



Series MMS4

Cat No MMS4-01-01-A

# 4. Modular Manufacturing System with Industry 4.0 Combination of Stations (1-2-3-4-5)

#### Features

- Modular System
- Energy Management
- Augmented Reality
- Manufacturing Execution System
- > Over All Equipment Effectiveness (OEE)
- Management Information System
- Intelligent Maintenance system



#### Application

The Modular Manufacturing System with Industry 4.0 is a miniature Smart Factory Automation System which demonstrates the application of latest manufacturing processes and Technologies in the complete value chain. It enables user to learn and understand the following technologies connected to Industry4.0

- Digitisation of entire value chain
- > Concepts, Architecture and design of IIoT systems
- Simulate and Develop the concept of various integration associated with Industry 4.0 such as Vertical, Horizontal, Integrated & Digital workforce
- > Remote monitoring and controlling of machine in real time
- > Experiencing AR (Augmented Reality) through Mobile application
- > Data communication to cloud through IOT Gateway module and Kepware (OPC)

Ordering No	MMS40-C01-P11-B03
Size (L x W x H) in cm	300 x 70 x 150
Installation	Vertical
Medium	Compressed air
Operating Voltage (Primary)	230V AC, 50Hz
Power Consumption	1KW ( 1.4 KVA)
Operating Voltage (Secondary)	24V DC
Material	CRCS, Aluminium, SS





Series MMS4

Cat No MMS4-01-01-A

#### System Architecture & Function



(The product image is only for reference)

#### Function

The Modular Manufacturing System with Industry 4.0 is a miniature factory which includes the industry standard processes such as Feeder, Inspection, Buffer, Process and Sorting.

The MMS4.0 system produces orders executed from Manufacturing Execution System (MES) which is an interface for the complete value chain management.

The feeder station feeds the work pieces to the Inspection station. The Inspection station measures the height of the components and transfers the correct components to buffer station. Buffer Station ensures steady flow of components to the process station by allowing one component at a time for processing. The process station is performing drilling operation and further transfers the work pieces to the sorting station. The sorting station segregates the work pieces based on the RFID tag.





Cat No MMS4-01-01-A

## **System Features**

## **1. PRODUCTION MONITORING – ANDON**

Production Monitoring	Production Start Production Stop	Parts Planned 10	Plant Janatics Andon System
Feeder	Inspection	Buffer	Process
Part Count 11	Part Count 16	Part Count 0	Part Count 0
Run Time (mins) 12807	Run Time (mins) 12807	Run Time (mins) 12807	Run Time (mins) 11509
Total Downtime	Total Downtime 0	Total Downtime 0	Total Downtime 0
Robot	Assembly	Sorter	
Part Count 0	Part Count 0	Part Count 0	
Run Time (mins) 12807	Run Time (mins) 12807	Run Time (mins) 11512	
Total Downtime	Total Downtime	Total Downtime	
	Production Monitoring	Production Monitoring     Production Start     Production Start       Feeder     Inspection       Part Count     11       Run Time (mins)     12807       0 %     0       0 %	Production MonitoringProduction StartProduction StartParts Planned 10FeederInspectionPart Count1Run Time (mins)128070 %0

Production monitoring enables to understand the Productivity, Run Time & Down Time of the various machines available in the factory.

#### 2. OVERALL EQUIPMENT EFFECTIVENESS - OEE

	Plant     Image: Constraint of the status     Machine     Freeder       Production     Machine Status     RUNNING	Outine SPC
	Overall Equipment Effectiveness	Production Summary
Production	5 % 100 % 5 % 100 % Q	Day Target Total Produced Part Count 2 Total Accepted Part Count 2
	OE - Ornal Equipment Electromess A - Auslability P. Performance Q. Quality	Total Rejected Part Count 0
	Production Trends	
Utility	07-2	10.42.45 10.43.25 10.44.05 10.44.45 10.45.25 10.46.05
10:45 AM 6/19/2020	Machine Status	
Logout	102 102 PRunning Operator Loss Minor toppage Break time Breakdown diale Planned maintenan Company Company and C	366 408 510 Tool replacement O Quality rework/inspection Management loss internal logistics loss
	Setup Consumables Ioss Conners	

OEE (Overall Equipment Effectiveness) enables to measure and monitor the Performance, Quality & Availability of the Individual Machines





Cat No MMS4-01-01-A

#### 3. MACHINE MONITORING



Condition monitoring enables to monitor the real time data of the machine through which down time can be reduced

#### 4. ENERGY MANAGEMENT

	Snergy Monanny Air Montaning			Drwgy Venitoria	ng Air Monitoving			
[[***	Electrical Ener	rgy Consumption				Air Const	umption	
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Energy management enables to monitor and record the trend of Electrical and Air consumption of the machine





Cat No MMS4-01-01-A

## 5. INTELLIGENT MAINTENANCE SYSTEM



Intelligent Maintenance System enables to monitor the Breakdowns

#### 6. MANAGEMENT INFORMATION SYSTEM



Management information system enables to monitor the trend of Production and Downtime





Series MMS4

Cat No MMS4-01-01-A



## 7. MANUFACTURING EXECTUTION SYSTEM

Manufacturing Execution system enables to monitor the complete customer value chain right from order to cash flow

## 8. AUGMENTED REALITY - TAB



Augmented reality enables to see Real-time data, assembly instruction, step by step instructions, and machine to design visualization





Series MMS4

Cat No MMS4-01-01-A

## Part List

Modular Manufacturing System with Industry 4.0 Combination of Stations (1-2-3-4-5)

S.no	Products description	Qty	Ordering code MMS4.0 Basic MMS40-C01- P11-B03
1.	MMS4.0 Control Unit	1no	✓
2.	Feeder Station with HMI	1no	✓
3.	Inspection Station with HMI	1no	$\checkmark$
4.	Buffer Station with HMI & RFID	1no	✓
5.	Process Station with HMI	1no	✓
6.	Sorting Station with HMI & RFID	1no	✓
7.	PLC Software And Accessories	1set	✓
8.	Technical Documents	1set	✓
9.	Work Piece set with RFID Tag	1set	✓
10.	Smart Manufacturing Execution System Application with 3 year subscription	1no	✓
11.	Janatics Augmented Reality Application– JARA4.0 with 3 year subscription	1no	✓

#### Note:

- 1. Apple I-Pad and Desktop PC / Laptop is mandatory for effective utilization of software application, which has to be purchased and preconfigured by end user@.
- 2. Smart Manufacturing Execution System Application & Janatics Augmented Reality Application is provided on SaaS basis with 3 years subscription, which shall be renewed after the term
- 3. Compressed Air connection with Max. 8 bar pressure to be provided by the customer.

#### @ - Recommended System Requirements

	Desktop PC / Laptop	-	Pad
Configuration Processor: 12th Generation Intel® Core ™ i5 processor or Latest Hard disk: 512GB or above RAM : 8GB or above	Make	Apple	
	Screen Size	11 Inch	
	RAM	16 GB	
	Connectivity	Wi-Fi + Cellular	
	Screen Size	11 Inch	
	Memory	128 GB	
	Accessories	Smart Folio for iPad Pro	
	A0003301103	11-inch	





Cat No MMS4-01-01-A

## 1. MMS4.0 Control Unit



Ordering No	JPS1588
Size (L x W x H) in cm	60x83x20
Installation	Vertical
Medium	Electrical
Operating Voltage +/- 10%	230V
Power consumption	180 W (224 VA)
Material	CRCS





Series MMS4

Cat No MMS4-01-01-A

## 2. Feeder Station with HMI

#### Features

- Vacuum based 180° Rotary Pick and Place
- Energy saving vacuum ejector
- Industrial control console
- Completely preassembled system
- Easy to use, and commission
- Workbook with tasks and Solutions



These Mechatronics systems are fully functional models of actual applications, mimicking hybrid, real life, industrial automation scenarios. A wide variety of project assignments and learning objectives help students to build hybrid systems by integrating important automation technologies, such as

- Pneumatics
- Electrical
- PLC
- Mechanical
- Sensors
- Vacuum

Model	MMS40-S14-P11
Size(in cm)	54x70x134
Installation	Vertical
Ambient temperature	60°C Max.
Medium	Filtered Compressed air
Operating Pressure range (Bar)	6-8 bar
Operating Voltage +/- 10%	230V AC, 50HZ
Power consumption	180 W (224 VA)
Sensors and actuator operating voltage	24V, DC
Material of construction	Aluminum, mild steel, Plastic. etc.







Series MMS4

Cat No MMS4-01-01-A

Function



The Feeder Station separates the components from the Stack Magazine and distributes the components one by one via rotary pick and place module for further processing. The Station consist of the following major parts

- FRCLM module
- Dispensing module
- Rotary Pick and Place module
- Valve module
- I/O Interface Module
- Profile Table work bench
- PLC control
- HMI Control Console

The Dispensing module separates the jobs stacked in magazine tube with the help of pneumatic cylinder and provisions made for detecting the availability of jobs with optical sensors. Rotary Pick and Place module have a rotary actuator with an arm and suction cup to pick up work pieces and relocate them to positions from '0 degree to 180 degrees' on horizontal plane, so as to feed the subsequent stations. The end positions of all pneumatic actuators are detected by using Magnetic sensors.

The feeder station consists of aluminium anodized profile table, filter regulator and lubricator unit with pressure gauge, solenoid valve, one touch fittings mounted with suitable mountings for easy assembly and disassembly.

Networking and signaling the subsequent station for further processing done by establishing IO and field bus communication between the PLC's of subsequent stations. The PLC used for the station is capable of handling digital inputs and outputs, and it has Ethernet interface to communicate with PC for programming





Series MMS4

Cat No MMS4-01-01-A

## 3. Inspection Station with HMI

#### Features

- LVDT based height measurement
- Rod less Pneumatic drive
- Industrial control console
- Completely preassembled system
- Easy to use, and commission
- Workbook with tasks and Solutions

#### Application

These Mechatronics systems are fully functional models of actual applications, mimicking hybrid, real life, industrial automation scenarios. A wide variety of project assignments and learning objectives help students to build hybrid systems by integrating important automation technologies, such as

- Pneumatics
- Electrical
- PLC
- Mechanical
- Sensors

Model	MMS40-S15-P11
Size(in cm)	68x64x135
Installation	Vertical
Ambient temperature	60°C Max.
Medium	Filtered Compressed air
Operating Pressure range (Bar)	6-8 bar
Operating Voltage +/- 10%	230V AC, 50HZ
Power consumption	180 W (224 VA)
Sensors and actuator operating voltage	24V, DC
Material of construction	Aluminum, mild steel, Plastic.etc.







Series MMS4

Cat No MMS4-01-01-A

Function



The Inspection station measures the height of the components received from its up stream station and transfers the correct and incorrect components to appropriate slides.

The Inspection station consists of following

- FRCLM module
- Inspection module
- Inspection slide module
- Valve module
- I/O Interface Module
- Profile Table work bench
- PLC control
- HMI Control Console

Inspection station checks the jobs for height of about 25 mm using analog sensors and provisions has made to detect work piece presence with the help of optical sensor. An arrangement is provided to transfer the right work piece by a slide to the next station and send faulty rejected work piece to the rejection bay.

Station consists of anodized profile table, filter regulator and lubricator unit with pressure gauge, on/off valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

Networking and signaling the subsequent station for further processing done by establishing IO and field bus communication between the PLC's of subsequent stations. The PLC used for the station is capable of handling digital inputs and outputs, and it has Ethernet interface to communicate with PC for programming.





Series MMS4

Cat No MMS4-01-01-A

## 4. Buffer Station with HMI & RFID

#### Features

- DC Brushless motor conveyor
- Twin Piston rod cylinders
- Industrial control console
- Completely preassembled system
- Easy to use, and commission
- Workbook with tasks and Solutions



#### Application

These Mechatronics systems are fully functional models of actual applications, mimicking hybrid, real life, industrial automation scenarios. A wide variety of project assignments and learning objectives help students to build hybrid systems by integrating important automation technologies, such as

- Pneumatics
- Electrical
- PLC
- Mechanical
- Sensors

Model	MMS40-S16-P11
Size(in cm)	55x64x106
Installation	Vertical
Ambient temperature	60°C Max.
Medium	Filtered Compressed air
Operating Pressure range (Bar)	6-8 bar
Operating Voltage +/- 10%	230V AC, 50HZ
Power consumption	180 W (224 VA)
Sensors and actuator operating voltage	24V, DC
Material of construction	Aluminum, mild steel, Plastic.etc.





Series MMS4

Cat No MMS4-01-01-A

#### Function



Buffer Station ensures steady flow of components to the process station by allowing one component at a time for processing. It can store upto 5 work pieces at a time and if the entry count has exceeded 5, it communicates with the upstream stations to STOP the processing activities until the exit count reaches <5. Buffer Station consists of the following

- FRCLM module
- Conveyor module
- Valve module
- I/O Interface Module
- Profile Table work bench
- PLC control
- HMI Control Console
- RFID System

Buffer station is capable of buffering up to 5 jobs. Buffering process should be controlled by a separator using up-stream and down-stream light barriers sensors. Retro reflective sensor detects the inserted job and keeps tag on the nos. of jobs buffered precisely while the separator module passes the job to the downstream station if the transfer point is free. The buffer station waits for the signal from the down-stream station & as soon as it receives the signal then the material is transferred. The end position of all pneumatic actuators is detected by using Magnetic sensors. The station includes RFID reader with I/O Link communication for work piece traceability.

The station consists of anodized profile plate, filter regulator and lubricator unit with pressure gauge, on/off valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

Networking and signaling the subsequent station for further processing done by establishing IO and field bus communication between the PLC's of subsequent stations. The PLC used for the station is capable of handling digital inputs and outputs, and it has Ethernet interface to communicate with PC for programming





Series MMS4

Cat No MMS4-01-01-A

## 5. Process Station with HMI

#### Features

- 6 stage Rotary Indexing table
- Rod less Pneumatic drive
- Pneumatic motor
- Completely preassembled system
- Easy to use, and commission
- Workbook with tasks and Solutions



#### Application

These Mechatronics systems are fully functional models of actual applications, mimicking hybrid, real life, industrial automation scenarios. A wide variety of project assignments and learning objectives help students to build hybrid systems by integrating important automation technologies, such as

- Pneumatics
- Electrical
- PLC
- Mechanical
- Sensors

Model	MMS40-S17-P11
Size(in cm)	72x64x141
Installation	Vertical
Ambient temperature	60°C Max.
Medium	Filtered Compressed air
Operating Pressure range (Bar)	6-8 bar
Operating Voltage +/- 10%	230V AC, 50HZ
Power consumption	180 W (224 VA)
Sensors and actuator operating voltage	24V, DC
Material of construction	Aluminum, mild steel, Plastic. etc.





Series MMS4

Cat No MMS4-01-01-A

Function



The Process Station performs the mechanical operations like Drilling, Inspection etc on a pneumatically driven rotary indexing table and transfers the work piece via transfer module to downstream Station. The Process Station consists of the following

- FRCLM module
- Rotary Indexing table module
- Drilling module
- Transfer module
- Valve module
- I/O Interface Module
- Profile Table work bench
- PLC control
- HMI Control Console

The processing station is capable of processing machining operations like drilling/grinding/polishing using pneumatically driven indexing table and electrically driven drilling machine using the six processing locations on the indexing table. A pneumatic linear drive module moves the drill unit up and down. Provisions can be made to detect the position of hole and the depth of hole using sensors. The station is provided with Pick and place module with 3 jaw gripper to transfer the job the down stream station.

The station should consist of anodized profile plate, filter regulator and lubricator unit with pressure gauge, ON/OFF valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

Networking and signaling the subsequent station for further processing done by establishing IO and field bus communication between the PLC's of subsequent stations. The PLC used for the station is capable of handling digital inputs and outputs, and it has Ethernet interface to communicate with PC for programming.





Series MMS4

Cat No MMS4-01-01-A

## 6. Sorting Station with HMI & RFID

#### Features

- DC Brushless conveyor
- Twin piston rod cylinder
- Inductive sensor
- Optical based RGB colour sensor
- Completely preassembled system
- Easy to use, and commission
- · Workbook with tasks and Solutions

## Application

These Mechatronics systems are fully functional models of actual applications, mimicking hybrid, real life, industrial automation scenarios. A wide variety of project assignments and learning objectives help students to build hybrid systems by integrating important automation technologies, such as

- Pneumatics
- Electrical
- PLC
- Mechanical
- Sensors

Model	MMS40-S18-P11
Size(in cm)	54x64x110
Installation	Vertical
Ambient temperature	60°C Max.
Medium	Filtered Compressed air
Operating Pressure range (Bar)	6-8 bar
Operating Voltage +/- 10%	230V AC, 50HZ
Power consumption	180 W (224 VA)
Sensors and actuator operating voltage	24V, DC
Material of construction	Aluminum, mild steel, Plastic.etc.







Series MMS4

Cat No MMS4-01-01-A

## Function



Sorting Station sorts the incoming work piece based on colour and material characteristics to appropriate slides

The Sorting Station consists of the following

- FRCLM module
- Sorting Conveyor module
- Valve module
- I/O Interface Module
- Profile Table work bench
- PLC control
- HMI Control Console
- RFID System

The sorting station has 3 slides to sort the different materials and color of jobs that are arriving at this station. The sensors sense the presence of jobs at the start of the conveyor and also to detect features of the jobs in order to start the conveyor and control the diversion of material in the appropriate slide. The pneumatically actuated sorting arrangements extend to intercept the work pieces into the appropriate slides. The station includes RFID reader with I/O Link communication for work piece traceability.

The station consists of anodized profile table, filter regulator and lubricator unit with pressure gauge, ON/OFF valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

Networking and signaling the subsequent station for further processing done by establishing IO and field bus communication between the PLC's of subsequent stations. The PLC used for the station is capable of handling digital inputs and outputs, and it has Ethernet interface to communicate with PC for programming.





Cat No MMS4-01-01-A

## 7. PLC software and accessories

Ordering No	A90097	
PLC programming software – S	iemens TIA Portal	
Technical	specifications	
Make	Siemens TIA Portal Basic	imatic
License	Single User, Floating license	SIEMERS
Supported programming language	ST, FBD, Ladder	
Version	V15 or Latest	
Packing	CD with case	
PLC programming cable		
Technical	specifications	
Make	Pheonix	
Cable	RJ45 to RJ45	
Length	5meter	
Packing	CD with case	





Series MMS4

Cat No MMS4-01-01-A

## 8. Technical Documents



Technical document contains the technical details of the station according to DIN ISP 1219 standard. It includes Pneumatic & Electrical circuit, positional sketch, assembly procedure, installation procedure, technical specifications of components and Troubleshooting etc.

S.no	Description	Qty
1	Technical Document for Feeder station	1
2	Technical Document for Inspection station	1
3	Technical Document for Buffer station	1
4	Technical Document for Process station	1
5	Technical Document for Sorting station	1
6	Technical Document for Combination stations	1

## 9. Work Piece set with RFID Tag

Ordering code		MMS-WP-04
Technical Specification		
Туре	Inbuilt with RF	ID tag
Work piece Approved	Diameter	39.5mm
	Height	25mm
Work piece Rejected	Diameter	39.5mm
	Height	23.5mm
Aluminium Work Piece - Approved		1set (6nos)
Delrin Work Piece - Approved		1set (6nos)
Hylum Work Piece - Approved		1set (6nos)
Rejection work piece –		6 no's (Each 2nos)
Aluminium, Delrin & Hylum		





Series MMS4

Cat No MMS4-01-01-A

## 10. Smart Manufacturing Execution System

#### Features

- Production Monitoring
- Overall Equipment Effectiveness OEE
- Condition Monitoring
- Order Management
- Energy Management
- Management Information System
- Maintanence

## Application

The SMES4.0 application is a Manufacturing Intelligent System, which establishes the communication between Operational technology (OT) and Information Technology (IT) for the complete value chain management of the Smart manufacturing System. It is provided on SaaS (Software as a Service) platform with yearly subscription.







## Series MMS4

Cat No MMS4-01-01-A

# 11. Janatics Augmented Reality Application- JARA4.0

#### Features

- Detects machine without any identification marks like QR code
- Displays the real time machine status and error notification for machine monitoring and diagnostics
- Provides online user manual and machine assembly & dismantling procedure
- Provides user to generate machine report
- Possible to self-create the error notifications for learning purpose
- It is compatible to mobile gadgets iOS & wearable gadget

#### Application

Janatics AR app allows users to create and access Augmented Reality experiences of the Modular Manufacturing System on your tablet or smartphone. Janatics AR application is freely downloadable from Apple store

Janatics AR app displays the real time machine data, the troubleshooting procedure in the form of digital documents and Videos and Machine downtime report. User can also configure and position the real time data variables to be displayed and integrate them with products like modular manufacturing system.

