TERCO

# Process-, Control- and Mechatronics System

Contents

Process Control Technology and Measuring Technique PID

Process control and measuring techniques is a modern educational package containing technical literature and hardware. The system is developed and tested in a working environment in line with the demands of modern education.The program product PID-Future together with the interface (PF-1) and many different control components combine to give a package that can handle the most common control processes, together with the help of a computer.

The program package consists of a PID regulator with which it is easy to adjust the different regulation parameters P, I and D and at the same time supervise the results. All of the Lab-Cards can be assembled on the Base Unit 2000. The equipment used in the experiments can also be used for Control Techniques (basic) and Control Techniques (advanced). The experiment book has clear instructions with 4-colour illustrations.

The educational package includes technical information, exercises and experiments
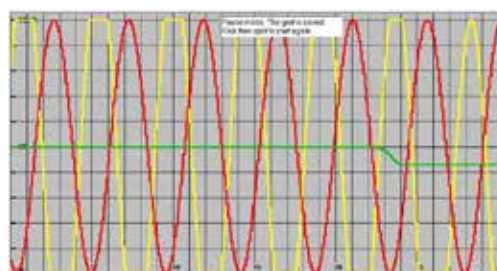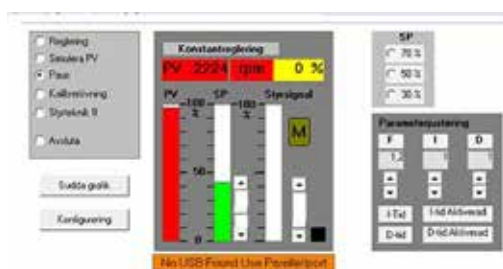
PRG302200 PID-Future Software

Windows based Programme Software for measurement, control and regulation. Setting of the set points, P. I and D. Simulation of a sine wave formed process value. Parameters are shown in number form and graphical. The programme material is bought under licence for 8 users. The program is based on Windows.

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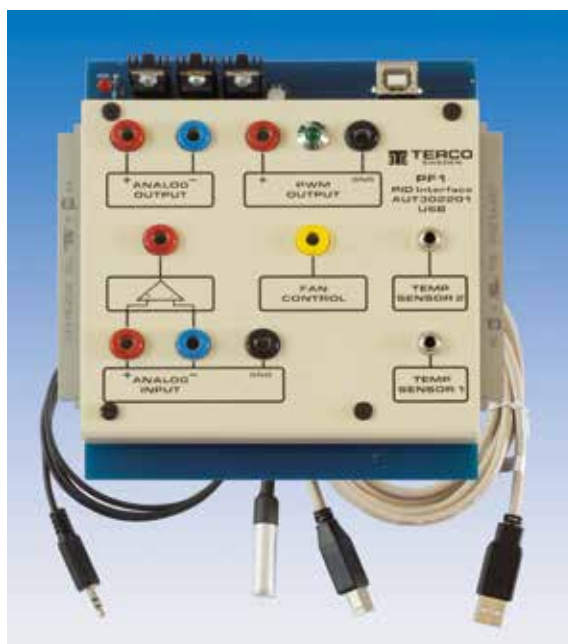Supply voltage: 220 - 240 V 50-60Hz 1-phase.

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

AUT302201 PID Interface PF1

PF1 is to be mounted on the Base Unit 2000 and connected to a PC using the software PRG 302200 (See page 5). The PF1 has one analogue input, one analogue output, current or voltage loop, one PWM output, one output for control of the fan and two inputs for temperature sensors.

General data:

Input Signal:	0-20 mA
	4-20 mA
	0-1 V (diff.input)
Output Signal:	0-20 mA
	4-20 mA
	20-0 mA

Smart Temperature Transmitter
20-4 mA -30^0C - $+130^0C$

PWM output: 1Hz

Dimension: 135 x 140 x 36 mm
Weight: 0.5 kg

AUT302202 Temperature Module PF2

PF2 is a Temperature Regulation system including a heating chamber (oven) of approx. 50W, a temperature sensor and a fan for cooling. It is connected to and regulated by the PID Interface PF1.

General Data:

Heating Chamber:	50 W
Dimension:	145 x 140 x 105 mm
Weight:	0.5 kg

AUT302203 Speed Regulation Module PF3

PF3 consists of a 12V DC motor, which has a 12V DC generator as a load. The purpose is to regulate the speed of the
motor. It is connected to the PID interface PF1.

General data:

|	
Dimension:	150 x 140 x 60 mm
Weight:	1 kg

![TERCO logo]

AUT302204 Signal Converter PF4 Including Band Cable

PF4 is an interface for adapting signals from the PC based PID- Future to the Tank Model. It is connected to PF1.
The Signal Converter is required to communicate between the PID Interface PF1 and the Car and Tank Models.

General data:
Dimension: 140 x 58 x 24 mm
Weight: 0.2 kg
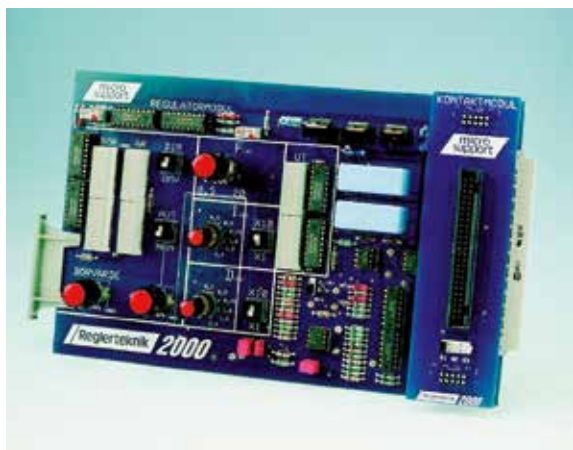
AUT 302103 Regulator module

The analogue controller, complete with contact module and band cable, is connected to base unit 2000. Setting of P, I and D is completed by trimming the potentiometer and setting of relays, rather than input data via a computer.

General data:
Dimensions: 240 x 140 x 30 mm
Weight: 0.3 kg

AUT302102 Tank Model

The Tank Model can be used to regulate level and flow. It is connected via a band cable to the signal converter PF4 which is connected to the regulator interface PF1. The model consists of a container (tank) having a capacity of 1 liter, where the level is measured at 2 places by means of a pressure gauge. The level tank can be divided into max three volumes to create different flow levels in the process. There are four taps for draining off the water to create different loads. The flow to the tank is measured by a sensor on a turbine wheel. The pump motor is driven via a rectifier which regulates the speed of the pump.

General data:
Supply Voltage: 24V DC
Current: 5A

Dimension: 550 x 350 x 510 mm
Weight: 11.7 kg

![TERCO logo]

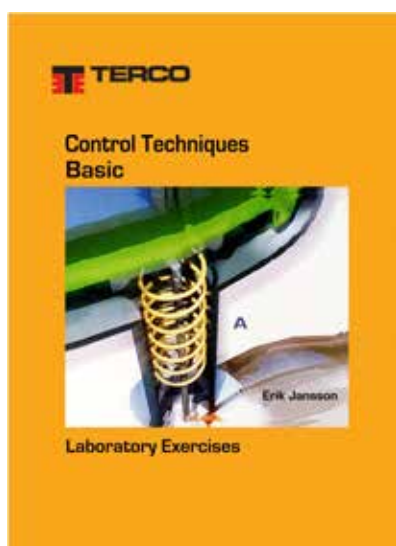## AUT302210 Sensor Set

The sensor kit consists of:
- 1 m thermocouple wire
- 1 PT 100 closed sensor
- 1 temperature sensor

The sensor kit is supplied with the required data sheets and is adapted for measuring courses, but can be used in other courses.

General data:
Dimensions: 250 x 90 x 65 mm
Weight: 0.4 kg

BOK302205 Control Techniques - Basic

Contents:
Control of the car model
Equipment installation
Temperature regulation
Speed regulation
Regulator models time constant
Measuring techniques
Examination of the tank model
Analogue regulator
Thermo element
Resistive temperature sensor
Light relay
Project work

ORDER DETAILS PROCESS CONTROL TECHNOLOGY AND MEASURING TECHNIQUE PID			
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Ref. 429

Servo Systems

This Servo Technique Set is an educational packet covering different types of servo motors and the associated electronics.

The experiments are carried out on a servo baseplate containing fixtures for the different motors having ball bearing screws for positioning. The different motors used, are DC stepper motors, AC and DC servo motors with relevant controls.

The control card is fitted to the Base Unit 2000. Servo motors are being used more and more in industry and are to a certain extent replacing both hydraulic and pneumatic. The Laboratory Exercise Book is easily understood with colour illustrations.

Basic Equipment

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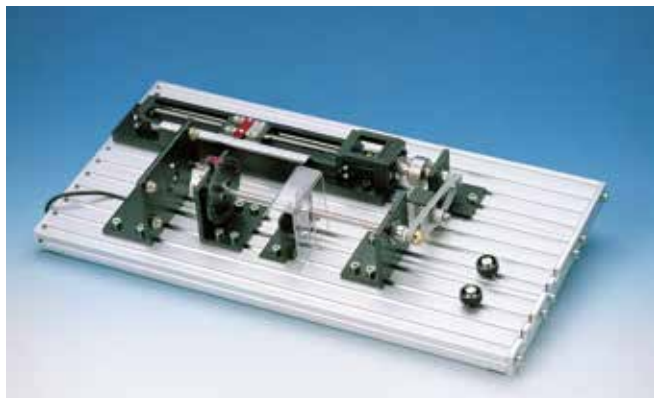Supply voltage: 220 - 240 V 50-60Hz 1-phase.

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

TERCO

AUT302500 Servo Base Plate with Linear Unit

The Servo Base Plate consists of a hard, sprayed aluminium profile. On the base plate a ball bearing supported axle is assembled.

On the axle a disc, graduated from 0 to 360 degrees, is attached, also a code disc, that controls an optical encoder with 500 pulses per rotation.

At one end of the axle, different types of motor can be attached. A Linear Unit, having a stroke length of 140 mm, is mounted on the base plate.

A millimetre scale showing 70-0-70 with an index on the travel carriage is also mounted on the base plate. The unit rises by 1mm/revolution, making it possible for good accuracy. The Linear Unit is equipped with a friction coupling.

General data:
Dimension: 420 x 240 x 100 mm, Weight: 5 kg

DC-Speed Servo

AUT302502 DC Servo Motor without Gears

A DC Servo Motor for direct connection to a servo system. It is connected to the axle on the servo base plate.

General data:

Nominal voltage	12 V
Nominal torque	10 Nmm
Nominal speed	2850 rpm
Input power	3.6 W
Dimension:	100 x 70 x 60 mm
Weight:	0.3 kg

AUT302504 Flywheel

The Servo System 2000 is loaded by connecting a Flywheel to the motor shaft by means of a shaft coupling. The flywheel weight excluding housing weighs 0.3kg.

General data:

Dimension:	100 x 40 x 60 mm
Weight:	0.4 kg

AUT302506 Generator Brake

For stepless adjustment of different loads, a Generator Brake is connected to the motor shaft. The brake action can be varied by means of a potentiometer.

General data:

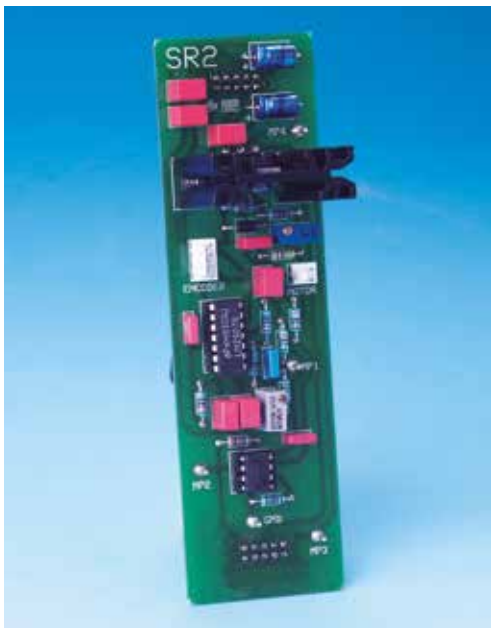|	
Dimension:	110 x 90 x 60 mm.
Weight:	0.4 kg

AUT302508 SR1 Servo Regulator

The Servo Regulator lab card is connected to the Base Unit 2000. It is used to regulate the DC servo. SR3 positioning module is used for positioning and SR2 speed module for control of speed.

General data:
Dimension: 290 x 140 x 45 mm.
Weight: 0.4 kg

AUT302510 SR2 Speed Regulation Module

Used together with the SR1 Servo Regulation Module for speed control of the DC-Motor without gear. The SR2 Speed Regulation Module will be mounted on the SR1 Servo Regulator with two electrical connectors.

General data:
Dimension: 140 x 55 x 40 mm.
Weight: 0.1 kg

DC-Position Servo

AUT302512 DC Servo Motor with Gears

This item is used with the DC positioning servo (see page 8). It is a 12V DC servo motor with built-in gears for reducing the speed to the base plate axle.

General data:

Voltage		24 V
Power	4 W	
Off load speed	5940 rpm	
Max load Current	285 mA	
Max torque	10.8 Nmm	
Dimension:	110 x 100 x 60 mm	
Weight:	0.3 kg	

AUT302514 Process Value Module

The Process Value Module for the potentiometer, functions as an analogue positioning sensor. The moving parts follow the turn of the axle. The potentiometer has an operational angle of 360°. There is no stop and the potentiometer follows the axle, changing the resistance continually.

General data:

Dimension: 160 x 60 x 60 mm.
Weight: 0.1kg

AUT302516 SR3 Positioning Module

SR3 Positioning Module is an analogue positioning sensor which can be connected via a shaft coupling to the Servo Base Plate. It includes a potentiometer which follows the torsion of the shaft. The potentiometer is single wound with an electrical angle of 360°. The potentiometer has no end stop, and it accompanies the shaft, continuously changing it's resistance.
Positioning Module SR3 is mounted on the Servo Regulator SR1.
(See on top of this side)

General data:

Dimension: 140 x 55 x 40 mm
Weight: 0.1 kg

AUT302518 Stepper Motor

The Stepper Motor is a brush-less DC motor with a rotor that can rotate to selected positions.

The motor can be made to move forwards or backwards and at different speeds with great accuracy by energising the motors different windings. The stepper

motor is connected to the axle on the Servo Base Plate. It is regulated by the Stepper Motor Module SM1. (See page 11).

General data:

Dimension: 100 x 100 x 60 mm
Weight: 0.7 kg

AUT302520 Stepper Motor Module SM1

The Stepper Motor Module SM1 is connected to the Base Unit 2000 for regulation of the stepper motor, which is mounted on the Servo base plate.

General data:

Dimension: 240 x 140 x 50 mm
Weight: 0.2 kg

AC- Servo

AUT302522 AC Servo Motor

The AC Servo Motor is mounted on the motor bracket with four quick release wing nuts. It is coupled to the shaft of the servo system.The servo motor is connected to the AC servo amplifier.

General data:
This AC Servo Motor has the following data:

Voltage	200 V
Current	0.9 A
Power	100 W
Speed	3000 rpm
Torque	0.3 Nm

Dimension:	90 x 100 x 60 mm
Weight:	0.8 kg

AUT302524 AC Servo Amplifier

The Amplifier contains a control unit, flash memory and a power
amplifier. From the control unit there are many switches for the   control of the servo system. Connection to the PLC is at the back of the amplifier. The servo system can be programmed using a   computer and then transferred to the flash memory in the amplifier.

General data:

Dimension:	290 x 260 x 170 mm
Weight:	5.3 kg

PRG302500 Programme Software Sigma Win

Sigma Win is a software for programming AC servo´s. The program is based on Windows.
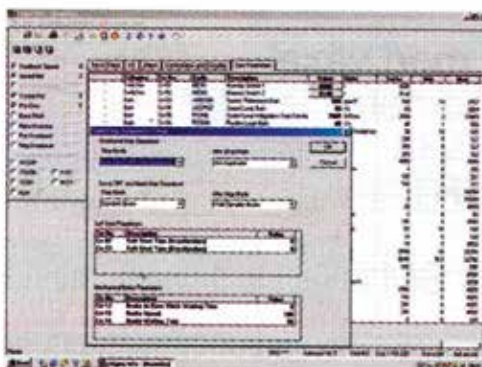
BOK302500 Text Book

Contents:
- Servo techniques
- Servo motors
- Sensors
- Servo amplifiers
- Servo control
- Automation with servo
- Hints for starting up

BOK302505 Laboratory Exercise Book

Contents:
- DC-Servo motor and encoder
- Speed servo with DC motor
- Positioning servo with DC motor
- Positioning with stepper motor
- Connection of linear unit
- AC servo

Servo system 2000 with AC servo motor connected to Servo amplifier with PC control
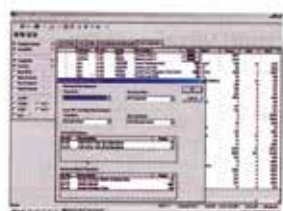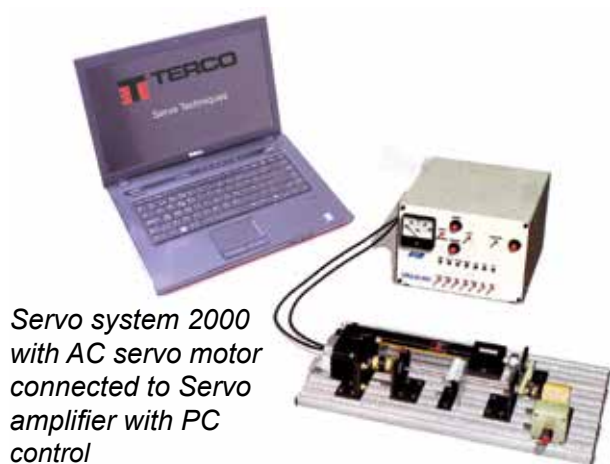
Programming software for the AC servo system.
To make it easier to programme and analyse the servo system a windows based software is used.

Different systems can be tested, servo systems variables can be configured and the signal flow observed.

ORDER DETAILS SERVO SYSTEMS			
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AUT302516	SR3 Positioning Module	1	10
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Ref. 425

Energy- and Process Control Trainer

"Exercises on the most common application that occurs in energy transport systems"

EB3000 Energy and Process Trainer kan brukes til studier på

- **Transformation of energy. For example, from electrical Power to warm water.**
- **Storage of energy.**
- **Distribution of energy.**

The equipment consists of a primary circuit which transports energy to a secondary circuit by a heat exchanger. Boiler and pumps are controlled individually via potentiometers on the front (or an operator's panel or a PC).

Values for temperature, pressure and flow may be read out directly with separate instruments, or via the HMI (Human Machine Interface) operator's panel. All values shown on the operator's panel may also be transferred to a PC and used in an Excel-sheet.

Control of the EB3000 can also be done via PC and VNC viewer.
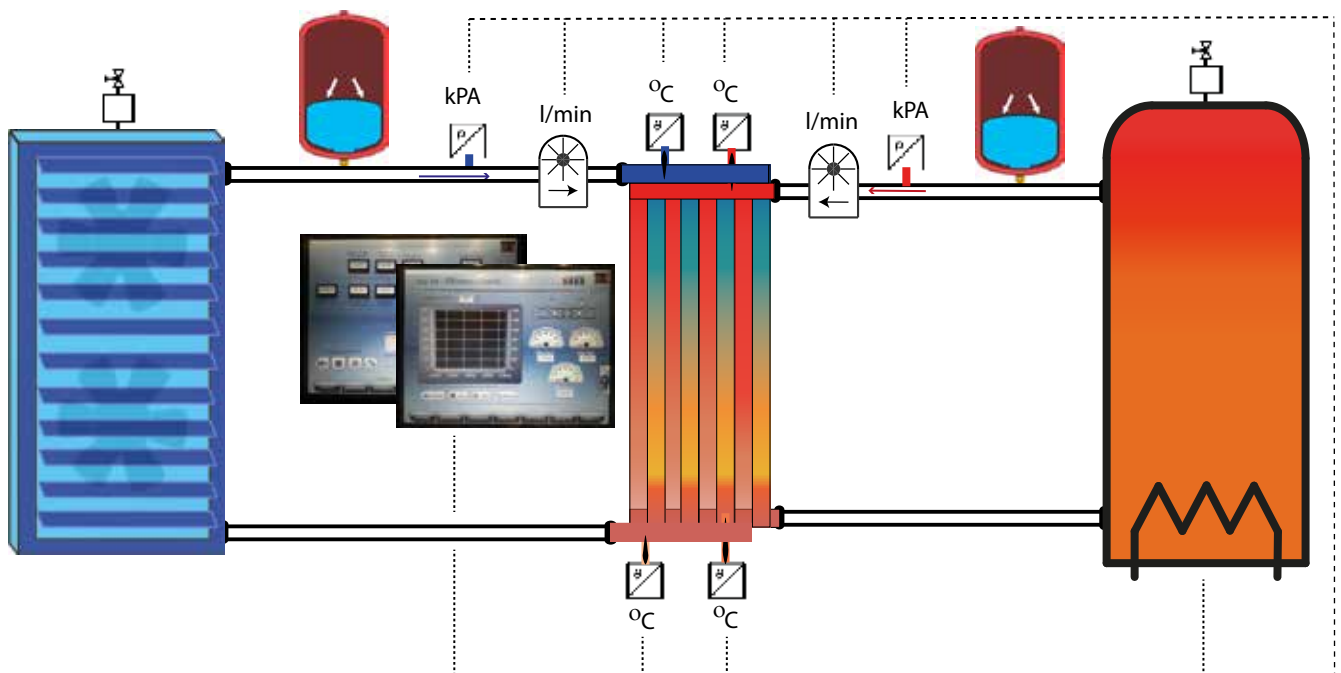
Technical Specification

The Energy Process Trainer is built up with industrial components on a varnished steel construction.
All signals are to be found on the internal mode bus.

As option it can be delivered with external connections. All signals can be obtained as analogue industrial standard 4–20 mA or 0–10 V.

Boiler power:	1000 W
Pumps:	2 x 25 W
Working temperature:	Nominal up to 65°C
Flow:	Primary 2-7 l/min; secondary 1-6 l/m
Dimension:	
Length x depth x height:	1540 x 510 x 620 mm
Total weight: approx.:	125 kg
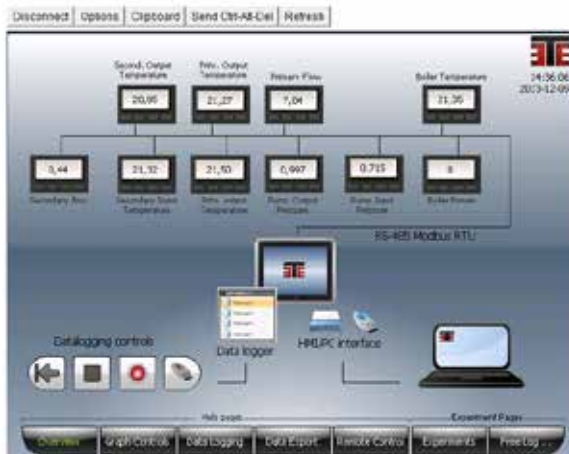
Overview

The overview page shows how EB3000 is constructed. On this page you can see the instruments via Modbus and how they are connected to the operator's panel. EB3000 can be connected to internet and be remote controlled from any computer.
Moreover, you can log, and store data in the memory of the operator's panel for later export of the data to a USB memory.
All exercises are prepared in the programme. Facts, instructions and questions are included in the Manual. Teachers Manual is included.

Graf Controller

The Graf Controller explains the features History and Legend. Updating of the Graf can be stopped by pressing History and get explained what the different Grafs are showing by
pressing Legend.
Through pressing the Graph panel, you can get access to the tool that allows you to pan and zoom the image. You can move up, down, forward, backward and zoom in, out in the graph.

Energy and Process Control Trainer Laboratory Exercises

Chapter 1 – Introduction to the Energy Process Trainer EB 3000
Chapter 2 – The Energy Process Trainer corresponding to reality
Chapter 3 – Function of the components
Chapter 4 – Fundamental concepts within energy
Chapter 5 – Experiment; Heat and temperature
Chapter 6 – Experiment; Flow control
Chapter 6 – Experiment; System pressure
Chapter 7 – Experiment; Measurement of effect
Chapter 8 – Experiment; Efficiency
Chapter 10 – Free log
Chapter 11 – Specifications

ORDER INFORMATION ENERGY AND PROCESS CONTROL TRAINER			
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ELE309902	Table with wheel for Energy Bench	1	13-15
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Ref. 500

Control Techniques - 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 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.

The laboratory package includes:
• Base Unit 2000
• Logic Module
• Software Automation Organizer
• PLC-Module
• Ball Selection Module
• Simulation Module
• Cylinder Module
• Terminal Block Module
• Traffic Lights Module

Technical Literature:
BOK312002   Basic PLC, Laboratory Exercises

Other supply voltages available on request.

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

AUT 302000 PLC Module

The PLC - Module has to be connected to the Base Unit 2000. To program a PLC a PC is connected to a programming port via a cable
Alternatively a PC software may be used for programming. The PLC-module contains a PLC-system with sockets to connect any chosen module card. For the sockets there are
several switches to simulate faults at the different in- and outputs.

General data
Mitsubishi Melsec FX3s DS PLC (24 V)
8 inputs and 6 outputs
Input and output of the PLC is connected to a 20 pin socket

Dimensions: 240 x 140 x 55 mm
Weight: 0.5 kg

USB Programming Cable for Mitsubishi Melsec FX Series PLCs,

AUT 302001 Simulation Module

The signal levels on the inputs can be altered through a simulation module, plugged into the sockets of the PLC module.

General data
Shows input status with 6 LED and has out-going signals simulated by 8 on/off switches.

Dimensions: 100 x 140 x 40 mm
Weight: 0.1 kg
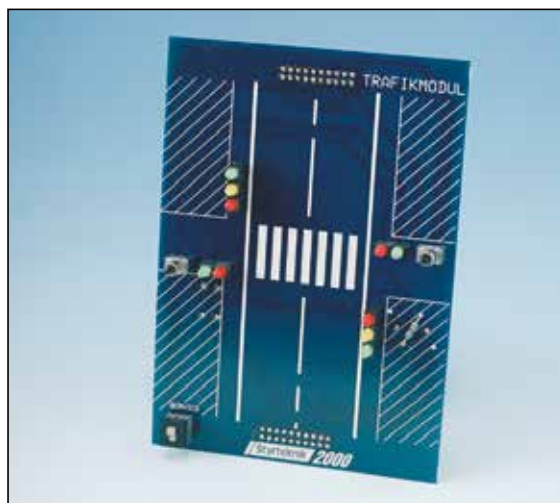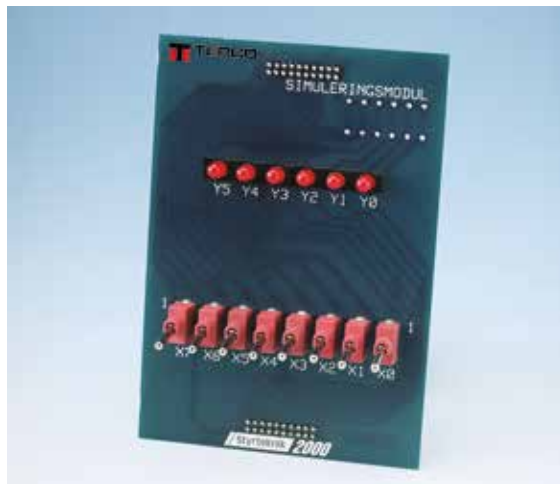
AUT302002 Traffic Lights Module

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
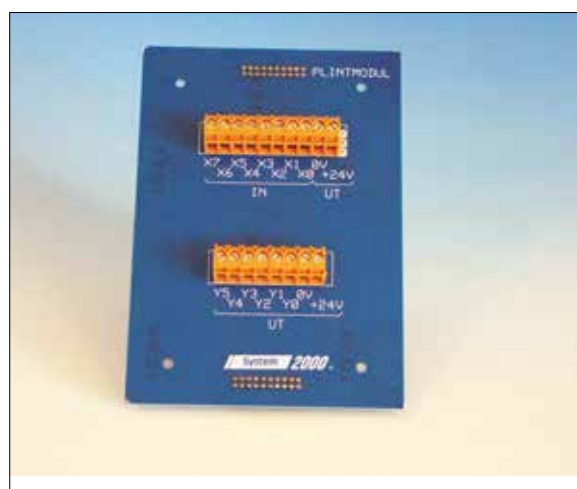Weight: 0.1 kg

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
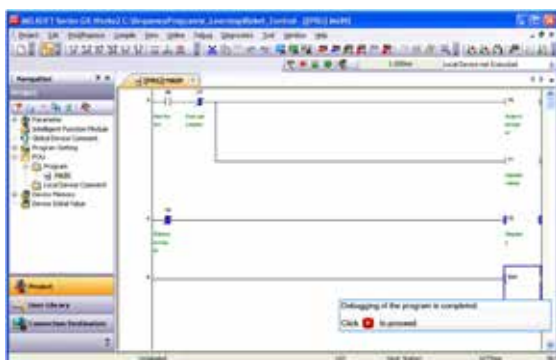
![TERCO logo]
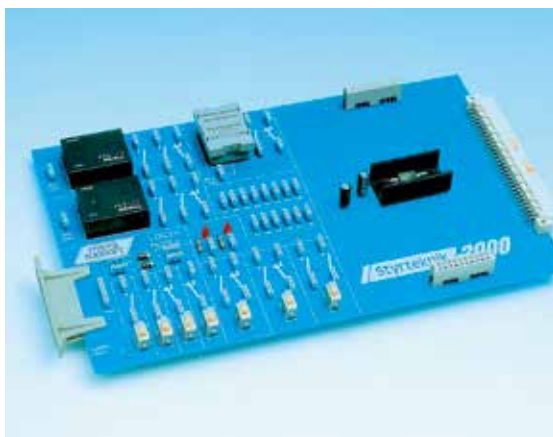
AUT 302006 Logikmodul

Logikmodulen är uppbyggd av en- och två-poliga brytare som kan vara i normalläge, öppen eller stängd.

Tekniska data:
Denna modul har två 20-poliga kontakter för anslutning av externa moduler. t.ex. Simulerings-, Trafikljus-, Cylinder- eller Kopplingsplintsmodul.

Dimensioner: 240 x 140 x30 mm
Vikt: 0.3 kg

AUT310710 Programming Software for PC
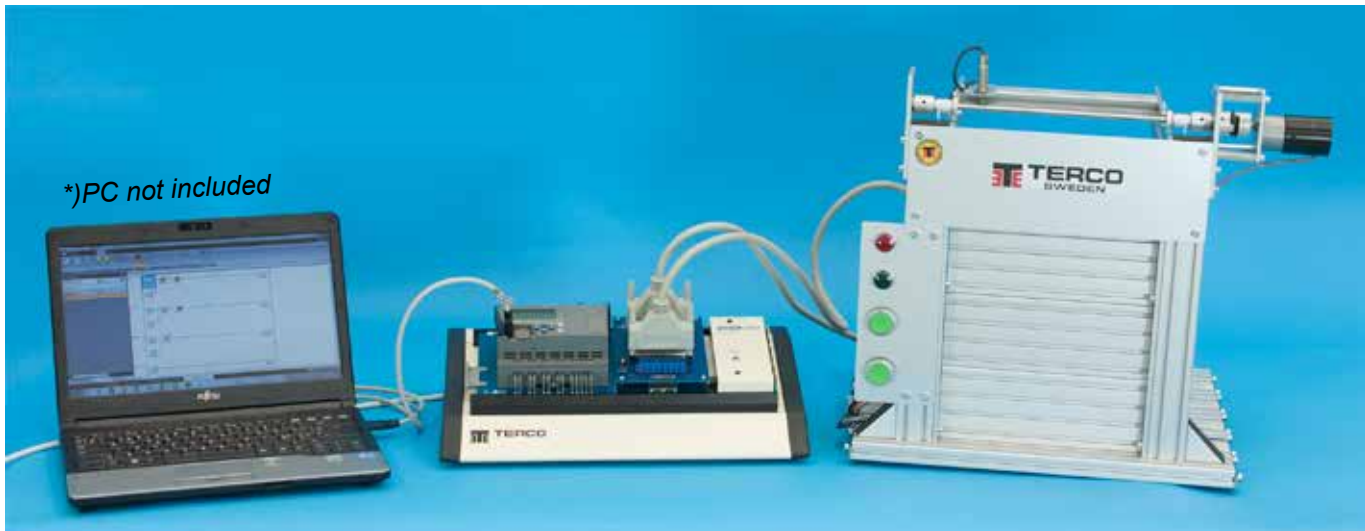
Programming software IQ Works for programming of PLC from PC including USB cable.

ORDER DETAILS MOTOR CONTROL TECHNIQUES-PLC			
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Ref. 419

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:

*)PC not included

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.

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

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 rely-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.

The laboratory package consist of:
- Automatic Sectional Door Model
- Control Module
- D-sub / Socket Module
- D-sub / Sim Module
- Socket Module
- Simulation Module
- PLC Module
- Base Unit 2000

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. I 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

AUT 302000 PLC Module

The PLC - Module has to be connected to the Base Unit 2000. To program a PLC a PC is connected to a programming port via a cable
Alternatively a PC software may be used for programming. The PLC-module contains a PLC-system with sockets to connect any chosen module card. For the sockets there are
several switches to simulate faults at the different in- and outputs.

General data
Mitsubishi Melsec FX3s DS PLC (24 V)
8 inputs and 6 outputs
Input and output of the PLC is connected to a 20 pin socket

Dimensions: 240 x 140 x 55 mm
Weight: 0.5 kg

USB Programming Cable for Mitsubishi Melsec FX Series PLCs,

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
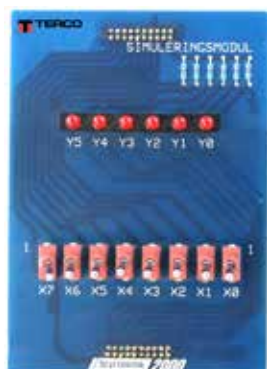
AUT309908 D-sub / Sim Module

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)
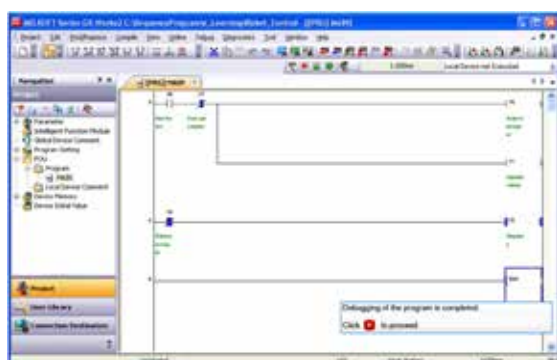Weight: 0.6 kg (incl. the cables)

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

AUT310710 Programming Software for PC

Programming software IQ Works for programming of PLC from PC including USB cable.

ORDER DETAILS MECHATRONICS, AUTOMATIC DOOR MODEL			
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AUT309907	ME1 Console	1	21
AUT309906	M2 Socket Module	1	21
AUT302000	PLC Module for Base Unit 2000	1	21
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Programming Tools when using PC			
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Base Unit with Power supply			
ELE102000	Base Unit 2000	1	3,7,16
Optional			
ELE102002	Storage Rack 1 row	1	29

Ref. 432

Lift Model

AUT300080 Lift Model

This Elevator 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
Power supply: 24V DC
Inputs: 10
Outputs: 12
LEDs: 8 (acknowledgement)
Position indicators: 4
Lift up
Lift down
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

AUT300010 PLC Mounting Profile

PLC mounting profile with pre-mounted DIN rail and terminals incl. 28-pin D-sub male and female contact. Optional PLC can be mounted.

General Data
Dimension: 320 x 360 x 100 mm
Weight: 3.2 kg

ORDER DETAILS LIFT MODEL			
Item	**Description**	**Pcs**	**Page**
AUT300080	Elevator Model Elevator	1	23
AUT300303	I/O-Module with DC Power Supply (Au5591)	1	
AUT302000	PLC mounting profile	1	23
Programming Tools when using PC			
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BOK110120	Lift Model, Laboratory Exercises	1	23
BOK320030	Introduction to PLC	1	23

Ref. 430

Mecha-Kit System

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.

Mecha-Kit components are contained in a hard shell hand box which is easy to carry and easy to stowe away.

General Data:

Operating Voltage	24V DC +/- 10%
Working Pressure	5-7 bars
Dimension:	600 x 590 x 220 mm
Weight:	17.5 kg

An assembled portal robot, 2 axis.

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List of components in Mecha-Kit system

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
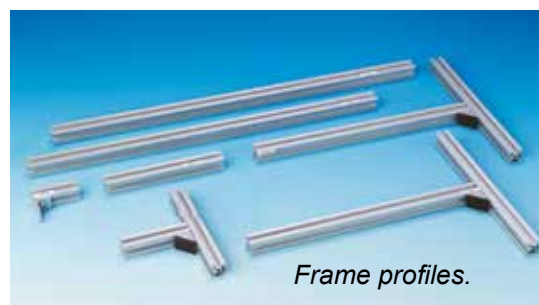
Frame profiles.

Manometers and components of Industrial standards are used.

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

Air handling unit.
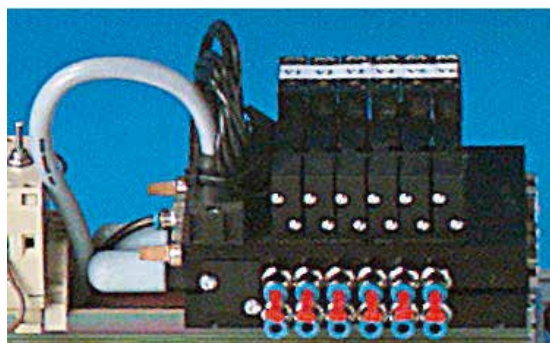
Valve unit consisting of six unistable valves.

Shuttle cylinder.

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, one of each single, double, 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

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.

AUT 302000 PLC Module

The PLC - Module has to be connected to the Base Unit 2000. To program a PLC a PC is connected to a programming port via a cable. Alternatively a PC software may be used for programming.
The PLC-module contains a PLC-system with sockets to connect any chosen module card. For the sockets there are several switches to simulate faults at the different in- and outputs.

General data
Mitsubishi Melsec FX3s DS PLC (24 V)
8 inputs and 6 outputs
Input and output of the PLC is connected to a 20 pin socket.

Dimensions: 240 x 140 x 55 mm
Weight: 0.5 kg

USB Programming Cable for Mitsubishi Melsec FX Series PLCs,
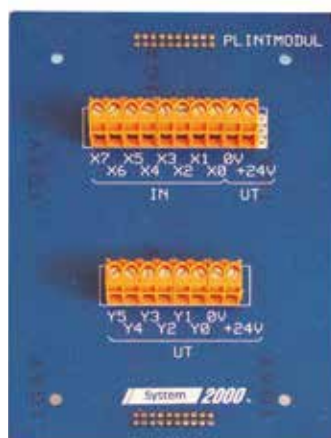
AUT302001 Simulation Module

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

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

AUT310710 Programming Software for PC

Programming software IQ Works for programming of PLC from PC including USB cable.

BOK300201 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.

BOK300200 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
- Pick and Place with shuttle, rotation device and cylinder
- Self-constructed Pick and Place

ORDER DETAILS MECHA-KIT SYSTEM INCL. BASIC PLC-SYSTEM			
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La. Equipment			
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AUT302001	Simulation Module	1	27
AUT302004	Terminal Block Module	1	27
AUT302002	Traffic Lights Module	1	27
Programming Tools when using PC			
AUT310710	IQ WorksProgramming Software for PC	1	27
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BOK300201	MECHA-Kit, Theory book	1	28
BOK300202	MECHA-Kit, Laboratory Exercises	1	
BOK312002	PLC Programming, Laboratory Exercises	1	
BOK320030	Introduction to PLC	1	
Optional (One Unit only)			
MT0415	Compressor	1	29

Ref. 421

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Optional / Accessories

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
Capacitiy: 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

ELE102002 Storage Rack 1 row

Storage rack for safe storage of the lab cards. It is constructed of hard plastic and very durable.

Technical Data:
Dimension: 355 x 180 x 180 mm
Weight: 1.4 kg

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
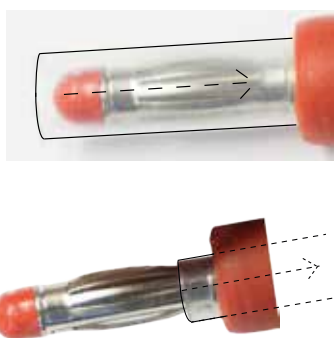
STO17000 IK Laboratory Flex Set

The Laboratory Flex Set includes the flexes needed for all the experiments.

3 pcs red	25 cm	3 pcs red	50 cm
3 pcs black	25 cm	3 pcs black	50 cm
1 Test clip	red		
1 Test clip	black		

The pin is protected by a plastic sleeve when the flex is not connected. The plastic sleeve is pushed in to the flex when the plug is connected to the equipment.

STO170000 IK Sats med Labsladdar

This set contains all the cords needed for the laboratory work.

3 pcs red	25 cm	3 pcs red	50 cm
3 pcs black	25 cm	3 pcs black	50 cm
1 pcs Test Clip red		1 pcs Test Clip black	

MV1904 Flex Stand

For suspension of laboratory flexes. The stand has 12 slots between parallel tubes with space for 10-15 laboratory flexes in each slot. Flexes of length 200 cm are suspended in a separate position above the stand. This rigid stand has a heavy steel plate pedestal.

General Data

Height:	1170 mm
Weight:	9 kg

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