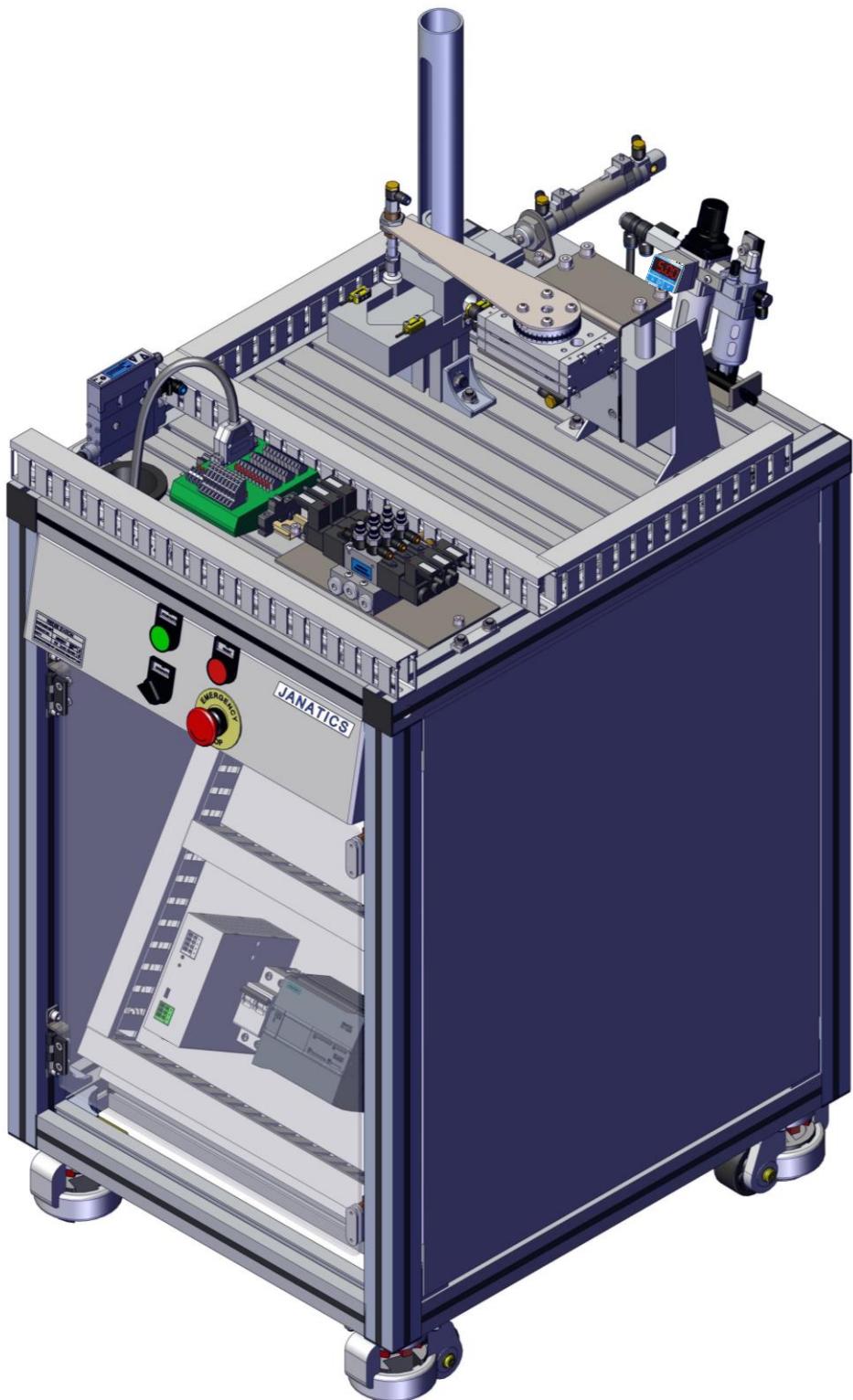


Feeder station

INDUSTRY
4.0



Preface

It is a concept which lets an industry to plan & setup their Smart Factory Automation System, so that they can be integrated with OT & IT systems through IIoT

JANATICS range of MMS4 system developed for educational purpose will demonstrate the application of latest manufacturing processes and Technologies in the complete value chain. It enables user to learn and understand the technologies connected to Industry4.0

Learning Outcomes

- ❑ Digitalization of entire value chain
- ❑ Concepts, Architecture and design of IIoT systems
- ❑ Simulate the concept of System Integration
- ❑ Remote monitoring of machine in real time
- ❑ Data communication to cloud through IOT Gateway module
- ❑ Experiencing AR (Augmented Reality) through Mobile application

Intended use

This module has been developed and produced exclusively for vocational and further training in the field of Mechatronics and automation. The training authority and/or the instructors are to ensure that trainees observe the safety instructions described in the manual provided.

DESCRIPTION : Feeder station

ISSUED BY : JANATICS INDIA PVT LTD

EDITION : 1.0 / 2023

© Copyright by Janatics India Private Limited

All rights reserved, including translation rights. No part of this publication may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopying, or otherwise, without the prior written permission of Janatics India Private Limited.

INDEX

SI No	Content	Page No
1.	Notes on safety	4
2.	Description	5
3.	Technical specifications	7
4.	Installation instructions	8
5.	Operation instructions	9
6.	Assembly views	10
7.	Assembling / Dismantling of feeder Station	12
8.	Wires and tubes routing instructions	23
9.	Terminal block diagram	25
10.	Table of components	26
11.	Positional sketch	27
12.	Step displacement diagram	29
13.	Electro pneumatic circuit	30
14.	Sequential function chart	31
15.	Electrical symbols for Input output elements	32
16.	PLC input and output wire connection diagram	33
17.	Inputs & Outputs list	36
18.	Assembly line sequence diagram	37
19.	System steps	38
20.	Technical information	39
21.	Maintenance instructions	67
22.	Do's and Don'ts	68
23.	Trouble shooting	69

** Chapter number 7 is applicable only if the sub-modules (Pre-Assembled/DIY kits) are procured and the MMS is assembled by customer/end user.

1. Notes on safety

In the interests of your own safety, please observe the following safety instructions:



General

- Trainees must only work on a station under the supervision of an instructor.
- Observe the data in the data sheets for the individual components, particularly all safety instructions!

Electrical

- Electrical connections are to be wired-up or disconnected only when the power supply is turned off!
- Use only appropriate main power supply as recommended in technical specifications.

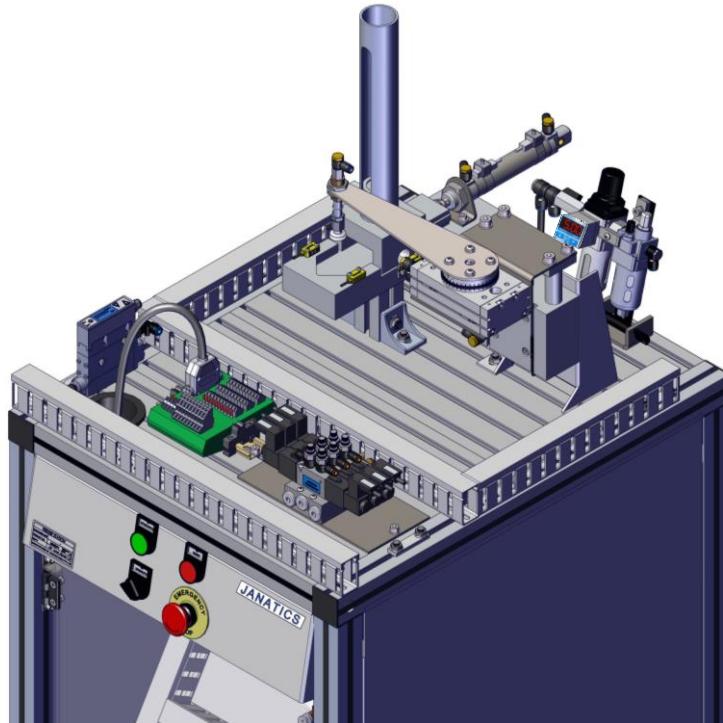
Pneumatic

- Do not exceed the maximum permissible pressure of 8 bar (800 Pa).
- Do not switch on the compressed air supply until you have established and secured all tubing connections.
- Do not disconnect air lines under pressure.
- Care should be taken while switching on the compressed air supply. Cylinders may advance or retract and cause injury, as the compressed air is switched on

Mechanical

- Attach all components securely on the mounting plate.
- No manual intervention is to take place unless the machine is at rest.

2. Description



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 consists of the following major parts

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

The Feeder station separates jobs stacked in magazine tube with the help of pneumatic cylinder, Rotary pick and place module having a rotary actuator with an arm and suction cup transfers the job through 180 degrees, so as to feed the subsequent stations. Provisions have been made for detecting the availability of jobs with optical sensors. Networking and signaling the subsequent station for further processing is done by establishing I/O communication between the PLC's of subsequent stations

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

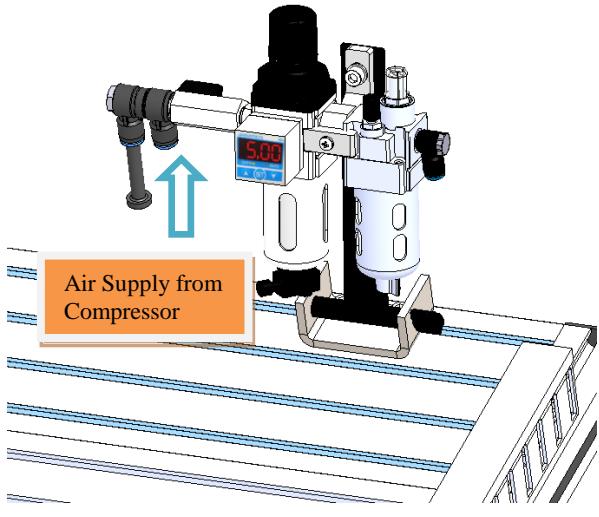
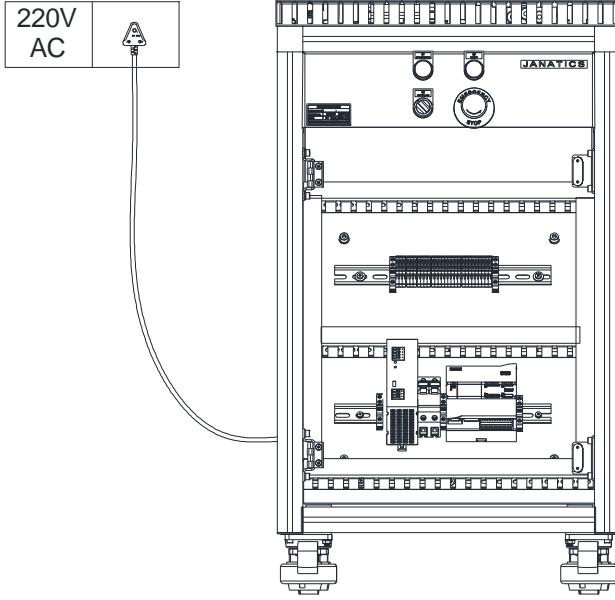
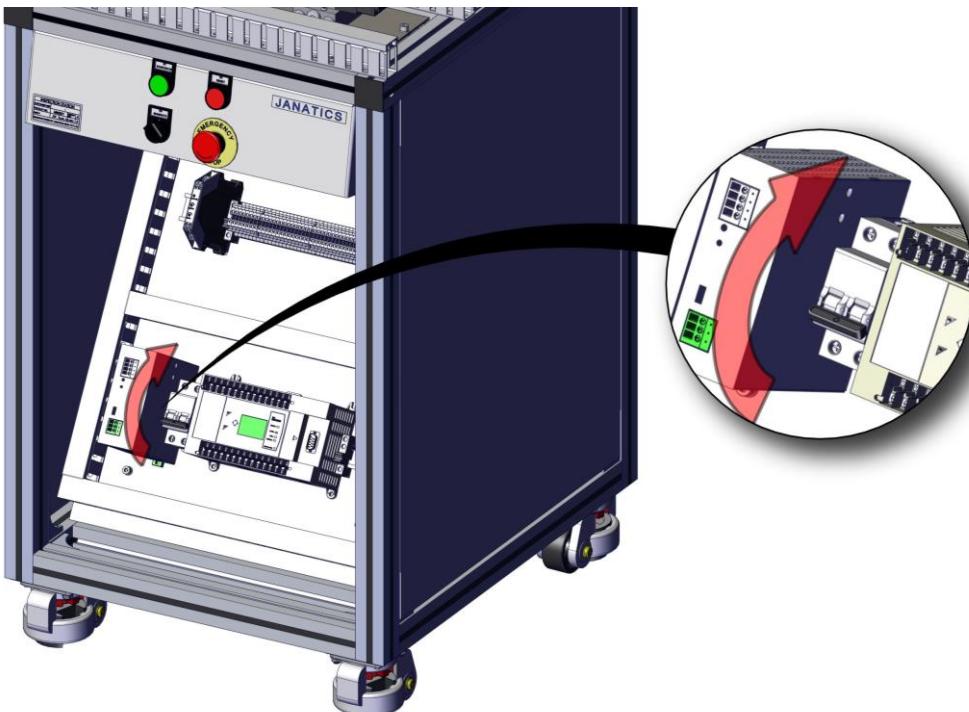
The separation of jobs from the magazine stack module is done pneumatically using double acting cylinder with magnetic sensors detecting the position of the cylinder. The pneumatic Rotary pick and place module with suction cup to pick up work pieces and relocate them to positions from '0 degree to 180 degrees' on horizontal plane is done by using Pneumatic rotary drives. The end position of all pneumatic actuators is detected by using Magnetic sensors

The PLC used for the station is provided with Ethernet interface to communicate with PC for programming

3. Technical Specifications

Model	MMS40-S01-P11
Size	54x70x134 cms
Installation	Vertical
Ambient temperature	60°C Max.
Medium	Filtered Compressed air
Operating Pressure range (Bar)	6-8 bar
Operating Voltage +/- 10%	AC 230V, 50Hz
Current consumption	1A
Power consumption	224 W (230 VA)
Sensors and actuator operating voltage	24V, DC
Material of construction	Aluminum, mild steel, Plastic,etc.

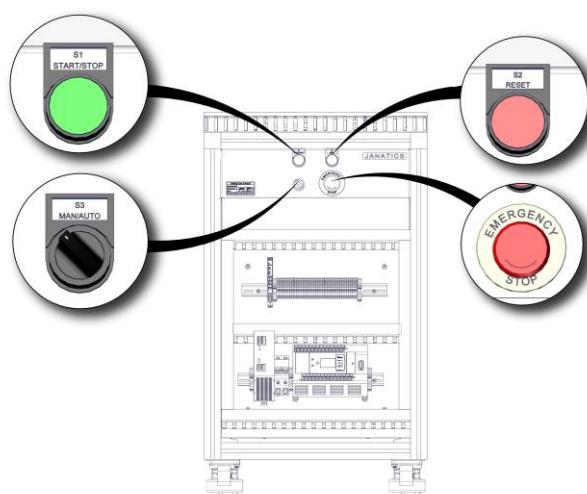
4. Installation Instructions

	
<p>Connect the air supply from the compressor to FRCLM using ø8 tube and set 6bar pressure in the regulator for effective operation</p>	<p>Connect the power cord of the MMS stations to the mains and Switch “ON”</p>
 <p>Switch “ON” the MCB on the PLC module. And make sure that the PLC is in “RUN” Mode</p>	

5. Operating Instructions

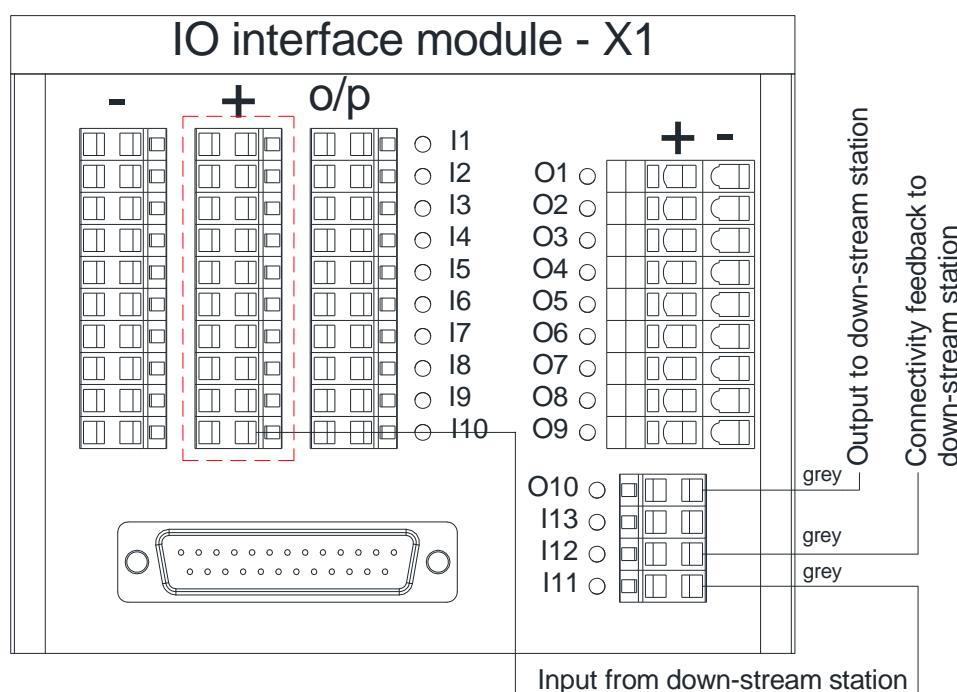
Before initializing the operations feed the work pieces in to the respective stations and follow the below steps as shown

Press and unlock the Mushroom head emergency switch (S4) and then press the Flush Red illumination button for emergency reset (S2), to bring the system in to home position



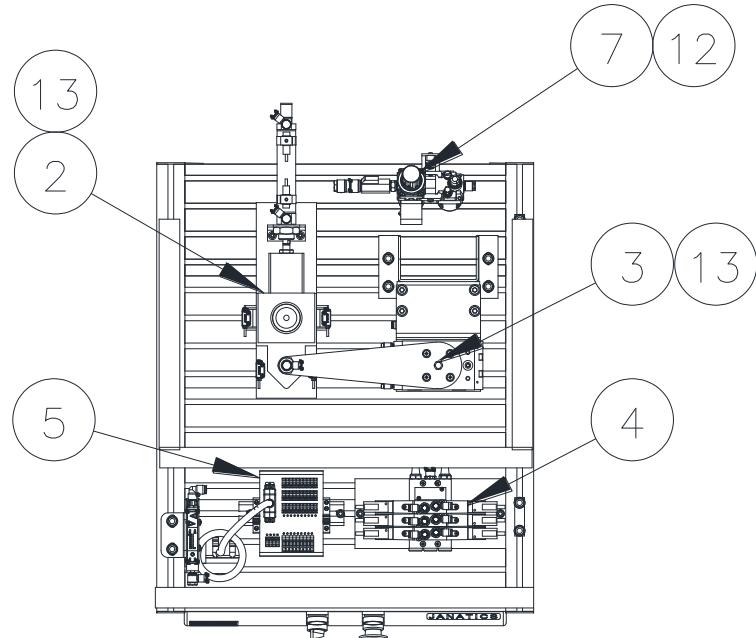
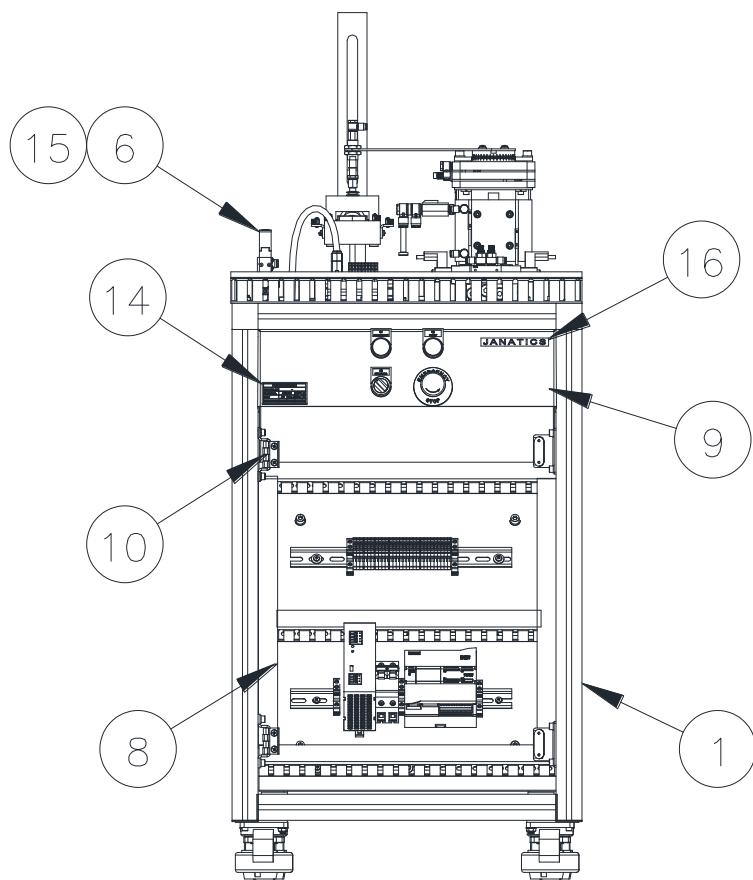
Press the green (S1) flush pushbutton to start/stop the cycle

After that turn the selector switch(S3) to Auto mode for the continuous mode

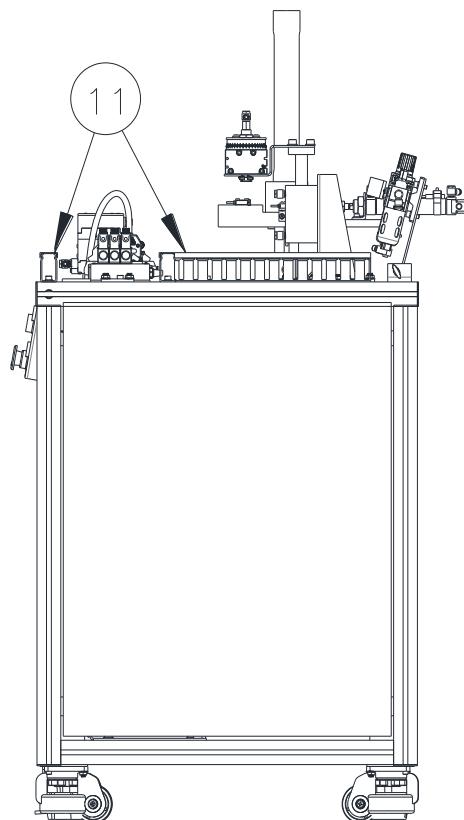


When operating in auto mode connect 24V power supply to terminal I11 in IO interface module (PLC input – I1.4) as shown in figure.

6. Assembled Views

Feeder station (Top View)**Feeder Station (Front View)**

Feeder Station (Side View)



Part List

SI. NO	Product Name	Qty	UOM
1	Horizontal profile table work bench	1	Nos
2	Dispensing module	1	Nos
3	Rotary pick and place module	1	Nos
4	3 Valve manifold assembly_MMS01 and MMS02	1	Nos
5	IO Terminal Assembly _MMS4.0_Feeder station	1	Nos
6	Compact ejector assembly_MMS01	1	Nos
7	FRL Assembly with pressure sensor	1	Nos
8	PLC panel assembly_feeder station (Common IO's)	1	Nos
9	Control console assembly	1	Nos
10	Acrylic Door Assembly	1	Nos
11	Cable duct and accessories	1	Nos
12	Tube(PU) OD6 (Blue)	4	Mtr
13	Tube(PU) OD4 (Blue)	12	Mtr
14	(69x34 Product sticker)	1	Nos
15	Union Y Dia 6	1	Nos
16	Janatics Logo Sticker-105x20mm (Backgorund:Silver Base), Pet200mic	1	Nos

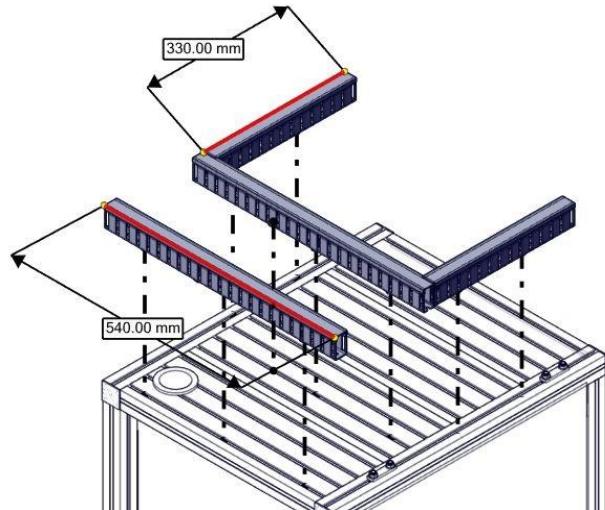
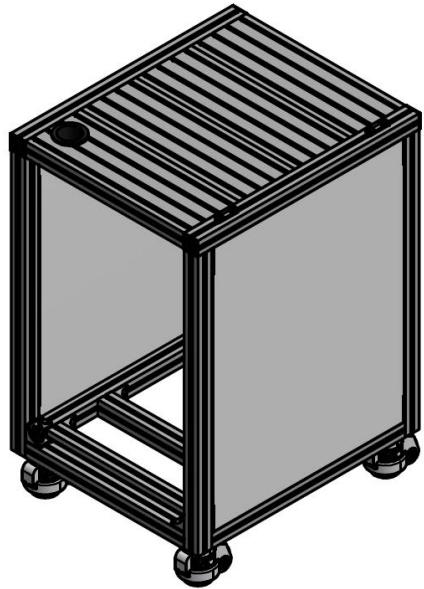
7. Assembling / Dismantling of feeder Station

This chapter is applicable only if the sub-modules (Pre-Assembled/DIY kits) are procured and the MMS is assembled by customer/end user.

Cable duct assembly

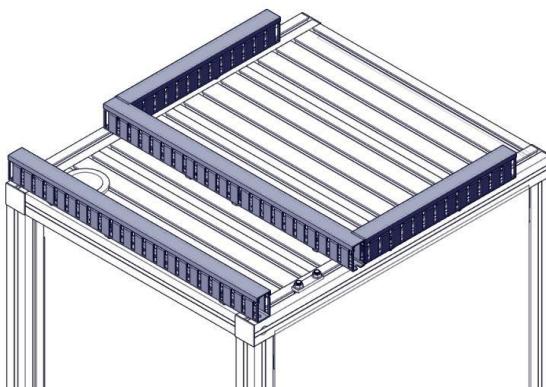
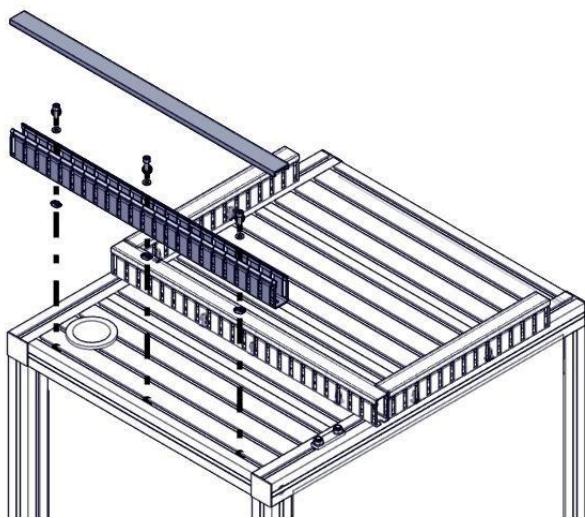
Tools required :

5mm allen key



MMS-PTHWB

Take the already cut cable ducts as shown in the figure and assemble it over the table

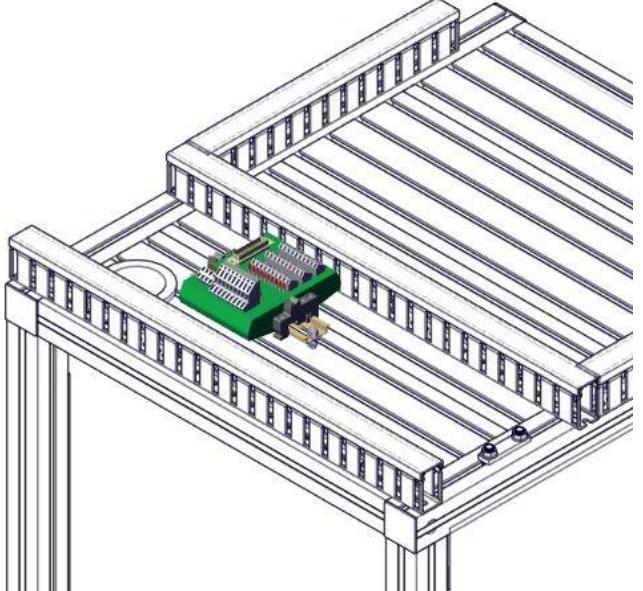
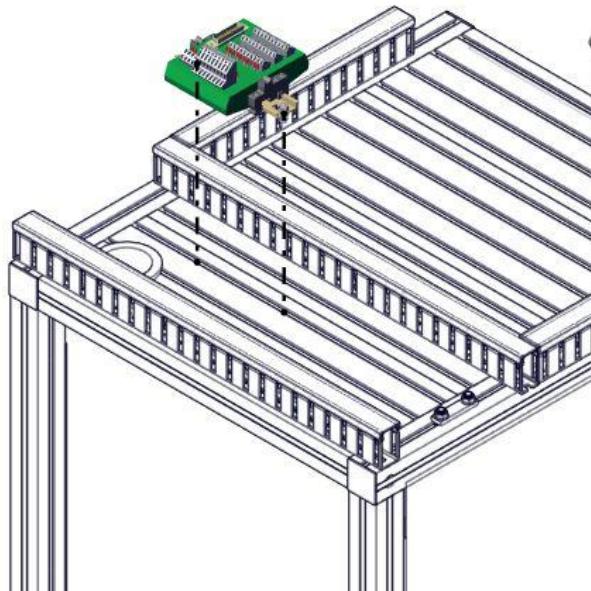


Insert M6x16 Socket head screw, M6 plate washer and M6 Slot stone in cable duct as shown in the figure

Cable duct assembled over table top

I/O Interface Module**Tools required :**

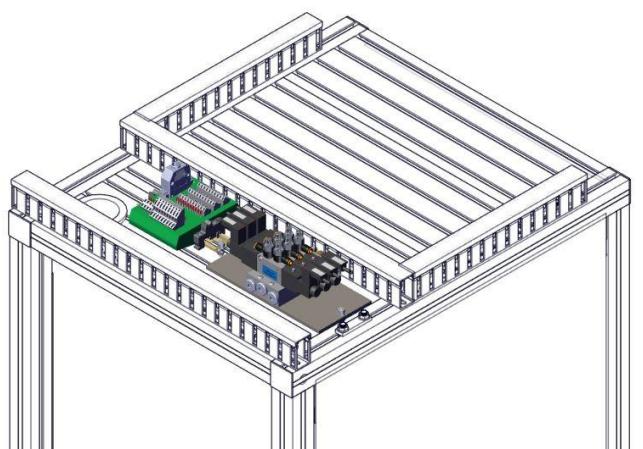
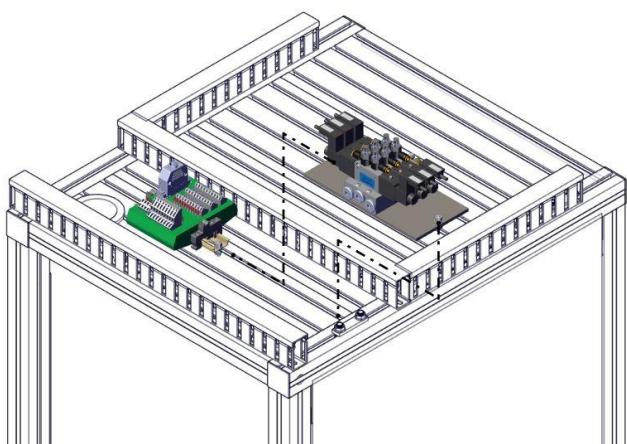
5mm allen key



Mount the pre-assembled IO terminal assembly over the profile table using M6x16 Socket head screw, M6 Plate washer and M6 Slot stone as shown in figure

Valve manifold assembly**Tools required :**

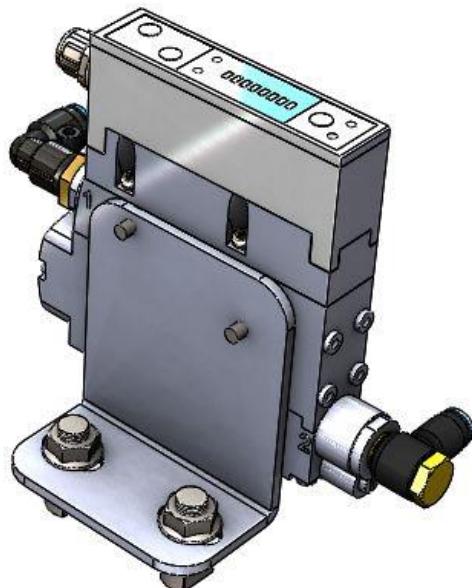
5mm allen key



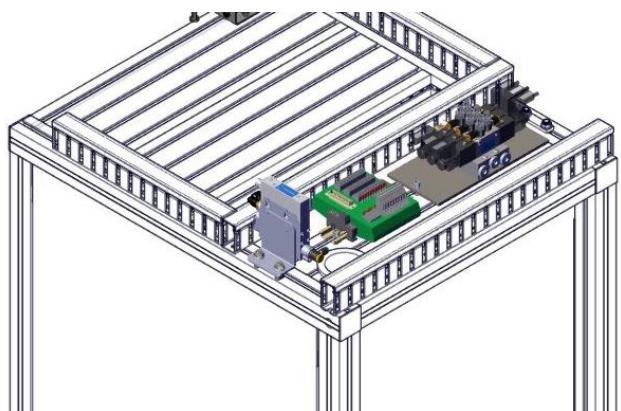
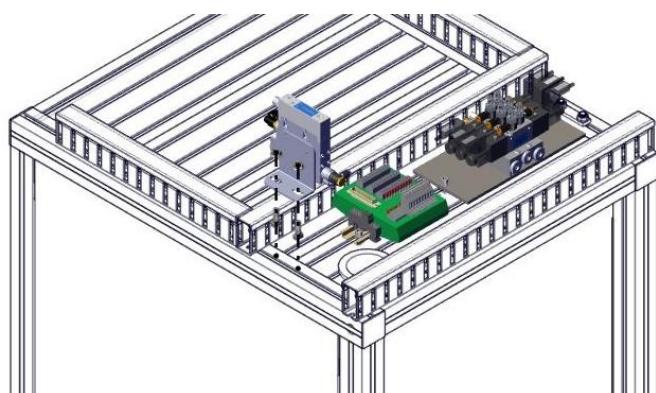
Mount the pre-assembled Valve manifold assembly over the profile table using M6x16 Socket head screw, M6 Plate washer and M6 Slotstone as shown in figure

Compact ejector assembly**Tools required :**

12 mm spanner



Take a pre-assembled Compact ejector



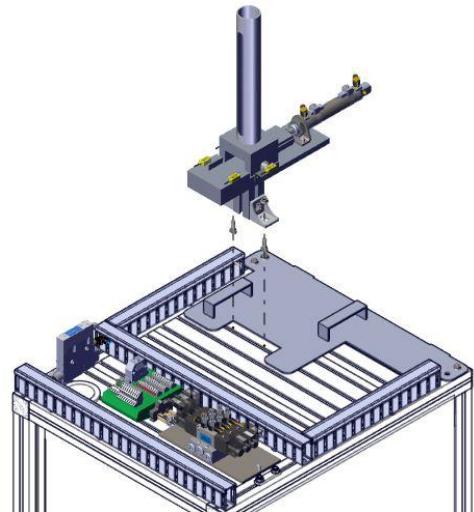
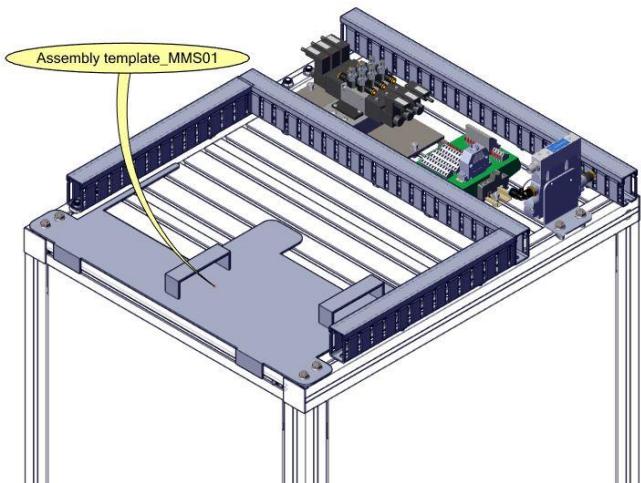
Assemble the compact ejector assembly over the table top as shown in figure and fasten them in the profile groove using spanner (Size 12)

Compact ejector assembly mounted over table top

Feeder Station**Dispensing module****Tools required :**

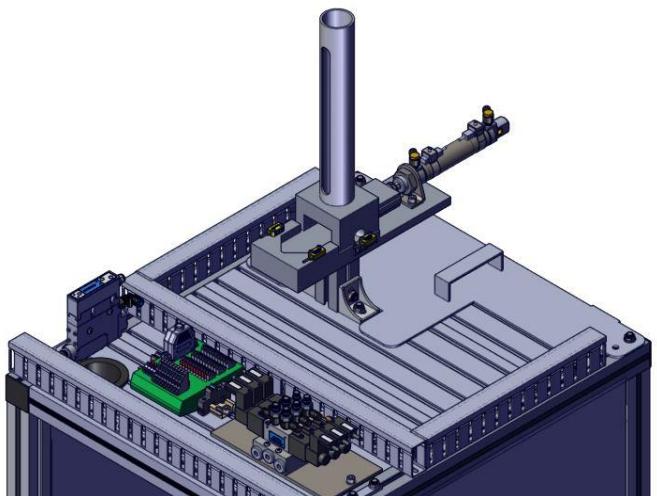
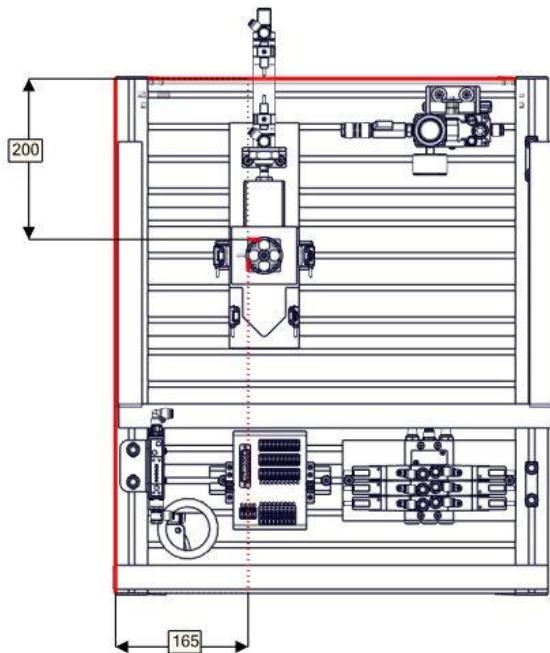
12 mm spanner

933241 – Assembly template for MMS01



Now assemble the assembly template (933241) over the profile table top as shown in figure

Assemble the dispensing module over the profile table top using M8 T bolt and flange Nut as shown in figure

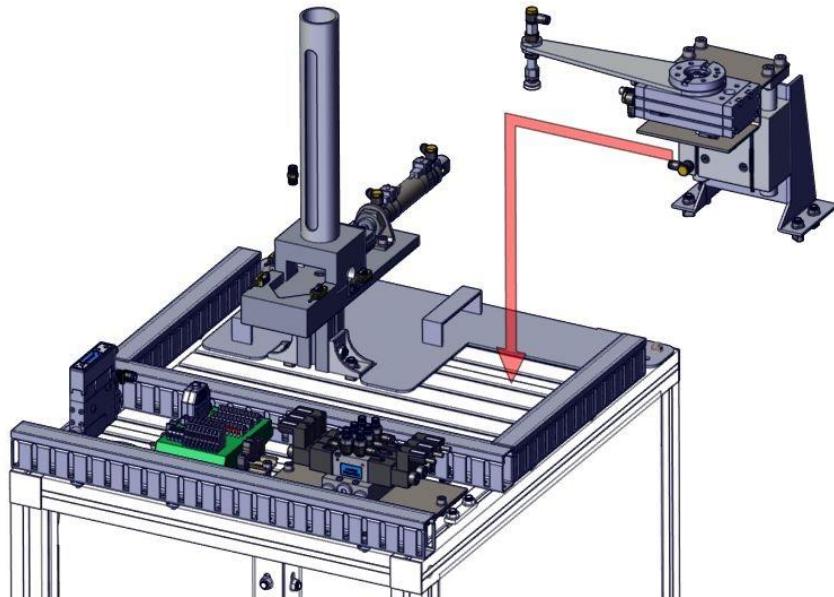


Use the values provided in the figure for assembling the module without templates.

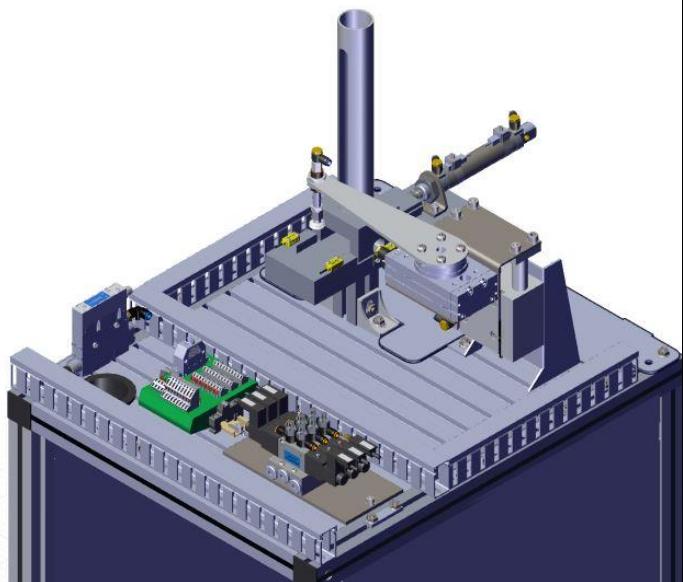
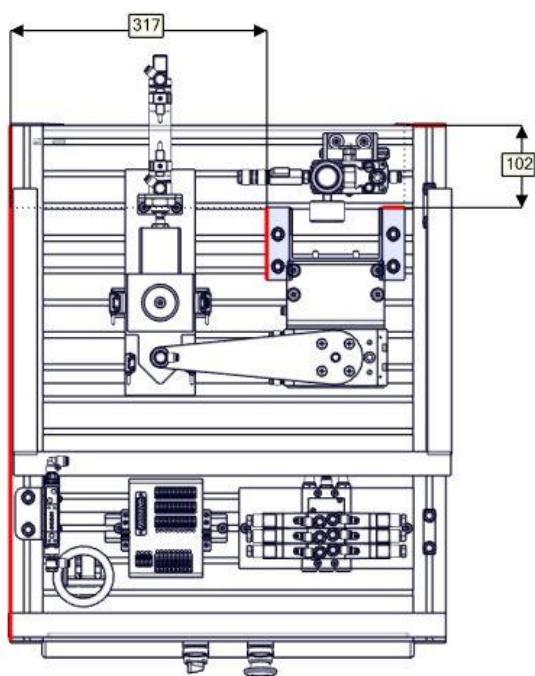
Dispensing module assembled over table top using assembly template

Feeder Station**Rotary pick and place module****Tools required :**

12 mm spanner



Assemble the changer module over the profile table top using M8 T bolt and Flange Nut as shown in figure



Use the values provided in the figure for assembling the module without templates

Rotary pick and place module assembled over table top using assembly template.
After completing the assembly remove the template from the profile table top.

Feeder Station

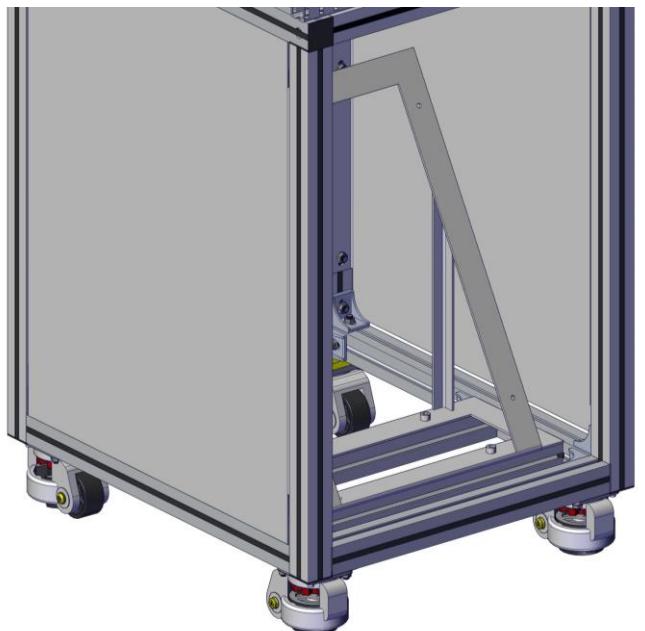
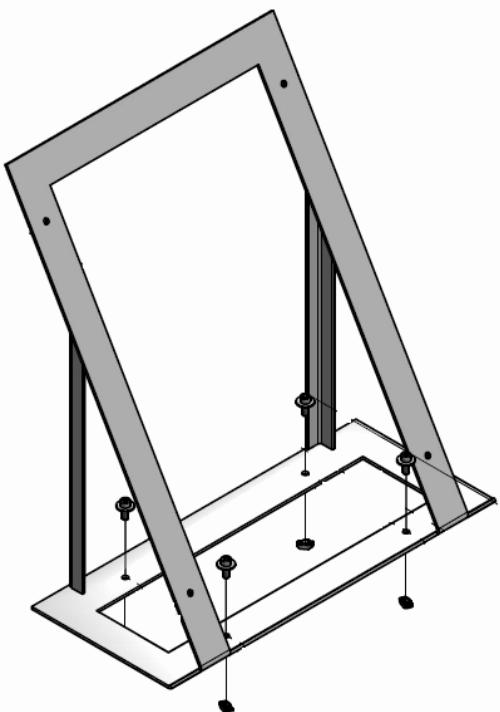
PLC Board for Feeder Station

Tools required :

5mm allen key



Take a pre-assembled PLC Board assembly

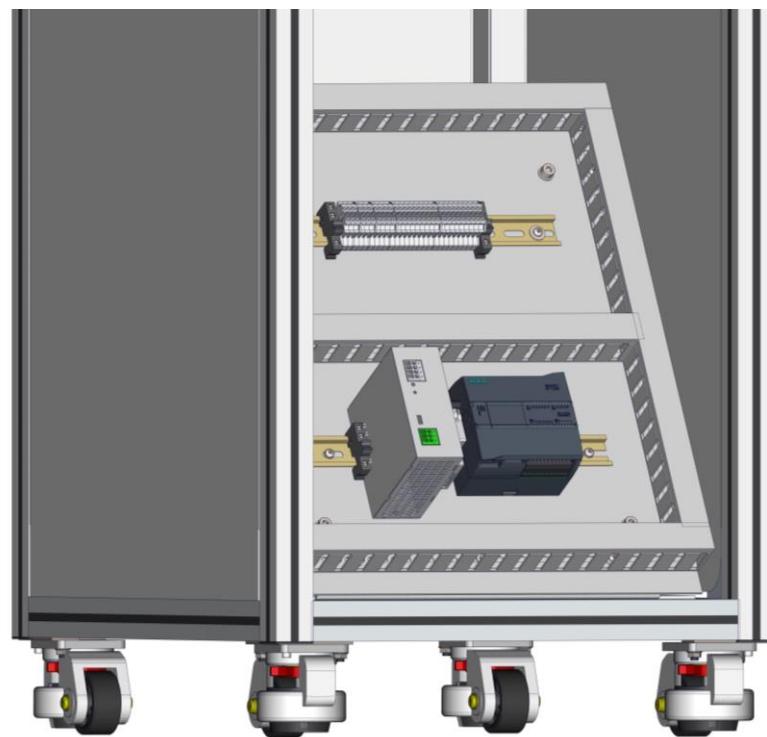


Detach the sheet metal frame from the assembly and insert M6 SHCS, M6 plate washer and M6 slot stone as shown in figure.

Mount the PLC sheet metal frame in the MMS-PTHWB as shown in the figure. Tighten the fasteners using 5 mm allen key.

Feeder Station

Mount the PLC panel assembly over the Sheet metal frame by using M6 plate washer and M6x16 SHCS as shown in the figure and tight them by using M5 allen key.

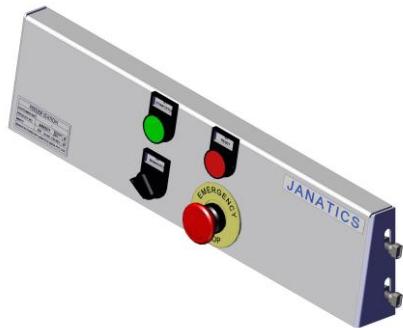


Fully assembled PLC board assembly

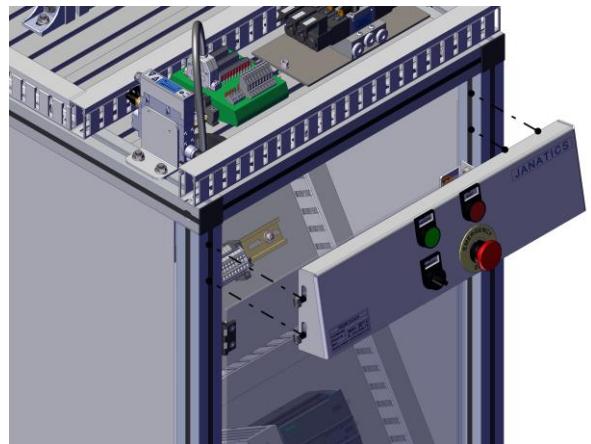
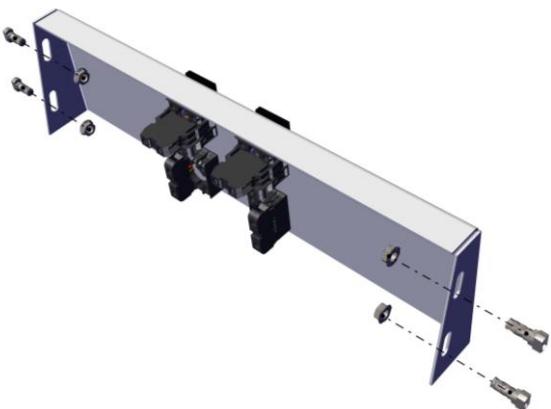
Feeder Station

Control console module**Tools required :**

12 mm spanner

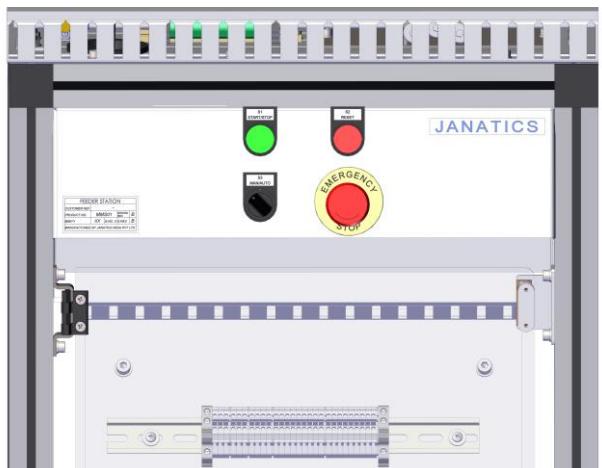
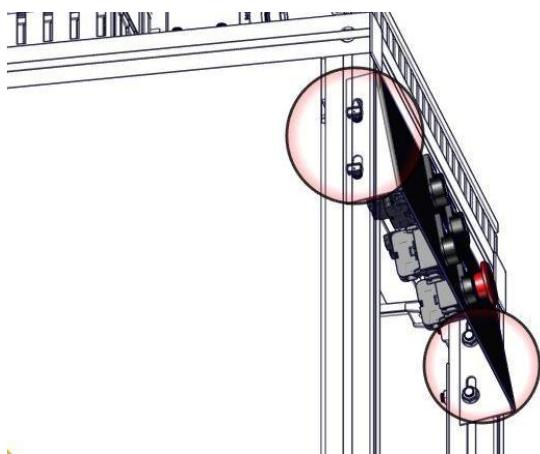


Take a pre-assembled Control console assembly



Insert M8 T bolt and M8 F-Nut in the slots as shown in the figure

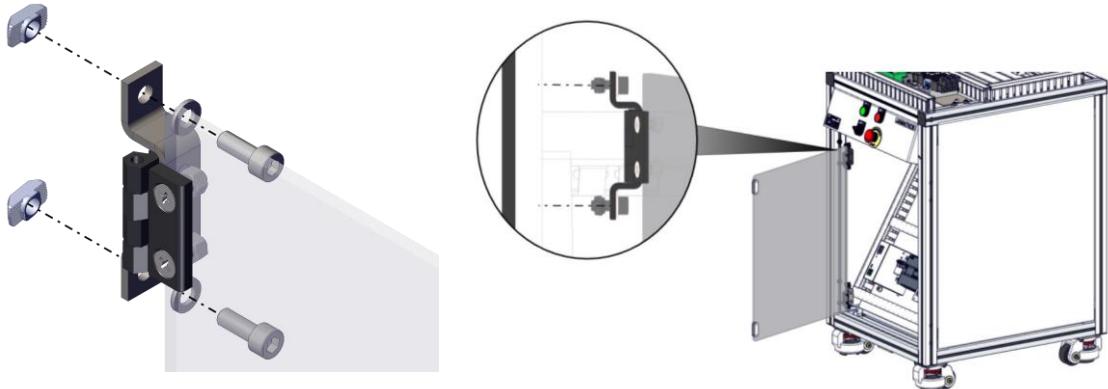
Mount the Control panel in the MMS-PTHWB as shown in the figure



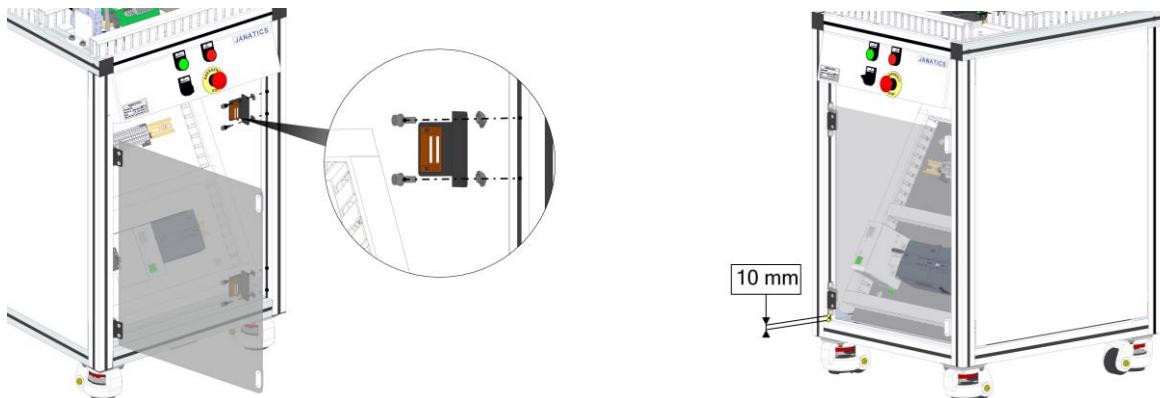
After mounting the control console assembly tighten the F-nut from the bottom of the control console assembly as shown in the figure.

Control console assembled with profile table top

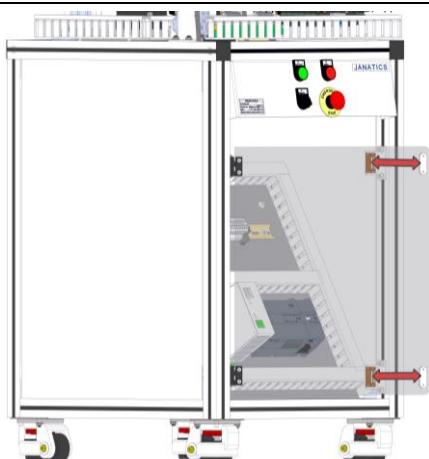
Feeder Station

Acrylic door assembly**Tools required :****5mm allen key**

Assemble the door with the profile table top using M6x16 Socket head screw, M6 plate washer and M6 slotstone as shown in figure.



Similarly assemble the magnets on the other side of the Profile table leg as shown in figure

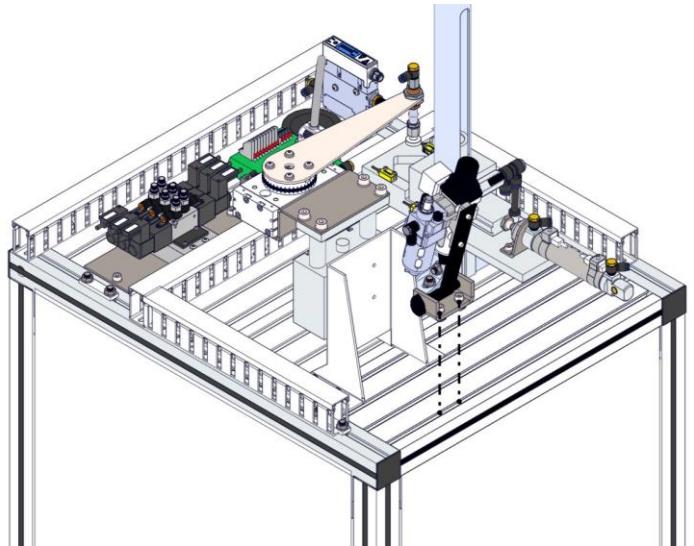
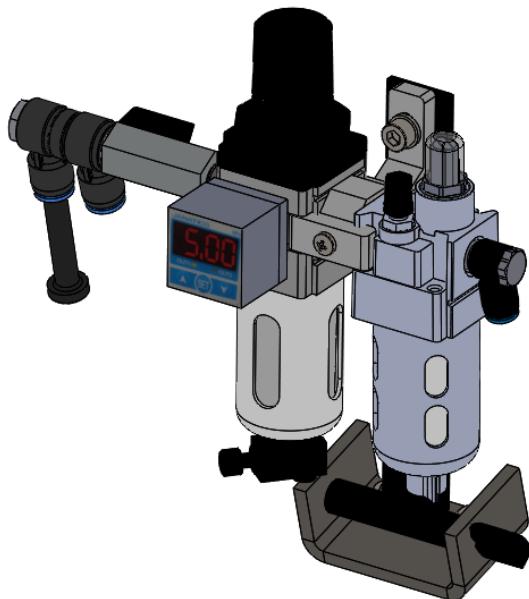


Make sure that the magnet is aligned with the metal strip of the door as shown in the figure. After aligning tighten the magnets firmly

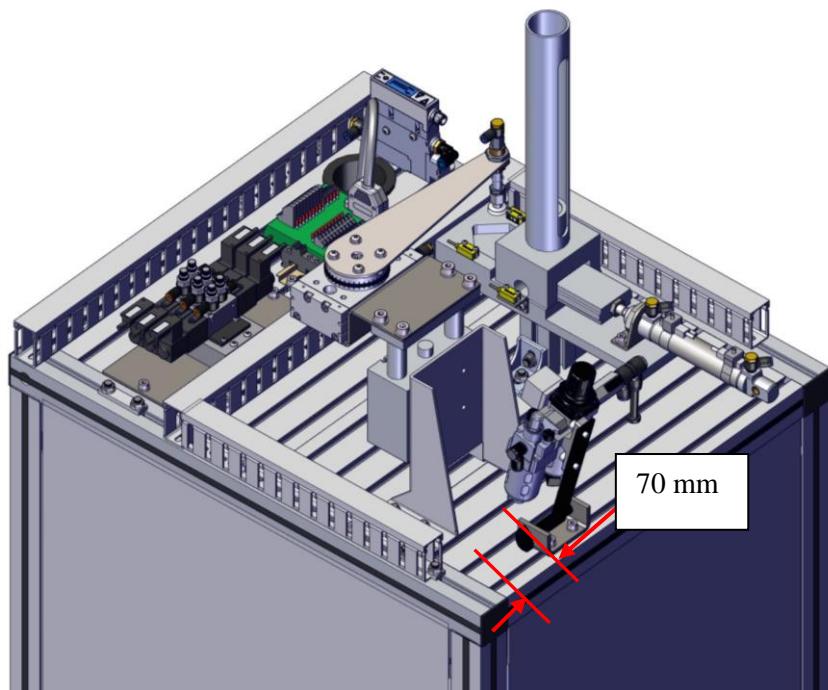
Acrylic door assembled with profile table

Feeder Station**FRLCM module****Tools required :**

5mm allen key

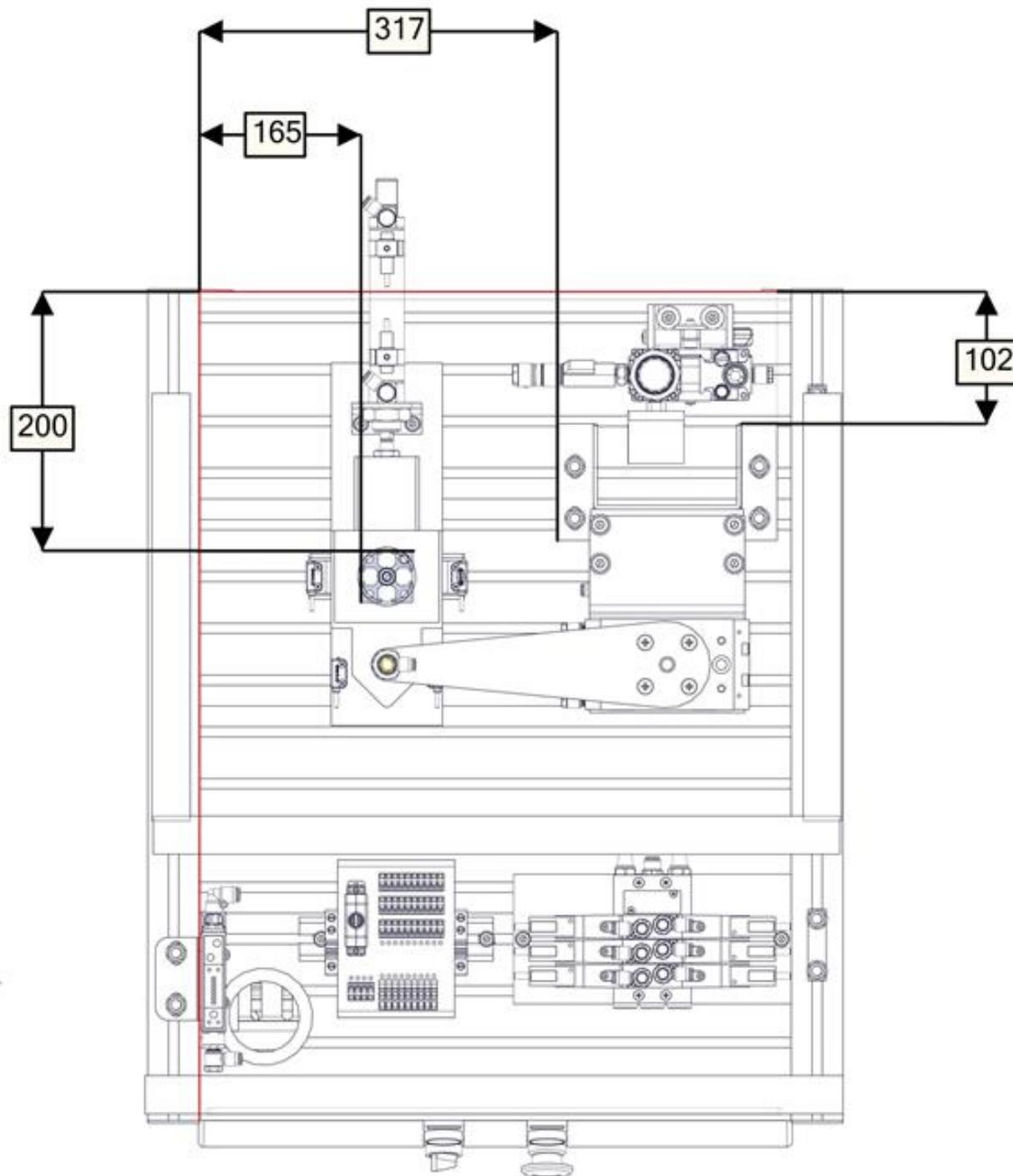


Mount the pre-assembled FRL assembly over the profile table using M6x16 Socket head screw, M6 Plate washer and M6 Slotstone as shown in figure



Maintain approximately 70 mm from the profile as shown in the figure

Positioning of modules

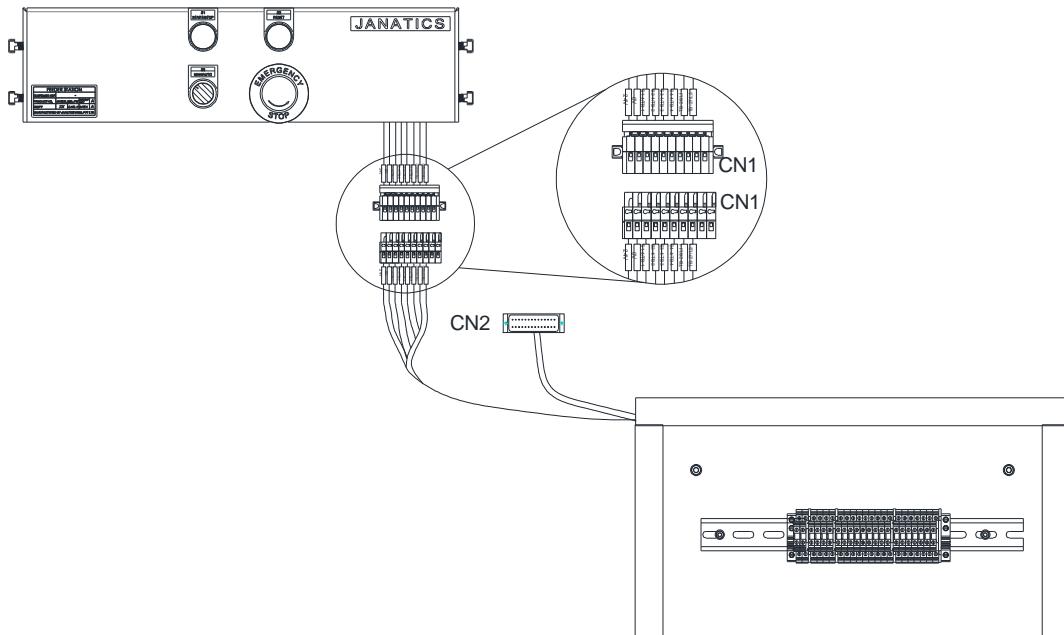


Note: After positioning the modules using assembly templates verify the dimensions as shown in figure. All units mentioned in the sketch are in **millimeters (mm)**

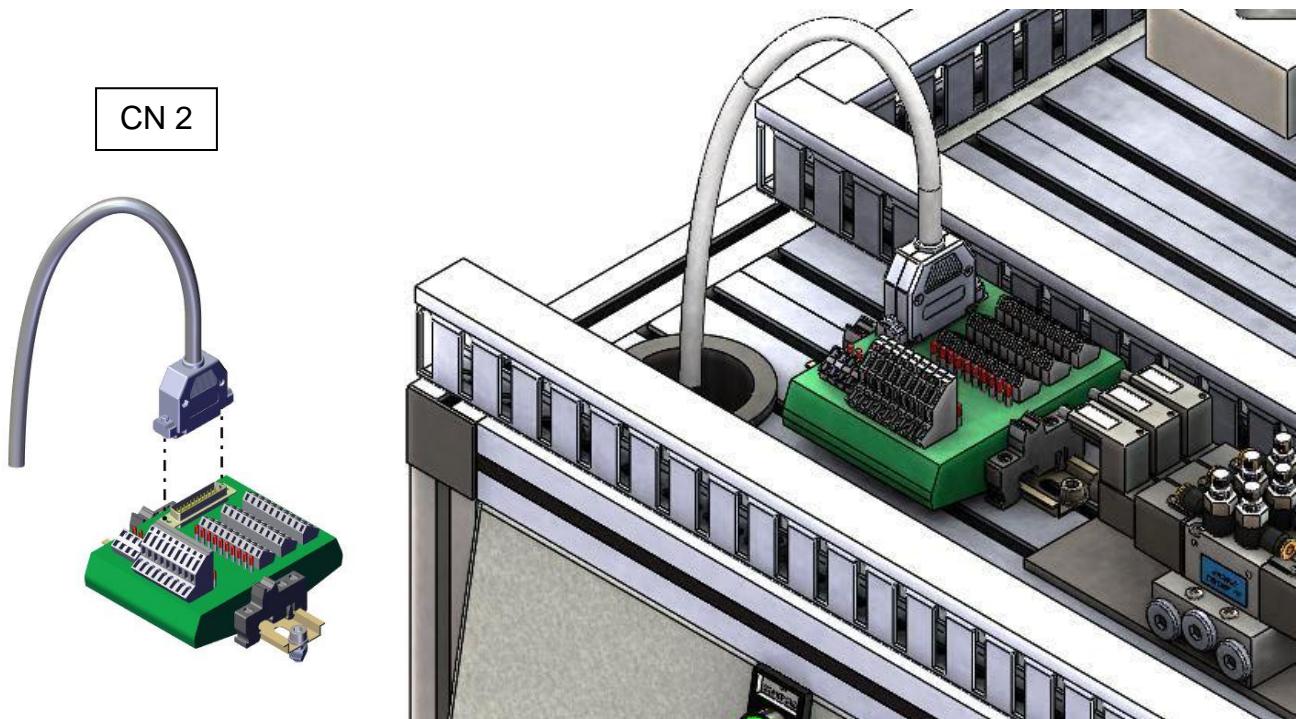
8. Wires and tubes routing instructions

1. Collect all pneumatic tubes, sensor wires and solenoid wires provided in the respective sub modules and route them through the nearest cable ducts to their destinations.
2. Connect the sensor wires and solenoid wires to their respective terminals.(Refer Terminal block diagram)
3. Connect the pneumatic tubes with respective valves on the valve module (Refer electro pneumatic circuit)
4. Hold and lock sensor wires and pneumatic tubes securely using appropriate cable ties wherever necessary
5. Provide necessary free length while Holding and locking the sensor wires and pneumatic tubes using cable ties, so that they do not interfere with the functionality of the sub modules
6. Make sure that the pneumatic tube's bending radius does not exceed beyond the specified value (Refer Technical information chapter for more details)

8.1 Control console wiring & routing



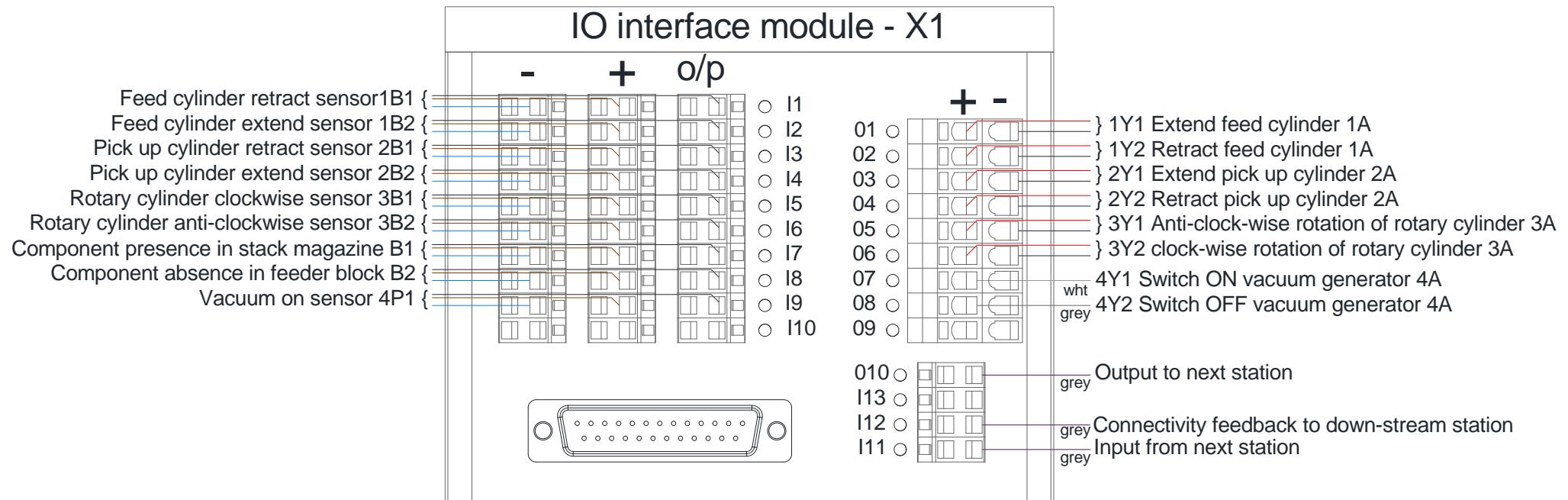
Connect the CN1 of PLC panel assembly with CN1 of Control console assembly as shown in figure



Take the D-sub cable(CN2) from PLC board assembly through the wire manager and connect them with the IO Interface module as shown in figure

Feeder station

9. Terminal block diagram



Wire connection details

For sensor wires

Negative (-): Blue; Positive (+): Brown; Output (o/p): Black.

For Solenoid Wires

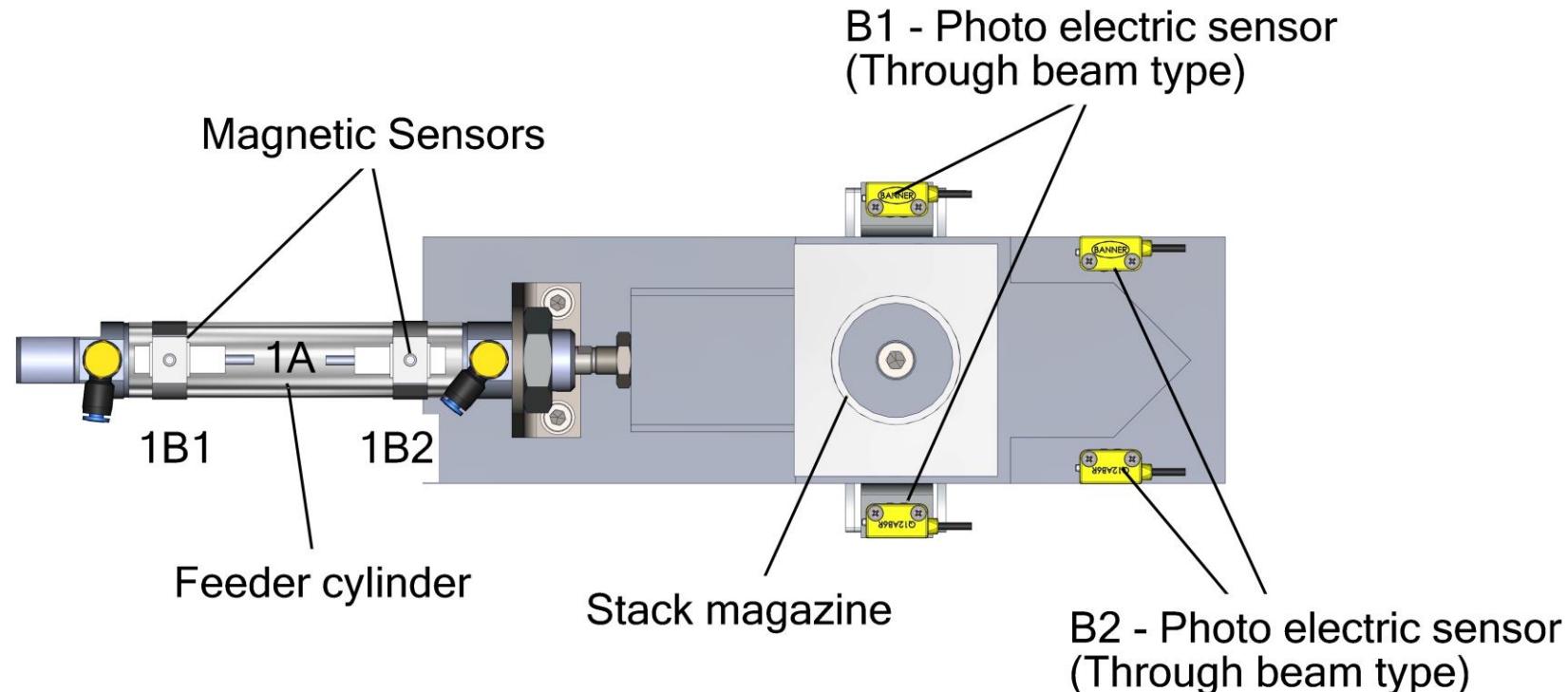
Negative (-): Black; Positive (+): Red

10. Table of components

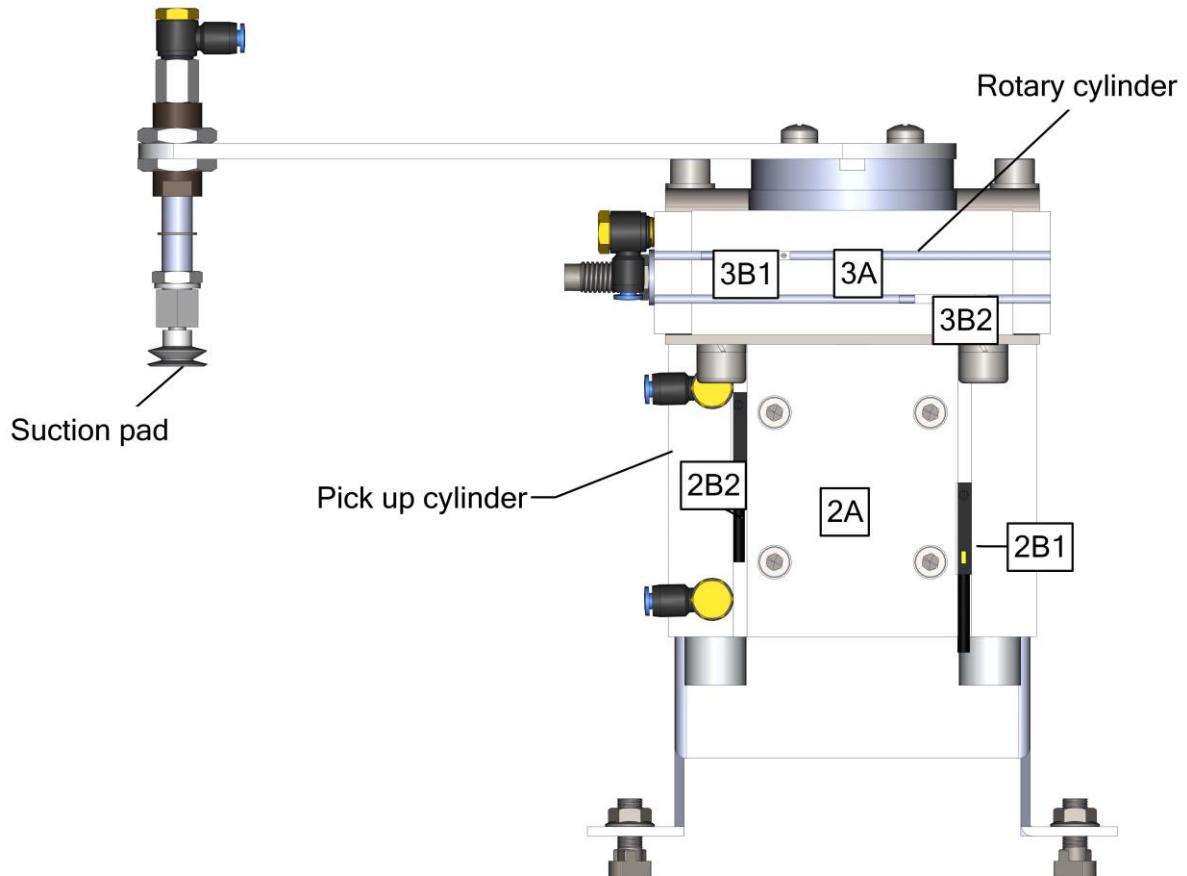
S.No	#	Symbol	Component
Pneumatics			
1	1	1A	Feeder cylinder
2	1	2A	Pick up cylinder
3	1	3A	Rotary cylinder
4	1	4A	Vacuum generator with suction cup
5	3	1V1, 2V1, 3V1	5/2 way DCV with double solenoid
6	2	1V2,1V3	Adjustable flow control valve(Inlet throttle)
7	2	2V2,2V3	Adjustable flow control valve(Inlet throttle)
8	2	3V2,3V3	Adjustable flow control valve(Inlet throttle)
9	1	0V	Ball Valve
10	1	0Z	Filter, Regulator, Lubricator and Pressure gauge
Mechanical			
11	1	-	Dispensing module
12	1	-	Rotary Pick and place module
Sensors			
13	2	B1,B2	Photo electric sensor - Through beam type
14	1	BP	Analogue Pressure sensor
14	2	1B1,1B2	Magnetic sensors
15	2	2B1,2B2	Magnetic sensors
16	2	3B1,3B2	Magnetic sensors
17	1	4P1	Vacuum ON sensor
Push buttons and controls			
18	1	S1	Start push button(N.O.) - Green illuminated
19	1	S2	Reset push button(N.O.) - Red illuminated
20	1	S3	Auto/Manual selector switch
21	1	S4	Emergency stop push button (N.C)
22	1	F1	Miniature circuit breaker
23	1	G1	24 V DC power supply
PLC			
24	1	Z1	PLC SIEMENS S7-1200

11. Positional sketch

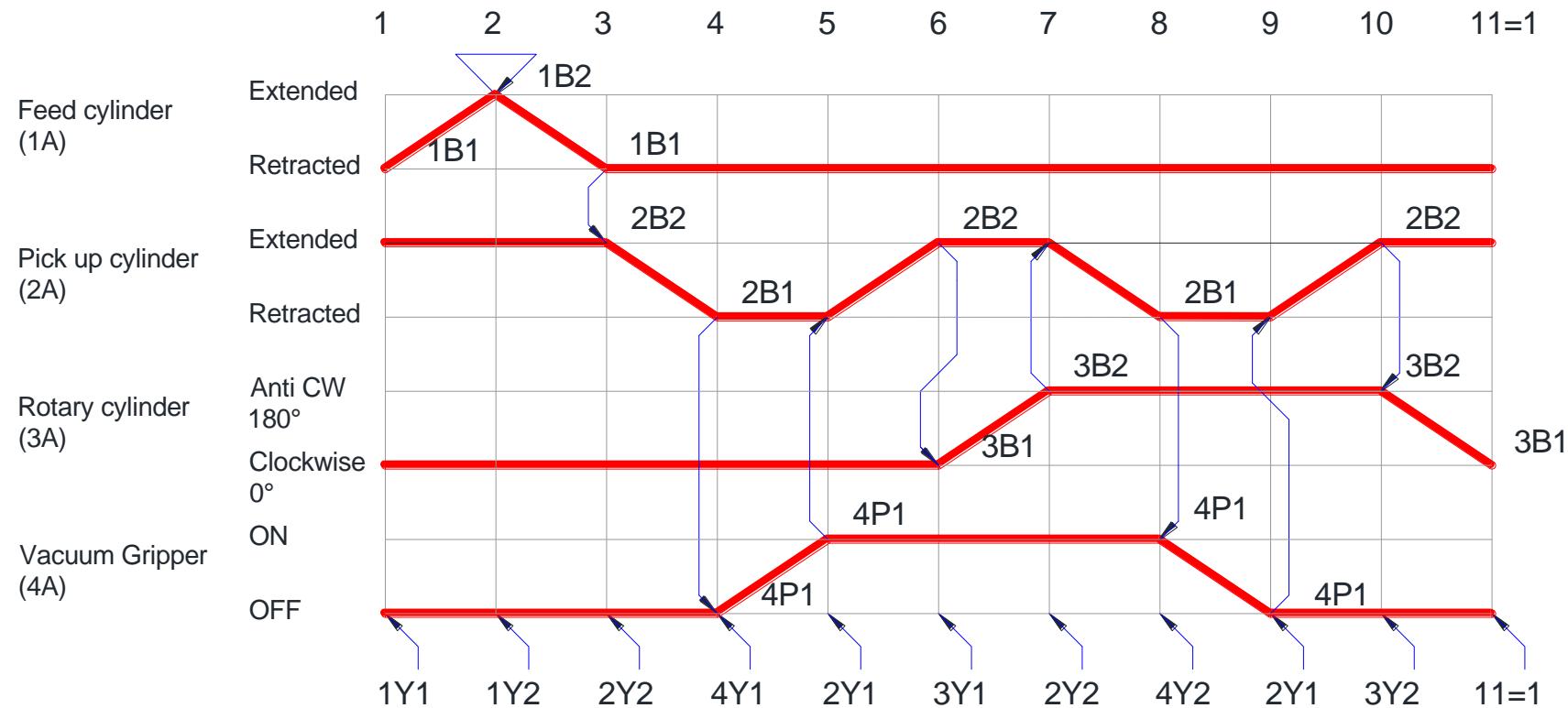
11.1 Dispensing module



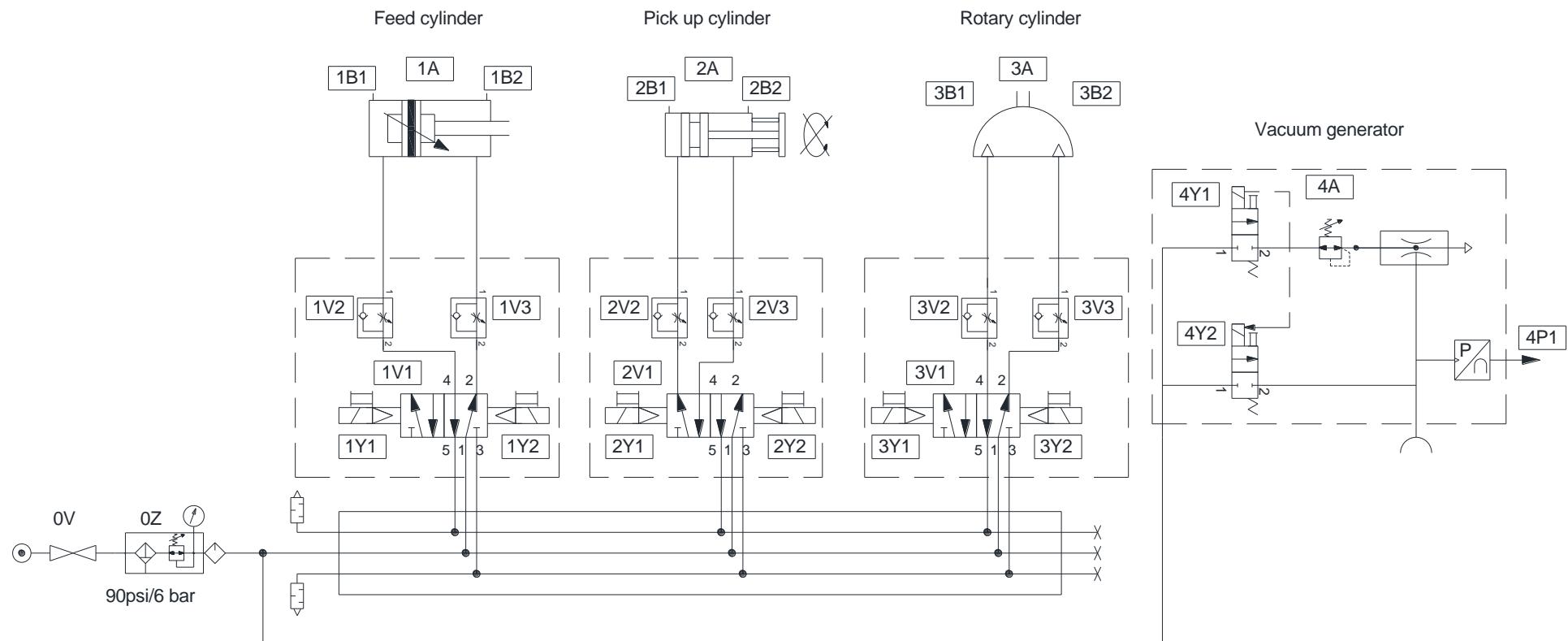
11.2 Rotary pick and place module



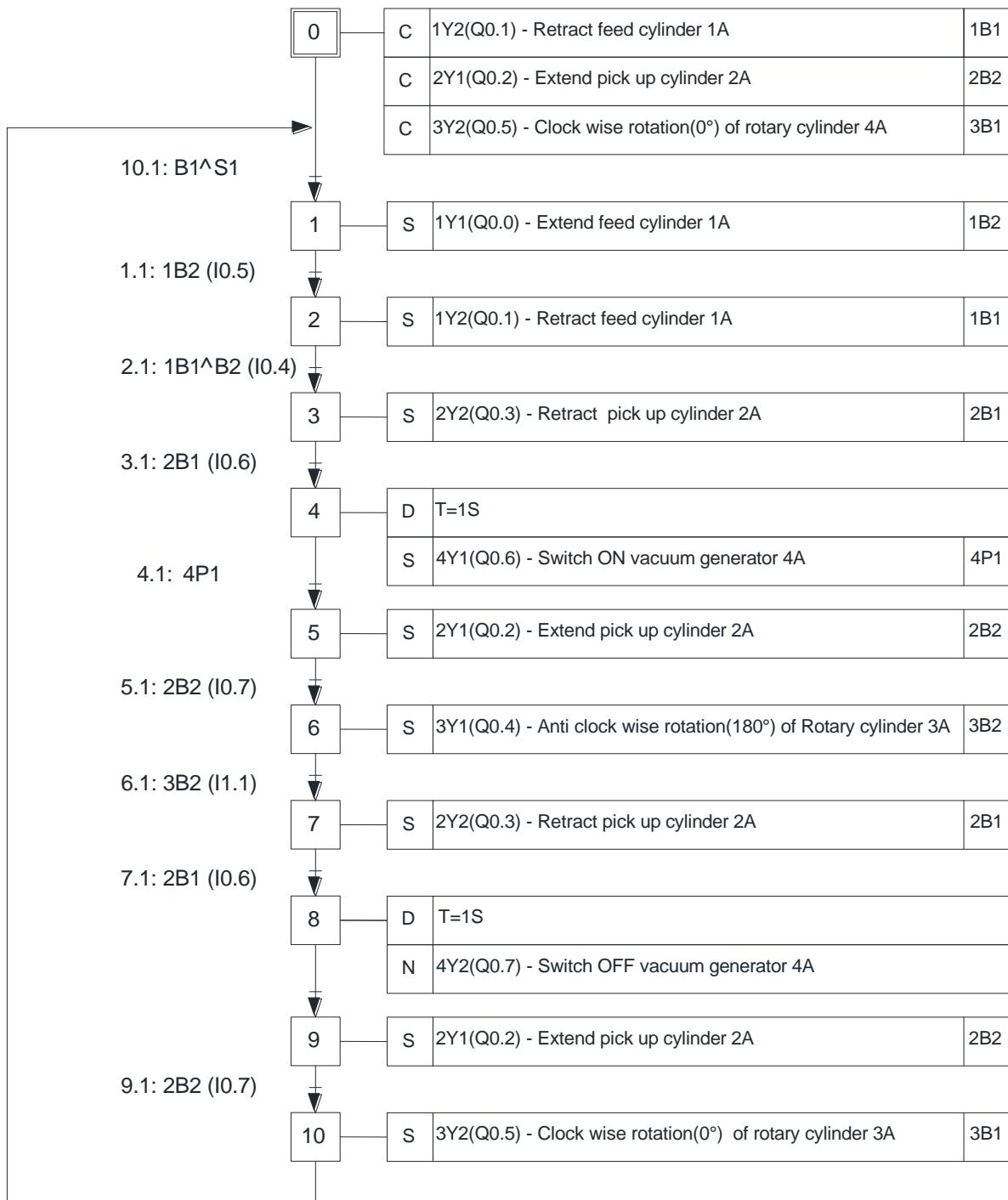
12. Step displacement diagram



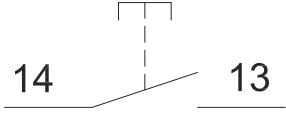
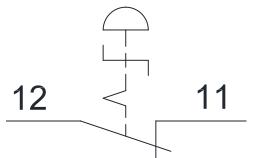
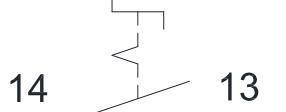
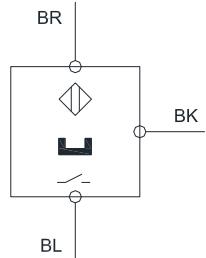
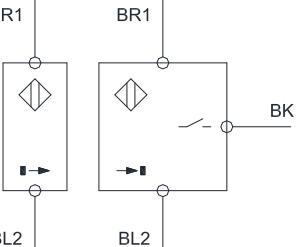
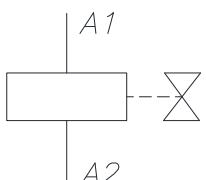
13. Electro pneumatic circuit



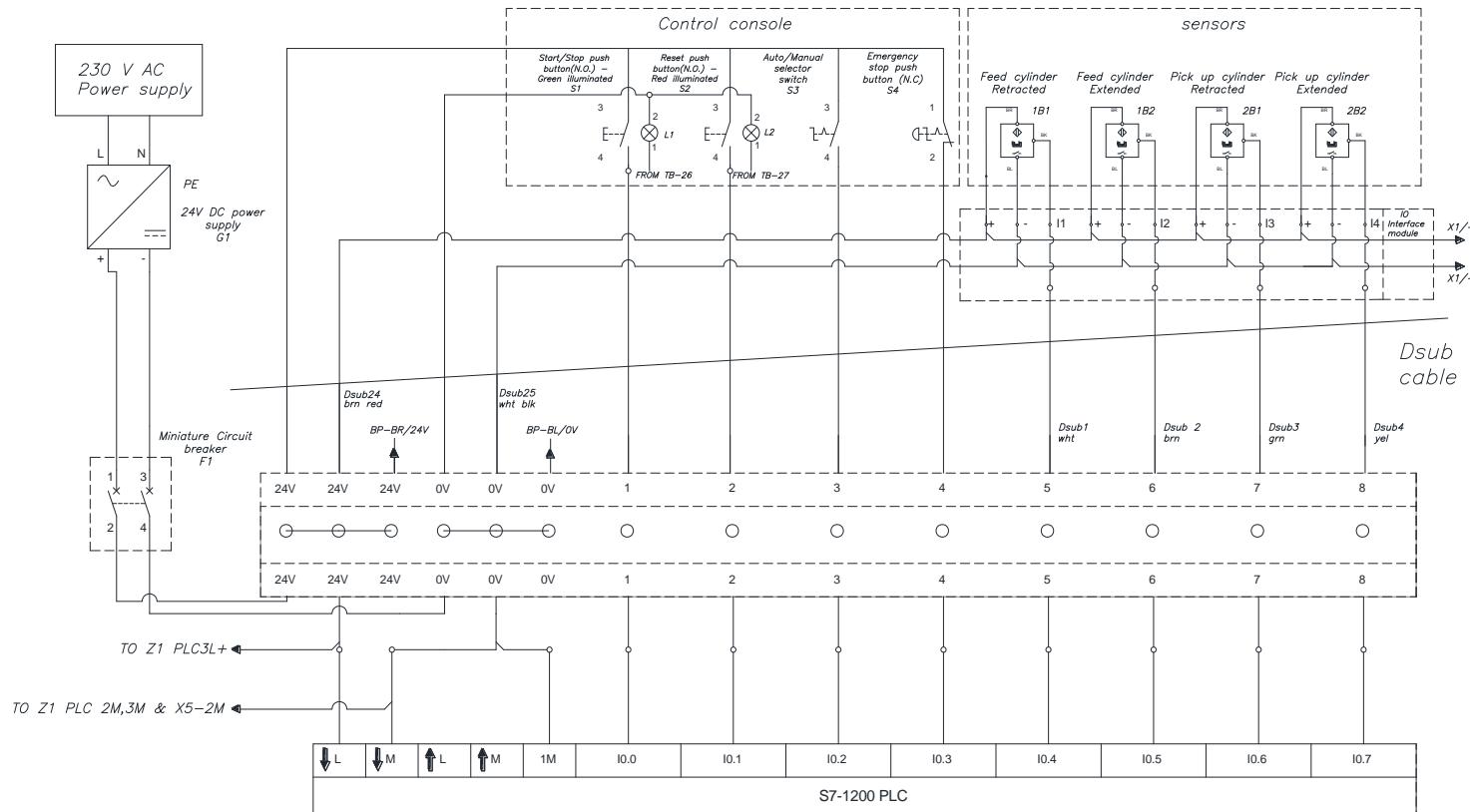
14. Sequential function chart



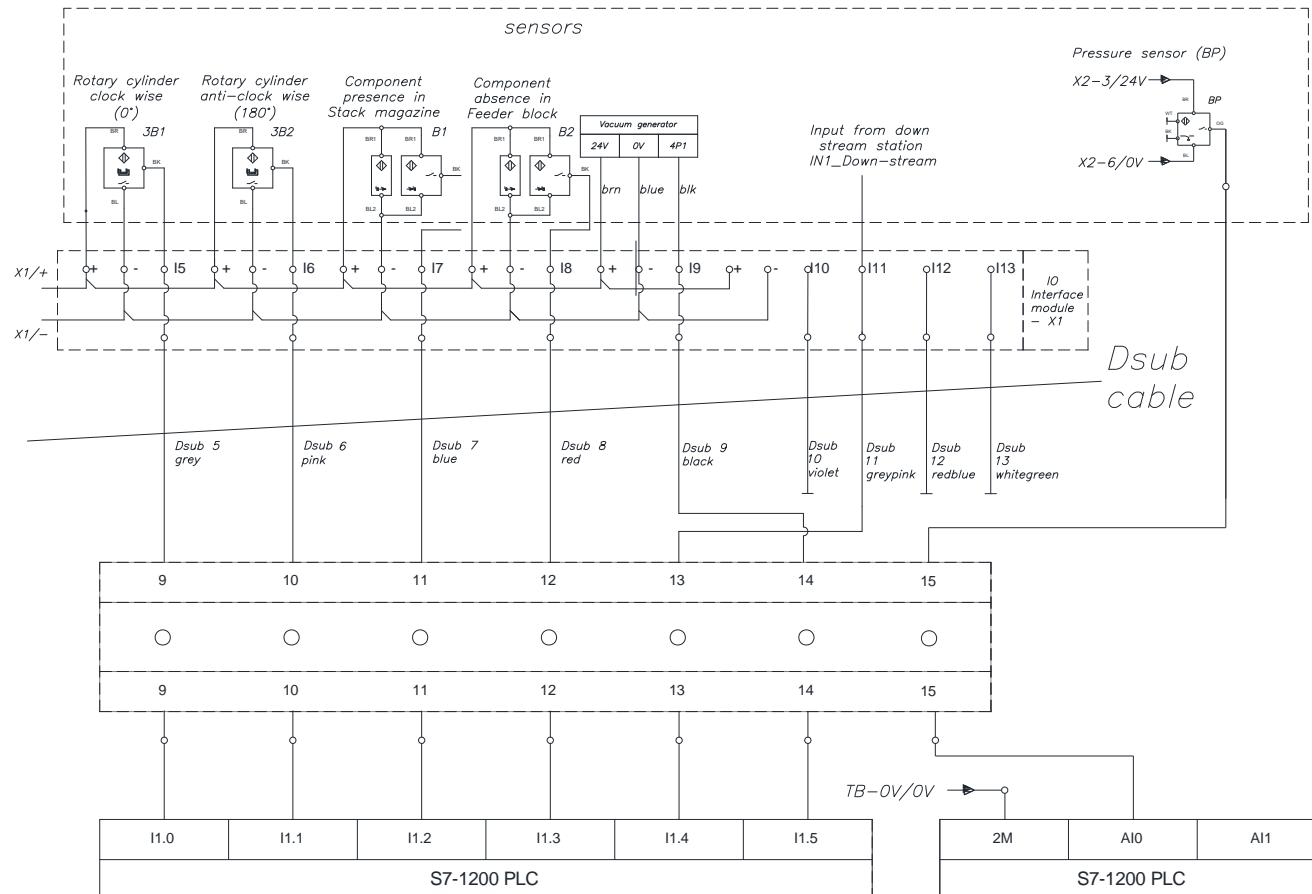
15. Electrical symbols for Input output elements

Electrical symbol	Description	Legends
Input elements		
	Push button - NO	S1,S2
	Emergency stop - NC	S2
	Selector switch with detent	S3
	Magnetic sensor	1B1,1B2, etc.,
	Photo electric sensor: Thru beam type	B1,B2 etc.,
Output elements		
	Solenoid coil	1Y1,1Y2, etc.,

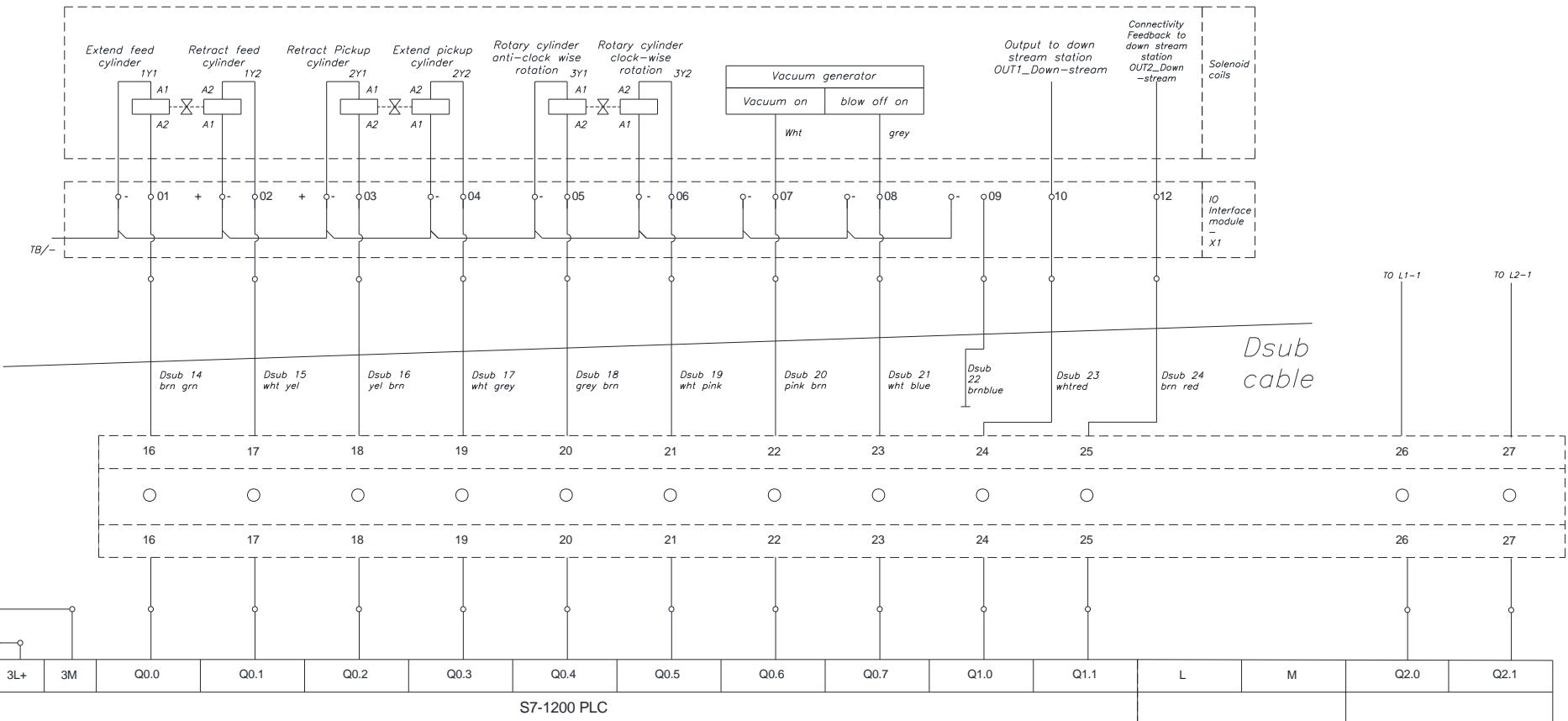
16. PLC input and output wire connection diagram



Feeder station



Feeder station



Name: Application department
Version: 1.0

PLC wiring diagram Output wire connections

Date: 03-06-2023
Page: 3 of 3

17. Input and outputs list

SI No.	Address	Symbol	Comment
1	I0.0	S1	Start push button(N.O.) - Green illuminated
2	I0.1	S2	Reset push button(N.O.) - Red illuminated
3	I0.2	S3	Selector switch
4	I0.3	S4	Emergency stop
5	I0.4	1B1	Feed cylinder 1A retract
6	I0.5	1B2	Feed cylinder 1A extend
7	I0.6	2B1	Pick up cylinder 2A retract
8	I0.7	2B2	Pick up cylinder 2A extend
9	I1.0	3B1	Rotary cylinder 3A clock wise- 0°
10	I1.1	3B2	Rotary cylinder 3A anticlock wise- 180°
11	I1.2	B1	Component presence in Stack magazine
12	I1.3	B2	Component absence in Feeder block
13	I1.4	IN1_NEXT	Input from down-stream station
14	I1.5	4P1	Vacuum ON
15	AI0.0	BP	Analogue Pressure sensor
16	Q0.0	1Y1	Extend Feed cylinder 1A (Solenoid of DCV 1V1)
17	Q0.1	1Y2	Retract Feed cylinder 1A (Solenoid of DCV 1V1)
18	Q0.2	2Y1	Extend pick up cylinder 2A (Solenoid of DCV 2V1)
19	Q0.3	2Y2	Retract pick up cylinder 2A (Solenoid of DCV 2V1)
20	Q0.4	3Y1	Anti-clock-wise rotation of rotary cylinder 3A (Solenoid of DCV 3V1)
21	Q0.5	3Y2	Clock-wise rotation of rotary cylinder 3A (Solenoid of DCV 3V1)
22	Q0.6	4Y1	Switch ON vacuum generator 4A
23	Q0.7	4Y2	Switch OFF vacuum generator 4A
24	Q1.0	OUT1_NEXT	Output to down-stream station
25	Q1.1	FB_NEXT	Connectivity Feedback to down-stream station
26	Q2.0	START	Green LED ON
27	Q2.1	RESET	Red LED ON

Feeder station

18. Assembly line sequence diagram

19. System steps

Step	Output	Actuator	Action	Sensor	Input
1	Q0.0	1Y1	Extend Feed cylinder 1A (Solenoid of DCV 1V1)	1B2	I0.4
2	Q0.1	1Y2	Retract Feed cylinder 1A (Solenoid of DCV 1V1)	1B1	I0.5
3	Q0.3	2Y2	Retract pick up cylinder 2A (Solenoid of DCV 2V1)	2B1	I0.7
4	Q0.6	4Y1	Switch ON vacuum generator 4A	2P1	I1.5
5	Q0.2	2Y1	Extend pick up cylinder 2A (Solenoid of DCV 2V1)	2B2	I0.6
6	Q0.4	3Y1	Anti-clock-wise rotation of rotary cylinder 3A (Solenoid of DCV 3V1)	3B2	I1.0
7	Q0.3	2Y2	Retract pick up cylinder 2A (Solenoid of DCV 2V1)	2B1	I0.7
8	Q0.7	4Y2	Blow off vacuum generator 4A		
9	Q0.2	2Y1	Extend pick up cylinder 2A (Solenoid of DCV 2V1)	2B2	I0.6
10	Q0.5	3Y2	Clock-wise rotation of rotary cylinder 3A (Solenoid of DCV 3V1)	3B1	I1.1

20. Technical Information



Silencer

Part No: ASC0161

Description: Silencer (Conical -1/4)

Silencers are used to reduce the noise of the exhaust air at the ports .



Features:

- Brass body and sintered bronze silencer elements
- Good flow and silencing characteristics
- Can be cleaned using kerosene and soap water
- There is no significant reduction in the stroke speed of pneumatic actuators

Polyurethane Tubing:

Polyurethane tubing is a high quality, precision-made tubing used in a wide range of demanding and critical applications. Polyether based, polyurethane tubing occupies a unique position among polymers, sharing the best properties of both rubber and plastic. Urethane exhibits the elongation and recovery characteristics of rubber and the chemical resistance associated with plastics. The tubing is tough, strong, kink-resistant and abrasion resistant, yet it's flexible and easy to assemble onto designated fittings. It is also highly resistant to oil, grease, oxygen and ozone.

Properties of polyurethane

- Tough
- Flexible
- Broad Temperature Range
- Wide variety of Colors
- Abrasion Resistant
- Chemical Resistant

Tubing Colors:

- Blue
- Transparent
- Silver
- Red
- Black
- Yellow

Usage instructions:

- Cut the tube-end burr free and square, using Tube cutter (WC1) and clean the edge to ensure leak tight joints (Do not use blunt tools/hacksaw/chisel etc.)
- Ensure the tube is fully inserted into the fitting-until the positive stop ,beyond the 'U' seal
- Follow the minimum bend radius given in the tube to avoid leakage

Various sizes of Polyurethane Tube:

The following are some types of Polyurethane Tube used in MMS.

1. Part No : WH00B04

Description: Tube (PU) OD4 (Blue)

Technical Specifications:

Feature	Data/Description
Tube OD	4 mm
Tube ID	2 mm
Minimum bend radius	10 mm
Maximum pressure	10 bar
Ambient temperature	5°C to 60° C
Material	Polyurethane
Color	Blue



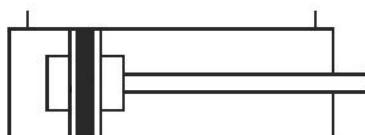
Feeder Station**Part No:** WH00B06**Description:** Tube (PU) OD6 (Blue)**Technical Specifications:**

Feature	Data/Description
Tube OD	6 mm
Tube ID	4 mm
Minimum bend radius	15 mm
Maximum pressure	10 bar
Ambient temperature	5°C to 60°C
Material	Polyurethane
Color	Blue

**2. Part No:** WH00B08**Description:** Tube (PU) OD8 (Blue)**Technical Specifications:**

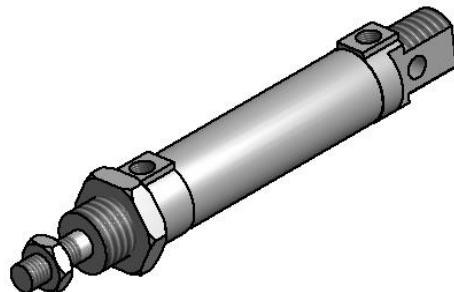
Feature	Data/Description
Tube OD	8 mm
Tube ID	5 mm
Minimum bend radius	25 mm
Maximum pressure	10 bar
Ambient temperature	5°C to 60°C
Material	Polyurethane
Color	Blue



Feeder Station**Air Cylinder**

Part No: A52 025 100 L

Description: Ø 25 x 100 Cyl. (Mag) Basic

**Features:**

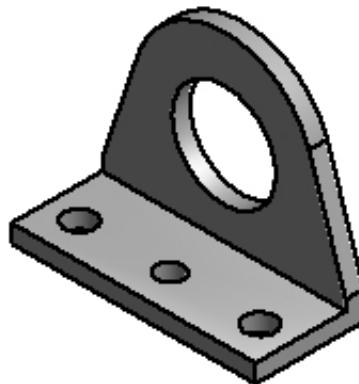
- Elastomer cushioning at both the ends
- Wide variety of mountings
- Low friction
- Long life
- Conforms to ISO 6432/ CETOP RP52P

Variants and Accessories:

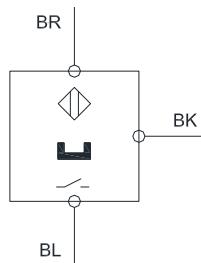
- 12, 16, 20&25 mm diameters for double acting cylinders
- Available in stroke lengths from 10 mm to 300 mm
- Mounting options: Front foot mounting, double foot mounting, front flange, rear flange, front trunnion, rear trunnion
- Accessories: Clevis foot bracket, rod end fork ,trunnion bracket, rod end aligner

Feeder Station**Accessories provided:**

- The Cylinder is provided with front foot mounting bracket for mounting (ML022),

Front foot mounting:**Technical Specifications:**

Feature	Data/Description
Bore diameter	25mm
Stroke length	100mm
Shape of piston	Round
Shape of piston rod	Round
Mode of operation	Double acting
Sensing type	Magnetic
Type of cushioning	Elastomer cushioning ring(Non adjustable)
Protection against torsion	Nil
Piston rod diameter	10 mm
End of piston rod	Male thread
Piston rod thread	M10x1.25
Working pressure	0.5-10 bar
Minimum temperature	5°C
Maximum temperature	60°C
Materials of construction:	
End cap	Aluminium alloy
Seals	Nitrile ,Polyurethane
Barrel/housing	Stainless high-alloy steel
Piston rod	Stainless high-alloy steel
Thread at the ports	G 1/8
Thread for mounting bracket in end cap	M22
Mounting provided	Front foot mounting (ML022)
Effective force at 6 bar (extension)	264N
Effective force at 6 bar (retraction)	222 N
Medium	Compressed air- filtered- lubricated

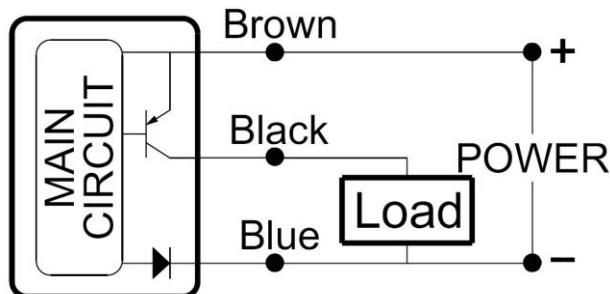
Feeder Station**Reed Switch with clamp**

Part No: AM1025

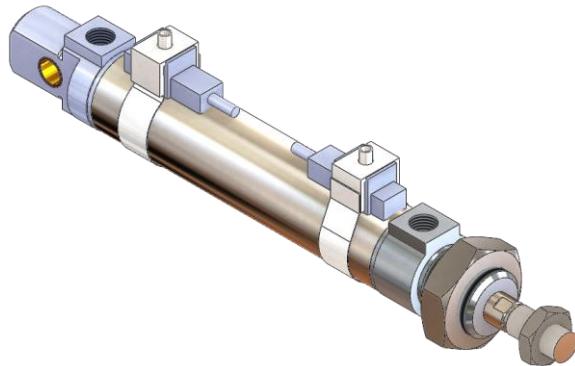
Description: Reed switch with clamp (A52025)

Function:

The reed switch and clamp kit assembly is mounted on the air cylinder series A52 for proximity sensing .The piston of the cylinder is equipped with a permanent magnet which activates the reed switch on approaching it. The reed switch closes the circuit giving an electrical signal which could be used further as required. The accuracy of sensing depends on the speed of the piston.

Connection diagram:

Cylinder with Reed switch and clamp in assembled condition



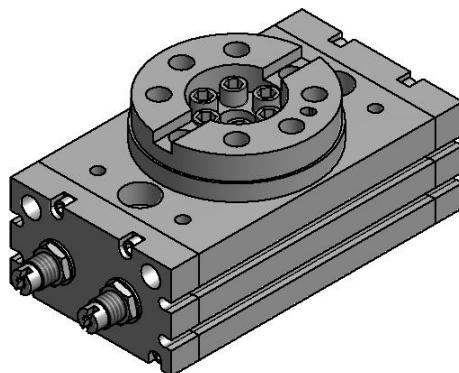
Feeder Station**Technical Specifications:**

Feature	Data/Description
Switching logic	Solid state output, normally open
Sensor type	PNP current sourcing
Operating voltage	10-30V DC
Switching current	100mA
Switching rating	3W max
Current consumption	14 mA @24 V max
Voltage drop	2V max
Leakage current	2V max
Colour of LED	Yellow
Cable	Ø 3.3,3C,PVC
Temperature range	-10° C to 70° C
Shock	50G
Vibration	9G
Protection	IEC 529 IP67
Protection circuitry	Power source reverse polarity, surge suppression

Rotary Actuator

Part No: A1R020

Description: Rotary actuator Ø20



Features:

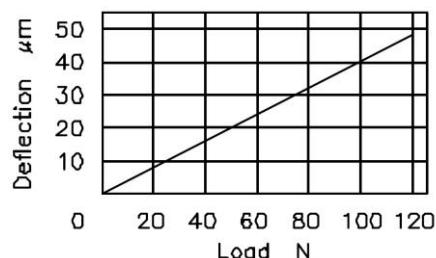
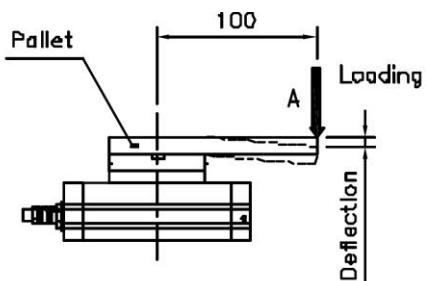
- Smaller in size and lighter in weight
- Double rack and pinion type
- Top and bottom mounting options
- Internal hollow axis for accommodating piping and wiring for the equipments mounted over the rotary actuator
- Shock absorber can be mounted internally or externally
- Provided with positioning pin hole for positioning the components mounted over the rotary actuator
- Body of the actuator has provisions for mounting magnetic sensor

Variants:

- Available in Ø15, Ø18, Ø20, Ø25, Ø28, Ø32 sizes for double rack and pinion type actuators.
- Rotation angle 0 to 90° or 0 to 180°

Feeder Station

Deflection under transverse load:

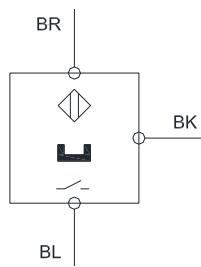


Allowable load:

Load	Side load (N)	Table load (N)	Allowable torque (N.m)
Ø20	185	a 188 b	358 4.8

Technical Specifications:

Features	Data/Description
Mode of operation	Double acting
Medium	Compressed air-filtered-lubricated/un lubricated
Torque	3.2 N.m
Rotation angle	180 degrees
Bore size	Ø20
Adjustable angle	Swing ±3°
Pressure range	1.5 to 7 bar
Port Size	G1/8
Materials of construction	
End covers	Aluminium alloy
O-ring	Synthetic rubber(NBR)
Piston(Rack)	Stainless steel
Rod	Hard steel
Bearing	Bearing steel
Stopper bolt	Alloy steel
Bearing	Bearing steel
Shock absorber	C5745
Reed switch to be used	RSWCS-9D
Weight	990g
Temperature	0°C to 50°C

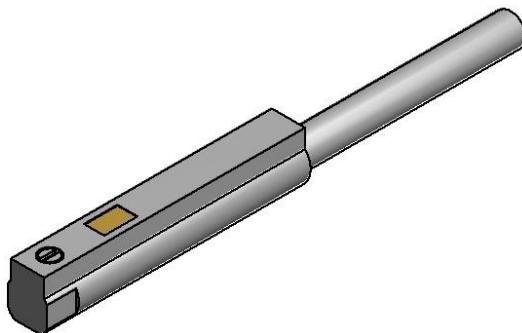


Proximity sensor for rotary actuator

Part No: RSWCS-9D

Description: Reed switch

With reed contact and light emitting diode, without mounting kit.



Function:

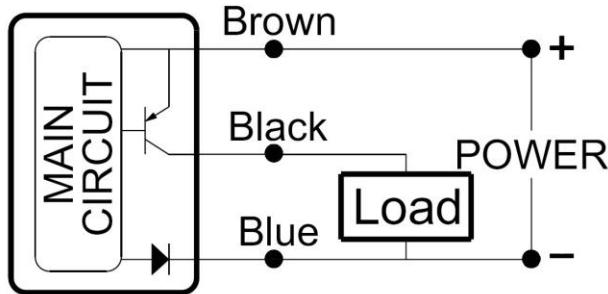
The proximity sensor consists of a reed switch whose contacts close when a magnetic field approaches thus generating a switching signal. This type of proximity sensor is used mainly in applications where it is necessary to switch high load currents. (e.g. for the direct control of electrical consuming devices).

Features:

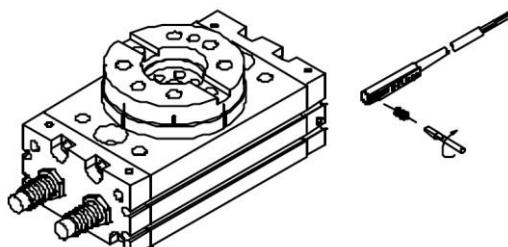
- Compact design
- Mounted directly in the slot provided for the actuator
- Integrated LED
- Simple installation and commissioning
- Sensors do not protrude from the slot

Wiring diagram:

Feeder Station



Installation:



The sensor is fitted on the cylinder body. The magnetic piston head will activate the sensor when it enters the operating range

Technical Specifications:

Feature	Data/Description
Switching logic	Solid state output, normally open
Sensor type	PNP current sourcing
Operating voltage	10-30V DC
Switching current	100mA
Switching rating	3W max
Current consumption	14 mA @24 V max
Voltage drop	2V max
Leakage current	2V max
Colour of LED	Yellow
Cable	Ø 3.3,3C,PVC
Temperature range	-10° C to 70° C
Shock	50G
Vibration	9G
Protection	IEC 529 IP67
Protection circuitry	Power source reverse polarity, surge suppression

Vacuum generator with suction cup

- Part No:**
1. Spring plunger
 2. Compact ejector (Vacuum generator)
 3. Suction pad + Female nipple



A suction pad does not attach itself to the surface of a work piece. Instead the ambient air pressure (atmospheric pressure) presses the suction pad against the work piece as soon as the ambient pressure is greater than the pressure between the suction pad and the work piece.

This pressure difference is achieved by connecting the suction pad to a vacuum generator, which evacuates the air from the space between the pad and the work piece. If the suction pad is in contact with the surface of the work piece, no air can enter it from the sides and a vacuum is generated. The holding force of the suction pads increases proportionally with the difference between the ambient pressure and the pressure inside the pad.

The spring plunger helps to remove excess load applied on the suction pad during pick and place operation.

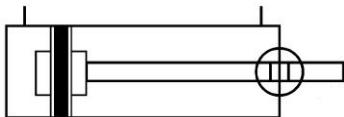
The holding force of a suction pad is calculated with the formula: $F = P \times A$

The suction pads are selected on the following criteria:

- Operating condition
- Material
- Surface

Technical data for vacuum generator

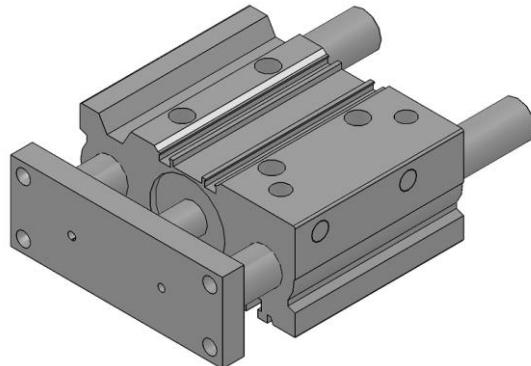
Technical data	
Nozzle size	2-0,9 mm
Degree of evacuation [%]	85.00%
Suction rate (max) [m ³ /h]	3.05 m ³ /h
Suction rate (max) [l/min]	49.5 l/min
Air consumpt. during evac. [m ³ /h]	2.49 m ³ /h
Air consumpt. during evac. [l/min]	40.5 l/min
Air consumption blow off [m ³ /h]	7.25 m ³ /h
Max. air consumption blow off [l/min]	118.0 l/min
Noise level free [dB(A)]	73.0 dB
Noise level workp. gripped [dB(A)]	60.0 dB
Pressure range (operating pressure) [bar]	0.0 bar
Recommended internal hose diameter, compressed-air side	4.0 mm
Recommended internal hose diameter, vacuum side	4.0 mm
Weight [kg]	0.195 kg
Operating temperature [°C]	0.0 °C
Pressure range (operating pressure) [psi]	0.0 psi
Suction rate (max) [cfm]	1.748 cfm
Air consumpt. during evac. [cfm]	1.43 cfm
Air consumption blow off [cfm]	4.267 cfm
Max. vacuum [inHG]	-25.1 inHg



Compact Guided cylinder

Part No: A91L40050

Description: Compact guided cylinder Ø40 X 50(Slide bearing)



Features:

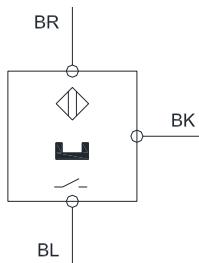
- Space saving design
- Cylinders are compatible with high loads, higher load withstanding capacity than conventional products
- Easy positioning due many mounting options
- Available with ball bushing bearing or linear bearing
- The guides prevent the rotation of piston rod and also provide resistance to lateral loads
- Slots are provided in the body for mounting the sensors
- Can be used for applications involving stopping, lifting, pushing etc.
- Top and side porting options for different demands

Variants:

- Available in bore Ø12, Ø16, Ø20, Ø25, Ø32, Ø40, Ø50 and Ø63mm and stroke length ranging from 10 to 100mm for both the linear and ball bushing bearing.

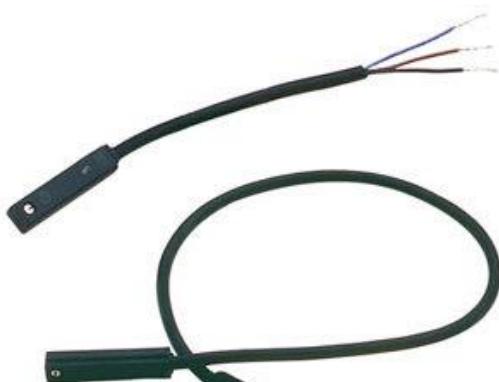
Feeder Station**Technical specifications:**

Feature	Data/Description
Bore diameter	40mm
Stroke length	50mm
Shape of piston	Round
Piston rod diameter	16mm
Bearing	Linear Slide bearing
Mode of operation	Double acting
Sensing type	Magnetic
Cushioning	Rubber bumper on both ends
Proof pressure	15 bar
Maximum operating pressure	10 bar
Minimum operating pressure	1 bar
Non-rotational accuracy of plate	±0.06°
Piston speed range	50 to 500 mm/s
Port Size	G1/8
Effective force (theoretical) at 6 bar adv.	754N
Effective force (theoretical) at 6 bar ret	634N
Temperature	-10°C to 60°C
Lubrication	Non-Lube
Stroke length tolerance	0 to +1.5mm
Magnetic sensor recommended	AM40-2-FL-04

Feeder Station**Magnetic sensor**

Part No: AM40-2-FL-04

Description: Magnetic sensor with flying lead (Solid state PNP)

**Function:**

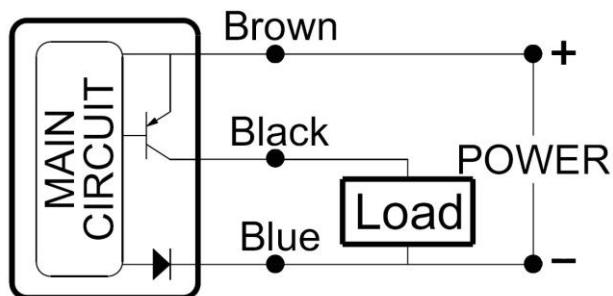
Unlike a reed switch the solid state sensor (magneto resistive sensor) has no moving parts. The sensor responds to a parallel magnetic pole by providing a digital signal to the output control circuit. This technique enables the sensing of weak magnetic fields, with no limit to the maximum strength of the magnetic field. These sensors work on the Hall Effect or magneto resistive principle.

Features:

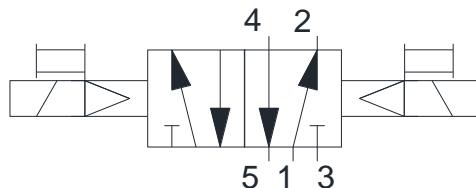
- Integrated LED
- Can be mounted on T-Slots provided for recommended Janatics series cylinders
- Higher switching frequency
- Rugged and they have a longer life since there is no moving elements involved
- Eliminates cumbersome electrical limit switches
- Moulded cable with flying lead

Variants:

- The Solid state magnetic sensors are available in both PNP and NPN type.
- The sensors are available either with Moulded cable or Quick Disconnect(QD) connector type

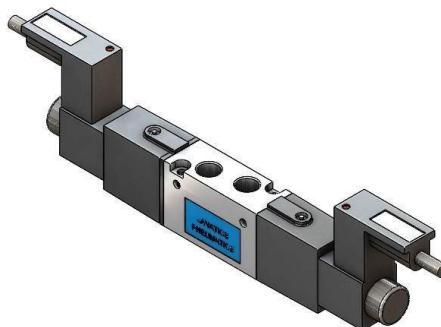
Wiring diagram:**Technical specifications:**

Feature	Data/Description
Switching logic	Solid state output, normally open
Sensor type	PNP current sourcing
Operating voltage	10-30V DC
Switching current	100mA
Switching rating	3W max
Current consumption	14 mA @24 V max
Voltage drop	2V max
Leakage current	2V max
Colour of LED	Yellow
Cable	Ø 3.3,3C,PVC
Temperature range	-10° C to 70° C
Shock	50G
Vibration	9G
Protection	IEC 529 IP67
Protection circuitry	Power source reverse polarity, surge suppression

Feeder Station**5/2 Double solenoid pilot operated valve**

Part No: DS254SS60-WT1R1

Description: 1/8-5/2,24V DC Double Sol.Sp return valve with LED socket

**Features:**

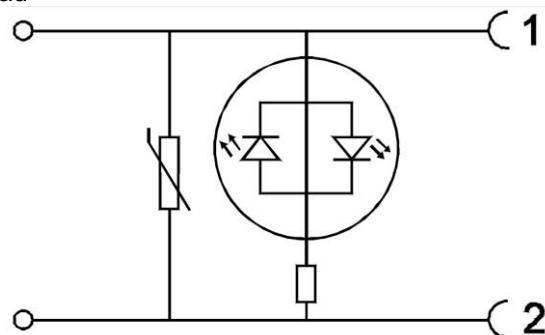
- Suitable for manifold mounting
- Mounting provision for individual unit
- Compact size
- Solenoid coils are suitable for continuous duty cycle
- Manual override

Variants:

- 3/2,5/2 and 5/3 solenoid valves are available in 1/8', 1/4' and 1/2' sizes respectively
- Wide range of coil voltages AC-220V,110V,48V & 24V, DC-110V, 48V, 24V& 12V

Protection Circuit:

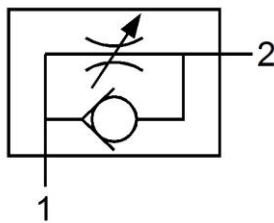
Transparent housing with Bipolar LED indicator conforming supply voltage plus varistor to give over voltage protection to source and the load



Feeder Station**Technical Specifications:**

Feature	Data/Description
Model	DS2
Type	5/2
Design	Spool type
Operating principle	Slide
With exhaust flow control	No
Type of reset	Air spring
Port size	G1/8
External auxiliary pilot air	No
Type of mounting	Manifold
Manual override	Detenting (Can be rotated to detent continuously)
Working pressure Min.	2 bar
Working pressure Max	8 bar
Recommended oil for lubrication	ISO VG32 (Servo system 32)
Ambient/medium temperature	5°C to 60°C
Flow*	450 lts/min
Actuation& reset	Double solenoid with spring return
Operating status display	No
Materials of construction	Aluminium ,Nitrile, Brass, Acetal, PBT, Zinc
Coil width	17mm
Voltage type	DC
Voltage (V) ± 10%	24V
Power consumption	2.5W
Duty cycle	Continuous
Class of insulation	Class F
Protection circuit	Over voltage protection circuit
Type of coil protection	IP 65
Medium	Compressed air, dry, filtered, lubricated

*-Inlet pressure 6 bar and pressure drop 1 bar

Feeder Station**Flow control valve**

Part No: GR5105004

Description: Flow control valve 1/8 x ø 4**Features:**

- Directly mountable on cylinder/valve ports
- Can be rotated by 360°
- Fine regulation of air flow
- Nickel plated body
- Male threads(R) Teflon coated
- Elegant design and finish

Function:

These valves allow controlled flow of air in one direction and free flow of air in the other direction. These valves are available in two versions

- I. Supply control version
- II. Exhaust control version

Application:

These valves are used to control the speed of the piston in a pneumatic actuator

Technical specifications:

Feature	Data/Description
Model	GR5
Function	One way flow control
Free flow	1 to 2
Controlled flow	2 to 1
Diameter of the tube	4 mm
Medium	Compressed air-dry/lubricated
Operating pressure range	1 to 10 bar
No of needle rotations	10
Ambient temperature	5°C to 60°C
Materials of construction	Brass ,Acetal ,Nitrile
Applicable tubes	Nylon, Polyurethane

Feeder Station**Valve Manifold****Function:**

The use of manifolds in pneumatic circuits allows compact & professional design by eliminating the individual routing and tubing for valves. The manifold also eliminates the need for individual inlet and exhaust by providing a common inlet and common exhaust for the valves connected over it.

Variants:

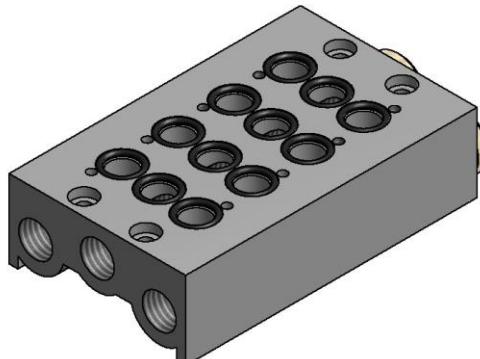
Manifolds are available for 3/2, 5/2 and 5/3 valve for 1/8, 1/4 and 1/2 for DS2-Compact valve series

Accessories provided:

Provided with M3 screws and gaskets for mounting the valves

Types:**1. Part No: M0030102**

Description: Manifold (4 valves) DS2-1/8", 5/2, 5/3

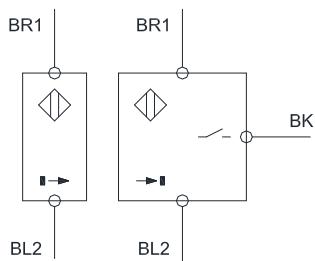
**Installation:**

The cover plate assembly can be used to plug the unutilized position in a manifold. For eg. If it is required to mount only 3 valves on the manifold, the fourth position can be plugged and made dummy using a cover plate assembly

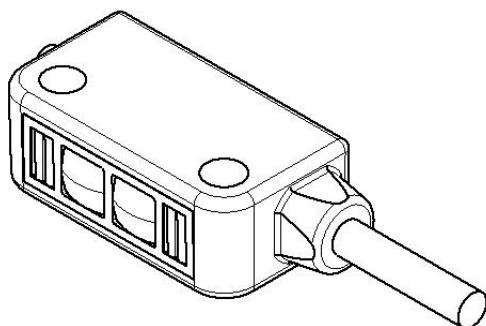
Technical Specifications:

Feature	Data/Description
Manifold Type	M003
Model	M0030102
Applicable valve	5/2 and 5/3
Applicable port size of valve	G1/8
No. of valves that can be mounted	4
Grid spacing (centre to centre)	19mm
Port Size of manifold	G1/4
Maximum no. of valves that can be mounted in this series	8
Overall length	103 mm

Photo Electric Sensor (Through Beam)



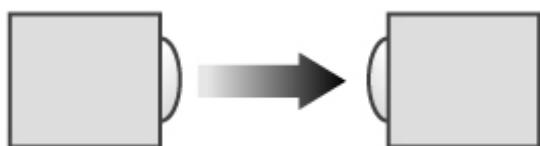
Description: Opposed type Photo electric sensor



Working Principle:

A photoelectric sensor is an optical control that detects a visible or invisible beam of light, and responds to a change in the received light intensity. An opposed type through beam sensor has two main components: an emitter and a receiver. The emitter contains the light source, which is either an LED or a laser. The emitter's light source is pulse-modulated by an oscillator.

The receiver contains an optoelectronic element, such as a phototransistor or a photodiode which detects the light from the emitter, and converts the received light intensity to an electrical voltage. That voltage is amplified and demodulated. The receiver is "tuned" to the pulse frequency of its emitter, and ignores all of the other ambient light, which is gathered by its lens.



The receiver is set to produce an output signal, which occurs either above or below a specified intensity of the light received from its emitter.

Feeder Station

Features:

- Bright, visible red (640 nm) light source
- Delivers powerful sensing performance in extremely confined areas
- Operates under a DC voltage of 10 to 30V
- Rectangular Housing of size 22 x 12 x 8 mm, with bipolar NPN/PNP outputs
- Sensing range of 2m
- Light Operate (L.O.) or Dark Operate (D.O.), depending on model
- Standard models available with 4-wire 2 m (6.5') or 9 m (30') cable or 3 or 4-wire 150 mm (6") pigtails with Pico-style M8 threaded connector
- Crosstalk-avoidance circuitry for multiple-sensor applications
- LED status indicators for Power ON, Output Overload, Signal Received, and Marginal Signal

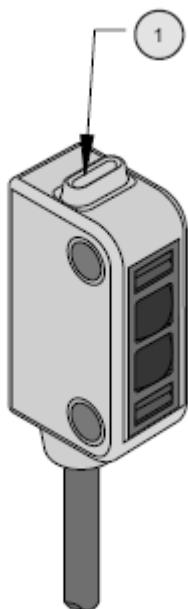
Installation:

- Position the receiver first
- Align the emitter as accurately as possible to the receiver

Accessories:

- Provided with M3 screws, Plate washer, serrated washer and nut for mounting purpose

Features of LED Indicator



• 1. Yellow and Green LEDs

- Green ON steady: power to sensor is ON
- Green flashing: output is overloaded
- Yellow ON steady: received signal
- Yellow flashing: marginal signal

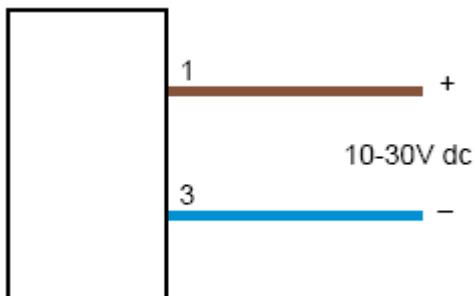
Light Operate (LO) & Dark operate (DO):

Light Operate (LO) describes a condition in which a photoelectric sensor's output energizes its load when the sensor "sees" a sufficient amount of its own modulated light.

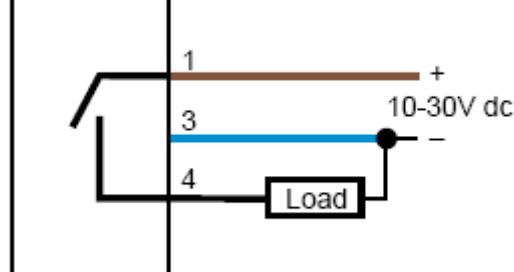
Dark Operate (DO), the complement of LO, is a condition in which the sensor output energizes its load when it no longer "sees" the modulated light.

Wiring Diagram for Opposed type photoelectric sensor:

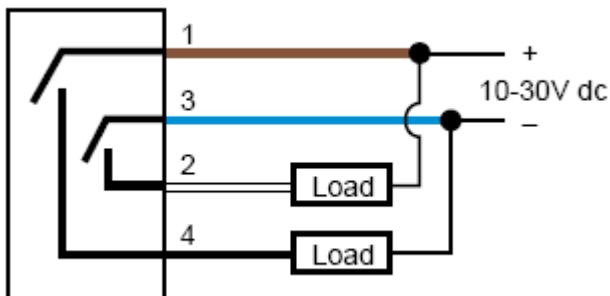
Emitter



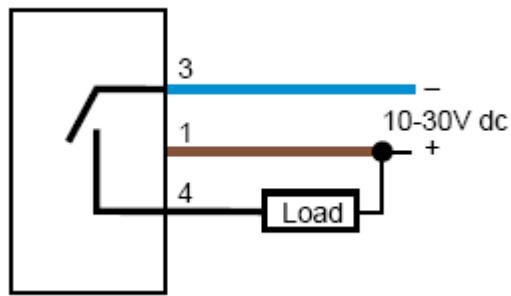
PNP output



Bipolar output



NPN Output



Wiring Key:

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black

Feeder Station**Technical Specifications:**

Feature	Data/ Description
Sensing Beam	640 nm visible red
Sensing range	2m
Function on actuation	Sender and receiver
Supply Voltage and Current	10 to 30V dc (10% max. ripple) @ 20 mA max current
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output configuration	Bipolar (1 NPN and 1 PNP) or solid-state output or Single output (PNP or NPN), LO or DO, depending on model
Out put response time	1.3 ms ON; 900 µs OFF
Connection	2 m (6.5') or 9 m (30') attached PVC cable, or 150 mm (6") pigtail with M8 or M12 threaded connection
Output protection Circuitry	Protected against false pulse on power-up, short-circuit protected
Repeatability	175 microseconds
Indicators	One Yellow and one Green LED
Material	Thermoplastic elastomer housing with polycarbonate lens
Degree of protection	IEC IP67
Operating temperature	20° to +55° C (-4° to +131° F)
Switching frequency	385 Hz
Type of mounting	Hole or slot
Mounting Screw	M3 x 15
Certifications	

Feeder Station**Power Supply**

DESCRIPTION: SMPS (230V AC to 24V DC, 4.2 Amps)



SMPS is known as Switched Mode Power Supply. It is a AC to Dc converter, which converts 230V AC to 24V Dc. Rating current is 4.2 Amps.

Features:

- Easy assembly on the DIN rail or panel
- Maximum energy efficiency thanks to low idling losses
- Quick startup with LED function monitoring
- High operating safety due to long mains buffering under full load and high MTBF (> 500,000 h)
- Can be used worldwide in all industrial sectors due to a wide-range input and an international approval package

Technical Specification**General data**

Feature	Data/Description
Standards	IEC 61010-2-201, EN 61204-3, EN 61000-3-2
Mounting method	DIN-rail mountable TH35 (EN 60715)
Temperature range	0...+40 °C, ...+55 °C derating (storage temperature -20...+85 °C)
Relative humidity	20...90%, no condensation
Protection	IP20
Efficiency	87% (115 V AC); 88% (230 V AC)
Connection	Screw terminals
Dimensions HxWxD	125x50x123 mm

Input data

Feature	Data/Description
Input nominal voltage range	100 V AC ... 240 V AC
Input current	2.4 A (100 V AC); 1.2 A (240 V AC)
Inrush current after 1 ms	max. 20 A (230 V AC)

Output data

Feature	Data/Description
Output voltage	24 V DC ±1%; 23...28 V adjustable
LED display	LED (green) for output voltage
Output current	5 A (+40 °C); 4 A (+55 °C)
Mains failure bridging time	min. 45 ms (115 V AC); min. 45 ms (230 V AC)
Ripple	max. 10 mV eff/rms
Spikes	max. 50 mV ss/pp
Unit protection	short-circuit and overload protected
Parallel usage/serial usage	no/yes (max. 2 units)

Feeder Station**Circuit Breaker**

Description: Miniature Circuit Breaker (MCB) 4Amps



Miniature Circuit Breaker is a switching element which cuts off power supply when overload or short circuit occurs, in order to protect the main circuit from malfunction/damage.

Technical Specification

Feature	Data/Description
Standards	IS 8828(1996), IEC 60898, VDE 0641/6.78
Series	5SX4/5SJ4
Tripping Characteristics	C'/D'
No of poles	Double Pole (DP)
Rated Voltage	110V DC
Current Range	0.5 – 63 Amps
Operational Voltage	Min. AC/DC V 24, Max.DC V/Pole 60, Max. AC V 440

PLC

Description: CPU 1214 (DC-DC-DC) PLC DI: 14 DO: 10



Programmable Logic Controller (PLC) is the main heart piece of the automation process control. It makes the physical connection very simple.

Features:

- The compact high-performance CPU
- With 24 integral input/outputs
- Expandable by:
 - 1 signal board (SB) or communication board (CB)
 - 8 signal modules (SM)
 - Max. 3 communication modules (CM)

Technical Specification:

Feature	Data/Description
Product type designation	CPU 1214C DC/DC/DC
Product version associated programming package	STEP 7 V10.5 or higher
Supply voltages	24V DC
Current consumption, max	1.2 A; 24 V DC
Usable memory for user data	50 Kbytes
Permissible temperature range	-40 °C to +70 °C
Degree of protection	IP20
CE mark	Yes
Dimensions, WXHxD	110X100X75 (all in mm)
Weight	435 g

21. Maintenance instructions

1. Before dismantling the unit, exhaust the air in the system completely and unplug the power cord from the mains.
2. Press the drain valve in the Filter, to drain the water condensated in the bowl
3. Check the lubrication level in the lubricator. And fill the SERVO VG 32 Oil in the lubricator, if required
4. Use M5 Allen key / 12-13 hexagonal spanner to assemble / Disassemble the sub modules from the stations
5. Check for loosening of fasteners in the systems. Tighten those using appropriate tools, if needed.
6. Check whether the modules are placed in line to the straight axis. Align them in line to straight axis, if required
7. Check the position of the sensors placed on the system. Reposition them using screw driver, if needed
8. Note the problems / troubles and ascertain the probable causes and its remedies from the table as shown in page

22. Do's and Don'ts

Do's

1. FRCLM is to be drained periodically, i.e. monthly once or twice
2. Use only SERVO VG 32 Oil for lubricator in FRCLM
3. Set the regulator at 6bar for effective operation
4. Collect and feed the work pieces from the sorting slide to stack magazine once it reach to maximum level
5. In case of any malfunctioning / emergency, press emergency switch and unplug the emergency switch,
6. Thereafter, press emergency reset switch to bring the system into normal operation
7. Stay away from the push button console once the cycle is started

Don'ts

1. Do not press the manual drain while the system is in working condition
2. Do not turn 'OFF' the power supply /SMPS while the system is in working condition
3. Do not unplug the D Sub connector cable from I/O module during the working condition
4. Do not adjust the flow control valves frequently
5. Do not change /adjust the position of magnetic sensors placed on the end actuators
6. Do not put your hands in front of any sensors while the system is functioning
7. Do not place the reject components on the conveyor module or next to it.
8. Do not feed any object /oversized components in the work stations rather than the provided work pieces
9. Do not change /adjust the position of all the sensors placed on the work stations

23. Troubleshooting

S.NO	TROUBLE	CAUSE	REMEDY
1	Dispensing module (or) Changer module (or) does not work after pressing the cycle start button	1) Low air pressure a) Less than 6 bar is set at FRCLM b) Ball valve is partially opened/ fully closed on the FRCLM 2) No Power supply a) Mains is OFF b) MCB is OFF c) Check for any loose connections in the PLC board wiring d) SMPS Failure e) PLC Failure 3) No work pieces in the stack magazine 4) Emergency switch is pressed 5) Push button wiring is disconnected or NO contact failure 6) Push button NO/NC contact failure 7) D-Sub connector cable is disconnected from the I/O module 8) I/O interface module is failure 9) D -Sub connector and cable is damage 10) Magnetic sensor is not set at actuator end position 11) Magnetic sensor is failure 12) Photo electric sensor receiver is not placed in line to transmitter or vice versa 13) Photo electric sensor does not powered up / give output 14) No signal /earth feedback provided 15) Solenoid coils are not energised 16) PLC does not give output to the solenoid 17) PLC Program is not downloaded / or erased 18) PLC is in stop mode/ shows Error 19) PLC Failure	1) Provide air pressure a) Set 6bar at FRCLM b) Open the ball valve fully 2) Provide power supply a) Switch ON the power supply b) Switch ON the MCB c) Ensure the proper wire connections d) Replace the SMPS e) Replace the PLC 3) Feed the work pieces in the stack magazine 4) Unlock the emergency switch and press the reset button 5) Connect the wires to the contact, if still persist then replace the contact 6) Replace the NO/NC contact 7) Connect the D-Sub connector cable firmly 8) Replace the I/O interface module 9) Replace the D-Sub cable 10) Set the magnetic sensor at actuator end position and tightened it 11) Replace the magnetic sensor 12) Check and make sure that the photo electric sensor placed in line to straight axis 13) Check for loose wire connections in the IO terminal assembly. if not so, then replace the photo electric sensor 14) Check for signal /earth feedback and connect them firmly 15) Check for any loose connections in the solenoid coil and connect it firmly 16) Check for proper inputs from the input elements 17) Check and download the PLC program to the PLC 18) Check for any wrong connections in the PLC and remove it. 19) Replace the PLC

Feeder Station

2	Vacuum generator does not pick the work piece	1) Vacuum generator is "OFF" 2) PLC does not give output 3) Suction pad damage 4) Work piece might have drilled hole 5) Vacuum generator is failure	1) Check the wire connection for any loose contacts 2) Check the output 3) Replace the suction pad 4) Replace the work piece 5) Replace the vacuum generator
3	Vacuum suction pad gives noise while blowing off the work pieces	1) Cushioning needle is fully open at vacuum generator	1) Adjust the cushioning needle until the noise goes off