

Sesona Kibi

From: Lungisa Mpati <lungisa@emcol.co.za>
Sent: Wednesday, 27 November 2024 21:31
To: Sesona Kibi
Subject: RE: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

Good Evening

This is to confirm that and to declare that I had no personal interest on the issues before the committee.

L Mpati
BSC Member

From: Sesona Kibi <sesona@emcol.co.za>
Sent: Wednesday, November 27, 2024 12:13 PM
To: Lester Moos <lester@emcol.co.za>; Lungisa Mpati <lungisa@emcol.co.za>; Feronica de Vos <feronica@emcol.co.za>; Thareef Bloew <thareef@emcol.co.za>
Subject: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

Good day Member,

Apologies for the inconvenience, please see below amended declaration as per the attached RFQ and Minutes for BSC.

Regards
Kibi

From: Sesona Kibi <sesona@emcol.co.za>
Sent: Wednesday, 27 November 2024 08:47
To: 'lester moos' <lester@emcol.co.za>; 'Lungisa Mpati' <lungisa@emcol.co.za>; 'Feronica de Vos' <feronica@emcol.co.za>; 'Thareef' <thareef@emcol.co.za>
Subject: Declaration: RFQ/SCM EMC 29/24 – SOURCING OF SERVICE PROVIDER FOR MACHINE TOOLS

Day Committee Members,

With reference to the BSC meeting held on the 26 November 2024 at 14:00 via SKYPE, attached is the final BSC report for:

RFQ/SCM EMC 29/24 – SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

As agreed at the meeting all BSC members are required to do the following:

1. Declaration of Attendance of above-mentioned meeting by responding to this mail
I declare.
2. Declaration of Interest, Confidentiality & Impartiality by responding to this mail
 - I declare that I did not purposefully unlawfully favour prejudice anyone in the procurement process (invitation, evaluation, recommendation or award of bid of the Code of Conduct C4.5 to C4.12 and C5.3 to C5.4 of the Public Service.
 - I, the undersigned, accept that all information, documentation and decisions regarding any matter serving before the Committee are confidential. I, therefore, undertake not to make known anything in this regard.

Sesona Kibi

From: Thareef Bloew <thareef@emcol.co.za>
Sent: Wednesday, 27 November 2024 15:46
To: 'Sesona Kibi '
Subject: RE: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

Good day

I declare to points 1, 2 and 3.

Regards

From: Sesona Kibi <sesona@emcol.co.za>
Sent: Wednesday, 27 November 2024 12:13
To: 'lester moos' <lester@emcol.co.za>; 'Lungisa Mpati' <lungisa@emcol.co.za>; 'Feronica de Vos' <feronica@emcol.co.za>; 'Thareef' <thareef@emcol.co.za>
Subject: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

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Sent: Wednesday, 27 November 2024 08:47
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 - *I declare that I did not purposefully unlawfully favour prejudice anyone in the procurement process (invitation, evaluation, recommendation or award of bid of the Code of Conduct C4.5 to C4.12 and C5.3 to C5.4 of the Public Service.*

Sesona Kibi

From: lester moos <lester@emcol.co.za>
Sent: Wednesday, 27 November 2024 03:18
To: 'Sesona Kibi '
Subject: RE: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATR
Attachments: MINUTES FOR RFQ-SCM EMC 29-24.pdf

From: Sesona Kibi <sesona@emcol.co.za>
Sent: Wednesday, 27 November 2024 12:13
To: 'lester moos' <lester@emcol.co.za>; 'Lungisa Mpati' <lungisa@emcol.co.za>; 'Feronica de Vos' <feronica@emcol.co.za>
Subject: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

Good day Member,

Apologies for the inconvenience, please see below amended declaration as per the attached RFQ and Minutes for B

Regards
Kibi

From: Sesona Kibi <sesona@emcol.co.za>
Sent: Wednesday, 27 November 2024 08:47
To: 'lester moos' <lester@emcol.co.za>; 'Lungisa Mpati' <lungisa@emcol.co.za>; 'Feronica de Vos' <feronica@emcol.co.za>
<thareef@emcol.co.za>
Subject: Declaration: RFQ/SCM EMC 29/24 – SOURCING OF SERVICE PROVIDER FOR MACHINE TOOLS

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As agreed at the meeting all BSC members are required to do the following:

1. Declaration of Attendance of above-mentioned meeting by responding to this mail

Sesona Kibi

From: Feronica de Vos <feronica@emcol.co.za>
Sent: Wednesday, 27 November 2024 12:15
To: Sesona Kibi
Subject: RE: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATF

Good day Kibi,

Kindly be advised that I declare to items 1, 2 & 3.

Thank you.

Regards

 <p>higher education & training Department: Higher Education and Training REPUBLIC OF SOUTH AFRICA</p>	 <p>Eastcape Midlands TVET College</p>	<p>Feronica De Vos Senior MIS Officer T: 041 996 1800 E: feronica@em W: www.emcol.co.za</p>
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From: Sesona Kibi <sesona@emcol.co.za>
Sent: Wednesday, 27 November 2024 12:13
To: Lester Moos <lester@emcol.co.za>; Lungisa Mpati <lungisa@emcol.co.za>; Feronica de Vos <feronica@emcol.co.za>;
Subject: Declaration: RFQ/SCM EMC 29/24 - SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

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Apologies for the inconvenience, please see below amended declaration as per the attached RFQ and Minutes for B

Regards
Kibi



BID SPECIFICATION COMMITTEE HELD ON TUESDAY, 26 NOVEMBER 2024

VIA SKYPE

AGENDA

1. OPENING AND WELCOME
2. ATTENDENCE
3. DECLARATION OF INTEREST
4. MATTERS TO BE TABLED

4.1 RFQ/SCM EMC 29/24 – SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1FAS SYSTEM

- 4.1.1 TYPE OF PROJECT
- 4.1.2 CONFIRMATION OF BUDGET
- 4.1.3 ADVERTISEMENT
- 4.1.4 BID SPECIFICATIONS
- 4.1.5 ADDITIONAL REQUIREMENTS

5. RECOMMENDATION

6. CLOSURE

**BID SPECIFICATION COMMITTEE HELD ON TUESDAY, 26 NOVEMBER 2024
VIA SKYPE**

1. OPENING AND WELCOME

2. ATTENDANCE

The confirmation of attendance was done via SKYPE.
In addition, committee members were required to confirm attendance via email.

3. DECLARATION OF INTEREST

Committee members were required to formally declare interests via email.

4. MATTERS TO BE DISCUSSED

4.1 TYPE OF PROJECT

**RFQ/SCM EMC 29/24 – SOURCING OF SERVICE PROVIDER FOR
MECHATRONICS 1FAS SYSTEM**

4.2 CONFIRMATION OF BUDGET/FUNDS/APPROVAL

4.2.1. Financial Approval

The budget was approved and signed by, Mr N Momoza, Deputy Principal Finance / CFO on 21/11/2024 – see attached appendix.

4.2.2. Accounting Officer Approval

Mr Van Heerden approved and signed on 22/11/2024 – see attached appendix.

4.3 ADVERTISEMENT

**RFQ/SCM EMC 29/24 – SOURCING OF SERVICE PROVIDER FOR
MECHATRONICS 1FAS SYSTEM**

4.4 BID SPECIFICATIONS

The Bid Specification and evaluation criteria are attached hereto

4.5 ADDITIONAL REQUIREMENTS

NONE



BID SPECIFICATION COMMITTEE HELD ON TUESDAY, 26 NOVEMBER 2024

VIA SKYPE

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4.5 ADDITIONAL REQUIREMENTS

NONE



SCM-022

REQUEST FOR APPROVAL – RFQ / RFP / BID

- Request for Quotation (RFQ) : R2000 – R200 000
Reviewed by AD: SCM, campus/depart manager, end-user rep.
- Request for Quotation (RFQ) : R200 001 – R500 000
Reviewed by BEC, BAC, approval by Accounting Officer
- Competitive bid: R500 001 – R1 000 000
Reviewed by BEC, BAC, approval by Accounting Officer
- Competitive bid: R1 000 000 – And above
Reviewed by BEC, BAC, approval by Accounting Officer

SOURCING OF SERVICE PROVIDER FOR MECHATRONICS 1 FAS SYSTEM

Procurement method: RFQ RFP BID Estimated delivery date: 30 April 2025

Shorter Bidding 3DAY 7DAY

1. BACKGROUND

The merSETA and Eastcape Midlands TVET College (EMC) signed a Memorandum of Understanding (MOU) on October 31, 2018 to establish a 4th Industrial Revolution: Eastcape Midlands TVET College Learning Factory (EMCOL-LF) to support the institutional strategic goal of teaching unemployed youth, semi-skilled and skilled employees in technologies connected to the Fourth Industrial Revolution

2. PURPOSE

To source service provider for the mechatronic training system which includes physical infrastructure, controlling software, mechanical and electrical diagrams supply, data collection, training, installation, maintenance, support and curriculum for technologies.

3. SPECIFICATION(S)

Detailed specifications and conditions attached for:

- MECH1 FAS System



13. ACCOUNTING OFFICER/AUTHORISED DELEGATE

(copy of delegation to be attached)

Based on the above background approval is requested for the **Request for Bid:**

NOT APPROVED // APPROVED BY:



**ACCOUNTING OFFICER or
AUTHORISED DELEGATE**

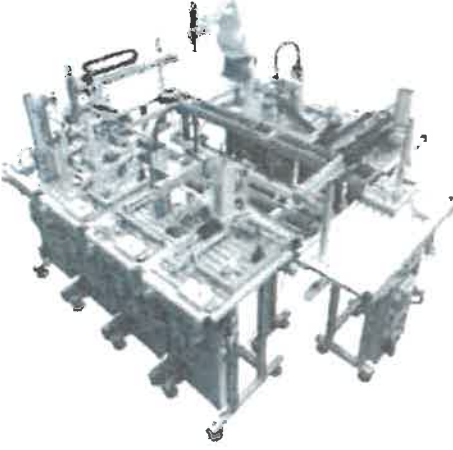
25/11/2024
DATE

COMMENTS:



Detail Specifications

A. MECH1 FAS SYSTEM

EXAMPLE	QUANTITY REQUIRED
	<p>1 x MECH1 FAS SYSTEM</p> <p>Breakdown of System</p> <ul style="list-style-type: none"> • 1x BODY SUPPLY STATION WITH MODULAR TRANSFER AND PLC • 1x BEARING SELECTION AND SUPPLY STATION WITH MODULAR TRANSFER AND PLC • 1x HYDRAULIC PRESS STATION WITH MODULAR TRANSFER AND PLC • 1x SHAFT SELECTION AND SUPPLY STATION WITH MODULAR TRANSFER AND PLC • 1x COVER SELECTION AND SUPPLY STATION WITH MODULAR TRANSFER AND PLC • 1x SCREWS SUPPLY STATION WITH MODULAR TRANSFER AND PLC • 1x ROBOTIZED SCREWING STATION WITH MODULAR TRANSFER AND PLC • 1x STORAGE STATION WITH MODULAR TRANSFER AND PLC • 1x MANAGEMENT SOFTWARE • 1x SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM • 1x PLC programming software • 1x Ethernet cable • 1x 3D SIMULATION APPLICATIONS • 1 X REMOTE ACCESS BOX

MECH1 FAS SYSTEM Specifications

AUTOMATED FLEXIBLE ASSEMBLY CELL WITH MODULAR TRANSFER

The system will provide professional training by simulating a real industrial assembly process. The system will consist of a Flexible Automated Assembly Cell that will assemble the different components that make up a turning mechanism. The device will consist of:

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- Aluminium base or body.
- Bearing
- Shaft
- Lid
- Screws

All the components used in the system will be industrial.

- To provide the system with greater flexibility, the various stations adapt to a wide variety of assemblies, introducing variations in the materials, colours and part sizes. The combination of all these possibilities means that a total of twenty-four different assemblies can be obtained enabling the use of production management strategies, which make the most of the cell's flexibility.

Transport system: Modular transfer:

- The transport system consists of a transfer section joined to each station to be able to configure different layouts, change the methods of assembling the unit and increase the system. Each station will have an RFID antenna that will make it possible to track the process.
- There will be the option of joining transfer sections at 90° or 180° depending on the user's needs. The angle of 90° or at 180° will depend on the mechanical parts used to join the sections.
- Depending on how the sections are joined, the transport system can have a rectangular layout or a linear layout.
- The stations can be easily extracted from the cell so that work can be carried out autonomously. Individual connections will be included in the electrical part and in the pneumatic part.

The following stations will be used to assemble the turning mechanism components, each of them carrying out one part of the overall assembly process.

- Body supply with modular transfer.
- Bearing selection / supply with modular transfer.
- Hydraulic press with modular transfer.
- Shaft selection / supply with modular transfer.
- Cover selection / supply with modular transfer.
- Screws supply with modular transfer.
- Robotized screwing with modular transfer.
- Storage with modular transfer.
- Paint drying in oven with modular transfer.
- Quality control using artificial vision with modular transfer.
- Linear transfer with modular transfer.

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- The system will come with a set of **DOCUMENTATION**, comprising a User Manual and Practice Activities Manual.
- PLC Memory cards

BODY SUPPLY STATION WITH MODULAR TRANSFER AND PLC

The function of the station is to feed the base which acts as the support to a turning mechanism and move it to the pallet with RFID tag located in the transfer system. The station process starts as soon as a pallet stops in front of the station.

This station will include an Augmented Reality application to access the machine's technical datasheets.

The part to be assembled will be a 65x65x32mm anodised aluminium block with an opening at the top, 32mm diameter, and another opening at the bottom, 28mm diameter, which will be used to detect whether the position is the right one or not.

The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components and a no material indication lamp.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.

It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector, disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Base feeder:
 - o A gravity feeder stores the bases. A pneumatic cylinder with a pusher adapted to the size of the base extracts one of these. This module will have the following components and characteristics:
- Storage capacity: 12 bases
- Actuators:

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- Double acting pusher cylinder, $\varnothing 16$ and 100mm stroke, with speed controllers and initial and final position switches. Controlled by a single 5/2 solenoid valve.
- Sensors:
 - Auto switches, Reed type.
 - Inductive detector to detect a shortage of material in the warehouse.

- Position verification:

The base will include housing to add the rest of the components, which must face a particular direction. A cylinder with a cylindrical part at the tip will move towards the top of the base to verify that the base is facing the right way. This module will have the following components and characteristics:

- Actuators:

- Double acting cylinder, $\varnothing 12$ and 50mm stroke, with speed controllers and final position switch. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Displacement to the assembly point:

A cylinder with a pusher at the tip will be used to position the base at the point from which it will be loaded on the pallet with RFID tag. The cylinder will be rectangular to avoid rotating the pusher. This module will have the following components and characteristics:

- Actuators:

- Rectangular pusher cylinder, $\varnothing 25$ and 200mm stroke, with speed controllers and final position switch. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Incorrect part rejection module:

If the base position verification module detects that it is incorrect, a single acting cylinder will drive the base onto a stainless-steel ramp, in order to leave the path unobstructed for the other parts. This module will have the following components and characteristics:

- Actuators:

- Single-acting ejecting cylinder, $\varnothing 10$, 15mm stroke, with speed controller. Controlled by a single 3/2 solenoid valve.

- Insertion of the base in the pallet:

A handling device with two shafts moves the base to the pallet with RFID tag. Each shaft contains a cylinder with parallel rods.

The terminal element is a vacuum holding platform with four vacuum pads to solve possible height misalignments. This module will have the following components and characteristics:

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- Actuators:

- Horizontal shaft: - Parallel-rod cylinder, $\varnothing 20$ and 150 mm stroke, with speed controllers and initial and final position switches. Controlled by a double 5/2 solenoid valve.
- Vertical shaft: - Parallel-rod cylinder, $\varnothing 15$ and 50 mm stroke, with speed controllers and initial and final position switches. Controlled by a double 5/2 solenoid valve.
- Holding plate: 4 buffer vacuum pads, $\varnothing 16$, with vacuum ejector. controlled by a single 3/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.
- Vacuum switch, PNP output with IO Link protocol. The intelligent IO Link protocol will make remote access possible along with sensor parametrization.

- Smart IO-link devices:

The System will include different IO-link devices with smart features:

- Valve blocks with IO-link: counter for number of valve cycles for preventive maintenance actions, detection of power supply failure, short-circuit detection, abnormal interior temperature, internal fault detection.
- Smart light and sound device with IO-link: Emission of 7 LED colours, emission of 8 sounds, remote monitoring.

- Pneumatic consumption monitoring and leak detection system:

This station will include a pneumatic consumption monitoring system and a leak detection system. This module will consist of the following components and features:

- Flow meter to monitor air consumption with a built-in electro valve to guide the air inlet.
- Two non-return flow regulators with silencers to simulate air leaks.

- Breakdown generation system:

The station has the possibility of generating up to 16 breakdowns or malfunctions. For this purpose a box will be assembled on the side of the station structure, inside which there will be 16 switches to activate the same number of breakdowns. When a switch is activated a breakdown will occur in one of the station components. To access these switches, the box lid must be opened, which can be locked.

- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

JK



- Electrical control panel:

All the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- Safety Relay
- It will include an Ethernet switch with 5 ports.
- It will include 220VAC/24VDC power supply.
- 1 control PLC wired and programmed to operate the module.
- IO Link Master.
- Industrial communication via standard Profinet for communication with the other modules.

- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.
- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
- Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
- RFID antenna to write information onto the RFID tag.
- Wi-Fi access point: It will have a wireless access point. This device will generate a local Wi-Fi network associated with the system's network, which will allow the user to connect wirelessly to the system.

BEARING SELECTION AND SUPPLY STATION WITH MODULAR TRANSFER AND PLC

The function of this station is to position a bearing inside the housing designed for that purpose in the base. The station process starts as soon as a pallet with RFID tag, with a base inside, stops in front of the station.

This station will include an Augmented Reality application to access the machine's technical datasheets.

The part to be assembled will be a metal ball bearing.

At



The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components and a no material indication lamp.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.

It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector, disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Bearing feeding module:

The bearings will be in a gravity feeder formed by a storage column and a pusher cylinder at the bottom, which extract the bearing to start the process. A presence sensor with a microswitch verifies whether a bearing has been extracted. This module will have the following components and characteristics:

- Storage capacity: 38 bearings

- Actuators:

- Double acting pusher cylinder, Ø16 and 100mm stroke, with speed controllers and final position switch. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Presence sensor: microswitch.

- Transfer to the measuring module:

It will be formed by a handling device which consists of a rack and pinion rotary actuator that moves 180°. The actuator has an arm with a parallel-opening type gripper in order to hold the bearing on the inside to transfer it. Inside the arm there will be a device formed by a cogged belt and two pinions. This module will have the following components and characteristics:

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- Actuators:

- Rotary actuator: double rack and pinion, $\varnothing 25$, μ max 180° with speed controllers and 0°, 90°, and 180° position switch. Controlled by a closed-centre 5/3 solenoid valve.
- Fixing arm: Air grippers with two parallel-opening jaws controlled by a solenoid 5/2 valve.

- Sensors:

- Auto switches, Reed type.
- Height measuring module:

Formed by a platform that will include a location pin driven by a pneumatic cylinder. This platform is lifted using a pneumatic rodless cylinder and the bearing makes contact with a straight plunger which measures the height. The straight plunger is comprised of a linear potentiometer. After the measurement has been taken the platform will return to its original position. If the bearing does not have the desired height, an ejecting cylinder pushes it up to the stainless steel evacuation ramp. This module will have the following components and characteristics:

- Actuators:

- Single acting compact cylinder, $\varnothing 12$, 5mm stroke. Controlled by a 3/2 solenoid valve.
- Vertical shaft: - Rodless cylinder, $\varnothing 20$ and 250mm stroke, with speed controllers and initial and final position switches. Controlled by a double 5/2 solenoid valve.
- Module for removal of incorrect part: - Double acting cylinder, $\varnothing 10$, 40mm stroke, with speed controller. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.
- Linear potentiometer.

- Bearing insertion module:

Formed by a roto linear unit. This unit will have an arm. with a two-jaw gripper. Once the bearing has been picked up, the arm lifts and turns 180°, to insert the bearing in its position. This module will have the following components and characteristics:

- Actuators:

- Compact linear and rotary drive cylinder, $\varnothing 32$, 25mm stroke, with speed controllers and an initial and end of stroke position switch during linear movement and 0° and 180° during rotary movement. Controlled by 2 single 5/2 solenoid valves.
- Fixing arm: Pneumatic grippers with two parallel-opening jaws. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.



- Leak detection system:

This station will include a leak detection system. This module will consist of the following components and features:

- Two non-return flow regulators with silencers to simulate air leaks.

- Breakdown generation system:

The station will have the possibility of generating up to 16 breakdowns or malfunctions. For this purpose a box will be assembled on the side of the station structure, inside which there will be 16 switches to activate the same number of breakdowns. When a switch is activated a breakdown will occur in one of the station components. To access these switches, the box lid must be opened, which can be locked.

- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

- Electrical control panel:

All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- Safety Relay.
- It will include an Ethernet switch with 5 ports.
- It will include 220VAC/24VDC power supply.
- 1 control PLC wired and programmed to operate the module.
- Industrial communication via standard Profinet for communication with the other modules.

At



- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.
- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
 - 1 double acting cylinder with guide, $\varnothing 16$, 30mm stroke, with air speed controllers. Controlled by a single 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.

HYDRAULIC PRESS STATION WITH MODULAR TRANSFER AND PLC

The function of the station will be to press a bearing inside a support base. The station process starts as soon as a pallet with RFID tag, with the base and bearing inside, stops in front of the station.

The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components.

A complete hydraulic press will be underneath the desktop.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.

It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector and disconnecting switch, endorsed emergency stop button and error warning light.



On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Insertion/extraction of the product in process:

The first process will consist of inserting the base with the bearing inside from the pallet with RFID tag that has stopped in front of the transfer section to an unloading point inside the station. The handling and reverse unloading process once the pressing process has finished is carried out using a pneumatic rotary actuator which includes an arm with four vacuum pads. This module will have the following components and characteristics:

- Actuators:

- Rotary actuator: double rack and pinion, Ø25, µmax 180° with speed controllers and 0°, 90°, and 180° position switches. Controlled by a closed-centre 5/3 solenoid valve.

- Fixing arm: 4 vacuum pads, Ø16, with vacuum ejector. controlled by a single 3/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.

- PNP output vacuum pressure switch.

- Feeding the press:

Formed by a platform with two double acting pneumatic cylinders. The first one transfers the product in process from the loading/unloading point to the pressing point and the second vice versa once the press has completed its function. This module will have the following components and characteristics:

- Actuators:

- 2 double acting pneumatic pusher cylinders, Ø12 and 125mm stroke, with speed controllers and initial and final position switches. Controlled by single 5/2 solenoid valves.

- Sensors:

- Auto switches, Reed type.

- Pressing the bearing:

Once the base containing the bearing is underneath the hydraulic cylinder, a protection screen actuated by a pneumatic cylinder descends and the cylinder press will lower with an adjustable force. Once the bearing is pressed, the product in process is transported to the unloading point. This module will have the following components and characteristics:

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- Actuators:
- Protection: Double acting parallel-rod cylinder, $\varnothing 15$ and 100mm stroke, with speed controllers and initial position switch. Controlled by a single 5/2 solenoid valve.
- Pressing: Compact double acting cylinder, $\varnothing 40$ and 50mm stroke, with speed controllers and initial and final position switches (two, for both bearing heights). Controlled by a closed-centre 4/3 solenoid valve.
- Sensors:
- Auto switch, Reed type.

- Leak detection system:

This station will include a leak detection system. This module will consist of the following components and features:

- Two non-return flow regulators with silencers to simulate air leaks.
- Breakdown generation system:
The station has the possibility of generating up to 16 breakdowns or malfunctions. For this purpose a box will be assembled on the side of the station structure, inside which there will be 16 switches to activate the same number of breakdowns. When a switch is activated a breakdown will occur in one of the station components. To access these switches, the box lid must be opened, which can be locked.
- Methacrylate enclosure with magnetic safety switch:
This station will have a methacrylate enclosure that completely covers the work area. This enclosure will have a door to access the work field with a magnetic safety switch fitted.
- HMI:
The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.
- Electrical control panel:
All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

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- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- Built-in thermal switch.
- It will include 220VAC/24VDC power supply.
- Safety Relay
- It will include an Ethernet switch with 5 ports.
- Network filter with high differential and common-mode attenuation.
- Frequency converter.
- Contactor to actuate hydraulic equipment.
- Hydraulic equipment with pressure gauge with display and pressure limiter.
- 1 control PLC wired and programmed to operate the module.
- Industrial communication via standard Profinet for communication with the other modules.
- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.
- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.

SHAFT SELECTION AND SUPPLY STATION WITH MODULAR TRANSFER AND PLC

The function of the station will be to assemble a shaft inside a bearing. The station process starts as soon as a pallet with RFID tag stops in front of the station.

The part to be assembled will be a shaft, 14.6mm diameter and 41mm height. There will be two shaft insertion options: metal shaft, anodised aluminium shaft and plastic shaft, made from black nylon.

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The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components and a no material indication lamp.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.

It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector and disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Dividing plate:

Made from anodised aluminium, this module will be used as an alternative rotary drive system, such that with each rotary movement it will advance 45 degrees. This will be achieved by a pneumatic pusher cylinder with oscillating drive. It will also have another two limiter cylinders operating alternately, one of them moving which will hold the plate while it turns, and the other fixed, which will lock it once the turning movement has stopped so that the plate is held firmly in place, and the pusher cylinder can return to its initial position to wait for a new cycle. This module will have the following components and characteristics:

- Actuators:

- Compact double acting pusher cylinder, Ø25 and 40mm stroke, with speed controllers and initial position switch. Controlled by a single 5/2 solenoid valve.

- Limits: 2 compact cylinders, Ø16, 10mm stroke. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Feeding the shafts:

The shafts are stored in a gravity feeder. A stepper feeding system, consisting of two pneumatic cylinders, will place them on the first of the plate stations. This module will have the following components and characteristics:

- Storage capacity: Minimum 17 shafts.

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- Actuators:

2 double acting cylinders, $\varnothing 10$, 10mm stroke. Controlled by a single 5/2 solenoid valve.

- Measuring the shaft height:

The shaft is not symmetrical and must be positioned over the assembly in a specific position. A pneumatic cylinder is used to check whether it hits the shaft when it moves forward or whether it reaches the end of its stroke. This module will have the following components and characteristics:

- Actuators:

- Double acting cylinder, $\varnothing 12$ and 50mm stroke, with speed controllers and end position switch. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Positioning the shaft in the correct position:

If the previous module detects that the shaft is positioned incorrectly, a handling device has to correct it. The handling device is formed by a parallel-rod cylinder, a 180° rotary actuator and a two-jaw gripper. This module will have the following components and characteristics:

- Actuators:

- Gripper with two parallel-opening jaws. Controlled by a single 5/2 solenoid valve.

- Vertical shaft: Double acting parallel-rod cylinder, $\varnothing 15$ and 50mm stroke, with speed controllers and initial and end position switches. Controlled by a single 5/2 solenoid valve.

- Rotary actuator: double acting $\alpha_{max}=180^\circ$, with speed controllers. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.

- Detection of the shaft material:

Two measurements will be taken to determine the shaft material using inductive and capacitive detectors. This module will have the following components and characteristics:

- Sensors:

- PNP inductive detector.

- PNP capacitive detector.



- Removal of incorrect shaft:

It will consist of a handling device that, when it receives the command, will remove the shaft from the plate. It will consist of two pneumatic shafts that will have a vacuum pad as the terminal element. Each one contains a pneumatic cylinder with parallel rods. This module will have the following components and characteristics:

- Actuators:

- Horizontal shaft: Double acting parallel-rod cylinder, $\varnothing 15$ and 100mm stroke, with speed controllers and initial and end position switches and controlled by a double 5/2 solenoid valve.

- Vertical shaft: Double acting parallel-rod cylinder, $\varnothing 10$ and 50mm stroke, with speed controllers and initial and end position switches. Controlled by a single 5/2 solenoid valve.

- Fixing arm: $\varnothing 8$ vacuum pad, with vacuum ejector. Controlled by a single 3/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.
- PNP output vacuum switch.

- Insertion of the shaft in the assembly

It will be formed by a rotoliner handling device to collect the shaft using vacuum technology, move it to the unloading point and position it in the assembly. This module will have the following components and characteristics:

- Actuators:

- Compact linear and rotary drive cylinder, $\varnothing 32$, 25mm stroke, with speed controllers and initial and end of stroke position switches during linear movement and 0° and 180° during rotary movement. Controlled by two single 5/2 solenoid valves.

- Fixing arm: $\varnothing 10$ vacuum pad, with vacuum ejector. Controlled by a single 3/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.
- PNP output vacuum switch.

- Leak detection system:

This station will include a leak detection system. This module will consist of the following components and features:

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- Two non-return flow regulators with silencers to simulate air leaks.

- Breakdown generation system:

The station has the possibility of generating up to 16 breakdowns or malfunctions. For this purpose a box will be assembled on the side of the station structure, inside which there will be 16 switches to activate the same number of breakdowns. When a switch is activated a breakdown will occur in one of the station components. To access these switches, the box lid must be opened, which can be locked.

- Methacrylate enclosure with magnetic safety switch:

This station will have a methacrylate enclosure that completely covers the work area. This enclosure will have a door to access the work field with a magnetic safety switch fitted.

- Security camera:

The station will have a security camera installed in the upper corner of the methacrylate enclosure. This security camera will detect any movement in the restricted security area and send the corresponding signal to the controller should any movement be detected.

- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

- Electrical control panel:

All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- It will include 220VAC/24VDC power supply.
- It will include a programmable safety relay.
- It will include an Ethernet switch with 5 ports.



- 1 control PLC wired and programmed to operate the module.
- Industrial communication via standard Profinet for communication with the other modules.

- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.
- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.

COVER SELECTION AND SUPPLY STATION WITH MODULAR TRANSFER AND PLC

The function of the station will be to feed a lid and move it to the pallet in the transfer system. The station process starts as soon as a pallet with RFID tag stops in front of the station.

The part to be assembled will be a lid. There will be twelve options for cap attachment. Six, in terms of the material: metal, made of anodised aluminium, blue plastic, made of blue nylon and white plastic, made of white nylon. Each cap also comes in two different heights, regardless of the material it is made from.

The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components and a no material indication lamp.

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The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.

It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector and disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Dividing plate:

Made from anodised aluminium, this module will be used as an alternative rotary drive system, such that with each rotary movement it will advance 45 degrees. This will be achieved by a pneumatic pusher cylinder with oscillating drive. It will also have another two limiter cylinders operating alternately, one of them moving which will hold the plate while it turns, and the other fixed, which will lock it once the turning movement has stopped so that the plate is held firmly in place, and the pusher cylinder can return to its initial position to wait for a new cycle. This module will have the following components and characteristics:

- Actuators:

- Compact double acting pusher cylinder, Ø25 and 40mm stroke, with speed controllers and initial position switch. Controlled by a single 5/2 solenoid valve.

- Limits: 2 compact cylinders, Ø16, 10mm stroke. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Feeding the lid

The lids are stored in a gravity feeder. A pneumatic pusher

cylinder extracts one of these. This module will have the following components and characteristics:

- Storage capacity: minimum 19 lids.

- Actuators:

- Double acting pusher cylinder, Ø16 and 100mm stroke, with speed controllers and end position switch. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switch, Reed type.

- Presence sensor: microswitch.



- Loading station:

The lid is loaded on the dividing plate by a handling device formed by a rotoliner cylinder with a gripper with two parallel-opening jaws. This module will have the following components and characteristics:

- Actuators:

- Compact linear and rotary drive cylinder, $\varnothing 32$, 25mm stroke, with speed controllers and an initial and end of stroke position switch during linear movement and 0° and 180° during rotary movement. Controlled by two single 5/2 solenoid valves.

- Fixing arm: Pneumatic grippers with two parallel-opening jaws. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.

- Material detection stations:

Three measurements will be taken to determine the lid material using inductive, capacitive and colour detectors. This module will have the following components and characteristics:

- Sensors:

- Inductive detector.

- Capacitive detector.

- Colour detector.

- Lid measuring station:

The lid height will be measured using a pneumatic cylinder that will move a plunger with regulated pressure until it touches the lid. This cylinder will include a digital transducer that will send a linear encoder with pulse output, depending on the cylinder's stroke. This module will have the following components and characteristics:

- Actuators:

- Double acting cylinder with stroke reading, $\varnothing 20$ and 50mm stroke, with speed controllers. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Linear encoder built into the cylinder.

- Pressure regulator.

Removal of the incorrect lid module:

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It will consist of a handling device that, when it receives the command, will remove the lid from the plate. It will consist of two pneumatic shafts that have three vacuum pads as the terminal elements. Each one contains a pneumatic cylinder with parallel rods. This module will have the following components and characteristics:

- **Actuators:**

- **Horizontal shaft:** Double acting parallel-rod cylinder, $\varnothing 15$ and 100mm stroke, with speed controllers and initial and end position switches. Controlled by a double 5/2 solenoid valve.
- **Vertical shaft:** Double acting parallel-rod cylinder, $\varnothing 10$ and 50mm stroke, with speed controllers and start position switch. Controlled by a single 5/2 solenoid valve.
- **Fixing arm:** 3 $\varnothing 8$ vacuum pads, with vacuum ejector. Controlled by a single 3/2 solenoid valve.

- **Sensors:**

- Auto switches, Reed type.
- PNP output vacuum switch.

- **Lid insertion module:**

The lid is inserted in the assembly by a handling device formed by a rotoliner cylinder with a gripper with two parallel-opening jaws. This module will have the following components and characteristics:

- **Actuators:**

- **Compact linear and rotary drive cylinder,** $\varnothing 32$, 25mm stroke, with speed controllers and initial and end of stroke position switches during linear movement and 0° and 180° during rotary movement. Controlled by two single 5/2 solenoid valves.
- **Fixing arm:** Pneumatic grippers with two parallel-opening jaws. Controlled by a single 5/2 solenoid valve.

- **Sensors:**

- Auto switches, Reed type.

- **Leak detection system:**

This station will include a leak detection system. This module will consist of the following components and features:

- Two non-return flow regulators with silencers to simulate air leaks.

- **Breakdown generation system:**



The station has the possibility of generating up to 16 breakdowns or malfunctions. For this purpose a box will be assembled on the side of the station structure, inside which there will be 16 switches to activate the same number of breakdowns. When a switch is activated a breakdown will occur in one of the station components. To access these switches, the box lid must be opened, which can be locked.

- Methacrylate enclosure with magnetic safety switch:

The station will have a methacrylate enclosure that will protect the entire station surface. This methacrylate enclosure will have a pair of security curtains installed at the front of the station. This security curtain will detect when any foreign object crosses the entrance of the methacrylate screen into the restricted security area.

- Smart IO-link devices:

The system will include a block of electro valves and a colour sensor to detect the colour of the caps. Both devices will use IO Link communication protocol. This smart IO-Link protocol will enable remote access and the parameterization of the sensor and the block of electro valves. It will also provide access to special operating parameters (for example, the number of cycles a pneumatic valve in the block has performed).

- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

- Electrical control panel:

All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- It will include 220VAC/24VDC power supply.
- Safety Relay



- It will include an Ethernet switch with 5 ports.
- 1 control PLC wired and programmed to operate the module.
- IO Link Master.
- Industrial communication via standard Profinet for communication with the other modules.
- Modular transfer system:
The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:
 - Measurements: 1000x130mm. Height: 970mm.
 - Drive: 1 motor: 24 VDC.
 - Actuators:
 - 1 compact double acting cylinder, Ø32, 25mm stroke. Controlled by a 5/2 solenoid valve.
 - Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.

SCREWS SUPPLY STATION WITH MODULAR TRANSFER AND PLC

The function of the station will be to feed four M6X16 DIN912 screws and position them in the holes on the base that will support a turning mechanism on the pallet in the transfer system. The station process starts as soon as a pallet with RFID tag stops in front of the station.

The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components and a no material indication lamp.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.



It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector and disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Screw feeding module:

The screws to be inserted will be stored in a vertical gravity feeder. There will be a pneumatic stepper feeder system, based on two double acting cylinders located opposite each other. This module will have the following components and characteristics:

- Storage capacity: minimum 38 screws.

- Actuators:

2 double acting cylinders, Ø10, 10mm stroke. Controlled by a single 5/2 solenoid valve.

- Transfer module:

Once the screws have been fed, they will be placed on a housing on a dual-parallel rod pneumatic cylinder. This housing will include a fibre optic barrier detector to detect the screw. This cylinder will transfer the screws from the feeding point to a collection point. An analogue magnetic sensor fitted onto the body of the cylinder will be used to determine the position of the double and parallel rod pneumatic cylinder.

This module will have the following components and characteristics:

- Actuators:

Double acting parallel-rod cylinder, Ø20 and 100mm stroke, with speed controllers and analogue magnetic sensor. Controlled by a double 5/2 solenoid valve.

- Sensors:

- Analogue magnetic sensor.

- Fibre optic photocell.

- Screw insertion handling device:

The screws will be loaded on the base held on the pallet using a handling device that will be formed by two pneumatic cylinders with parallel rods, relating to the horizontal and vertical shafts. It will include a pneumatic gripper with two parallel-opening jaws



as the terminal element. Three different magnetic sensors fitted onto the bodies of the actuators will be used to determine the positions of the three pneumatic actuators.

This module will have the following components and characteristics:

- Actuators:

- Horizontal shaft: Double acting parallel-rod cylinder, $\varnothing 25$ and 200mm stroke, with speed controllers and analogue magnetic sensor. Controlled by a double 5/2 solenoid valve.

- Vertical shaft: Double acting parallel-rod cylinder, $\varnothing 15$ and 50mm stroke, with speed controllers and analogue magnetic sensor. Controlled by a single 5/2 solenoid valve.

- Holding system: Pneumatic grippers with two parallel-opening jaws and analogue magnetic sensor. Controlled by a single 5/2 solenoid valve.

- Sensors:

- Analogue magnetic sensors.

- Leak detection system:

This station will include a leak detection system. This module will consist of the following components and features:

- Two non-return flow regulators with silencers to simulate air leaks.

- Breakdown generation system:

The station has the possibility of generating up to 16 breakdowns or malfunctions. For this purpose a box will be assembled on the side of the station structure, inside which there will be 16 switches to activate the same number of breakdowns. When a switch is activated a breakdown will occur in one of the station components. To access these switches, the box lid must be opened, which can be locked.

- Smart IO-link devices:

The system will include a block of electrovalves and analogue sensors to determine the position of the different actuators. Both devices will use IO Link communication protocol.

This smart IO-Link protocol will enable remote access and the parameterization of the sensors and the block of electrovalves. It will also provide access to special operating parameters (for example, the number of cycles a pneumatic valve in the block has performed).



- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

- Electrical control panel:

All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- It will include 220VAC/24VDC power supply.
- Safety Relay
- It will include an Ethernet switch with 5 ports.
- 1 control PLC wired and programmed to operate the module.
- IO Link Master.
- Industrial communication via standard Profinet for communication with the other modules.

- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.
- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
 - 1 double acting cylinder with guide, $\varnothing 16$, 30mm stroke, with air speed controllers. Controlled by a single 5/2 solenoid valve.

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- 1 two-way rotary actuator, max: 90°, with air speed controllers. Controlled by a single 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.

ROBOTIZED SCREWING STATION WITH MODULAR TRANSFER AND PLC

The function of this station will be to screw and assemble and disassemble the turning mechanism components. The station process starts as soon as a pallet with RFID tag, with a turning mechanism inside, stops in front of the station.

The parts to be assembled will be shafts, 14.6 diameter and 41mm height and lids that will fit on the shafts.

The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components that carry out the process are mounted.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.

It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector and disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5µm filter with a pressure controller, pressure gauge, manual 3/2 stop valve.

The station will comprise the following modules:

- Shaft and lid warehouses:

The station will have two shaft and lid warehouses to store 3 shafts and 3 lids each. They will be made from anodised aluminium.

- Robot tools:



The station will include a double tool that will be formed by a pneumatic parallel-opening multi-jaw gripper and an electric screwdriver. This tool will include the necessary coupling to be assembled in the robot arm. This module will have the following components and characteristics:

- Electric screwdriver.
- Parallel-opening pneumatic gripper controlled by a solenoid valve.
- Auto-switch reed type.

- Robot arm and controllers:

It will be formed by an anthropomorphic robot arm, 6 DOF, controller unit and programming console. This module will include the following components and characteristics:

- Robot: minimum 6 shafts.
- Robot controller.
- Programming console.

- Methacrylate enclosure with magnetic safety switch:

This station will have a methacrylate enclosure that completely covers the work area. This enclosure will have a door to access the work field with a magnetic safety switch fitted.

- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

- Electrical control panel:

All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- Built-in thermal switch.
- Safety Relay
- It will include an Ethernet switch with 5 ports.
- It will include 220VAC/24 VDC and 220VAC/5VDC power supplies.

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- 1 control PLC wired and programmed to operate the module.
- Industrial communication via standard Profinet for communication with the other modules.
- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.
- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
 - 1 double acting cylinder with guide, $\varnothing 16$, 30mm stroke, with air speed controllers. Controlled by a single 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.

STORAGE STATION WITH MODULAR TRANSFER AND PLC

The function of this station is to automatically store the finished product. The station process starts as soon as a pallet with RFID tag, with an assembly inside, stops in front of the station. Once the pallet is free again, it can be used in a new cycle.

The assembly to be stored will be a turning mechanism formed by a 65x65x32mm anodised aluminium block with an opening at the top, 32mm diameter, and an opening in the bottom, 28mm diameter, that can house a bearing, shaft, lid and four screws inside.

The station will be formed by a 900x540x900mm height-adjustable aluminium structure, on which the components used to perform the process will be mounted, which include a block of control solenoid valves in the case of pneumatic components.

The electrical panel will be on the front, from which the station will be controlled. A magneto-thermal switch will be installed.



It will also include the control keypad, with the following buttons and indicator lights: start, stop and reset buttons, continuous/single cycle selector and disconnecting switch, endorsed emergency stop button and error warning light.

On one side of the station there will be an air treatment unit comprising a 5 μ m filter with a pressure controller, pressure gauge and manual 3/2 stop valve.

The station will comprise the following modules:

- Vertical shaft:

The vertical shaft will be formed by a parallel rod pneumatic cylinder to which a platform is attached with four vacuum pads to hold the part. This module will have the following components and characteristics:

- Actuators:

Double acting parallel-rod cylinder, \varnothing 20 and 75mm stroke, with speed controllers and initial and end position switches. Controlled by a single 5/2 solenoid valve.

- Holding system: 4 \varnothing 16 vacuum pads, with vacuum ejector. Controlled by a single 3/2 solenoid valve.

- Sensors:

- Auto switches, Reed type.

- PNP output digital vacuum pressure switch.

- Leak detection system:

This station will include a leak detection system. This module will consist of the following components and features:

- Two non-return flow regulators with silencers to simulate air leaks.

- Methacrylate enclosure with magnetic safety switch:

This station will have a methacrylate enclosure that completely covers the work area. This enclosure will have a door to access the work field with a magnetic safety switch fitted.

- Positioning shafts:

The system to position the assembly at the different points on the desktop surface will be formed by two motorised linear shafts. The pneumatic vertical shafts will be



attached to one of the positioning shafts and will form a three-shaft system (x,y,z) two of which will be able to position. This module will have the following components and characteristics:

- Actuators:
 - 2 linear servodriven actuators.

- HMI:

The station will integrate a Human Machine Interface with an application that will allow the status of the station to be displayed: initialising, ready, busy, alarm. It will also allow the selection of the working mode: manual, integrated and ALDS mode. Additionally, each station will have commands or specific information about the process being carried out in the station.

- Electrical control panel:

All of the pneumatic cables and tubing must be properly identified and labelled at both ends.

- Mounted on a 550x400mm mesh
- Accessible electrical connection terminal box with power input and coded I/O.
- It will include 220VAC/24VDC power supply.
- It will include 2 drivers to control the motors built into the linear actuators, one of them with digital inputs and outputs and the other via fieldbus.
- It will include programming software and cable for the servodrivers.
- Safety Relay
- It will include an Ethernet switch with 5 ports.

- 1 control PLC wired and programmed to operate the module.
- Industrial communication via standard Profinet for communication with the other modules.
- Modular transfer system:

The transport system consists of an aluminium transfer section joined to the station to be able to configure different layouts, change the methods of assembling the unit, hold and identify the part type on the pallet and increase the system. The actuators and sensors will be controlled by a field bus. This module will have the following components and characteristics:

- Measurements: 1000x130mm. Height: 970mm.



- Drive: 1 motor: 24 VDC.
- Actuators:
 - 1 compact double acting cylinder, $\varnothing 32$, 25mm stroke. Controlled by a 5/2 solenoid valve.
- Sensors:
 - 1 microswitch.
 - Field bus module: Module required to implement 4 digital inputs and 4 outputs in the transfer section.
 - RFID antenna to write information onto the RFID tag.
 - Artificial vision camera to check the quality of the turning mechanism before storing or shipping it.

MANAGEMENT SOFTWARE

It will consist of a management software package that includes an online permanent MES Production Execution System, integrated into the plant.

It will allow the user to control and manage the system, by storing and monitoring all of the process data. It will be arranged into four blocks: management, movements, supervision and administration.

General characteristics:

- Access via Internet/LAN
- Multiplatform
- Multi-user

Characteristics:

- Definition of the physical lay-out:
 - It will make it possible to inform the software of the physical lay-out. It will be possible for this physical lay-out to be extended to a maximum of 8 stations.
- System status:
 - o Will make it possible to check the status of each station: station connected, manual or integrated mode, position of the work underway and identification of the station status: work/alarm.
- Order management:
 - o Will make it possible to register production orders and dispatch orders.
 - o Will mean that production orders can be made to stock or for a predefined customer.
 - o Will make it possible to produce 98 different products.
- Dispatcher

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- o Will make it possible to filter according to the following types of orders:
 - ☑ Make To Order: Order for specific end client
 - ☑ Make To Stock: Warehouse order
 - ☑ Expedition Order: Shipping order
 - ☑ Combined orders, for specific end client and shipping order
 - Warehouse
- o Will make it possible to deactivate and activate locations in the warehouse.
- o Will make it possible to control the following minimum information per stored item: product name and RFID ID.
- o Will make it possible to control which of the products are already assigned to customers in the registered shipping orders.
- o Will make it possible to enter and delete items in the warehouse.
 - Tracking
- o Will make it possible to track orders and products.
 - Notifications
- o Will provide information about events occurred during the manufacturing process.
 - User management
- o Will make it possible to modify the settings of the predefined user.

SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM

The system will come with a SCADA application to supervise the process carried out. This will be open and will allow other projects to be changed or implemented (alarm manager, report editor, graphics, etc...).

The SCADA structure will be via screens, i.e. the screen for each station can be accessed from a main screen.

The SCADA screen for each processing station will comprise:

- Keypad: including the "start", "stop", "auto/man" and "reset" buttons.
- Display of alarms generated in each station, for example, air shortage, shortage of raw material, station switched off and station malfunctioning.
- Station synoptic screen: includes the different station modules that allow the process carried out in each station and each of the movements in real time to be monitored remotely.

It will come with a software licence to control at least 50 variables and a run-time licence for 2 hours of continuous running.

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PLC programming software – Quantity: 1

- It will include 1 programming software license for PLC.

Ethernet cable – Quantity: 1

- It will include 1 standard Ethernet cable with (2x) RJ-45 connectors.

3D SIMULATION APPLICATIONS

It should enable the user to simulate, control and supervise the real automated process from a virtual environment.

It will be comprised of software applications which will include 3D models of the real process.

Each application should include the following features:

- Compatibility with simulation software in automation applications.
- Independent window with 3D model.
- Independent window with keypad and control commands.
- Access to the programming editor of a built-in virtual PLC responsible for controlling the movements of the 3D model.
- Access to the symbols table in the virtual PLC.
- Access to the libraries and to the simulation panel for components in pneumatics, electro-pneumatics, hydraulics, electro-hydraulics and electrics.

The simulator will include the following applications:

- Automated flexible assembly cell comprised of:
 - o Base supply.
 - o Bearing insertion.
 - o Bearing hydraulic pressing.
 - o Axis insertion.
 - o Cap insertion.
 - o Screw insertion.
 - o Robotic screwing.
 - o Warehouse.

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The package must include 16 licences for its use along with simulation software for automation applications.

OTHER REQUIREMENTS

- Platform should include human-centered automation
- Automated quality checks must be included with respect to operator functions
- The cell should provide access to and interoperability of components for monitoring and control operations.
- Supply of training curriculum must be included
- After-sales support in terms of upgrades, maintenance and addition of modules where relevant must be included
- Industry relevant (focused on South African markets) training applications
- The training system must be suitable for application at the level of universities, vocational training centres, technical training centres, education research and development centres
- The supplier will deliver the physical infrastructure, controlling software, training, installation and provide maintenance and support of the training system.
- All software needs to be installed on provide computers and tested to show they are working
- Propose and cost a LMS system



Annexure A: Mandatory Requirements

Description of Appendix	Requirement	Circle yes if submitted	
		Yes	No
RFQ Document	Submission of a detailed and signed quotation	Yes	No
Technical specifications and pricing	Pricing according to the technical specification	Yes	No
Proof of Bank Account	Signed letter from the Bank (not older than 3 Months)	Yes	No
Company registration documents	Supply Company registration documents	Yes	No
Tax PIN	PIN Status certificate	Yes	No
BBBEE certification	A valid BBBEE certificate / An original Sworn-In Affidavit	Yes	No
Declaration of Interest	SBD 4 SBD 6.1 SBD 6.2 SBD 8 SBD 9	Yes	No
CSD	Supply proof of registration with the National Treasury	Yes	No
ID Copy of Company's director(s)	Supply with certified copy of IDs	Yes	No
Complete and sign the official document	Request for proposal form to be completed, signed and email back	Yes	No
Eligible Companies	OEM's or authorised resellers or distributors. Must provide signed letter that you are an authorised reseller/distributor of the product in South Africa	Yes	No

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Annexure B: Functional criteria

MECH1 FAS SYSTEM

Functional/Technical criteria	Weighting	0	5	7	10
Technical review. Provide detail technical proposal for a Mech FAS System	50%	Meeting not all of the requirements	NA	NA	Meets all of the requirements
Technical Capability Organisation should demonstrate experience in constructing similar equipment, providing case studies or references for similar projects.	40%	No experience or capability are demonstrated	Limited experience and capabilities demonstrated	NA	Relevant capabilities and experience are demonstrated
Concept Design Provide a concept design of the training desk through a CAD drawing or rendering. This should provide the evaluator with a view of how the equipment is going to look like once completed.	10%	No design	Poor design	NA	Good design

Handwritten signature or mark.