

# IA 520

## Computer integrated manufacturing and handling system



### Description

- familiarisation with the sequences involved in an automated manufacturing process
- PLC and process control software for sequence monitoring
- 5-axis servo robot as overhead system
- communication between PLC and control software via USB

The IA 520 training system presented here represents a fully functional CIM cell (CIM = Computer Integrated Manufacturing). The system allows an automated manufacturing process to be created. The IA 520 demonstrates the basic processes of handling (robots), manufacturing (CNC machining), and control (PLC). An overhead robot on a travel unit supplies two CNC machines with raw parts taken from a magazine. The machined dimensions of the parts are checked in an inspection station before the parts are placed in a finished parts store. Defined planning and control data is used to control various machines. The relevant data is stored in a software program, and is processed by the control units of the individual machines. A PLC system monitors and controls the process. The manufacturing cell is equipped with all necessary sensors and control devices.

The control and programming software for the CNC machines, the robot, the travel unit and the software for the PLC (monitoring and control) are installed on two PCs. The sequences in the CIM cell can be altered by modifying the PLC programming. Using a patchboard, control inputs and outputs can be interconnected such that the machines can be flexibly configured and custom concepts implemented (such as the integration of additional elements). A demo program for a manufacturing process is included.

Safety devices prevent reaching into the working area during operation of the CIM cell.

### Learning objectives/experiments

- creating part data
- writing a CNC program
- programming an industrial robot, including teach-in
- programming a travel unit
- programming a PLC
- analysis of process sequences
- intermeshing individual sequences
- investigation of the kinematics of robots
- development of safety concepts
- starting up and shutting down automated systems
- response to malfunctions

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1 safety device (photoelectric barrier), 2 lathe, 3 stock, 4 patchboard, 5 PLC, 6 robot controller, 7 inspection station, 8 milling machine, 9 travel unit, 10 robot, 11 finished parts store



The illustration shows the robot removing a part from the lathe



The illustration shows the robot storing a machined part on a pallet in the finished parts store

### Specification

- [1] demonstration of automated processes in a CIM cell
- [2] robot with travel unit as overhead system
- [3] CNC milling machine with pneumatic vice
- [4] CNC lathe with automatic tool changer, pneumatic chuck and pneumatic safety guard opening
- [5] stock with gravity feed for spherical material, capacity dependent on diameter of part
- [6] inspection station, e.g. for checking part diameter
- [7] finished parts store with self-centering pallets and interchangeable part mounts
- [8] sequence control of the individual manufacturing steps by PLC and process control software
- [9] communication between PLC and PC via USB
- [10] programming software for CNC machines, robot, PLC, travel unit under Windows
- [11] required compressed air supply: 6bar

### Technical data

Travel unit with DC servo motor

- travel: 2700mm
- repeat accuracy: 0,1mm
- max. velocity: 1,4m/s

5-axis robot with AC servomotors

- all 5 axes can be moved simultaneously
- 2-finger gripper: gripping force adjustable via compressed air

CNC lathe

- drive power output: 490W
- distance between centres: 140mm
- height of centres: 20mm
- spindle speed: 200...3200min<sup>-1</sup>
- programmable feed: 0...1500mm/min

CNC milling machine and drill

- drive power output: 450W
- travel: x=225mm / y=150mm / z=140mm
- spindle speed: 350...3500min<sup>-1</sup>

PLC

- 40 digital inputs / 1 analogue input
- 40 digital outputs

400V, 50Hz, 3 phases

400V, 60Hz, 3 phases; 230V, 60Hz, 3 phases

UL/CSA optional

LxWxH: 3270x1540x2350mm

Weight: approx. 717kg

### Required for operation

compressed air connection: min. 6bar

### Scope of delivery

- 1 experimental plant
- 2 PC
- 1 set of instructional material