WUEKRO

Training & Didactic Systems

Automation Technology with SIMATIC S7

➤ Table of Contents

➢ Training System Automation Technology

Educational Systems – Allocation – Target Groups

	SIMATIC S7 - Experimenters	Programmable controllers, programming, industrial models	New technologies	Industrial bus systems	Automation systems
Study projects **Dissertations**					
Specialized practical training **College/University**					
Basic practical training **College/University**					
Master craftsman/technician **Further education (Chamber of Industry and Commerce)**					
Skilled worker training					
Fundamentals **Training/education**					

➢ Introduction

Learning targets

are reached with our training systems.

- Structure of numerical systems
- Declaration of variables
- Methods of PLC representation with FBL, LAD, STL, Graph 7, SCL according to standard IEC 1131-3
- Getting to know program execution procedures
- Getting to know the function groups of a PLC and their principles of operation according to standard IEC 1131-1,2
- Basic logic operations with a PLC
- Logic controls with dynamic responseCounters and comparators with/without storage function Sequential controls with mode sectionSequencers Operating status messages process- or time-oriented
- Analog value processing
- Word processing
- Digital closed-loop control
- Autonomous modules
- Drive/position control
- Startup, maintenance
- Industrial networking
- Fundamentals of open communications
- Process visualization/control
- Fault diagnostics without/with visualization systems

The concept

The aim of the new IEC 1131 standard is to attain a worldwide unified system in the field of PLC technology. The programming languages are standardized in part 3. The standard encompasses the ladder diagram (LAD), function block language (FBL), sequence language (SL), statement list (STL), and structured text (ST).

PLC systems are an integral component of automation today. SIMATIC S7 has taken the lead by offering a basic system for the entire field of automation.

SIMATIC S7 is the platform for

- PLC
- Man-machine interface
- Industrial networking
- Process control engineering
- Automation computers
- Measurement and control
- DP applications

A great advantage for the user is the fact that this knowledge, once attained, can also be put to use in the other fields of technology. The goal of our training concept for the different fields of automation is to provide

- Vocational schools
- Colleges
- Universities
- Places of training and further education

with the theoretical and practical prerequisites leading to trainees' and students' complete understanding of modern automation technology.

In general, there are two ways in which you can fulfill your training needs:

1. By working with the low-cost experimenter consoles and the technology simulators.
2. By working with the modular rack system, the technology simulators and models.

Here you can choose from the modules which are tailored to your curriculum.

Our program is rounded off with the model industrial bus system, the modular automation system aimed at engineering schools and colleges/universities.

Practical experiment instructions

Experiment instruction manuals on the individual modules, which have been compiled by specially trained and qualified employees, are available for use.
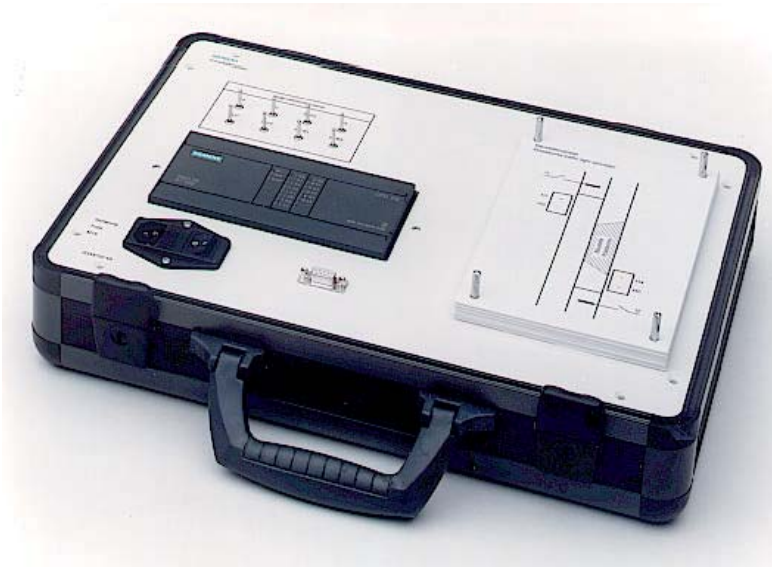
In general, the experiment instructions consist of three parts:

Part 1 Introduces the training needs and provides the basic theory.

Part 2 Contains the programming and test tasks.

Part 3 Contains solutions to part 2. This keeps the time for test preparations to a minimum and offers a way of checking the results.

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➢ Experimenters with SIMATIC S7-200

General

The experimenters have a compact design and are conceived according to the motto "set up, switch on, training".

This makes a mobile use in multiple locations possible. All cases are equipped with a mains plug with fuse for external connection to the mains voltage of 230 V and a mains connecting lead (approx. 2 m).

The PPI interface is brought out to a 9-pin D-SUB socket.

➢ Experimenters with SIMATIC S7-200

➢ Experimenters for Electrical Engineering with SIMATIC S7-200

Experimenters for Electrical Engineering with SIMATIC S7-212

Basic equipment

Industrial components
1   Micro-PLC SIMATIC S7-212,
1 Kbyte RAM, 1.3 ms/kAW,
Onboard 8DI/6DO

Simulation panel
8 digital inputs DI brought out to
momentary-contact/maintained-
contact switches and 4-mm safety
lab sockets
6 digital outputs DO brought out to
4-mm safety lab sockets
24-V power supply brought out to
4-mm safety lab sockets
PPI interface brought out to 9-pin D-
Sub socket

Experimenter E with integrated universal simulator Electrical Engineering
This experimenter is especially suited
for fundamental PLC training in the
vocational field electrical engineering.
The experiments have been aligned
with the curriculum.
The experimenter is equipped with the
Micro-PLC SIMATIC S7-212 and an
integrated universal simulator with
overlays.
The inputs and outputs of the SIMATIC
S7-212 are internally wired to the
simulation panel matrix of the
experimenter and additionally brought
out to 4-mm safety lab sockets.
Also supplied are 11 different
overlays with examples for training,
from the straightforward logic control
to sequential control.
- Fan control
- Tank filling device
- Star-delta start-up
- Gate control
- Roadwork traffic light
- Pump control
- Starter control
- Oven door control
- Traffic light control
- Buffer control
- Sheet bending device

By replacing the overlays, the LEDs
assigned to the respective exercise
become visible.

Training content:

- Cyclic program processing
- Logic operators
- Interlock circuit
- Sequence control
- Storage types
- Pulse generators, edge
  evaluation
- Clock generator
- ON/OFF delay
- Counters and comparators
- Up/down counter
- BCD coding/pulse count
  memory
- Signal preprocessing
- Initializing pulse generator/pulse
  contact
- Structured programming
- Status diagram
- Process-oriented/time-oriented
  sequential control
- Mode sections
- Sequencers
- Step enabling conditions
- Word messages

In scope of delivery:
Instruction manual S7-200 and
operating instructions in German

Dimensions
(W x H x D)   420x150x300 mm
Weight approx.   5 kg

Order-No. W4722-4A

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➤ Experimenters for Metal Engineering with SIMATIC S7-200

Experimenters for Metal Engineering with SIMATIC S7-212

Basic equipment

Industrial components
1 Micro-PLC SIMATIC S7-212,
   1 Kbyte RAM, 1.3 ms/kAW,
   Onboard 8DI/6DO

Simulation panel
8 digital inputs DI brought out to
momentary-contact/maintained-
contact switches and 4-mm safety
lab sockets
6 digital outputs DO brought out to
4-mm safety lab sockets
24-V power supply brought out to
4-mm safety lab sockets
PPI interface brought out to 9-pin D-
Sub socket

Experimenter M with integrated universal simulator Metal Engineering
This experimenter is especially suited
for fundamental PLC training in the
vocational field Metal Engineering. The
experiments have been aligned with
the curriculum and contain training
subjects in the field of
electropneumatics.
The experimenter is equipped with the
Micro-PLC SIMATIC S7-212 and an
integrated universal simulator with
overlays.
The inputs and outputs of the SIMATIC
S7-212 are internally wired to the
simulation panel matrix of the
experimenter and additionally brought
out to 4-mm safety lab sockets for the
control of original pneumatic
technology packages of the company
FESTO Didactic.
The scope of supply includes 11
different overlays with examples,
ranging from simple logic control to
sequential control.

- Punching device
- Lifting unit for packages
- Stamping device
- Lifting unit for packages with
   sorting facility
- Positioning unit
- Forming station
- Press with safety installation
- Silo control for 2 bulk goods
- Quality testing installation
- Distribution unit
- Sorting unit

By replacing the overlays, the LEDs
assigned to the respective exercise
become visible.

Training content:

- Electropneumatics
- Electropneumatic signal flow
   chart
- Safety conditions in installations
   with electropneumatics
- Logic operators
- Interlock circuit
- Process-oriented/time-oriented
   sequential control
- Storage types
- Counters and comparators
- Structured programming
- Status diagram
- Step enabling conditions

In scope of delivery:
Instruction manual S7-200 and
operating instructions in German

Dimensions
(W x H x D)   420x150x300 mm
Weight approx.   5 kg

Order-No. W4722-4B

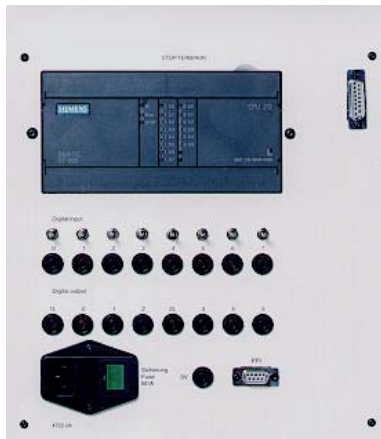## ➤ Experimenter consoles with SIMATIC S7-200

General

The experimenter consoles have a modular design and can be hung into the experimental rack or can be put down onto the lab table owing to the sturdy PVC console casing.

Basic equipment

1 Experimenter console completely wired
1 Sturdy PVC console casing with non-slip feet
1 Mains connecting lead
1 Instruction manual

Experimenter consoles with SIMATIC S7-200

Experimenter console S7-212

Industrial components:
Micro-PLC S7-212 with 8 DI and 6 DO, 24-V actuated
Simulation panel:
8 DI on momentary-/maintained-contact switches and
4-mm safety lab sockets
6 DO on 4-mm safety lab sockets
Mains plug, short-circuit protection, fuse and illuminated ON/OFF switch
PPI interface

Dimensions
(W x H x D)   195x297x100 mm
Weight approx.   3 kg

Order-No. W4722-2 A

Experimenter console S7-214

(not illustrated)

Industrial components:
Micro-PLC S7-214 with 14 DI and 10 DO, 24-V actuated
Simulation panel:
14 DI on momentary-/maintained-contact switches and
4-mm safety lab sockets
10 DO on 4-mm safety lab sockets
Mains plug, short-circuit protection, fuse and illuminated ON/OFF switch
PPI interface

Dimensions
(W x H x D)   260x297x100 mm
Weight approx.   3.5 kg

Order-No. W4724-2 A

Experimenter consoles with further S7-200 CPUs are available on request.

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➢ CPU Overview SIMATIC S7-300

Scope of application

For the training units with S7-300 there are several CPUs available with a scaled set of features:

- CPU 312 IFM, the compact CPU with integrated inputs/outputs, for small systems without analog technology
- CPU 313, for systems with additional requirements on the program range
- CPU 314, for systems with high requirements on the program range and command processing speed
- CPU 314 IFM, the compact CPU with integrated digital and analog inputs/outputs, for systems with high requirements on response speed and special functions
- CPU 315/315-2 DP, for systems with medium/high requirements on the program range and distributed structure via PROFIBUS-DP
- CPU 316, for systems with high requirements on the program range
- CPU 318/315-2 DP, for systems with very high requirements on the program range and distributed structure via PROFIBUS-DP

Programming

Programming of the CPUs is done in LAD, SFC or STL.

The engineering tools (e.g. S7-GRAPH, S7-HiGraph, SCL, CFC or SFC) are executable from CPU 314 up, but are recommended only from CPU 315 up.

SIMATIC S7-300 with	CPU 313	CPU 314	CPU 314 IFM	CPU 315	CPU 315-2DP
Order number extension	W473**3**-xx	W473**4**-xx	W473**6**-xx	W473**5**-xx	W473**5**-xx-**DP**
Memory	12 Kbytes	24 Kbytes	24 Kbytes	48 Kbytes	64 Kbytes
Processing time	0.6 to 1.2 ms	0.3 to 0.6 ms	0.3 to 0.6 ms	0.3 to 0.6 ms	0.3 to 0.6 ms
Flags	2048	2048	2048	2048	2048
Counters	64	64	64	64	64
Timers	128	128	128	128	128
Digital inputs and outputs	max. 128 / 0 integrated	max. 512 / 0 integrated	max. 548 / 36 integrated	max. 1024 / 0 integrated	max. 1024 / 0 integrated
Analog inputs and outputs	max. 32 / 0 integrated	max. 64 / 0 integrated	max. 69 / 5 integrated	max. 128 / 0 integrated	max. 128 / 0 integrated
Communications interface	MPI	MPI	MPI	MPI	MPI PROFIBUS-DP
Networking	AS – Interface PROFIBUS Ind. Ethernet	AS – Interface PROFIBUS Ind. Ethernet	AS – Interface PROFIBUS Ind. Ethernet	AS – Interface PROFIBUS Ind. Ethernet	AS – Interface PROFIBUS Ind. Ethernet
Real-time clock	–	integrated	integrated	integrated	integrated

Training units with the following CPUs are available on request:

- CPU 312 IFM
- CPU 316
- CPU 318-2 DP

➢ Experimenter Consoles with SIMATIC S7-300

Illustration:
Experimenter console W4736-2E
with SIMATIC S7 – 314-IFM

Scope of delivery
Experimenter consoles S7-300

The following table shows an overview of the available standard experimenter consoles.

Please add the missing figure for the required CPU and the missing letters for the required simulation modules when ordering.

Order number: **W473 _ - 2 _ - __** **(order number supplementation see table)**

Central processing units				
CPU 313	CPU 314	CPU 315	CPU 314 – IFM	CPU 315-2 DP
W4733-2x	W4734-2x	W4735-2x	W4736-2x	W4735-2x-DP

	SM configuration (interface modules)			Simulation modules					
	SM321-1BH 16 DI, 24 V SM322-1BH 16 DO, 24 V	SM334 Analog I/O module 4 AI / 2 AO	free slot (40 mm)	Basic module	DI module	DO module	Analog module	Word module	free reserve modules (in WU)
A	1x)* each		1	√	√	√			4
B	1x)* each		1	√	√	√		√	2
D	1x)* each	1x)*	—	√	√	√	√		2
E	1x)* each	1x)*	—	√	√	√	√	√	—
H	1x)* each	1x)*	—	√	2	2	√		—

)* Annotation

When the CPU 314 – IFM is used, the digital I/O modules and the analog I/O module are not included.

1 WU = Width Unit = 40 mm

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➢ **Simulation Modules for SIMATIC S7-300 Experimenter Consoles**

Simulation modules for experimenter consoles

The simulation modules are 297 mm high and correspond to 1 or 2 width units (except for basic module)
1 WU = 40 mm

The material of the front plate is of rigid, non-transparent PVC. The printing is scratch- and solvent-resistant.

All simulation modules are equipped with 4-mm safety lab sockets. High-quality momentary-contact/maintained-contact switches with over 100,000 possible switching operations guarantee durability.

Basic module

- Power supply unit PS307-1B AC 230V; DC 24 V/2 A
- Mains plug, short-circuit protection, fuse and illuminated ON/OFF switch
- 37-pin D-Sub socket connected to S7 modules with 16 digital inputs and 16 digital outputs, also connected to 24-V power supply

- Power supply unit 24 V/2 A at 4-mm safety lab sockets
- MPI interface wired to 9-pin D-Sub socket
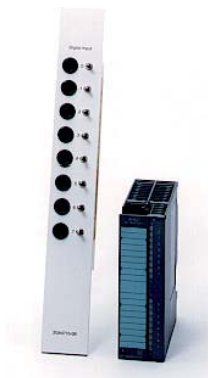- Rear cover out of plexiglass in console shape

Order-No. W4710-1B

DI module

Simulation panel for digital input

- 8 digital inputs wired to momentary-/maintained-contact switches and to 4-mm safety lab sockets LED status indication for digital inputs

Order-No. W4710-0B

DI module with SM321-1BH

- Digital input module SM321-1BH with 16 DI 24 V
- Simulation panel for digital input 8 digital inputs wired to momentary-/maintained-contact switches and to 4-mm safety lab sockets LED status indication for digital inputs

Order-No. W4710-2B

➢ Training Units with SIMATIC S7-300 in Rack Design

Racks in general

The training units in rack design have a modular structure and can be retrofitted with expansion modules. The number of possible expansions depends on the basic configuration of the rack.

The racks are especially suited for an individual arrangement. They may be retrofitted with communications processors for PROFIBUS or AS-Interface or also with special function modules (FM).

The width of the simulation module depends on the SIMATIC S7-300 module above and corresponds to:
1 WU = 40 mm
By default, the training racks are equipped with 4-mm safety lab sockets.

Basic configuration of training unit with S7-300

1   Training rack, completely wired, out of steel sheet with scratch-resistant powder coating
1   Mains connecting lead
1   Mounting channel
1   Signal routing module I/O Switch
1   Back-up battery
1   Operating instructions

**Illustration:
Training unit W4734-1E
with SIMATIC S7-300
in rack design**

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➢ **Training Units with SIMATIC S7-300 in Rack Design**

Scope of supply for racks

The following table shows an overview of the available standard SIMATIC S7-300 rack models. Please add the missing figure for the required CPU and the missing letters for the required simulation modules when ordering.

If you require additional modules, please choose them from the expansion modules on the following pages and quote them separately with your order.

Please take note of the number of free reserve modules.
If you order also a rack at the same time, mounting is inclusive.

Order number: W473 _ -1_ - __   (order number supplementation see table)

Central processing units				
CPU 313	CPU 314	CPU 315	CPU 314 – IFM	CPU 315-2 DP
W4733-1x	W4734-1x	W4735-1x	W4736-1x	W4735-1x-**DP**

	SM configuration (interface modules)				Simulation modules					
	SM321-1BH 16 DI, 24 V SM322-1BH 16 DO, 24 V	SM334 Analog I/O modules 4 AI/2 AO	CP342-5 Profibus-DP	CP342-2 AS-Interface	PS module	DI module	DO module	Analog module	Word module	free reserve modules (in WU[j])
A	1x)* each				√	√	√			7
B	1x)* each				√	√	√		√	5
C	2x (1x)* each				√	2	2		√	3
D	1x)* each	1x)*			√	√	√	√		5
E	1x)* each	1x)*			√	√	√	√	√	3
F	2x (1x)* each	1x)*			√	2	2	√	√	1
H	1x)* each	1x)*			√	2	2	√		3
N	1x)* each		1x		√	√	√		√	5
Q	1x)* each	1x)*	1x		√	√	√	√	√	3
S	1x)* each			1x	√	√	√		√	5
T	1x)* each	1x)*		1x	√	√	√	√	√	3

)* Annotation
When the CPU 314 – IFM is used, the digital I/O modules and the analog I/O module are not included.
In the case of model "C" or "F", respectively, 1 digital input or output module is built in.

1 WU = Width Unit = 40 mm

➢ Simulation Modules for Training Units with SIMATIC S7-300 in Rack Design

Simulation modules for racks
for expansion of racks already present.
The simulation modules are 297 mm high and correspond to 1 or 2 width units:
1 WU = 40 mm

The material of the frontplate is of rigid, non-transparent PVC. The printing is scratch- and solvent-resistant.

All simulation modules are equipped with 4-mm safety lab sockets and a backplane PCB. High-quality momentary-contact/maintained-contact switches with over 100,000 switching operations guarantee durability.

PS module

- Power supply unit PS307-1B AC 230 V; DC 24 V/2 A
- Mains plug, short-circuit protection, fuse and illuminated ON/OFF switch
- 37-pin D-Sub socket connected to S7 modules with 16 digital inputs and 16 digital outputs, also connected to 24-V power supply

- 24-V power supply unit, brought out to 4-mm safety lab sockets

Order-No. W4710-0A

DI module

Simulation panel for digital input

- 8 digital inputs wired to momentary-/maintained-contact switches and to 4-mm safety lab sockets
  LED status indication for digital inputs

Order-No. W4710-0B

DI module with SM321-1BH

- Digital input module SM321-1BH with 16 DI 24 V
- Simulation panel for digital input
  8 digital inputs wired to momentary-/maintained-contact switches and to 4-mm safety lab sockets
  LED status indication for digital inputs

Order-No. W4710-2B

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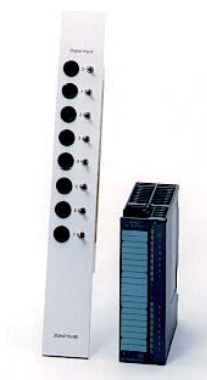
➢ CPU Overview SIMATIC S7-400

Scope of application

For the training units with S7-400 there are numerous CPUs available with a scaled set of features:

- The CPU 412-1 is the inexpensive entry into the medium performance range.
  It can be used in small systems with a limited number of peripherals.
- The CPU 412-2 is the CPU for applications in the medium performance range.
- The CPU 414-2 and the CPU 414-3 are CPUs for higher demands in the medium performance range.
  The integrated PROFIBUS-DP interface makes the direct connection to the field bus
  PROFIBUS-DP as a master possible.
- In the case of the CPU 414-3, a further DP line can be connected via interface module IF 964-DP.
- The CPU 416-2 and the CPU 416-3 are powerful CPUs of the SIMATIC S7-400, for systems with the high
  requirements of the upper performance range.
  The integrated PROFIBUS-DP interfaces make the direct connection to the field bus
  PROFIBUS-DP as a master possible.
  In the case of the CPU 416-3, a further DP line can be connected via interface module IF 964-DP.

The CPU 417-4 DP is the most powerful CPU of the SIMATIC S7-400, for systems with the highest requirements of the upper performance range.
The integrated PROFIBUS-DP interface makes the direct connection to the field bus
PROFIBUS-DP as a master possible.
Two more DP lines can be connected via the IF 964-DP interface modules.

Programming

The CPUs are programmed in STEP 7 V5.0 SP2 (LAD, SFC, STL), SCL, CFC, GRAPH and HiGraph.

SIMATIC S7-400 with	CPU 412-1	CPU 412-2	CPU 414-2	CPU 414-3	CPU 416-2
Order number extension	W474**2**-1x	W474**2**-1x-**DP**	W474**4**-1x-**DP**	W474**4**-1x	W474**6**-1x-**DP**
Memory	84 Kbytes	144 Kbytes	256 Kbytes	768 Kbytes	1.6 Mbytes
Processing time/µs	0.2 / 0.6	0.2 / 0.6	0.1 / 0.6	0.1 / 0.6	0.08 / 0.48
Flags	4 Kbytes	4 Kbytes	8 Kbytes	8 Kbytes	16 Kbytes
Counters	256	256	256	256	512
Timers	256	256	256	256	512
1st interface	MPI DP Master	MPI DP Master	MPI DP Master	MPI DP Master	MPI DP Master
2nd interface	-	DP Master	DP Master	DP Master	DP Master
Pluggable interface modules	-	-	-	IF 964-DP as DP Master	-
Real-time clock	integrated	integrated	integrated	integrated	integrated

Training units with the following CPUs are available on request:

- CPU 416-3
- CPU 317-4DP

➢ Training Units with SIMATIC S7-400 in Rack Design

Racks in general

The training units in rack design have a modular structure and can be retrofitted with expansion modules.The number of possible expansions depends on the basic configuration of the rack.

The racks are especially suited for an individual arrangement.
They may be retrofitted with communications or function modules for example.

The width of the simulation module corresponds to: 1 WU = 40 mm
By default, the training racks are equipped with 4-mm safety lab sockets.

Basic configuration of the training units with SIMATIC S7-400

1   Training rack, completely wired, out of steel sheet with scratch-resistant powder coating
1   Subrack UR2
    (UR1 upon request)
1   Signal routing module
    I/O Switch
1   Back-up battery
1   Mains connecting lead
1   Operating instructions

**Illustration:
Training unit W4744-1E
with SIMATIC S7-400
in rack design**

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➢ Training Units with SIMATIC S7-400 in Rack Design

Scope of supply for racks

The following table shows an overview of the available standard SIMATIC S7-400 rack models. Please add the missing figure for the required CPU and the missing letters for the required simulation modules when ordering.

If you require additional modules, please choose them from the expansion modules on the following pages and quote them separately with your order.

Please take note of the number of free reserve modules.
If you order also a rack at the same time, mounting is inclusive.

Order number: W474 _ -1_ - __ (order number supplementation see table)

Central processing units				
CPU 412-1 W474**2**-1x	CPU 412-2 W474**3**-1x	CPU 414-2 W474**4**-1x	CPU 414-3 W474**5**-1x	CPU 416-2 W474**6**-1x

	SM configuration (interface modules)				Simulation modules					
	Digital input SM 421, isolated 32 DI; DC 24 V	Digital output SM 422, isolated 32 DO; DC 24 V; 0.5 A	Analog input SM 431, isolated 8 AI; Resolu-tion 14 bits, U/I/ resis-tance/ therm-oelement Pt100 1 piece	Analog output SM 432, isolated 8 AO; Resolution 13 bits, U/I	PS module	DI module	DO module	Analog module	Word module	free reserve modules (in WU[1])
A	1x	1x			√	2	2			7
B	1x	1x			√	2	2		√	5
D	1x	1x	1x	1x	√	2	2	√		5
E	1x	1x	1x	1x	√	2	2	√	√	3

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1 WU = Width Unit = 40 mm

➤ Simulation Modules for Training Units with SIMATIC S7-400 in Rack Design

Simulation modules for racks

for expansion of racks already present.
The simulation modules are 297 mm high and correspond to
1 or 2 width units:
1 WU = 40 mm

The material of the front plate is of rigid, non-transparent PVC. The printing is scratch- and solvent-resistant.
All simulation modules are equipped with 4-mm safety lab sockets and a back plane PCB.

High-quality momentary-contact/maintained-contact switches with over 100,000 switching operations guarantee durability.

PS module

- Power supply unit PS307-1B AC 230 V; DC 24 V/2 A
- Mains plug, short-circuit protection, fuse and illuminated ON/OFF switch
- 2 37-pin D-Sub sockets connected to S7 modules with 16 digital inputs DI and 16 digital outputs DO each, also connected to 24-V power supply

- 24-V power supply unit, brought out to 4-mm safety lab sockets

Order-No. W4710-1D

DI module

Simulation panel for digital input
- 8 digital inputs wired to momentary-/maintained-contact switches and to
4-mm safety lab sockets
LED status indication for digital inputs

Order-No. W4710-0B

DO module

Simulation panel for digital output
- 8 digital outputs wired to 4-mm safety lab sockets
LED status indication for digital outputs

Order-No. W4710-0C

➢ Programming Software

STEP7 – Micro/DOS

The programming software under MS-DOS for the SIMATIC S7-200 STEP 7-Micro/DOS has been developed with the goal to provide a programming software that can also be applied on PCs with medium capability.
With STEP 7-Micro/DOS V1.3 all functions of the CPUs of the S7-21x series (CPU 212/214/215/216) can be programmed. The additional functions of the S7-22x series (CPU 221/222/224) cannot be programmed.

STEP 7-Micro/DOS features commands for binary operations, edge evaluation, starting of subroutines, counters, timers, fast counter functions, 16- and 32-bit integer arithmetics, comparison operations, numeric conversions, table editing, data transfer, loop programming, parameterization of TD 200, networks (NETR, NETW, RECEIVE-Freeport), network node table, PID control and parameterization of input delay time.

STEP 7-Micro/DOS is executable under MS-DOS 5.0 on PCs with 80286, 80386, 80486 or Pentium processors, 640 Kbytes working memory and 5 Mbytes of free disk space.
In a DOS window it also runs under Windows 3.1, 3.11 or Windows 95.

For the use of STEP 7-Micro/DOS on a PC and a PLC the PC/PPI cable (W4700-2L) is required.

Order-No. W4700-1A

STEP7 – Micro/WIN

The easy-to-use, easy-to-learn programming software under Windows for the SIMATIC S7-200
For solving even difficult automation tasks
For a fast start-up and time-saving programming
Based on the standard software Windows (known from many standard applications like Winword, Outlook, etc.)
Due to its extensive set of features also difficult automation tasks can be solved.

Moreover, it is also especially user-friendly owing to a fast start-up and time-saving programming.
With STEP 7-Micro/WIN32 V3.0 all functions of the S7-200 CPUs can be programmed.
Programming languages are LAD, SFC and STL
Operation of LAD and SFC optionally in IEC 1131-1 or S7-200 mode
Can be integrated in STEP 7 V4.x and STEPV5.x

STEP 7-Micro/WIN32 V3.0 runs under Windows 95, Windows 98 or Windows NT; disk space requirement 35 Mbytes

For the use of STEP 7-Micro/WIN on a PC and a PLC the PC/PPI cable (W4700-2L) is required.

Order-No. W4700-2 A

WUEKRO

➢ Programming Software

STEP7 – Mini

STEP 7-Mini is the cost-efficient software for implementing standard stand-alone applications of the SIMATIC S7-300 and C7-620.
The programming software STEP 7-Mini offers the user essentially the same tools as the basic software STEP 7:

- • Project manager;
  for a joint easy-to-view handling of projects
- • Programming languages;
  statement list (STL), ladder diagram (LAD) and function block diagram (FBD)

- • Hardware configuration;
  for configuring and parameter setting of hardware components
  Configuring the distributed peripherals is also possible. FM and CP modules cannot be parameterized.
- • Symbol table;
  for specifying the global variables
- • Communications;
  The communication between automation systems is not supported.
- • Information functions;
  For the fast overview of internal states, CPU data, diagnostic messages, etc.

Additional SIMATIC software packages, e.g. engineering tools cannot be used together with STEP 7-Mini.
Programs that have been created using STEP 7-Mini can also be edited under STEP 7.

For Windows 95, Windows 98 or Windows NT
For use with a PC, an MPI card (W4700-4K) or a PC adapter (W4700-4L) are required.

Order-No. W4700-3A

STEP7 – Basis

The basic software STEP 7 is the standard tool for the automation systems SIMATIC S7, SIMATIC M7 and SIMATIC C7. It makes it possible for the user to utilize the capability of these systems comfortably and easily.
STEP 7 includes comfortable functions for all phases of an automation project:

- • Configuring and parameter setting of hardware
- • Specifying communications
- • Programming
- • Testing, commissioning and service
- • Documenting, archiving
- • Operating and diagnosing functions
- All functions are supported by the detailed online help.

For programming, the proven programming languages ladder diagram (LAD), function block diagram (FBD) and statement list (STL) are available. In the classical PLC programming languages ladder diagram (LAD) and sequential function chart (SFC), programs can be created acc. to DIN EN 6.1131-3.

For Windows 95, Windows 98 or Windows NT

For use with a PC an MPI card (W4700-4K) or a PC adapter (W4700-4L) are required.

Order-No. W4700-4A

➢ Programming Software – Manuals/Accessories

Manual STEP7 – Micro/DOS

Manual for the software
STEP7 – Micro/DOS

Order-No. W3047-1_

Manual STEP7 – Micro/WIN

Hardware and software system
manual, for S7-200

Order-No. W3047-2_

Manual SIMATIC S7-200

Documentation on CD-ROM,
incl. HMI manuals TD200,
Step7 Micro Dos/Win, with Adobe
Acrobat Reader, in 5 languages

Order-No. W3047-2C

**Manual package
STEP7 – Mini / Basis**

Consists of:
- Beginners' manual
– User manual
- Programming manual
- Converter manual
- STL/LAD/SFC manual
– Reference manual

Order-No. W3047-4_

PPI cable

for PC programming with
STEP7-Micro,
with built-in RS232/PPI converter

Order-No. W4700-2L

PC adapter

with RS 232C/MPI converter
transfer rate 19.2 / 38.4 kbit/s
incl . RS 232 cable (5 m)
9-pin socket/9-pin socket

Order-No. W4700-4L

**CP 5611-MPI
(MPI card)**

The CP 5611 serves for connecting
PG740, PG 760 and PCs with a free PCI
slot to the PROFIBUS and the multipoint
interface MPI.
Owing to the PCI architecture of the CP
5611, easy operation via Plug & Play is
possible.
In conjunction with the programming
software Step 7, the CP 5611 can be
used in the following applications.
Direct MPI coupling
(programming the SIMATIC S7 without
PROFIBUS)
PG functions with STEP 7 via PROFIBUS

Configuration:
Short PCI card of type II
9-pin Sub-D socket for connection to
PROFIBUS and MPI
Transfer rate:
9.6 kbit/s to 12 Mbit/s

Scope of supply includes MPI cable, 5
m

Order-No. W4700-4K

WUEKRO

➢ Software Package

STEP7 trainer package (12-user license)

This package contains all important programming languages for the programmable control technology.

➢ STEP7 V5 with STL, SFC and LAD

➢ S7-PCLSIM V4, the new offline/online test tool for the PC

➢ S7-SCL V5, structured text acc. to IEC 61131-3

➢ S7-GRAPH V5, sequencer programming acc. to IEC 61131-3

➢ S7-HiGraph V4 for state graph programming and

➢ STEP7 – Mini students' version

The new SIMATIC Software not only is a tool for PLC programming but covers everything you need for automation: PLC, automation system, industrial networking and external control and monitoring solutions up to PC-Based Control. All that on one user interface, without any incompatibilities, as a fully integrated and consistent overall solution. For establishments of research and education the SIMATIC S7 Trainer Package V5 provides a compact classroom solution at attractive special conditions.

Target system:
SIMATIC S7-300/400, SIMATIC M7, SIMATIC C7
Delivery:
German, English, French, Spanish, Italian;
without documentation
Software: on CD
Authorization: on 3 ½" diskettes

Requirements:
PC/PG 7xx with Pentium II processor (or higher), Windows 95/98 and at least 32 Mbytes memory or Windows NT and at least 64 Mbytes memory

Order-No. W4700-5A

WinCC Trainer Package V 5 (12-user license)

The more complex automated processes become the more important is a process-oriented "man-machine communication". For the SIMATIC S7 the open process visualization system WinCC provides an industry- and technology-independent basic system with all important functions for control and monitoring.

WinCC has a configuring interface that matches the other SIMATIC software applications, has access to the database that all tools share and is thus a part of Totally Integrated Automation.
An extensive library with graphical objects and even complete operating screens (faceplates with integrated process interfacing!) is available.

For establishments of training and further education a compact classroom license at attractive conditions is ready for delivery.

All-included WinCC version RC 256 Variable 12-user classroom license

Order-No. W4700-6A

ProTool/Pro Trainer Package V5.1 (12-user license)

SIMATIC ProTool/Pro has been conceived for the visualization and operation of machines and small plants. The runtime software permits short response times and safe process control. Jog mode at the machine and safe data collection are no problem.
The industry- and technology-neutral operator control and monitoring software SIMATIC ProTool/Pro allows universal use for all automation applications as a stand-alone solution.

ProTool/Pro is an expansion for the set of configuration tools SIMATIC ProTool and ProTool/Lite. While ProTool and ProTool/Lite are made to measure for configuring graphical and text-based operator panels or for the text-oriented ones only, ProTool/Pro can be used to configure all systems, i.e. apart from TD17, OP3 to OP37 and TP27/37 also OP37/Pro and even solutions on a standard PC.

ProTool/Pro is especially suited for vocational training as it enables an easy entry into a wide-ranging education. The industrial field of application with the man-machine interface is aimed at the skilled worker. Thus, the trainee works already during his training with the software he will have to use later as a skilled worker in the factory again. ProTool/Pro with 12 runtime licenses V5.1 + SP1 and 1 configuration license

Order-No. W4700-7A

➢ Software Packages – Manuals

Manual package STEP7
Trainer Package

- Consists of:
- Basic STEP 7 knowledge
- STEP 7 reference manuals
- Documentation for S7-SCL
- Documentation for S7-GRAPH
- Documentation for S7-HiGraph

Order-No. W3047-5_

Manual package WinCC
Trainer Package

Consists of:

- WinCC configuration manuals,
  CD with examples,
  Getting Started V5.0,
- WinCC basic documentation in
  cardboard sleeve (3 volumes),
  manual and description of
  software protection

Order-No. W3047-6_

Manual package Protool/Pro
Trainer Package

Consists of:

- Commissioning instructions
  Protool/Pro Runtime
- User manual "Configuring
  Protool
  Text Units"
- User manual "Configuring
  Protool
  Graphical Units"

Order-No. W3047-7_

WUEKRO

➢ Programming Devices

PG 702

The universal „screw driver" for the CPUs 212, 214, 215 and 216 of the SIMATIC S7-200 (S7-21x series)
Ideal for maintenance and service
Handy dimensions for easy mobile use
Can also be mounted in control cabinets on site
The PG 702 can only be used online, but complete user programs can be copied from one control to another.

The PG 702 contains:
Backlit liquid crystal display;
2 lines, 20 characters/line,
for representing STEP 7 programs in STL-200
Keypad with 33 keys
Interfaces:
PPI with 9.6 and 19.2 kbit/s
Power is supplied via the S7-200.
Alternatively, also a plug-in power supply unit can be used.

Order-No. W4780-1A

Programming Devices
PG720/PG740

The industrial programming device PG 720/740
- comfortable and powerful, especially suited for maintenance and service but also for programming and configuring
The PG 720/740 is a light-weight, portable programming device.
AT compatibility, powerful hardware and the provision of all required SIMATIC interfaces make the programming device PG 720/740 ideal for the use on site.
"Unpack – switch on – running":
The installed software does away with all time-consuming preparatory work and enables the user to concentrate on the automation work.
Moreover, the PG 720/740 is a full industrial PC and also perfectly suited for demanding PC software due to the integrated Pentium ll processor.

The programming device PG 720/740 has cardbus/PC card slots (2 x type II or 1 x type III) where modules the size of a check card can be plugged in for manifold applications. Possible modules are network interfaces, modems or SCSI interfaces.
What is more, the pre-installed software enables the use of:
Additional SIMATIC software
Software from the entire world of automation (e.g. CFC)
Software from the PC world

Scope of delivery
Operating system Windows 98 (optional Windows NT)
STEP 5 basic package (ST)
Programming software STEP 7 and STEP 7-Micro/Win-32
MPI cable (5 m) for the connection to SIMATIC S7/M7/C7
PG-PLC cable (5 m) for the connection to SIMATIC S5
Mains connecting lead, bag
Product information
Windows 98 CD or Windows NT CD, language acc. to version installed
STEP backup CD
(STEP 5, STEP 7, STEP 7-Micro/WIN-32);
includes hardware drivers, electronic instruction manuals for PG hardware, and STEP software

➤ Programming Devices

PG 720 PII

The PG 720 PII contains:

Motherboard with Tutel mobile
Celeron 400 MHz
Memory (RAM) with 64 Mbytes,
expandable up to 256 Mbytes
Hard disk drive with 6.4 Gbytes
Superdisk LS 120 drive 3 ½" for 1.44-
MB diskettes and
120-MB LS 120 diskettes
1 CD-ROM drive, 24-speed
31-cm (12.1") active-color TFT
display, SVGA 800 x 600 pixels,
256 K colors

Connection of external monitor: APG
graphics, 2 Mbyte Video RAM,
max. 1280 x 1024 pixels, 60 Hz,
256 K colors
Connection for external PS/2 mouse
Programming facility for
EPROM/EEPROM and Memory Card

1 parallel interface (Centronics) for
printer
1 serial interface (COM1, V.24 and
20 mA) for SIMATIC S5
1 serial interface (V.24) for mouse,
modem and printer
1 MPI/PROFIBUS-DP interface up to
max. 12 Mbit/s for SIMATIC S7 (CP
5611 compatible)
1 USB interface type A
1 cardbus/PC card slot V 2.01
type III or 2 x cardbus/PC card slots
V 2.01 type II
Battery, external power supply unit
MPI cable (5 m) for the connection to
SIMATIC S7
PG-PLC cable (5 m) for the
connection to SIMATIC S5
Subject to technical changes
without prior notice.

Order-No. W4781-3A

PG 740 PIII

The PG 740 PIII contains:

Motherboard with Intel Pentium III 450
MHz with 512 Kbyte second-level
cache
Memory (RAM) with 128 Mbytes,
expandable up to 768 Mbytes
Hard disk drive with 8.4 Gbytes
1 CD-ROM drive, 24-speed
Superdisk LS 120 drive 3 ½" for 1.44-
MB diskettes and
120-MB LS 120 diskettes
Backlit 34-cm (13.3") TFT color
display, 1024 x 768 pixels,
64 K colors
XGA graphics interface, connection
for external color monitor (2 Mbyte
VRAM); max. resolution:
1280 x 1024 pixels
Connection for external PS/2 mouse
Programming facility for
EPROM/EEPROM and Memory Card

1 parallel interface (LPT1, Centronics)
for printer
1 serial interface (COM1, V.24 and 20
mA) for SIMATIC S5
1 serial interface (COM2, V.24) for
mouse, modem and printer
1 MPI/PROFIBUS-DP interface for
SIMATIC S7, 12 Mbit/s
Cardbus/PC cards (type II)
1 PCI/ISA slot, 1 PCI slot
(170 mm long)
16-bit sound, 2 speakers
Internal power supply unit
MPI cable (5 m) for the connection to
SIMATIC S7
PG-PLC cable (5 m) for the connection
to SIMATIC S5

Subject to technical changes without
prior notice.

Order-No. W4781-4A

➢ Accessories – Leads/Plugs

| **Connecting lead** | 32 A/250 V, black, 100 cm long, with 4-mm safety plug | **Order-No. W3907-3E** |

| **Connecting lead** | 32 A/250 V, red, 100 cm long, with 4-mm safety plug | **Order-No. W3907-3F** |

| **Adapter** | 4-mm plug/2-mm socket for the connection of 2-mm connecting leads | **Order-No. W3942-2 A** |

| **Connecting lead** | 37-pin D-SUB plugs on both sides, 1.5 m long, for the connection of technology simulators to SIMATIC S7 training devices | **Order-No. W4760-8A** |

| **Connecting lead** | 1 x on 2 x 37-pin D-SUB plug, 1.5 m long, for the connection of models/simulators to SIMATIC S5 training devices | **Order-No. W4760-8B** |

| **Connector plug for PROFIBUS** | up to 12 Mbit/s, 90-degree cable attachment, terminating resistor with disconnecting function, without PG socket | **Order-No. W3947-1A** |

| **Connector plug for PROFIBUS** | up to 12 Mbit/s, 90-degree cable attachment, terminating resistor with disconnecting function, with PG socket | **Order-No. W3947-1B** |

| **PROFIBUS lead** | Bus lead 2-wire, shielded, special design for quick assembly, length: 20 m | **Order-No. W3947-2 A** |

| **PROFIBUS lead** | Bus lead 2-wire, shielded, special design for quick assembly, length: 50 m | **Order-No. W3947-2B** |

| **PROFIBUS lead** | Bus lead 2-wire, shielded, special design for quick assembly, length: 100 m | **Order-No. W3947-2C** |

➢ Accessories – Manuals/Documentation

A = German
B = English

SIMATIC S7-300 manual	Manual for setup, CPU data, module data, instruction list	**Order-No. W3030-1_**
SIMATIC S7-300 manual, integrated functions	Manual for the documentation of integrated functions, concerns compact units	**Order-No. W3030-2_**
SIMATIC S7-400 manual	Manual for automation systems SIMATIC S7-400, M7-400; setup, module data	**Order-No. W3040-1_**
Communications manual	Communications manual for SIMATIC S7-300/-400	**Order-No. W3048-1_**
PROFIBUS network manual	Manual for PROFIBUS networks, network architecture, components, configuration and assembly	**Order-No. W3048-2_**
Manual collection on CD, multilingual	Includes S7-200/300/400, M7-300/400, C7, Step7, engineering software, SIMATIC DP, SIMATIC HMI, SIMATIC NET	**Order-No. W3048-3C**

WUEKRO

➢ Experiment Instructions

Practical experiment instructions
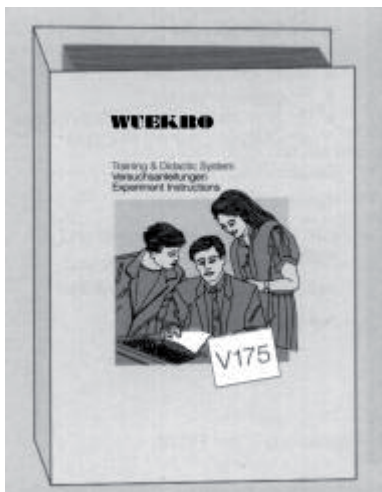
Experiment instruction manuals for all SIMATIC training systems, which have been compiled by specially trained and qualified employees, are available for use.

In general, the experiment instructions consist of three parts:

Part 1: Fundamentals
Introduces the training needs and provides the basic theory

Part 2: Experiments
Contains the experiments like programming and test tasks

Part 3: Solutions
Contains solutions to Part 2, offers ways of checking the results and thus reduces the time for preparation

Experiment instructions

A = German
B = English

V172	SIMATIC S7-200	Order-No. W3017-2_
V173	SIMATIC S7-300	Order-No. W3017-3_
V174	Digital Control II with SIMATIC S7	Order-No. W3017-4_
V175	Digital Control I with SIMATIC S7	Order-No. W3017-5_
V176	PROSIM 95 (Process Simulation)	Order-No. W3017-6_
V177	FUZZY Logic	Order-No. W3017-7_
V178	PROFIBUS DP	Order-No. W3017-8_
V179	Universal Simulator Electrical Engineering	Order-No. W3017-9_
V186	S7-SIM Programming Course 1	Order-No. W3018-6_
V187	Universal Simulator Digital/Analog Technology	Order-No. W3018-7_
V189	Universal Simulator Metal Engineering	Order-No. W3018-9_

➢ Literature – Computer Based Training

Basic PLC course with SIMATIC S7

This basic PLC course covers control with the SIMATIC S7-300.

Programming is carried out under Windows 95 or Windows NT.
For all programming examples from the practice a proposed solution is offered. The book is suitable for vocational schools, colleges, etc., and self-study.
It contains:

- Design and functioning of a PLC
- Program execution and programming

- Logic operations and program input
- Momentary impulses, timer functions, clock generators, counters, comparators
- Practical examples with simulators
- Sequential controls
- Safety regulations
- Solutions Note: This book is available in German only.

Order-No. W3049-1A

PLC for beginners - learning software

What are the advantages of programmable logic control compared to wired-program control? What different types of signals are there?
How is a program executed in a programmable controller?
How do I program in sequential function chart, ladder diagram and statement list?
These and further questions on programmable logic controls are answered by this multimedia and interactive learning program. It is suitable for learners who have basic knowledge of electrical engineering and want to get familiar with the basics of programmable logic control. Depending on the knowledge already available the learning time will be 2 - 6 hours. Decide for yourself when and where you want to learn and which chapters you want to go through! Check your acquired knowledge afterwards in the exercise module by making a comprehensive test!

Learning targets:

- From contactors to PLC
- Fundamentals of PLC: Hardware and software
- Basic terms:
  The IEC 1131 standard
  Methods of representation
  SFC, LAD, STL Addressing and signals
  Logic operators:
  AND, OR, XOR operators
  Storage function and flags
- Numeric processing:
  Characteristics of a numeric system, Data types, Parameter types, Accumulators, Arithmetic operations
- Program execution:
  Cyclic program execution
  Linear programming
  Structured programming
  Block types and functions
  Programming a PLC:
- SFC, STL and LAD programming
  Creating a PLC program
- Commissioning
- Exercises

Note: This book is available only in German language.

Order-No. W3049-2 A

➢ System Introduction for SIMATIC S7

Upgrade from S5 to S7

3 days training
8 learning units each (45 min)
incl. training documentation
Training location: Würzburg

In the practical programming exercises available simulators and applications are integrated.

Basic knowledge of STEP5 programming is a prerequisite for a participation in that course.

Individual quotation upon request.
If required also on site.

Training contents:

1. System information about SIMATIC S7 and about STEP7
   - Scope of application → position within SIMATIC automation family
   - Method of operation and functions
   - Setup
   - Startup
   - Bus interfacing via MPI and Profibus

2. Introduction to STEP7 programming based on an easy example
   - Setting up a project
   - Configuring the SIMATIC station
   - Writing program block OB1
   - Testing and storing program block OB1

3. Programming language STEP7 with programming exercises
   - Directory structure and general notes
   - Archiving and documenting the program
   - Addressing and program representation (LAD, SFC and STL)
   - Program structure
   - Program blocks (OB, FB, FC and DB)
   - Basic logic operations
   - New commands in STEP7
   - Analog value processing
   - Word processing
   - Mathematical functions

4. Introduction to further STEP7 system features
   - Symbolic addressing
   - Test and diagnostic functions
   - Data blocks
   - Converting S5 files
   - Rewiring

5. Applying one's knowledge on a more complex automation exercise with:
   - Symbolic addressing
   - Data blocks
   - Usage of test and diagnostic functions

➢ **System Introduction for SIMATIC S7**

Basic training
SIMATIC S7

5 days training
8 learning units each (45 min)
incl. training documentation

Training location: Würzburg

In the practical programming exercises
available simulators and applications are
integrated.

Individual quotation upon request.
If required also on site.

Training contents:

1. System information about SIMATIC
    S7 and about STEP7
    -   Scope of application →
        function within SIMATIC
        automation family
    -   Method of operation and
        functions
    -   Setup
    -   Startup
    -   Bus interfacing via MPI and
        Profibus

2. Introduction to STEP7 programming
    based on an easy example
    -   Setting up a project
    -   Configuring the SIMATIC
        station
    -   Writing program block OB1
    -   Testing and storing program
        block OB1

3. Programming language STEP7 with
    programming exercises
    -   Directory structure and
        general notes
    -   Archiving and documenting
        the program
    -   Addressing and program
        representation (LAD, SFC
        and STL)
    -   Program structure
    -   Program blocks (OB, FB, FC
        and DB)

-   Basic logic operations:
    AND, OR, exclusive OR
    Storage elements, R-S FF
    Edge operations
    Direct processing of RLO
    Loading and transfer
    operations
    Counting and
    comparisonoperations
    Timing functions and
    integratedclock memory
    Program organization and
    jump functions

WUEKRO

Training & Didactic Systems

Automation Technology with SIMATIC S7
Technology Stations/Simulators/Models

Catalog	WA2E/04.02

WUEKRO

➤ Table of Contents   Page

➢ Training System Automation Technology

Educational Systems – Allocation – Target Groups

	SIMATIC S7 - Experimenter	Programmable controllers, programming, industrial models	New technologies	Industrial bus systems	Automation systems
Study projects / Dissertations					
Specialized practical training College/University					
Basic practical training College/University					
Master craftsman/technician / Further education (Chamber of Industry and Commerce)					
Skilled worker training					
Fundamentals Training/education					

➢ Introduction

Your learning needs will be fulfilled with our training systems

- Structure of numerical systems
- Declaration of variables
- Methods of PLC representation with FBL, LAD, STL, Graph 7, SCL according to standard IEC 1131-3
- Getting to know program execution procedures
- Getting to know the function groups of a PLC and their principles of operation according to standard IEC 1131-1,2
- Basic logic operations with a PLC
- Logic controls with dynamic response
  Counters and comparators with/without storage function
  Sequential controls with mode section
  Sequencers
  Operating status messages
  Process-oriented or time-oriented
- Analog value processing
- Word processing
- Digital closed-loop control
- Autonomous modules
- Drive/position control
- Startup, maintenance
- Industrial networking
- Fundamentals of open communications
- Process visualization/control
- Fault diagnostics without/with visualization systems

The concept

The aim of the new IEC 1131 standard is to attain a worldwide unified system in the field of PLC technology. The programming languages are standardized in part 3. The standard encompasses the ladder diagram (LAD), function block language (FBL), sequence language (SL), statement list (STL), and structured text (ST).
PLC systems are an integral component of automation today. SIMATIC S7 has taken the lead by offering a basic system for the entire field of automation.

SIMATIC S7 is the platform for

- PLC
- Man-machine interface
- Industrial networking
- Process control engineering
- Automation computers
- Measurement and control
- DP applications

A great advantage for the user is the fact that this knowledge, once attained, can also be put to use in the other fields of technology.
The goal of our training concept for the different fields of automation is to provide

- Vocational schools
- Colleges
- Universities
- Places of training and further education

with the theoretical and practical prerequisites leading to trainees' and students' complete understanding of modern automation technology.

In general, there are two ways in which you can fulfill your training needs:

1. By working with the low-cost experimenter consoles and the technology simulators.
2. By working with the modular rack system, the technology simulators and models.

Here you can choose from the modules which are tailored to your curriculum.
Our program is rounded off with the model industrial bus system, the modular automation system aimed at engineering schools and colleges/universities.

Practical experiment instructions

Experiment instruction manuals on the individual modules, which have been compiled by specially trained and qualified employees, are available for use.
In general, the experiment instructions consist of three parts:

Part 1 Introduces the training needs and provides the basic theory.

Part 2 Contains the programming and test tasks.

Part 3 Contains solutions to part 2. This keeps the time for test preparations to a minimum and offers a way of checking the results.

WUEKRO

➢ Technology Simulators

General

Technology diagrams in 3-D simplify the understanding of the illustrated process and optimize the periods of training.
High-intensity LEDs symbolize sensors, actuators and operating states.

The material of the frontplate is of rigid, non-transparent PVC. The printing is scratch and solvent-resistant due to a double layer of protective lacquer. High-quality momentary-contact/maintained-contact switches with over 100,000 switching operations guarantee durability.

Thus, technology simulators with 3-D are a low-cost training alternative to models.

Logic controls without storage function

Logic controls without storage function are based on the application and combination of the basic logic functions:
• NOT • AND • OR
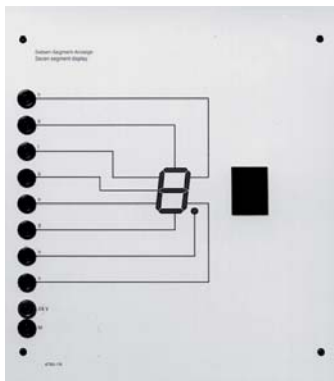
Seven-segment display technology simulator

The seven-segment display indicates the digits 0 to 9. The respective decimal value in BCD code (8-4-2-1) has to be set by the momentary-contact/maintained-contact switches on the PLC training unit.
The single segments are discretely controlled for each number.

Training content
- Cyclic program processing
- Introduction of flags
- Structures of numerical systems

Number of inputs: 4
Number of outputs: 8

Order-No. W4760-1A
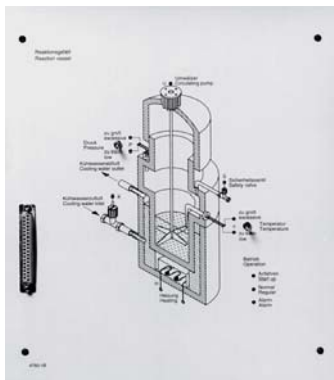
Reaction vessel technology simulator

A chemical process takes place at a certain temperature and under a certain pressure.
Limiting values for temperature and pressure are simulated by switches. The actuators for heating, cooling-water and safety valve are used to control the three plant states.

Training content
- Control analysis
- Logic operations
- Status messages

Number of inputs: 4
Number of outputs: 7

Order-No. W4760-1B

➢ Technology Simulators

Logic controls with storage function

Many control tasks require a storage function.

This is available where a fleeting signal state is retained, i.e. stored.
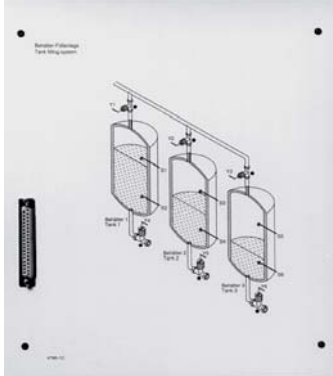
Tank-filling device technology simulator

Three storage tanks with sensors for "full" and "empty" indication are to be discharged in a random order. One tank with "empty" indication is to be filled until "full" is indicated. But only one tank is to be permanently filled. The tanks are to be filled in the same order in which they were emptied.

Training content
- Interlock circuit
- Sequence control
- Storage types

Number of inputs: 6
Number of outputs: 3

Order-No. W4760-1C
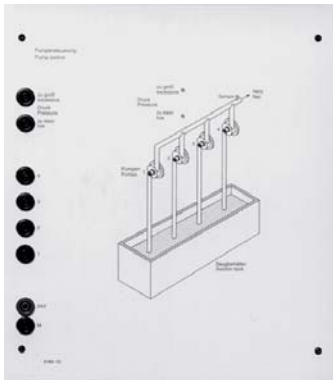
Pump control technology simulator

Four motor-driven pumps deliver water from a suction tank into a pipeline. By switching the four pumps on and off in stages, the pressure in the mains is kept constant. The requirement is for the operating time of the pumps and the switching frequency to be as uniform as possible. Before switching the next stage on and off, an appropriate delay time is required.

Training content
- Truth table
- Pulse generator
- ON/OFF delay
- Process register

Number of inputs: 2
Number of outputs: 4

Order-No. W4760-1D

WUEKRO

➢ Technology Simulators

Logic controls with dynamic response
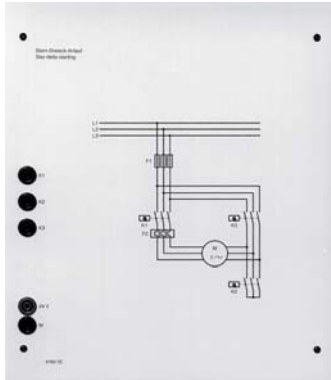
The time generation is a basic binary function in control technology. Programmable „timers" create a requested time-logic relationship between a start signal at the input and a response signal at the output.

Automatic star-delta start-up technology simulator

The start-up of a three-phase asynchronous motor is to be controlled via a star-delta controller. When pressing a pushbutton switch the motor first runs in star connection and is then automatically switched to delta connection. When pressing another switch or operating the overcurrent relay the motor is disconnected at all poles.

Training content
- Time functions
- Interlock circuit

Number of inputs: 3
Number of outputs: 3

Order-No. W4760-1E

Belt control technology simulator

The three conveyor belts are to be switched on and off via a pushbutton switch. Belt 1 and 2 are not to run simultaneously. Belt 3 is to automatically run at the time when belt 1 or 2 are conveying. Belt monitors signal the conveyor movement. The belts are to slow down with different times after the OFF button has been pressed. Faults are signaled by a flashing light.

Training content
- Clock generator
- Pulse monitor of ON delays
- OFF delays
- Status messages

Number of inputs: 7
Number of outputs: 7

Order-No. W4760-1F

➢ Technology Simulators

Controls with counters and comparators
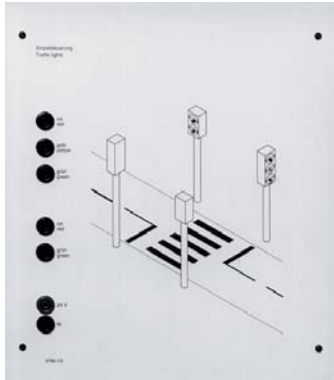
A certain set of values is often acquired by summating pulse. The corresponding pulses are passed to a counter which summates the received pulses.

Based on the compare functions, two digital values are compared with one another. The result of the comparison is binary and can be further processed.

Traffic light control technology simulator

A pedestrian crossing is regulated by traffic lights. During the day, the system operates automatically by permanently repeating a switch cycle.

During the night, only the amber signal is required to flash in order to warn drivers.

Training content
- Counters and comparators
- BCD coding/pulse count memory
- Clock generator

Number of inputs: 1
Number of outputs: 5

Order-No. W4760-1G
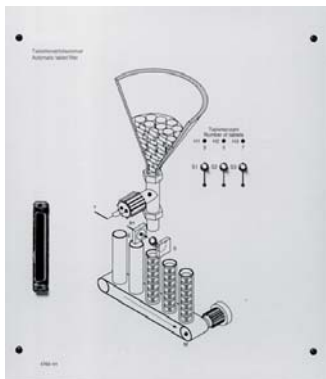
Automatic pill filling device technology simulator

An automatic pill filling device is to continuously fill a variable number of pills into tubes. The required number of pills is to be preselected by pressing a pushbutton. A conveyor belt moves the empty tube into the filling position. The number of pills to be filled is counted by a light barrier.
When the desired amount of pills is reached, the next empty tube is to be positioned.
When preselecting the amount of pills or stopping the machine, the last filling operation must first be completed.

Training content
- Up/down counter
- Signal preprocessing
- Initializing pulse generator/pulse contact
- Pulse count memory
- Status diagram

Number of inputs: 6
Number of outputs: 5

Order-No. W4760-1H

WUEKRO

➢ Technology Simulators

Sequential controls

Sequential control is the control of a sequence of operations in individual steps. Switching from one step to the following step is controlled by the control program in accordance with the "step enabling conditions". The main property of the sequential control is that it can clearly assign individual steps to technological procedures with respect to time and function. Consequently, distinction is made between "time-oriented" and "process-oriented" sequence control.
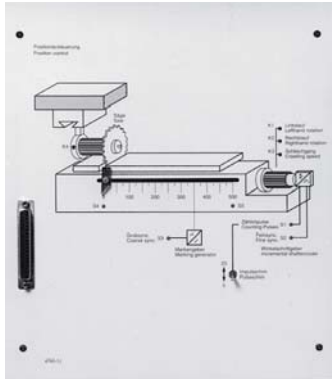
Positioning control technology simulator

Pieces of wood are cut true to dimensions on a saw table. For this purpose a stop is to be positioned from a control console with the help of an electric motor.
The movement of the stop is measured with a shaft-angle encoder. Limit switches are located at the end position of the spindle, which are to prevent the stop from entering the restricted area. Prior to restart and cold restart of the installation, the reference point is to be approached. The spindle drive can be controlled in clockwise or counter-clockwise rotation and also with creep speed.

Training content
- Word processing
- Positioning control
- Pulse contact
- Counters and comparators
- Prestructured status diagram
- Message display

Number of inputs: 5
Number of outputs: 4

Order-No. W4760-1J
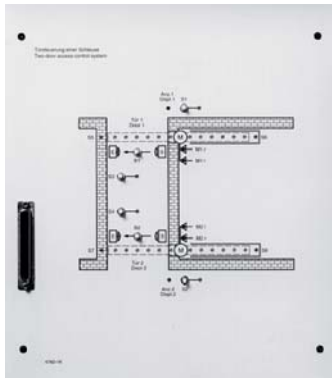
Two-door access control system technology simulator

A dust-free room can be entered or left only through an air-lock with two automatically opening and closing doors. Light barriers monitor the entrances. In the case of an emergency the air-lock room can be opened or closed from within using additional door openers.
Limit switches indicate the corresponding positions of the doors.
All operating states are to be indicated via LEDs.

Training content
- Process and time-oriented sequential control
- Signal preprocessing
- Prestructured status diagram
- Structured sequencers
- Non-retentive flags
- Status messages

Number of inputs: 10
Number of outputs: 6

Order-No. W4760-1K

WUEKRO

➢ Technology Simulators for Closed-Loop Control
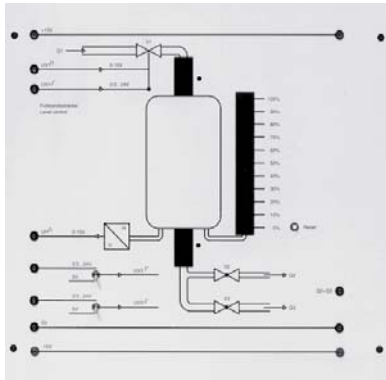
Filling range control technology simulator

This simulator is an electronic model of a level control system in which the volume discharged in a specific time depends on the filling level (PT1 controlled system). Since the discharge is detected in analog mode, a system of n-order can be constructed with a second simulator, if this system is switched onto the inlet of the second simulator. Valves with different flow rates per unit time can be switched onto the system as a disturbance variable.

The filling level is indicated by a bar graph and is measured by an analog position sensor.
In combination with the experimental panel PT1 Element you can switch variable, adjustable delay constants and gains onto the control circuit (PTn system).

According to the time spent on theory and practical experiments, the following learning targets can be reached:

- Analog value processing with SIMATIC S5/S7
- Getting to know the fundamentals of closed-loop control
- Know the characteristics of the controlled system, be able to differentiate between them and assess them according to their controllability
  - controlled system
  - steady-state behavior
  - dynamic response
  - flow chart

- Getting to know the tasks and elements of the controlling system
- Getting to know the structure and method of operation of discontinuous controllers
- Getting to know the structure and method of operation of continuous controllers
- Getting to know the combinations of controller and controlled system
- follow-up control
- set value control
- Being able to assess the control quality

Outputs

2 x   binary: valves V2/V3
1 x   analog: 0...10 V, proportional valve V1

Inputs

0...10 V, actual value of filling level
0...10 V, actual value of discharge rate

All I/O are connected to 4 mm safety sockets.

Required power supply: +/- 15 V
e.g. W4610-4N

Order-No. W4760-1M
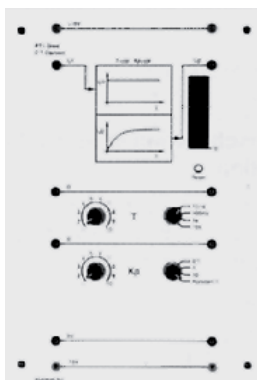
PT1 element technology simulator

Electronic simulation of a delay element of the 1st order.
A stepless time-delay constant from 10 ms to 100 s and a stepless gain from 0.1 to 100 can be programmed.
The PT1 element can be switched onto the control circuit of the simulator.

Training content

- Assessing control circuits of higher order according to
  - controllability
  - control quality
  - stability of control systems

Control 0...10 V
All I/O are connected to 4 mm safety sockets.

Order-No. W4760-1N

WUEKRO

➢ Universal Simulators

Universal simulator electrical engineering

This simulator is especially suited for fundamental PLC training in the vocational field electrical engineering.
The experiments have been aligned with the curriculum.
The universal simulator is equipped with operator panel and simulator including overlays, and operates in a voltage range from 5 V...24 V DC. It is thus also suitable for applications from the fields of digital and microprocessor technology.

Design
Power +5V…24V is supplied via 4 mm safety sockets or 2 mm sockets, respectively.
There are 8 freely assignable momentary-contact/maintained-contact switches mounted on the operator panel. The connectors of the switches are brought out to 4 mm safety sockets and to 2 mm sockets.

The 5 digital inputs for the simulator are also wired to 4 mm safety sockets and to 2 mm sockets.
The scope of supply includes 11 different overlays with examples, ranging from simple logic control to sequential control.

- Fan control
- Tank filling device
- Star-delta start-up
- Gate control
- Roadwork traffic light
- Pump control
- Starter control
- Oven door control
- Traffic light control
- Buffer control
- Sheet bending device

By replacing the overlays, the LEDs assigned to the respective exercise become visible.

Teaching content (in conjunction with SIMATIC training units)

- Cyclic program processing
- Logic operations
- Interlock circuit
- Sequential circuit
- Storage types
- Pulse generator
- Edge evaluation
- Clock generator
- ON/OFF delay
- Counters and comparators
- Up/down counter
- BCD coding/pulse count memory
- Signal processing
- Initializing pulse generator/pulse contact
- Status diagram
- Process-oriented/time-oriented sequential control
- Mode sections
- Sequencers
- Step enabling conditions
- Word messages

Order-No. W4760-2A

Experiment instructions V 179
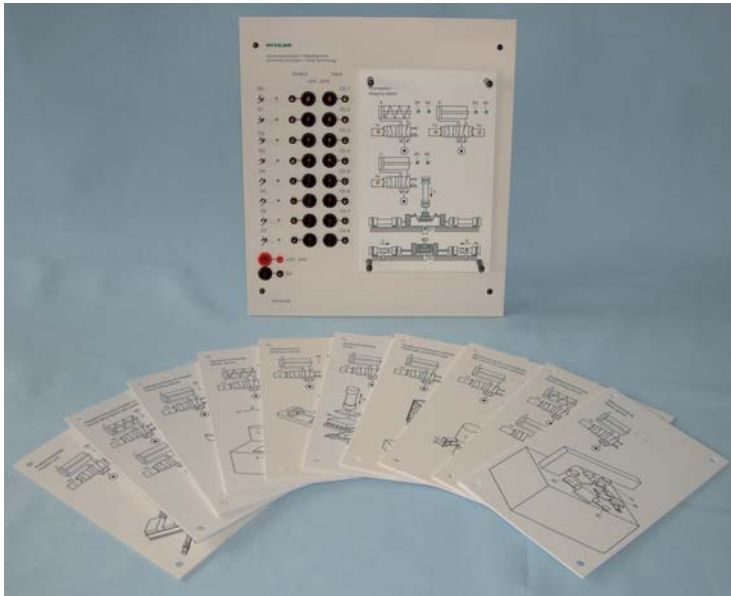**Universal simulator Electrical Engineering**

- Programming to standard IEC 1131-3
- Configuration of control tasks
- Instructions for setup and programming
- Example of a consistent configuration

- Programming tasks for universal simulator W4760-2A with solutions for instructor and teacher, English

Order-No. W3017-9B

➢ Universal Simulators

Universal simulator Metal Engineering

This simulator is especially suited for fundamental PLC training in the vocational field metal engineering. The experiments have been aligned with the curriculum.

The universal simulator is equipped with operator panel and simulator including overlays, and operates in a voltage range from 5 V...24 V DC. It is thus also suitable for applications from the fields of digital and microprocessor technology.

Design

Power (+ 5 V ... 24 V) is supplied via 4 mm safety sockets or 2 mm sockets, respectively.

There are 8 freely assignable momentary-contact/maintained-contact switches mounted on the operator panel. The connectors of the switches are brought out to 4 mm safety sockets and to 2 mm sockets.

The 8 digital inputs for the simulator are also wired to 4 mm safety sockets and to 2 mm sockets.

The scope of supply includes 11 different overlays with examples, ranging from simple logic control to sequential control.

- Punching device
- Lifting unit for packages
- Stamping device
- Lifting unit with sorting unit
- Positioning unit
- Forming station
- Press with safety installation
- Silo control for 2 bulk goods
- Quality testing installation
- Distribution unit
- Sorting unit

By replacing the overlays, the LEDs assigned to the respective exercise become visible.

Teaching content (in conjunction with SIMATIC training units)

- Electropneumatics
- Electropneumatic signal flow diagram
- Safety conditions in installations with electropneumatics
- Logic operations
- Interlock circuit
- Process-oriented/time-oriented sequential control
- Storage types
- Counters and comparators
- Structured programming
- Status diagram
- Step enabling conditions

Order-No. W4760-2B

Experiment instructions V 189 Universal simulator Metal Engineering

- Programming to standard IEC 1131-3
- Configuration of control tasks
- Instructions for setup and programming
- Example of a consistent configuration

- Programming tasks for universal simulator W4760-2B with solutions for instructor and teacher, English

Order-No. W3018-9B

WUEKRO

➢ Universal Simulators

Plant Simulator Analog/Digital technology
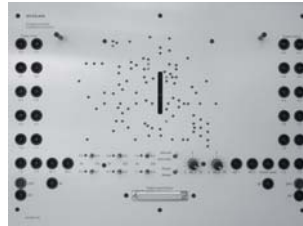
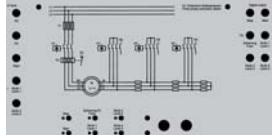**Basic Unit**

Set of Overlays
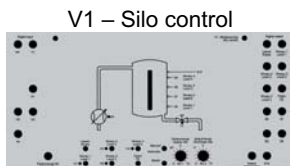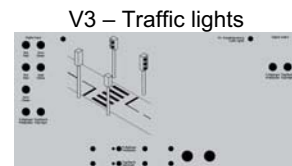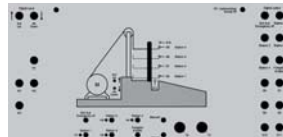
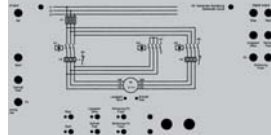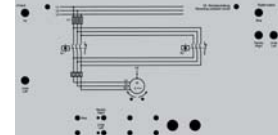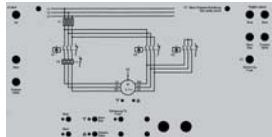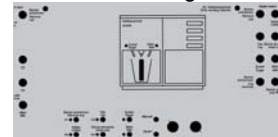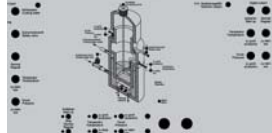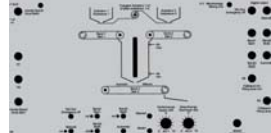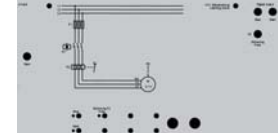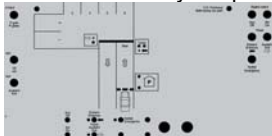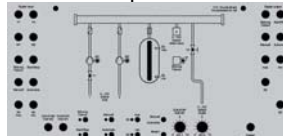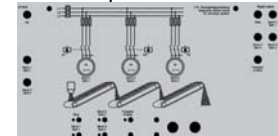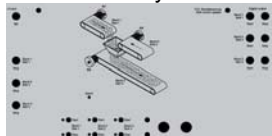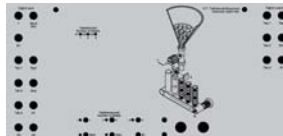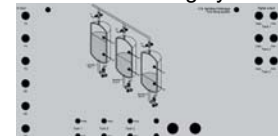|		
V1 – Silo control	V2 – Goods lift	V3 – Traffic lights
V4 – 3-phase automatic starter	V5 – Dahlander circuit	V6 – Reversing contactor circuit
V7 – Star-delta circuit	V8 – Running light	V9 – Drink vending machinet
V10 – Reaction vessel	V11 – Mixing unit	V12 – Latching circuit
V13 – Multi storey car park	V14 – Compressed air net	V15 – Sequence control unit
V16 – Conveyor control	V17 – Automatic tablet filler	V18 – Tank filling system
V19 – Embossing machine	V20 – Pump control	

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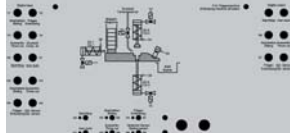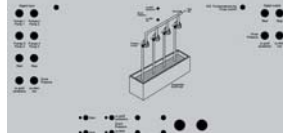
➢ Models for Training Units with SIMATIC S7

Industrial application

Models of complex industrial installations ensure that training is close to practice and are suitable for imparting specific fundamental knowledge in the fields electrotechnical engineering, pneumatics, material flow, design and sensor technology.

The purpose is to learn to deal with technical devices in a technical way using the proper instruments.

Conveyor belt model

For training in programmable logic control and material flow technology.

Consists of aluminum profile rails and a built-on 24 V DC industrial motor, spherically seated concave belt rollers, non-slip, rubber-coated fabric belt.
Connection to SIMATIC training unit via 37-pin D-SUB plug.

Training content
Material flow technology
Startup
Troubleshooting
Maintenance
Process-oriented sequential control
Sequencer programming

Order-No. W4761-1B

Supplementary kit
Sensor Technology

Supplementary kit Sensor Technology for conveyor belt model W4761-1B.

All cable ends are fitted with 2 mm connectors.

Consists of:
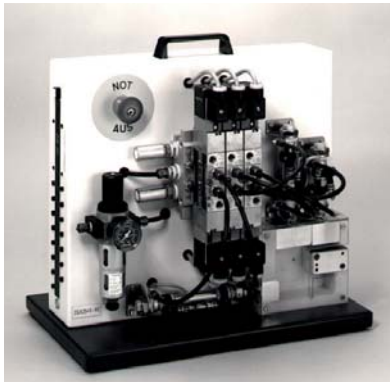|	
2	sensors: inductive S=15 mm
	optical
3	transport containers out of aluminum, black plastic and white plastic
2	fastening angles

Order-No. W3545-6J

Connecting lead

With 37-pin subminiature D-SUB plug (model side) and 1 x 37-pin D-SUB plug for connection to the SIMATIC S7 training units.

Order-No. W4760-8A

➢ **Models for Training Units with SIMATIC S7**

Pneumatic model
Sheet Bending Device

Sheet is to be bent by means of three 5/2-way valves, which are electropneumatically actuated on both sides.

The device is to be wired up using the pneumatic circuit diagram, and the control program is to be created.

The device can be isolated by a pneumatic Emergency-Stop switch. All terminals are wired to 4 mm safety sockets. For operation, a compressed-air supply of 6 bar is required.

The maximum sheet thickness which can be processed is 0.5 mm.

Training content

- Reading and applying pneumatic circuit diagram
- Creating sequencer
- Process-oriented sequential control system
- Getting to know safety-related precautions in electro-pneumatic installations

Number of inputs: 8
Number of outputs: 6

Experiment instructions are part of the scope of delivery.

Order-No. W4761-1C

Compressor

Fits the pneumatic model W4761-1C.

Technical specifications:

Supply voltage	1 AC 230 V
	50/60 Hz
Power	340 W
Volume	4 l/340 W
Output	56 l/min
Admissible operating pressure	8 bar
Weight approx.	20 kg

Order-No. W3545-8A

WUEKRO

➢ Models for Training Units with SIMATIC S7

Elevator Model 3 storages

Features

with elevator cage over 3 floors.
The desired floor can be selected
in the control panel.
When the elevator cage reaches
the appropriate floor, limit switches
issue a signal and the elevator
cage should stop for 5 s.
The inputs and outputs are wired to
4 mm sockets.

Learning contents:

- Process-controlled sequence control
- Commissioning
- Symbolic addressing
- Mode sections
- Installation, commissioning, operating and maintenace of automized controls

Number of inputs: 7
Number of outputs: 5

Dimensions (W x H x D):
                    680 x 200 x 260 mm
Weight: approx. 7 kg

Including experiment instructions with
tasks and solutions.

Order-No. W3545-6A

➢ Technology Stations

Task

- The work pieces are loaded from the loading magazine to the process
- Convey the work piece to the process

Structure

- Magazine with pneumatic double-acting thruster and control of level by means of the capacitive sensor
- Deposit table with sensor checking

Dimensions of the base plate (W x D) 350 x 500 mm

Technical data:

- 2 digital inputs ,
- 3 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:

Training material for the technology station Loading and handling

Technology Station Loading

Didactic indications :

The technology station negotiates awareness of function and application of industrial components of the branch feeding of stock and handling.
By means of the didactic prepared industry components, the physical function principles, connecting technique and variants to the material provision are practically presented.

The station with the typical interfaces to the mechanics, pneumatics, electrical engineering/electronics and PLC-technique, is especially suitable to the approach in the multiple fields of the MECHATRONICS.
As individual station in the teaching or during the exercises in the lab, the station can be used quick and uncomplicated and it can be set into operation independently.

Scope of delivery

1	Loading magazine
1	Profile plate complete
1	Hardware
1	Technical documentation

Order-No. W4764-3A

Neccessary Accessories

Connecting lead to SIMATIC Training unit (Order-No. W4760-8A)

Air compressor
(Order-No. W3545-8A)

Optional addition

Mobile underframe
(Order-No.: W4764-5A)

Control panel
(Order-No.: W4764-6A)

WUEKRO

➢ Technology Stations

Technology Station Conveyer Belt

Scope of delivery

2	sensors
1	reactive proximity switch, switching distance 15 mm
1	optical proximity switch, 18 mm diameter switching distance 60–400 mm
2	fixing brackets for sensors
1	brief description
1	technical documentation
1	STEP-7 program

Mounted on mounting panel
(W x D) 650 x 500 mm

Construction

Programmable logic controls and material flow technology.
Made of aluminum profiles and equipped with a built-on 24V industrial D.C. motor, incremental encoder, spherically seated concave ball-bearing, conveyor drums, a slip-resistant rubberized proofed textile belt, the speed of the belt can be controlled by means of a potentiometer or additional 0 to 10 V DC analog input, 2 switches for changing the direction left/right in setting-up mode.
37-pin D-SUB connector to connect conveyor belt to SIMATIC Training Equipment.

Learning contents

- material flow technology
- commissioning
- fault location
- maintenance
- process controlled sequence control
- sequencer programming
- analog value processing

Order-No. W4764-3B

Neccessary Accessories
Connecting lead to SIMATIC Training unit (Order-No. W4760-8A)
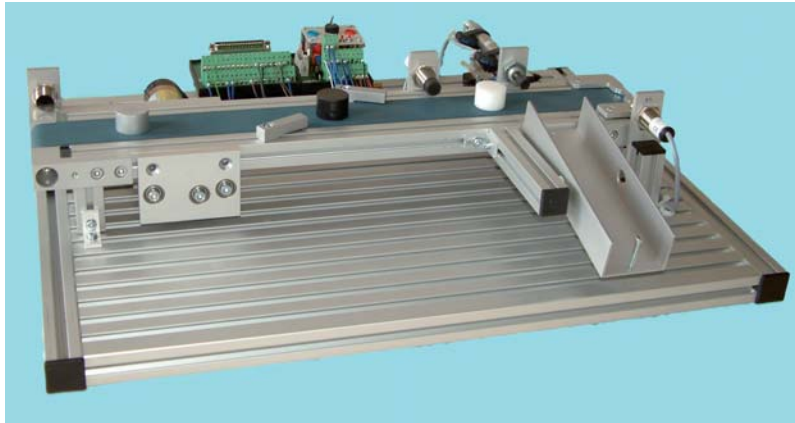Air compressor
(Order-No. W3545-8A)

Optional addition
Mobile underframe
(Order-No.: W4764-5A)
Control panel
(Order-No.: W4764-6A)
Pusher, pneumatic
(Order-No. W3545-6H)
Pusher, electric
(Order-No. W3545-6E)

➢ Technology Stations
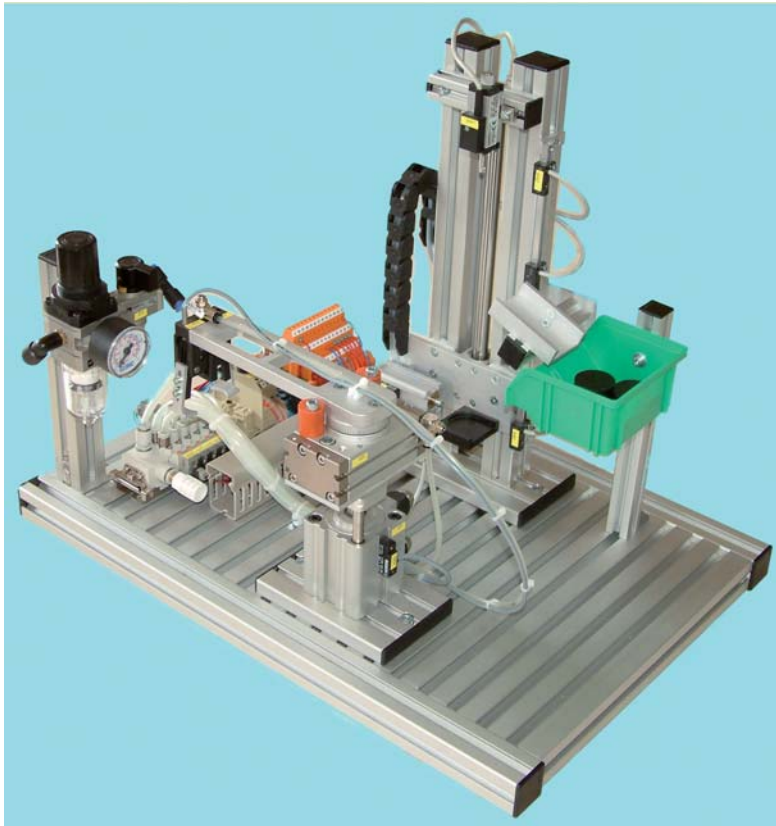
Technology Station Measuring and Handling

The technology station measuring and handling negotiates awareness of function and application of industrial components of the branch handling and material selection.
Learning contents
The station with its coupling interfaces to other stations is suitable for learning the terms e.g. recognition of signals, signal processing and evaluation in training.

For example of optimization of conveying distance and a collision free movement, it will be shown, that the contradictory requirements in a mechanical system can also be controlled.
The technology station can be combined and be used quick and uncomplicated and it can be set into operation independently

Task:
- Thickness measuring with digital sensor
- Convey the work piece to the next process

Structure:
- Underframe with pneumatic lifting platform
- Analog thickness measuring
- Pneumatic pick and place with a pair of gripper jaws

Technical data
8   digital inputs,
6   digital outputs
1   analog output 0-10V

Necessary working pressure :
min. 6 bars , max. 8 bars

Teachware
Training material for the technology station measuring and handling

Scope of delivery
1   Analog thickness measuring
1   Pneumatic lifting platform
1   Pneumatic arm
1   Profile plate complete
1   Hardware
1   Technical documentation

Order-No. W4764-1C

Neccessary Accessories
Connecting lead to SIMATIC Training unit (Order-No. W4760-8A)
Air compressor
(Order-No. W3545-8A)

Optional addition
Mobile underframe
(Order-No.: W4764-5A)
Control panel
(Order-No.: W4764-6A)

WUEKRO

➢ Technology Stations

Technology Station High-Bay Warehouse

General

With the high shelf storing, you can store 20 work pieces of a diameter Ø 30 mm and of 20 mm height with a 3-axis handling system in 4 floors with 5 storing places each.
The work pieces are picked up (placed) from a position being in a distance of 85 mm next to the assembly plate by a pneumatic gripper. The 3-axis handling system consists of 2 electrically driven axis and one pneumatically driven axis.

Construction

- AL-T-slot plate 350x500x30 mm with one T-slot 8 mm, in a 25 mm grid
- 25-channel data interface
- 2 relay functional modules as reversing contactor circuit
- Maintenance unit with manual valve
- Valve island with 2 5/2 directional control valves, monostable
- High shelf store made out off aluminum elements with 20 storing places and 3-axis handling system

Function
X-axis:

The X-axis is driven with a d. c. motor 24V DC via a relay functional module. The final positions are protected with a micro switch as final position switch. At the same time, this switch is available as DU at the control and can be used as reference point. The positioning is done with a fork light barrier in defined positions for the deposit positions and the take-over (transfer). The correction of the transfer position is done by positioning of the whole high-shelf storing in X-direction. For the collection of the position the usual DU of a PLC (SPS) are sufficient.

Y-axis:
The Y-axis has got the same drive as the X-axis. The positioning is done with a linear sensor with direct path measuring. The sensor reacts to a magnetic signal transmitter (metal strip at the axis). The impulse distance is approx. 0,4 mm. With the evaluation of the channels A and B you can reach a positioning accuracy of 0,2 mm.
For the collection of the impulses a counter input of the control is necessary.

Z-axis

The Z-axis is pneumatically controlled by a torsion-free cylinder and has only got 2 states. "Gone-in" is the transport position of the work pieces and "gone-out", the work pieces are put down or picked up. The position of the Z-axis is collected with a reed switch at the cylinder. An angular gripper at the cylinder piston picks up the work pieces for the transport. The position "gripper closed" is collected with an inductive sensor.

Technical Data
Signal transmitters:

3   cylinder switches
1   fork light barriers
1   path-measuring sensor
4   micro switches

Actuators:

2   5/2-directional control valves, monostable
4   relays as reversing contactor circuit.
Compressed air not oiled from 4 up to 6 bar
Power supply 24V DC Installation 37-pin. D-Sub-plug
Valve island
Maintenance unit with manual valve
Work pieces: 1 Cylinder Ø30 x 20 mm
Dimensions: 350+150 x 500 x 450

Scope of delivery:

Technical documentation + PLC S7 programm "getting started"

Order-No. W4764-3R

High-Bay Warehouse, only electrically driven
Order-No. W4764-3R-Z-EL

Neccessary Accessories

Connecting lead to SIMATIC Training unit (Order-No. W4760-8A)
Air compressor
(Order-No. W3545-8A)

Optional addition

Mobile underframe
(Order-No.: W4764-5A)
Control panel
(Order-No.: W4764-6A)
Work pieces (Order-No.: W4764-5B)

Accessories - Leads/Plugs

Connecting lead	32 A/250 V, black, 100 cm long, with 4 mm safety plug	**Order-No. W3907-3E**
Connecting lead	32 A/250 V, red, 100 cm long, with 4 mm safety plug	**Order-No. W3907-3F**
Adapter	4 mm plug/2 mm socket for connection of 2 mm connecting leads	**Order-No. W3942-2A**
Connecting lead	37-pin D-SUB plug on both sides, 1.5 m long, for connection of technology simulators to SIMATIC S7 training units	**Order-No. W4760-8A**
Connecting lead	1 x on 2 x 37-pin D-SUB plug, 1.5 m long, for connection of models/simulators to SIMATIC S5 training units	**Order-No. W4760-8B**
Connector for PROFIBUS	SIMATIC DP, Bus Connector for PROFIBUS up to 12 MBIT/S 90 degree angle outgoing cable	(W X H X D): 15,8 X 54 X 34 mm Terminat. resistor with isolat. function without PG socket **Order-No. W3947-1A**
Connector for PROFIBUS	SIMATIC DP, Bus Connector for PROFIBUS up to 12 MBIT/S 90 degree angle outgoing cable	(W X H X D): 15,8 X 54 X 34 mm Terminat. resistor with isolat. function with PG socket **Order-No. W3947-1B**
PROFIBUS – Cable	SIMATIC NET, PB FC Standard Bus Cable, 2-Wire,	shielded special design for rapid installation, 20 m **Order-No. W3947-2A**
PROFIBUS – Cable	SIMATIC NET, PB FC Standard Bus Cable, 2-Wire,	shielded special design for rapid installation, 50 m **Order-No. W3947-2B**
PROFIBUS – Cable	SIMATIC NET, PB FC Standard Bus Cable, 2-Wire,	shielded special design for rapid installation, 100 m **Order-No. W3947-2C**

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➢ Experiment Instructions

Practical experiment instructions

Experiment instruction manuals on all SIMATIC training systems, which have been compiled by specially trained and qualified employees, are available for use.
In general, the experiment instructions consist of three parts:

Part 1:   Fundamentals
Introduces the training needs and provides the basic theory

Part 2:   Experiments
Contains the experiments like programming and test tasks

Part 3:   Solutions
Contains solutions to Part 2, offers ways of checking the results and thus reduces the time for test preparation

A = German
B = English

Experiment instructions

V172	**SIMATIC S7-200**	**Order-No. W3017-2_**
V173	**SIMATIC S7-300**	**Order-No. W3017-3_**
V175	**Digital Control I with SIMATIC S7**	**Order-No. W3017-5_**
V174	**Digital Control II with SIMATIC S7**	**Order-No. W3017-4_**
V176	**PROSIM 95 (Process simulation)**	**Order-No. W3017-6_**
V177	**FUZZY-Logic**	**Order-No. W3017-7_**
V178	**PROFIBUS DP**	**Order-No. W3017-7_**
V179	**Universal Simulator Electrical Engineering**	**Order-No. W3017-9_**
V189	**Universal Simulator Metal Engineering**	**Order-No. W3018-9_**
V187	**Plant Simulator**	**Order-No. W3018-7_**
V188	**Contactor Control with SIMATIC S5/S7**	**Order-No. W3018-8_**

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Training & Didactic Systems

Process Control Technology
with SIMATIC S7

Catalog	WA2E/04.03

➤ Table of Contents   Page

➢ Model for Process Control Engineering - General

The model for process control engineering, a laboratory distillation plant, promotes the understanding of the functioning of sequential control systems by developing and programming simple sequential control systems.

So, when creating a sequential control for example – regardless whether in the laboratory (automation of experimental or test processes) or in production (automation of production processes) – reaction processes are split up into very small successive steps. This way the student learns to think in those single steps the control unit is using.

Order-No. W5211-1A

1. Plant Description

This model in lab size is meant to represent the batch distillation principle, which is one of the most frequently used dissociation methods of distillation in process engineering. The control and switching processes using temperature, clock cycle and level monitoring, which are important in large and small plants, are combined with a programmable logic control on an operation and automation level and are controlled and activated in logical order.

The subsequent control board level with PC visualization, open-loop and closed-loop control including documentation is supposed to explain the application of instrument boards as practiced in industry. The laboratory distillation plant is made from a chemically resistant special glass (borosilicate glass 3.3) in order to offer a full view and to make it possible to observe the experimental process in detail.

The 2-l distillation flask with external heating represents the often used distillation vessel out of steel, steel/enamel or special alloys. Sensors for temperature and level monitoring are brought in via the various nozzles.

➢ Model for Process Control Engineering – Technical Data

1.1. Processes, Process Parameters, Media

The distillation equipment has been conceived as a demonstration model for the automation of switching and controlling processes with the SIMATIC PCS 7.

The design with the materials DURAN® and PTFE ensures a high degree of resistance to all kinds of media.

Materials	Borosilicate glass ®
	PTFE
Operating temp.	max. 180 °C
Oper. pressure	-1/0.1 bar
Resistance to temperature change:	100 K

1.2. Equipment Configuration

The plant consists of the following components:

- Packed column - K1
- Still-head - B1
    - Heating hood - H1/H2
    - Column head as liquid separator with condenser - W1
    - Distillate receiver - B2
    Stirrer - R1
- Mounting frame
- Field measuring and control technology
- Connector module

Accessories

- Piping elements
- Spindle valve
- Flanged joints and seals
- Filling bodies
- Automatic valves
- Connecting pieces and adapters
- Ducts for sensors

1.3. Technial data

		Column K:		Dimensions	
Operating pressure	-1/0.1 bar	Packed column	DN 25 x 300 mm	(BxHxT)	650x1500x400 mm
Operating temp.	max. 180°C	Filling bodies -		Weight approx.	65 kg
Nominal volumes:		Raschig rings	4 x 4 mm		
still-head	(B1) - 1000 ml	Stirrer:	type RW 16 basic		
distillate receiver	(B2) - 250 ml	Driving power:	75/35 W		
Exchanger surface:	condenser	Power at the stirrer shaft:			
	(W1) - 0.10 m²		53 W		
Heating capacity:	heating hood	Output torque:	30 Ncm		
	(H1/H2) - 400 W	Output speed:	40 ... 1200 rpm		
	2 heating zones		max. 800 rpm		
Max. coolant pressure:			admissible		
	condenser	Electric connection:			
	(W2) - 2 bar		230 V/50 Hz		
	(overpressure)	Stirrer type:	blade stirrer		

1.4. Specifications of the Materials Used

Glass components:

- Borosilicate glass 3.3 (DURAN)
- Resistance to temperature change: 120 K
- Chemically resistant
- Transparent, non-porous surface
- Catalytically indifferent

Stirrer closure	glass/PTFE
Stirrer	glass/PTFE
Seals	PTFE
Spindle valves	glass/PTFE
Frame elements	high-grade steel tubes

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➢ Programmable Logic Control

Equipment

Industrial components:

1   SIMATIC CPU S7 414-3
    Central Processing Unit,
    768 kByte RAM

1   Digital-Input SM 421,
    32 DI; DC 24V

1   Digital-Output SM 422,
    32 DO; DC 24V;0,5A

1   Analog-Input SM 431,
    8 AI; 14 Bit;
    U/I/Resistor/PT 100

1   Analog-Output SM 432,
    8 AO, 13 Bit, U/I

1   Power Supply module
    PS 407, 10A, AC 120/230V,
    DC 5V/10A

1   SITOP, Power 5, Basic Line,
    DC 24 V / 5 A

1   Backup batterie 3,6 V/1,9 Ah
    for PS 405, 4 A/10 A/20 A
    and PS 407 4 A/10 A/20 A

1   UR2 RACK, centralized and
    distributed with 9 slots

Simulation modules:

DI-module:

32 digital inputs, of which 16 DI are
connected on momentary-contact/
maintained-contact switch and to 4
mm MC-safety sockets,
signal statuses by LED

DO-module:

32 digital outputs, of which 16 DO
are connected
to 4 mm MC-safety sockets, signal
statuses by LED

AI - module:

8 analog inputs, are connected to
4mm safety-sockets,
1 potentiometer steplessly
adjustable, voltage +/-10V
or current 4 -20mA

AO - module:

8 analog outputs, are connected to
4mm safety-sockets , 1 digital
measuring device, voltage +/-10V
or current 0 -20mA,

PS-module:

Inlet connector for non-heating
apparatus 230 V AC , short circuit
protection, fuse and illuminated on-
of switch 24 V / 5A on 4 mm safety-
sockets
32 DI on 37-pin D-SUB connector
32 DO on 37-pin D-SUB connector

Supply connection cable 2m,

Operator´s guide english

Order-No. W4745-1D-PCS7

➢ Software

PCS 7 Trainer Package V5
3 licences

consisting of:

Part 1:
Engineering Toolset
The Engineering Toolset is used to convert the basic hardware into an engineering station for
AS engineering.
The Engineering Toolset comprises:

- STEP 7 V5.0,
- CFC,
- SFC,
- S7-SCL,
- Technological hierarchy,
- Import/export assistant,
- DOCPRO

Part 2:
OS-Software Engineering V5.0
Corresponding OS software is required for the basic hardware to permit operation as an operator station.
The OS software Engineering is required to produce an OS engineering workstation.
SIMATIC PCS7, Software OS-Software Engineering V5 OS Controlsoftware Runtime And Engineering for Engineering station for 64k Variables

Part 3:
SFC visualization
The sequential controls for SIMATIC PCS 7 which are generated with SFC are visualized by this option package in the same form on the operator station. To do this, you must call the plans to be visualized in the navigation and overview form. The step and transition displays can be opened in the overview display, and a step comment or the dynamic conditions displayed.

Part 4:
Documentation for SIMATIC PCS 7
The documentation comprises the following:

- SIMATIC PCS 7 System Description
- PCS 7 Getting Started
- PCS 7 Configuring Manual
- STEP 7 Programming Software: configuration of hardware, programming with STEP 7, STL, LAD, CSF, STEP 7 standard/system functions
- Engineering Tools: libraries, CFC, SFC, S7-SCL, DOCPRO
- SIMATIC Automation Systems: S7-300 modules, S7-400, automation system, ET 200M (IM 153)
- SIMATIC NET: NCM S7 for Industrial Ethernet and PROFIBUS, brief instructions for Industrial Ethernet and PROFIBUS, Ethernet incl. PROFIBUS networks, industrial twisted pair networks, CP 1613, CP 5412 (A2)

- Validation Support: validation manual and validation-supporting control system functions
- WinCC: basic documentation, WinCC Getting Started,
- Hardware options, configuration manual, communications manual, basic process control,
- Runtime
- BATCH flexible (automation of batch processes)
- Web link with @PCS 7

On CD-ROM, Softwarelicense on Multiauthorisation disk

Order-No. W4700-8A

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➢ Accessories

PC adapter CP 5611-MPI

Application

The CP 5611 enables connection of programming devices and AT-compatible PCs to PROFIBUS and to the multipoint interface (MPI) of SIMATIC S7. For PGs/PCs with PCI slot.

Design

- Short PCI card of type II
- 9-pin sub D socket for connection to PROFIBUS

Functions

The CP 5611 is operated under different software packages and allows the user to execute programming device functions and PC functions via PROFIBUS and the multipoint interface (MPI).

Only one CP can be operated for each programming device/PC. Similarly only one protocol (PROFI-BUS-DP, S7 communication or FDL) can be used for each CP.

Delivery incl. MPI-cabel, 5m

Order-No. W4700-4K

Cooling water reservoir with electrical water-pump

Container for cooling water tank for operation of the process control model. The container contains a 20 liter tank with submersible-pump (12 V DC).
The mains voltage is supplid by an integrated power supply.

The control of the PLC is realized by a control relay (24 V DC).
The length of the connecting tubes to the model for the forward and backward movement is 3m each

The mains supply is connected via inlet connector for non-heating apparatus 230 V AC

Dimensions
(W x H x D):   340x340x450mm

Order-No. W5211-1P

Set of connecting leads

For connecting the process control model (W5211-1A),

consisting of:
10   leads black; length 300cm, with 4-mm safety laboratory plug connectors
10   leads red; length 300cm, with 4-mm safety laboratory plug connectors

Order-No. W3901-0P

Getting Started Project "Lab and Destillation unit"

"Getting Started – PCS 7"

Application program with one example for introduction and commission of the destillation unit

Consisting of:
1   CD ROM
1   Brief manual

Recommendation:

Commissioning, System introduction and short training through our experts, duration: 1 day

Order-No. W3050-3A

LOGO! Set – The LOGO! Training module

LOGO! Set Training module
The LOGO! Set training module simplifies the familiarization with the world of the universal and innovative Logic module LOGO!
It includes all the necessary items for your training with your students of the 8 basic- and 22 special functions as well as application examples:

• **LOGO! Set Training module**
The digital inputs I1 - I8 are to be operated by means of switches. The inputs I7 and I8 are suitable as analog inputs and each of it is additionally connected to a potentiometer.
The output status of Q1 - Q4 is displayed by LED's. Therefore, all applications can be tested immediately.
(Delivery without LOGO! - Module)

• **Overlays**
25 overlays are included in the supply to support you to train the 8 basic- and 22 special functions.

• **LOGO! Workshop on CD-ROM**
For all overlays an experimental documentation is included in the supply. For all exercises the respective solutions are an integrated part of the documentation.
This safes preparation time for carrying out the different experiments.

• **Power supply**
Power supply 12V / 500mA for operating LOGO!

• **Base plate for LOGO! Set**
Base plate for the training module

LOGO! sets standards
Integrated in several technical Schools and institutes, LOGO! has already set a standard for basic education in automation technology.

Set Your Standard, order by Fax!

Please quantify:

**Yes, we order ___ pcs. LOGO! Set Training module(s)
for the special price of EUR 137,– each.*)
to be delivered as follows:**

1   **LOGO! Set Training module (W4452-1T)
    (for LOGO! 12/24 RC,
    LOGO!-module not incl. in delivery)**
25 **Overlays for workshop**
1   **LOGO! workshop on CD-ROM**
1   **Power supply 12V / 500mA**
1   **Base plate for LOGO! Set Training module**

Please fax to:

+49 (0) 9721/ 6 46 91 - 20

WUEKRO GmbH
Germany

Order / delivery address:

_____
Company

_____
Name/Position

_____
Street

_____
Area Code/City

_____
Phone

_____
Fax

_____
Date   Signature

*) Pricing: ex works, excluding VAT.

WUEKRO GmbH
Hafenstrasse 5
97424 Schweinfurt / Germany
**Phone: +49 (0) 9721 / 6 46 91 – 0
Fax: +49 (0) 9721 / 6 46 91 - 20
Internet: www.wuekro.de**

The LOGO! Starter Box –
Order by Fax and make a low cost start!

Innovative switching and control: LOGO!
Up to 8 basic functions and 21 special functions can be combined with each other up to 56 times in LOGO!

The following maximum numbers are optionally possible:

- 16 timer functions
- 24 counter functions
- 8 time switches
- 42 pulse relays
- 42 latching relays
- Functions for analog value processing and message texts

You can forget about individual components like time switches, timer relays, counters and auxiliary contactors – they are all included in LOGO!

Low-cost switching and control: LOGO!
And the LOGO! Starter Box contains everything you need for getting to know and testing LOGO! at your leisure:

- **LOGO! 12/24RC**
  which saves on wiring and offers 29 integral and commonly used functions that you can combine up to 56 times.
- **LOGO! Soft Comfort V3.1**
  The simple software for creating, testing, simulating, modifying, archiving and printing out your control program on the PC.
- **LOGO! PC cable**
  For transferring your control program from the PC to the logic module and vice versa.
- **LOGO! manual**
  With detailed information on operation and application.

Please request more information on LOGO! by return from :

Please complete the Quantity:

Yes, we would like to order _____ LOGO! Starter Box(es) for the special price of EUR 155,– each *)

LOGO! 12/24 RC (6ED1 057-3BA00-0BA2)

Please fax to:

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Germany

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Date   Signature

*) Pricing: ex works, excluding VAT.

WUEKRO GmbH
Hafenstrasse 5
97424 Schweinfurt / Germany
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Training & Didactic Systems

Automation Technology
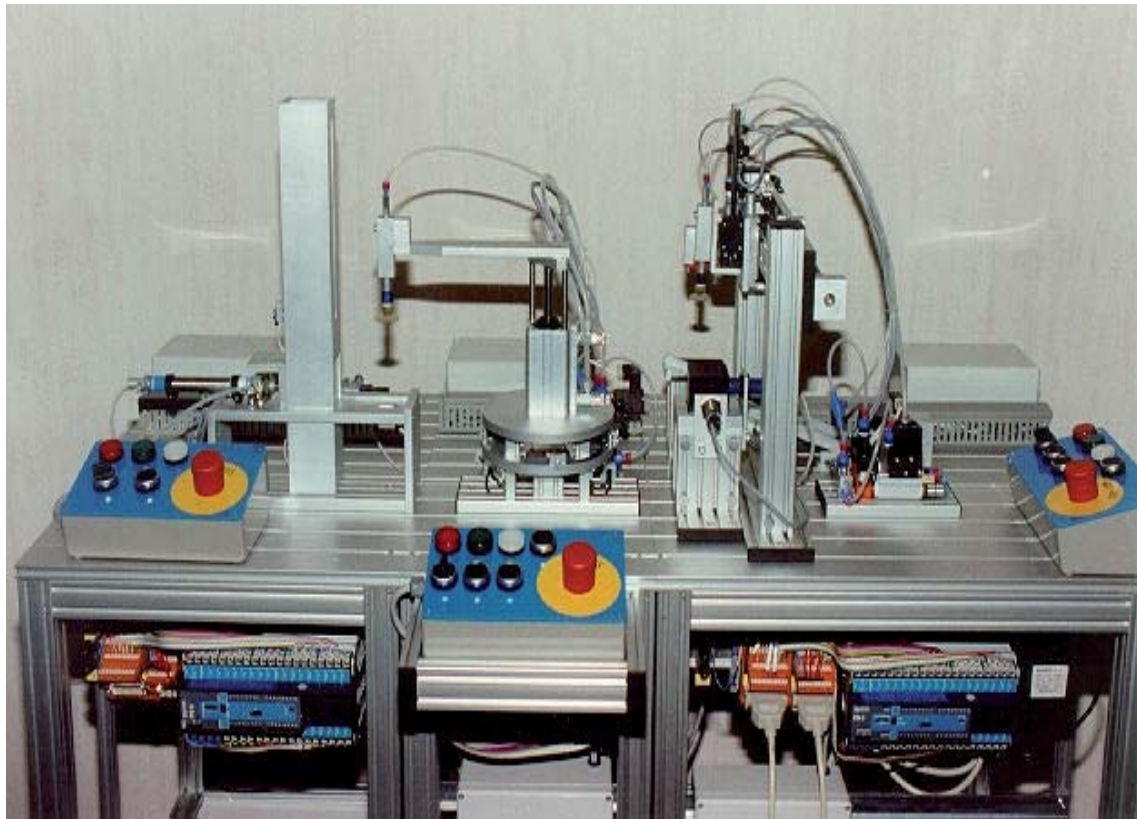Modular Training System for flexible manufacturing - **Mechatronic**

Catalog   WA2E/04.08

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➢ **Table of Contents**

Page

> **Training system mechatronic**

Educational Systems – Allocation – Target Groups

Study projects **Dissertations**	
Specialized practical training **College/University**	**Industrial models, Technology stations**
Basic practical training **College/University**	
Master craftsman/technician **Further education (Chamber of Industry and Commerce)**	
Skilled worker training	
Fundamentals **Training/education**	

➢ **System concept MSK**

Realize your teaching aims with our training equipment

Further to our already mentioned training aims in our catalog WA1E/04.01, you can teach with our modularized training units the functions and applications of industrial systems in the field of "mechatronic".

Training aims

- Handling
- Support
- Checking
- Measuring and quality assurance
- Selection
- Processing
- Storage with inventory management and optimization
- Positioning
- Transportation
- Transfer systems
- Analization
- Image processing
- Robot integration and -programming
- CNC-Technology
- Assembling
- FMS/CIM integration
- Service and maintenance

Praxis oriented training documentation

For the training modules didactic documentation and didactic software modules are provided.

The system concept MSK consists of the following elements:

- SL - Hardware module
- SL - Software module
- SL - Coupling module

- MHM = Mechatronic hardware module
- MSM = Mechatronic software module
- MKM = Mechatronic coupling module

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➢ **General**

SL - Hardware module MHM

The SL - Hardware module almost offers an industrial environment for the technical training and further training by using the technology stations.
Each station consists of two modules minimum, usually the working module with the handling module, both on an aluminum baseplate mounted and wired.

In addition, there are the necessary controls, underframes and the necessary PLC for the drive. Industry-justified training by using the industry components, the MHM - concept fulfill this claim and guarantees, that the aims are adapted to the student's claims

The connection of each station with another is an essential characteristic of this system. It guarantees, that the user can assembly step by step his optimal training system.
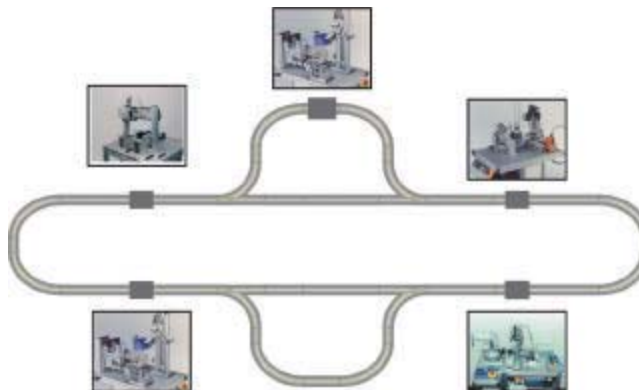
There are two possible material handling:

1. Linear material handling

Linear material handling through the concatenation of the individual technology station linear with each other

2. Product-oriented material handling

Product oriented material handling through the use of a shuttle system with any structure of bypasses for optimizing the tasks.

Advantage of the SL-Hardware module MHM

- Each module is connectable with each other one
- Through the open interface structure, each PLC can be changed, through its newest field-bus technologies can be teached
- Material handling can be analyzed and optimized
- Improvement of team capability
- Project-oriented work
- Use of industrial components
- Optimal coordination between software and hardware
- Fully matured and practicable teachware

➢ SL - Hardware modules   MHM

Station A: Loading and handling

Station B: Check and handling

Station C: Measuring and handling

Station D: Sorting and handling

Station E: Drilling and handling

Station F: Buffering and handling

Station G: Storage and handling

Station H: Mounting with buckling arm robot

Station I: Quality assurance ISO

Station J: Turning and handling

Station K: Milling and handling

Station L: Flexible manufacturing cell

Station M: Mounting with scara robot

Station N: Ejection with digital camera

Station O: Transport
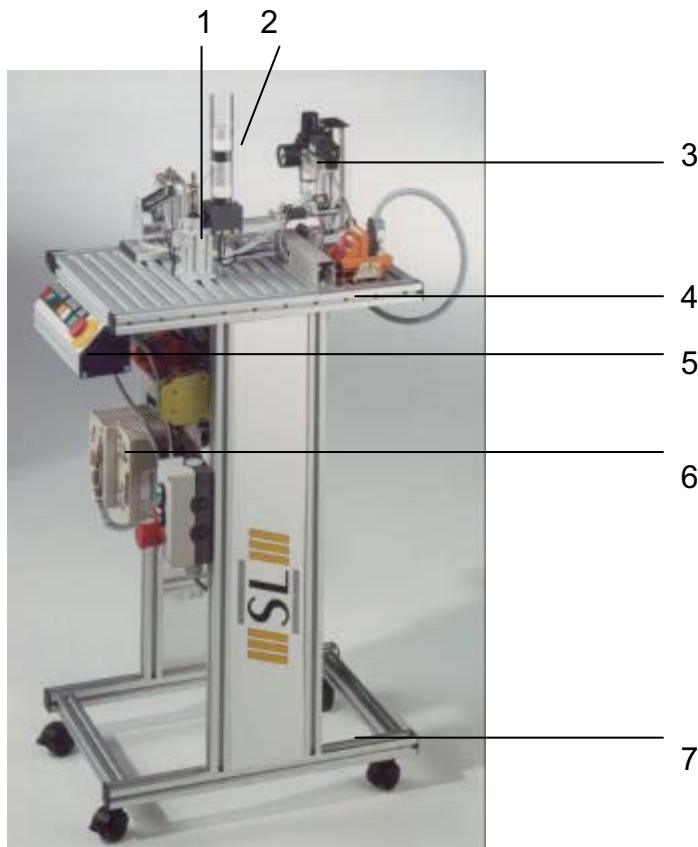

Station P: Hydraulic press and handling

Station Q: Robot station with linear axis

Station R: High shelf storage

Station S: Customers application

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➢ Structure of the technology stations MHM

1   2

3

4

5

6

7

The central thought of the concept is to combinate the
different MHM stations with another one.
By this opportunity the different industry-
justified environments can be varied, built and indoctrinated.

Each station consists of the
- Handling module (Pos. 1)
- working module (Pos. 2)
- e.g.   distribution, checking, machining
    handling, inlaying, buffering, testing, mounting, sorting, stamp,
    CNC-machining turning
    CNC-machining milling
- Maintenance unit (Pos. 3)
- Aluminum profile plate (Pos. 4)
- Control panel (Pos. 5)
- PLC-board (Pos. 6)
- Mobile underframe (Pos. 7)

1 = handling module

2 = working module

3 = maintenance unit

4 = Aluminum profile plate

5 = control panel

7 = mobile underframe
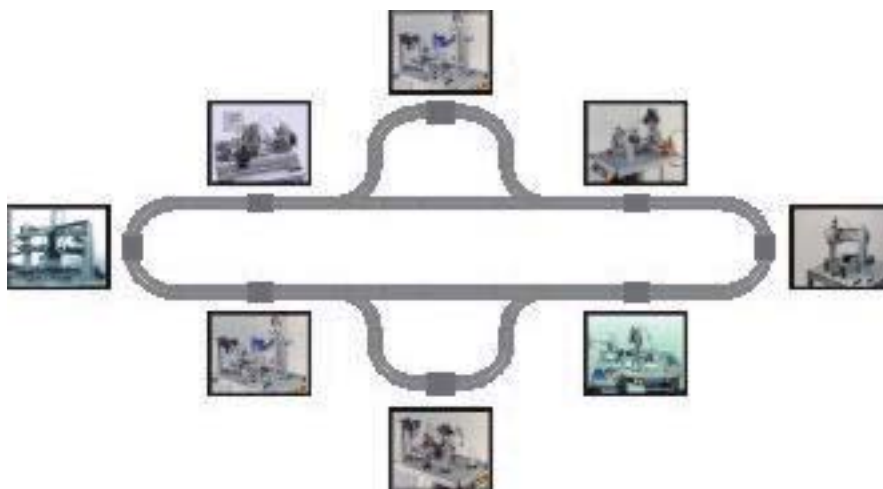
➤ Coupling possibilities of the stations MHM

Linear material handling suitable for the base training. All the stations A to R can be combined with others.

Product oriented material handling suitable for the training in the industrial standard.
Around the station O, all stations A to R can be connected at any position.

➤ Coupling possibilities of the stations MHM

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➢ Technology stations MHM

Loading and handling
(Station A)

Task :
- The work pieces are loaded from the loading magazine to the process
- Convey the work piece to the process

Structure :
- Magazine with pneumatic double-acting thruster and control of level by means of the capacitive sensor
- Deposit table with sensor checking
- Pneumatic swivel arm with suction gripper

Technical data :
- 6 digital inputs ,
- 5 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware :
- Training material for the technology station Loading and handling

Didactic indications :

The technology station negotiates awareness of function and application of industrial components of the branch feeding of stock and handling.
By means of the didactic prepared industry components, the physical function principles, connecting technique and variants to the material provision are practically presented.
The station with the typical interfaces to the mechanics, pneumatics, electrical engineering/electronics and PLC-technique, is especially suitable to the approach in the multiple fields of the MECHATRONICS.
As individual station in the teaching or during the exercises in the lab, the station can be used quick and uncomplicated and it can be set into operation independently.

Extent of supply:
1   Loading magazine
1   Pneumatic swivel arm
1   Profile plate complete
1   Hardware
1   Technical documentation

Optional addition:
- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1A

➢ Technology stations MHM

**Measuring and handling
(Station B)**

Task:

- Material recognition by means of three sensors
- convey the work piece to the next process

Structure:

- Underframe with three sensor, inductive capacitive and optic
- Transport module with DC drive
- Pneumatic swivel arm with suction gripper

Technical data:

- 6 digital inputs,
- 5 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:

- Training material for the technology station Measuring and handling.

Didactic indications:

The technology station negotiates awareness of function and application of industrial components of the branch material rognition, transport and handling.

By means of the didactic prepared industry components, the physical function principles, e.g. sensor technology are practically presented. The definitions like part recognition, material fixing and evaluation can be used in the experiments. The decision criterion for influencing the material movement can be derived in connection with the next station.

As individual station it can be used quick and uncomplicated and it can be set into operation independently.

Extent of supply :

1	capacitive sensor
1	Inductive sensor
1	Optical sensor
1	Transport module with DC motor
1	Pneumatic swivel arm
1	Profile plate complete
1	Hardware
1	Technical documentation

Optional addition:

- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1B

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➢ Technology stations MHM

**Measuring and handling
(Station C)**

Task:
- Thickness measuring with digital sensor
- Convey the work piece to the next process

Structure:
- Underframe with pneumatic lifting platform
- Analog thickness measuring
- Pneumatic pick and place with a pair of gripper jaws

Technical data:
- 8 digital inputs,
- 6 digital outputs
- 1 analog output 0-10V
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station Measuring and handling

Didactic indications:

The technology station negotiates awareness of function and application of industrial components of the branch handling and material selection
The station with its coupling interfaces to other stations is suitable for learning the terms e.g. recognition of signals, signal processing and evaluation in training. For example of optimization of conveying distance and a collision free movement, it will be shown, that the contradictory requirements in a mechanical system can also be controlled. The technology station can be combined and be used quick and uncomplicated and it can be set into operation independently

Extent of supply:
1   Analog thickness measuring
1   Pneumatic lifting platform
1   Pneumatic arm
1   Profile plate complete
1   Hardware
1   Technical documentation

Optional addition:
- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1C

➢ Technology stations MHM

**Sorting and handling
(Station D)**

Task:
- Deposit according to the material properties and to the form
- Convey the work piece to the next process

Structure:
- Deposit unit with pneumatic loading
- Pneumatic pick and place with a pair of gripper jaws

Technical data:
- 5 digital inputs,
- 5 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  Sorting and handling

Didactic indications:

The technology station negotiates awareness of function and application of industrial components of the branch handling and material selection

The station with its coupling interfaces to other stations is suitable for learning the terms e.g. recognition of signals, signal processing and evaluation in training. For example of optimization of conveying distance and a collision free movement, it will be shown, that the contradictory requirements in a mechanical system can also be controlled. The technology station can be combined and be used quick and uncomplicated and it can be set into operation independently.

Extent of supply:

1	Pneumatic deposit module
1	Pneumatic arm
1	Profile plate complete
1	Hardware
1	Technical documentation

Optional addition:
- Mobile underframe
  (Order-No.: W4764-5A)
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1D

> ➢ **Technology stations MHM**

**Drilling and handling
(Station E**)

Task:

- Drilling the work piece
- Convey the work piece to the next process

Structure:

- 24V DC drilling machine with pneumatic infeed
- Pneumatic work piece holding
- Pneumatic arm with a pair of gripper jaws

Technical data:

- 5 digital inputs,
- 5 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:

- Training material for the technology station
  Drilling and handling

Didactic indications:

The technology station negotiates awareness of function and application of industrial components of the branches material processing and handling. Using the example of the machining method drilling, the signals and the safety-technical contexts are imposing confronted. The didactical prepared components are clearly developed for the training. Complex tasks with higher level can be done for the branch maintenance. So the maintenance time and the operational hour counter can be recorded in the control program for controlling the wear of tools (drills). The technology station can be used as single station or in combination with others.

Extent of supply:

1   Pneumatic drill module
1   Pneumatic arm
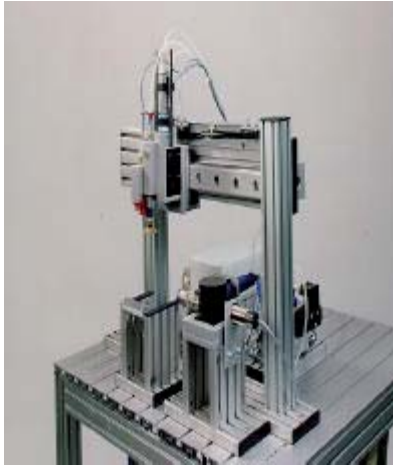1   Profile plate complete
1   Hardware
1   Technical documentation

Optional addition:

- Mobile underframe
  (Order-No.: W4764-5A)
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1E

➢ Technology stations MHM

Drilling and handling
(Station F)

Task:
- Intermediate buffer of work pieces for further processing
- Convey the work piece to the next station

Structure:
- Buffer the parts by means of module of belt band
- Pneumatic arm with a pair of gripper jaws

Technical data:
- 6 digital inputs,
- 5 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  Buffer and handling

Didactic indications:

The technology station negotiates awareness of function and application of industrial components for buffering and handling of work pieces.

In accordance with the practical manufacturing installation, the necessity of a buffer distance shall be shown in the manufacturing sequence, when the cycle times of placing of the work pieces are different. For that, it needs the evaluation of station in training in the environment (station before and afterwards) of the buffer distance. The signals and the technological in training for an optimal sequence can be evaluated with this station. As individual station in the teaching or during the exercises in the lab, the station can be used quick and uncomplicated and it can be set into operation independently.

Extent of supply:

1	Pneumatic buffer for parts
1	Pneumatic arm
1	Profile plate complete
1	Hardware
1	Technical documentation

Optional addition:
- Mobile underframe
  (Order-No.: W4764-5A)
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1F

WUEKRO

➢ Technology stations MHM

Storage and handling (Station G)

Task:
- Deposit acc. to the material properties and form

Structure:
- Deposit unit with three thrust
- Electrical gripper with suction

Technical data:
- 6 digital inputs,
- 8 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  Storage and handling.

Didactic indications:

The technology station negotiates awareness of function and application of modules for storing and handling of work pieces of different forms and structure. By means of a practicable example, the possibilities and the limits can be used at the didactic prepared industrial components with electropneumatical and electromechanical modules. The safety requirements referring to the switching off can be approached in the lab. The connection, the wiring and the adjusting of stop position switch as well as the inquiry in the control program can be approached with this station. The technology station can be used as single station or in combination with others.

Extent of supply:
3   Deposit thrust
1   Electrical gripper with suction
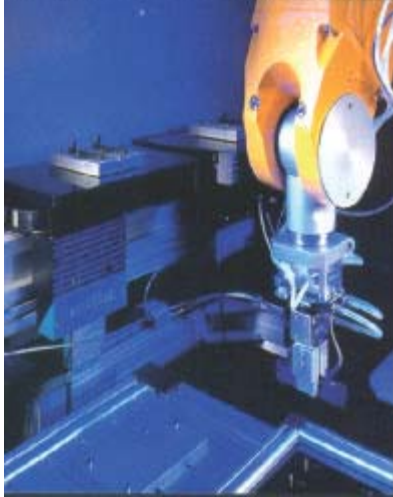1   Profile plate complete
1   Hardware
1   Technical documentation

Optional addition:
- Mobile underframe
  (Order-No.: W4764-5A)
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1G

➢ Technology stations MHM

**Assembling with
buckling-arm robot
(Station H)**

Task:

- Mounting a gear with a robot
- Convey the work pieces to the next process
- Three work pieces (A , B , C) which are placed in readiness in the loading modules are set to an unit

Structure:

- Industrial robot with 5 axis (buckling-arm robot)
- Isolation module part A (Gearbox)
- Isolation module part B (Gear shaft)
- Isolation module part C (Gear cover)

Technical data:

- 10 digital inputs,
- 10 digital outputs
- necessary working pressure : min. 6 bar , max. 8 bar

Teachware:

- Training material for the technology station
  Mounting with robot

Didactic indications:

The technology station negotiates awareness about the function and the application of industrial components of the branch handling with a robot. As industrial components with an high technical claim, the principles for using, controlling and coupling with other industrial controls (PLC) are strengthened. Experiences in the mounting, positioning and collision-free move are permanent parts of training and can be used in connection with further stations.
As individual station, it can be used quick and uncomplicated and can be set into operation independent.

Extent of supply:

1	5-axis buckling robot
1	Electrical gripper
1	Control panel
3	Isolation module
1	Profile plate complete
1	Hardware
1	Technical documentation
1	Teach pendant
1	Mobile underframe

Order-No. W4764-1H

➤ Technology stations MHM

Quality assurance acc. to ISO
(Station I)
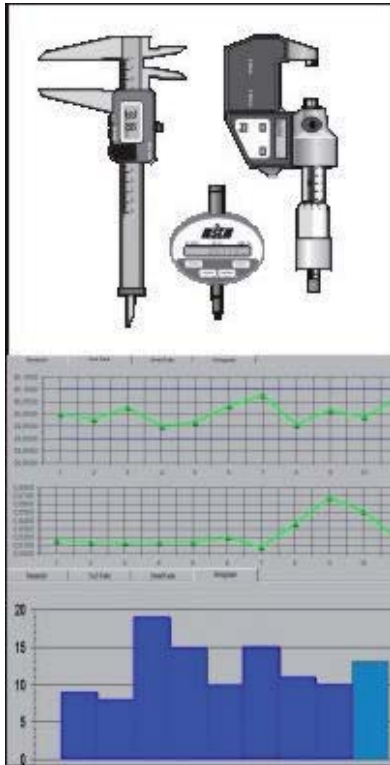
Task:
- Measuring and evaluation of the work pieces by means of digital measuring device.
- Measuring and online transmission to a PC-software
- Evaluation according to the usual methods mean value, range,
- standard deviation, histogram

Structure:
- Digital caliper gauge 0 - 150 mm
- Digital micrometer gauge 0 - 25 mm
- Digital dial gauge, 12 mm measuring range
- Operating unit for GOOD-pieces and rejects

Technical data:
- 4 digital inputs, 4 digital outputs

Teachware:
- Training material for the technology station
  Quality assurance acc. to ISO

Didactic indications:

With the station "Quality assurance", the subject is didactic prepared and clearly negotiated using the Industry components. The installed Software program fulfill thereby all requirements referring to operating, handling and data interfaces.

A controlling work piece is taken manually, prepared for the measuring and is finally measured by using the selected measuring device.

After recording the measured value in the software, the data stand for further evaluation (for example in the control charts) to the disposition. The training station can be used independent in the teaching or in exercises in laboratory.

Extent of supply:

1	Digital caliper gauge
1	Digital micrometer gauge
1	Digital dial gauge
1	Foot switch
1	QS-100 Software
1	Digital interface for 6 digital measuring device
1	Measuring desk
1	Technical documentation

Optional addition:
- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1I

➢ Technology stations MHM

**Turning and handling
(Station J)**

Task:

- Machining the work pieces on a CNC-turning machine and hand over to a next station

Structure:

- CNC-turning machine
- PC-controlled robot
- Transversal axis

Technical data:

- 4 digital inputs,
- 4 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:

- Training material for the technology station
  CNC-machine turning
  Training at robots

Didactic indications:

The station is suitable for teaching the CNC turning. The programming can be done in different controls.
At the same time the programming and the cinematic of robots can be learned as well as the communication of signals between a robot and the CNC-machine.
The technology station can be used as single station.

Extent of supply:

1	CNC-turning machine PC D2145
1	Tool basic equipment
1	Automation module
1	5-axis buckling robot
1	Transversal axis 400 mm long
1	Hardware
1	Technical documentation

Optional addition:

- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1J

➢ Technology stations MHM

**Milling and handling
(Station K)**
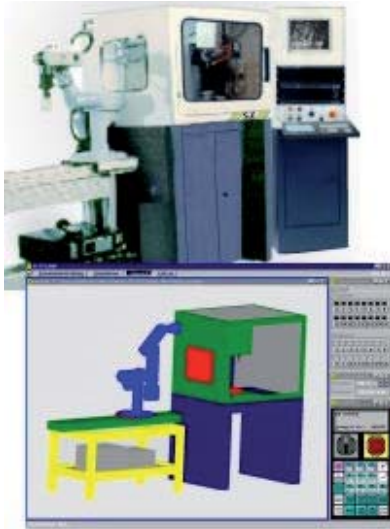
Task:

- Machining the work pieces on a CNC-milling machine and hand over to a next station

Structure:

- CNC-milling machine
- PC-controlled robot
- Transversal axis

Technical data:

- 4 digital inputs,
- 4 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:

- Training material for the technology station
  CNC-machine milling
  Training at robots

Didactic indications:

The station is suitable for teaching the CNC milling. The programming can be done in different controls.
At the same time the programming and the cinematic of robots can be learned as well as the communication of signals between a robot and the CNC-machine.
The technology station can be used as single station.

Extent of supply:

1	CNC-milling machine PC F2145
1	Tool basic equipment
1	Automation module
1	5-axis buckling robot
1	Transversal axis 400 mm long
1	Hardware
1	Technical documentation

**Optional addition:**

- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1K

➢ Technology stations MHM

**Flexible manufacturing cell
(Station L)**

Task:
- Machining the work pieces on a CNC-turning machine and CNC-milling machine
- Hand over to a next station

Structure:
- CNC-turning machine
- CNC-milling machine
- PC-controlled robot
- Transversal axis

Technical data:
- 8 digital inputs,
- 8 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  CNC-machining turning
  CNC-machining milling
  Training at robots

Didactic indications:

The station is suitable for teaching the CNC turning and milling. The programming can be done in different controls.
At the same time the programming and the cinematic of robots as well as the communication of signals between a robot and the CNC-machine can be learned.
The technology station can be used as single station.

Extent of supply:

1	CNC-turning machine PC D2145
1	Tool basic equipment
1	Automation module turning
1	CNC-milling machine PC F2145
1	Tool basic equipment
1	Automation module milling
1	5-axis buckling robot
1	Transversal axis 600 mm long
1	Hardware
1	Technical documentation

Optional addition:
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1L

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➤ Technology stations MHM

Assembly with scara robot (Station M)

Task:

- Assembly the work pieces with the robot
- Convey the work pieces to the next process
- Three work pieces (A , B , C) which are placed in readiness in the loading modules are set to an unit

Structure:

- Industrial robot with 5 axes (buckling-arm robot)
- Isolation module part A (Gear box)
- Isolation module part B (Gear shaft)
- Isolation module part C (Gear cover)

Technical data:

- 10 digital inputs,
- 10 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:

- Training material for the technology station
  Assembling with robot

Didactic indications:

With the technology station the awareness about the functions, industrial application and programming of a scara robot are negotiated. The robot as one industrial component points an high technical claim on. The particularities of a swiveling robot can also be demonstrated. The topics like kinematics, positioning and repeatability, which determine the use of this robot can also be negotiated with the didactic prepared industrial components. The technology station can be used as single station or together with other ones.

Extent of supply:

1	5-axis scara robot
1	Electrical gripper
1	Control panel
3	Isolation module
1	Profile plate complete
1	Hardware
1	Technical documentation
1	Teach pendant
1	Mobile underframe

Order-No. W4764-1M

➢ Technology stations MHM

**Evaluation with digital camera
(Station N)**

Task:
- Recognition and evaluation of work pieces by means of CCD-camera

Structure:
- CCD- camera
- Light source
- Support

Technical data:
- 5 digital inputs, 5 digital outputs

Teachware:
- Training material for the technology station
  Image processing by using the CCD-camera

Didactic indications:

The training station with its interested combined Industrial components and the variables operations make this station to a performed training equipment. The operations of the automatic image processing on this station are so transparency configured, that the contexts of this innovative technology can be clearly teached. In the teamwork of the hardware and the software, it shows, how the signals from the image processing are created and evaluated.
The technology station can be used as single station.

Extent of supply:

1   CCD-camera
1   Light source
1   Support
1   Digital in- and output module
1   Image recognition and evaluation software
1   Technical documentation

Optional addition:
- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1N

➢ Technology stations MHM

**Transport
(Station O)**

Task:
- Optimizing the material handling

Structure:
- Central line with shuttles
- Bypass
- Identification unit
- Underframe

Technical data:
- 22 digital inputs,
- 22 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  Automation of installations

Didactic indications:

The transport system represents in the classes a complexly automation task. According to the didactic prepared Industrial components, the awareness are negotiated of the function and structure of the modular controls in a decentralized automation concept. The requirement for it, is an intelligently "dissection" of the task in autonomic part functions. In the teaching or in the practice in laboratory, the different bus-technologies are learned.
The security inquiries of signal as well as the requirements in the adjusting mode of a complex installation form a further main focus in the training program. The transport system can be used as a single technology station.

Extent of supply:
1   Central transport system
1   Bypass
2   Shuttles
4   Stopper
4   Positioning stations
4   Identification modules
1   Management software
1   Technical documentation
1   Underframe

Optional addition:
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1O

➢ Technology stations MHM

Hydraulic press and handling (Station P)

Task:
- Punching a bed in a gearwheel
- Convey the work piece to the next process.

Structure:
- Hydraulic pressroom machine
- Loading module of the bed of the gearwheel
- Handling module

Technical data:
- 8 digital inputs,
- 8 digital outputs
- 60 bar oil pressure
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  Hydraulic pressroom machine

Didactic indications:

The station is suitable for the instruction to the terms hydraulics. All the industrial components are didactic prepared and can be used to mediate the basic knowledge in the classes and in the laboratories. The deepening of the contents occurs in practical exercises. It can be used as a single technology station.

Extent of supply:
1 Hydraulic thruster
1 4/3-port directional control valve
1 Loading module
1 Valve block
1 Current regulation valve
1 Sound absorber
1 Technical documentation

Optional addition:
- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1P

➢ **Technology stations MHM**

**Robot station and
Transversal axis
(Station Q)**

Task:
- Assembling the work pices with a robot under using an additional axis
- Convey the work pieces to the next process
- Three work pieces (A , B , C) which are already in the separation modules, are assembled

Structure:
- Industrial robot with 5 axes (buckling-arm robot)
- Transversal axis (Length 500mm to 3000mm)
- Deposit table
- Separation module part A (Gear box)
- Separation module part B (Gear shaft)
- Separation module part C (Gear case)

Technical data:
- 8 digital inputs,
- 8 digital outputs

Teachware:
- Training material for the technology station
  Assembling with robot

Didactic indications:
The technology station is suitable for the instruction the terms handling techniques. The fundamental principles for the kinetics of a robot and the particularities of the programming are treated. With the additional transversal axis, you can see the repercussions on the workspace. Apart from the programming of movements and positions, the robot controller can also process and evaluate the signals. The technology station can exchange the signals and data in training with other stations.
It can be used as a single technology station.

Extent of supply:
1	5-axis buckling-arm robot
1	Transversal axis 600 mm long
1	Gripper
1	Control unit
1	Teach pendant
1	Magazine
1	Deposit table
1	Technical documentation
1	Underframe

Order-No. W4764-1Q

➢ Technology stations MHM

High-shelf storage
(Station R)

Task:
- Storage of any work piece by means of the chaotic store keeping
- Convey the work pieces to the next process

Structure:
- High-shelf storage with 40 pallets
- 3-axial handling unit
- Pallets
- Bar code reader

Technical data:
- 8 digital inputs,
- 8 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  High-shelf storage

Didactic indications:

The technology station represents an automation system with complex teaching contents. The subject storage techniques is negotiated according to the didactic prepared industrial components by means of the practical examples. The bandwidth reaches from the conventional storage logistics until to the chaotic stock keeping. With the software the storage processes shall be controlled, observed and evaluated. In combination with other stations the signals and data can be exchanged and can be further processed to new in training in the superior systems.

Extent of supply:

1   High-shelf storage with 40 places
40 Palettes
1   Barcode reader
1   3-axis handling unit
1   Management software of high-shelf storage
1   Hardware
1   Technical documentation
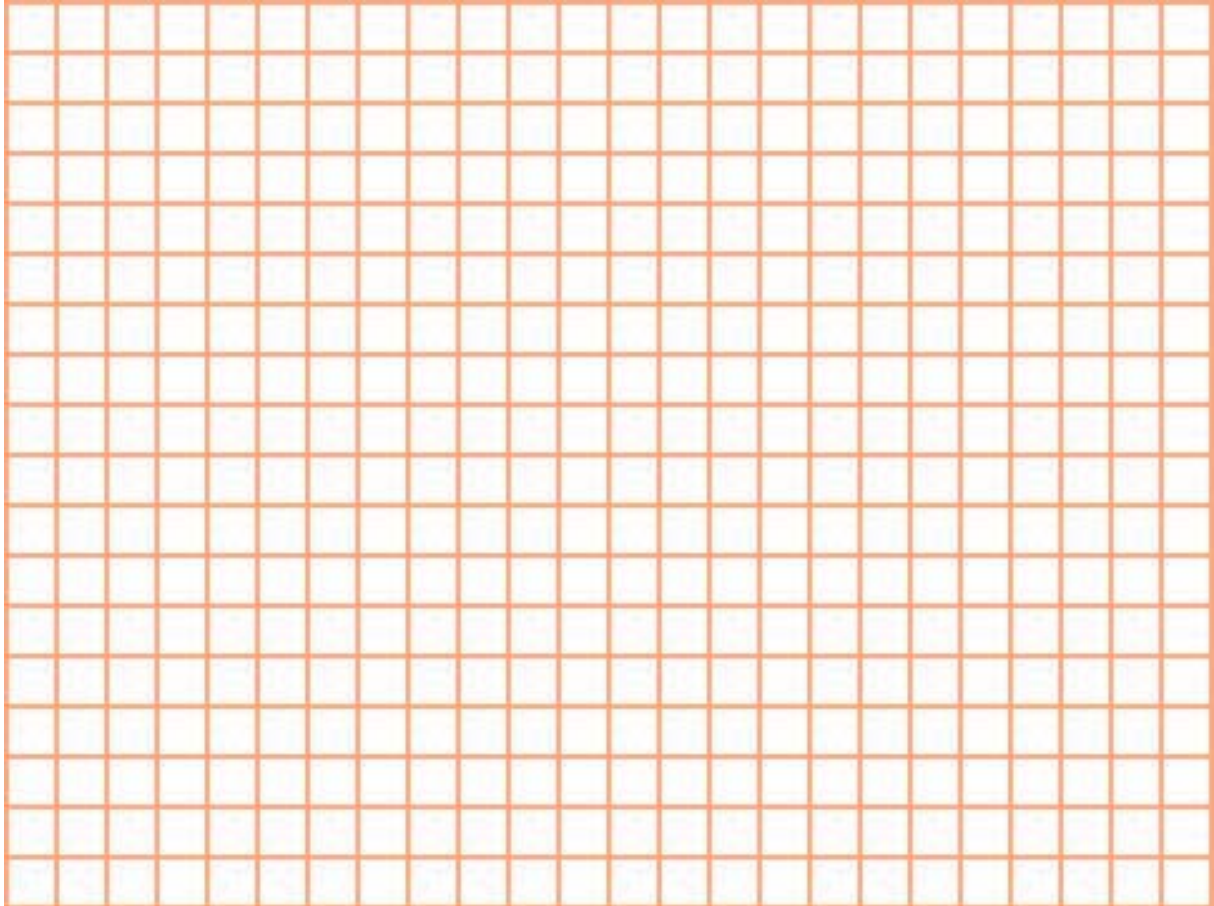1   Underframe

Optional addition:
- Mobile underframe
  (Order-No.: W4764-5A)
- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1R

➢ Technology stations MHM

**Customer's application
(Station S)**

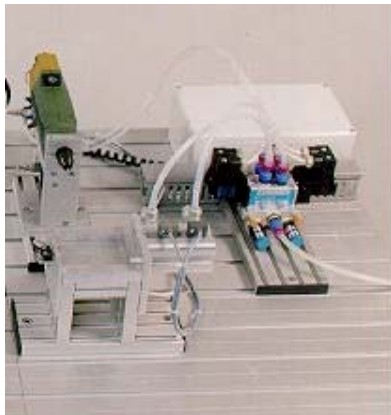**Organize here your own technology system**

**We appreciate to support you
by planning your own system**

Order-No. W4764-1S-Z

➢ Technology stations MHM

**Processing and handling with
rotary indexing table
(Station T)**

Task:
- Drilling of work pieces
- Convey the work pieces to the next process

Structure:
- 24V DC-drilling machine with pneumatic infeed
- Pneumatic work piece holding
- Electrical rotary indexing table
- Quality test by checking the drill whole

Technical data:
- 8 digital inputs,
- 6 digital outputs
- necessary working pressure : min. 6 bars , max. 8 bars

Teachware:
- Training material for the technology station
  Processing and handling with electric rotary indexing table

Didactic indications:

The technology station negotiates awareness of function and application of industrial components of the branches material processing and handling by using an electric rotary indexing table. Using the example of the machining method drilling, the signals and the safety-technical contexts are imposing confronted. The didactical prepared components are clearly developed for the training. Complexly tasks with higher claim can be done for the branch maintenance. So the maintenance time and the operational hour counter can be recorded in the control program for controlling the wear of tools. The technology station can be used as single station or together with other stations

Extent of supply:
1   Pneumatic drilling module
1   Electric rotary indexing table
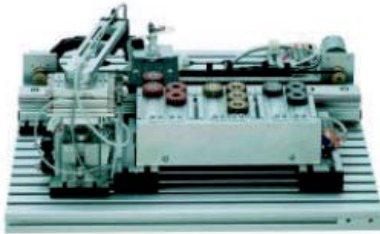1   Profile plate complete
1   Hardware
1   Technical documentation

Optional addition:
- Mobile underframe (Order-No.: W4764-5A)
- Control panel (Order-No.: W4764-6A)

Order-No. W4764-1T

➢ Technology stations MHM

**Sorting and handling
(Station U)**

Task:

- Sorting of work pieces by type or by material and color

Structure:

- Linear conveyer
- Rotary gripper
- work piece storage
- Motor control

Technical data:

- 21 digital inputs for sensors, 11 digital outputs for actors
- necessary working pressure : min. 6 bars , max. 8 bars
- 17 sensors
- 10 Actuators

Teachware:

- Training material for the technology station
  Storing and handling

Didactic indications:

The technology station negotiates awareness of function and application of industrial components of the branch storage. Depending on the test result at the testing station, this allows work pieces to be stored according to material type and/or processed state. The rotary gripper picks up the work pieces from the processing station and places them on the transport saddle of the linear conveyor. This linear conveyor is equipped with an optical positioning unit, which can scan six different positions in the storage system. The didactical prepared components are clearly developed for the training. Complexly tasks with higher claim can be done for the branch maintenance. So the maintenance time and the operational hour counter can be recorded in the control program for controlling the wear of tools. The technology station can be used as single station or together with other stations.

Extent of supply:

1   Pneumatic rotary gripper
1   work piece storage
1   Motor control
1   Profile plate complete
1   Hardware
1   Technical documentation

Optional addition:

- Control panel
  (Order-No.: W4764-6A)

Order-No. W4764-1T

➢ Basic module for the optimal entry

**Mechatronic training module
(Module A)**

Task:
- Entry into the mechatronic
- Basic module to train at mechatronic systems

Structure:
- On an aluminum basic plate mechanical, electrical, pneumatic and electric-pneumatic modules can be built and used as functional processes fast and easily

Teachware:
- Training material for Entry into the mechatronic

Didactic indications:
Instruction in the combines between mechanical, electrical, pneumatic, electric-pneumatic and control-technical elements.

Extent of supply:
1 Training system
   Entry system to the mechatronic, pneumatic and control technology
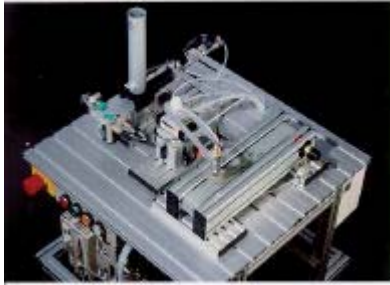
Optional addition:
- Mechatronic coupling module
- Teacher working book
- Student working book

Order-No. W4764-2A

➢ Basic module for the optimal entry

Compact station
(Module B)

Task:

- Entry to the mechatronic technology stations to train at mechatronic systems with the possibilities:
  adjust, programming, optimization, searching for faults

Structure:

- On an aluminum basic plate, the function modules loading, handling and transport are put together to one station

Teachware:

- Training material for Entry to the mechatronic

Didactic indications:

Instruction in the combines between mechanical, electrical, pneumatic, electric-pneumatic and control-technical elements.

Extent of supply:

1 Compact station
   Entry system to the mechatronic, pneumatic and control technology

Optional addition:

- Mechatronic coupling module
- Teacher working book
- Student working book

Order-No. W4764-2B

➤ Customer's individual special solutions

Loading, material recognition, checking, manufacturing and storage

Task:

- Mechatronic basic exercises (adjusting, mounting, checking, measuring, using)
- Making of PLC-programs for every station and for the total-installation

Structure:

- Work pieces of different material characteristic are loaded to the process and linked with a second work piece with the help of a punch-unit and afterwards stored after same materials

Teachware:

- Training materials for Entry to the mechatronic

Didactic indications:

Out of a magazine gears of most different materials are loaded to the process. In the station material recognition the material-characteristics are found out with the help of three different kinds of sensors. In station 3 plain bearings are to be put in by pressing. In station 4 the gears of same material characteristics are to be stored.

Extent of supply:

1   Mounting, transport and handling system
    Industry system for the education on the areas mechatronic, pneumatic, robotic, automation and control technology, logistics, process optimization

Optional addition:

- Mechatronic coupling module
- Teacher working book
- Student working book

Order-No. W4764-3A

WUEKRO

> ## Individual customer's solution / Installations in industry format

Mounting, transport and handling system

Task:

- Programming of buckling-arm robots, scara robots, PLC-installations with PROFIBUS
- Programming and evaluation via a assembly control center
- Work piece recognition via write and read installation

Structure:

- With a shuttle work pieces are finished at different robot mounting stations to the to one total-installation
- The unit consists of a buckling-arm robot with clutch-change-station, scara robot, transportation- and distribution system, pick- and place system, individualization system, programming software for the PLC, the robots, assembly control center- and simulation software

Teachware:

- Training material for Entry to the mechatronic

Didactic indications:

Instruction in the combines between mechanical, electrical, pneumatic, electric-pneumatic and control-technical elements

Buckling-arm robot with clutch-change station, scara robot, transportation and distribution system, pick- and place system, individualization module, programming software for the PLC, the robots, assembly control center and simulation software

Extent of supply:

1   Mounting, transport and handling system
    Industry system for the education on the areas mechatronic, pneumatic, robotic, automation and control technology, logistics, process optimization

Optional addition:

- Mechatronic coupling module
- Teacher working book
- Student working book

Order-No. W4764-4A

➢ Individual customer's solution / Installations in industry format

Manufacturing, transportation, storage and handling system

Task:

- Programming of CNC-tool machines, buckling-arm robots, scara robots, PLC-installations with PROFIBUS, high-shelf storage, programming and evaluation via manufacturing-management system

Structure:

- Out of a high-shelf storage with chaotically storage work pieces are transported via shuttle-system to the CNC-controlled machine-tools. A portal robot takes the work pieces and put them down into the tool-machines.
- After the operation they are checked for dimensional accuracy and afterwards stored again

Teachware:

- Training material for Entry to the mechatronic

Didactic indications:

Instruction in the combines between mechanical, electrical, pneumatic, electric-pneumatic and control-technical elements.

CNC-turning and milling machine, portal robot, transportation and distribution system, quality assurance system, high-shelf storage with chaotic storage and all software (CNC, PLC, robotics, storage management, manufacturing management, job-administration)

Extent of supply:

1   Mounting, transport and handling system
    Industry system for the education on the areas mechatronic, pneumatic, robotic, automation and control technology, logistics, process optimization

Optional addition:

- Mechatronic coupling module
- Teacher working book
- Student working book

Order-No. W4764-4B

WUEKRO

➢ Individual customer's solution / Installations in industry format

Manufacturing, transportation and quality evaluation system

Task:
- Programming of CNC-milling machines, buckling-arm robot with linear axis, PLC-installations with PROFIBUS
- Quality evaluation
- Operation of a manufacturing management system

Structure:
- Out of storage, work pieces are transported to the CNC-controlled milling machine
- After the operation they are checked for dimensional accuracy and afterwards stored again

Teachware:
- Training material for Entry to the mechatronic

Didactic indications:

Instruction in the combines between mechanical, electrical, pneumatic, electric-pneumatic and control-technical elements.

PC-controlled milling machine with automation installation. Loading of the CNC-machine tool through the additional side-door for the free use of the front-side. Customers robot Mitsubishi RV M1 at a transversal axis adapted. The work pieces are handed over after the production at a measuring place. Delivery all affiliated software, (CNC, PLC, robotic quality assurance).
Through the PC-control, the VCNC-machine tool is in any industry-usual syntax programmable, e.g. SIEMENS 840D, Heidenhain TNC430, FANUC 21T, NUM 1060.

Extent of supply:
1 Mounting, transport and handling system
   Industry system for the education on the areas mechatronic, pneumatic, robotic, automation and control technology, logistics, process optimization

Optional addition:
- Mechatronic coupling module
- Teacher working book
- Student working book

Order-No. W4764-4C

➢ Individual customer's solution / Installations in industry format

Manufacturing, transportation system with digital camera supervision

Task:

- Programming of robots (buckling-arm robots, scara robots), PLC-installations.
- Palette-transportation-system, identification system (write and read unit),
- Visualize system and service of a manufacturing management system.
- Data transfer of all active elements through ETHERNET.

Structure:

- From a camp, work pieces are put on a transportation-system and correspond to their complexity at 4 bypass-positions by means of buckling-arm robots or scara robots to one prefabricated part installed

Teachware:

- Training material for Entry to the mechatronic

Didactic indications:

Instruction in the combines between mechanical, electrical, pneumatic, electric-pneumatic and control-technical elements.

With one ETHERNET are connected: one manufacturing-management system, two buckling-arm robots type Stäubli RX60, one scara robot Adapt ONE, one scara robot Adapt 600, one palette-transporting-system (7,5 m long, 2,5 m wide, 15 kg load-capacity) with four bypasses, two CD-cameras for the part-identification and situation-recognition, one identification system, seven PLC-installations and nine PC's.

Extent of supply:

1. Mounting, transport and handling system
   Industry system for the education on the areas mechatronic, pneumatic, robotic, automation and control technology, logistics, process optimization

Optional addition:

- Mechatronic coupling module
- Teacher working book
- Student working book

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