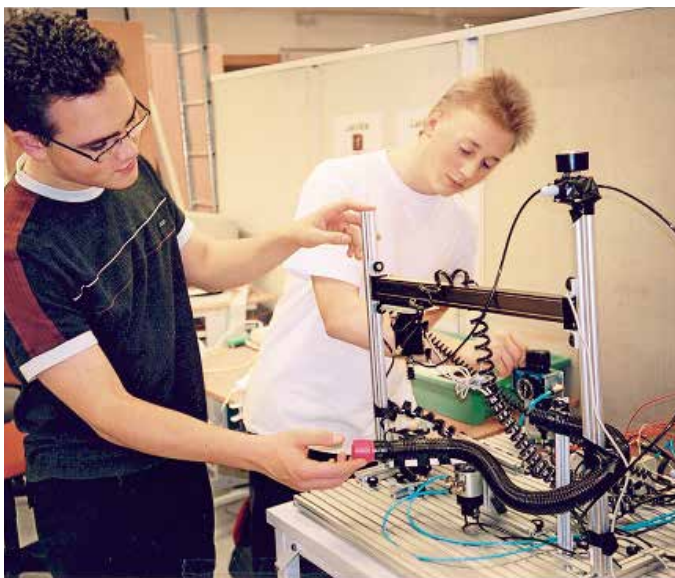


# Control Technology Mechatronics



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## CONTROL TECHNIQUES BASIC COURSE - PLC



The Basic Control Technology course offers a good ground training before more advanced courses in control technology and automation. The courses in this concept make use of a Laboratory Exercise Book.

The laboratory package includes:

- Logic Module
- Ball Selection Module
- Terminal Block Module
- Software Automation Organizer
- Simulation Module
- Traffic Lights Module
- PLC-Module
- Cylinder Module
- Base Unit 2000

The logic module for the Base Unit 2000 contains a logic block with switch and light diodes and various other relays. The IDEC PLC board has 12 inputs and 8 outputs. Inputs and outputs of the PLC are connected to a 20 pin socket. The PLC is to be programmed by using the software Automatic Organizer. The simplest PLC practices can be performed using a simulator board which shows the input status in the form of 6 LED's and has output signals simulated by 8 on/off switches. With the traffic lights module, pedestrian and vehicle control can be programmed. The cylinder module introduces pneumatics and sensors. The ball selection module gives more training with pneumatics. Balls of metal and non-metal are taken from a storage area and sent to a selection station where the balls are detected by an optical sensor.

### Technical Literature:

BOK312002 Basic PLC, Laboratory Exercises

*Terco reserves the right to make changes in the design and modifications or improvements of the products at any time without incurring any obligations.*



## AUT302020 Micro PLC Module

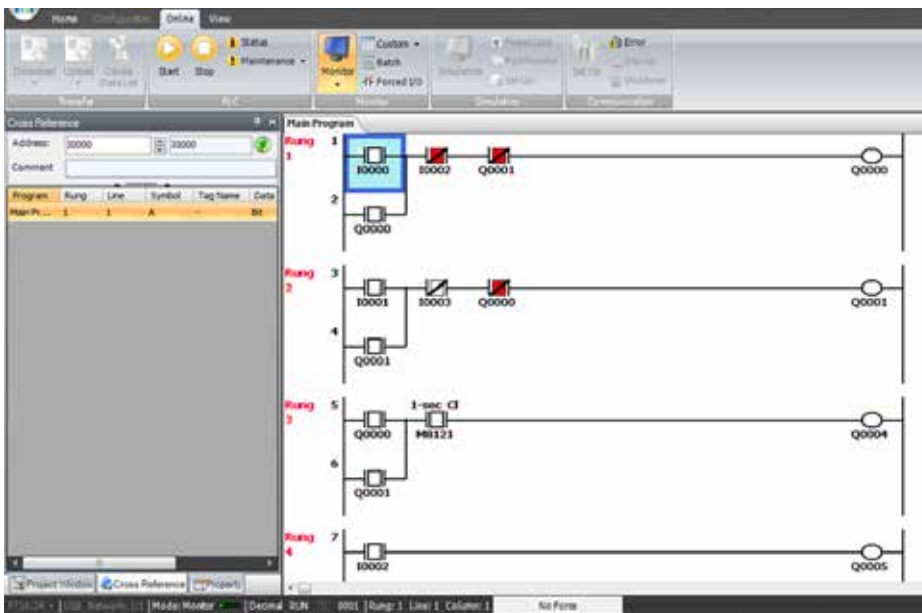
The PLC Module is to be mounted on the Base Unit 2000. To program the PLC a PC software is used for programming.

The PLC Module contains a PLC-system with sockets to connect to different module cards. For the sockets there are several switches to simulate faults at the different in- and outputs.

The PLC is equipped with a display for e.g. text messages created in the PC-software. Input and output of the PLC is connected to a 20 pin socket.

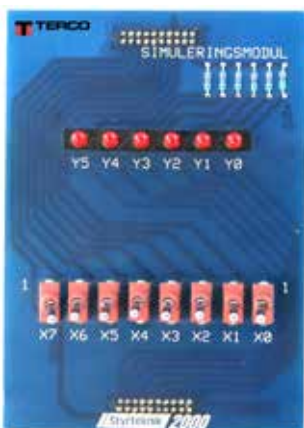
### General Data:

- PLC (24V DC)
- 12 inputs and 8 outputs
- Dimension 270 x 140 x 65 mm
- Weight 0.5 kg



## AUT311680 Programming Software

Programming Software, Automation Organizer for programming of PLC from the PC. A USB-cable for connection between the PC and the PLC is included. The program is based on Windows.



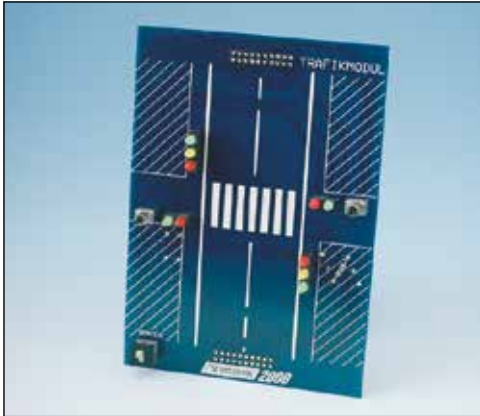
## AUT302001 Simulation Module

The output signal levels can be altered using the Simulation Module that is plugged into the sockets of the PLC Module. Shows output status with 6 LED's and has input signals simulated by 8 on/off switches.

### General Data:

- Dimension: 100 x 140 x 40 mm  
 Weight: 0.1 kg





### AUT302002 Traffic Lights Module

The Traffic Lights Module is to be connected to the PLC Module. The Module simulates a traffic crossing for cars and pedestrians at a pedestrian crossing.

When experimenting with the Traffic Module, the student has the task of creating a PLC program to control the traffic lights.

There are red and green lights for the pedestrian crossing, and red, yellow and green for the vehicle traffic.

#### General Data:

Dimension: 100 x 140 x 40 mm  
Weight: 0.1 kg



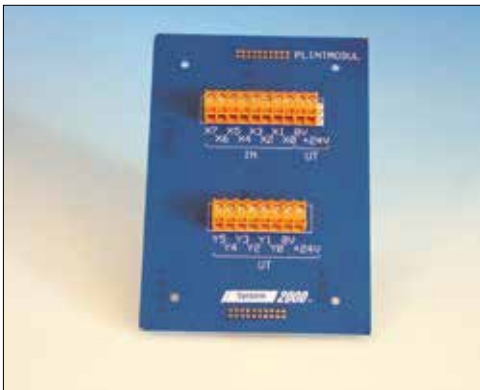
### AUT302003 Cylinder Module

This module is used to study the actions and uses of electrically controlled valves.

#### General Data:

The module consists of two pneumatic cylinders, two electrically controlled valves and four sensors. The components are mounted on a metal panel. Compressed air (3-8bar) is required.

Dimension: 200 x 140 x 90 mm  
Weight: 1 kg



### AUT302004 Terminal Block Module

The Terminal Block Module is to be connected to the PLC-Module. The PLC-Module together with the the Terminal Block Module will be used for connections to the Ball Selection Module. The connections will be made with one wire to each output and input.

In this case there will be 8 inputs and 6 outputs for control of the valves (for the cylinders), and sensors on the Ball Selection Module.

#### General Data:

Connection between PLC and Lab Equipment

Dimension: 100 x 140 x 40 mm  
Weight: 0.1 kg



### **AUT302005 Ball Selection Module**

This module is used to select balls of different colour and material to two different stores. It includes store, collect position having a measurement fixture, two output positions and two stores.

On the board there is magnetic detection, inductive sensor and micro switch. The Ball Selection Module gives the student more advanced training in pneumatics. From a storage area, the balls of metal and non-metallic materials are sent down to a sorting station.

The arrival of the balls is detected by an optical sensor. The selection is made by a shuttle cylinder that carries the balls to the relevant container. A mini cylinder deposits the balls into the correct container. The Ball Selection Module is connected to the PLC board via the Terminal Block Module.

#### **General Data:**

Dimension: 340 x 360 x 240 mm

Weight: 5.5 kg



### **AUT302006 Logic Module**

The Logic Module is built up from one, and two pole switches that can be normally open or normally closed.

#### **General Data:**

This module has two 20 pin connectors for connecting external modules, e.g. Simulation Module, Traffic Lights Module, Cylinder Module or Terminal Block Module.

Dimension: 240 x 140 x 30 mm

Weight: 0.3 kg



### **ELE102000 Base Unit 2000**

The starting point of this laboratory system is Base Unit 2000, a control panel and PCB-holder.

The Base Unit can be loaded with laboratory cards which have been carefully designed to suit each particular area of study.

The Lab Cards are placed in slots and are automatically powered via a D-sub connector.

#### **General Data:**

Supply voltage 220-240V 50-60Hz 1-phase.

The unit has 6 outputs with following data:

Outputs 1-3: DC 12V / 3A with LED indication and fuse.

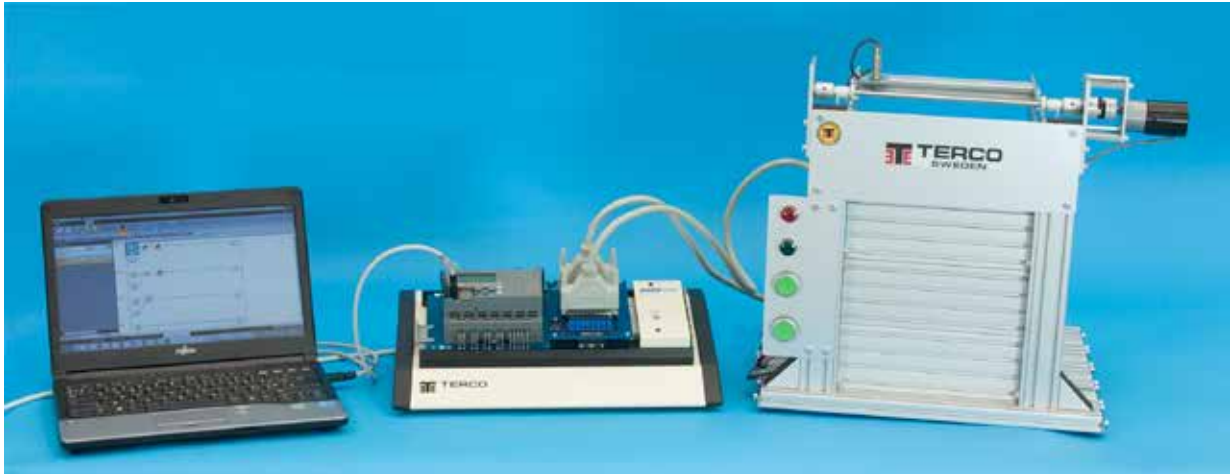
Outputs 4-6: AC 24V / 3A with LED indication and fuse.

Dimension: 370 x 180 x 75 mm.

Weight: 4 kg

***Other supply voltages available on request.***

## AUTOMATIC SECTIONAL DOOR MODEL



The Automatic Sectional Door package offers a good training in control technology and automation. The course starts with basic exercises on logical functions with relays up to more advanced PLC - exercises. A complete laboratory package includes:

- Automatic Sectional Door Model
- Control Module
- D-sub / Socket Module
- D-sub / Sim Module
- Socket Module
- Simulation Module
- PLC Module
- Base Unit 2000

The laboratory exercises comprises various labs where you get to test a number of logical functions and how you gradually build up different controls of the door.



### AUT309905-M Automatic Sectional Door Model

The Door is a miniature of a garage door. It consists of a roller shutter which can be hoisted up and down by means of a motor coupled to a cable system. The garage door can be controlled by either a relay-based control system or PLC. You can study start-stop functions, logical functions sequence and timing etc. Inductive sensors are used as limit switches. Other sensors can of course be used as optional.

The garage door is moved up and down by a DC - motor. It can be controlled manually by the push-buttons on the door side or with the switches on the Control Panel AUT309907 which is needed for both exercises.

It can also be controlled by a PLC e.g. AUT302020 via either labflexes or cables with D-sub contacts.

For these experiments the socket Module AUT302008 plus D-sub Module AUT309906 or D-sub / Sim Module AUT309908 are needed.

#### General Data:

Dimension: 500 x 400 x 430 mm  
Weight: 8 kg



### AUT309907 Control Module ME1

This Control Module contains components for doing basic experiments with relays, switches and LED's. ME1 is to be placed in slots of the Base Unit 2000 and automatically powered via a 32-pole D-sub connector. ME1 has following components:

- 4 pcs switching relays 24V DC
- 4 pcs toggle switches
- 4 pcs LED's
- 4 pcs pushbuttons

#### General Data:

Dimension: 280 x 140 x 50 mm  
Weight: 0.4 kg



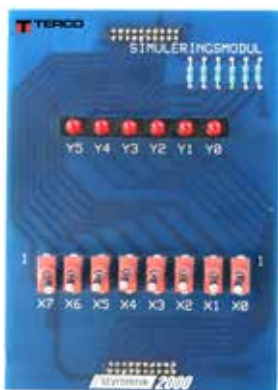
### AUT309906 D-sub / Socket Module ME2

With this module it is possible to connect the inputs and outputs of the Automatic Door Model to 4mm lab flexes. It contains:

- 16 sockets (4 mm)
- 2 D-sub contacts
- 2 sockets for power supply +24V DC

#### General Data:

Dimension: 175 x 65 x 50 mm  
Weight: 0.15 kg



### AUT302001 Simulation Module

The output signal levels can be altered using the Simulation Module that is plugged into the sockets of the PLC Module.

The 6 LED's shows output status and has input signals simulated by the 8 on/off switches.

#### General Data:

Dimension: 100 x 140 x 40 mm  
Weight: 0.1 kg



### AUT302008 Socket Module

The Socket Module is to be connected to the PLC-Module. The PLC-Module together with this socket Module will be used for 4 mm connections to the Automatic Door Model.

#### General Data:

4 Toggle switches  
Dimension: 100 x 140 x 45 mm  
Weight: 0.1 kg

**ELE102000 Base Unit 2000** For image and details see page 5 or 12





### AUT309908 D-sub / Sim Module

With the D-sub / Sim Module, you can either simulate your program function using the switches or connect to your process model using the 37-pol D-sub contacts. Two cables are included.

The Module contains:

- 2 D-sub contacts
- 6 LED's (Y0 - Y5)
- 8 Switches (X0 - X7)

#### General Data:

Dimension: 100 x 140 x 30 mm (only the card)

Weight: 0.6 kg (incl. the cables)



### AUT302020 Micro PLC Module

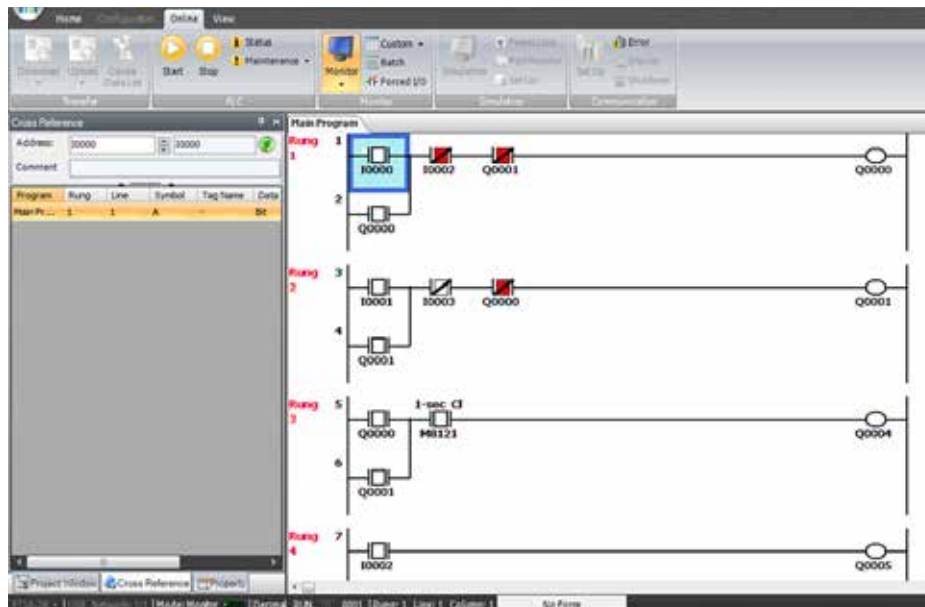
The PLC Module is to be mounted on the Base Unit 2000. To program the PLC a PC software is used for programming.

The PLC Module contains a PLC-system with sockets to connect to different module cards. For the sockets there are several switches to simulate faults at the different in- and outputs.

The PLC is equipped with a display for e.g. text messages created in the PC-software. Input and output of the PLC is connected to a 20 pin socket.

#### General Data:

- PLC (24V DC)
- 12 inputs and 8 outputs
- Dimension 270 x 140 x 65 mm
- Weight 0.5 kg



### AUT311680 Programming Software

Programming Software, Automation Organizer for programming of PLC from the PC. A USB-cable for connection between the PC and the PLC is included.

The program is based on Windows.

## PNEUMATIC AND CONTROL TECHNIQUES



### **AUT300200 Mecha-Kit**

Terco Mecha-Kit is a modular system for education in pneumatic and control techniques, known today as Mechatronics.

The Kit consists of an aluminium base plate and a hard case, and a plastic box containing a number of different components within the field of Mechanics, Electronics, and Pneumatics.

With the Kit the students can build a number of simple automatically controlled handling units where only the imagination of the students sets the limit.

All electrical wiring and pneumatic circuitry work is done by the students.

The combination of direct hands on training and almost unlimited possibilities, inspire the students and quickly increases their interest in this kind of engineering.

Most of the handling units can be linked to a PLC unit for automated control.

The units can be linked together and form a network and simulate a flexible manufacturing cell.



### **AUT300202 Wheel Table**

This Wheel Table is suitable to use together with the Mecha-Kit.

#### **General Data:**

Dimension: 600 x 600 x 900 mm (approx.)

Weight: 19 kg

## The Mecha-Kit System



Mecha-Kit components are contained in a hard shell hand box which is easy to carry and easy to stow away. Lists of the components in the Mecha-Kit are specified on pages 14-15.

The exercises are completed using the Mecha-Kit. The kit includes various pneumatic components to be assembled in automation exercises. An automated installation is often made up of various mechanical units capable of performing specific tasks with a high degree of efficiency. Units with linear, swivel or rotary movements are easily constructed using profile systems. One of the advantages of a profile system is the relative ease with which portals can be built up for the inclusion of linear movement. Stands, frames or portals for automation units are built using combinations of three different units:

### General Data:

Operating Voltage 24V DC +/- 10%  
Working Pressure 5-7 bars

Dimension: 600 x 590 x 220 mm  
Weight: 17.5 kg



*Manometers and components of Industrial standards are used.*



*An assembled portal robot, 2 axis.*





## AUT302020 Micro PLC Module

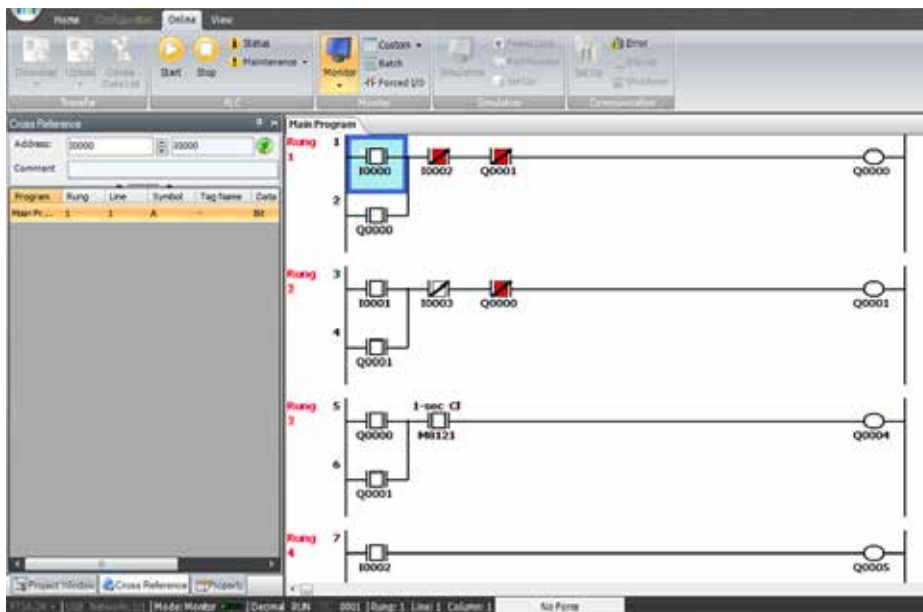
The PLC Module is to be mounted on the Base Unit 2000. To program the PLC a PC software is used for programming.

The PLC Module contains a PLC-system with sockets to connect to different module cards. For the sockets there are several switches to simulate faults at the different in- and outputs.

The PLC is equipped with a display for e.g. text messages created in the PC-software. Input and output of the PLC is connected to a 20 pin socket.

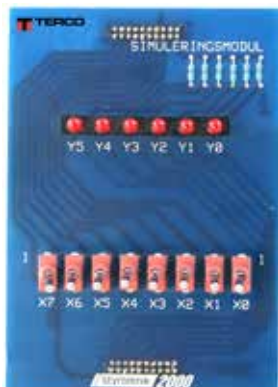
### General Data:

- PLC (24V DC)
- 12 inputs and 8 outputs
- Dimension 270 x 140 x 65 mm
- Weight 0.5 kg



## AUT311680 Programming Software

Programming Software, Automation Organizer for programming of PLC from the PC. A USB-cable for connection between the PC and the PLC is included. The program is based on Windows.



## AUT302001 Simulation Module

The output signal levels can be altered using the Simulation Module that is plugged into the sockets of the PLC Module.

Shows output status with 6 LED and has input signals simulated by 8 on/off switches.

### General Data:

- Dimension: 100 x 140 x 40 mm  
Weight: 0.1 kg





### AUT302004 Terminal Block Module

The Terminal Block Module is to be connected to the PLC-Module. The PLC-Module together with the the Terminal Block Module will be used for connections to the Ball Selection Module. The connections will be made with one wire to each output and input.

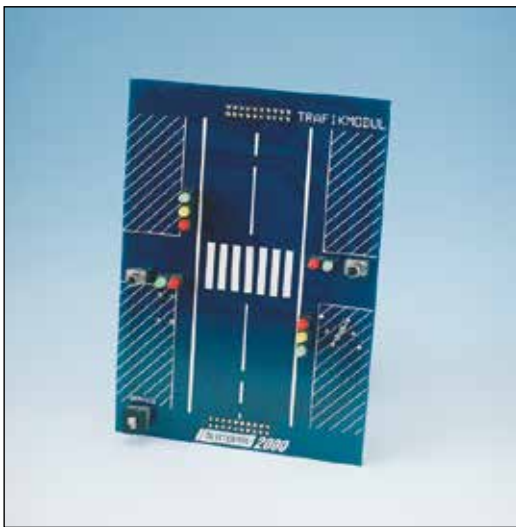
In this case there will be 8 inputs and 6 outputs for control of the valves (for the cylinders), and sensors on the Ball Selection Module.

#### General Data:

Connection between PLC and Lab Equipment

Dimension: 100 x 140 x 40 mm

Weight: 0.1 kg



### AUT302002 Traffic Lights Module

The Traffic Lights Module is to be connected to the PLC Module. The Module simulates a traffic crossing for cars and pedestrians at a pedestrian crossing.

When experimenting with the Traffic Module, the student has the task of creating a PLC program to control the traffic lights.

There are red and green lights for the pedestrian crossing, and red, yellow and green for the vehicle traffic.

#### General Data:

Dimension: 100 x 140 x 40 mm

Weight: 0.1 kg



### ELE102000 Base Unit 2000

The starting point of this laboratory system is Base Unit 2000, a control panel and PCB-holder.

The Base Unit can be loaded with laboratory cards which have been carefully designed to suit each particular area of study.

The Lab Cards are placed in slots and are automatically powered via a D-sub connector.

#### General Data:

Supply voltage 220-240V 50-60Hz 1-phase.

The unit has 6 outputs with following data:

Outputs 1-3: DC 12V / 3A with LED indication and fuse.

Outputs 4-6: AC 24V / 3A with LED indication and fuse.

Dimension: 370 x 180 x 75 mm.

Weight: 4 kg

**Other supply voltages available on request.**

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## Technical Literature

Mecha-Kit is delivered with a comprehensive laboratory manual in 4 colour print which contains traditional laboratory exercises as well as problem based tasks.

For theoretical studies the following technical literature will be supplied.

### **BOK 300201 Text Book**

Contents:

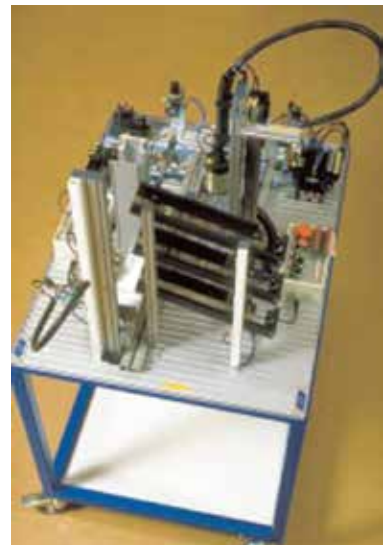
- What is Automation
- Actuators
- Valves
- Grippers
- Sensors
- Control systems
- Automation units
- Hints on commissioning and fault finding
- For practical training we have a laboratory exercise book.



### **BOK 300200 Laboratory Exercise Book**

Contents:

- Equipment explanation
- Cylinder power, setting force
- Deceleration, setting speed and deceleration
- Vacuum, use vacuum to grip
- Measuring fixture
- Pick and Place robot with short movements
- Pick and Place with rotation
- Linear movements
- Assembly station
- Hoist



### **Learning objectives**

- **Mechanics**
- **Electronics**
- **Pneumatics**
- **PLC programming**
- **Automation**
- **Sensor technology**
- **Fault finding**

## Lists of components in Mecha-Kit

The Mecha-Kit mechanical building unit comprises of the following components:

### Profile system

- 1 Base plate with carrier handle, 600 x 560 mm, no. 1
- 1 Assembly bracket, low angle and two mounting screws, no. 2
- 1 Assembly bracket, high angle and two mounting screws, no. 3
- 2 T-profile, long angle and two mounting screws, nos. 4 and 5
- 1 T-profile, smaller, no. 6
- 1 Frame profile, larger, length 506 mm, no. 7
- 1 Frame profile, larger, length 467 mm, no. 8
- 1 Frame profile, smaller, length 150 mm, no. 9
- 1 Frame profile, short, length 55 mm, with T-groove mounting, no. 10
- 1 Short tube for suction plug, no. 11
- 1 Long tube for suction plug, no. 12
- 6 T-groove mountings for profiles
- 12 Mounting nuts, round, with plastic
- 1 Mounting for sensors, no. 13

### Pneumatic and electrical components

- 1 Air handling unit 1/4" conn. with shut-off valve, filter, pressure regulator and pressure gauge
- 1 Manifold lock, with connections
- 1 Pressure regulator with pressure gauge and non-return throttle valve
- 1 Double-acting cylinder, Ø 20 mm, stroke 40 mm, complete with mounting plate and mounting nuts
- 1 Double-acting cylinder, Ø 20 mm, stroke 50 mm, complete with mounting plate
- 1 Swivel device with 180° swivel, complete with mounting bracket, rotary arm and two PNP sensors
- 1 Shuttle cylinder Ø 16 mm, stroke 300 mm, complete with subplate and mounting brackets
- 8 Variable non-return throttle valves, mounted on all cylinder ports
- 1 Valve unit comprising six unistable valves, electrical control with spring return
- 1 Manifold block, electrical with starter button
- 6 PNP sensors, 3-wire
- 1 Vacuum monitor sensor
- 1 Ejector, complete with vacuum gauge
- 1 Plastic ejector, complete with connections
- 1 Suction pad with nipple
- 1 Suction pad, bellows type
- 1 Main air supply valve



Frame profiles.



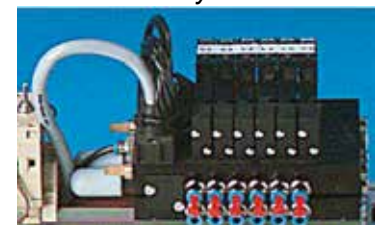
Air handling unit.



Pressure regulator with pressure gauge and variable non-return throttle valve.



Shuttle cylinder.



Valve unit consisting of six unistable valves.

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### Other components included

- 1 Plastic storage box, 250 x 205 x 40 mm
- 2 Mountings for ball conveyor
- 1 Ball conveyor, 600 mm
- 1 Plastic cup, red Ø 35 x 15 mm
- 3 Pucks Ø 50 mm, height 30 mm, white, black and metallic
- 1 Square, 50 mm side, height 30 mm.
- 4 Wooden balls Ø 22 mm
- 1 Ball socket
- 5 Straight connection leads for sensors, 1 m
- 3 Angle connection leads for sensors, 1 m
- 4 Sensor mountings with double-acting cylinders
- 3 Sensor mountings for shuttle cylinder (painted red)
- 1 Dismantling fork
- 1 Plastic tube 4 mm, 5 m
- 1 Spiral hose, single, 4 mm
- 1 Spiral hose, double, 4 mm
- 1 Spiral hose, triple, 4 mm
- 1 Plastic tube clipper
- 2 Plastic mountings for cable and sensors
- 1 Screwdriver
- 1 8mm spanner
- 3 Hexagon (Allen) keys, 2 mm, 3 mm, 4 mm
- 2 T-coupling Ø 4 mm
- 10 Plugs Ø 4 mm
- 1 Tote box for profile systems and components, with inlay and mounting for tube and spiral hose, 530 x 385 x 120 mm



### MT0415 Compressor

Suitable compressor for Mecha-Kit.

This is a piston type oil-lubricated compressor driven by a single phase electric motor and of fully automatic design.

The compressor works silently and without vibrations.

The compressor is equipped with:

- Overload protection
- Pressure switch with unloader
- Safety valve
- Manometer
- Drain cock
- Filter regulator with 5µm filter

#### General Data:

- Power supply: 220-240V, 50-60Hz 1-ph
- Power consumption: 250W
- Capacity: 26 l/min at 8 bar
- Max. working pressure: 8 bar
- Tank size: 15 l

- Dimension: 380 x 380 x height 470 mm
- Weight: 22 kg

**Other supply voltages available on request.**

**A 5-7 bar compressed air supply is required. If this is not available then the compressor shown above is recommended.**



## ADDITIONAL CONTROL OBJECT

### AUT300080 Lift Model

This Lift Model is intended as a control object for programming exercises with a control system, PLC or computer. The process consists of a lift cage to be moved between four levels. The pushbuttons at each level and inside the lift cage have LEDs for indication.

#### General Data

Inputs: Power supply 24V DC

Lift up

Lift down

8 LEDs (acknowledgement)

Outputs: 8 Push buttons

4 position indicators

Logic level: 24 V DC

Connection: Via terminal block or two 37 - pin D - connectors for quick connection to I/O Module

#### General Data:

Dimensions: 340 x 405 x 650 mm

Weight: 9 Kg



### AUT302025 Micro PLC Module

The PLC Module is to be mounted on the Base Unit 2000. To program the PLC a PC software is used for programming.

The PLC is equipped with a display for e.g. text messages created in the PC-software. Input and output of the PLC is connected via D-sub contacts.

#### General Data:

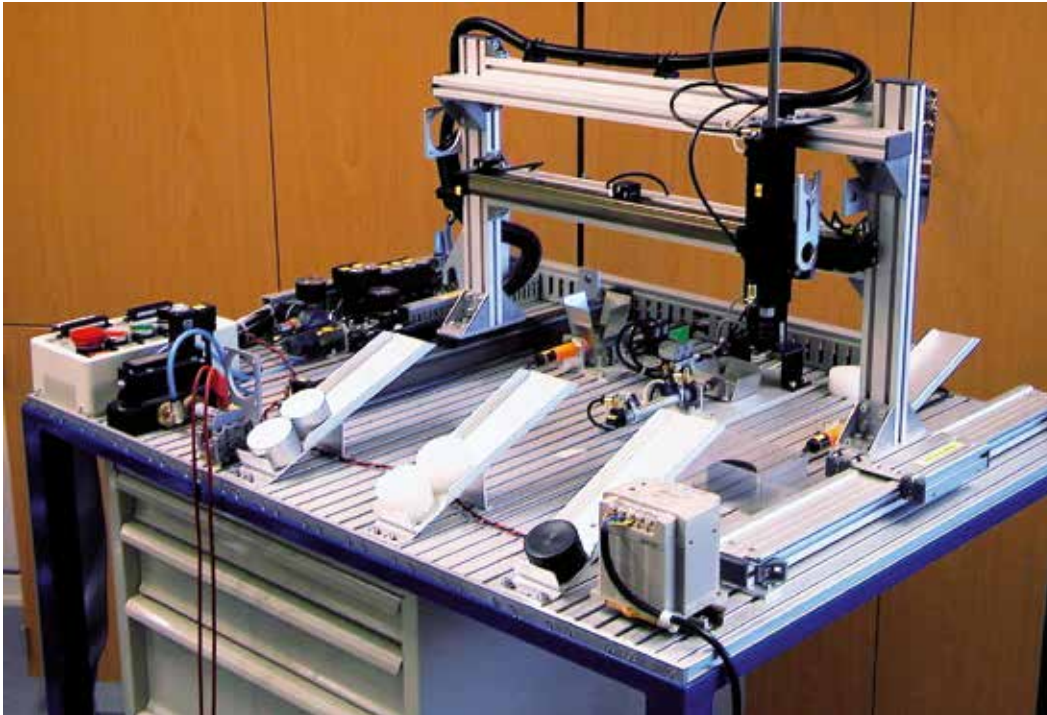
- PLC (24V DC)
- 18 inputs and 16 outputs
- Dimension 270 x 140 x 65 mm
- Weight 1 kg



**AUT311680 Programming Software** For image and details see page 11

**ELE102000 Base Unit 2000** For image and details see page 5 or 12

## ADVANCED CONTROL TECHNOLOGY



### AUTOPORTAL

AUT300130 Autoportal provides a means of studying industrial automation techniques on the basis of PLC-controlled pneumatics. It has three axis consisting of two shuttle cylinders (X- and Y- axes) which can be positioned independently of each other, as required. The third axis is a double-acting cylinder (Z-axis) complete with a vacuum cup in which objects of different shapes and materials are collected, identified with a variety of transducers and sorted between different stations.

The Autoportal is mounted on a 750 x 960mm aluminium plate, which is grooved so as to facilitate adjustment and positioning of the different modules. The Autoportal includes a control and connection box which can be used for manual control or for connecting control systems (PLC).

The Autoportal is an excellent system for basics training, and can also be used for more advanced studies of control technology.

### AUT300130 Autoportal

Autoportal is an educational model for automation training. It measures and identifies different products (samples) which differ as follows: The products are either 30 mm or 25mm in height. They are either round  $\varnothing$  50 mm or square having a side length of 50 mm. In addition they are either black or white and some of them have a metal covering. With the automation unit the student can learn how products are transported between the following stations.

- Magazine (store) for incoming products
- Measuring station for measuring height
- Station for detecting the product material
- Store for rejected products
- Store for selected products (3)

**General Data**

Required number of I/O:s	20 in; 10 out
Equipment:	1 regulator with filter 15 Sensors, 5 Cylinders, 6 Valves 1 Ejector 1 Suction Cup 2 D-connectors 37 pin
Logic level:	+ 24 Volt
Working pressure range:	5-7 bar
Dimension:	750 x 960 x 1180 mm
Weight:	50 kg

A PLC is required with the Autoportal.  
A suitable PLC can be quoted on request.

**AUT300150 Trolley for Autoportal**

The trolley for Autoportal is constructed from steel and has fixtures for the different units. The rubber wheels are lockable to keep the trolley stationary. The trolley can be seen on page 14, under the Base - Plate.

**General Data**

Dimension:	755 x 955 x 790mm
Weight:	25 kg

## Guarantee & Terms

All overseas deliveries are dispatched in special, made to order wooden crates, extremely sturdy and damage resistant.

The guarantee is valid for 24 months from delivery and covers repair or exchange of parts, defective due to faulty design or workmanship at our factory. Detailed conditions of guarantee are specified in our Terms of Guarantee. Spare parts for 2-5 years of normal operation can be offered on request.

Regular after-sales service is performed by the worldwide network of Terco representatives, along with the advice and support of our engineers.

Commissioning and training is normally offered separately. Special training can be arranged on request either in Sweden or on site.

Terco is ISO 9001 certified



## TERCO HEADOFFICE



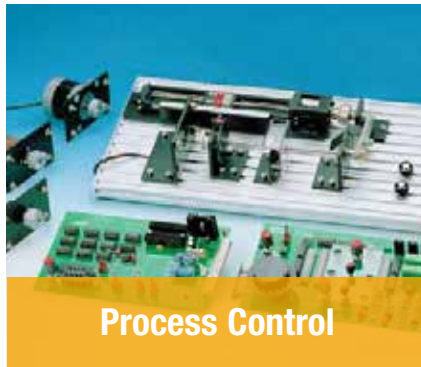
Terco headoffice and factory outside Stockholm, Sweden



TERCO AB was founded in 1963 with the aim of producing and supplying practically oriented equipment for technical education.

TERCO develops, manufactures and markets advanced equipment and systems for technical education. TERCO is today represented in more than 50 countries world wide.

# TRAINING FOR TOMORROW'S WORLD



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