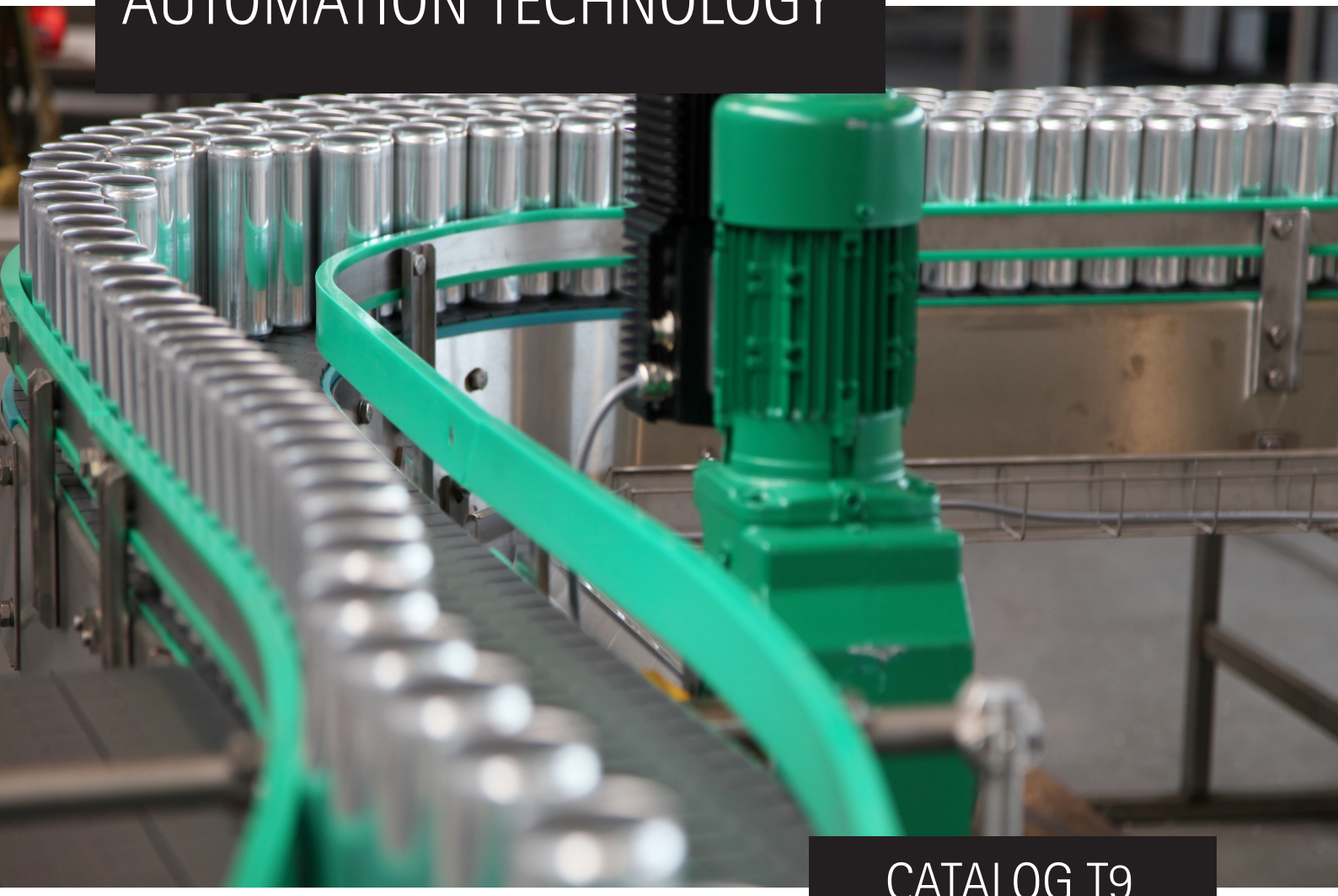
PHYSICS
CHEMISTRY
BIOLOGY
ENGINEERING

LD DIDACTIC

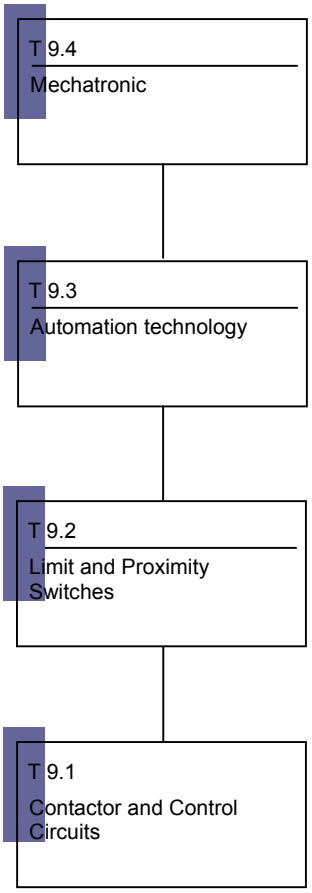
AUTOMATION TECHNOLOGY



CATALOG T9

LEYBOLD®

Content



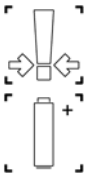
Druckstand: Februar 2011

Content

Symbols:


Experiment literature included in the package


Software included in the package


Accesories required

Battery required


Bus-capable (USB, PROFIBUS, ...)

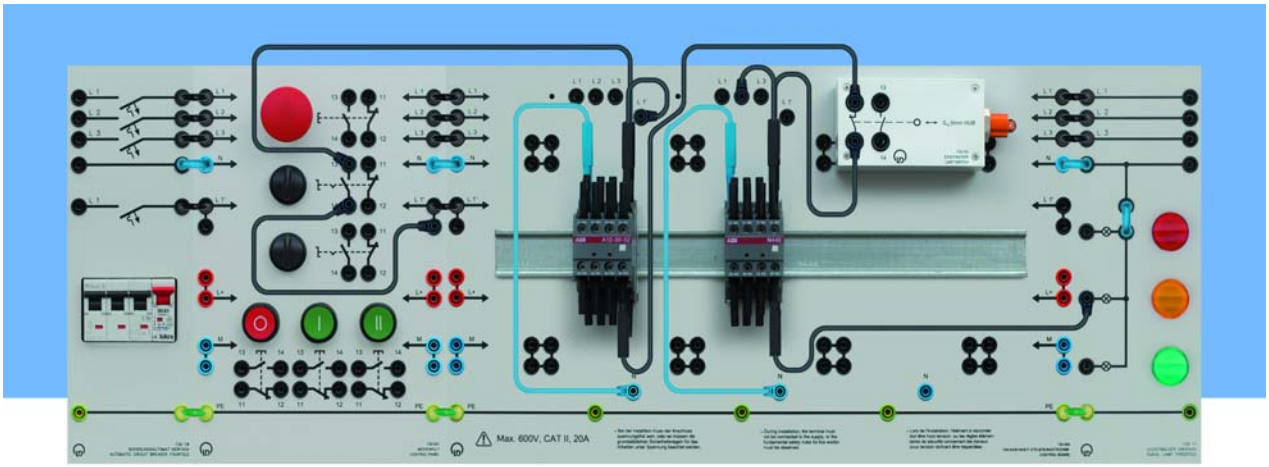

Equipment is COM3LAB compatible

The Concept

LD DIDACTIC has didactically engineered SIMATIC components for practice-oriented vocational training and education. For the connection of these components to peripheral equipment we have developed a training panel equipped with 4-mm safety sockets for the mounting of basic modules as well as their input and output modules. In addition to the basic equipment sets completely configured found in this catalogue you can also select the CPU appropriate for your special needs and combine this with input/output modules of your choice, or simply extend the already configured equipment sets.
The Automation Technology multimedia course and the vivid models as well as networking the components the programmable controller PLC is extended into an entire system the guaranteeing objective-oriented training.

- Fundamentals of control technology
- Fundamentals of PLC programming with COM3LAB course, bus and automation technology
- Programming in accordance with IEC 1131-3 (LAD, FBD, STL)
- Application models (PC process simulations as well as hardware models)
- The networking of automation technology components (PROFIBUS-DP, MPI Multiple Point Interface , AS-I (Actuator/Sensor Interface) sensor technology
- Sensor technology
- Control relays and logic
- Mechatronic System

T 9.1 Contactor and control circuits



Selection of Training Objectives

- Functioning of break-contact and make-contact elements
- Logical interconnections with break-contact and make-contact elements
- Automatic locking of a contactor
- Contactor locking
- Sequential actuation circuit with power-off
- Button locking
- Contactor circuit with motor protection switch and motor protection relay
- Stepping operation and continuous operation
- On-delay auxiliary contactors and delayed-action relay
- Stator-resistance starting circuit
- Star-delta circuit
- Reversing star-delta circuit
- Dahlander and Reversing Dahlander circuit
- Pole-switchable motor with separate windings

T 9.1 Contactor and control circuits

Practical training in control technology

The new apparatus appropriate for practical applications allows the cost-efficient setting up of basic control engineering circuits as well as the free design of larger projects.
Simple control circuits have up to the present day been economically realised by means of contactor circuits. However, even complex SPC controls cannot operate without external protection mechanisms such as button locks or contactor locks.

The modular experimentation panel system “T 9.1 Contactor and control circuits” contains the various buttons, contactors, indicator lights etc, and can be sensibly extended by Electrical machines (T10) and the “T 9.2 Limit switches and proximity switches” apparatus. The setting up of control circuits and power circuits is possible without difficulty. All connections are made via 4 mm safety leads without risk of contact. The comprehensive accompanying literature contains a teacher part and a student practise part. It covers everything from the method of functioning of the individual components to the realisation of complex machine circuits and expert circuits. The T 9.1 apparatus forms the basis for the subsequent PLC training.

All devices are equipped with special safety sockets.

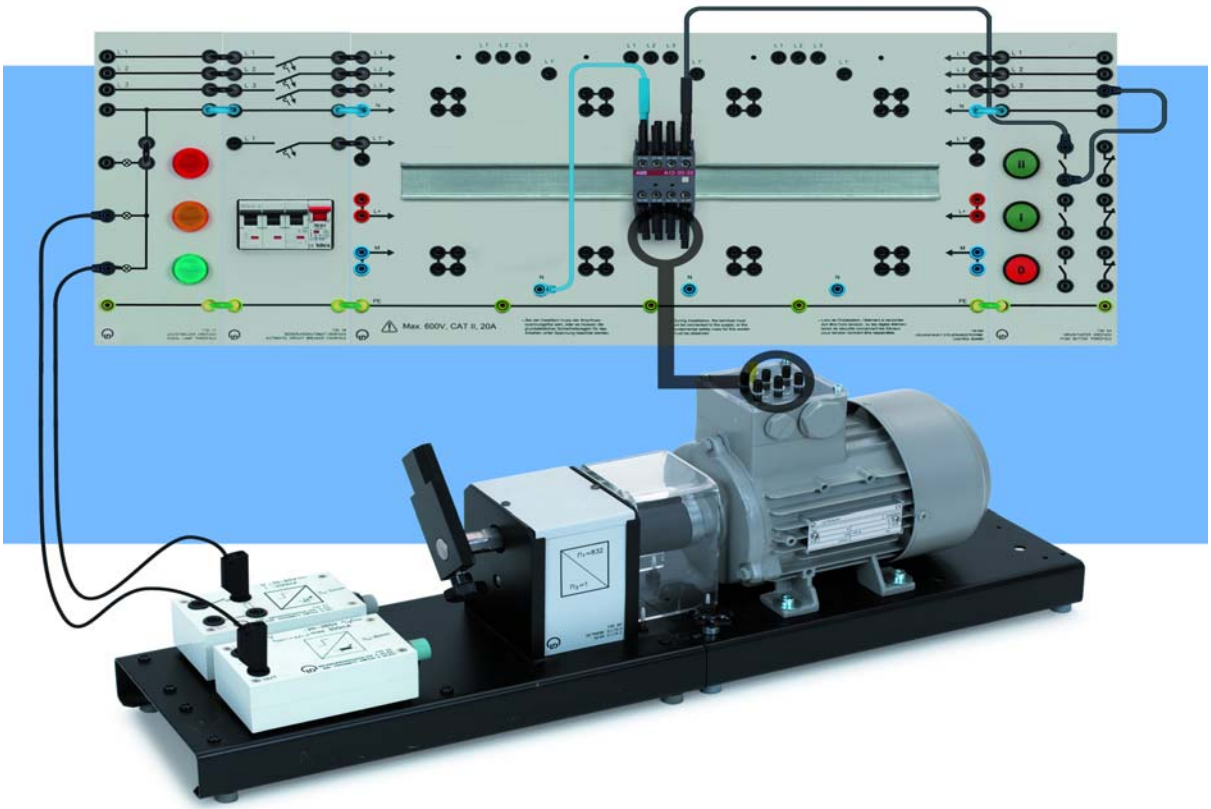
T 9.1

Contactor and control circuits

Quantity	Cat.-No.	Description
2	730 17	Signal Lamp, Threefold
1	730 18	Autom. Circ. Breaker Fourfold
3	730 93	Limit Switch 1NO 1NC
2	730 002	Operating panel
2	730 004	Base unit control circuits
1	730 009	Storage box for control circuit
2	730 072	Multi-function relays
3	730 121	Auxiliary Contactor 4NO 4NC
5	730 131	Power Contactor 3-pole 3NC 2NO
2	732 131	Motor Protection Switch 0.6-1 A
3	732 151	Motor Protection Relay 0.6-1 A

For getting the complete equipment list please look at an actual offer.

T 9.2 Limit and proximity switches



Selection of Training Objectives

- Mechanical limit switch
- Inductive proximity switch
- Capacitive proximity switch
- Optical proximity switch

T 9.2 Limit and proximity switches

T9.2.1.3

Gear 0,3 with limit switches

Quantity	Cat. No.	Description
1	730 18	Autom. Circ. Breaker Fourfold
1	730 90	Gear with 2 Switch Arms 0.1/0.3
2	730 93	Endtaster 1S 1Ö
1	730 002	Operating panel
1	730 004	Base unit control circuits
3	730 131	Power Contactor 3-pole 3NC 2NO
1	732 151	Motor Protection Relay 0.6-1

For getting the complete equipment list please look at an actual offer.

T9.2.2

Inductive proximity switches

Quantity	Cat. No.	Description
1	730 17	Signal Lamp, Threefold
1	730 18	Autom. Circ. Breaker Fourfold
1	730 90	Gear with 2 Switch Arms 0.1/0.3
1	730 94	Induktiver Näherungsschalter 2-AC/DC
1	730 95	Induktiver Näherungsschalter 3-DC
1	730 002	Operating panel
1	730 004	Base unit control circuits
2	730 131	Power Contactor 3-pole 3NC 2NO
1	732 151	Motor Protection Relay 0.6-1
2	730 381	Relais 24V 1NO 1NC

For getting the complete equipment list please look at an actual offer.

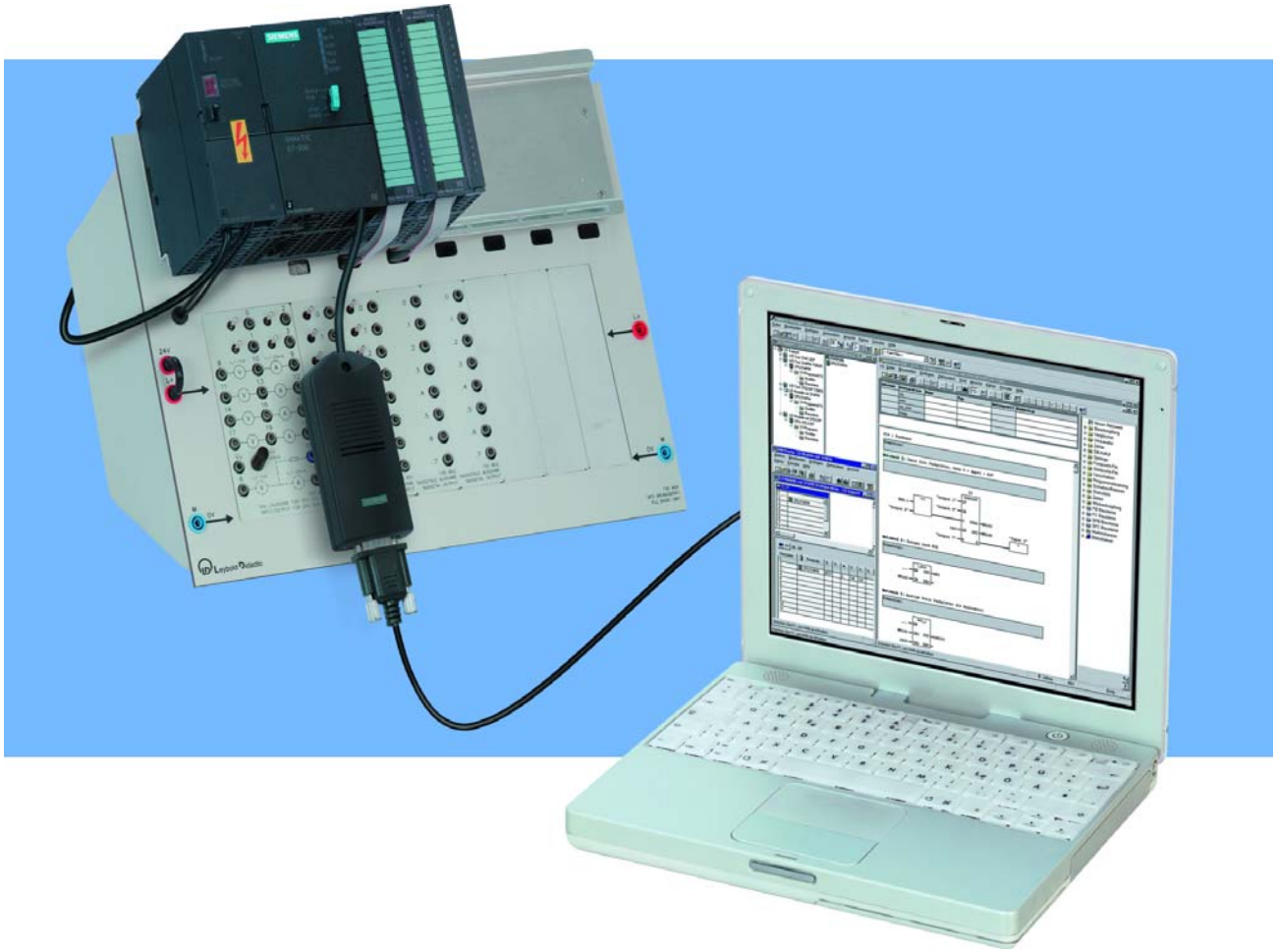
T9.2.3

Capacitive and optical proximity switches

Quantity	Cat. No.	Description
1	730 17	Signal Lamp, Threefold
1	730 18	Autom. Circ. Breaker Fourfold
1	730 90	Gear with 2 Switch Arms 0.1/0.3
1	730 95	Inductive Proximity Switch 3-DC
1	730 97	Capacitive Proximity Switch 3-DC
1	730 99	Optischer Näherungsschalter 3-DC
1	730 002	Operating panel
1	730 004	Base unit control circuits
2	730 131	Power Contactor 3-pole 3NC 2NO
1	732 151	Motor Protection Relay 0.6-1
2	730 381	Relais 24V 1NO 1NC

For getting the complete equipment list please look at an actual offer.

T 9.3.1 Programmable logic control S7-300



Selection of Training Objectives

- PLC setup and project planning
- Commissioning, testing and troubleshooting of an automation system
- Programming in compliance with IEC 1131-1 (STL, LAD, FBD)
- Documenting and archiving

T 9.3.1 Programmable logic control S7-300

Practice automation tasks are implemented - just like they are in industry – on CPUs of the Siemens 300 series with the STEP 7 software package. This software makes the programming of the automation devices in compliance with IEC 1131-1 possible. Editors are available for the LAD (ladder diagram), FBD (function block diagram), and STL (statement list) programming languages as well as tools for software testing and hardware configuration.

Software Step7

Ausstattungsliste T9.3.1.1

SPS SIMATIC S7

Quantity	Cat. No.	Description
1	730 820	SIMATIC S7-CPU 315C 2PN/DP
		Cat. No. 730820 can replaced by:
1	*730 821*	SIMATIC S7-CPU 314C 2DP
1	730 871	Software Step 7
		Cat no. 730871 can replaced by (Only for Schools and training centres in the not commercial scope):
1	*730 870*	Simatic S7 Trainer Package
1	730 880	Complete Step 7 Documentation (CD)
1	730 879USB	S7 PC-Adapter USB

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.3.1 Programmable logic control S7-300

COM3LAB mit Kurs
Bus- und Automatisierungstechnik

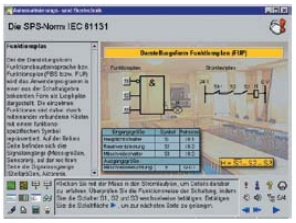
Selection of Training Objectives

- Fundamentals and terminology (IEC 1131) for PLC programming
- Logic functions, timing, counters, numeric processing and program editing
- Simple sensors and signal conditioning with analog/digital converters and multiplexers
- Project planning of an automation system
- PLC programming and commissioning
- Data transfer structures and protocols
- Connecting Fieldbus systems and putting them into operation
- Transmitting and error analysis
- Connecting of external components
- Integrating PROFIBUS stations

Fundamentals of PLC programming in the COM3LAB multimedia learning environment

The COM3LAB Course, Bus and Automation Technology (700 31) presents fundamental concepts of programmable logic controllers (PLC) and demonstrates their capabilities for being networked, including networking with sensors and actuators, on the basis of the PROFIBUS. Many examples, explanations, exercises and practical problems explicitly present PLC fundamentals and behavior. The compact, yet complex, hardware accompanying this course makes it possible for you to gain real practice-oriented experience with the instructional material. Options for connecting additional external PROFIBUS components offer you comprehensive means to form constellations for experimenting with bus and automation technology sequences that are realistic and yet easy to set up.

- 24 digital inputs
- 8 analog inputs
- sensors: temperature sensor, photo
- 20 digital outputs
- 2 analog outputs
- 1 motor
- 1 dimmable lamp
- 4 mm sockets for external applications
- PROFIBUS (1 master, 2 slaves)
- connection for external PROFIBUS components



T9.3.1.3

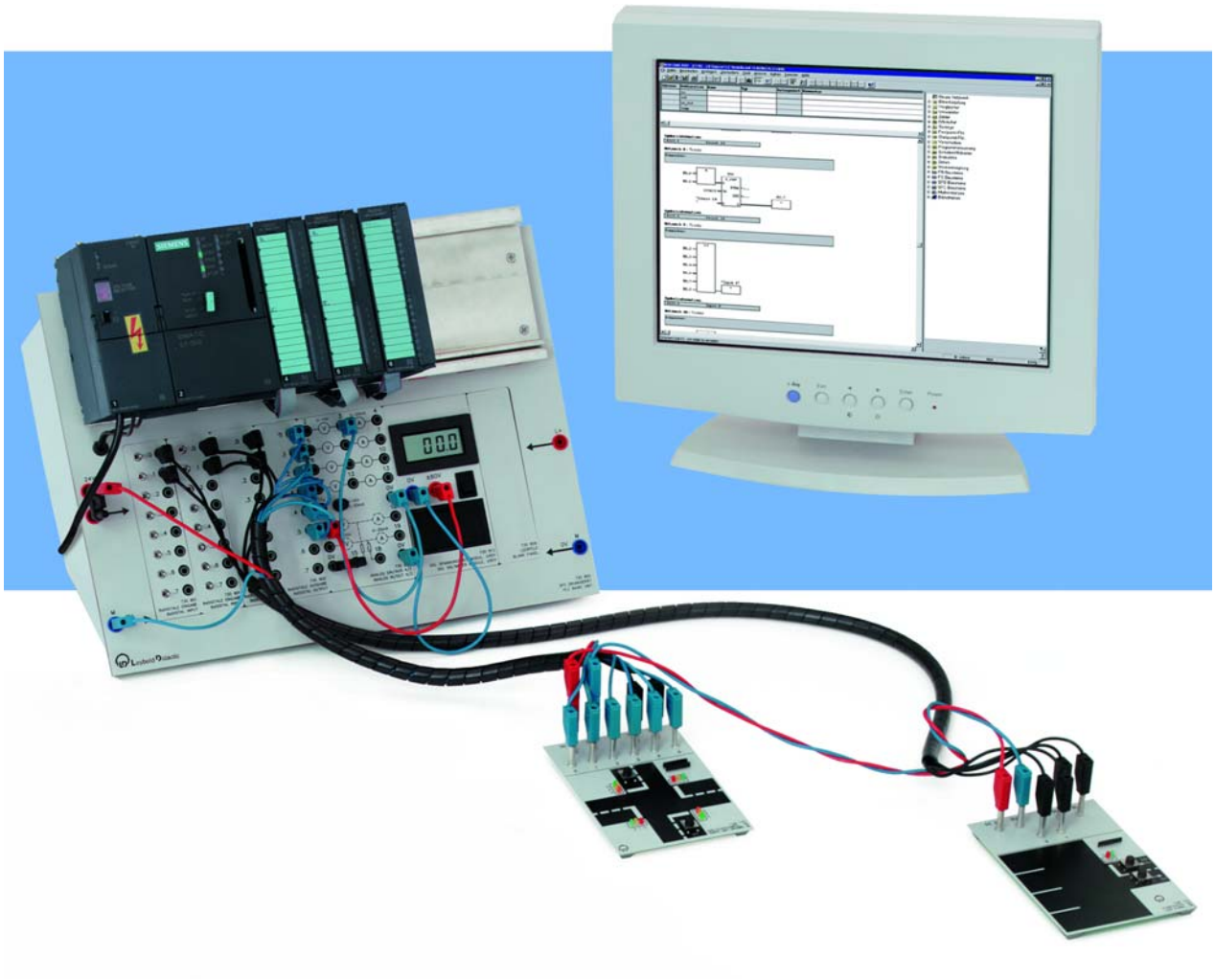
COM3LAB Kurs Automatisierungs- und Bustechnik

Quantity	Cat. No.	Description
1	700 31	COM3LAB Course: Automation and bus technology
		Additional required:
1	700 00USB	COM3LAB Master Unit (USB)
1	700 00CBTEN	COM3LAB Software English

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.3.2 PLC Applications



Selection of Training Objectives

- Digitale Prozessabläufe analysieren
- Programmierung nach IEC 1131-1 (AWL, KOP, FUP)
- Inbetriebnahme, Test und Fehlersuche an Hardware-Modellen

The ideal introduction to the complex world of automation technology

Various LD Didactic application models have been developed to exercise and instill programming techniques (constants, variables, block structures, etc.) as well as demonstrate the application of PLC resources (markers, timing, system functions, etc.). These have been conceived such that clearly arranged equipment engenders rapid learning success. These models are available as table-top models or PC simulations. The traffic light and park house hardware models are an ideal introductions to the complex world of PLC programming.

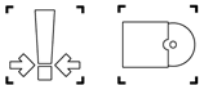
T9.3.2.1

Hardware Models

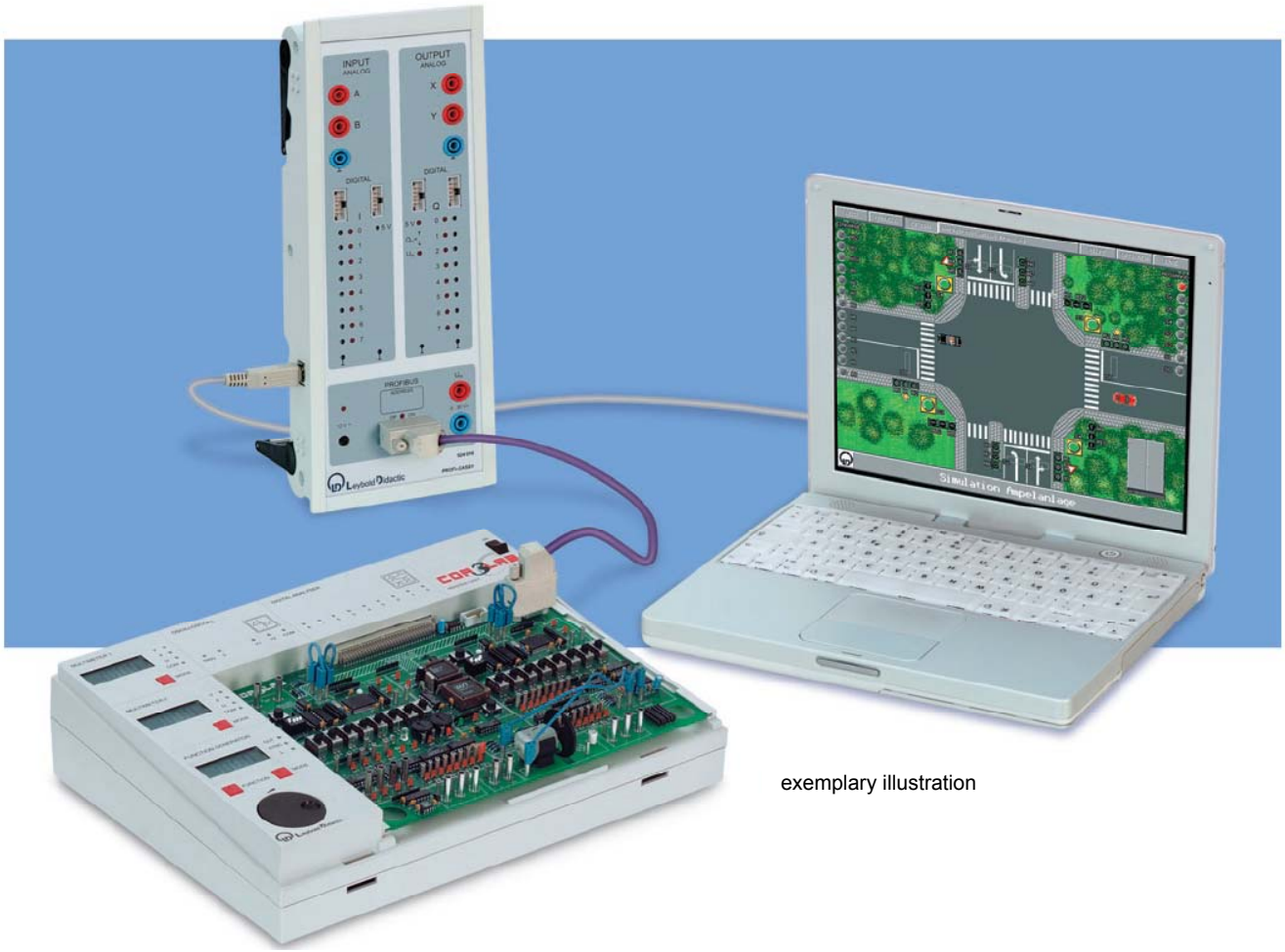
Quantity	Cat. No.	Description
1	728 740	Traffic Light Crossing,TM
1	728 741	Car Park, TM
1	730 820	SIMATIC S7-CPU 315C 2PN/DP
		Cat. No. 730820 can replaced by:
1	730 821	SIMATIC S7-CPU 314C 2DP
1	730 871	Software Step 7
		Cat no. 730871 can replaced by (Only for Schools and training centres in the not commercial scope):
1	730 870	Simatic S7 Trainer Package
1	730 880	Complete Step 7 Documentation (CD)
1	730 879USB	S7 PC-Adapter USB

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.



T 9.3.2 PLC Applications



exemplary illustration

Selection of Training Objectives

- Analogue and digital process flow analysis
- Programming in compliance with IEC 1131-1 (STL, LAD, FBD
- Commissioning, testing and troubleshooting on technologically differing equipment
- Simulation of process flows
- Centralized operation and monitoring of equipment and processes

Complex processes clearly presented

When the Profi-CASSY is combined with CBS 9 software models, the result is a universal equipment simulator. This hardware/software combination is connected on one side, via PROFIBUS or directly with a flat cable, to the PLC and, on the other side, via USB to a PC. This gives the PC access to 16 digital and 2 analog inputs and outputs.
Process simulations are available for the most diverse equipment. These simulators are easily installed on the PC. Profi-CASSY makes the equipment‘s actuators and sensors accessible to an external, real controller. Operating elements on the simulated equipment can be activated with the PC‘s mouse or keyboard.
A real PLC takes over control of the equipment. PLC outputsare connected to Profi-CASSY inputs, and thereby the equipment‘s actuators.
PLC inputs are connected to Profi-CASSY outputs, which allows acquisition of all of the equipment simulator‘s sensor signals.

Profi-CASSY is the intelligent interface for many applications required for vocational training. Digital and analogue inputs/outputs in conjunction with PROFIBUS-DP and USB interfaces open up many other application possibilitis.

- Instrumentation and control techniques with CASSY-LAB or Winfact
- Digital and microcomputer technology as well as COM3LAB

T9.3.2.2

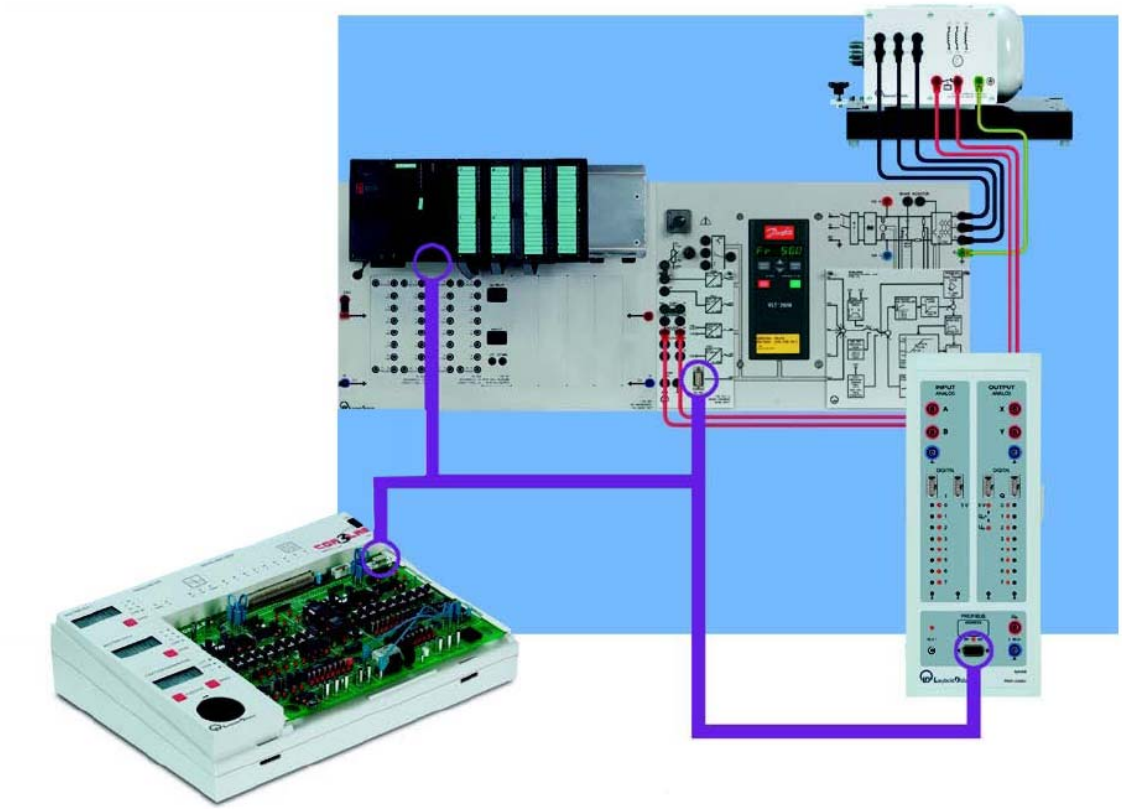
Software Models

Quantity	Cat. No.	Description
1	524 016	Profi-CASSY
1	730 431	PROFIBUSConnection Cable
		Cat no. 730 431 can replaced by
1	728 799	Set of Connection Cable, 10-pole
1	728 872	Software: 5 Modelle CBS 9 (25 Platz-Lizenz)
		Cat no. 728 872 can replaced:
1	728 871	Software: 5 Modells CBS 9 (single user)
1	730 823	Erforderliches Zubehör
1		PLC (PROFIBUSinterface recommended) and Software Step7 required

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.3.3 PROFIBUS - DP

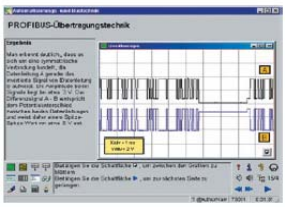


Selection of Training Objectives

- Centralized operation and monitoring of decentralized equipment
- Connecting and commissioning Fieldbus systems
- Connecting differing PROFIBUS stations
- Testing and troubleshooting on the PROFIBUS

T 9.3.3 PROFIBUS - DP

From the fundamentals of PLC to a complex networked system



The simple introduction to the complex world of automation technology is child's play with the practical COM3LAB multimedia course „Bus and Automation Technology" (700 31). This course conveys program logic controller (PLC) fundamentals through its extensive examples and exercises. Building on these fundamentals, the networking of controllers, including sensors and actuators, is treated with the PROFIBUS approach. The knowledge gained in this course is the basis for dealing with real industry devices. These prepared training components are realistic representations of quite complex mechatronic systems which include, for example, PROFIBUS (used here with frequency converter and squirrel-cage motor), or actuator/sensor interface (AS-i).

T9.3.3A

PROFIBUS-DP (with Step 7 Single User Lisence)

Quantity	Cat. No.	Description
1	730 821	SIMATIC S7-CPU 314C-2DP
1	730 871	Software Step 7
1	730 880	Complete Step 7 Documentation (CD)
1	730 879USB	S7 PC-Adapter USB
1	732 104	Squirrel Cage Motor 230/400 V 0,3
1	735 312	Industrial Frequency Converter 300 W
1	735 314	LCP2 Local Control Panel
1	730 4312	PROFIBUS Cable
2	730 4313	Bus connecting plug RS 485

Frequency converter/motor 0.3
with PROFIBUS connection

Personal Computer with operating system required !!!

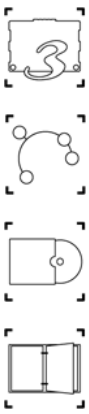
For getting the complete equipment list please look at an actual offer.

T9.3.3B

PROFIBUS-DP (with Step 7 Trainerpackage)

(Only for Schools and training centres in the not commercial scope):)

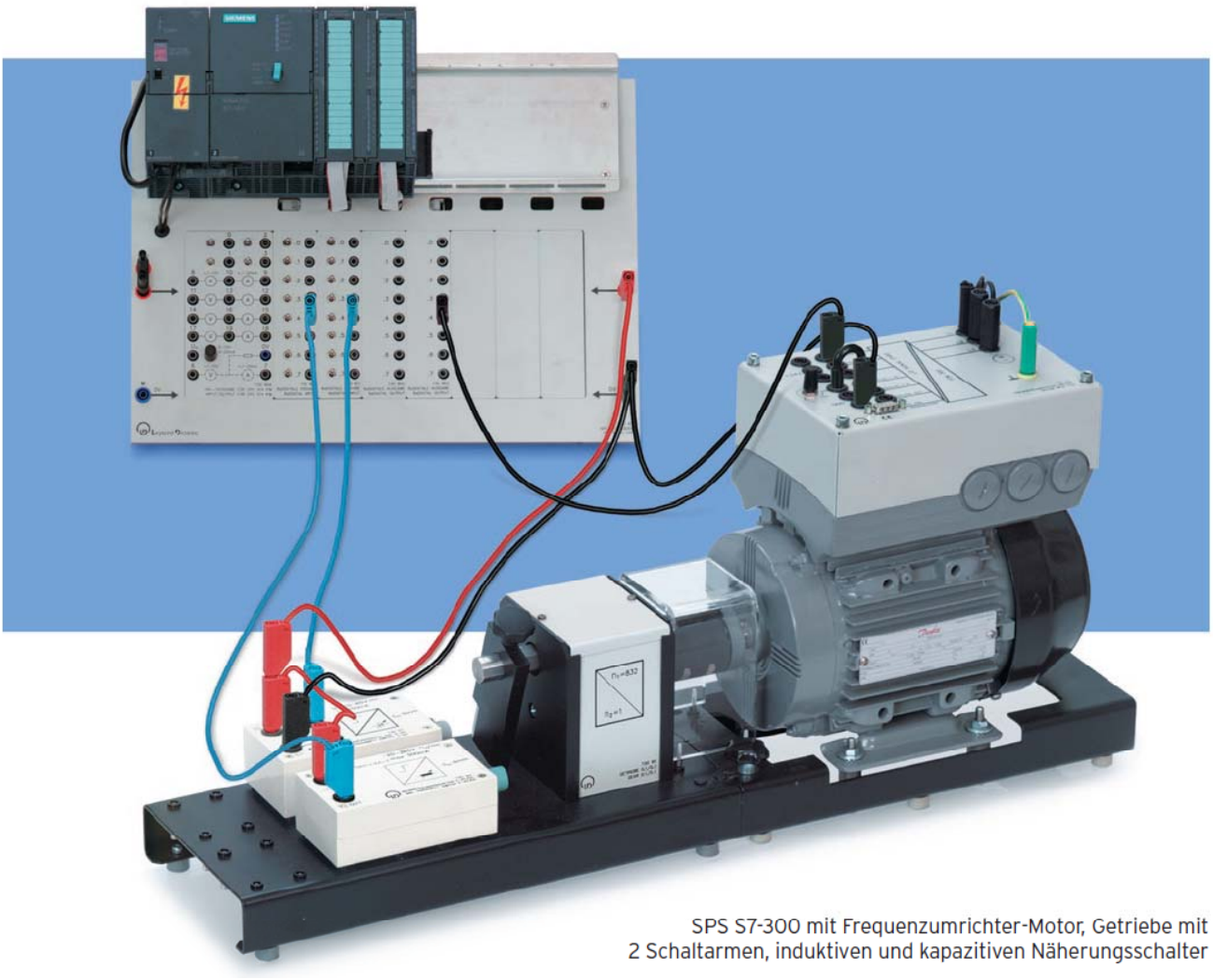
Quantity	Cat. No.	Description
1	730 821	SIMATIC S7-CPU 314C-2DP
1	730 870	Simatic S7 Trainer Package
1	730 880	Complete Step 7 Documentation (CD)
1	730 879USB	S7 PC-Adapter USB
1	732 104	Squirrel Cage Motor 230/400 V 0,3
1	735 312	Industrial Frequency Converter 300 W
1	735 314	LCP2 Local Control Panel
1	730 4312	PROFIBUS Cable
2	730 4313	Bus connecting plug RS 485



Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.3.4 Sensor Technology



SPS S7-300 mit Frequenzumrichter-Motor, Getriebe mit
2 Schaltarmen, induktiven und kapazitiven Näherungsschalter

Selection of Training Objectives

- Sensor behavior and applications
- Checking and setting sensors
- Connecting different kinds of sensors to a PLC
- Material recognition, frequency and rotary speed measurements

T 9.3.4 Sensor Technology

The ideal introduction to automation sensor Technology

The Sensor Compact Trainer is the perfect complementation for the education of industrial Sensors in the automation technology

The basic set for sensor technology consists of limit switches and proximity switches. These are used to clearly convey fundamental concepts of sensor technology in automation.

T9.3.4A

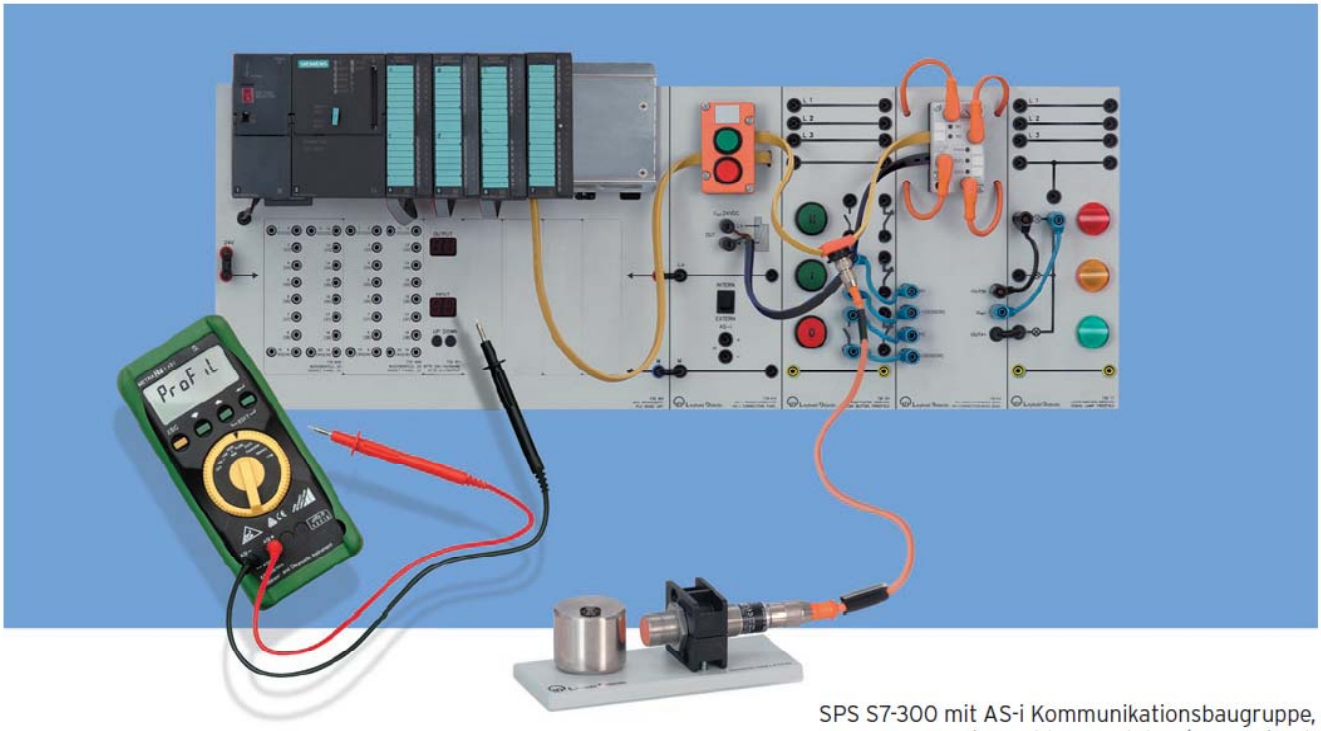
Sensor Technology

Quantity	Cat. No.	Description
1	730 90	Gear with 2 Switch Arms 0.1/0.3
1	730 93	Limit Switch 1NO 1NC
1	730 95	Indunctive Proximity Switch 3-DC
1	730 97	Capazitive Proximity Switch 3-DC
1	732 46	Motor with FCC 0.3
1	730 820	SIMATIC S7-CPU 315C 2PN/DP
		Cat. No. 730820 can replaced by:
1	730 821	SIMATIC S7-CPU 314C 2DP
1	730 871	Software Step 7
		Cat no. 730871 can replaced by (Only for Schools and training centres in the not commercial scope):
1	730 870	Simatic S7 Trainer Package
1	730 880	Complete Step 7 Documentation (CD)
1	730 879USB	S7 PC-Adapter USB

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.3.5 AS - Interface



SPS S7-300 mit AS-i Kommunikationsbaugruppe, AS-i Anschlussmodul 2E/2A, AS-i Set, Leuchtmelder dreifach, Drucktaster dreifach und AS-i Busprüfgerät

Selection of Training Objectives

- Centralized operation and monitoring of decentralized equipment
- Connection of differing AS-i devices
- Applying special AS-i connection techniques
- Connecting bus subscribers, addressing, programming and functional

Simply AS-i Interface Instead of Cable Confusion

The actuator/sensor interface (AS-i) requires only one unshielded two-wire conductor to connect all of your actuators and sensors with the controller. The system is concise and, thanks to insulation-displacement technology, easy to assemble. In conjunction with an existing S7-300 set, an actuator/sensor system can be built up with the AS-i Communications Module as master and AS-i Connection Module 2E/2A and AS-i Set as slaves.

Employing intelligent sensors along with the AS-i bus system makes it possible to explain the function of industrial sensors in a very graphic manner. The intelligent inductive sensor contained in the AS-i Set allows example states to beInvestigated with the aid of the simulator

T9.3.5

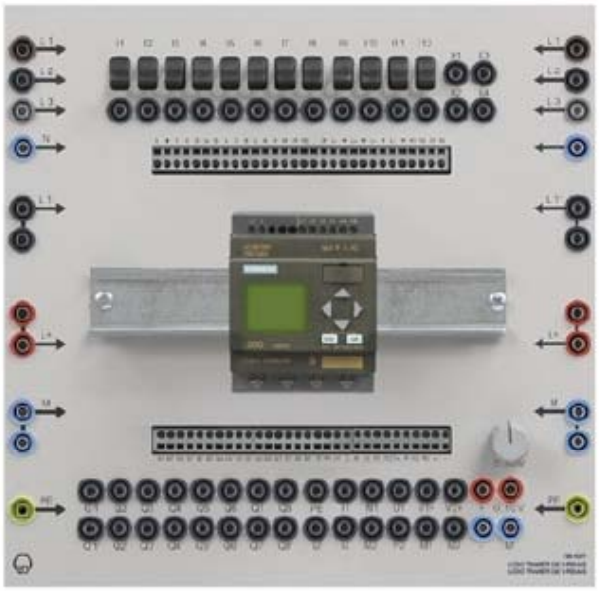
AS-Interface

Quantity	Cat. No.	Description
1	730 04	Pushbutton, Threefold
1	730 37	Signal Lamp 24V, Threefold
1	730 412	AS-I Connection Module 2E/2A
1	730 413	AS-I Set
1	730 414	AS-i Bus Testing Instrument
1	730 4101	DP / AS-I Communications Module
1	730 820	SIMATIC S7-CPU 315C 2PN/DP
		Cat. No. 730820 can replaced by:
1	730 821	SIMATIC S7-CPU 314C 2DP
1	730 871	Software Step 7
		Cat no. 730871 can replaced by (Only for Schools and training centres in the not commercial scope):
1	730 870	Simatic S7 Trainer Package
1	730 880	Complete Step 7 Documentation (CD)
1	730 879USB	S7 PC-Adapter USB

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.3.6 Steuerrelais



Selection of Training Objectives

- Connecting logic modules and testing their basic functions
- PC programming, visualization and documentation of the application

T 9.3.6 Steuerrelais

The ideal solution for smaller control tasks

The control relays or logic modules described below permit smaller control tasks to be realized quickly and easily.

Simple operation is achieved with the help of an integrated keypad and LCD indicator panel. Alternatively, switching programs can be created, simulated, duplicated, documented and archived on the PC with the LOGO!Soft software package.

Basic functions: AND, OR, NOT, NAND, NOR, XOR

Extended functions: turn-on delay, stored turn-on delay, turn-off delay, current surge relay, clock-pulse generator, counter (up and down), timer switch

T9.3.6.1

LOGO! 24V

Quantity	Cat. No.	Description
1	730 4021	LOGO! 24V Relais mounted on board
		Additional required:
1	730 406	LOGO! SOFT
1	730 4051	LOGO! Manual
1	730 4081	LOGO! cable USB

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T9.3.6.2

LOGO! 230V

Quantity	Cat. No.	Description
1	730 4031	LOGO! 230V Relais mounted on board
		Additional required:
1	730 406	LOGO! SOFT
1	730 4051	LOGO! Manual
1	730 4081	LOGO! cable USB

Personal Computer with operating system required !!!

For getting the complete equipment list please look at an actual offer.

T 9.4 Mechatronic

This conveyor belt offers various possibilities to deepen the knowledge in PLC programming. The controlling of the model can be realized e.g. using a PLC with PROFIBUS interface or with the COM3LAB Course: Automation and Bus Technology.

T9.4.1

Station Conveyor Belt

Information: Please ask for an actual offer!

Accessory Equipment

Lab Instrumentation

Cable Carts and Experimental Frames

Rollable experimental frames and setups are ideal in temporarily experiments and demonstrations. Cable carts keep the experimentation cables nearby during lab work.

Supply devices in industrial standard

The modular 19“ system offers many options for integration of power supply into the laboratory!

Integration is possible in:

- the channel module
- the desktop
- İn the high-level desktop
- as fold away variant

On demand, supply devices are even electrically lowerable.

Accessory

On the following pages there is a selection of the accessory like frames, cables, plugs, power supplies, function generators, etc. Detailed information will be included in your individual offer.

Frames

When teaching by demonstration or for laboratory experiments, transportable or permanently installed, our various profile frames provide many options.

Frame selection:

- Angled frame
- Freestanding frame
- Frame for mounting on the table
- Frame for mounting above the supply channels

Bridging plugs for connections on training panels.

Experimentation cables and cable sets with standard or safety plugs.

Accessory

Profi-CASSY

Technische Daten

- 16 digital inputs I 0 to I 15
- 16 digital outputs Q 0 to Q 15
- 2 analog voltage inputs A and B
- 2 analog outputs X and Y
- 1 PROFIBUS connection
- USB-Port for connection to the PC
- 1 CASSY – Bus for connection to Sensor- or Power-CASSY-interfaces
- Dimensions (BxHxT mm): 115 x 295 x 45
- Weight: 1 Kg

LD DIDACTIC

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1355002-T9 Automation Technology– 22.12

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