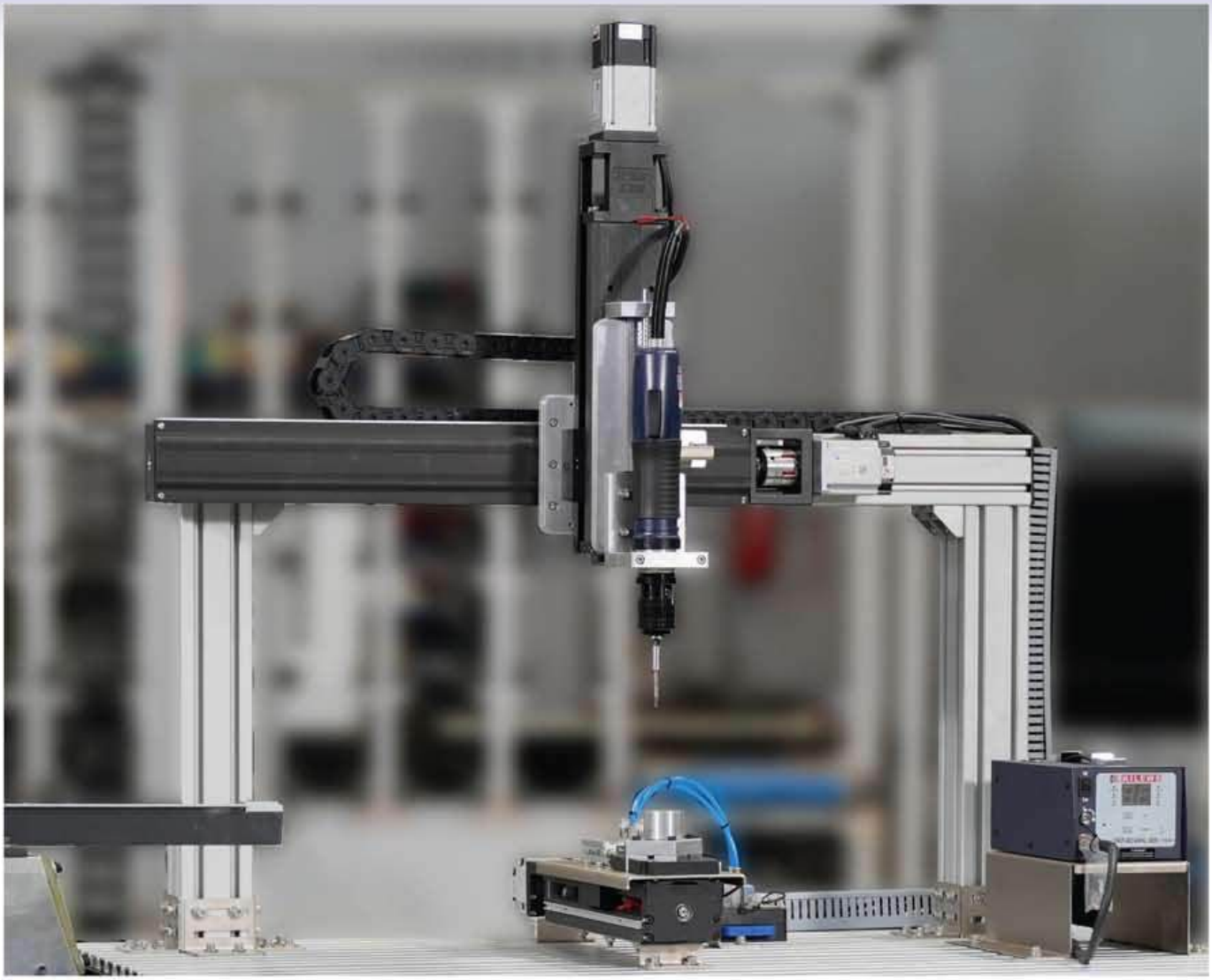
AUTOMATED BOLT ASSEMBLY STATION

Hytech Didactic Automated **Bolt Assembly Station** can be used individually or in integration with the Computer Integrated Manufacturing Setup.

This station is used to carry out bolt assembly application automatically with integration of servo slide and DC Nut Runner. Entire station is controlled and programmed with Siemens S7 1200 PLC and Siemens KTP 700 HMI.

Actual bolt feeding and assembly application is carried out on this station in integration with PLC, HMI, Digital AC Servo Motor and Pneumatically actuated systems. User is expected to carry out entire ladder programming to achieve desired results.

Basic technical requirement of this station is to assemble bolts using DC Nut runner. DC Nut runner is mounted on the servo slide powered by Digital AC Servo Motor controlled from PLC. There are three servo slides each powered by digital AC Servo motor. User can carry out interpolated motion and conclude the bolt assembly process. Users are expected to carry out the complete programming utilizing the Servo motor operation techniques in integration with PLC and HMI.



Pneumatic guided cylinder is provided on the Y axis Servo Slide to clamp the job for carrying out bolt assembly process.

Bolt Feeder station is also equipped with vibratory bowl feeder which can feed bolts of M5 x 25mm to the system. Vibratory bowl feeder operation is also actuated from the PLC and HMI of Bolt feeder station. In integrated CIM (Computer Integrated Manufacturing) System, bolt feeder station is the last process from where the assembled job is stored back in the ASRS.

In integrated CIM mode, Jobs are loaded on the Y Axis Pneumatic module by Articulated Robot. In Individual mode operation, user has to manually load the job on the pneumatic module. In CIM mode, bolt feeder station will be integrated with SCADA and MES and eventually be controlled by the Central Control Unit.

Automated Bolt Assembly Station is completely integrated with Siemens MCD – Mechatronics Concept Designer software which acts as a digital twin software with remote commissioning facility.IIOT with Siemens Nano box can also be integrated with this station.

Technical Details of Bolt Feeder Station:

Structure	
Total Dimensions	155mm x 720mm x 1670mm (HT)
Approximate Weight	150 KG
Worksurface	Made in aluminum extrusions with minimum dimensions of 1000mm x 720mm
Mobility	4 Qty castor wheels with brakes

Servo Slides	
Servo Slide 1 (X Axis)	Servo Slide with ball screw and LM Block
	Minimum stroke of 500mm
	Servo Motor (AC Digital Servo) with minimum capacity of 400 Watt
	Servo Motor amplifier with PT Logic
	Drag Chain for Servo Slide 1
Servo Slide 2 (Y Axis)	Servo Slide with ball screw and LM Block
	Minimum stroke of 200mm
	Servo Motor (AC Digital Servo) with minimum capacity of 200 Watt
	Servo Motor amplifier with PT Logic
	Pneumatic Guided cylinder for job clamping (With FCV)
	Reed Switches for Guided Cylinder (2 Qty)
Servo Slide 3 (Z Axis)	Servo Slide with ball screw and LM Block
	Minimum stroke of 200mm
	Servo Motor (AC Digital Servo) with minimum capacity of 200 Watt
	Servo Motor amplifier with PT Logic
	Drag Chain for Servo Slide 3
	Mounting arrangement for DC Nut Runner
	Floating LM Rail with block for free movement of DC Nut runner at the time of bolt assembly process

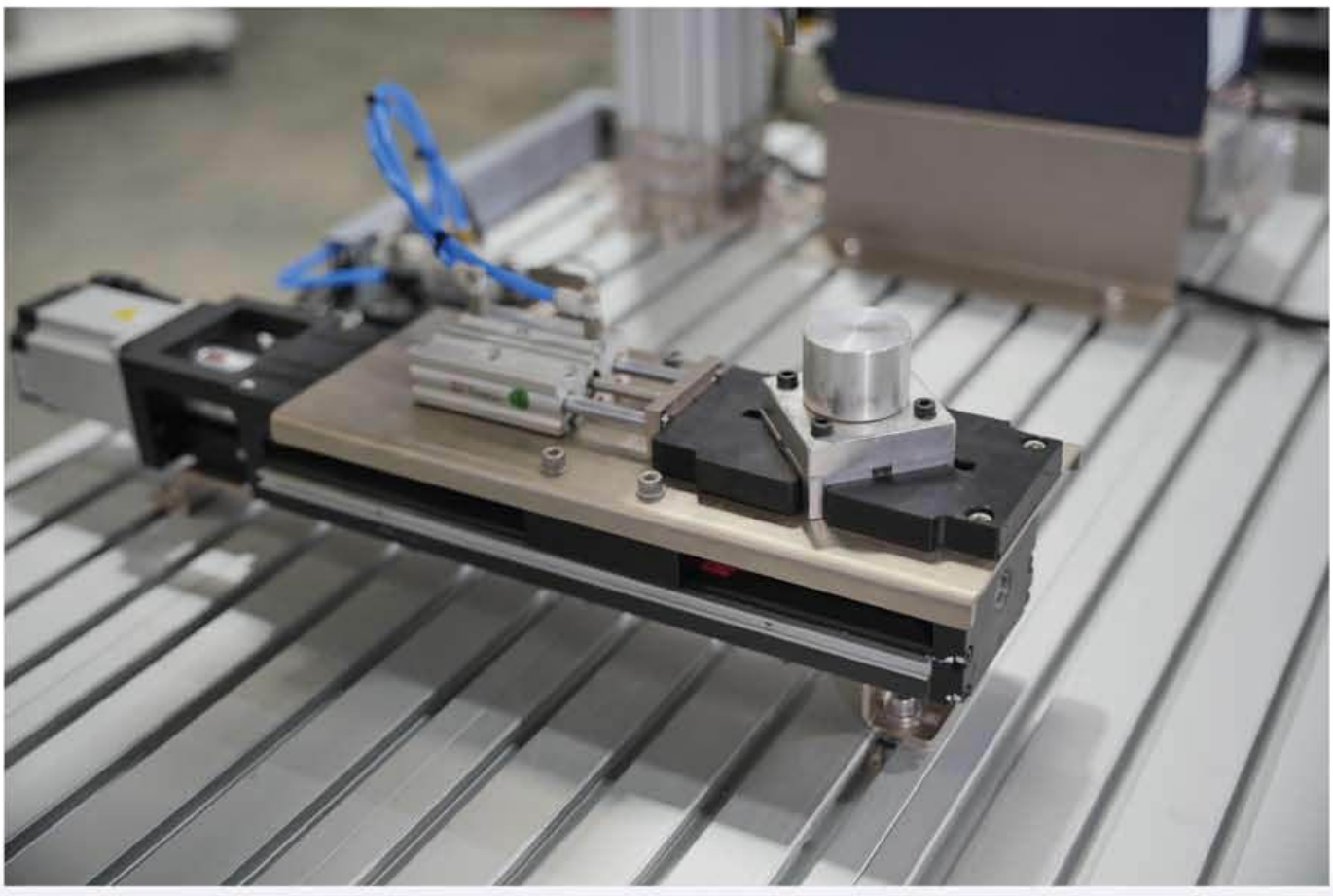
DC Nut Runner	
Nut Runner	DC Nut Runner with Controller
Maximum Torque	12 Nm
Trigger	From PLC Signals
Timer / Counter	Digital output with settable counter

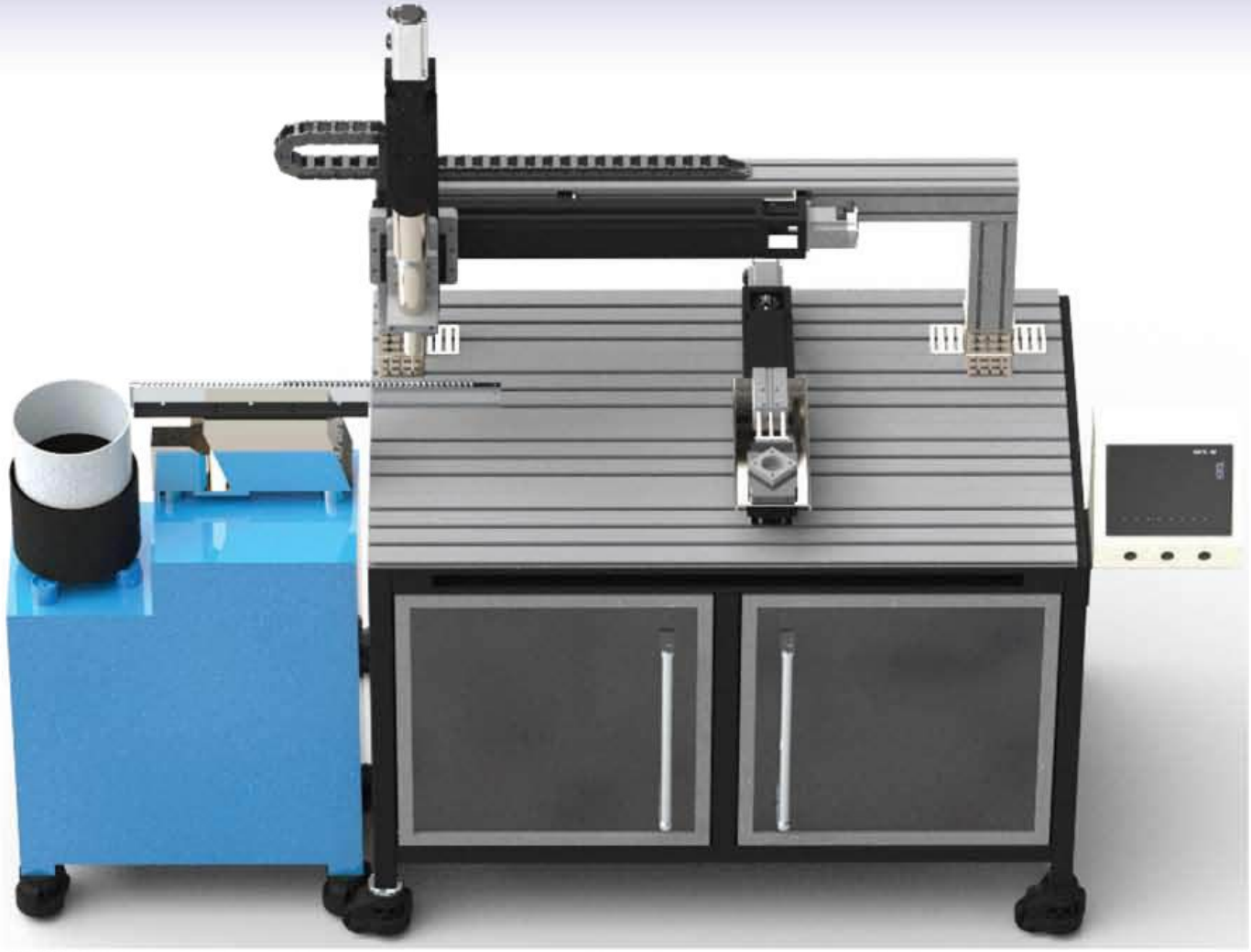
	Bolt Feeder
Type of Bolt Feeder	Vibration bowl feeder
Feeding length	Minimum 150mm (Cantilever away from vibration bowl for bolt pick up)
Bolt Size	M5 x 25 (Allen Head)
Capacity	400 Bolts
Sensor	Inductive proximity sensor

Controller	
PLC	Siemens S7 1200
HMI	Siemens KTP 700 HMI (Basic)
Switch	5 Port unmanaged switch

Pneumatics	
Pneumatic Valve	5/2 Way double acting solenoid valve
Pressure Switch	Digital Pressure Switch with analog output

Software	
PLC	Siemens TIA Basic - Perpetual





Bolt Feeder Station Experiments:

Bolt Feeder Station can be used individually as well as in integration with the entire CIM Setup. Bolt Feeder Station is equipped with PLC as well as HMI and relevant software necessary for the PLC and HMI programming.

Even in integration setup with CIM, Bolt Feeder cell will initiate the process once it receives the signal from Central Control Unit. It will complete entire task of bolt assembly and pass on the signal of process completion to CCU (Master PLC) for further process.

For experimentation, user is expected to carry out all process cycles or experiments on Bolt Feeder station in individual mode. In ideal scenario, Bolt Feeder station is programmed individually and then integrated with the CIM setup.

There are 3 jobs which are to be assembled together on Bolt Feeder station. Three manufactured jobs which are to be assembled in assembly station are as follows:

1. Mill Job 1 – Pocket Job
2. Mill Job 2 – Male Job
3. Turning job – Shaft

All three jobs are assembled together (Press Assembly) and placed in the pneumatic module for experimentation to start.

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