 inches monitor with 2K resolution or higher and 12:9 or 16:9 image aspect ratio.
  - DCS controller:
    - Supports PROFIBUS/HART/MODBUS and other common international fieldbus. Third-party devices, such as intelligent instruments, PLCs, and inverters.
    - Centralized supervision in real time
    - Centralized/decentralized I/O modules,
    - Decentralized risks and control
    - Open system architecture supporting OPC industrial standards
  - Programmable Logic Controller/s
    - Ethernet and other communication standards
    - Support cloud-based monitoring and control
    - With digital and analog I/Os
    - Expandable centrally and on distributed basis
  - Field devices
    - Pressure Transmitter, 0-100 Kpa 4-20mA, HART protocol
    - Level Transmitter 0-5 Kpa 4-20mA, HART protocol
    - Temperature Transmitter 0-100℃ 4-20mA, HART protocol
    - Flow Sensors-RS485 communication
    - Weight sensor 0-10 kg RS485
  - Software (2 users), compatible to latest release of Windows
    - PLC Programming software
    - Visualization design software
    - DCS Monitoring and supervision software
  - Set of tools for equipment servicing
  - This includes curriculum and instruction to exercises in print and digital format
  - Extra hoses and electrical wires

Additional requirement:

- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:

Conceptual diagram for reference only

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Bottle Filling Production Line Trainer
Item Code	09-002
Technology Area(s)	Industrial Process Control

General Description

The learning system is a miniature bottle filling process simulation equipment which allows remote data collection, monitoring and control. In detail, the system should provide simulation of liquid mixing, bottle filling and labeling, handling and transferring, and sorting and storage.

Required Topics/Lessons:

1. Pneumatic technology
    - air pump
    - air source processor
    - vacuum generator
    - various cylinders
    - solenoid valve
    - Cognition and application of magnetic switch
    - Knowledge of tracheal intubation
    - Knowledge of speed joint
    - Solenoid valve installation and commissioning
    - Cylinder installation and debugging
    - Installation and commissioning of air source treatment
    - Maintenance and maintenance of various cylinders
    - Maintenance and maintenance of various solenoid valves

2. Sensor technology
    - Cognition and application of photoelectric sensor
    - Cognition and application of optical fiber sensor
    - Cognition and application of magnetic sensor
    - Cognition and application of inductive sensors
    - Wiring methods of various sensors
    - Fault judgment and maintenance of various sensors
    - Wide application of various sensors in industrial field

3. Mechanical transmission technology
    - belt transmission
    - cylinder transmission/actuation

4. Industrial automation technology
    - The principle and application of PLC
    - The method of programming the filling station program by PLC
    - The method of programming assembly station program by PLC
    - The method of programming the transfer station program by PLC
    - The method of writing storage station program by PLC
    - Ethernet communication
    - Application of stepping motor and stepping driver
    - PLC motion control programming method

- PID control programming method
- Configuration and application of touch screen
- Dynamic real-time monitoring
- Dynamic real-time monitoring
- Different programming language
    - LD(Ladder Diagram) (ladder diagram)
    - IL (Instruction List) (Instruction List)
    - SFC (Sequential Function Charts) (Sequential Function Chart)
    - FBD (Function Block Diagram) (Function Block Diagram)
    - ST (Structured Text) (Structured Text)
- Equipment calibration, fault diagnosis and maintenance

Technical Description

A. Description of system operation

- Filling station
  The filling station will simulate how liquid from two tanks will be pumped-in a mixing container in which the ratio is based on a certain percentage/amount. This liquid mixture will then be transferred to the empty bottles in the assembly station.

- Assembly station
  The assembly station is the simulation of the process where the bottles will be filled with the liquid mixture, sealed with a cap and stamped with a label.

- Handling station
  The handling station is a pick and place system that simulates the transferring of filled bottles to the simulated warehousing station.

- Storage/Warehousing station.
  This station will simulate the sorting process of bottles that are to be transported into two different locations/ containers.

B. General parameters

- Working power supply 220 $\pm$ 10% 60Hz single phase (a transformer should be provided if the system requires other power supply)
- Protection: short circuit, leakage, grounding, overcurrent, undervoltage, and emergency stop.
- Security: fingerprint for system power on.
- Web server and networking: stations should be interconnected via ethernet protocol which allows remote data collection, monitoring and control and accessible via web service.

- Overall size should not be greater than 2m (width) x 3m (height) to ensure that ingress of the machine will not be an issue.
- Two (2) computer/s for programming and visualization should be Windows 11 compatible, 20 cores, 32 GB RAM, 1TB SSD, 2TB HDD, 2x 1Gbit LAN port and dual 27~34 inches monitor with 2K resolution and 21:19 or 16:9 image aspect ratio.
- Programmable Logic Controller/s
    - Ethernet and other communication standards
    - Support cloud-based monitoring and control
    - With digital and analog I/Os
    - Expandable centrally and on distributed basis
- PLC Programming software (2 users), compatible to latest release of Windows
- Touch screen Human Machine Interface (HMI) 4~6 inches

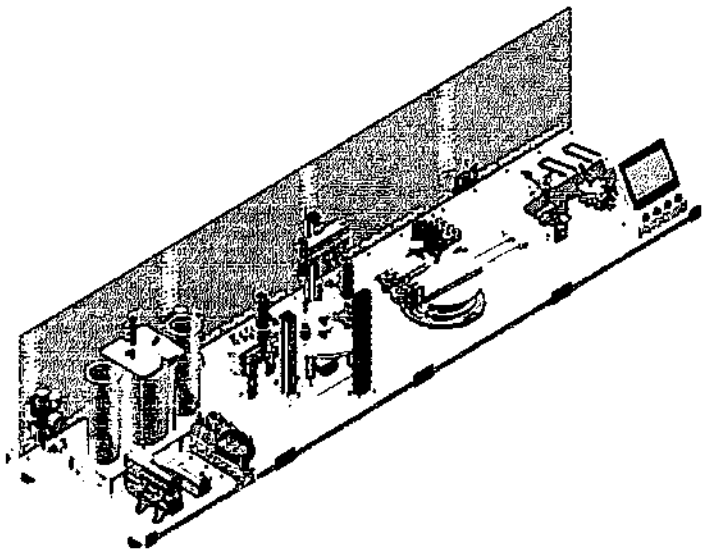
- Silent type compressor
- Set of tools equipment servicing
- Includes 2 sets of bottles/workpiece
- This includes curriculum and instruction to exercises in print and digital format

- 2 sets connecting wires and two sets of hoses

Additional requirement:

- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



Picture for reference only

Technical Specifications

Lot 9 : **Motor Control Simulator**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Motor Control Trainer	Kindly refer to the technical specifications attached as **Annex D9.**	2	set			

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ANNEX D9

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
9	Motor Control Simulator	09-003	Motor Control Trainer	refer to Technical Specification of Item Code 09-003	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Motor Control Trainer
Item Code	09-003
Technology Area(s)	Motor Control Simulator

Brief Description

This learning system will develop the learner's ability to apply control technology using various types of magnetic contactors, electromechanical and electronic switches both in AC and DC circuits.

Required Topics/Lessons

Specifically, this learning system will cover the following topics:

- Frequency Converter Panel Control Motor Start and Stop
- External Terminal Control Experiment Based on Frequency Converter
- Reverse Switch Control Motor Forward and Reverse Experiment
- Use Star - Delta starter to Star Motor
- Combination Switch Control Two-speed Motor Experiment
- Contactor Controlled Motor Self-locking Experiment
- Contactor Interlocking Motor Forward & Reversing Control Circuit
- Dual-interlock Three Phase Asynchronous Motor Forward/Reversing Control Circuit
- Y-△ Start Experiment Controlled by Contactor
- Y-△ Start Experiment Controlled by Time Relay
- Three-phase Asynchronous Motor Sequence Control
- Single-phase Capacitor Motor Start Experiment
- Single Phase Capacitor Motor Forward and Reverse Experiment
- Single-phase Resistance Motor Forward and Reverse Rotation Experiment
- Switched Reluctance Motor Speed Control Experiment
- How to Use Torque Sensor

Technical Description

The requirements for this learning system are as follows:

- Modules:
  - Power supply
    - 3 phase 380V 60hz
    - 220 VDC 60Hz
    - Variable AC 0~220V 3 Phase
    - Variable DC 0~200V
    - Fixed 24 VDC
  - Frequency converter
    - 3 phase
    - 0.55 kW
    - 1.7 A
    - 0~550Hz frequency out
    - Voltage depends on engineering design of the system

- Variable resistant module
  - 0-90Ω adjustable resistance
  - 150W
  - 4 groups

- Motor drag modules
  - Composed of circuit breaker, magnetic contactors,switches, relays, protection and other devices
  - Quantity and specification should be sufficient to run the exercises covered in each topics

- Motors
  - DC servo motor with controller
  - Shaded pole motor (motor + governor)
  - Repulsion motor with controller (single phase gear motor)
  - Single-phase capacitor motor 220VAC 60hz 120 watts, 1400 rpm
  - Two speed motor AC 380 VAC 60hz, 300/450 watts, 1400/2800 pm
  - Single-phase resistance motor, AC 220V 60Hz, 1400rpm
  - Three-phase induction motor AC380V, 60hz, 1 torque sensor, 1 magnetic powder brake and 3 sets of aviation plugs. (The motor can be replaced with any other motor)
  - Three-phase winding motor AC380V 60Hz 1400r/min

- Measuring instruments (panel type or hand held instruments/multimeters)
  - 3 AC digital voltmeter
  - 3 digital ammeter
  - 1 three phase digital power meter
  - 1 single-phase power meter
  - 1 digital power factor meter
  - 1 digital frequency meter
  - phase-sequence indicator
  - digital tachometer

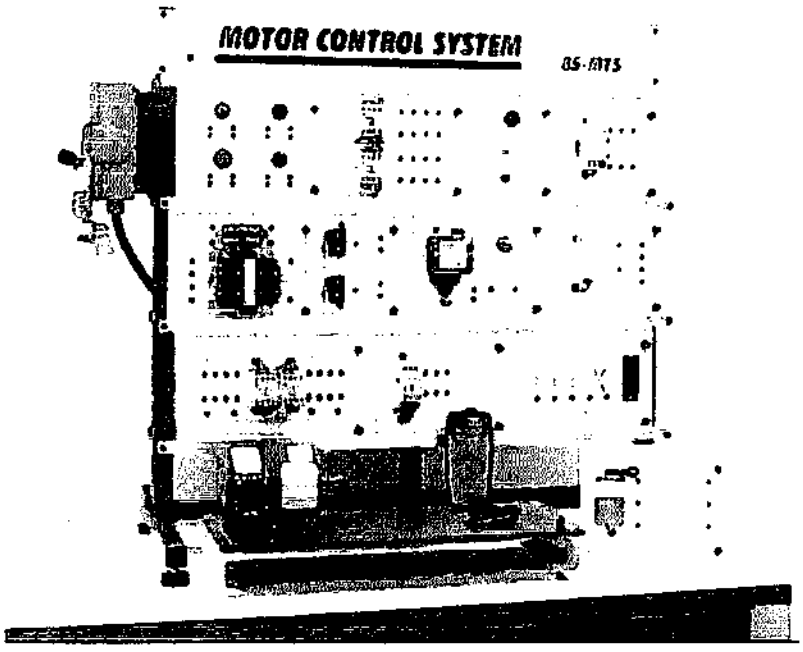
- Other devices
  - torque sensor display meter,
  - tension controller

- Multi-level frame to hold the modules, table top to hold additional instruments and storage cabinet to hold modules not in use.
- Three Phase 220VAC, 60Hz
- 150 pieces per color of connecting wires
- Dimension: The equipment when installed should not consume more than 6 sqm space and not over 2m for the overall height.
- This includes curriculum and instruction to exercises in print and digital format

Additional requirement:

- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



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Technical Specifications

Lot 10 : **Industrial Automation**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Mobile Robotics 4.0	Kindly refer to the technical specifications attached as **Annex D10.**	1	set			

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ANNEX D10

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
10	Industrial Automation	10-001	Mobile Robotics 4.0	Refer to Technical Specification of Item Code 10-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of The Learning System	Mobile Robotics 4.0
Item Code	10-001
Technology Area(s)	Industrial Automation

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Electrical and electronics circuit connection
- Mechanical assembly of robots
- Advance application in mobile robotics
- Familiarization and application of mechatronics and automation devices
- Application of the internet of things (IOT)
- Industry 4.0
- Programming

Courseware:
- Robotic SIM Professional
- CIROS Studio, single license

Hardware / Specification:
- **Parameters / Data**
  - Height: 325 mm
  - Diameter: 450 mm
  - Total weight (unladen weight): 20 kg
  - Total weight (including 4 rechargeable battery packs): 22.8 kg (approx. 700 g per rechargeable battery pack)
  - Degree of protection: IP 00
  - Battery voltage: 18 V
  - Housing material: Stainless steel, PA6
  - Degrees of freedom: 3 translational in x- and y-direction rotational about the z-axis
- **Control and Interface**
  - Controller: Embedded PC to COM Express specifications
    Intel i5, 8th generation, 2.5 GHz frequency, up to 4.2 GHz in turbo mode, 4 physical cores with hyperthreading Integrated UHD Graphics 630
  - Main memory: 8 GB RAM
  - Hard disk: 64 GB SSD
  - Operating system: Linux Ubuntu 18.04 LTS (64 bit)
  - Motor control: microcontroller with 32-bit microprocessor and separate Ethernet interface
  - Drive wheels: 3 x omnidirectional wheels with 120 mm diameter
  - Drive wheels: 3 x DC motors, maximum 3,600 rpm, with encoders and gear unit, gear ratio: 32:1
- **Interface**
  - 2 x USB 2.0 (1 x occupied by Access point)
  - 1 x RJ-45 (occupied by Access point)
  - 2 x 12 V WAGO-734-162 (max. 2 A total)

- 4 x USB 3.0 (1 x occupied by camera)
- 2 x PCI express slots (Gen3 4 x, extensions)
- 1x HDMI 2 x Digital I/O connector 1 x analog input connector
- 1 x relay connector
- 1 x Wago 721-462 2-pole motor 4, power plug
- 1 x MPE RM 2.54 2x3-pole motor 4, encoder
- WLAN to specification, 5 GHz and 2.4 GHz as client or access point in bridge mode

- **Digital inputs/outputs**
  - Inputs: 8
  - Outputs: 8
  - Max. 24VDC
  - Max. 2.A per output
  - Max. 2 A total"
  - Analog inputs: 8
  - Analog output: 2"
  - "WLAN standards: 5 GHz (IEEE 802.11 ac/n/a)
  - 2.4 GHz (IEEE 802.11 b/g/n)
  - Transmission power: CE: max. 23 dBm (5 GHz) max. 20 dBm (2.4 GHz)
  - Power supply: 5 V max. 2 A

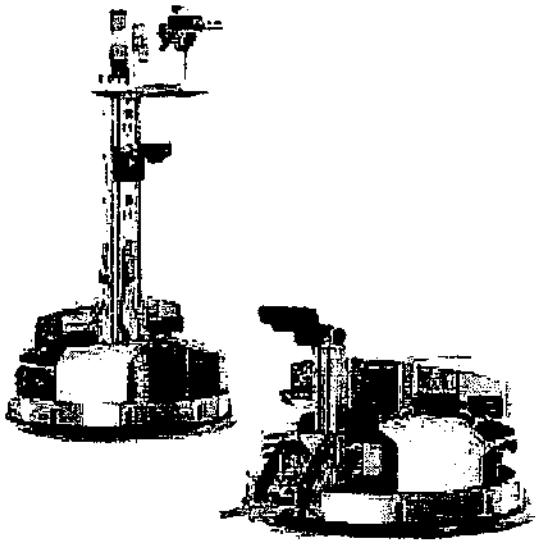
Other Equipment & Accessories:

- Tower
- Segment
- Laser range finder
- Legacy electric gripper
- Forklift
- Electric gripper
- Height adjustment
- Interface box
- Leg signal lamp
- Sensor package

Additional requirements:

- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



Picture for reference only

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

Technical Specifications

Lot 11 : **Robot station simulator**

No.	Item	Minimum Agency Specifications Unless Otherwise Specified	Qty	Unit	Statement of Compliance*	Make Brand / Model	Reference
1	Robot Station	Kindly refer to the technical specifications attached as **Annex D11.**	1	set			

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

ANNEX D11

Lot No.	Lot	Code	Item	Agency Specification	Classification	Test Procedure (Post Evaluation)	Test Procedure (Inspection and Acceptance)	English Manual
11	Robot station simulator	11-001	Robot Station	Refer to Technical Specification of Item Code 11-001	Learning System	Evaluation of Brochure with picture and/or data sheet and training proposal	- Checking the conformity with the quantity including parts and accessories - Checking the conformity of hardware vis-a-vis offered specifications - Functionality testing	Yes

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Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date

TECHNICAL SPECIFICATION

Name of the Learning System	Robot Station
Item Code	11-001
Technology Area(s)	Robot station simulator

Required Topics/Lessons:
The training system shall include, but not limited to the following topics/lessons:

- Installation and wiring of industrial robot body and controller;
- Initialization and parameter recovery of industrial robots;
- Pneumatic technology application;
- Application of sensor detection technology;
- Industrial robot IO wiring;
- Track programming and debugging of industrial robots;
- Installation and wiring of industrial robot handling applications;
- Selection and design of fixtures for industrial robot handling applications;
- Programming and debugging of industrial robot handling applications;
- Industrial robot palletizing application installation and wiring;
- Selection and design of fixtures for industrial robot palletizing applications;
- Industrial robot palletizing application programming and debugging;
- Programming and debugging of industrial robot trajectory curve;
- Industrial robot detection, arrangement, application, installation and wiring;
- Selection and design of fixtures for industrial robot inspection and arrangement applications;
- Application programming and debugging of industrial robot detection and arrangement;
- Installation and debugging of industrial robot workstation.

Technical Description

- **Robot Arm System**
  - Basic platform
    - Made of aluminum profile
    - Includes cable and house management
    - Push button switches and emergency stop switch for manual/automatic selection switch, start, stop, enable, reset, alarm light, and emergency stop
  - Six-axis robot arm
    - Load capacity: 4kg
    - Working range: 600mm
    - Robot fixtures: claw fixture, calibration block, suction cup fixture and tracing fixture
    - Clamps: drawing pen clamp, gripper clamp
  - Tracing module
  - Parts palletizing module
  - Detection arrangement module

- Plane raw material warehouse
- Drawing puzzle module
- Electric control system

- **General parameters**
  - Working power supply 220 ± 10% 60Hz single phase (a transformer should be provided if the system requires other power supply)
  - Protection: short circuit, leakage, grounding, overcurrent, undervoltage, and emergency stop.
  - Security: fingerprint for system power on.
  - Web server and networking: stations should be interconnected via ethernet protocol which allows remote data collection, monitoring and control and accessible via a web service.

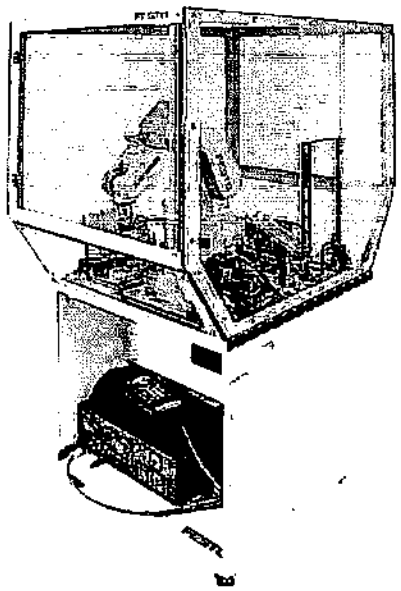
  - Overall size should not be greater than 2m (width) x 3m (height) to ensure that ingress of the machine will not be an issue.
  - One (1) computer station for programming and visualization. with the following specs:
    - OS: Windows 11 or higher,
    - No. of Cores: 20 cores,
    - RAM: 32 GB RAM,
    - Storage: 1TB SSD and 2TB HDD,
    - Network: 2x 1Gbit LAN, WiFi and Bluetooth port
    - Dual 27" inch ultrawide 2K/4K curved monitor.
    - Industry grade table and chair

  - Programmable Logic Controller/s
    - Ethernet and other communication standards
    - Support cloud-based monitoring and control
    - With digital and analog I/Os
    - Expandable centrally and on distributed basis
  - PLC Programming software (2 users), compatible to latest release of Windows
  - Touch screen Human Machine Interface (HMI) 4~6 inches
  - Silent type compressor

- Includes 3 set of workpiece
- This includes curriculum and instruction to exercises in print and digital format

Additional requirements:
- Certificate of authority to sell from the manufacturer or local distributor/reseller
- Certificate of End of Life (EOL) Service from Manufacturer (5 years)

Sample Image:



Picture for reference only

I hereby certify that the statement of compliance to the foregoing technical specifications are true and correct, otherwise, if found to be false either during bid evaluation or post-qualification, the same shall give rise to automatic disqualification of our bid.

Name of Company/Bidder	Signature over Printed Name of Authorized Representative	Date